

FSSM Plan for Kolhapur

A report prepared under

H T Parekh Foundation Grant

CWAS, CRDF, CEPT University

CWAS CENTER
FOR WATER
AND SANITATION

CRDF CEPT RESEARCH
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Faecal Sludge and Septage Management Plan (FSSM) for Kolhapur Municipal Corporation

The Faecal Sludge and Septage Management (FSSM) Plan was prepared by the Center for Water and Sanitation (CWAS),
at the Centre for Research and Development Foundation (CRDF), CEPT University
in consultation with Kolhapur Municipal Corporation
under a grant from HT Parekh Foundation

Acknowledgements

It is estimated that 70% – 80% of the faecal waste generated in India is not treated, leading to water-borne diseases, child and infant mortality, and a host of other developmental challenges. In a country where nearly two-thirds of urban households depend on on-site sanitation systems, absence of sustainable sanitation practices results in water pollution. This affects the health of residents. For better environmental hygiene and public health, it is important to have facilities for safe desludging, treatment, and proper disposal/reuse of fecal matter.

Center for Water and Sanitation (CWAS) has been supporting the Swachh Maharashtra Mission for Urban Areas (SMMUA) in developing strategies, building capacity of ULBs and supporting implementation, since 2015. It also supports cities in Maharashtra on city-wide sanitation planning and implementation of ODF and FSSM plans. To scale up these interventions and support other cities, the H T Parekh Foundation provided grant support to CWAS for strengthening the Faecal Sludge and Septage Management (FSSM) activities in Kolhapur Municipal Corporation and Satara Municipal Council in Maharashtra.

In Kolhapur, 40% households, largely slum dwellers, are not connected to the sewerage system. Thus, a **Fecal Sludge and Septage Management (FSSM)** plan for Kolhapur has been prepared for the population which relies on onsite sanitation system. The plan includes a) scheduled desludging of septic tanks once in 3 years in one pilot zone and ensure 100% treatment of scheduled desludging load at STP, b) Landscaping and resource centre at the Sewage Treatment Plant (STP), c) monitoring system for safe desludging and treatment by using online monitoring systems, and d) reuse plan for treated wastewater and sludge from STPs. A mix of secondary data provided by the city, primary surveys, and stakeholder interactions were done to prepare the FSSM plan for the city.

CWAS team acknowledges excellent support by Kolhapur Municipal Corporation and its officials (Municipal commissioner, Dy. Municipal commissioner, officials of Health Department, other ward-level officials and sanitary inspectors). Discussions with other stakeholders such as private operators (Desludging operators and STP operators), MIDCs/agricultural societies, sanitation workers, community groups and slum households have also helped shape this FSSM plan.

We thank the H T Parekh Foundation for its grant to CWAS for this activity.

Meera Mehta and Dinesh Mehta
Executive Directors, CWAS

FSSM is recognized as a viable solution for safely managed sanitation

Targets 6.2 and 6.3 of SDG 6 of the Sustainable Development Goals aims in achieving the target on ending open defecation with provision of access and sanitation hygiene for all and improving water quality, wastewater treatment and safe re-use by 2030.



Image source: <http://www.campaign.exchange/campaigns/sustainable-development-goals/>

Image source: <https://www.ice.org.uk/eventarchive/achieving-sdg-6-the-water-goal>

Image source: <https://textilesforsdgs.org/sdgs/goals/6-clean-water-and-sanitation/>

Government of India has put a strong focus on FSSM



Swachh Bharat Mission (2014-2019) achieved significant success to make India Open Defecation Free. In 2017 the GOI adopted its national policy on “Faecal Sludge and Septage Management” (FSSM)

KEY ACHIEVEMENTS

SBM Urban Phase 1 Focus mostly on toilet construction



6.6 MILLION TOILETS

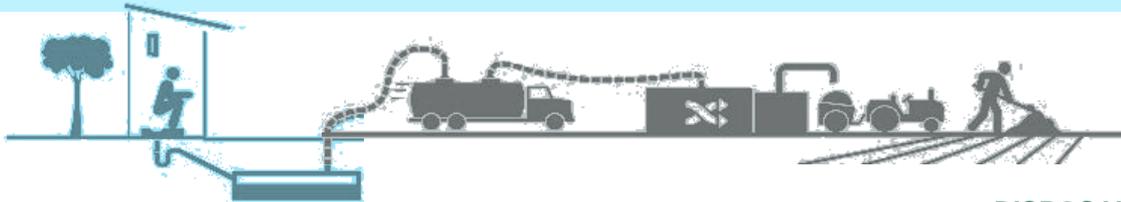


98% CITIES DECLARED OPEN DEFECATION FREE



35 STATES / UTs CERTIFIED AS ODF

FSSM OPERATION VALUE CHAIN



ACCESS TO TOILET
Access to hygienic toilets to all households
CONTAINMENT
Toilets connected to efficient systems like septic tanks

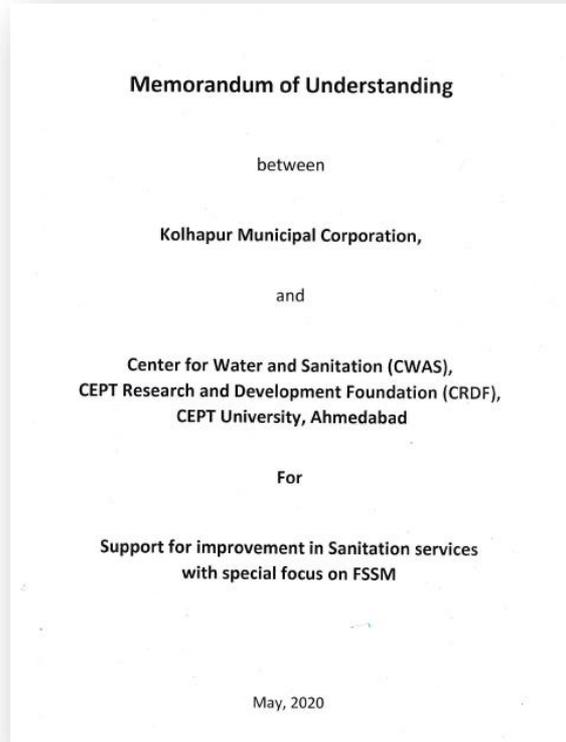
EMPTYING AND TRANSPORT
Desludging of septic tanks by suction machines and transportation to treatment plant

TREATMENT
Treatment at centralized or decentralized plants

DISPOSAL/REUSE
Reuse of treated effluents and other byproducts for agricultural or other uses or disposal at designated site

Need to focus on entire 'sanitation value chain (both desludging & treatment) to obtain ODF+ and ODF++ status

FSSM activities envisaged for Kolhapur



1

Sanitation assessment and FSSM Plan of the city
Special focus on slums

2

Scheduled desludging of septic tanks
Trucks procurement and implementation support

3

Monitoring systems for desludging and treatment services
Implementation and procurement support

4

Resource Centre and Landscape at STP
Implementation and procurement support

5

Capacity building of ULB staff and key stakeholders and Documentation

6

Reuse plan for treated wastewater and sludge

MoU signed with KMC for support for sanitation improvement in the Kolhapur city



Contents

- 1** Kolhapur city overview
- 2** Sanitation assessment of the city
- 3** Identification of pilot zone and planning for scheduled desludging
- 4** Online monitoring systems
- 5** Landscaping and resource center at STP
- 6** Overview of sanitation activities in Kolhapur

Contents

This section provides an overview of Kolhapur city including: demography, administrative setup, land use and natural resources..

1 Kolhapur city overview

2 Sanitation assessment of the city

3 Identification of pilot zone and planning for scheduled desludging

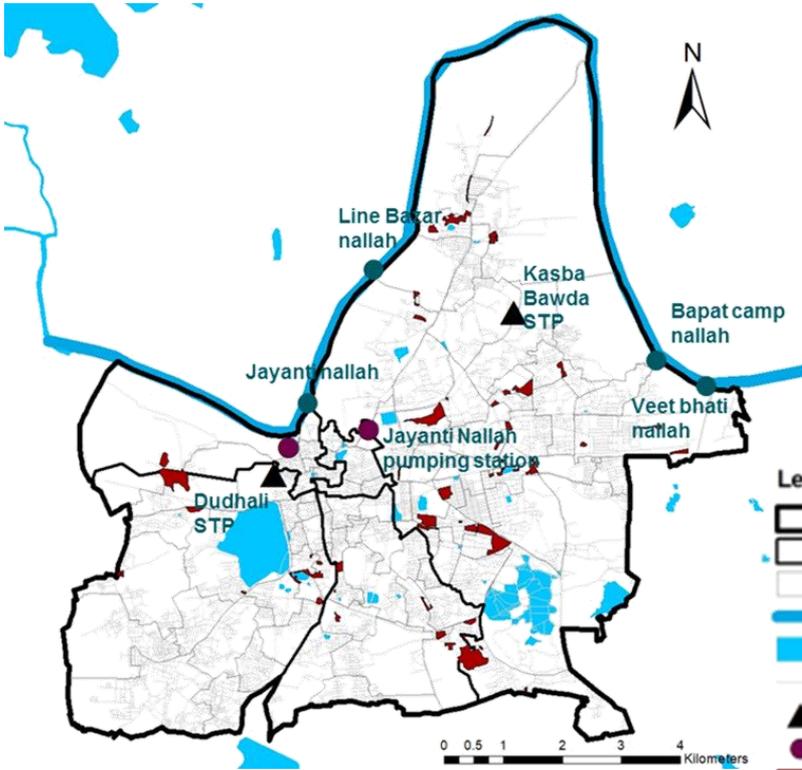
4 Online monitoring systems

5 Landscaping and resource center at STP

6 Overview of sanitation activities in Kolhapur



Kolhapur city overview



6,00,000
Population



1,27,000
Households



57
Total slums



10%
Slum Population
(62,256 population)



66.8
Sq.Km
Area



81
Wards

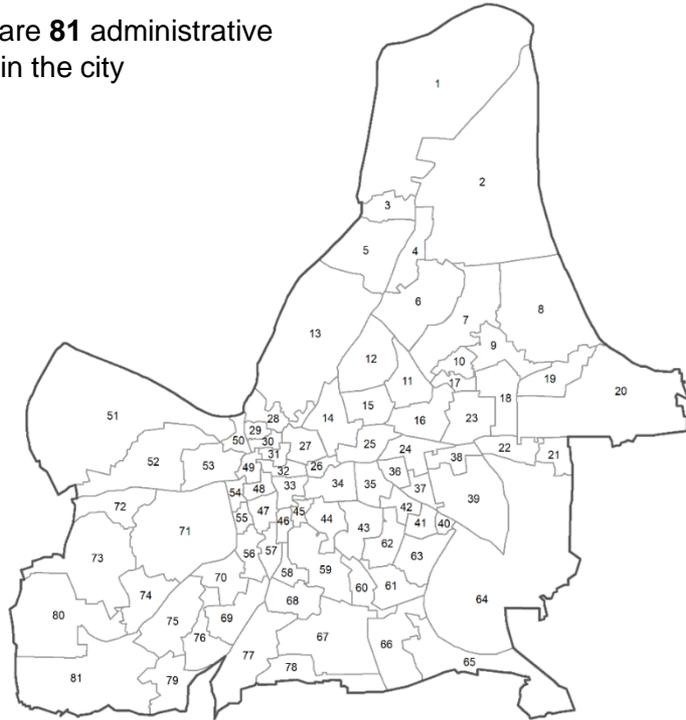
**Declared as
ODF in 2016 ; ODF++ 2019**

Source: CDP, Swachh Sarvekshan 2020 data and PAS-SLB 2019; Environmental Status Report of Kolhapur City 2015-16, Kolhapur Municipal Corporation.

Municipal boundary and ward map

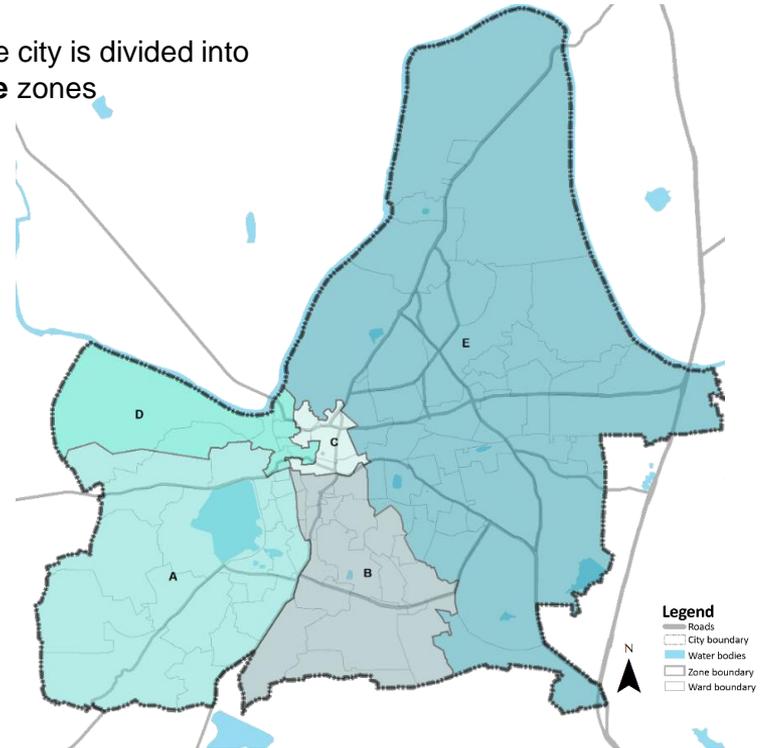
Administrative ward map

There are **81** administrative wards in the city



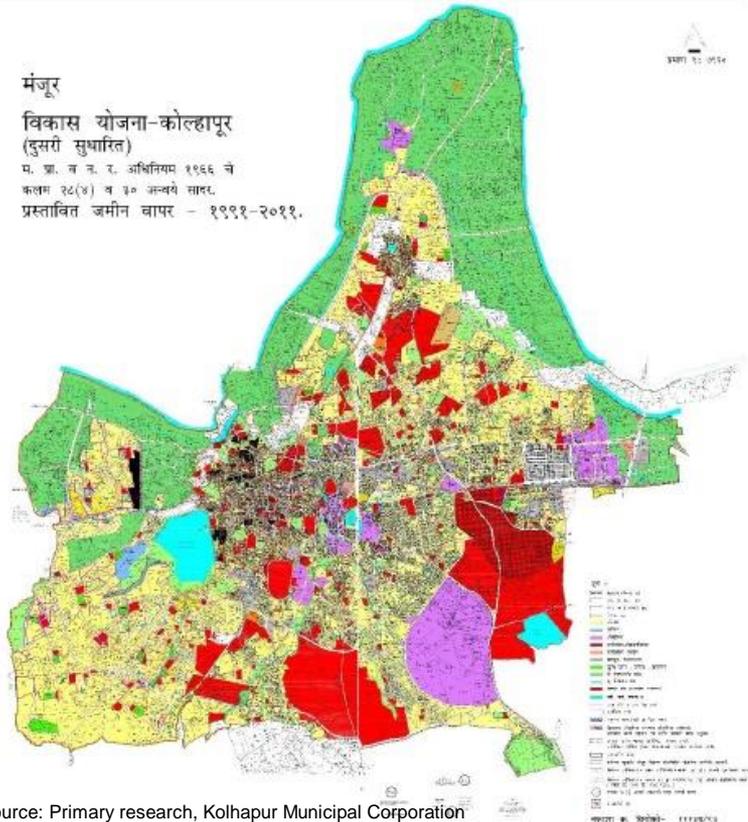
Prabhag/ Zone map

The city is divided into **five** zones

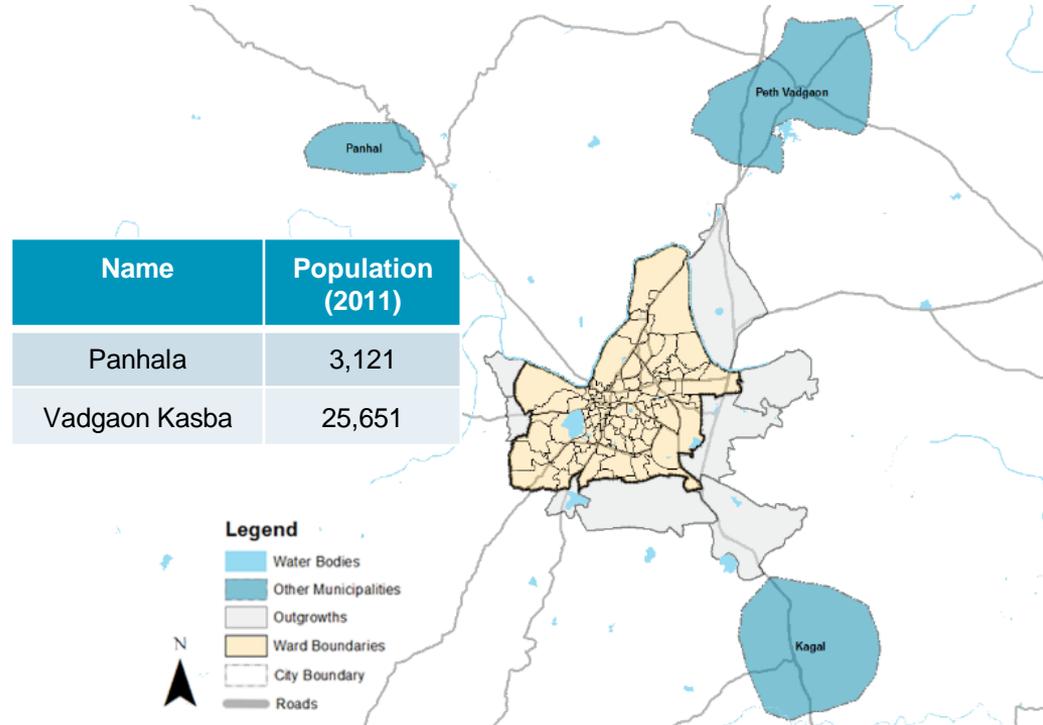


Outgrowths and land use

Land-use map



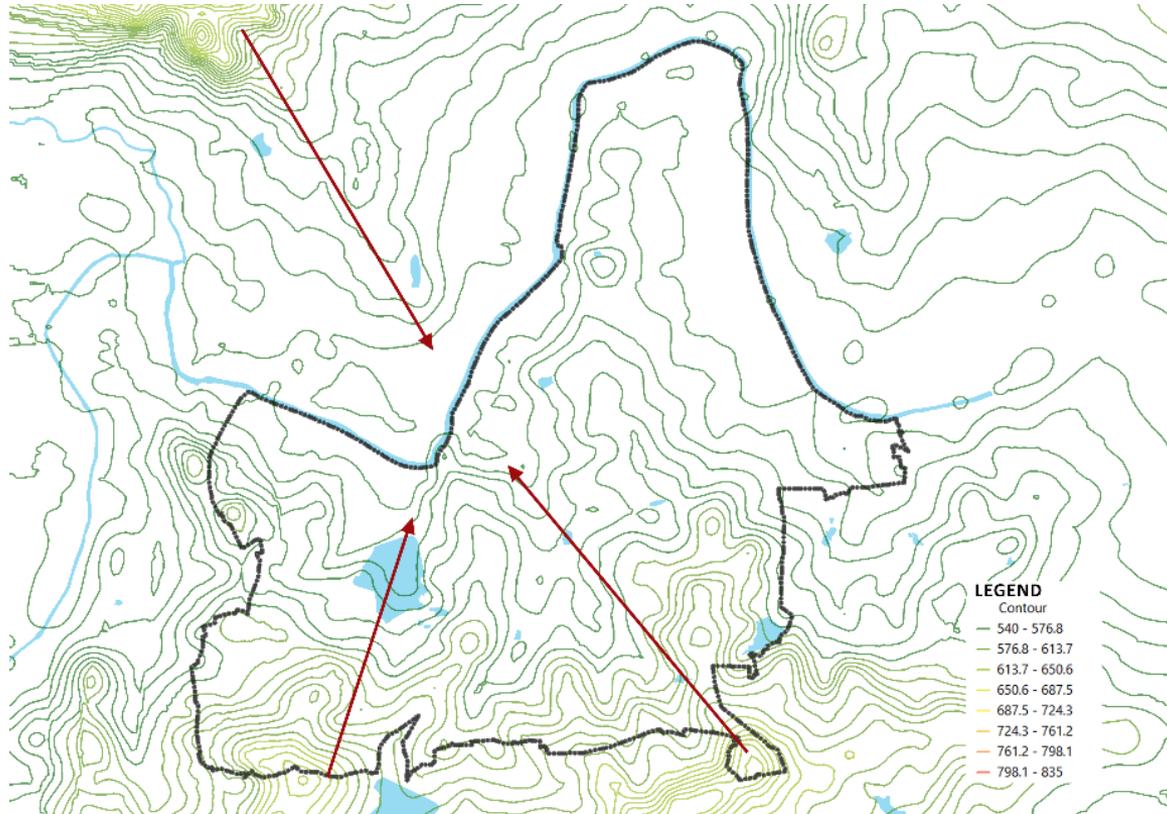
Municipal limits and outgrowth areas



There are 4 Municipal councils nearby Kolhapur city. Panhala & Vadgaon council are within 25km while Ichalkaranji and Jaysingpur are within 50km.

Topography of Kolhapur

Contour map



N



The slope from south to North

The city has an average elevation of 550m

- The town topography is uneven, and slopes in the western direction. Kolhapur lies above the foothills of the Sahyadri ranges and therefore has flat topography.
- Soil type is **rich black soil** and in some areas there are **hard strata**.
- Ground water is available at **15-20 ft** below ground in Gavthan areas while in outskirts it is at **50-70ft**.
- The normal annual rainfall is **1239 mm**. It varies from about **500 to 6000 mm**.

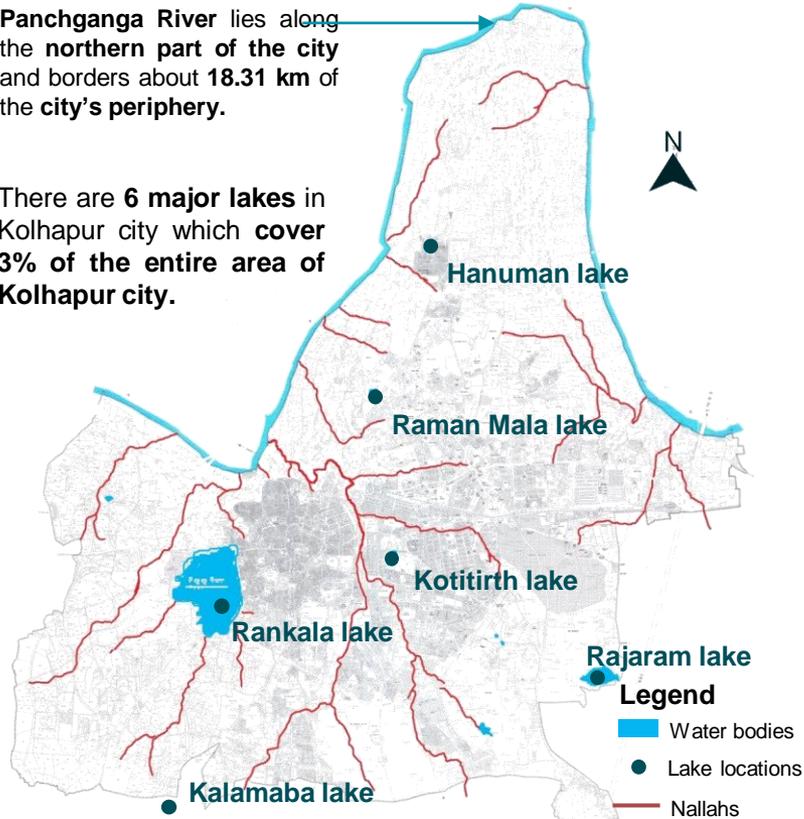
Source: Primary research, Kolhapur Municipal Corporation

Rivers and lakes in the city

River, lakes and nallahs location map

Panchganga River lies along the northern part of the city and borders about 18.31 km of the city's periphery.

There are 6 major lakes in Kolhapur city which cover 3% of the entire area of Kolhapur city.



Source: TERI, Retrieved from Environmental Status Report of Kolhapur City 2015-16.

Panchganga River



- The five rivers - the Kasari, the Kumbhi, the Tulsi, the Bhogawati, and Dhamni convene at the Prayag Sangam to form the Panchganga River.
- As per data records maintained by KMC, the river has a catchment area spread across 2538 km² and the city of Kolhapur depends on the river as a source of drinking water for the city.

Lakes in Kolhapur city

Sr. No	Name of lake	Area (Ha)	Depth (meters)	Year	Use
1.	Rankala	107	30	1877-83	Irrigation, Recreation
2.	Kalamaba	63.13	14	1873	Water supply, fishing, irrigation
3.	Kotitirth	5.8	60	ND	Domestic purpose
4.	Hanuman	0.85	3	2002-03	Domestic purpose
5.	Rajaram	21.6	11	1928	Fishing, irrigation, domestic purpose
6.	Raman Mala	1.85	4	ND	In water park for recreational activity



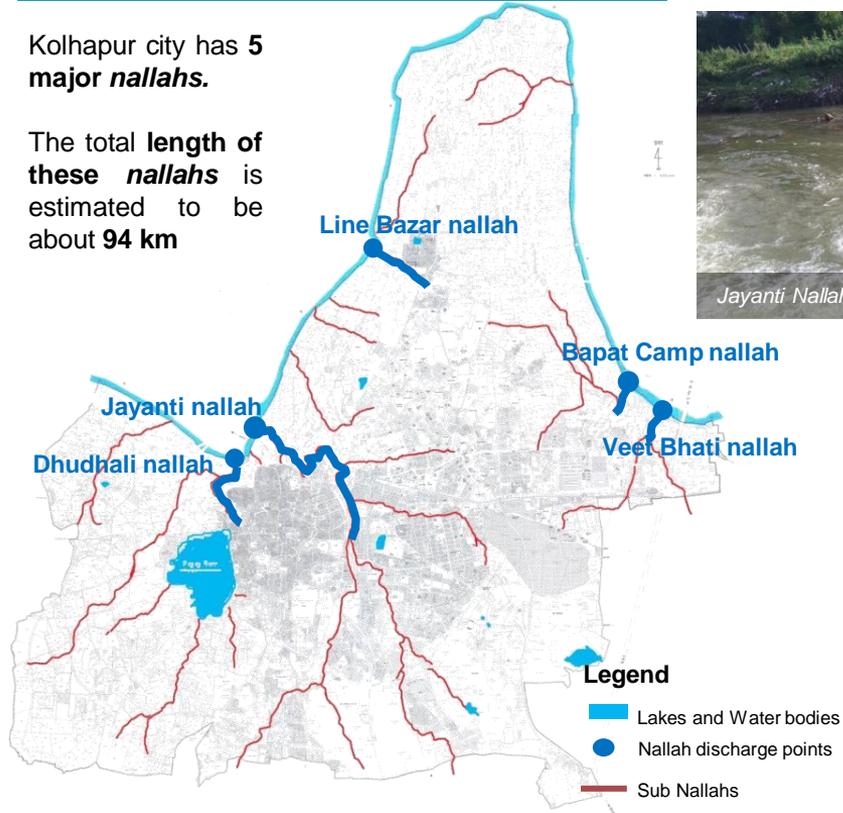
- The city is dependent on these resources for various activities including water supply, fishing, irrigation, recreation, and so on.
- Apart from these, Kolhapur city has other lakes like Lasktirth, New Palace Lake, and 2 lakes at the Shivaji University campus.

Main nallahs in the city

Nallas location map

Kolhapur city has **5 major nallahs**.

The total length of these **nallahs** is estimated to be about **94 km**



- All these **nallahs drain into the Panchganga river.**

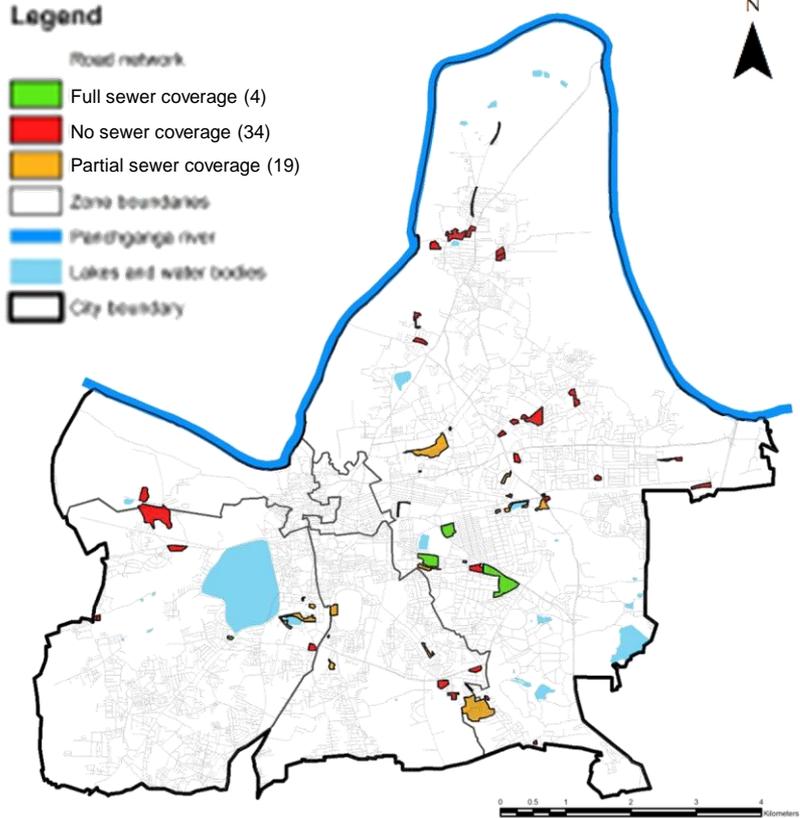
List of nallahs and sub nallahs in Kolhapur city

Sr. No	Main Nallah	Sub-Nallah	Catchment area (Ha)
1.	Dudhali	Phulewadi and Dudhali	1447.8
		Laxtirth	260.23
		Jamadar Club	19.63
2.	Jayanti	Jayanti	2446.62
		CPR	20.21
		Juna Budhawar	26.91
3.	Bapat Camp	Bapat camp	982.83
		Kawala Naka	592.83
4.	Line Bazar	Rajhauns	106.82
		Raman Mala	125.96
		Dream world	107.66
		Laine Bazar	196.01
		Kasaba Bawada	131.09
5.	Veet Bhati	Veet Bhati	217.33
Total			6682

Source: Environmental Status Report of Kolhapur City 2015-16, Kolhapur Municipal Corporation.

Distribution of slums

Slum cluster map showing the extent of sewer coverage



57
slums in Kolhapur
(as per Shelter Association)

62,256
Slum population

14,663
Slum households

155
(huts/hectare)
Tenement density

4.75
Average household size

52%
(7,624) Individual
toilet coverage

46%
(6,744) CTB usage

27%
Drainage coverage

Around 60% of slums in the city lack connection to sewer network. In these slums, 2,489 IHHTs are connected to septic tanks.

Source: Based on information from Shelter Associates and Kolhapur Municipal Corporation.

Organogram of Kolhapur Municipal Corporation

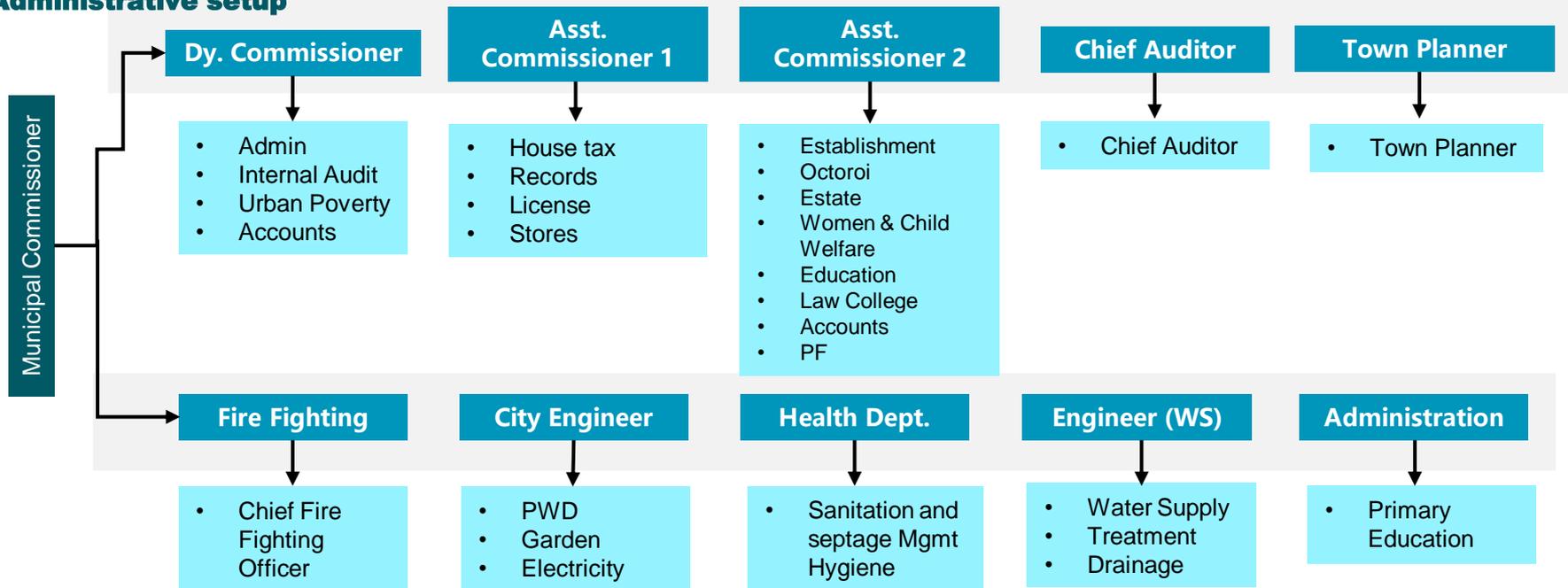
The departments in the corporation are **General Administrative, PWD, Sanitation/ Birth and Death, Accounts/Tax, Water supply, Firefighting, Electricity, Establishment, Town Planning, Clinics, Hygiene**

Political set up

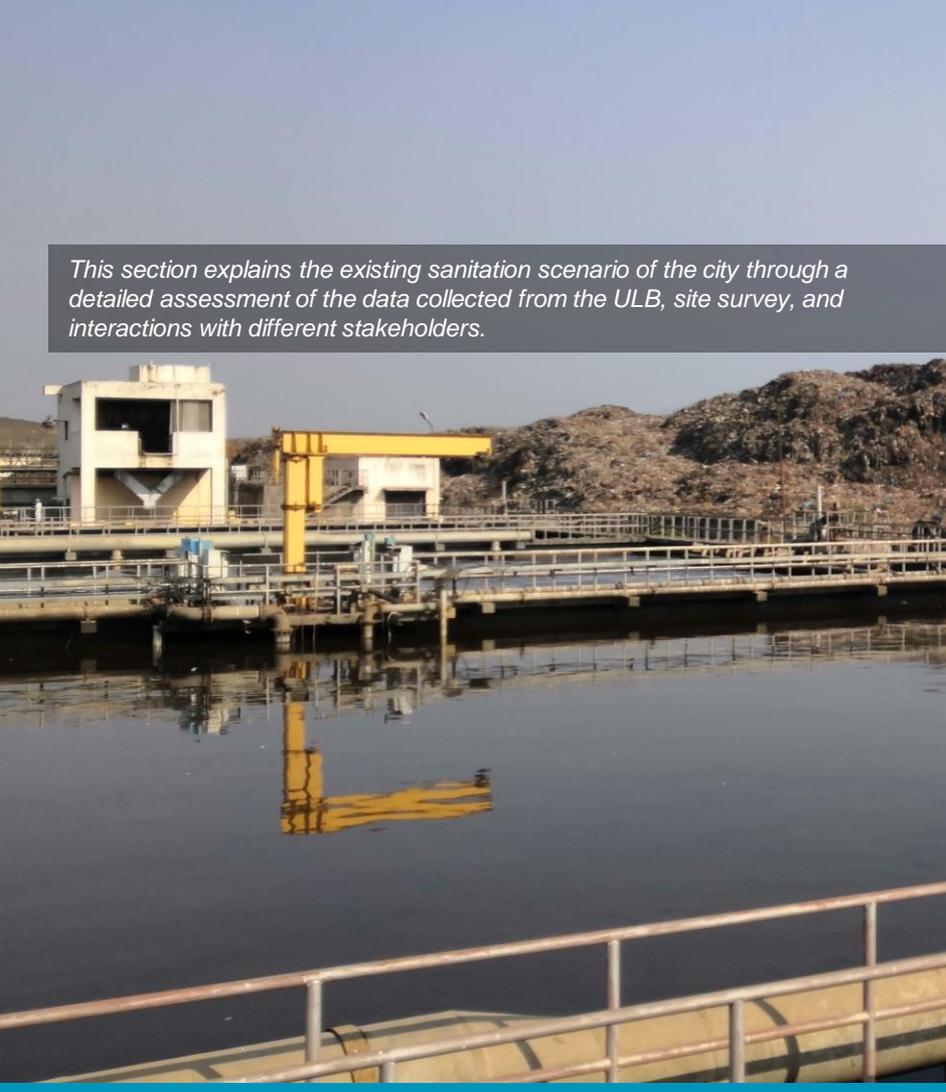
The general body is headed by the Mayor followed by Dy. Mayor

Number of Election Wards	81
Municipal staff	3,527

Administrative setup



Source: Primary research, Kolhapur Municipal Corporation



This section explains the existing sanitation scenario of the city through a detailed assessment of the data collected from the ULB, site survey, and interactions with different stakeholders.

Contents

- 1** Kolhapur city overview

- 2** Sanitation assessment of the city

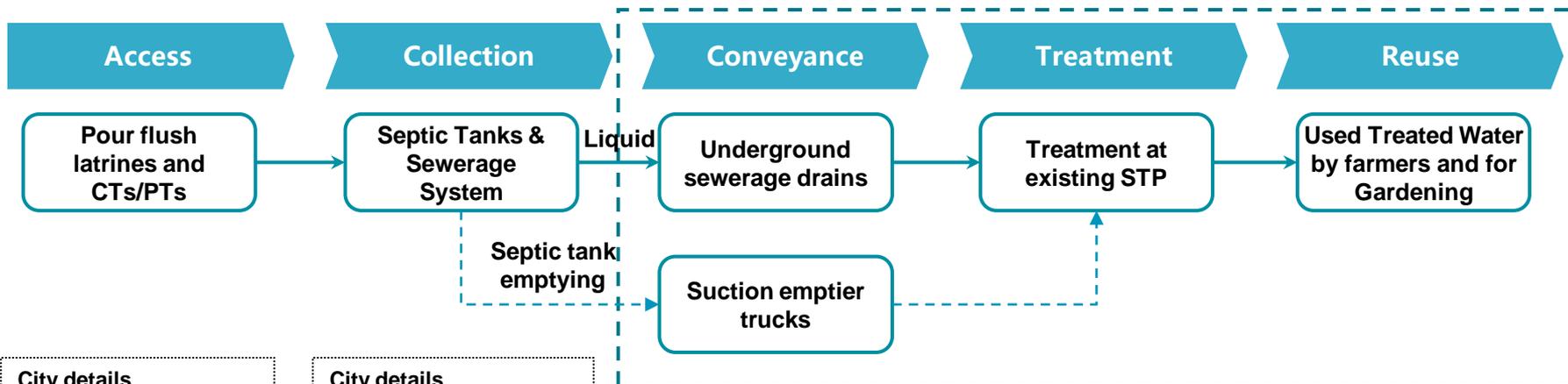
- 3** Identification of pilot zone and planning for scheduled desludging

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Existing sanitation service chain - Overview



Existing situation

City details
 Individual toilets- **1,16,383 HHs (92%)**
 Dependent on
 Community toilet- **15,583 HHs (8%)**

Slum level details
 Individual toilets- **7,600 HHs (52%)**
 Dependent on
 Community toilet- **7,000 HHs (48%)**

City details
 Sewerage system- **70,000 HHs (60%)**
 Septic tanks- **46,000 HHs (40%)**

Slum level details (57 slums settlements)
34 slums with septic tanks
19 slums with partial sewer network
4 slums with full sewer coverage

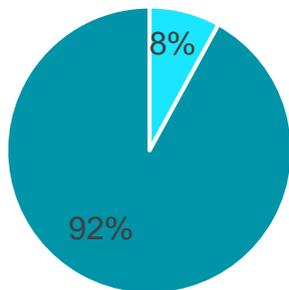
- **4 major Nallahs** are diverted to STPs
- ULB owns **5 suction trucks: 2 @ 6000 litre; 3 @ 3000 liters** and **1 vacuum tractor @ 3000 liters**
- **One private desludging operator-3 trucks @ 3000 liter**
- Irregular desludging, emptied only when full once **in 8-9 years**
- Manual logbooks for monitoring.
- The trucks dispose of the collected septage at pumping stations

- **2 STPs:** Kasaba Bawda (76 MLD) and Dudhali (17 MLD)
- **85.2 MLD** wastewater generated and **83 MLD** is treated
- **40 KLD** septage co-treated at STP
- Manual log-books for monitoring FS load at STP.

- **Only 4%** of the treated wastewater is reused (3 MLD)
- Farmers from the nearby area use the treated water and sludge but no record is maintained.
- **The city lacks a reuse plan for the treated water**

Source: Kolhapur Municipal Corporation; Detailed Project Report for underground sewerage scheme, Kolhapur, DPR, Kolhapur Municipal Corporation; Primary data collection and site visits

Sanitation access - Individual toilets and community/public toilets



- Total households dependent on CT/PT
- Total households dependent on IHHT

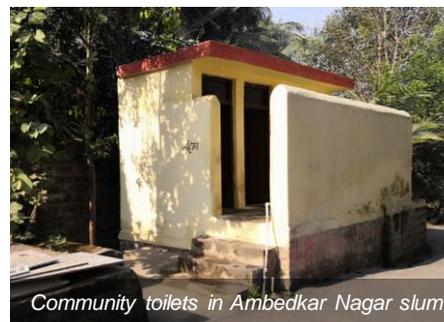
As per Swacch Survekshan 2021, households access to **IHHTs in the city is 92% while others are dependent upon community or public toilets.**

Parameter	Number (2021)	%
Households	1,26,937	93%
Total number Households having IHHTs	1,16,383	92%
Total Households dependent on CT/PT	10,554	8%
Practicing Open Defecation	-	0%

Source: Swacch Survekshan 2020; discussion with ULB officials and site visits

Current status of Community Toilets (CT) and Public Toilets (PTs)

Parameters	CTs	PTs
Total no of CT and PT	61 Seats - 795	9 Seats - 117
Toilets connected to Septic Tanks	32	3
Toilets connected to Sewer network	29	6
O & M of CTs/PTs	All CTs maintained by KMC	All PTs maintained by KMC



Community toilets in Ambedkar Nagar slum

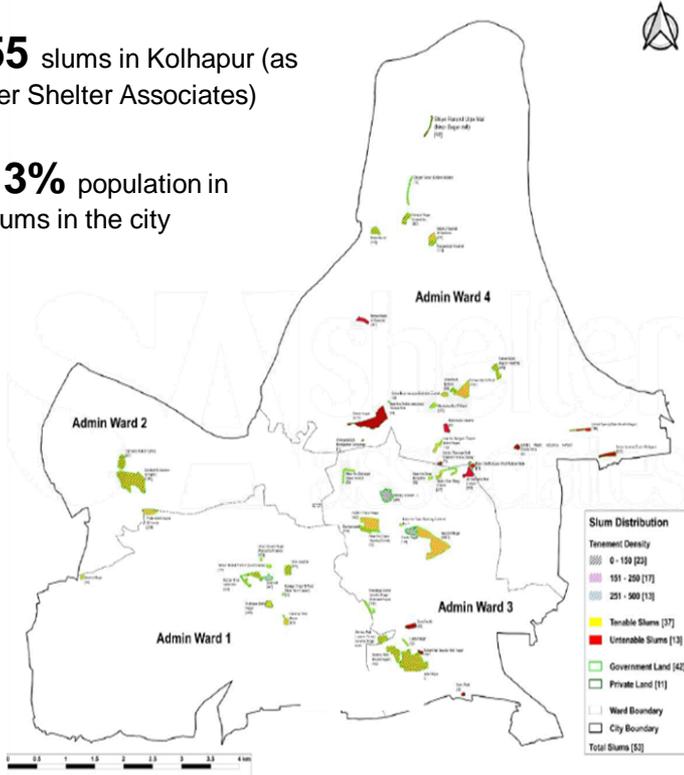


Distribution of slums in Kolhapur

Slum location map of the city

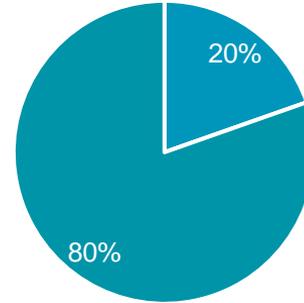
55 slums in Kolhapur (as per Shelter Associates)

13% population in slums in the city



Source: Shelter Association (2020); Rajiv Awas Yojana (2013). Guidelines for Preparation of Slum Free City Plan of Action 2013-2022

Land ownership in slums



■ Private land ■ Government land

80% of the total slums are located on Government land (44 slums) and others on private land

Highest and least populated slums in the city

Highest populated slums	
1	Awachit Nagar
2	Rajendra Nagar
3	Lakshatirth Vasahat
4	Vichare Mala E-Ward
5	Yadav Nagar Kotitirth
6	Ambedkar Nagar slum
7	Kanan Nagar
8	Jamsandekar Mala
9	Makadwale Vasahat
10	Raman Mala K-Bawada
11	United Agency(Rajiv Gandhi Nagar)

Least populated slums	
1	GhorpadeGalli,Koregaokar Compound
2	Near the Dafale compound Tarabai Park
3	Kamgar Chawl B-Ward (Near Race Course) (Sambhaji Nagar)
4	Near the Chaya Housing Society
5	Near the Town Planning Scheme No.1

Visual assessment of slums

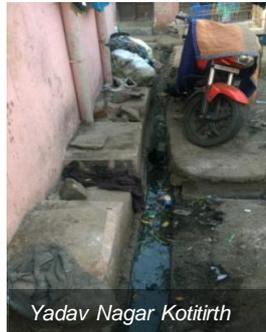
Roads



Community Toilets



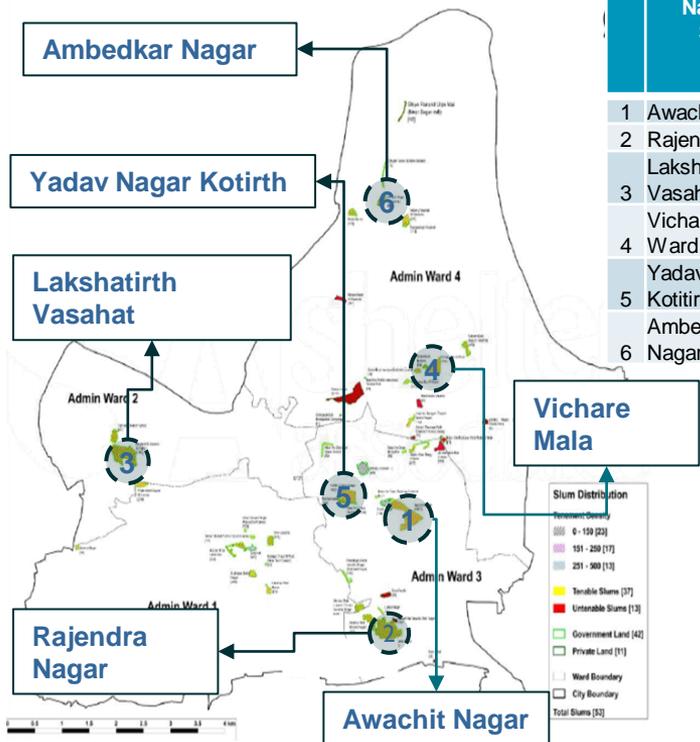
Open Drains



Source: Slum visit

Sanitation scenario in the large slums (1/2)

Highly populated slum location



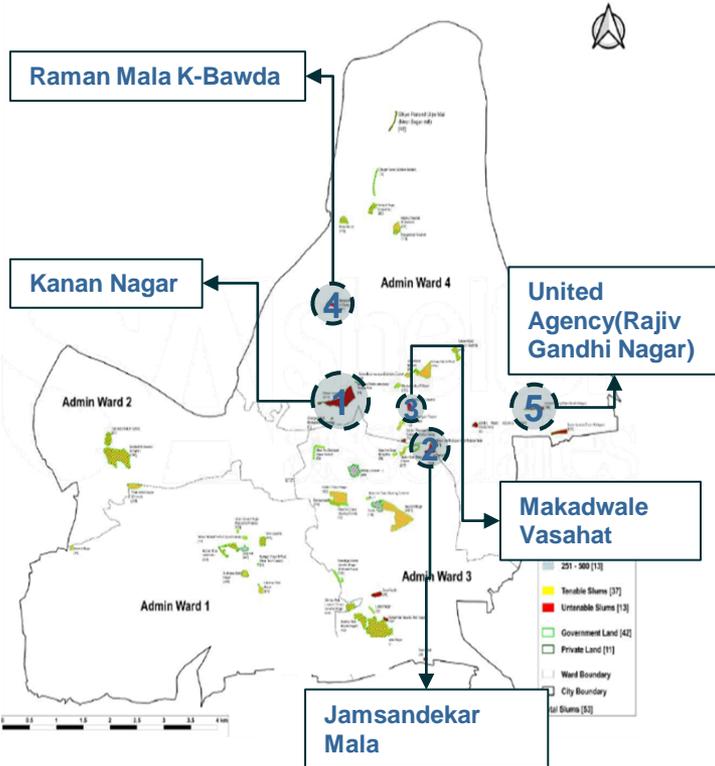
	Name of Slum	Land ownership	Total population	Total HH	Tenement density (huts/ha)	HH dependent on IHHLs (%)	HH dependent on CTBs (%)	HH defecating in open	Community Toilet seat to person ratio	Sewer coverage	Water supply coverage
1	Awachit Nagar	State Govt.	8405	1681	164	30%	52%	17%	1:11	Partial	Full
2	Rajendra Nagar	M. Corp	8065	1613	137	10%	78%	0%	1:20	Partial	Partial
3	Lakshatirth Vasahat	State Govt.	6335	1267	126	37%	49%	19%	1:04	No	Full
4	Vichare Mala E-Ward	State Govt.	5880	1176	247	13%	78%	0%	1:42	No	Full
5	Yadav Nagar Kotirth	State Govt.	4260	852	193	25%	61%	13%	1:30	Full	Full
6	Ambedkar Nagar slum	State Govt.	1575	315	527	35%	46%	0%	1:43	No	Full

- Awachit Nagar slum is the highest populated slum whereas **Ambedkar Nagar slum is the densest slum showing a tenement density of 527 huts/hectare.**
- Rajendra Nagar slum and Vichare Mala show higher dependency on Community toilets. Vichare mala, Yadav Nagar Kotirth, and Ambedkar Nagar slum have more than 25 people per seat dependent on Community toilets.
- **Awachit Nagar slum, Lakshatirth Vasahat, and Yadav Nagar Kotirth show more than 17%, 19%, and 13% HH defecating in open respectively.**
- **All the identified slums have full water supply coverage except in the Rajendra Nagar slum. However, only the Yadav Nagar Kotirth slum shows full sewer network coverage.**

Source: Shelter Association (2020), site visits

Sanitation scenario in the large slums (2/2)

Highly populated slum locations



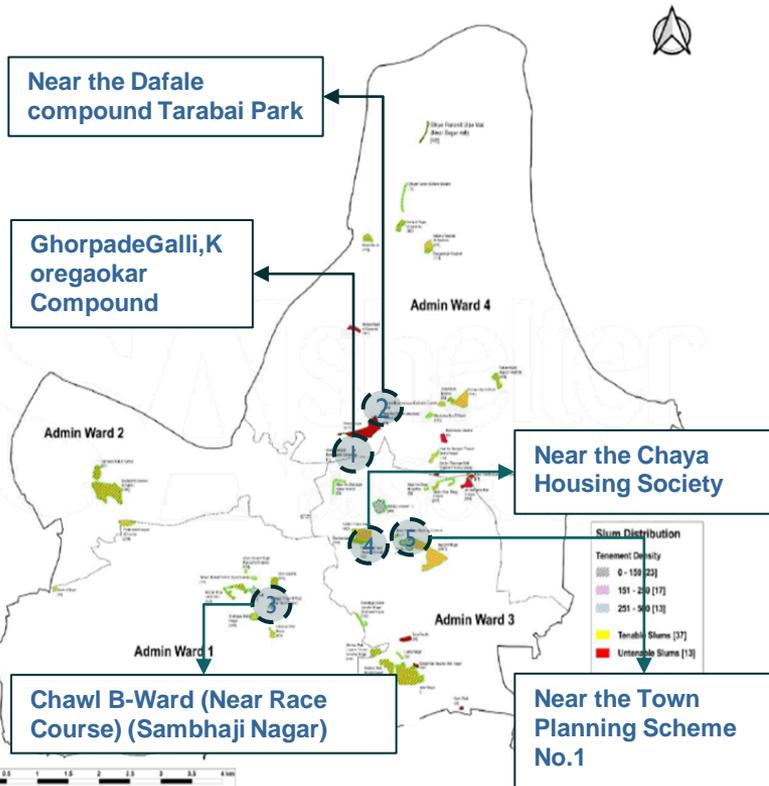
	Name of Slum	Land ownership	Total population	Total HH	Tenement density (huts/ha)	HH depend ent on IHHs (%)	HH depend ent on CTBs (%)	HH defecati ng in open	Communi ty Toilet seat to person ratio	Sewer covera ge	Water supply covera ge
1	Kanan Nagar	Private	4920	984	131	18%	70%	0%	1:43	Partial	Full
2	Jamsandekar Mala	Private	1365	261	197	3%	81%	0%	1:30	No	Partial
3	Makadwale Vasahat	Private	1095	219	225	8%	72%	0%	1:31	No	Full
4	Raman Mala K-Bawada	Private	905	181	152	17%	74%	0%	1:17	No	Full
5	United Agency(Rajiv Gandhi Nagar)	State Govt.	780	156	182	3%	93%	0%	1:79	No	Full

- Kanan Nagar slum is the highest populated slum whereas **Makadwale Vasahat slum is the densest slum showing a tenement density of 225 huts/hectare.**
- **All these slums show higher dependency on Community toilets** with the highest dependency in United Agency slums with 93% HH. Kanan Nagar, Jamsandekar Mala, and Makadwale Vasahat slum have more than 25 people per seat dependent on Community toilets.
- **The highest populated Kanan Nagar slum shows partial coverage of the sewer network** which is lacking in other slums.
- **All the identified slums have full water supply coverage** except in the Jamsandekar Mala slum.

Source: Shelter Association (2020), Site visits

Other less populated slums

Least populated slum location



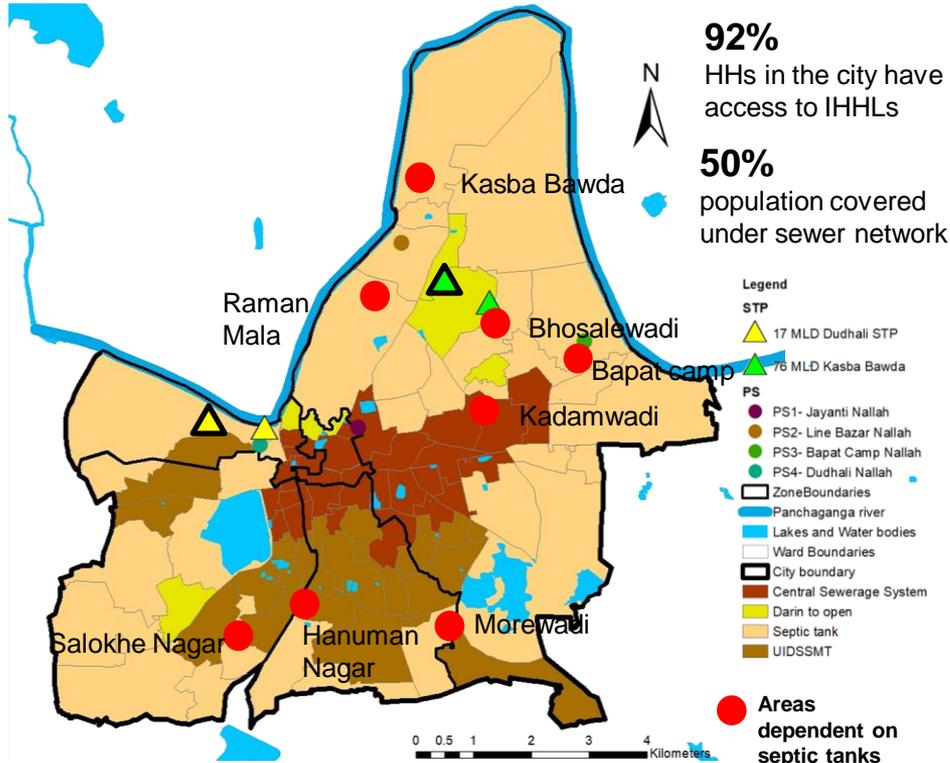
Sr. No	Name of Slum	Land ownership	Legal status	Total population	Total HH	HH dependent on IHHLs (%)	HH dependent on CTBs (%)	HH defecating in open	Community Toilet seat to person ratio	Sewer coverage	Water supply coverage
1	GhorpadeGalli, K oregaokar Compound	Private	Declared	60	12	3	0	0	NA	Partial	Full
2	Near the Dafale compound Tarabai Park	M. Corp	Undeclared	80	16	0	16	0	1:37	No	Full
3	Kamgar Chawl B-Ward (Near Race Course) (Sambhaji Nagar)	State Govt.	Declared	130	26	2	23	0	1:29	No	Full
4	Near the Chaya Housing Society	M. Corp	Undeclared	150	30	3	29	0	NA	No	Partial
5	Near the Town Planning Scheme No.1	M. Corp	Undeclared	170	34	3	27	0	1:09	Partial	Full

- It is observed that the least populated Ghorpade Galli slum is undeclared slum located on private land. However, Dafale compound slum, slum near Chaya Housing society, and near Town Planning Scheme No.1 are undeclared slums located on the M.corp land.
- **The HH dependency on CT/PTs located outside the slums is higher indicating lower access to IHHTs**
- **Majority of these slums lack sewer coverage but have sufficient water coverage.**

Source: Shelter Association (2020), Site visits

Collection – Partial sewerage coverage suggests dependency on septic tanks

Existing desludging truck zones map of Kolhapur



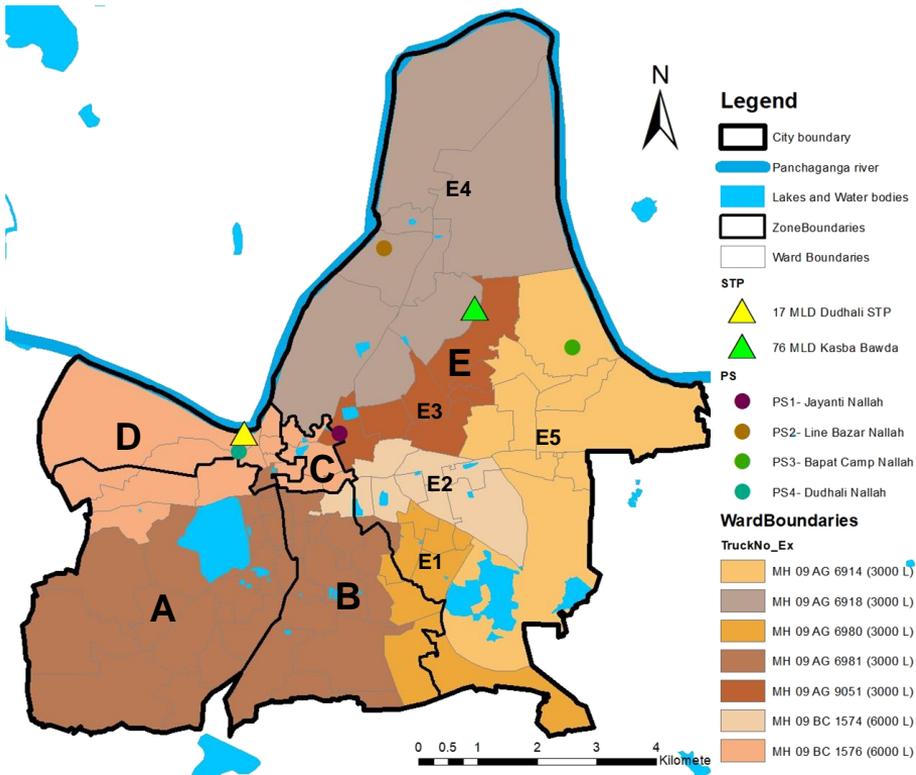
Parameter (2019)	Number	%
Households	1,26,937	-
Total number HHs having IHHL	1,16,383	92%
IHHT Connected to Septic Tanks	44,609	40%
IHHT Connected to Sewer system	70,392	60%

- All the **peripheral zones of Kolhapur lack sewer networks**, thus showing septic tanks as the majorly used toilet disposal mechanism.
- Under UIDSSMT Scheme – **45 Kms sewerage line (main trunk) functional**.
- Existing sewerage network is a **combination of underground and open drains**
- Under AMRUT scheme- **116 km drainage line proposed and under construction**.
- There are **four zones for sewage management** Jayanti, Line Bazar, Bapat camp from where sewage is pumped to **Kasba Bawda STP** and from **Dhudhali nallah is pumped to Dhudhali STP**.
- **Apartments have their STP for the treatment of wastewater**.
- Outlet of septic tanks is connected to the open drains.

Source: Kolhapur Municipal Corporation; Unity Consultants Pvt. Ltd. (2016). Detailed Project Report for underground sewerage scheme, Kolhapur, DPR, Kolhapur Municipal Corporation; Primary data collection and site visits

Conveyance - Desludging is carried out by both KMC and private operators

Existing desludging truck zones map of Kolhapur



- **KMC has 5* desludging trucks** (2 trucks of 6000 liters; 3 trucks of 3000 liters) and **1 vacuum tractor (3000 liters)** for septic tank desludging
- There are **2 private desludging operators** in the city with a total of 3 trucks of 3000 liters capacity
- In addition, 1 vacuum Tractor is used for the areas having narrow roads.
- **The desludging trucks dispose the collected septage at the Pumping Station of STP (~40 KLD)**

User charges for Suction Vehicle of KMC and Private Operators

1	KMC	Within KMC boundary	Rs. 500 /- per Trip
2	KMC	Outside KMC boundary	Rs. 2500 /- per Trip
3	Private	Within KMC boundary	Rs. 700 /- per Trip
4	Private	Outside KMC boundary	Rs. 3000 /- per Trip

Payment and receipts are made in the drainage department by making a single receipt of Rs. 500/- per trip.

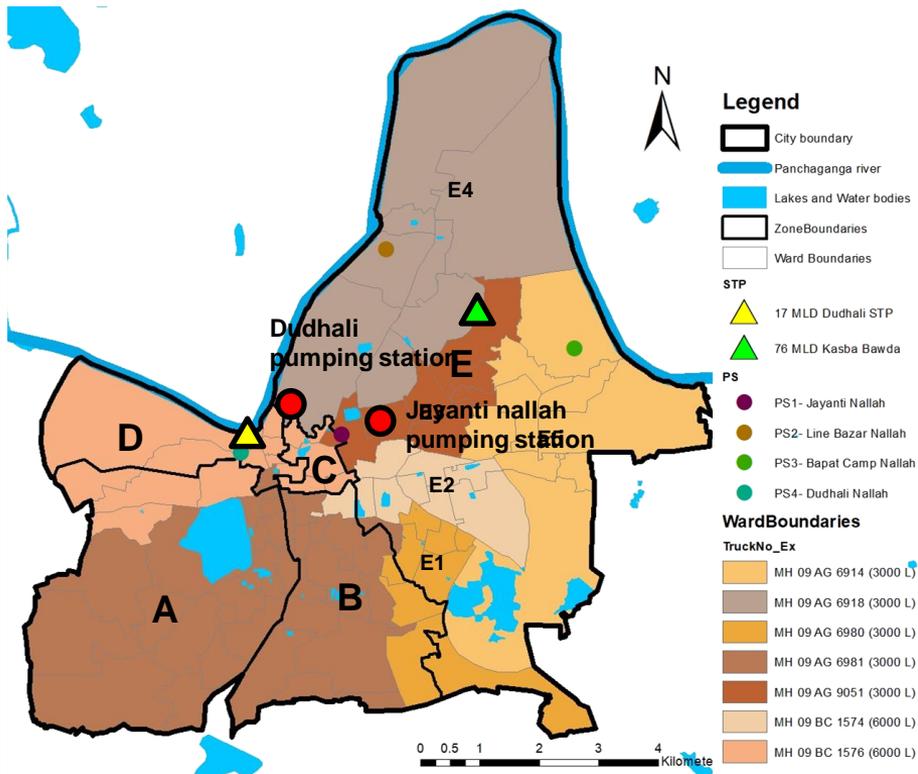


* In addition to 5 trucks, 2 Suction Trucks are available but not operational since last 2 years.

Source: Kolhapur Municipal Corporation; Primary data collection (October 2020)

Conveyance - Daily septage disposal at pumping stations

Existing desludging truck zones map of Kolhapur



The desludging trucks dispose the collected septage at **Jayanti nallah** pumping station and **Dudhali** pumping station.

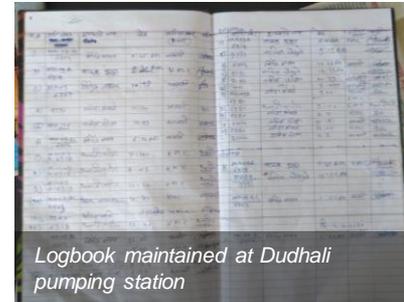
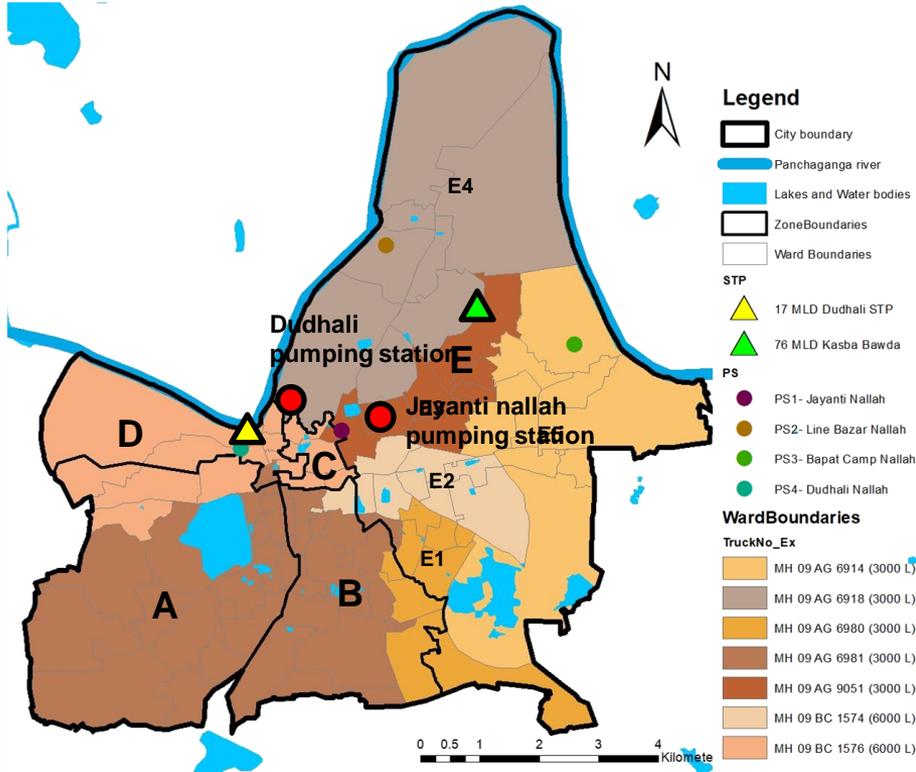
1. Average septage discharge at **Dudhali** pumping station is = **19000 Ltr./day**
2. Average septage discharge at **Jayanti nallah** pumping station is = **21000 Ltr./day**
3. Total daily septage collection by **KMC** and private operator = **40000 Ltr./day**



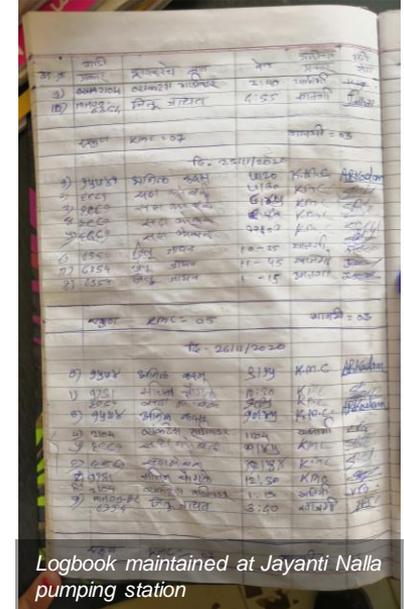
Source: Kolhapur Municipal Corporation; Primary data collection (October 2020)

Monitoring is through paper based logbooks at pumping stations

Existing desludging truck zones map of Kolhapur



Logbook maintained at Dudhali pumping station



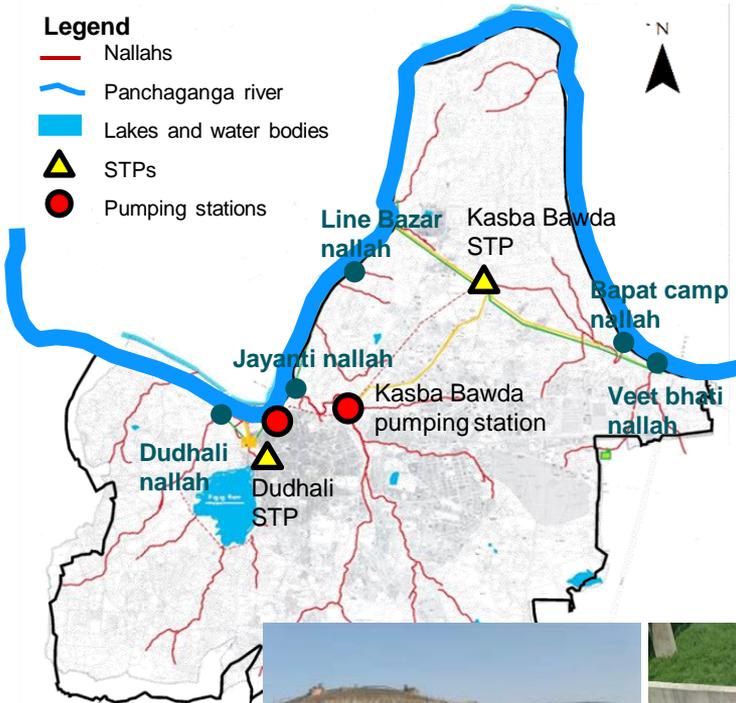
Logbook maintained at Jayanti Nalla pumping station

- **Logbooks are maintained** at both the pumping stations to track the details of trucks visits arriving for decanting the septage.
- It captures data such as **truck numbers, driver's name, time of entry, type of operator (KMC/private) and signature, etc.**

Source: Kolhapur Municipal Corporation; Primary data collection (October 2020)

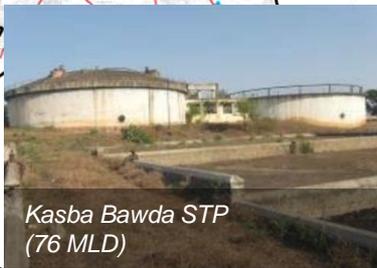
Treatment- There are two STPs to treat wastewater and septage

- Legend**
- Nallahs
 - Panchaganga river
 - Lakes and water bodies
 - STPs
 - Pumping stations



- Wastewater is diverted from *nallahs* to STP through *nallah* plugging.
- There are two main pumping stations- *Jayanti nallah* and *Dudhali nallah* pumping station
- Jayanti Nallah pumping station is connected to Kasba Bawda STP and Dudhali pumping station is connected to Dudhali STP.
- Suction trucks (ULB and private) **dispose collected septage into the nearest pumping station.**

Sr. no	STPs	Designed capacity	Utilized capacity	New STP Proposed under AMRUT	Total septage currently treated
1	Kasba Bawda STP	76 MLD	Avg. 65 -70 MLD	4 MLD	40 KLD
2	Dudhali STP	17 MLD	Avg. 20 - 24 MLD	6 MLD	



Source: Kolhapur Municipal Corporation; Primary data collection (October 2020)

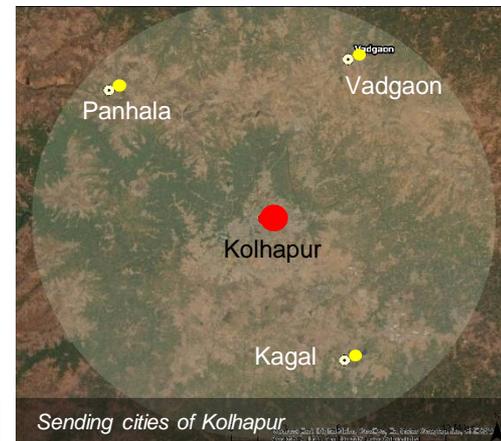
Co-treatment practice in Kolhapur

Along with co-treating 40 KLD of fecal sludge from the septic tanks in the city, Kolhapur also co-treats the fecal sludge from nearby cities.

- As per the GR on co-treatment for Maharashtra, **Kolhapur** is identified as a receiving city for the cities of **Kagal, Panhala, and Vadgaon**.
- Daily a total of **10 KLD fecal sludge** is treated at **both the STPs**
- Kolhapur has adequate infrastructure for co-treatment in terms of quantity and quality.
- All three cities have signed a memorandum of agreement (MoU) with Kolhapur. MoU clearly defines the roles and responsibilities of sending and receiving cities.



Co-treatment activity at Kolhapur STP



Sending cities of Kolhapur.

Details of 'Sending Cities' that Co-treat at Kolhapur

Name of city	Distance	Load sent to KMC(KLD)	In charge of Desludging activity	Monitoring between ULB and private	Desludging charges(Per trip)	Decanting station
Vadgaon	17.3 km	2 KLD	Both	Contracted	Vadgaon municipality - Rs. 1500, private operators – Rs.3,000	Jayanti nallah pumping station
Kagal	19 km	3 KLD	Only ULB	-	Rs. 1500 charges + 50 Rs per km(outside city boundary)	Dudhali pumping
Panhala	20 km	5 KLD	Only ULB	-	Panhala municipality Rs. 3000/ per trip	

Source: Primary survey and stakeholder interactions

Treatment - Decentralized STPs in hospitals and apartment buildings

1. There are **38 functional apartment level STPs** monitored by the Environment Officer of KMC.
2. **As per building development control rules, it is mandatory to install an individual STP**, treat wastewater, and practice reuse of recycled water in the following cases:
 - Layouts more than 4000 m² (1 acre) area
 - Apartments having more than 20 tenements
 - Hospitals having more than 40 beds
 - Daily water usage more than 10000 lit
 - Commercial area more than 1500 m²
3. DEWATS of 10 m³ capacity is installed at the isolation hospital, Rajendra Nagar, and Salokhe Park.



Source: Primary survey. March 2021

Existing reuse of treated wastewater (1/2)

- Estimated quantity of treated wastewater produced– **83.2 MLD** and estimated quantity of treated sludge produced– **120.5 Kg/D**.
- Currently, Kolhapur is reusing the treated wastewater for gardening and at the SWM site:-

Treated water from Kasba Bawda is currently reused for **dousing fire at the city dump site**



Figure: The dousing fire at the city dump site

The treated wastewater is reused for dousing fire at the dumpsite every 2 to 3 days. **300 M length pipeline is laid to supply the treated wastewater until the SWM site.**

The treated wastewater is also reused for **watering the road medians and road cleaning**



Figure: Tanker filling point for reuse of treated wastewater from Kasaba Bawada STP

The treated wastewater is also used for watering the medians and road cleaning every day except in the rainy season. **Water tankers are hired on rental basis for the same.**

Source: Primary survey, stakeholder interaction, PPT On Wastewater reuse PRACTICES & REUSE POTENTIAL IN THE URBAN AREAS OF Maharashtra prepared CEPT students

Existing reuse of treated wastewater (2/2)

The treated wastewater is sporadically reused in the **agricultural fields** in the vicinity of the STP.



Figure: Pumping Station install by farmers to reuse treated wastewater from Kasaba Bawada STP through the chambers at treated wastewater drainage pipeline

The treated wastewater is used for agriculture purpose everyday except in the rainy season. **Farmers pump the water through the drainage line connecting the STP.**

Treated wastewater from the STPs is used at the SWM site for **reducing the dust problem and sometimes for composting purpose too.**



Figure: Reuse of treated wastewater from Kasaba Bawada STP to reduce dust problem at site

Approximately, 25000 liters of treated wastewater is reused for dusting everyday. **A 5000 liter tanker is used daily covering 4 to 5 trips till the SWM site.**

Sanitation is financed through sewerage tax

Sewerage tax for domestic/commercial/industrial connection as per water usage for existing and newly constructed drainage connection is as under -

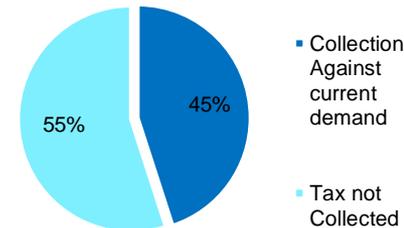
	Water Use	Sewerage Tax (as a % of water bill per connection)
1	Domestic connection 0 to 20000 liters per bimonthly	10%
2	Domestic connection 20000 to 40000 liters per bimonthly	20%
3	Domestic connection more than 40000 liters per bimonthly	25%
4	For Commercial Connection	30%
5	For Industrial Connection	35%

- Drainage connection supervision fee Rs.1000/-
- Illegal drainage connection fine Rs.2500/-
- Sewerage tax have been imposed from 1 April 2013

The water extracted from the private boreholes in the city mixes with the *nallahs* as wastewater after use, hence the following sewerage Tax is also levied the boreholes

	Particulars	Sewerage Tax
1	Per-Bunglow	Rs.400/- per year
2	Per Flat	Rs.100/- per year
3	One Five Star Hotel and Lodging	Rs.250/- per room per year
4	Two or More Five star hotels and lodging	Rs.500 per room per year

Tax Collection Efficiency



Year 2018-19	
Collection against current demand	201.2 Lakhs
Tax not collected	248.8 Lakhs

Source: Data from KMC & PAS Data

Water charge collection efficiency needs to be improved

Water Charges

	Water Usage	Bill
Domestic	0-20000 Litres	Rs.190/- Stable for two months
	20001- 40000 Litres	Rs.190/- + Rs.11.5- for 1000 Litres
	40001 and more	Rs.190/- + Rs.15.0- for 1000 Litres + Rs.9.5- for 1000 litres
Commercial	Rs. 40/- per 1000 litre	
Industrial	Rs. 65/- per 1000 litre	

- New water connection form fee Rs.200/-
- NOC fee for citizens having water connection is Rs.75/- and for a citizen not having water connections is Rs.150/-
- Water tax has been revised from 1 April 2013

Source: Data from KMC and PAS SLB Data

द्विमासिक आकारणी सुधारित दृ												
व्यय मिति	कमीत कमी द्विमासिक आकारणी			मीटर बंद प्रथम २ महिने			मीटर बंद २ महिन्यांनंतर			मीटर बंद ६ महिन्यांनंतर		
	घरगुती	व्यावसायिक	औद्योगिक	घरगुती	व्यावसायिक	औद्योगिक	घरगुती	व्यावसायिक	औद्योगिक	घरगुती	व्यावसायिक	औद्योगिक
15	190	780	1620	520	1560	3240	650	1950	4050	1040	3120	6480
20	754	1300	2620	1508	2600	5240	1885	3250	6550	3016	5200	10480
25	1086	1940	3870	2132	3880	7740	2865	4850	9675	4264	7760	15480
32	1638	3080	6110	3276	6160	12220	4095	7700	15275	6552	12320	24440
40	2496	4750	9340	4992	9500	18680	6240	11875	23350	9984	19000	37360
50	3822	7360	14400	7644	14720	28800	9555	18400	36000	15288	29440	57600
65	6344	12340	24100	12688	24680	48200	15860	30850	60250	25376	49360	96400
80	9490	18580	36200	18960	37150	72400	23725	46450	90500	37960	74320	144800
100	21190	49200	103500	42380	98400	207000	52975	123000	278750	84760	196800	414000
150	47580	110600	233000	95160	221200	466000	118950	276500	582500	190320	442400	932000
200	84500	196600	414100	169000	393200	828200	211250	491500	1035250	338000	786400	1656400
250	132600	307200	647100	265200	614400	1294200	331500	786000	1617750	530400	1228800	2588400

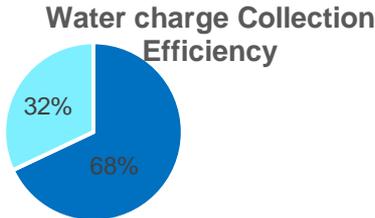
* नवीन 'नव' कोव्हसन फॉर्मिटी किंमत रु. १००/- ऐवजी सुधारित किंमत रु. २००/- इतकी करणे आलेली आहे.
 * 'नव इतका वाढवत (NOC)' फॅमिली प्रॉव्हिडंट फंड रु. २५/- ऐवजी रु. ५५/- व बिगर प्रॉव्हिडंट रु. ५०/- ऐवजी रु. १५०/- इतके करणे आलेले आहे.
 * ज्या दबाखान्यामध्ये केवळ 'वाढवत' (ओ.पी.टी.) टायपची केटी जाते अशा टिकावण्या पाण्याचा वापर व्यावसायिक वा वाणिज्यीयतेने घरणेच वेळ आहे व ज्या दबाखान्यामध्ये ऑटोमॅट (आय.पी.टी.) टायपचे केले जाऊन अशा टिकावण्या पाण्याचा वापर औद्योगिक वर्कशॉपमध्ये करणेच वेळ आहे.
 * ज्या इमारतीचा वापर लॉजिंग वा बाजारपेठेतील होत आहे अशा इमारतींमध्ये कोव्हसनची कॅमिटी औद्योगिक दराने करणेच वेळ आहे.
 सुधारित दराने विलंबी आकारणी रुजित मे २०१३ चे विलंबित टॅक्झेशनसूची सन्मू. होईल.

There are also a charge table if the meters are non-functional for two Months or three months; HHs have to pay water tax even if meters are closed

101507
Total connections

98093
Metered connections

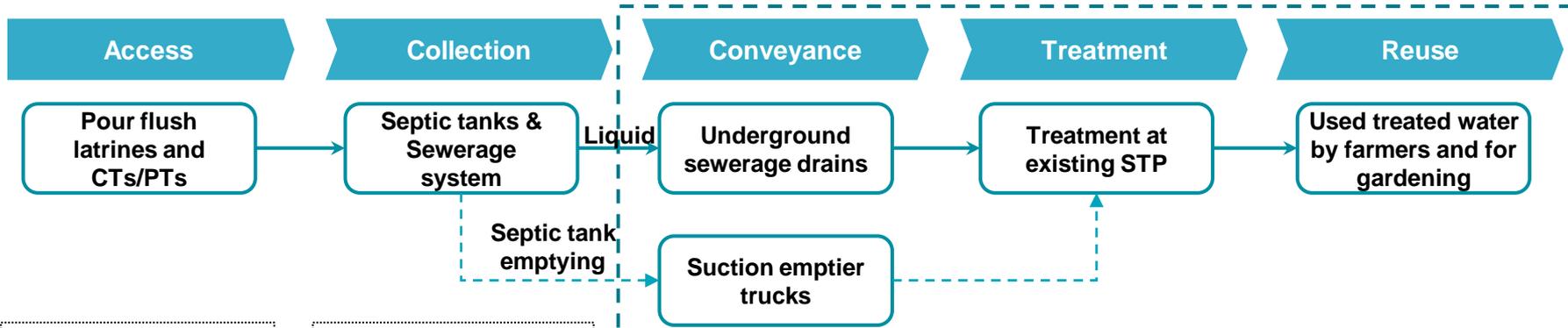
36.23%
The extent of non-revenue water in 2018-19 (SLB Data)



- Collection Against current demand
- Tax not Collected

Year 2018-19	
Collection against current Demand	2572.12 Lakhs
Tax not collected	1226.15 Lakhs

Existing sanitation service chain- Overview



Existing situation

City details
Individual toilets- **1,16,383 HHs (92%)**
Dependent on
Community toilet- **15,583 HHs (8%)**

Slum level details
Individual toilets- **7,600 HHs (52%)**
Dependent on
Community toilet- **7,000 HHs (48%)**

City details
Sewerage system- **70,000 HHs (60%)**
Septic tanks- **46,000 HHs (40%)**

Slum level details (57 slums settlements)
34 slums with septic tanks
19 slums with partial sewer network
4 slums with full sewer coverage

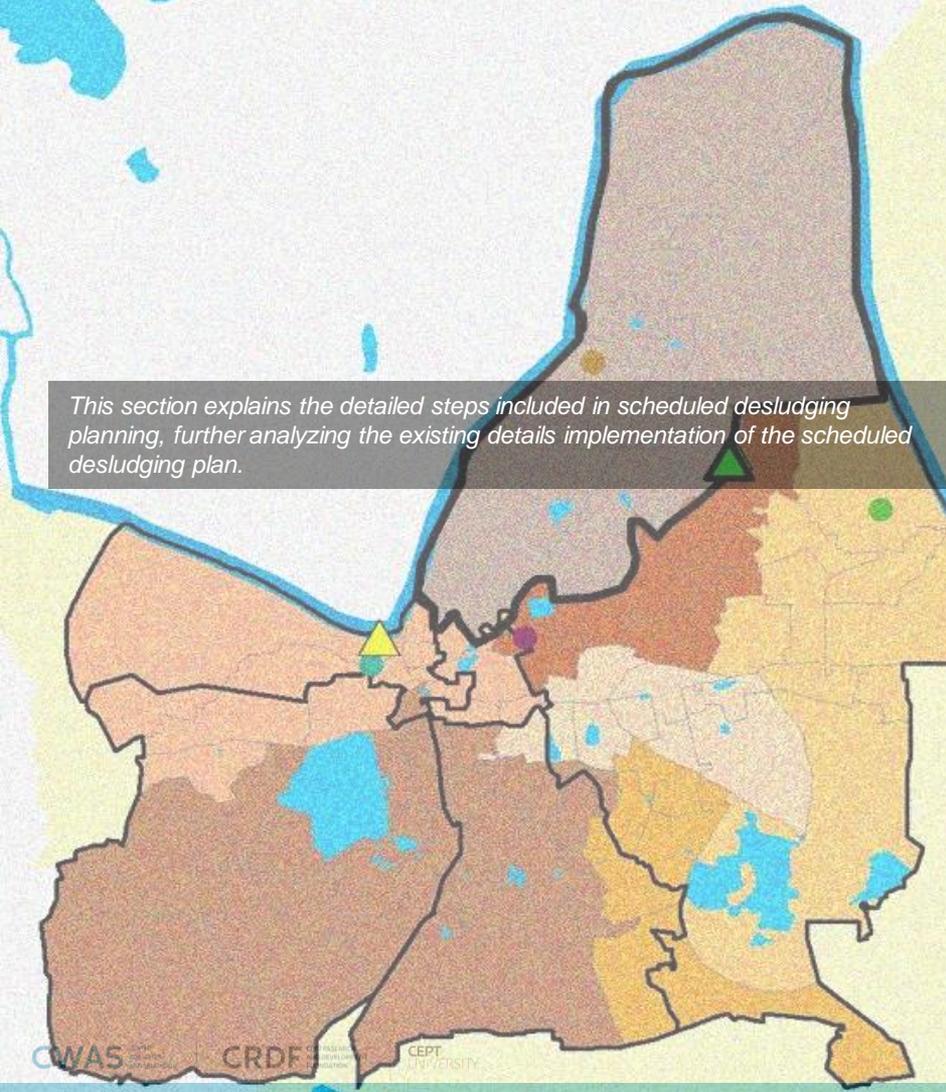
- **4 major Nallahs** are diverted to STPs
 - ULB owns **5 suction trucks: 2@ 6000 litre; 3@ 3000 liters** and **1 vacuum tractor @ 3000 liters**
 - **One private desludging operator-3 trucks @ 3000 liter**
 - Irregular desludging, emptied only when full once **in 8-9 years**
 - Manual logbooks for monitoring.
 - The trucks dispose of the collected septage at pumping stations
- Proposed interventions**
- **2 STPs:** Kasaba Bawda (76 MLD) and Dudhali (17 MLD)
 - **85.2 MLD** wastewater generated and **83 MLD** is treated
 - **40 KLD** septage co-treated at STP
 - Manual log-books for monitoring FS load at STP.
- **Only 4%** of the treated wastewater is reused (3 MLD)
 - Farmers from the nearby area use the treated water and sludge but no record is maintained.
 - **The city lacks a reuse plan for the treated water**

- **Schedule desludging of septic tanks once in 3 years**
- **Ensuring 100% treatment of scheduled desludging load at STP**
- **Resource center and landscape at STP**
- **Online monitoring systems**
- **Landscape at STP for reuse of treated wastewater**
- **Reuse plan for treated wastewater and treated sludge**

Source: Kolhapur Municipal Corporation; Detailed Project Report for underground sewerage scheme, Kolhapur, DPR, Kolhapur Municipal Corporation; Primary data collection and site visits

Contents

- 1 Kolhapur city overview
- 2 Sanitation assessment of the city
- 3 Identification of pilot zone and planning for scheduled desludging
- 4 Online monitoring systems
- 5 Landscaping and resource center at STP
- 6 Overview of sanitation activities in Kolhapur

A map of Kolhapur city, India, showing various zones and landmarks. The city is divided into several colored regions: a large brown area in the north, a yellow area in the east, and a large blue area in the south. A green triangle is located in the brown area, a yellow triangle is in the blue area, and a purple dot is in the yellow area. A blue line representing a river or canal runs along the western and southern edges of the city. A north arrow is located in the top left corner of the map.

This section explains the detailed steps included in scheduled desludging planning, further analyzing the existing details implementation of the scheduled desludging plan.

To achieve water plus status, the ULB should adopt scheduled desludging of septic tanks

Demand Desludging



Scheduled Desludging



Cleaning is done **on-call** by the household, when septic tank is full



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.

ULBs operate trucks only when demand arises

Households generally pay the user charges



Septic tanks will be cleaned **once in three years** on a **pre-determined schedule**.

Service provision to ensure scheduled desludging
Awareness generation activities will educate households about the need for regular cleaning.



City will require an additional number of trucks to meet service standards as per schedule



Local taxes may be levied by the ULB to recover the operating expenses for regular cleaning

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 - Lowered likelihood of septic tank overflows, increased efficiency of septic tanks resulting in lower pollutants (such as faecal coliforms) in drain effluent

Key considerations for successful scheduled desludging practice



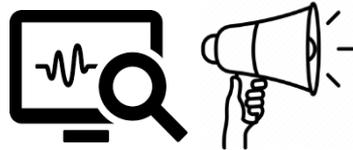
Providing scheduled desludging service as a Municipal Service

- Like provision of SWM door to door collection service
- Promote supply driven approach and not demand driven.
- The onus of desludging the septic tank must not be on the HHs



Higher degree of desludging acceptance rate linked to indirect cost recovery

- Avoid/ user chargers based model (Based on international experiences)
- Should promote indirect cost recovery mechanism such as sanitation tax or sewerage tax as percentage of property tax.



Proper monitoring and IEC campaigns

- Involving various stakeholders for Awareness generations i.e. Citizens, NGOs, ULB officials, SHGs, etc.
- Paper based or IT based monitoring systems

Steps to be followed for planning of scheduled desludging in Kolhapur



Select zone for scheduled desludging
Assess number and size of septic tanks in that zone

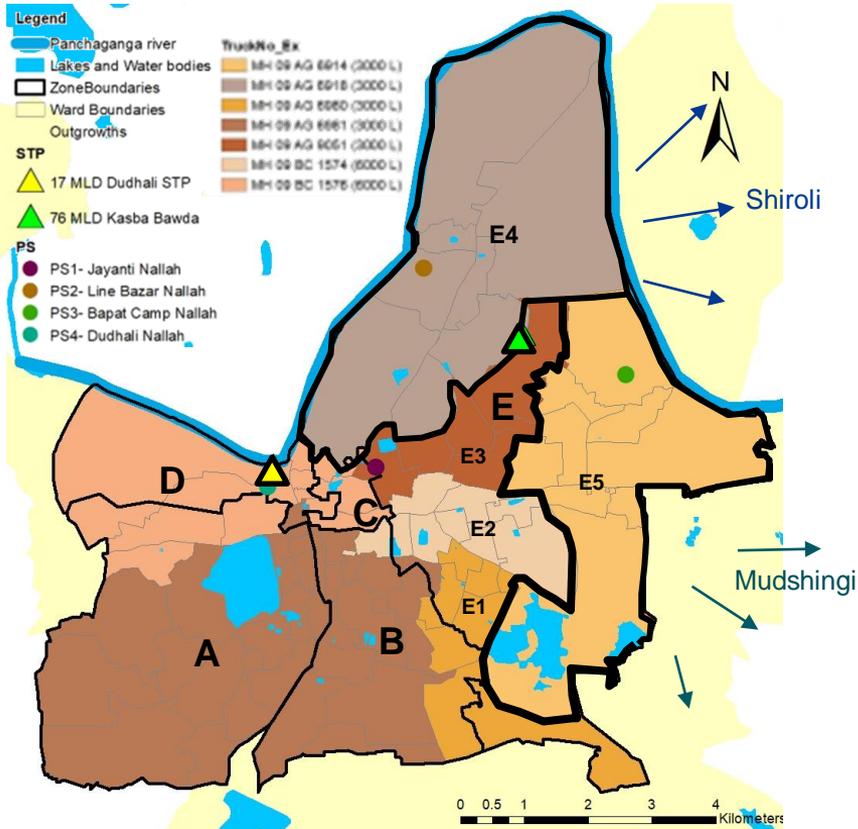
Assess the infrastructure requirement – additional emptying trucks and STP capacity required

Decide model of operations for desludging (Local Govt. or Private sector) and sanitation tax required to be levied

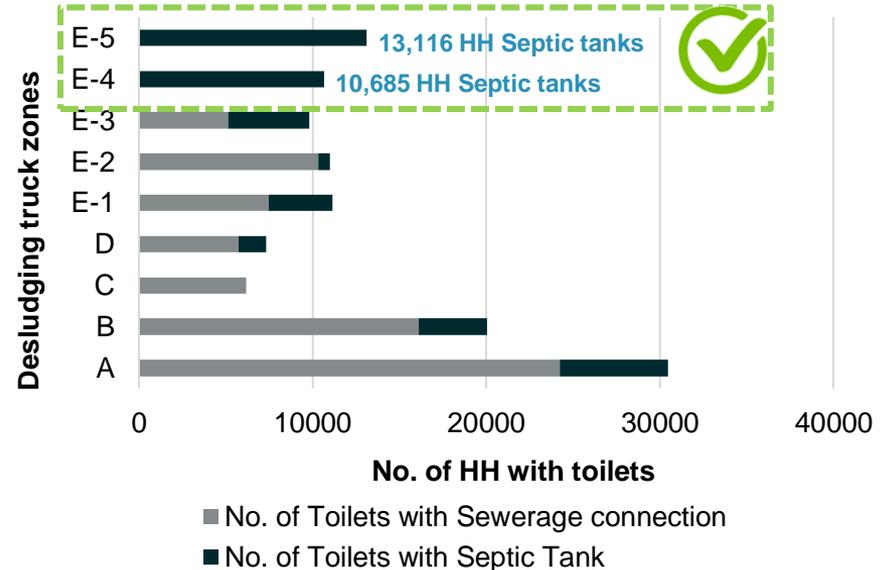
Online monitoring systems for scheduled desludging and treatment

The criteria for selection of **pilot zone for scheduled desludging** includes zone without any sewerage network, high coverage of septic tanks, and the presence of slum settlements.

Zone E4/E5 identified for pilot project on the basis of number of toilets connected to septic tanks



Zone wise > septic tank coverage

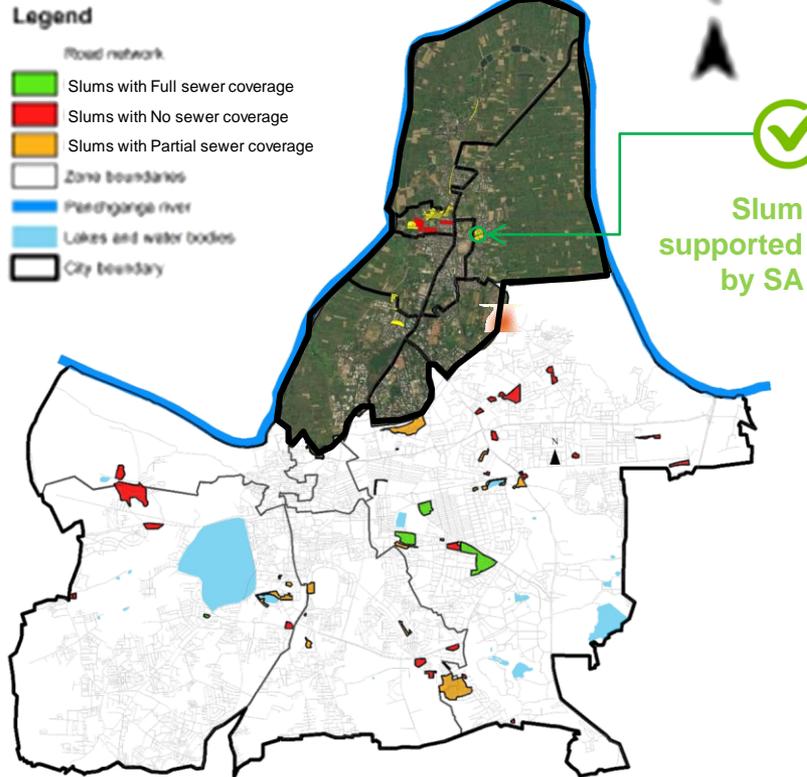


- Zone A, B, C, D, E1, E2, and E3 are partially covered and connected with the central sewerage system.
- These zones are also proposed with the upcoming sewerage network under AMRUT.
- Therefore, **Zone E4, and E5** are selected as they show the highest number of toilets connected to **septic tanks (>10,000)**

Source: Data shared by KMC | Swacch Survekshan 2020; primary analysis

Slums in the identified zone E4

Map showing slums sewer network coverage



Slum assessment in the identified desludging zone E4

Sr NO	Name of Slum	Population	HHs	HHs dependent on CT/PT	CTB	CTB Usage %	Individual Toilet coverage	Drainage coverage (Full/ Partial / No)	Water coverage (Full/ Partial / No)
1	Ambedkar Nagar	1575	315	146	3	39.63	57.78	No	Full
2	Bhagatsingh Vasahat	615	123	96	1	37.29	62.71	No	Full
3	Datta Mandir	595	119	106	2	77.24	21.95	No	Full
4	Matang Vasahat	1080	216	181	3	85.38	14.62	No	Full
5	Near Shasakiya Godam	410	82	-	3	65.67	32.84	No	Full
6	Raman Mala K-Bawada	905	181	134	2	76.22	23.78	No	Partial
7	Sankapal Nagar	1035	207	127	2	48.24	49.25	No	Full
8	Shiye Panand Ulpe Mal	240	48	25	2	58.14	39.53	No	Partial
9	Shugar Panad	365	73	56	2	83.08	16.92	No	Full

Total slum clusters
9

Sewer coverage
No

Total slum population
6500

Community toilets-
20

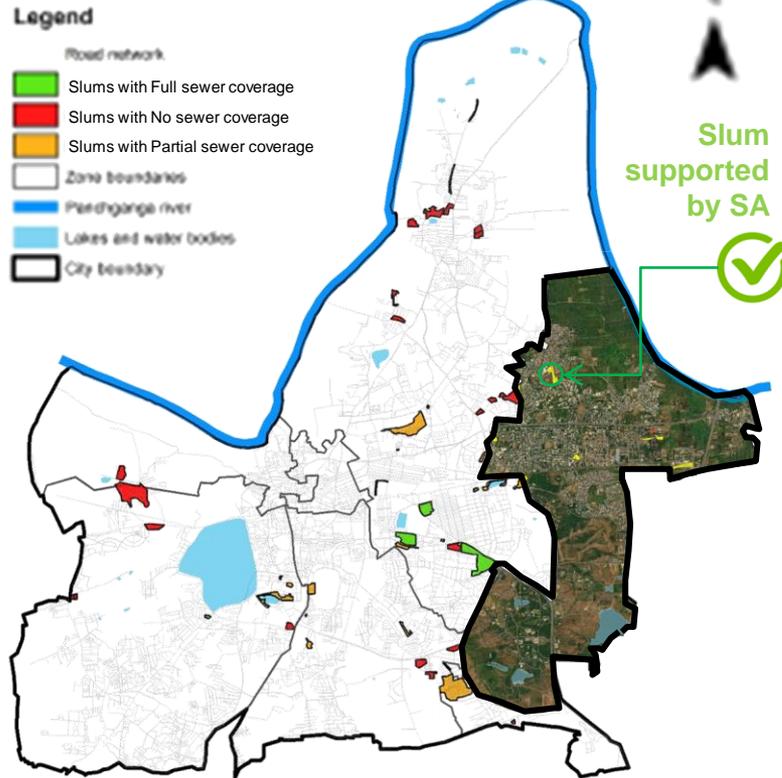
Total households
1364

IHHLs constructed by SA - **> 45**

Source: Shelter Associates, November 2020, primary site visit and analysis

Slum profiles in the identified zone E5

Map showing slums sewer network coverage



Slum assessment in the identified desludging zone E5

Sr NO	Name of Slum	Population	HHs	CTB	CTB Usage %	Individual Toilet coverage	Drainage coverage (Full/ Partial / No)	Water coverage (Full/ Partial / No)
1	Ambika Plastic Industries	365	65	2	66.04	30.19	No	Full
2	Behind Ghadage Patil	350	70	1	100		No	Full
3	Kadam Wadi	1175	235	2	30.84	69.16	No	Full
4	Lonar Vasahat	605	121	1	35.14	61.26	No	Full
5	Makadwale Vasahat	1095	219	3	90.23	9.77	No	Full
6	Tembalai Wadi Railway Gate	350	70	1	89.66	5.17	No	Full
7	United Agency	780	156	2	27.27	72.73	No	Full

Total slum clusters
7

Total slum population
4720

Total households
936

Sewer coverage
No

Community toilets-
12

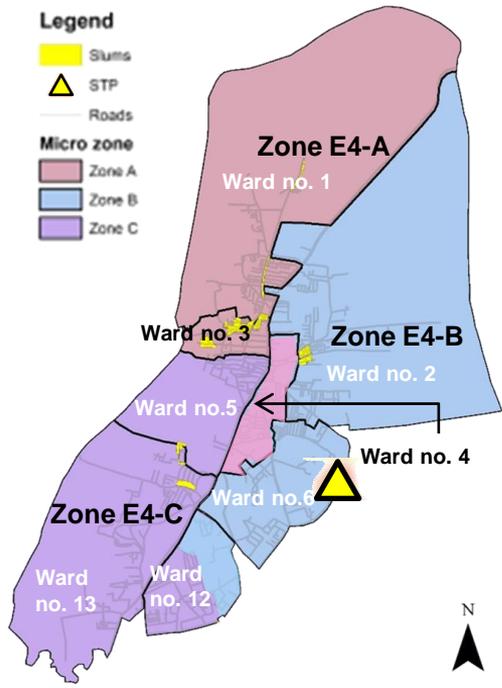
IHHs constructed by SA - **> 40**

Source: Shelter Associates, November 2020, primary site visit and analysis

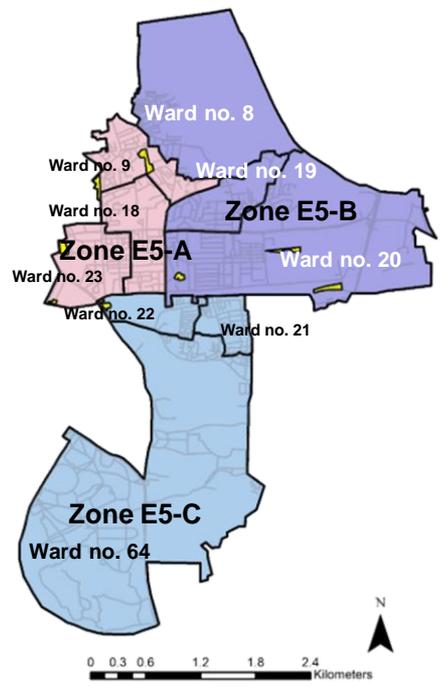
Micro zones planned for 3-year scheduled desludging- one zone per year

Zone E4 and E5 divided into micro zones on the basis of administrative ward boundary and equal distribution of septic tanks per year

Micro-zone map of E4



Micro-zone map of E5



Number of septic tanks to be desludged in one year

Parameters	E4 - A	E4 - B	E4 - C
Wards	1,3,4	2,6,12	5,12,13
Households	4745	3892	4098
No. of Slums	5	2	2
Slum households	762	339	263
No. of Septic tanks	3515	3665	3505
No. of CTB	11	4	5

Parameters	E5 - A	E5 - B	E5 - C
Wards	9,18,23	8,19,20	21,22,64
Households	4620	4703	4653
No. of Slums	3	3	1
Slum households	524	342	70
No. of Septic tanks	4498	4447	4171
No. of CTB	6	5	1

Source: Kolhapur Municipal Corporation | Swacch Survekshan 2020, primary analysis

Assessment of infrastructure requirement for scheduled desludging in the city

E4 Zone

Septic tanks per day



12 septic tanks/day

Scheduled desludging:

Desludging 12 septic tanks per day i.e. it will generate 36 KLD septage.
(~3500 septic tanks annually)

Desludging Trucks



X 2 @ 3KLD

Three new trucks of 3000 liters for scheduled desludging in one pilot zone

ULB vehicle can be used for demand desludging requests and cleaning of CT and PT septic tanks

Co-treatment at STP



36 KLD
Septage to be co-treated at STP

The existing STP capacity is enough to co-treat septage desludged from septic tanks

E5 Zone



15 septic tanks/day

Scheduled desludging:

Desludging 15 septic tanks per day i.e. it will generate 48 KLD septage.
(~4500 septic tanks annually)



X 3 @ 3KLD

Four new trucks of 3000 liters for scheduled desludging in one pilot zone

ULB vehicle can be used for demand desludging requests and cleaning of CT and PT septic tanks



48 KLD
Septage to be co-treated at STP

The existing STP capacity is enough to co-treat septage desludged from septic tanks

Source: Kolhapur Municipal Corporation; Primary data collection and analysis, October 2020

Identification of operational model for O & M of scheduled desludging in the city- ULB model / Private model

Parameters

ULB Trucks

Private Trucks

The ULB can consider either ULB or Private Trucks for O&M



Cities following similar model

Existing model followed by **Kolhapur Municipal Corporation**

The scheduled desludging contracts in **Wai and Sinnar** cities use a performance-linked annuity model with a pay-for-results contract between the desludging company and local government.

ULB

Private

ULB

Private



Operations and Maintenance

Financials



CAPEX

Rs. 44 - 66 lakh



OPEX

37-62 lakh (per annum)

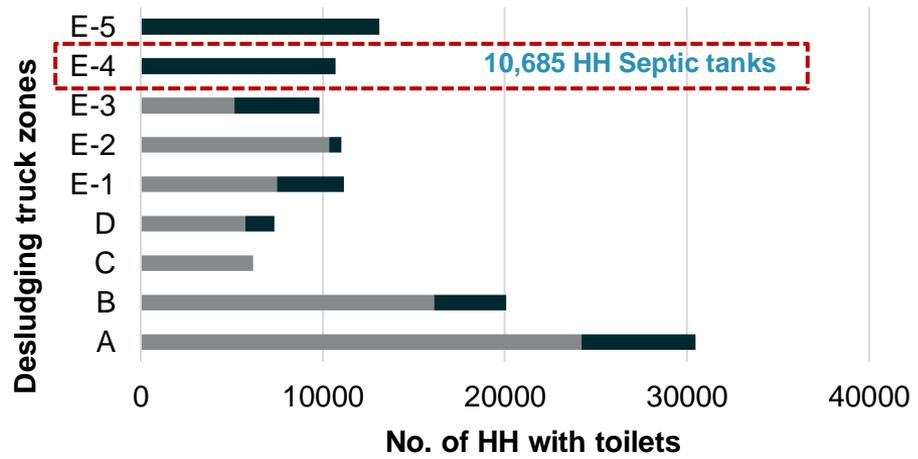
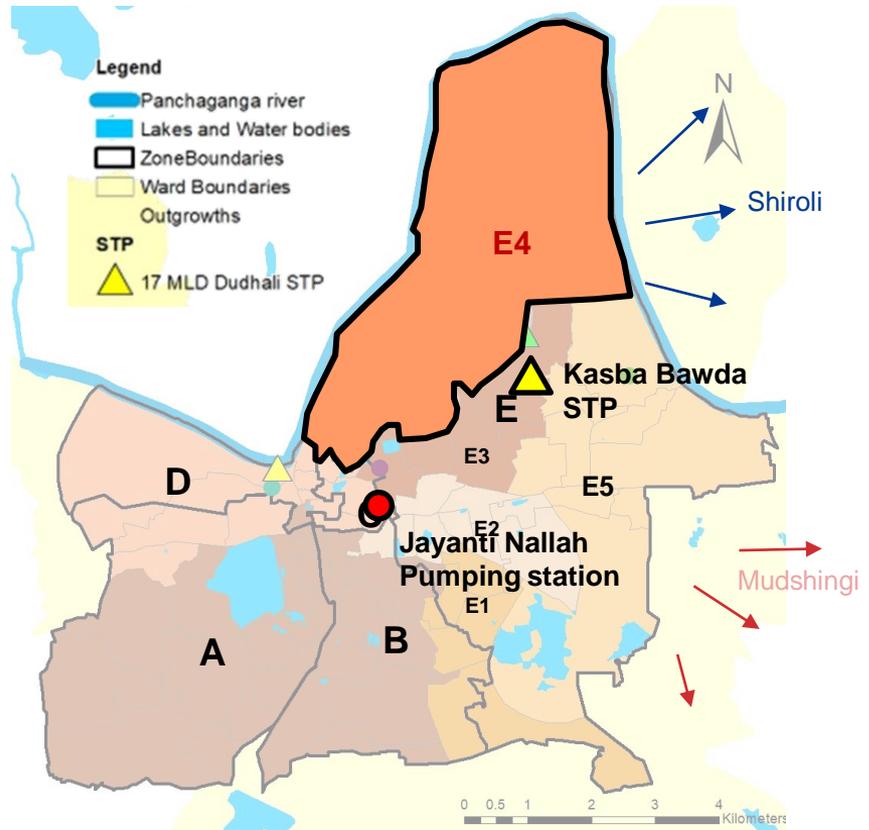
Source of funding

CSR funds (CWAS can provide support for additional trucks required for desludging in the identified zone)

Source of funding

- KMC can fund scheduled desludging in the pilot zone through Sewerage / Conservancy tax.
- KMC will look after the maintenance of desludging trucks

Zone E4 selected for pilot project for scheduled desludging



■ No. of Toilets with Sewerage connection ■ No. of Toilets with Septic Tank

- Zone E4 comprises of **9 slums with slum population more than 6000 people.**
- **Residential zone - Mix of individual houses and apartments.**
- **Developed/ Planned area with accessible roads.**
- **All the slums in these zone show complete absence of sewer network.**

Zone E4 identified for pilot project owing to high number of toilets connected to septic tanks and presence of slums

Source: Meeting and discussion with KMC officials

Scheduled desludging to be financed through sewerage / conservancy tax...

- Currently, the **sewerage tax is levied on all the properties in the city** connected / not connected to the sewerage network.
- The **properties not connected to the sewerage network** end up paying **both sewerage tax as well as the user charges for desludging**.
- Therefore, it is proposed that **Scheduled desludging expenses can be covered through existing sewerage tax/conservancy tax...**
- **In consultation with KMC, it was agreed that the current practice of user charges for desludging will not be applicable. Desludging will be treated as a ‘public service’ and financed through sewerage tax.**

Planning for scheduled desludging in zone E4 (1/2)

1 Zones of Emptying cycle

- The pilot area will be divided into 3 zones and each zone will be taken in each year

Implementation timeline	Zones	Wards	Total no of HH septic tanks
Year 1	E4 -A	1,3,4	3515
Year 2	E4 -B	2,6,12	3665
Year 3	E4- C	5,12,13	3505

2 Number of septic tanks to be desludged daily

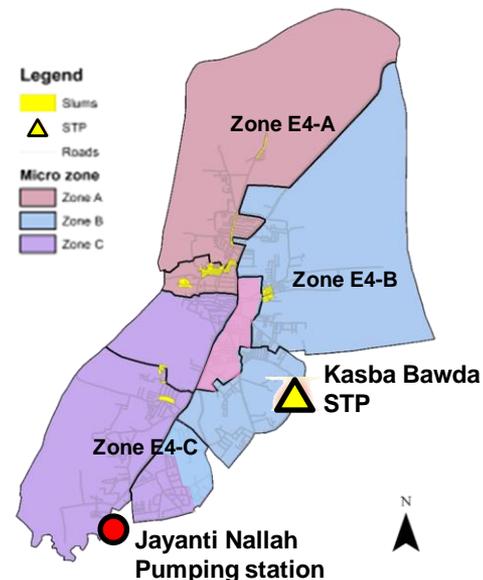
Zones	Wards	Total no of HH septic tanks	No of Septic Tanks to be cleaned per day	Daily Septage generated (L)
E4 -A	1,3,4	3515	10	37661
E4 -B	2,6,12	3665	10	39268
E4- C	5,12,13	3505	10	37554



10-12 septic tanks/day



X 2 @ 3KLD



Scheduled desludging:
Desludge **10 septic tanks per day** i.e. it will generate **38-40 KLD septage**.
(3500 septic tanks annually)

Desludging vehicles required:
Two new truck of 3000 litres for scheduled desludging in one pilot zone

Planning for scheduled desludging in zone E4 (2/2)

3 Proper route planning

- Proper Route plan to be prepared and desludging should be planned through planned route only- **infrastructure optimization and service efficiency.**
- **CWAS in consultation with city will assist in preparing route planning for scheduled desludging.**



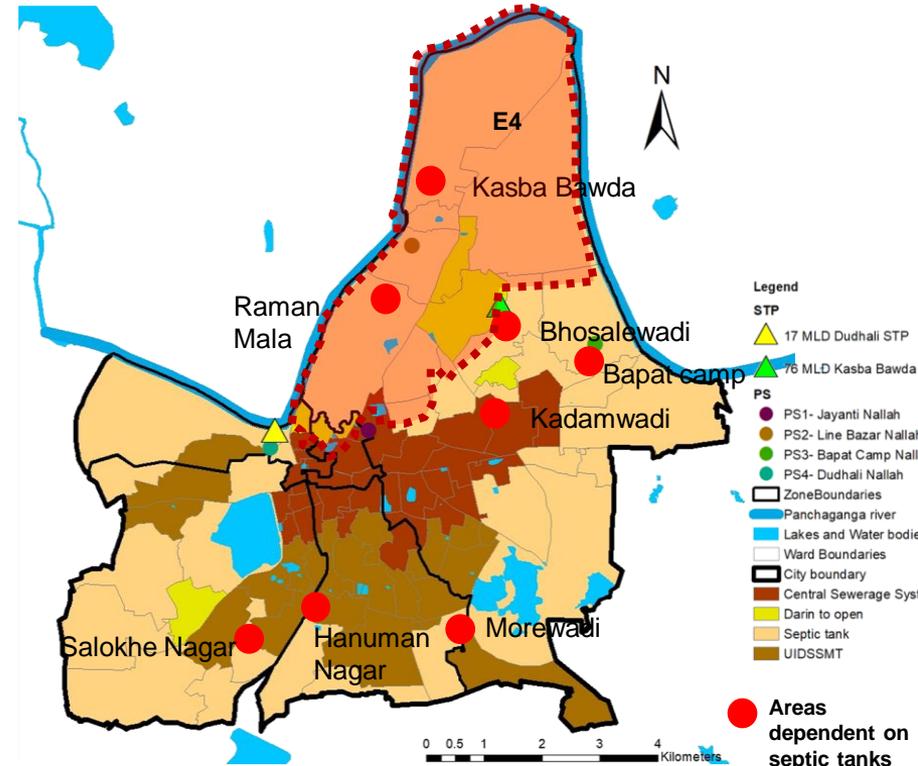
4 Awareness activities in pilot area

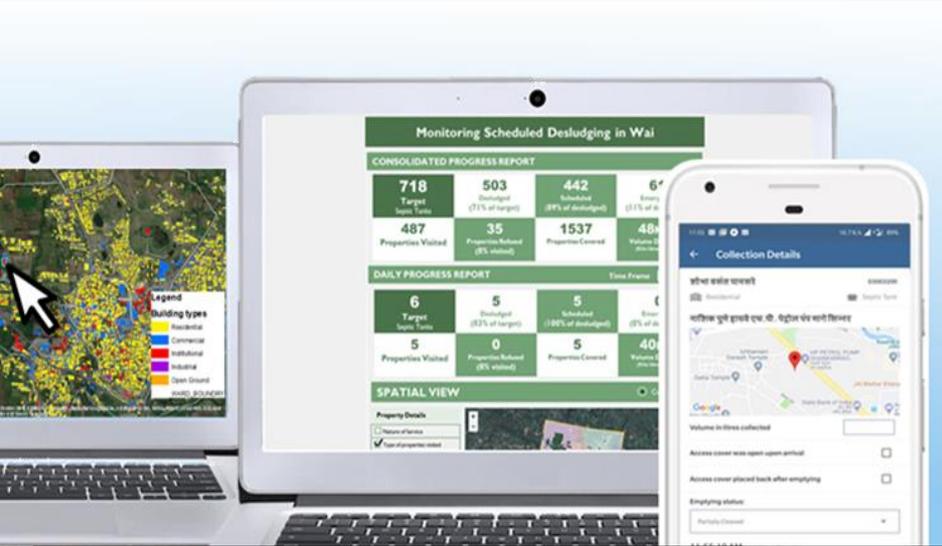
- Household visits with information leaflets and informed about scheduled desludging.
- **Develop awareness material and carry out one week awareness drive and property survey in pilot scheduled desludging area.**



Scaling up scheduled desludging in other zones

- Based on success and experience of scheduled desludging in pilot E4 zone, the **Kolhapur City** can further **scale up scheduled desludging** in other areas dependent on on-site sanitation systems.
- City can select different implementation models for scheduled desludging in other areas. Possible models are:
 - ULB lead model-** Capex of trucks (Own funds, SBM program funds or CSR funds) and Opex by ULB
 - Involving Private operator with Performance linked payments-** Capex of trucks and Opex by private operator
 - Private Sector Participation model-** Capex of trucks by ULB and Opex by private operator
 - Involving SHGs** in operations of desludging activities





This section gives an idea about the various monitoring mechanisms planned and installed in the city to systematically track the entire scheduled desludging process right from collection to safe disposal.

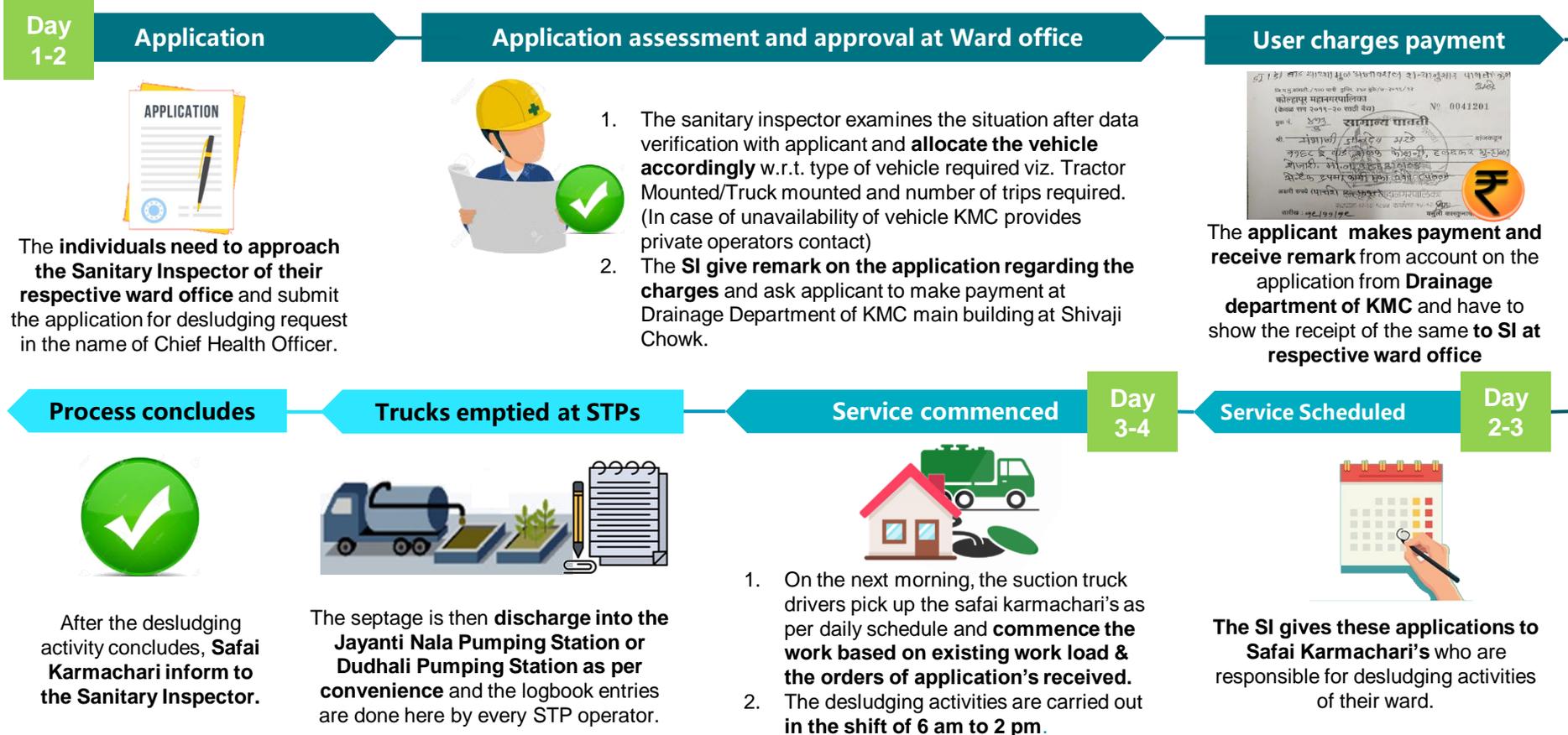


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Existing demand based desludging requisition process was cumbersome



Source: Kolhapur Municipal Corporation , Primary analysis

Legend (Departments)

Drainage department

Vehicle department

Health department

What needs to be improved in existing desludging process

- Instead of involvement of different departments of KMC, a single **common department/authority** should be identified to monitor emptying service and single point contact to receive complaints/request regarding desludging.
- **An online monitoring system and common dashboard should be developed to keep the records of emptying.** The system should also indicate which septic tanks needs to be emptied and which has already been emptied and create database for onsite sanitation systems in the city.
- **A monitoring system should be deployed to ensure desludging trucks emptied septage at treatment plants only** and not at open lands or waterbodies.
- **A regular desludging service should be provided by KMC to avoid emergency cleaning or overflowing of waste.**

Online monitoring systems

- Currently city is maintaining desludging service record on **Manual log-books**.
- **Online monitoring systems** is adopted for tracking desludging and treatment services efficient services.
- Online monitoring systems called **Sanitrack** will be used in pilot scheduled desludging zone. Sanitrack helps to monitor scheduled desludging service at property end and safe decanting at FSTP
- **CWAS** will set-up system for online monitoring of scheduled desludging through Sanitrack.
- **CWAS** will support set-up of RFID system at STP site and pumping stations to record and track desludging trucks.
- **CWAS** will provide training assistance to ULB staff, sanitary workers and private operators to effectively use online monitoring systems.

SaniTrack - End to End Monitoring for FSSM

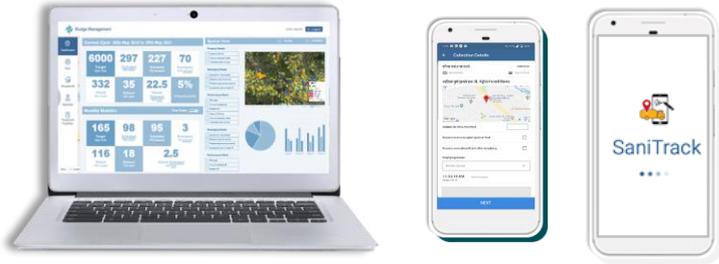


RFID system at pumping station and desludging trucks



Implementation of SaniTrack for efficient monitoring of scheduled desludging

SaniTrack- Amazon delivery like app for desludging operations



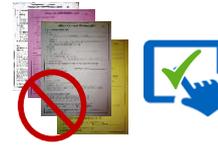
- ✓ Add properties to “today's schedule” by property tax number - **GIS linked property tax data attached to app**
- ✓ **Access cover, photo of property**
- ✓ **Customer's & operator's signature** – like Amazon delivery app
- ✓ Pumping station operator signature at disposal
- ✓ In-built validation checks
- ✓ Unique database



Integrated monitoring system –
Across FSM service chain



“Real time” monitoring. No need to
process data



Easy to Operate, Reduce paper work,
Minimize human error



Dashboard to monitor progress easily



Citizen awareness about
emptying procedures



Photo stamping, Geo stamping,
Signatures



Supports vernacular
language

RFID system for monitoring desludging trucks decanting at pumping stations

1



The RFID tags are attached to all desludging suction trucks, Truck Driver will pick up the truck in the morning from KMC Workshop

2



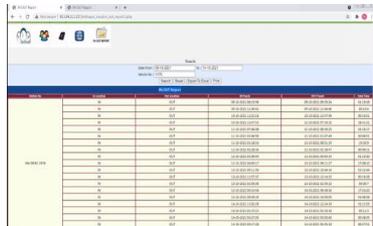
Desludging Trucks visits the allocated premises for desludging of CT/PT or IHHT Septic Tank

3



Desludging Trucks visits the Jayanti Nala Pumping Station or Dudhali pumping Station for discharge the septage

6



Truck ID	Date	Time
101	2023-10-27	08:00:00
102	2023-10-27	08:15:00
103	2023-10-27	08:30:00
104	2023-10-27	08:45:00
105	2023-10-27	09:00:00
106	2023-10-27	09:15:00
107	2023-10-27	09:30:00
108	2023-10-27	09:45:00
109	2023-10-27	10:00:00
110	2023-10-27	10:15:00
111	2023-10-27	10:30:00
112	2023-10-27	10:45:00
113	2023-10-27	11:00:00
114	2023-10-27	11:15:00
115	2023-10-27	11:30:00
116	2023-10-27	11:45:00
117	2023-10-27	12:00:00
118	2023-10-27	12:15:00
119	2023-10-27	12:30:00
120	2023-10-27	12:45:00

Computer System receives the data from controller panel and generate the report consisting of In and Out time of desludging truck.

5



Controller Panel with antenna & GPRS installed at security room or building receives the signal from the RFID reader and analyse the data

4



RFID Readers will be installed at Entry Gate. It will detect tag installed at vehicle and identify particular vehicle. Each tag has its unique identification code



This section explains the proposed portable resource center and landscaping plan that has been implemented with an aim to display and disseminate the sanitation story of the city to the citizens and facilitate the reuse of wastewater and sludge for maintenance of the landscape area.

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Sanitation resource park at STP

- **Convert STPs to Sanitation Resource Parks for training, awareness and dissemination**
- **Landscape around STP** to promote **reuse** of treated wastewater and sludge and **create carbon sinks**.
- **Resource centre/ visitor center** at STP/FSTP to display and disseminate the sanitation story of the city. These treatment plants can be visited by citizens, students, engineers and city officials from other cities and states.
- **CWAS will support for planning, design and implementation of landscape and resource centre .**



Treatment facilities will be converted into **Sanitation resource parks**



Develop **landscape** to promote **reuse of treated wastewater**

Resource centre with landscape set-up at FSTP

Landscape



Resource center building

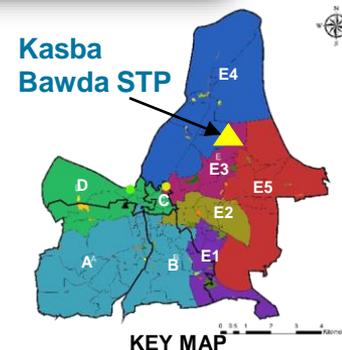
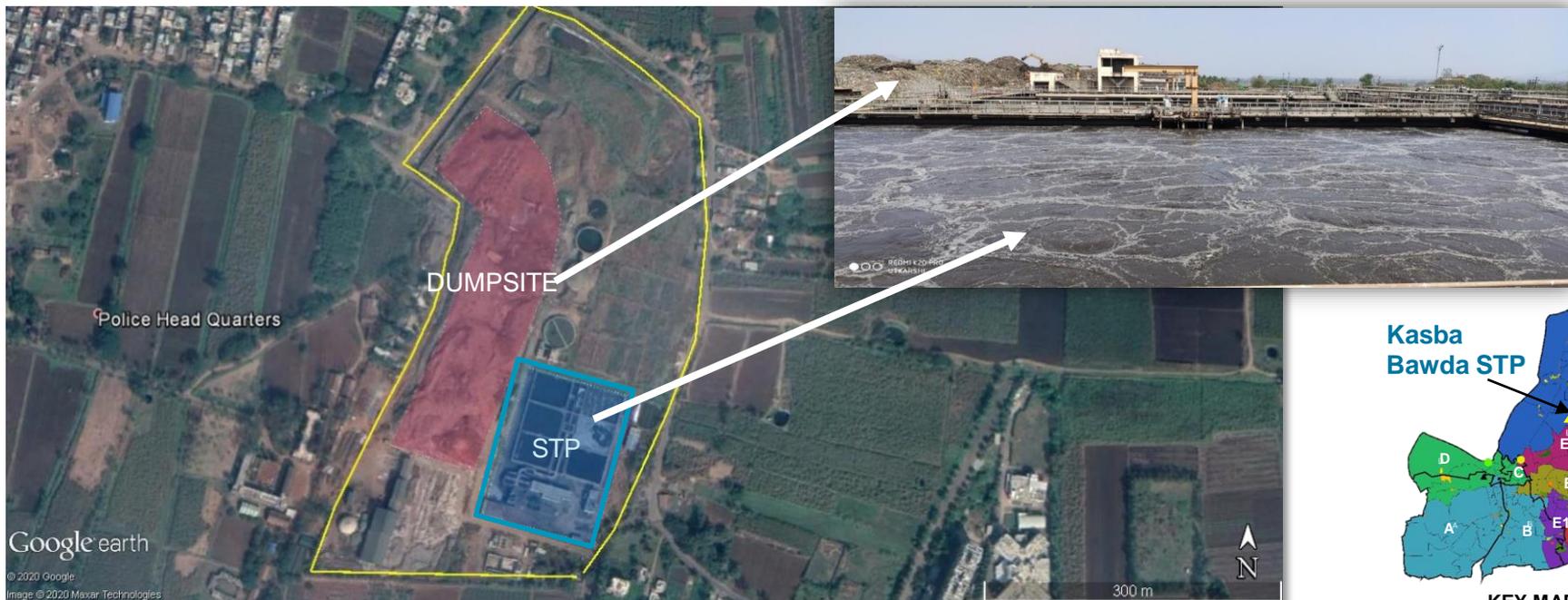


Kasba Bawda STP identified for the proposal

The STP at Kasba Bawda has been identified for developing of landscape and resource center

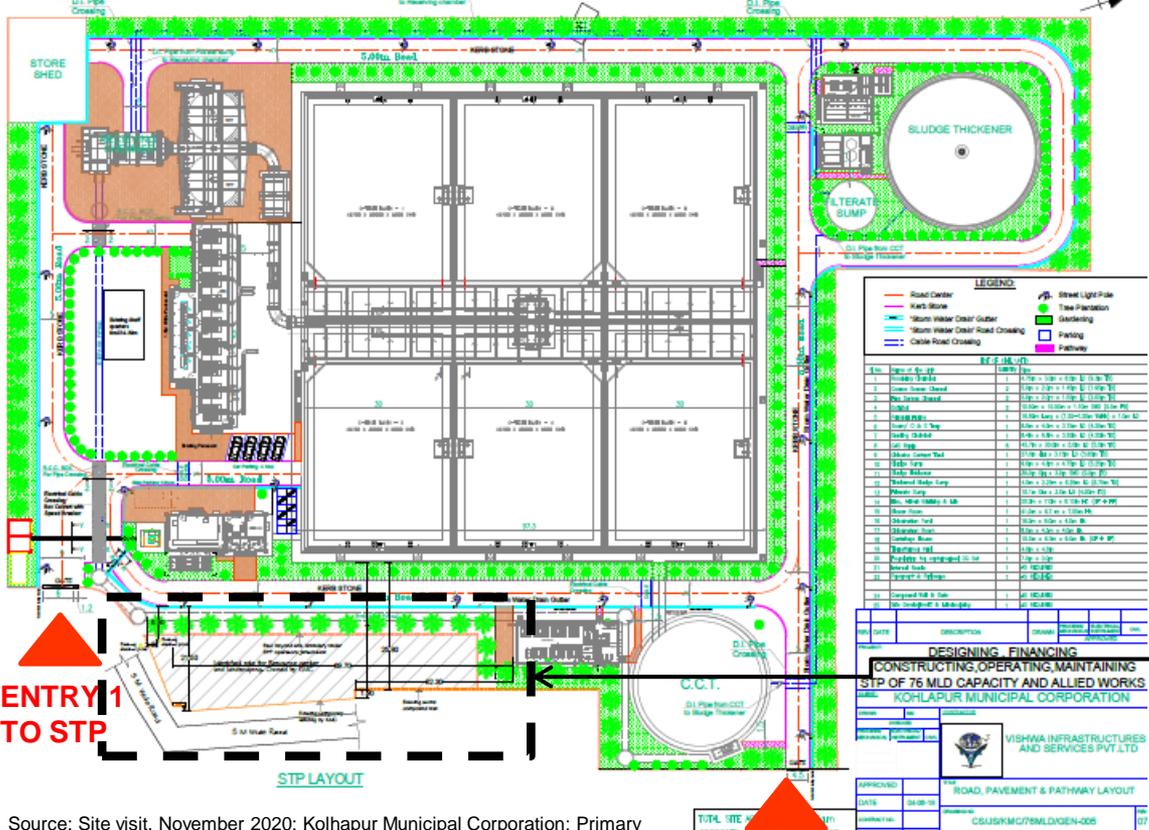


Sr. no	STPs	Designed capacity	Utilized capacity	Proposed under AMRUT	Total septage currently treated
1	Kasba Bawda STP	76 MLD	Avg. 66 - 70 MLD	4 MLD	21 KLD
2	Dudhali STP	17 MLD	Avg. 20 - 24 MLD	6 MLD	



Resource centre and landscape plan at the Kasba Bawda STP (1/3)

Existing Kasba Bawda STP layout



TOTAL SITE AREA = 25169.08 Sq.m (2.52 Ha)
 PROPOSED ROAD AREA = 4040.52 Sq.m (0.40 Ha)

PROPOSALS:

- Resource Centre**
 - A **PORTA Cabin** can be installed at the STP site to be used as a resource center. With a seating capacity of 30 people, the resource center will be used for dissemination of KMC sanitation story and about the STP
- Landscape around the STP**
 - To make area around STP aesthetically pleasing by doing landscaping such as walkways and flower beds

Identified area for proposal at STP- 851 Sq.m (0.08 Ha~ 0.21 acre)

- The identified area is an extension to the existing STP site and so owned by KMC.
- This extended area is not included under the jurisdiction of STP operator.
- The entire area of STP is covered externally with temporary fencing.

Source: Site visit, November 2020; Kolhapur Municipal Corporation; Primary data collection, October 2020

ENTRY 2 TO STP

Source: KMC

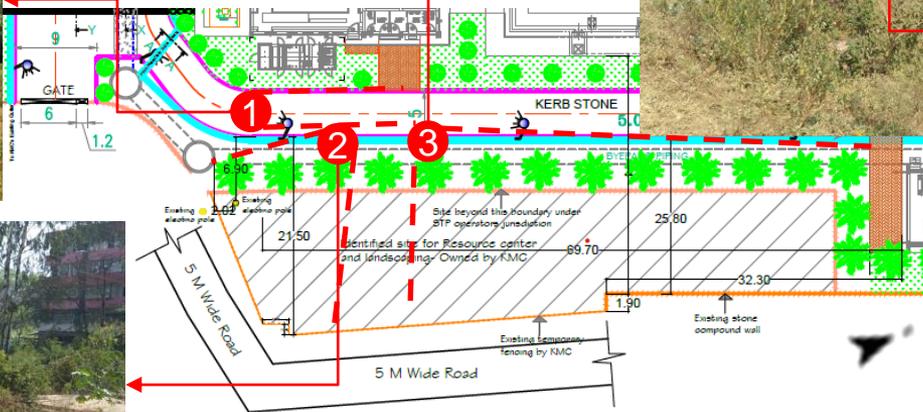
Resource centre and landscape plan at the Kasba Bawda STP (2/3)

Site photographs of the identified area at Kasba Bawda STP

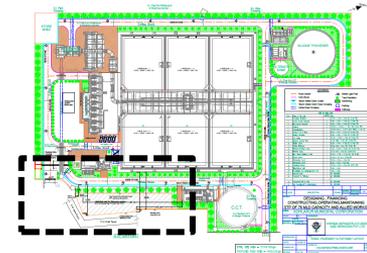


Temporary fencing by KMC

Proposed 5M road parallel to the identified site



Existing stone compound wall

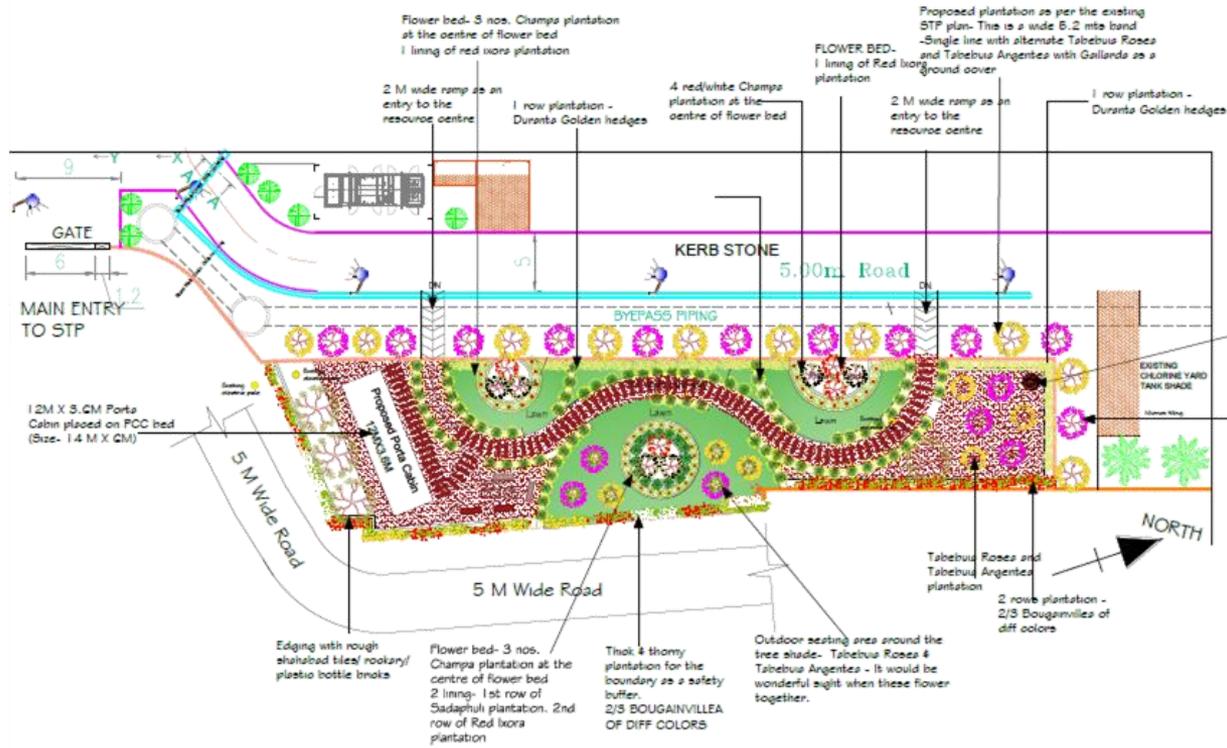


STP KEY PLAN

Source: Site visit, November 2020; Kolhapur Municipal Corporation; Primary data collection, October 2020

Resource centre and landscape plan at the Kasba Bawda STP (3/3)

Proposed landscape and resource center layout at STP



- The detailed landscape plan was prepared by CWAS. The design was discussed and approved by KMC.
- KMC will support for maintenance of landscape site.
- The project ensures the reuse of treated waste water and sludge produced for maintenance of the plants and lawn etc



Source: Site visit, November 2021

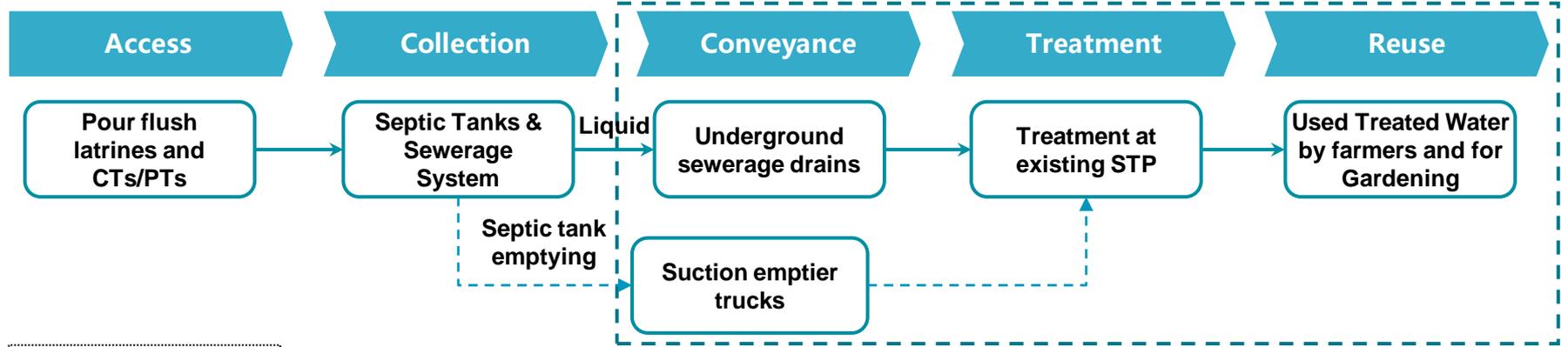


This section gives an overview all the activities envisaged under FSSM plan thus finding solutions leading to long-term sustainable environmental impacts on the city.

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Summary of sanitation activities in Kolhapur—RED to GREEN



Existing situation

City details

Individual toilets- 92%
Dependent on
Community toilet- 8%

City details

Sewerage system- 60%
Septic tanks- 40%

Slum level details

Individual toilets- 52%
Dependent on
Community toilet- 48%

Slum level details

60% slum with septic tanks (34)
33% slum partial sewer network (18)
7% slum full sewer coverage (4)

- 4 major Nallahs are diverted to STPs
- ULB owns 7 vacuum trucks of 5000 litre capacity
- Irregular desludging, emptied only when full once in 8-9 years
- Manual log books for monitoring

- 2 STPs: Kasaba Bawda (76 MLD) and Dudhali (17 MLD)
- 25 KLD septage co-treated at STP
- Manual log-books for monitoring FS load at STP

- Only 4% of the treated wastewater is being reused (3 MLD)
- Farmers from the nearby area use the treated water and sludge but no record is maintained.
- The city lacks a reuse plan for the treated water

Proposed activities

- Schedule desludging of septic tanks once in 3 years
- Procurement of new trucks
 - E4 zone- 2 trucks @ 3KLD
- Online monitoring systems

- Ensuring 100% treatment of scheduled desludging load at STP
- Resource centre at STP for dissemination of sanitation story to students/residents
- Online monitoring systems

- Landscape at STP for reuse of treated wastewater
- Reuse plan for treated wastewater and treated sludge

FSSM plan of Kolhapur (1/2)

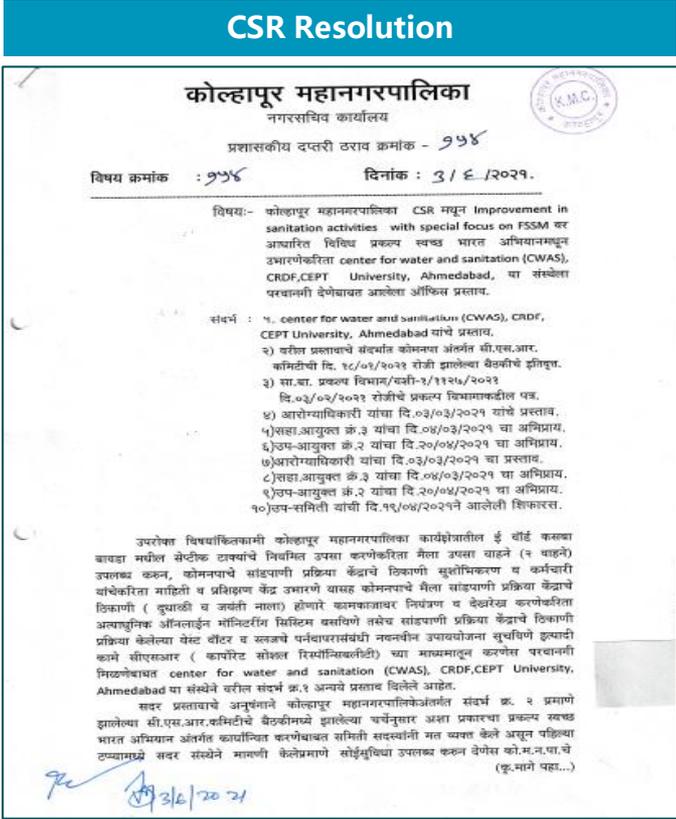
	Activities	Impacts
1	<p>Scheduled desludging (3 year cycle) of septic tanks in the E4 zone and ensuring treatment of collected septage at STPs</p> <ul style="list-style-type: none"> - Procurement of desludging trucks (2 trucks of 3000 litres capacity) - Operation and Maintenance of desludging trucks 	<p>Timely and affordable services Regular desludging improves local environment, eliminates need for manual desludging, and prevents solids overflowing from septic tanks in open gutters which ultimately pollutes Panchganga river. Regular service to urban poor, without high user fees, enables them to get their septic tanks desludged and avoid any overflows. The households may also be encouraged to use the toilets, without worrying about the septic tanks getting filled up and having to pay high user charges to get them emptied. The O&M cost of the service for the Kolhapur Municipal Corporation will be covered through existing sanitation/sewerage or property tax. 100% treatment of collected septage at treatment plants.</p>
2	<p>Resource centre and landscape at STP site</p> <ul style="list-style-type: none"> - Identified land for landscape and resource centre - Planning and design of landscape plan - Implementation of landscaping and installation of resource centre 	<p>Treatment facilities to be converted into Sanitation resource parks; landscape to promote reuse of treated wastewater; Resource centre will be used for dissemination of sanitation story of Kolhapur with students, government officials, sanitation workers, local residents, etc.</p>

FSSM plan of Kolhapur (2/2)

	Activities	Impacts
3	Online Monitoring systems <ul style="list-style-type: none"> - Sanitrack for scheduled desludging - RFID for tracking entry/exist of desludging trucks at STPs 	<ul style="list-style-type: none"> - Online monitoring system sanitrack used daily by KMC for recording and monitoring scheduled desludging. All entries are recorded digitally and analysis are captured in graphical form using dashboards. - RFID systems installed at both the STPs to monitor that desludging trucks decant sludge at treatment plant. This is regularly monitored by STP operators.
4	Capacity building of stakeholders <ul style="list-style-type: none"> - Training and Sensitization of KMC officials - Training of sanitation workers, STP operators, etc. - Awareness program with citizens 	Increased awareness and training of key stakeholders
5	Reuse plan for Kolhapur <ul style="list-style-type: none"> - Assessment of current reuse practice; explore potential for other reuse options - Discussion with key stakeholders- STP operators, KMC officials, agricultural societies, MIDCs. 	Increase reuse for treated wastewater and sludge

FSSM plan has been discussed and approved by the KMC CSR committee and a resolution was passed by KMC giving a formal approval

- FSSM plan was presented and discussed with the KMC commissioner and other officials. **Suggestions and feedback** were incorporated in the plan.
- CWAS presented the FSSM plan in the **CSR committee meeting at KMC** where in-principal approval was given by the committee members.
- Detailed note and presentation was submitted by CWAS.
- **Proposal** was prepared by the health department at KMC and was approved through various departments viz. Health department, town planning department, sanitation department, city planning department, finance department.
- **CSR resolution was formally passed on 3rd June 2021** and the project was approved to begin on ground implementation.



THANK YOU

CWAS CENTER
FOR WATER
AND SANITATION

CRDF CEPT RESEARCH
AND DEVELOPMENT
FOUNDATION

CEPT
UNIVERSITY

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.



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Annexure-1: Ward wise details of households with IHHTs (1/2)

3.2.A Ward wise details of all residential areas with toilets within Households (IHHL)							
Name & Location of Residential area	Type of Residential area	Ward No./	Total No. of Households in residential area	Total No. of Households with functional toilets	No. of Toilets with Sewerage connection (Where black water goes to FSTP)	No. of Toilets with Septic Tank	No. of Households with Twin pit latrines
		Ward Name					
Sugar mill	Unplanned	1	1426	1296	0	1296	0
kasbabawda, east	Slum	2	1625	1402	0	1402	0
kasbabawda, hanuman lake	Slum	3	1652	1187	0	1187	0
kasbabawda, line bazar	Slum	4	1667	1032	0	1032	0
laxmivilas palace	Planned	5	1646	1415	0	1415	0
police line	Planned	6	1477	1854	0	1854	0
circuit house	Planned	7	1761	1687	0	1687	0
bhosalewadi-kadamwadi	Slum	8	1450	2107	0	2107	0
kadamwadi	Slum	9	1702	1580	0	1580	0
shahu college	Slum	10	1594	1530	0	1530	0
tarabai park	Planned	11	1478	877	0	877	0
nagala park	Planned	12	1581	818	0	818	0
raman mala	Slum	13	1662	1681	0	1681	0
venus corner	Commercial	14	1606	1326	1060	265	0
kanannagar	Slum	15	1571	1401	1401	0	0

shivaji park	Commercial	16	1519	1588	1270	317	0
sadar bazar	Slum	17	1619	1397	1397	0	0
mahadikvasahat	Planned	18	1443	1538	0	1538	0
muktasaikvasahat	Planned	19	1671	1556	0	1556	0
shahu market yard	Planned	20	1582	784	0	784	0
temblaiwadi	Slum	21	1575	1256	0	1256	0
vikramnagar	Slum	22	1505	1475	0	1475	0
ruikar colony	Planned	23	1475	1380	0	1380	0
saix extension	Planned	24	1588	2045	1636	409	0
shahupuritalim	Planned	25	1636	1245	1245	0	0
commerce college	Commercial	26	1592	1265	1265	0	0
treasury office	Commercial	27	1625	1501	1501	0	0
siddharthnagar	Slum	28	1505	1419	1419	0	0
shipugadetalim	Old City	29	1582	1228	1228	0	0
kholkhandoba	Commercial	30	1439	882	882	0	0
bazar gate	Commercial	31	1525	893	893	0	0
binduchowk	Commercial	32	1492	1094	1094	0	0
mahalaxmimandir	Commercial	33	1572	1395	1395	0	0
shivajiyamnagar	Planned	34	1490	1432	1432	0	0
yadavnagar	Slum	35	1584	1268	1268	0	0
rajarampuri	Slum	36	1427	1325	1325	0	0
rajarampuri – tavanappatnehighschool	Planned	37	1656	1270	1270	0	0

Source: Swacch Survekshan 2020, discussion with ULB officials and site visits

Annexure-1: Ward wise details of households with IHHTs (2/2)

takala khan mali colony	Slum	38	1510	1330	1064	266	0
rajarampuri extension	Planned	39	1668	1103	1103	0	0
daulatnagar	Slum	40	1432	1820	1820	0	0
pratibhanagar	Planned	41	1680	1761	352	1409	0
panjar pol	Unplanned	42	1460	1162	1162	0	0
shashtrinagar - jawaharnagar	Slum	43	1422	1041	520	521	0
mangeshkarnagar	Planned	44	1636	1282	1282	0	0
kailasgadswari temple	Old City	45	1554	1068	1068	0	0
siddhala garden	Planned	46	1525	1049	1049	0	0
Firagai	Old City	47	1677	1584	1584	0	0
tatakaditalim	Commercial	48	1476	1287	1287	0	0
rankala stand	Commercial	49	1511	1379	1379	0	0
panchagangatalim	Old City	50	1608	1355	1355	0	0
laxtirthavasahat	Slum	51	1830	1583	0	1583	0
balaramcoloy	Unplanned	52	1991	1270	0	1270	0
dudhalipavalion	Old City	53	1581	1718	1374	343	0
chandreshwar	Old City	54	1516	1647	1647	0	0
padmaraje garden	Planned	55	1533	598	598	0	0
sambhajinagar bus stad	Planned	56	1730	1347	1347	0	0
nathagoletalim	Old City	57	1373	1008	1008	0	0
sambhajinagar	Slum	58	1505	955	955	0	0
neharunagar	Unplanned	59	1565	1870	935	935	0

jawaharnagar	Slum	60	1423	1379	0	0	0
subhashnagar	Slum	61	1676	1683	1683	0	0
buddha garden	Slum	62	1439	1807	900	907	0
samratnagar	Planned	63	1631	1350	0	1350	0
shivaji university - agriculture college	Unplanned	64	1573	1440	0	1440	0
rajendranagar	Slum	65	1706	772	772	0	0
swatantryasainik colony	Slum	66	1643	1575	1575	0	0
ramanandnagar - jaragnagar	Unplanned	67	1471	2208	900	1308	0
kalambafiter house	Planned	68	1603	2040	850	1190	0
tapovan	Slum	69	1510	3017	0	3017	0
rajlaxmynagar	Planned	70	1441	2375	751	1624	0
rankalatalav	Planned	71	1589	2375	2375	0	0
phulewadi	Unplanned	72	1537	1567	1567	0	0
phulewadi ring road	Slum	73	1611	1935	1935	0	0
sane gurujivasahat	Planned	74	1435	1603	1603	0	0
aptenagar - tuljabhavani	Planned	75	1629	2120	2120	0	0
salokhenagar	Unplanned	76	1543	1407	1407	0	0
central jail	Unplanned	77	1470	1167	1167	0	0
raigadcoloybabajaragnagar	Unplanned	78	1530	1296	1296	0	0
survennagar	Planned	79	1530	1402	1402	0	0
kamerkarnagarkrantisingh nana patilnagar	Unplanned	80	1572	1187	1187	0	0
krantisingh nana patilnagar - jivbananaPark	Unplanned	81	1592	1032	1032	0	0

VIJAY SARJERAO PATIL
(VETERINARY OFFICER)

 Nodal Officer (SBM)

Kolhapur Municipal Corporation, Kolhapur

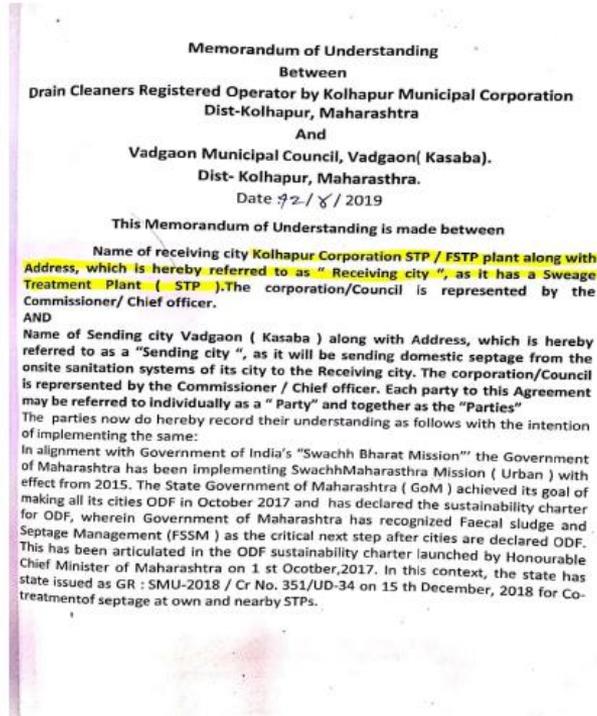
Source: Swacch Survekshan 2020, discussion with ULB officials and site visits

Annexure-2: Co-treatment MoU with KMC

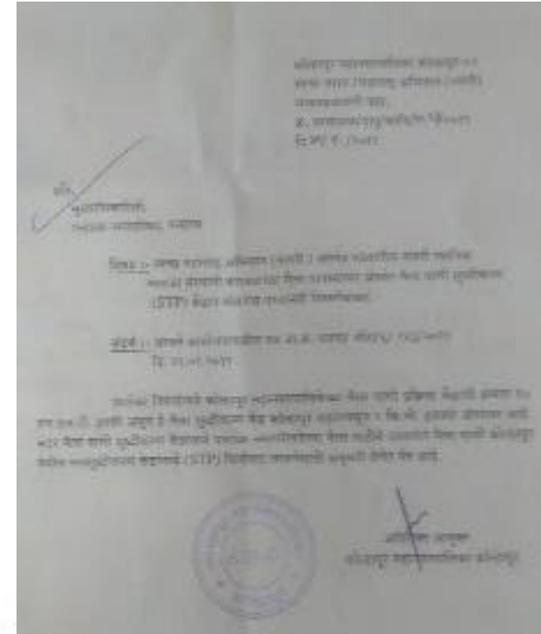
MoU with Kagal city



MoU with Vadgaon city



MoU with Panhala city



Annexure-3: Cost requirement for scheduled desludging in the identified zones E4

1. Additional infrastructure and human resource requirement for Scheduled desludging

Sr. No	Parameters	units	Zone E4
1	Number of trucks required	Number	2 @ 3000 L
2	Number of drivers	Number	2
3	Number of helpers	Number	4
4	Number of supervisors	Number	1

2. Capital Investment

Sr. No	Parameters	units	Zone E4
1	Average cost per truck (@3 KLD)	Rs	25 lakh
2	Personal protective equipment + Uniform (Rs per employee)	Rs	5000
3	Total Capital cost required trucks @ 3000 liter, drivers and helpers	Rs	55.2 lakh

3. Operations and Maintenance cost for schedule emptying service (per annum)

Sr. No	Parameters	units	Zone E4
1	Fuel cost for schedule emptying service	Rs	19.2 lakh
2	Repair and maintenance cost of truck	Rs	48,000
3	Establishment expenses	Rs	14.4 lakh
4	Overhead + Insurance + other Miscellaneous cost (10% of 1+2+3)	Rs	3.4 lakh
5	Total O&M cost for schedule septic emptying service	Rs	37.5 lakh

- **The capital investment includes the truck cost and PPE+Uniform cost of the 1 driver and 2 helpers per truck.**
- The total capital investment required for E4 zone is 55.2 lakh whereas, the O & M cost per annum will be 37.5 lakhs.

Annexure-4: Case study- STP Resource Center model in Sinnar

FSTP at Sinnar



Landscaping around FSTP



Resource center at FSTP



Urban forest at FSTP



Photo credits: Support to Sinnar for Improving Sanitation. (2020). (July).