

Impacts of scheduled desludging on water quality in onsite sanitation system dependent cities

Prof. Dinesh Mehta

**Co-authors: Jigisha Jaiswal, Aasim Mansuri, Dhruv Bhavsar,
Prof. Meera Mehta**

Current practice of Demand based desludging

Low frequency of desludging

On-demand desludging
= only done when septic tanks overflow
= frequency of 8-10 years+
CPHEEO norm is 2-3 years

Environmental impacts of poor-quality effluent

Low desludging frequency
= poor efficiency of septic tank
= poor quality of supernatant / effluent
overflow being released in rivers

Increased chances of Manual Scavenging

Low desludging frequency
= sludge hardens in the tank
= requirement of manual labour to remove it

High costs per desludging

Not affordable to all
Desludgers find it difficult to achieve
economies of scale.
Cannot optimize trips or have assured amount
of business in on-demand service

High desludging charges may discourage HHs from using toilets

Adversely affects ODF sustainability

Environmental impacts of poor quality effluent



Low desludging frequency

- = poor efficiency of septic tank
- = poor quality of supernatant / effluent overflow being released in rivers
- = requirement of manual labour to remove it



With no designated sites for safe disposal, truck operators often have to resort to dumping on open ground or in water bodies

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



Benefits of Scheduled Emptying



Equitable and inclusive services

- all households / properties are covered by services. The payment is linked to property tax.



Pricing – Services are offered at lower prices, due to efficiency gains and the pricing is much less than the distress fee that households had to pay previously



Behavior change - Contribution to ODF sustainability as toilet usage can increase



No manual labour - Removal of need for manual labour due to regular emptying



Infrastructure optimization – Planned schedule and frequency for all. Clustered service visits. More predictable loads for treatment facility and route optimization of trucks



Environmental benefits - Likely reduction in BOD in septic tank effluent, as well as lower likelihood of septic tank overflows

WAI

First Indian city to implement Schedule Desludging of Septic Tanks



43,000
Population

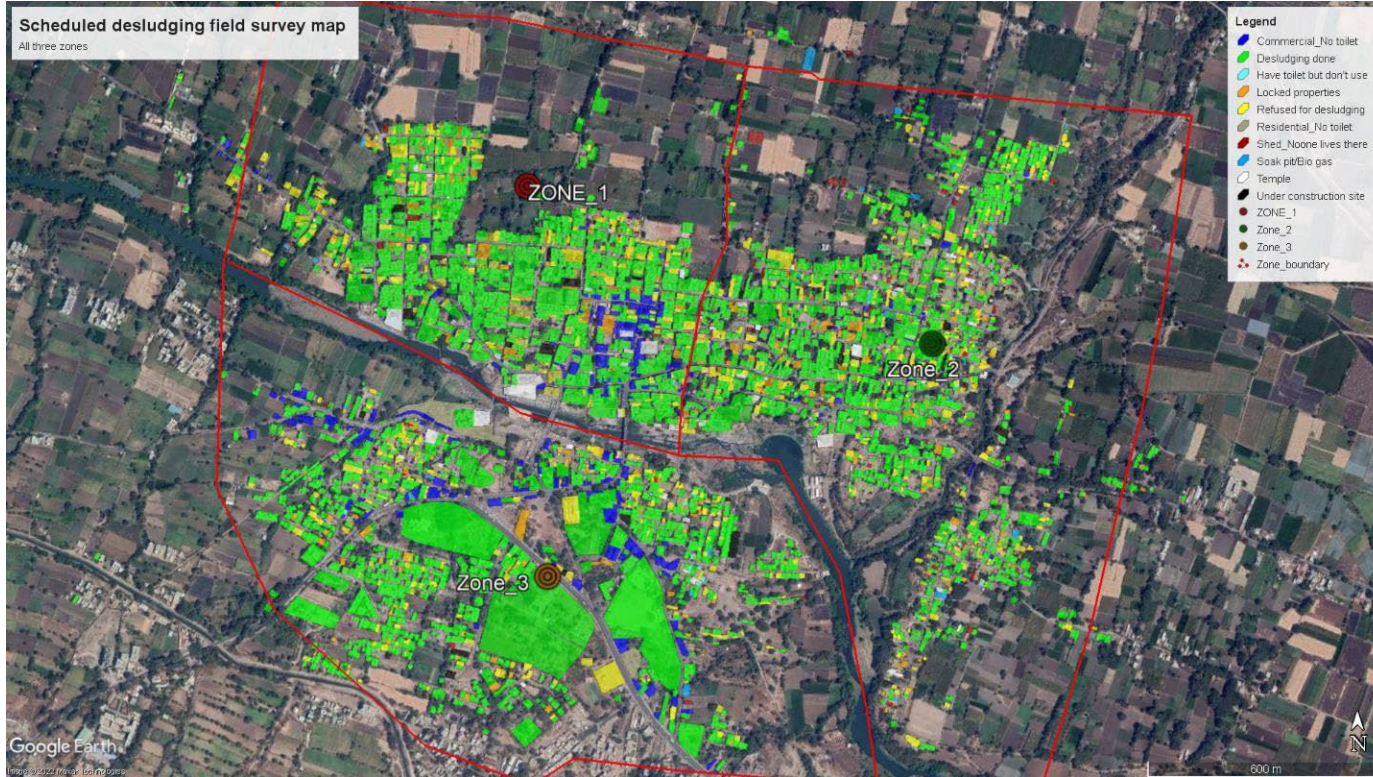


Toilets connected to
Septic Tanks.
Septic tanks connected
to drains



City divided in 3 zones. Each zone
covered in one year

In January 2022, Wai successfully completed its first 3-year cycle of scheduled desludging



3600+

Septic tanks served

6800+

Properties covered

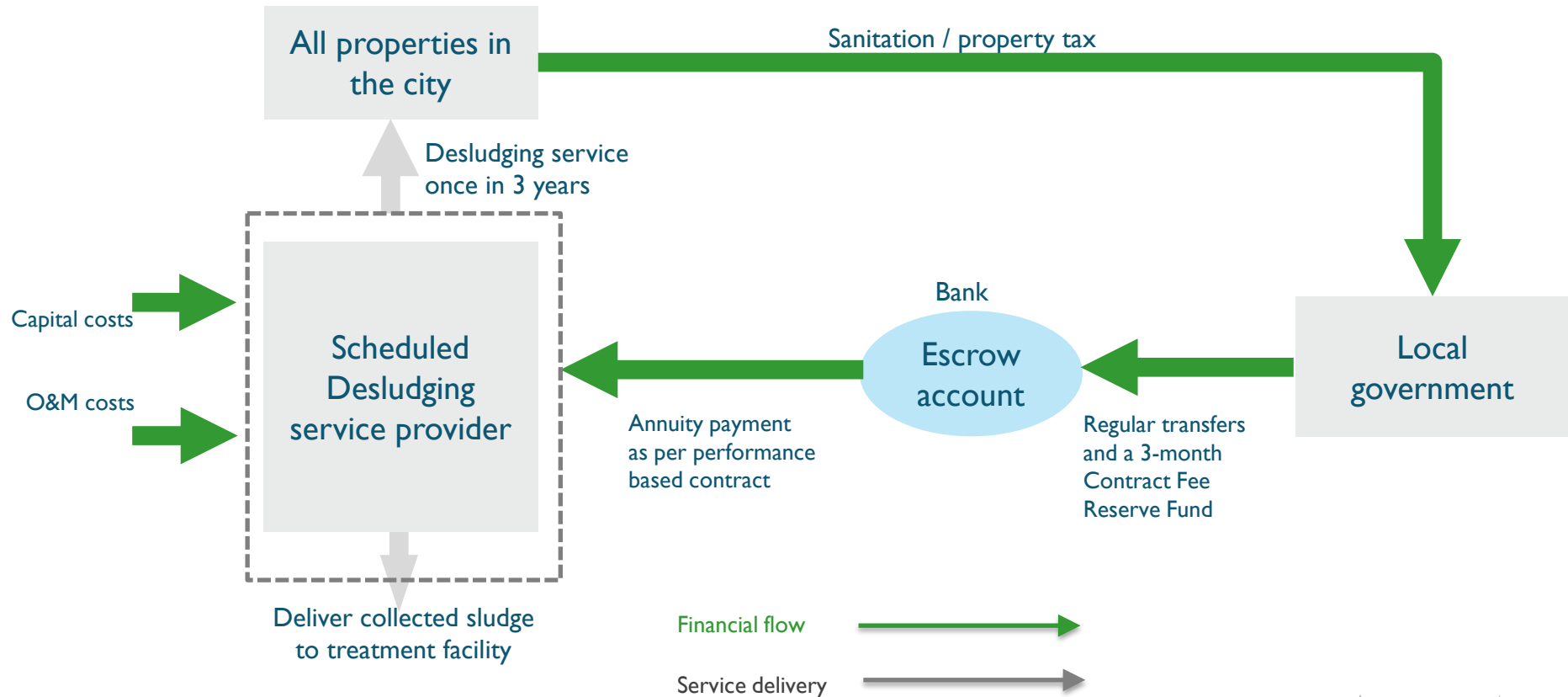
95%

Acceptance rate of services

19 million

Liters of septage treated

Performance Linked Annuity Model (PLAM) adopted



IT enabled monitoring and database creation



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



SaniTab

Easy to Operate,
Reduce paper work,
Minimize human error



Can view progress easily
and process payments

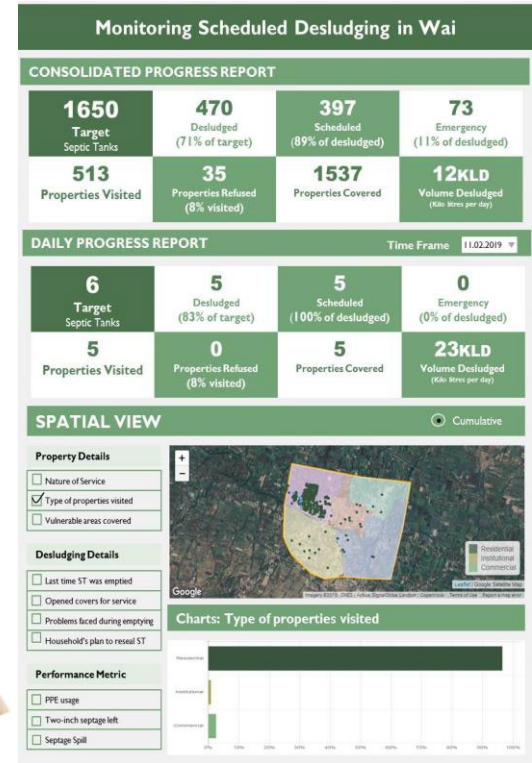
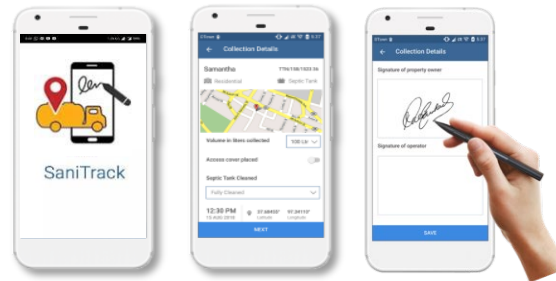


SaniTrack

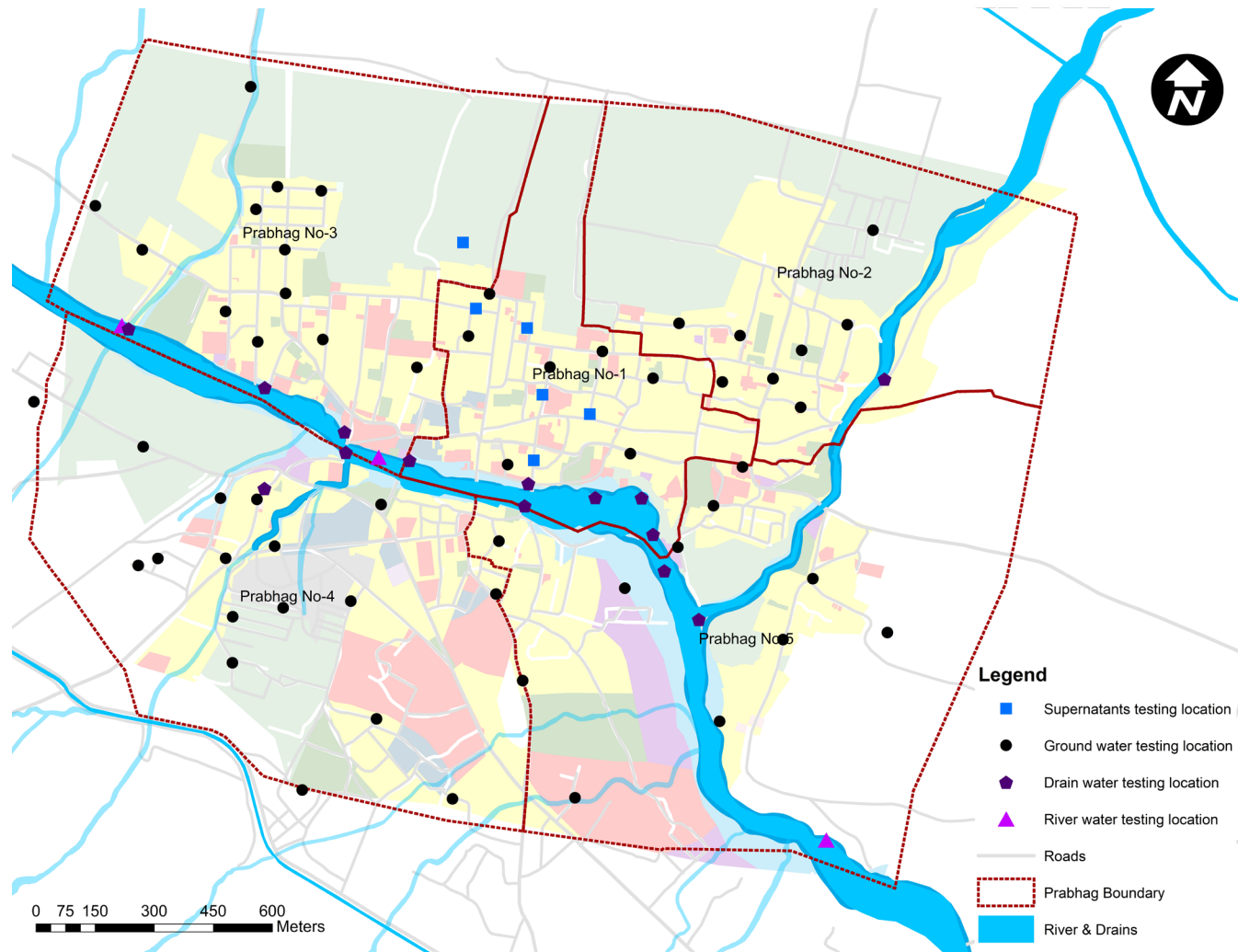
Photo stamping,
Geo stamping,
Signatures



Unique database



Spread of septic tanks, drain water, groundwater and river water samples across Wai



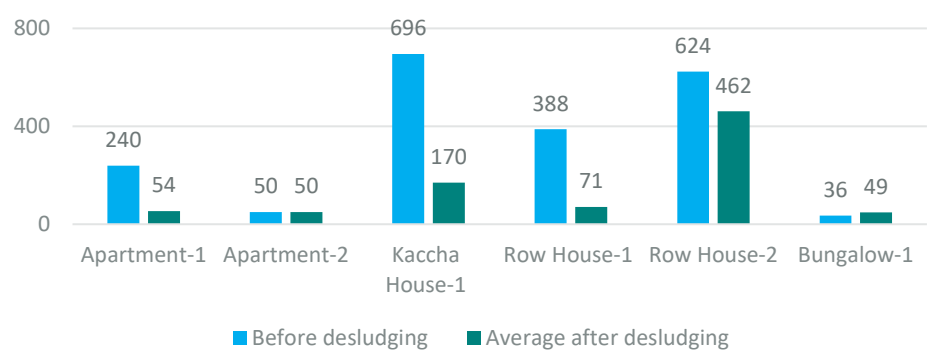
Performance of septic tank, before and after desludging in Wai (All values in mg/l)

Point (i)	Type (ii)	Septic tank (size KL) (No. of users) (iii)	Schedule (samples no.) (iv)	BOD Mean (v)	BOD RMS (vi)	COD Mean (vii)	COD RMS (viii)	TSS Mean (ix)	TSS RMS (x)	TN Mean (xi)	TN RMS (xii)
1.1	Apartment-1	12	BD (1)	132	132	395	395	240	240	142	142
1.2		(16)	AD (16)	75	84	212	236	48	54	26	34
2.1	Apartment-2	10	BD (1)	36	36	110	110	50	50	129	129
2.2		(20)	AD (14)	53	58	202	181	58	50	96	93
3.1	Kaccha House-1	5	BD (1)	318	318	920	920	696	696	210	210
3.2		(4)	AD (16)	140	160	350	371	135	170	154	158
4.1	Row House-1	5	BD (1)	105	105	430	430	388	388	160	160
4.2		(5)	AD (16)	67	85	190	231	58	71	120	126
5.1	Row House-2	5	BD (1)	198	198	460	460	624	624	437	437
5.2		(10)	AD (16)	241	215	634	708	415	462	445	449
6.1	Bungalow-1	6	BD (1)	99	99	294	294	36	36	145	145
6.2		(2)	AD (16)	54	60	163	175	44	49	141	149
7.1	Bungalow-2	5	BD (1)	22	22	70	70	18	18	145	145
7.2		(4)	AD (16)	42	45	144	148	47	50	125	134

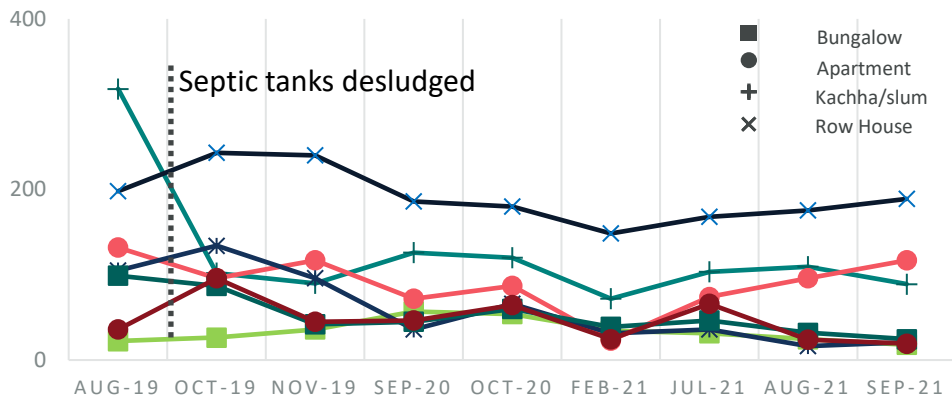
For the row-house-2 where the performance of septic tank has not improved is probably due to age of septic tank. The septic tank is 40 years old and since it wasn't desludged regularly, the bottom sludge had thickened.

Improvements in performance of septic tank after desludging

Average Total Suspended Solids (TSS) (mg/L)– before and after desludging



Biological Oxygen Demand (mg/L)– before and after desludging

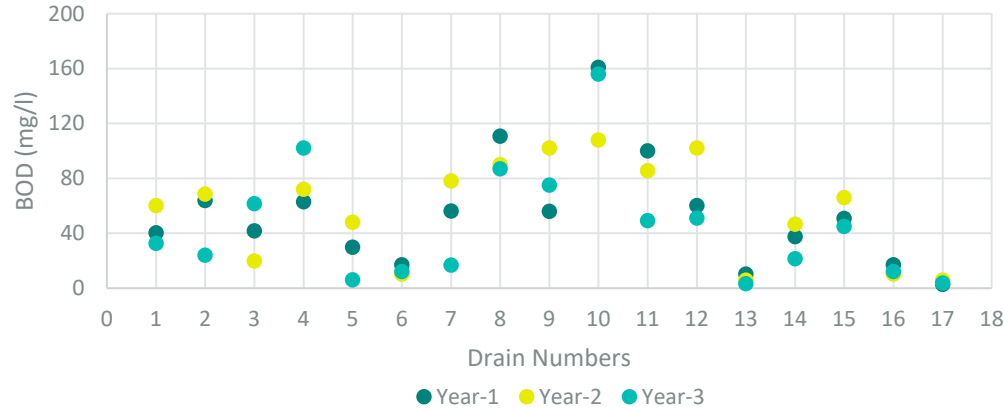


- **Suspended solids** from septic tanks have **reduced** significantly as well as an overall trend is **decline in BOD**
- The **increase in retention time** post desludging is one of the major factors for reduction in the suspended solids as well as other factors
- The variations can be attributed to **house types, access and availability of water**, inlet quality of influent.

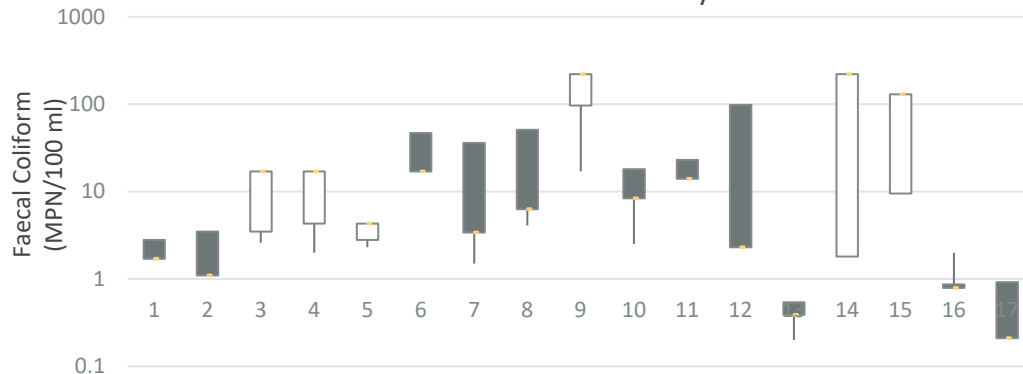
[Slide to detailed results](#)

Improvements in drain water quality

BOD over three years



Faecal Coliform over three years



- The quality of water in drains has improved progressively during scheduled desludging.
- 80% of drain samples showed reduction in organic load, nutrients and pathogen content as more septic tanks were desludged

Improvements in River water and Ground water quality

Range of Faecal Coliform (MPN/ 100 ml) in River over three years

	Year 1	Year 2	Year 3
Upstream	84-350	110- 430	10- 210
Downstream	172-920	210- 730	75-635

- River water and ground water saw the presence of faecal coliforms
- The quality of river water has seen a reduction in the presence of faecal coliforms at downstream
- While the ground water samples also showed improvement in its quality
- The presence of faecal coliform was found in 56% of samples, after desludging found in only 30% of samples
- Future regular cycles will help in improving the quality of river water.

Conclusion

- The results suggest positive association of regular desludging and improved performance of septic tanks.
- Though we recognize that septic tank performance is also influenced by various factors of design, capacity, users and maintenance, regular desludging certainly helps in improving performance.
- Such studies can inform decision making at state and national level to strengthen their recommendation of desludging.



Read our full paper here

Publication: Sage Journals

Journal: Environment and Planning B: Urban Analytics and City Science2

Paper title: Impacts of scheduled desludging on quality of water and wastewater in Wai city, India





Sage Journals Search this journal ▾ Enter search terms... [Advanced search](#)  Access/Profile  Cart


Browse by discipline ▾ Information for ▾

Environment and Planning B: Urban Analytics and City Science








Impact Factor: 3.5 / 5-Year Impact Factor: 3.9 [JOURNAL HOMEPAGE](#) [SUBMIT PAPER](#)

 Open access  Research article | First published online March 25, 2022

Impacts of scheduled desludging on quality of water and wastewater in Wai city, India

[Jigisha Jaiswal](#)  [Dinesh Mehta](#), and [Meera Mehta](#) [View all authors and affiliations](#)

[Volume 49, Issue 8](#) | <https://doi.org/10.1177/23998083221078596>

 Contents |  PDF / ePub  Cite article  Share options  Information, rights and permissions  Metrics and citations  Figures and tables

Scan QR to read the full paper

Abstract

The common practice for desludging of septic tanks is 'demand-based desludging' rather than a regular service. Such practices have adverse social and environmental impacts. Scheduled desludging is advocated to maintain the performance of septic tanks and avoid adverse effects on the environment. Wai, a small town in the state of Maharashtra, India, is the first city in India to implement scheduled desludging. This



CWAS CENTER
FOR WATER
AND SANITATION

CRDF CEPT RESEARCH
AND DEVELOPMENT
FOUNDATION

CEPT
UNIVERSITY

dineshmehta@cept.ac.in
cwas@cept.ac.in



**Thank
you**

About us

The Center for Water and Sanitation (CWAS) is a part of CEPT Research and Development Foundation (CRDF) at CEPT University. CWAS undertakes action-research, implementation support, capacity building and advocacy in the field of urban water and sanitation. Acting as a thought catalyst and facilitator, CWAS works closely with all levels of governments - national, state and local to support them in delivering water and sanitation services in an efficient, effective and equitable manner.



cwas.org.in
pas.org.in



cwas@cept.ac.in
tiny.cc/pasehnews



[CEPT_CWAS](https://twitter.com/CEPT_CWAS)



[cwas.cept](https://www.instagram.com/cwas.cept)



[cwas.cept](https://www.facebook.com/cwas.cept)



[cwas.cept](https://www.linkedin.com/company/cwas.cept)