

21st African Water Association International Congress & Exhibition
and The 7th International Faecal Sludge Management Conference

IT enabled systems for monitoring citywide FSSM services

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CWAS CENTER
FOR WATER
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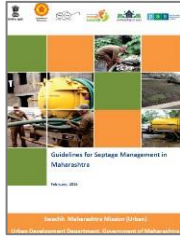


ABIDJAN 2023

In India, Maharashtra state has taken up FSSM in a big way

Increased focus on moving cities towards ODF+/++ (FSSM) after declaring Urban Maharashtra ODF on 2nd Oct. 2017

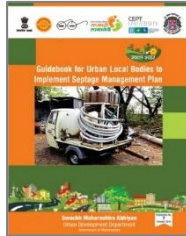
Septage Management Guidelines



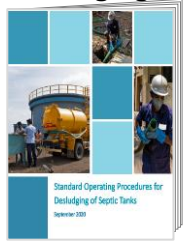
O&M of treatment plants



Step by Step Guide for ODF+



SOP for scheduled desludging



Co-treatment at own/near by STP Cities - 71

Independent FSTP Cities - 323

Category A cities: ULBs with STPs

Category B cities: Co-treatment at nearby STPs

Category C cities: Independent FSTPs

Co-treatment at own STP and accept FS from nearby cities

Co-treatment at nearby STPs within 20 km

Remaining ULBs will treat septage at FSTPs

Functional STPs

Co-treat at nearby STPs

Independent FSTP

35 cities

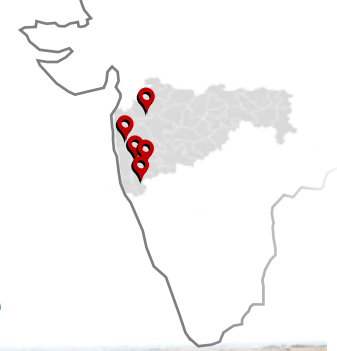
36 cities

323 cities

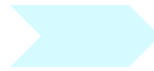
State level policy for taking up scheduled desludging across all 390 + cities . . .

Ideas demonstrated in these cities have become models for FSSM in India

Wai, Sinnar, Kolhapur, Satara, Khopoli



Comprehensive City Sanitation planning



Pioneer cities in India to implement citywide scheduled emptying of septic tanks



City Wide Inclusive Sanitation



Scheduled emptying of septic tanks



Involving Private sector for emptying operations



Levying a Sanitation tax to support operations



Faecal Sludge and Septage treatment facility (FSTP)



Use of Own (DBO) / Philanthropy funds for FSTPs



Reuse of treated wastewater



Online monitoring systems for emptying and treatment



Municipal council commitment and leadership



Gender inclusivity in sanitation



Involvement of SHGs



San Workers training

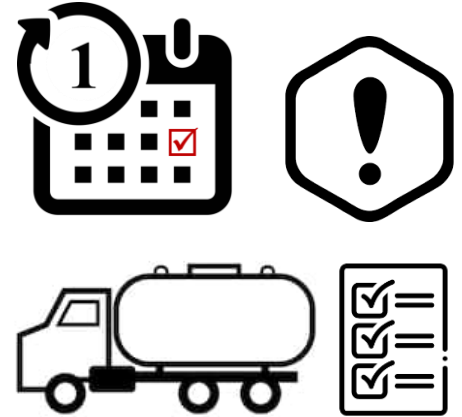


Equitable Services for Slums and Vulnerable areas



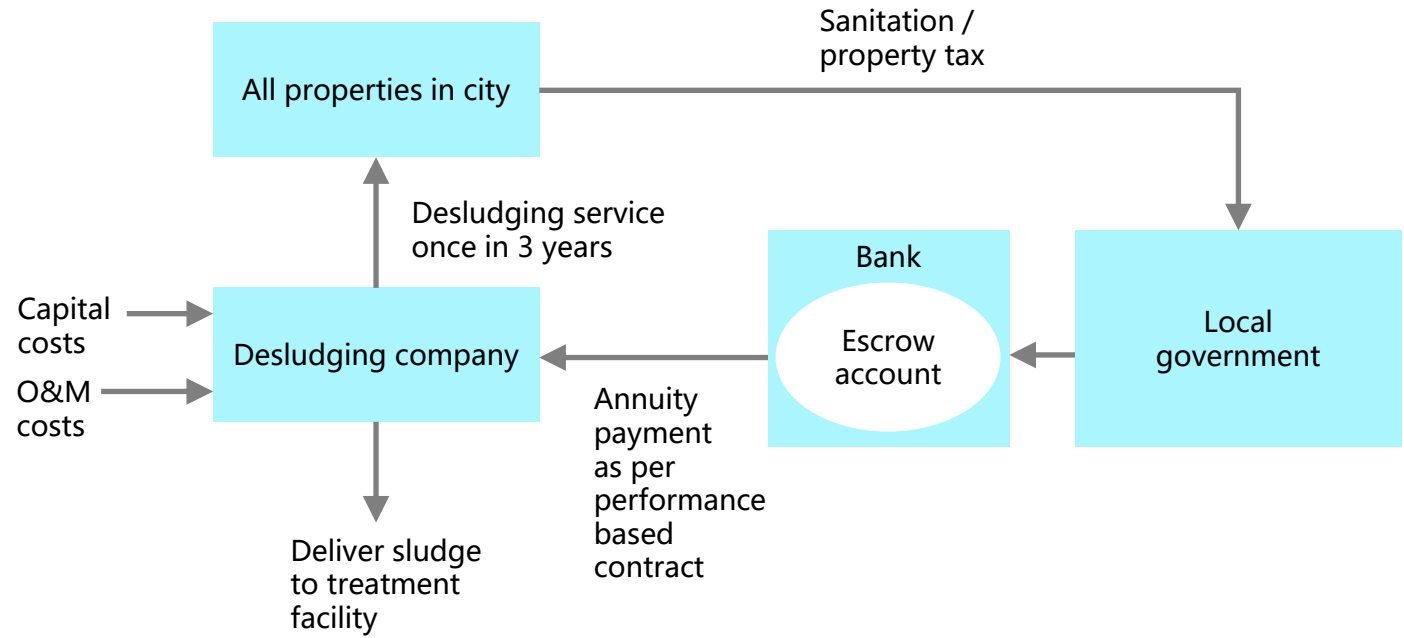
Introduction of scheduled desludging services

- Current practice of septic tank owners is to call desludging operators only when tanks overflow
- Under a scheduled desludging service...
 - all septic tanks** in the city are visited...
 - once** during a **fixed cycle** according to a **predetermined schedule**...
 - by one or more **service providers**...
 - who collect and transport fecal waste safely to a **designated site for treatment and reuse**
 - paid through **annuity payment** linked with tax collection systems



PLAM - Performance linked annuity model for scheduled desludging

-  Involving Private sector for emptying operations
-  Performance linked payments
-  Ensure safe collection



Need monitoring systems for FSSM !



1 Ensure desludging at regular intervals

2 Safe collection of sludge by following necessary protocol

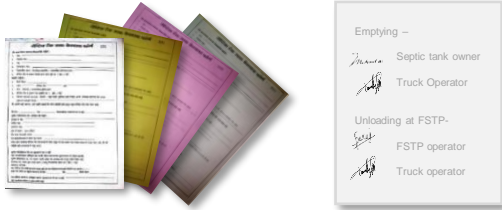
3 Safe conveyance to designated treatment site

4 Indicators for making decisions on "performance linked payments"

5 Collect data on onsite systems

Why use digital monitoring tools?

Originally - Paper based monitoring for Scheduled desludging under Performance Linked Annuity Model

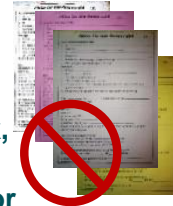


- Successful desludging = signature of the customer on a paper form at collection as well as signature of FSTP operator at unloading.
- Submission of required number of such forms is mandatory for municipality to approve monthly payment
- For issues like manual scavenging, illegal dumping, spillage, damage to septic tanks – only option is to complain by phone
- Forms only record basic data such as amount of sludge, date and time – No way to visualize geographical coverage and other performance metrics
- Not capturing post-commencement issues like customer readiness (septic tank covers not open), refusals and rescheduling, high trip ratio

“Real time” monitoring
No need to process data for results



Easy to Operate,
Reduce paperwork,
Minimize human error



Integrated monitoring system –
Across FSM service chain



Inclusive – support vernacular language



Can view progress easily and process payments

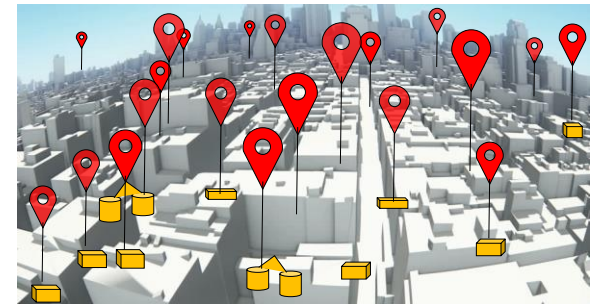


SaniTab - Mobile App for Sanitation Survey



Key Features of SaniTab application: -

- Citywide digital data collection
- Custom survey forms
- Capture location and photos
- Supports local languages



In 2015: > 10,000 properties surveyed in Wai for sanitation baseline assessment

✓ Citywide survey on :

- Toilet availability
- Type of disposal system
- Size and shape of septic tank
- Location of septic tanks
- Accessibility of septic tanks
- Last time septic tank was emptied

✓ Online dashboard for analysis of data



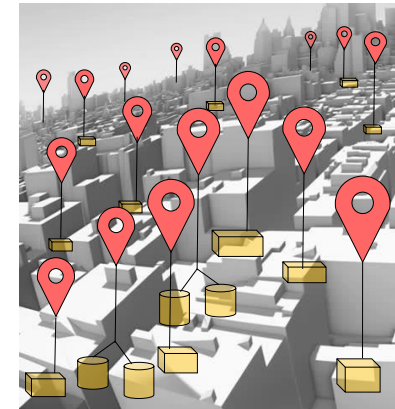
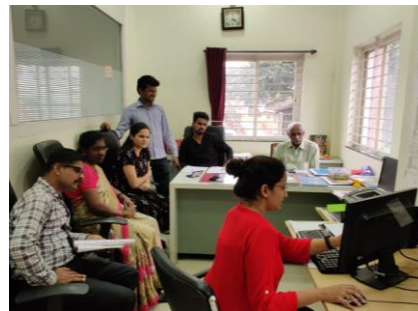
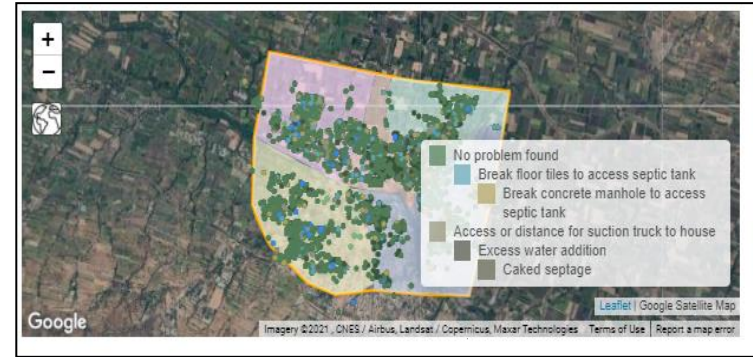
Spatial distribution of properties with and without access to individual toilets in Wai (2015).



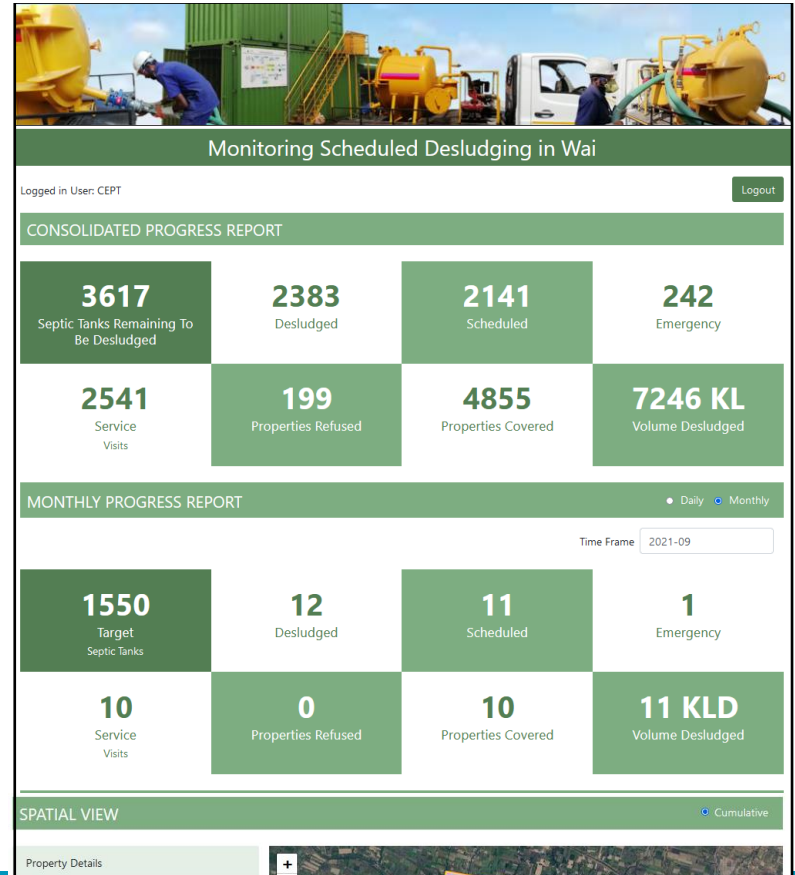
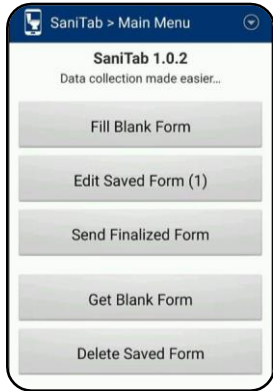
On-field surveyors conducting surveys using SaniTab

Currently – developing a database of onsite systems

- Customizable - not only as a data collection tool but also as a **monitoring system**
- **Desludging monitoring form** for monitoring performance of the desludging services the private sector service provider and the ULB truck
- **Dashboard**
- If all tanks are to be visited in 3 years – use this opportunity to create a database!
- Creating a **unique database of onsite systems** – Added questions about septic tanks



Surveyor app + Monitoring Dashboard



Downloadable MIS results

Submissions Form Management Site Admin Log Out

Filter Submissions Exported Submissions

Form Scheduled Emptying Filter: none Visualize Export Publish

Save Save As Delete Submissions per page 100 Add Filter Display Metadata

| Form | Scheduled Emptying | Filter | none | Visualize | Export | Publish | | | | | |
|--------|-------------------------|-------------------------|-----------------|-----------|--------|---------|-----------|-----|-----------|------|-----|
| guest1 | 2019-02-08 10:33:15.003 | 2019-02-08 10:32:52.517 | 358410093182955 | 417 | 1 | 6 | मण्डी अडो | 423 | prop_open | empt | yes |
| guest2 | 2019-02-08 13:16:39.99 | 2019-02-08 14:09:21.172 | 358410093182955 | 418 | 1 | 7 | मण्डी | 161 | prop_open | empt | yes |
| guest3 | 2019-02-08 10:38:54.905 | 2019-02-08 17:45:23.567 | 358410093182955 | 419 | 1 | 6 | मण्डी अडो | 449 | prop_open | empt | yes |
| guest4 | 2019-02-09 17:18:45.993 | 2019-02-11 17:52:19.161 | 358410093182955 | 423 | 1 | 6 | मण्डी अडो | 612 | prop_open | empt | yes |

FILE HOME INSERT PAGE LAYOUT FORMULAS DATA REVIEW VIEW PdfForm Enhanced 6 Creator

Clipboard Font Alignment Number Styles

| Surveyor Id | start_time | end_time | Actual Date of Empt | device_id | Form Id | Actual form | Zone No. | Ward No. | Locality Name | Property No. | Property No. | Status of property at | Natur of services o |
|-------------|------------|------------|---------------------|-------------|---------|-------------|----------|----------|------------------------------|----------------|----------------|-----------------------|---------------------|
| 1 | 31-05-2019 | 31-05-2019 | 31-May-19 | 8.69184E+14 | 18 | 118 | 3 | 3 | वाघपावडी चौकी जवळ विवाही नगर | 87.88 | 283 | Open | Scheduled Empt |
| 2 | 31-05-2019 | 31-05-2019 | 31-May-19 | 8.69184E+14 | 119 | 119 | 3 | 3 | वाघपावडी चौकी जवळ विवाही नगर | 87.88 | 336 | Open | Scheduled Empt |
| 3 | 31-05-2019 | 31-05-2019 | 31-May-19 | 8.69184E+14 | 20 | 120 | 3 | 3 | वाघपावडी चौकी जवळ विवाही नगर | 87.88 | 336 | Open | Scheduled Empt |
| 4 | 31-05-2019 | 31-05-2019 | 31-May-19 | 8.69184E+14 | 121 | 121 | 3 | 3 | वाघपावडी चौकी जवळ विवाही नगर | 87.88 | 340 | Open | Scheduled Empt |
| 5 | 01-06-2019 | 01-06-2019 | 1-Jun-19 | 8.69184E+14 | 122 | 122 | 3 | 3 | वाघपावडी चौकी जवळ विवाही नगर | 87.88 | 350 | Open | Scheduled Empt |
| 6 | 01-06-2019 | 01-06-2019 | 1-Jun-19 | 8.69184E+14 | 123 | 123 | 3 | 3 | वाघपावडी चौकी जवळ विवाही नगर | 87.88 | 349 | Open | Scheduled Empt |
| 7 | 01-06-2019 | 01-06-2019 | 1-Jun-19 | 8.69184E+14 | 124 | 124 | 3 | 3 | वाघपावडी चौकी जवळ विवाही नगर | 87.88 | 353 | Open | Scheduled Empt |
| 8 | 01-06-2019 | 01-06-2019 | 1-Jun-19 | 8.69184E+14 | 125 | 125 | 3 | 3 | वाघपावडी चौकी जवळ विवाही नगर | 87.88 | 356 | Open | Scheduled Empt |
| 9 | 01-06-2019 | 01-06-2019 | 1-Jun-19 | 8.69184E+14 | 126 | 126 | 3 | 3 | वाघपावडी चौकी जवळ विवाही नगर | 87.88 | 355 | Open | Scheduled Empt |
| 10 | 01-06-2019 | 01-06-2019 | 1-Jun-19 | 8.69184E+14 | 127 | 127 | 7 | 7 | वाघपावडी चौकी जवळ विवाही नगर | 87.88 | 767 | Open | Emergency yes |
| 11 | 01-06-2019 | 01-06-2019 | 3-Jun-19 | 8.69184E+14 | 128 | 128 | 3 | 3 | वाघपावडी चौकी जवळ विवाही नगर | 87.88 | 296 | Open | Emergency yes |
| 12 | 01-06-2019 | 01-06-2019 | 3-Jun-19 | 8.69184E+14 | 129 | 129 | 4 | 4 | वाघपावडी चौकी जवळ विवाही नगर | 87.88 | 6,96,099 | Open | Emergency yes |
| 13 | 01-06-2019 | 01-06-2019 | 4-May-19 | 8.69184E+14 | 18 | 38 | 5 | 5 | उजवेल नगर m i d c | 5213 | 5213 | Open | Emergency yes |
| 14 | 01-06-2019 | 01-06-2019 | 4-May-19 | 8.69184E+14 | 47 | 68 | 5 | 5 | उजवेल नगर m i d c | 5221 | 5221 | Open | Emergency yes |
| 15 | 01-06-2019 | 01-06-2019 | 3-Jun-19 | 8.69184E+14 | 130 | 130 | 5 | 5 | उजवेल नगर | 5248 | 5248 | Open | Emergency yes |
| 16 | 01-06-2019 | 01-06-2019 | 4-May-19 | 8.69184E+14 | 24 | 41 | 6 | 6 | उजवेल नगर | 1867 | 1867 | Open | Emergency yes |
| 17 | 01-06-2019 | 01-06-2019 | 4-May-19 | 8.69184E+14 | 30 | 40 | 6 | 6 | उजवेल नगर | 1866 | 1866 | Open | Emergency yes |
| 18 | 01-06-2019 | 01-06-2019 | 29-Dec-19 | 8.69184E+14 | 19 | 466 | 6 | 6 | उजवेल नगर | 1862 | 1862 | Open | Emergency yes |
| 19 | 01-06-2019 | 01-06-2019 | 4-Jun-19 | 8.69184E+14 | 131 | 131 | 6 | 6 | उजवेल नगर | 2799 | 2799 | Open | Emergency yes |
| 20 | 01-06-2019 | 01-06-2019 | 4-Jun-19 | 8.69184E+14 | 132 | 132 | 6 | 6 | उजवेल नगर | 2780 | 2780 | Open | Emergency yes |
| 21 | 01-06-2019 | 01-06-2019 | 3-Jun-19 | 8.69184E+14 | 14 | 32 | 6 | 6 | उजवेल नगर | 2302/2300-2311 | 2302 | Open | Emergency yes |
| 22 | 01-06-2019 | 01-06-2019 | 10-May-19 | 8.69184E+14 | 38 | 59 | 5 | 5 | उजवेल नगर | 4200 | 4200 | Open | Emergency yes |
| 23 | 01-06-2019 | 01-06-2019 | 27-Mar-19 | 8.69184E+14 | 1 | 1 | 5 | 5 | उजवेल नगर | 4327 | 4327 | Open | Emergency yes |
| 24 | 01-06-2019 | 01-06-2019 | 4-May-19 | 8.69184E+14 | 16 | 36 | 5 | 5 | उजवेल नगर | 4344 | 4344 | Open | Emergency yes |
| 25 | 01-06-2019 | 01-06-2019 | 20-May-19 | 8.69184E+14 | 67 | 88 | 5 | 5 | उजवेल नगर | 4692 | 4692 | Open | Emergency yes |
| 26 | 01-06-2019 | 01-06-2019 | 4-Jun-19 | 8.69184E+14 | 121 | 113 | 6 | 6 | उजवेल नगर | 2799 | 6/2792 to 2803 | Open | Emergency yes |
| 27 | 01-06-2019 | 01-06-2019 | 20-May-19 | 8.69184E+14 | 63 | 84 | 2 | 2 | उजवेल नगर | 50 | 50 | Open | Emergency yes |
| 28 | 01-06-2019 | 01-06-2019 | 12-May-19 | 8.69184E+14 | 48 | 69 | 4 | 4 | उजवेल नगर | 1988 | 1988 | Open | Emergency yes |



What data are we collecting?

Property and owners

1. Property Tax number
2. Ward Number
3. Owner name and phone number
4. Address
5. GPS location
6. Type of property
7. Is it a shared system?
8. Prop. no of sharers
9. Readiness of owners to receive service
10. Ownership of Property – Owner or Tenant?

Onsite Sanitation System characteristics

1. Type of Disposal System
2. Is it a shared system?
3. Size & location of disposal system
4. Shape of disposal system
5. Accessibility from road
6. Type of access cover

27 data points for properties

7 data points for CT/PT

Service Delivery / Desludger Performance

1. Volume desludged in Its.
2. No. of Trips
3. Use of PPE
4. When was the last time the septic tanks was emptied
5. Problems faced during emptying?
6. Was there any septage spill?

CWIS Principles

1. Vulnerable Areas Covered – BPL Card Holder, width of road on which property is located, caste
2. Gender Aspect – gender of the person responding to the form and gender of the person supervising the emptying service

CT/PT emptying

1. Type of toilet – CT/PT/IHHL
2. Details of Property (if IHHL) or toilet (If CT or PT)
3. Problems faced during emptying
4. Volume desludged in litres.
5. Total no. of trips
6. Use of PPE
7. GPS location

One step further -



Scheduled Emptying of Septic Tanks Collection and transport record

Unique desludging ID: 14/02/19/01

Property
 Property number: 07-1432-01, 07-1432-02, 07-1433-00, 07-1434-00
 Type: Residential - Apartment, Commercial - Shop
 Address: कार्गो मार्ग, नॉर्थ एच रोड, सिटी - 422103
 Owner: श्री शैली कृष्णकांतशर्मा
 Phone no: 9873456234

Emplyer
 Truck ID: Subject truck #1
 Reg. no: 43A/13/12345
 Truck cap.: 3000 L

Desludging service
 Type: Scheduled
 Date: 14/02/2019
 Start time: 13:20
 Total trips: 3
 Volume: 4560 L
 Access cover: open on arrival, replaced after emptying
 PPE use:
 Customer satisfaction: Good, Yes, Bad

Safe disposal
 Disposal site: Subject FSTP and Resource center
 Date: 14/02/2019
 End time: 15:30
 Disposal at correct location:

| 14/02/19/04 | 14/02/19/05 | 14/02/19/06 | Trip number |
|-------------|-------------|-------------|--------------------------------------|
| | | | Truck Operator signature at emptying |
| 13:40 | 14:30 | 15:30 | |
| | | | Property owner Signature at emptying |
| 13:40 | 14:30 | 15:30 | |
| | | | Truck Operator signature at disposal |
| 13:40 | 14:30 | 15:30 | |
| | | | FSTP Operator signature at disposal |
| 13:40 | 14:30 | 15:30 | |

SaniTrack - end to end monitoring for FSSM

End to end monitoring for desludging operations from service at property end to safe unloading at FSTP

Web and mobile modules catering to every stakeholder – truck operators, ULB Officials, administrators etc

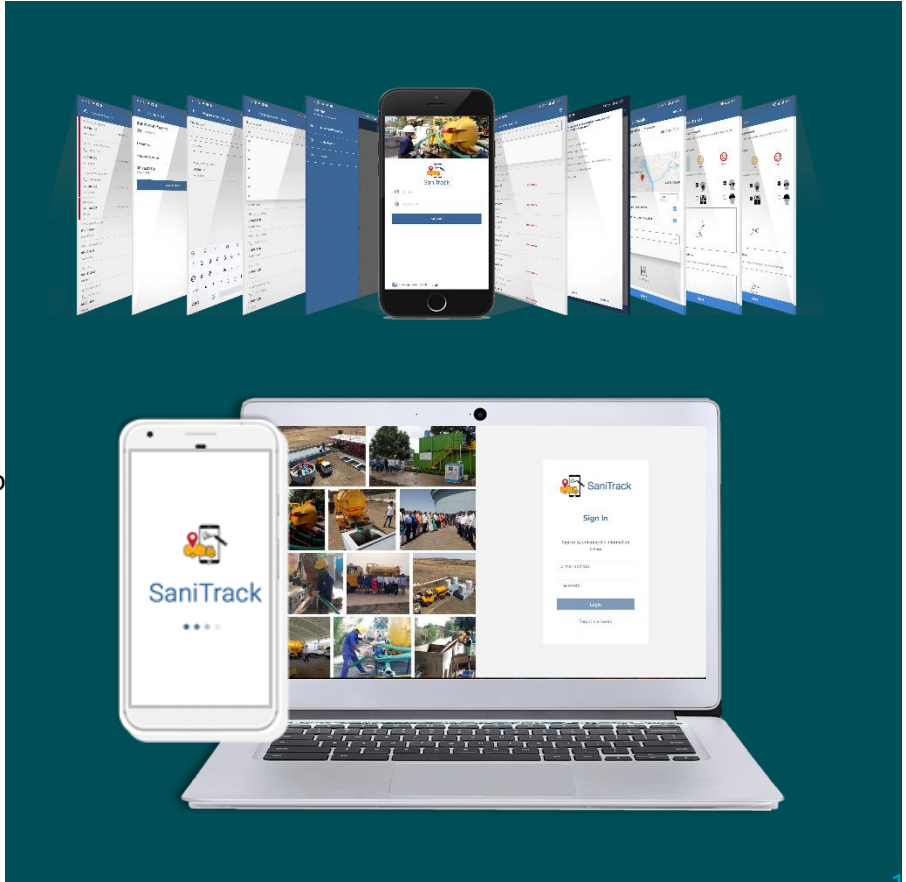
Can handle both scheduled emptying as well as demand based operations

Integrate validation checks. Simpler choice based questions, location checking, volume and truck capacity

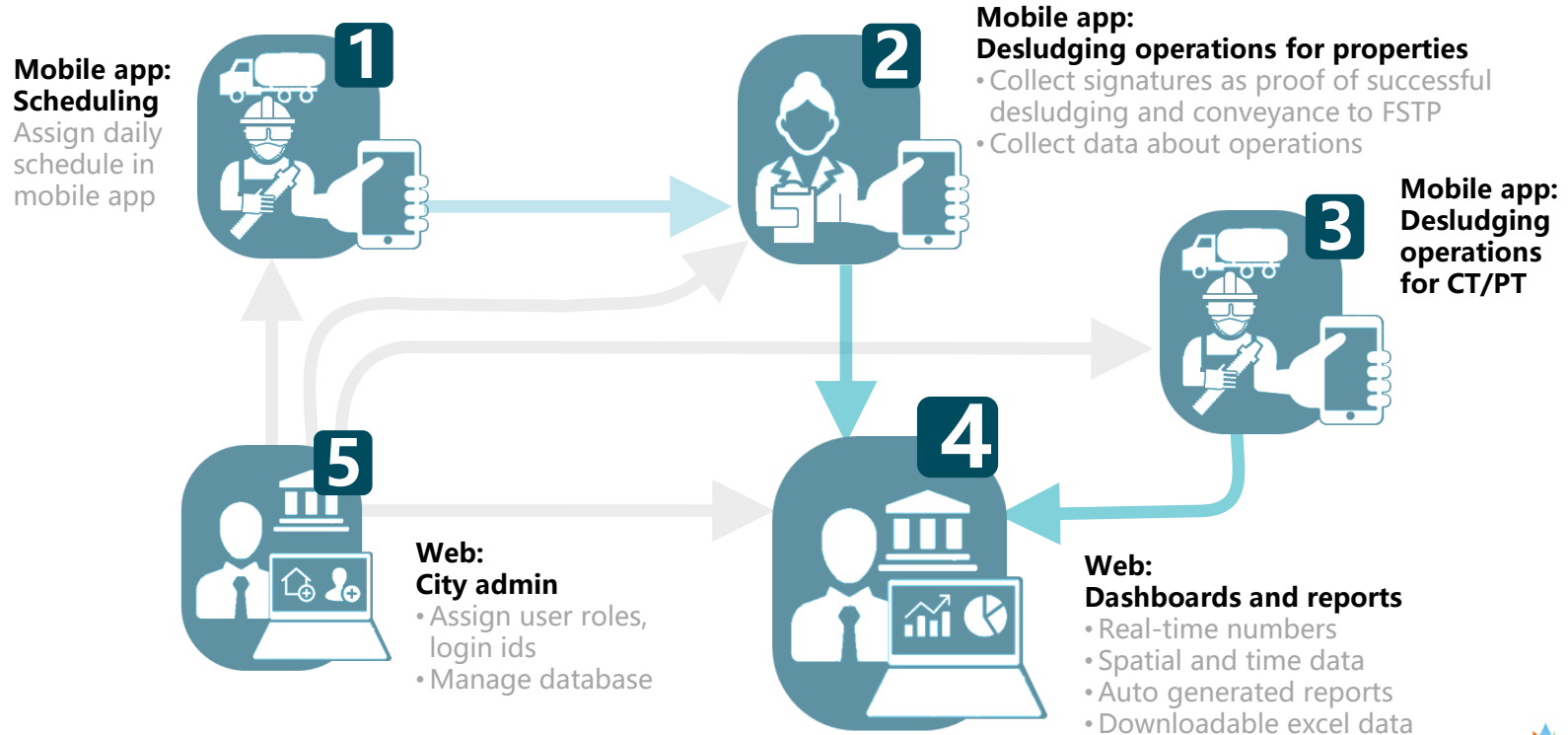
On-screen signatures like modern delivery apps (eg: Amazon). Can also generate individual reports automatically like paper form reporting system.

Real time results on dashboards. Key performance indicators displayed. Basic analysis possible.

Performance linked payments – Payment to private operator can be linked to results from this system

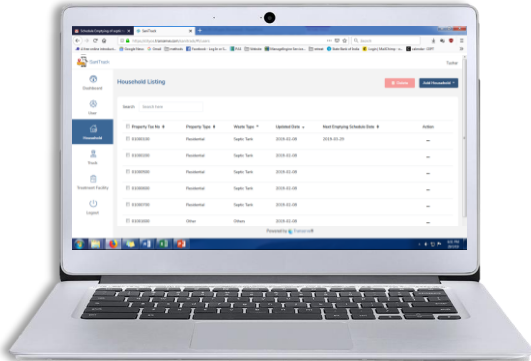


Components and modules

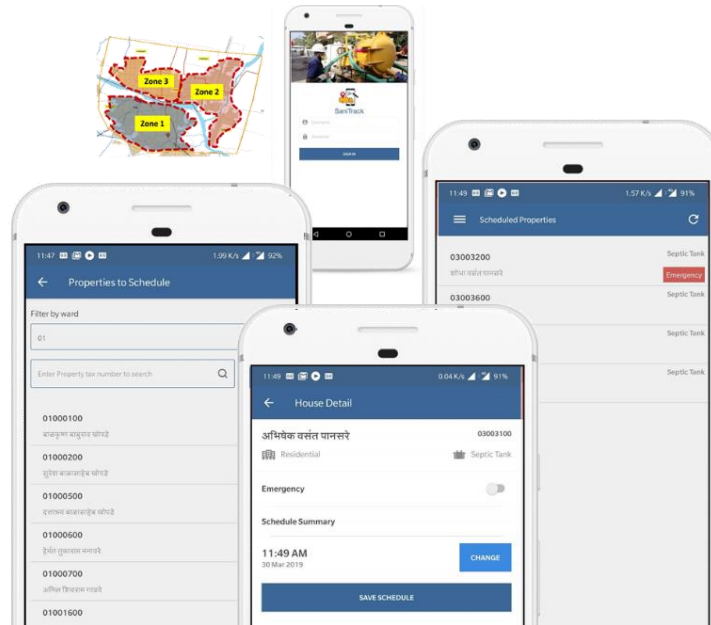


How does it work?

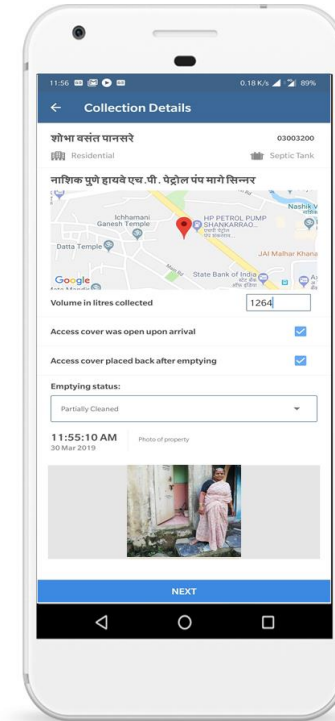
1 System set up – one time



2 Supervisor creates daily schedule in app - periodically



3 Deslugder records operations and signatures on app - daily



Validation checks at various points!

Truck operator knows the daily schedule

Owners are ready with access covers open

Signature proofs and photo for safe collection

Tanks are fully emptied – multiple trips if needed

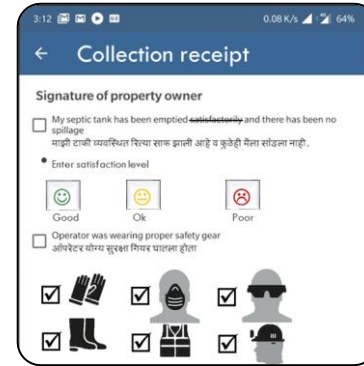
Correct protective equipment is used

Truck capacity is not exceeded by load

Access covers placed back

Correct GPS location for unload

Signature proofs for safe disposal



3:12 0.08 K/s 64%

← Collection receipt

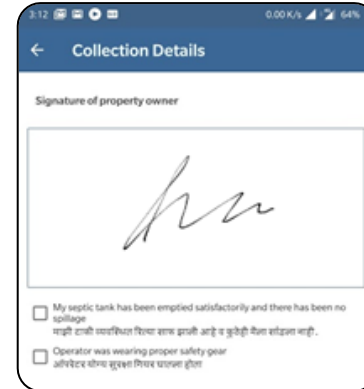
Signature of property owner

My septic tank has been emptied satisfactorily and there has been no spillage.
माझे टांकी व्यवस्थित रिच्यु साक झाली आहे व कुठेही मैला सोडला नाही.

• Enter satisfaction level

Good Ok Poor


Operator was wearing proper safety gear
ऑपरेटर योग्य सुरक्षा गिअर घातला होता



3:12 0.00 K/s 64%

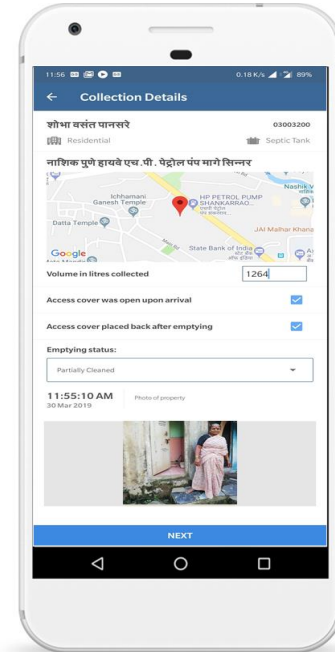
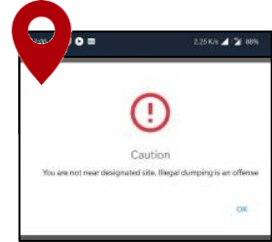
← Collection Details

Signature of property owner

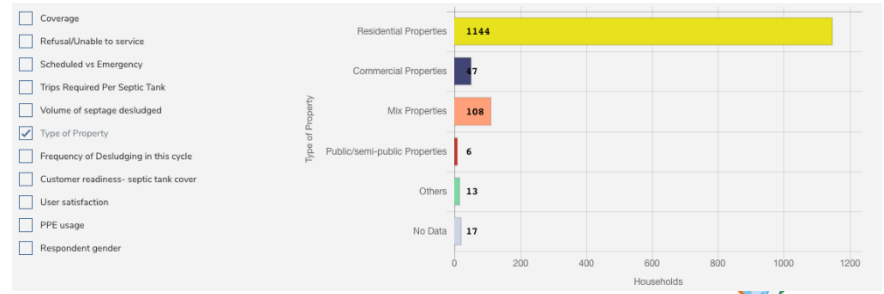
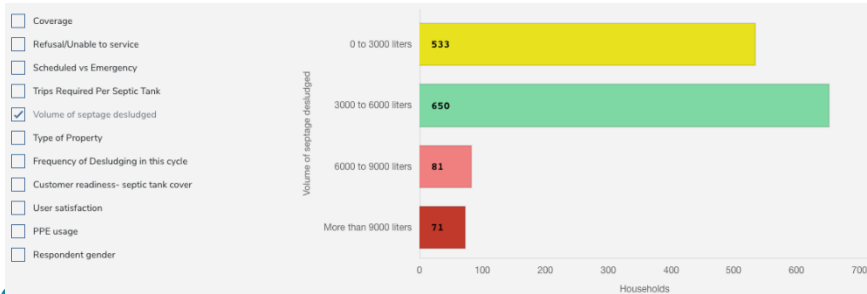
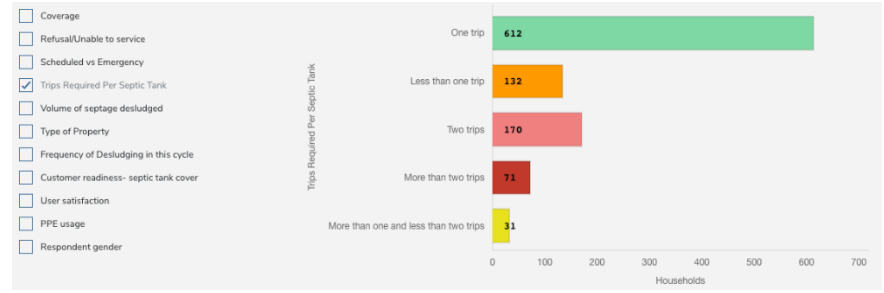
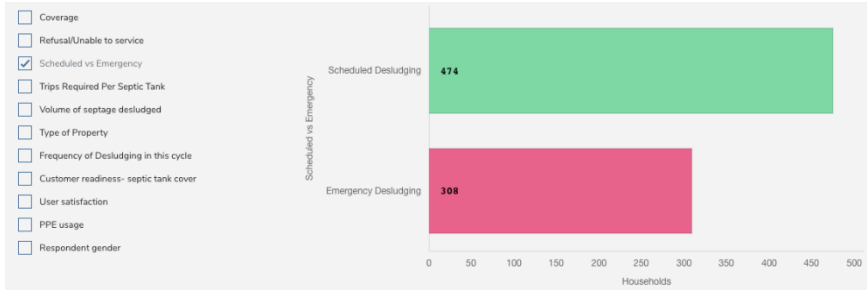
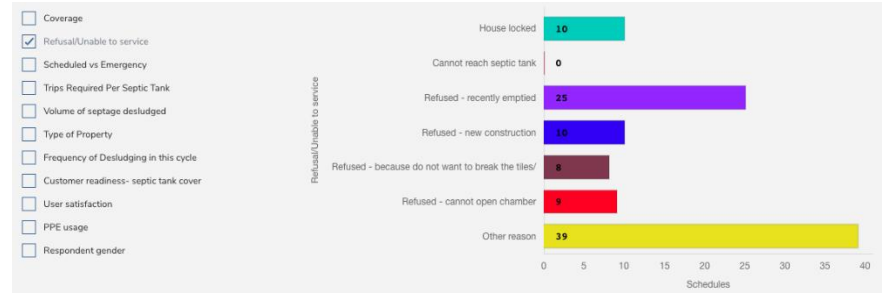
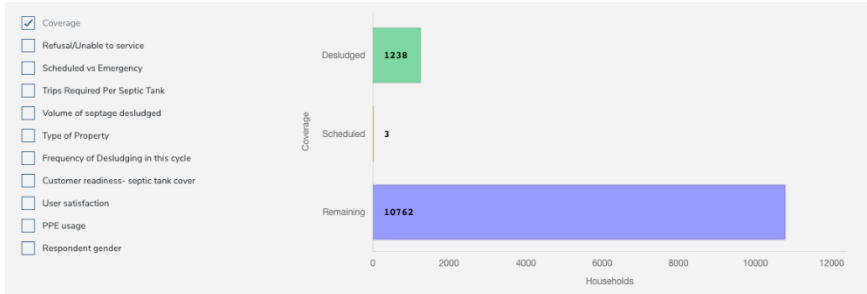


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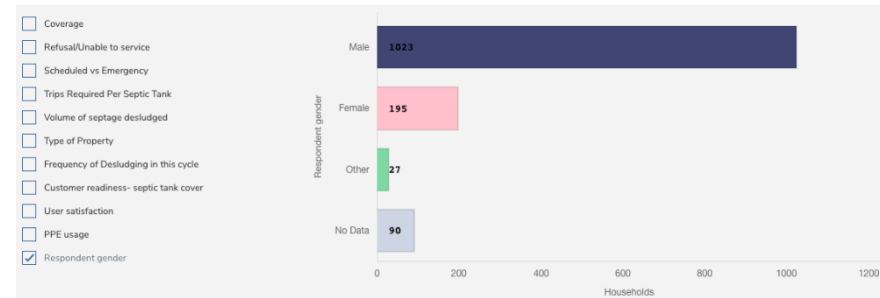
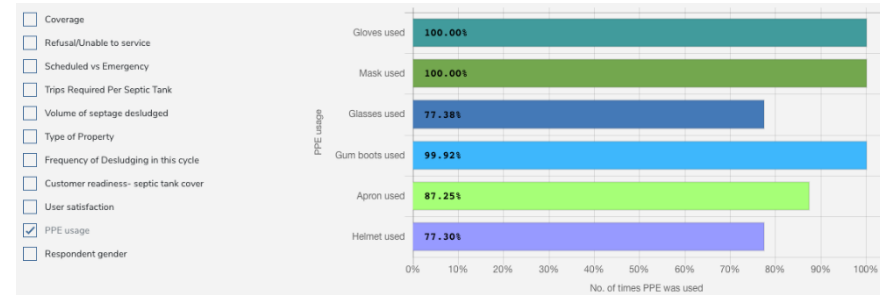
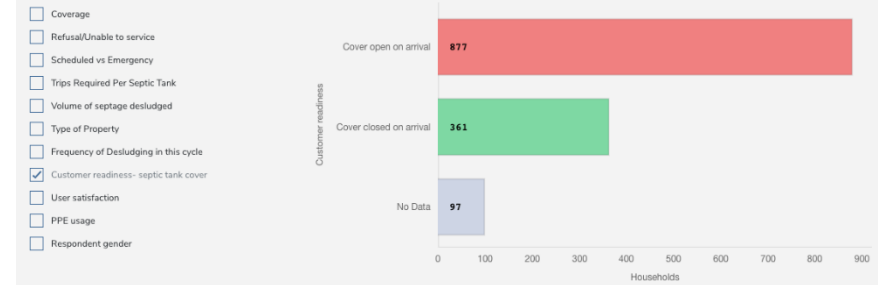
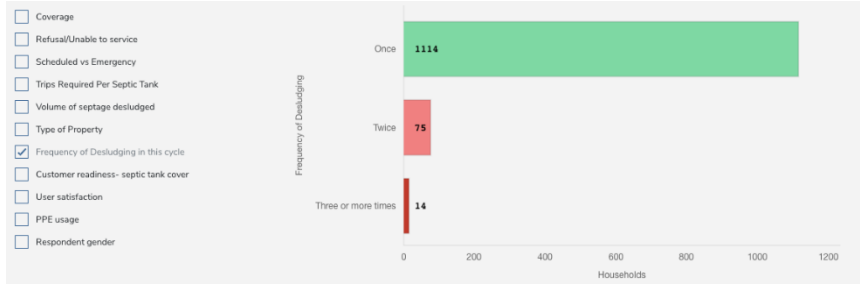
Operator was wearing proper safety gear
ऑपरेटर योग्य सुरक्षा गिअर घातला होता



Web module – Dashboard



Web module – Dashboard



What data are we collecting?

29 data points
for properties

15 data points
for CT/PT



Pre-uploaded database

1. Property Tax number – WARD:NUMBER:PART
2. Owner name and phone number
3. Address
4. GPS location
5. Type of property
6. Type of sanitation system
7. Is it a shared system?
8. Prop. no of sharers



Property desludging data

9. Emergency or Scheduled
10. Unique Desludging ID
11. Service refusal
12. Time stamps and dates
 - Scheduled
 - Desludging started
 - Desludging ended
 - Delivery at FSTP
16. Respondent gender
17. Status of access cover
18. Volume collected
19. PPE usage
20. Trips taken
21. Signatures
 - Property owner at collection
 - Operator at collection
 - Operator at delivery to FSTP
 - FSTP operator at delivery
25. Photo at collection
26. User Satisfaction level
27. Desludged by which truck
28. If near FSTP at delivery
29. Delivered to which Treatment Facility



CT/PT desludging data

1. Name of CT/PT
2. Unique Desludging ID
3. Time stamps and dates
 - Desludging started
 - Desludging ended
 - Delivery at FSTP
6. Volume collected
7. PPE usage
8. Trips taken
9. Signatures
 - Operator at collection
 - Operator at delivery to FSTP
 - FSTP operator at delivery
12. Photo at collection
13. Desludged by which truck
14. If near FSTP at delivery
15. Delivered to which Treatment Facility

SaniTab and SaniTrack

Key Benefits - Program efficiency for FSSM services

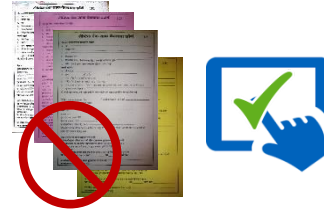
Integrated monitoring system – Across FSM service chain



**“Real time” monitoring
No need to process data**



**Easy to Operate,
Reduce paper work,
Minimize human error**



Can view progress easily and process payments



Citizen awareness about emptying procedures



**Photo stamping,
Geo stamping,
Signatures**



Unique database



Supports vernacular language



Partnerships and Collaboration

BILL & MELINDA
GATES foundation



Government of
Maharashtra



स्थापना - १८६०



स्थापना: १२-१०-१८५४ स्थालि: १५-१२-१९७२



CWAS
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Thank you

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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