

Reuse plan for treated wastewater and sludge at Satara

Center for Water and Sanitation (CWAS)
CRDF, CEPT University

CWAS CENTER
FOR WATER
AND SANITATION

CRDF CEPT RESEARCH
AND DEVELOPMENT
FOUNDATION

CEPT
UNIVERSITY

Reuse Plan for treated wastewater and sludge for Satara Municipal Council

The Reuse Plan for treated wastewater and sludge was prepared by the Center for Water and Sanitation (CWAS),
at the Centre for Research and Development Foundation (CRDF), CEPT University
in consultation with Satara Municipal Council

Acknowledgements

Satara is representative of a large number of cities in India that rely on on-site sanitation system, characterized by toilets connected to septic tanks. This is prevalent in small and medium sized cities as well as parts of larger cities with sewerage. In these cities, it is estimated that over 70% of the faecal waste is not collected and treated. This may have consequences on public health. 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.

Satara municipal council has implemented scheduled desludging in a pilot zone and has an operational dedicated facility for safe treatment of the collected septage. The city is now exploring the reuse of the by products which will help develop a circular economy model for getting some economic benefit from the plant. In this context, CWAS has planned to undertake a study to identify potential reuse options for treated wastewater and sludge.

CWAS team acknowledges excellent support by Satara Municipal Council and its officials. Discussions with other stakeholders such as Kachra Vechak Sangh and farmers have helped shape this reuse plan.

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

Meera Mehta and Dinesh Mehta
Executive Directors, CWAS



Contents

- 1 Executive Summary**

- 2 Introduction**

- 3 Current treated wastewater and sludge reuse practice in Satara**

- 4 Potential reuse options for Satara**

- 5 Way Forward**



Contents

- 1** **Executive Summary**

- 2** **Introduction**

- 3** **Current treated wastewater and sludge reuse practice in Satara**

- 4** **Potential reuse options for Satara**

- 5** **Way Forward**

Introduction

- Satara is located in the Pune Division in the western part of Maharashtra state. The city of Satara is the administrative center as headquarters of Satara Tehsil and District. The city has a historical significance as once it was the seat of Chhatrapati dynasty of Maharashtra.
- Based on the state government resolution (GR) to make Maharashtra ODF++ Satara Municipal Council constructed Faecal Sludge Treatment Plant (FSTP) of 50 KLD at Songaon Kachra Depot. The FSTP generates treated wastewater and compost as by-products which have a potential for reuse.

Need for reuse study

- The Government of Maharashtra has issued a policy for wastewater reuse (GR-2016/P.No.259/UD-33), which mandates cities to reuse treated wastewater.
- Due to scheduled emptying, high volume of treated wastewater and septage is generated at Satara FSTP which can be reused further for various purposes.
- In this context, CWAS undertook a study to identify potential reuse options for treated wastewater and sludge in Satara.

Reuse options are identified based on different parameters and estimated quantities of the by-products produced

- There are **two by-products** generated after treatment at FSTP i.e. – **treated waste water and dewatered sludge**.
- The quantities and qualities of by products were assessed.
 1. The capacity of FSTP is 50 KLD which runs at capacity of **30 KLD**. The quality results from the testing after chlorination treatment of waste water shows that it is **within the fit for reuse**.
 2. Dewatered sludge average generation is approximately **250 kg daily**. Its quality shows that it can be **used as an additive for the fertilizer**. Currently, it is being sold to the farmers for reuse as compost in agriculture fields..

Existing treated wastewater reuse scenario in Satara

Treated Waste Water



Plantation at Depot



Evaporation Pond

Dewatered Sludge



Dried Sludge packed



Wet Wastecompost Plant



Sieving and Packing of sludge

Source: Primary site survey

The potential reuse options identified are as follows:



Agriculture and co-composting

- In the surroundings of FSTP, there are farmlands that can be benefitted from reusing the TWW along with the dried sludge to improve the crop yields.
- Satara agriculture department is supporting in generating market and quality testing of dried sludge.
- Dried sludge can be used as manure/compost and be given to the farmers as well as the local households.



Onsite Reuse

- Treated waste water can be reused for watering the landscape around FSTP, watering the planted gravel filter units (PGF) of FSTP and cleaning of screens and site cleaning.
- Treated waste water can also be used for watering the road medians.
- Visitors can be demonstrated the benefit of reusing the by-products and their quality.

Source: Primary analysis



Contents

- 1 Executive Summary

- 2 Introduction

- 3 Current treated wastewater and sludge reuse practice in Satara

- 4 Potential reuse options for Satara

- 5 Way Forward

Satara is town in Pune division with 130,000 population

 **130,000**
Population(2019)

 **33,800**
Households

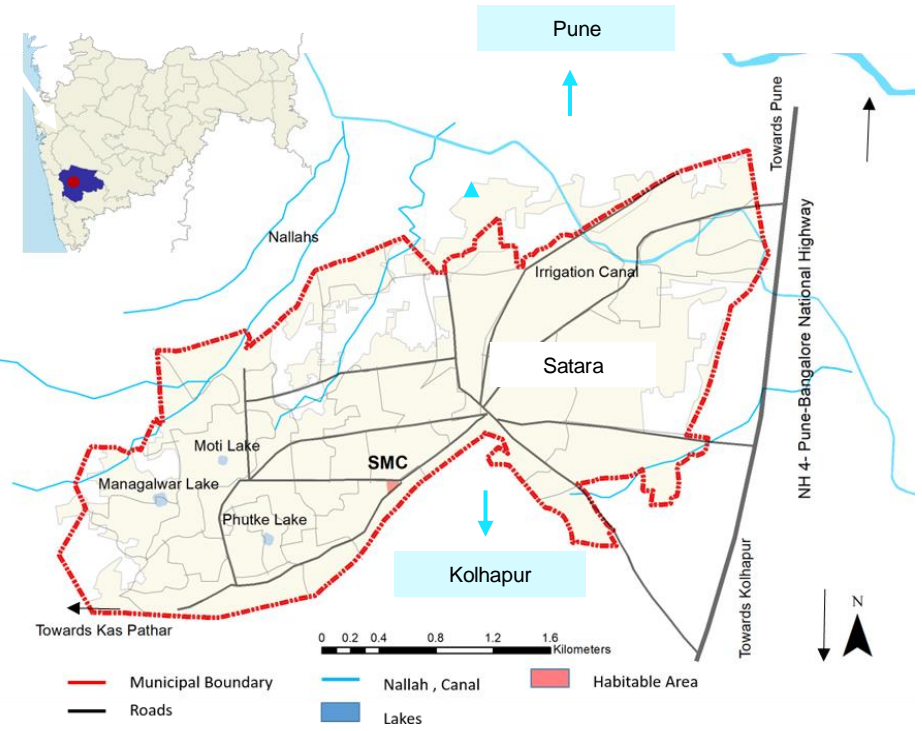
 **27**
Total slums

 **11%**
Slum Population
(15,330 population)

 **8.15**
Sq. km
Area

 **20**
Wards

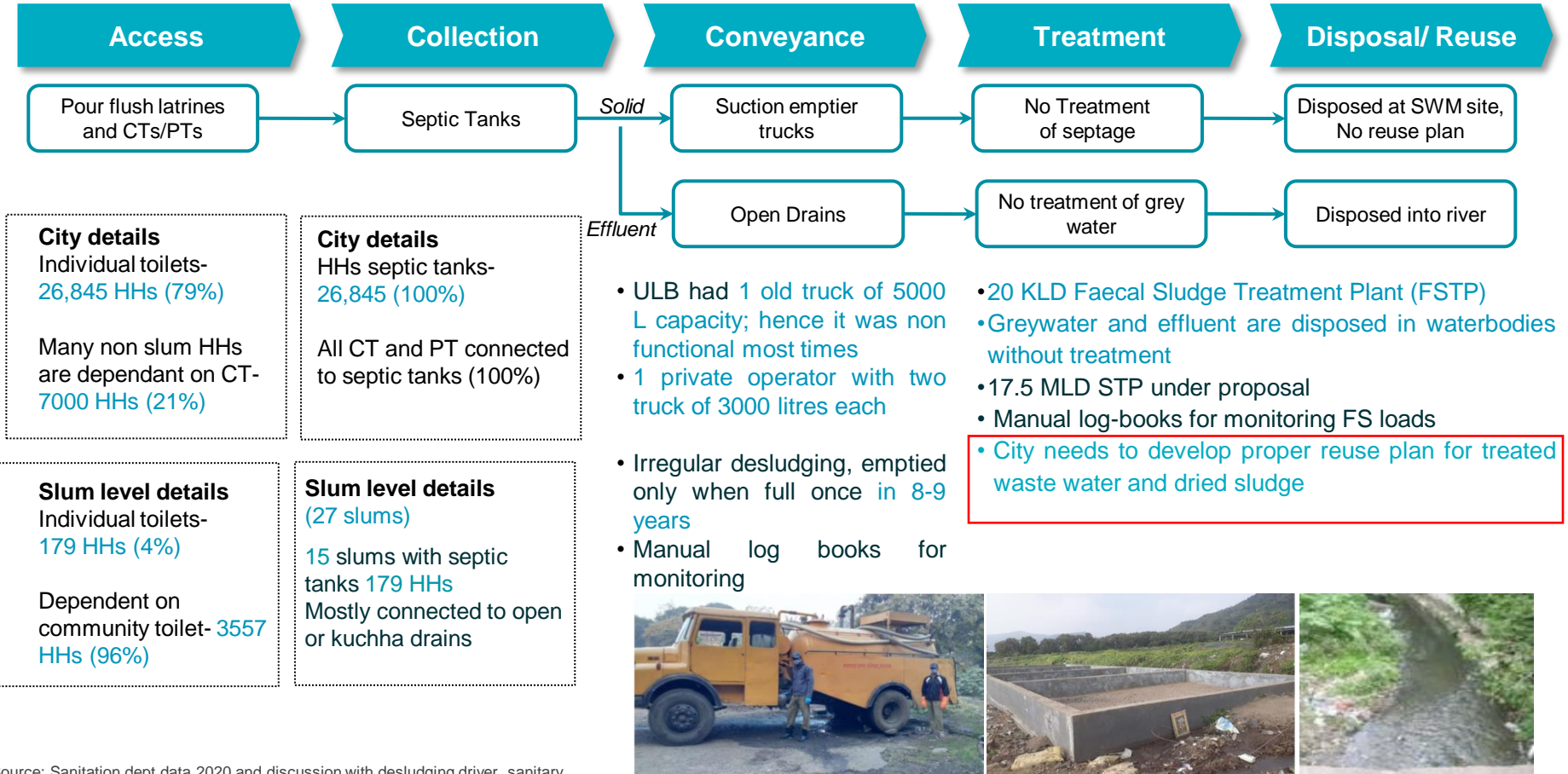
Based on discussion with council, the FSSM plan is prepared on the old limit. Work is still in progress for merging the new limits.



The city has a **historical significance**. It is located near **diversion of Pune Bangalore national highway** and has **good connectivity** with other important towns. **Krishna river** and its tributary **Veena river** is located at **5 km** from Satara

Source: SWM DPR, Census 2011, STP DPR, Water audit report 2015, PMAY dept, Primary discussion with ULB officials and analysis

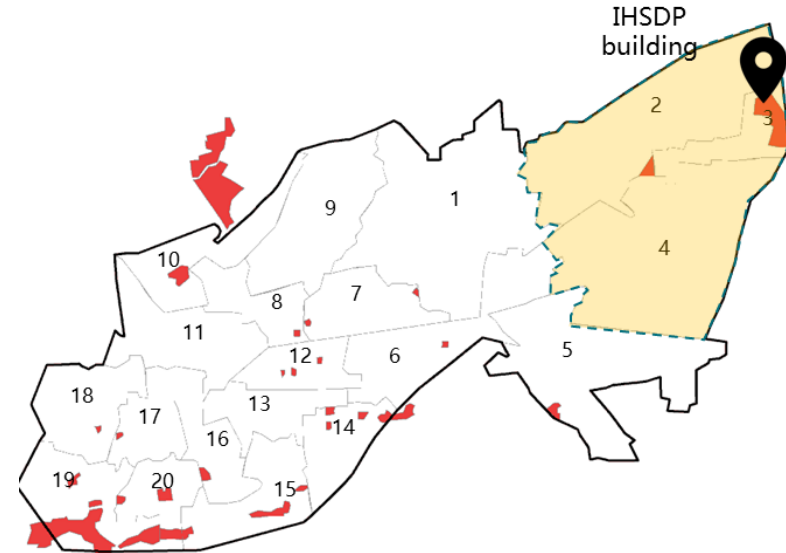
Existing sanitation situation in Satara



Source: Sanitation dept data 2020 and discussion with desludging driver, sanitary supervisors, etc. and SS20 database

Scheduled desludging being carried out under the FSSM plan for Satara

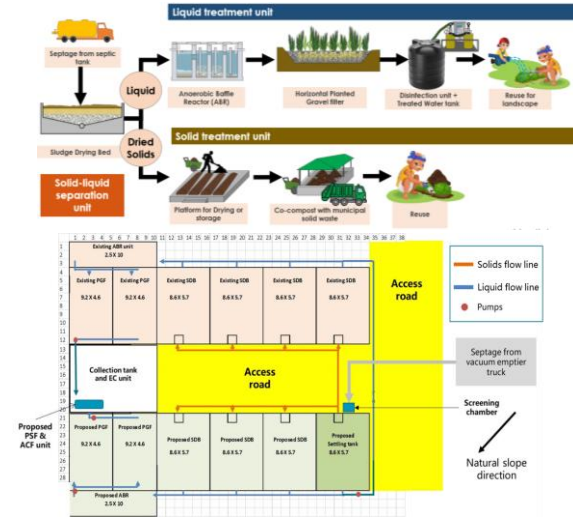
- Scheduled desludging represents a planned effort to ensure regular desludging. Under the scheduled desludging, all the septic tanks of this zone will be desludged at a regular interval of 3 years.
- The local governments of Satara in Maharashtra with support of CWAS and HTPF introduced a scheduled desludging in one pilot zone including all slums in the city and the collected septage will be treated at fecal sludge treatment plant.
- 5-6 septic tanks are desludged per day and around 25-30 KLD of septage is delivered to treatment plant.
- Due to scheduled emptying high volume of treated wastewater and sludge is generated at treatment plant.



Source: Primary analysis and data collection

Ensuring proper treatment of collected sludge at FSTP

- The collected septage is treated at 50 KLD Fecal Sludge Treatment Plant (FSTP). The FSTP is located at Songaon Kachra Depot.
- The FSTP uses simple sludge drying bed technology which is simple to operate and requires less electricity.
- The FSTP generates treated wastewater and compost as by-products which has huge potential for reuse. At present, treated sludge is sold to farmer for using as compost in agriculture fields and treated wastewater is reused for on-site gardening and cleaning purpose.



Fecal sludge treatment plant in Satara



O&M of FSTP by Kachra Vechak Sangh

Compost from treated sludge

Source: Primary analysis and data collection

Need for reuse in Satara

The quality of treated wastewater would meet the **MPCB norms** and the treated sludge would meet the **USEPA standards**

Quantity of TWW produced by 50 KLD FSTP

Approx 30 KLD

*Quantities generated
are per day*

Quantity of dewatered sludge produced

Approx 250 KG

River quality

To preserve the rivers which are exploited as the drains discharge the waste water into the Venna river and eventually into Krishna.



River
quality



Reuse
potential

Reuse potential

Due to scheduled emptying high volume of septage is generated. In order to explore some economic or indirect benefit from the plant, the reuse study is being conducted for Satara.

Reuse Policy

The treated wastewater reuse policy of Maharashtra, urges cities to reuse the treated wastewater and sludge



Reuse
Policy



ODF++/
Water+
status

ODF++ & Water +

Due to Swachh Bharat Mission and cities moving towards ODF++, an increasing focus is witnessed towards Water Plus protocol which encourages treatment and reuse of wastewater.

Revenue Generation

Revenue generation to meet the FSTPs O&M cost



Revenue
generation



Project
objective

Project Objective

Explore potential of reuse of treated wastewater and sludge.

Study for understanding quantity and quality of by-products



Understanding the quantity and quality of by products

- Understanding **quantities** and **quality** of treated waste water and treated septage generated at Satara FSTP. Quality can further be understood by identifying the parameters that affect selection of an option (on-site and off-site).



Consultation with stakeholders

- Based on **consultation** with **stakeholders** and **assessment** of various qualitative and financial parameters **developing** a **reuse proposal** for TWW and septage.



Contents

- 1** Executive Summary

- 2** Introduction

- 3** Current treated wastewater and sludge reuse practice in Satara

- 4** Potential reuse options for Satara

- 5** Way Forward

Existing treated wastewater reuse in Satara

Prior to FSTP becoming operational, it was observed that the untreated **sludge was disposed on open land at SWM site or at farmlands.**

Private desludging operators used to **directly disposed septage in farmlands** as no disposal point was allocated by ULB.

With commissioning of **Fecal Sludge Treatment Plant (FSTP)**, all collected septage is disposed and properly treated at treatment facility.

FSTP O&M has been given to local waste collector group called **Kachra Vechak Sangh.**

Treated wastewater from FSTP is currently reused in following activities:

- Onsite cleaning- screen at FSTP
- Watering plants around FSTP
- Dust control at SWM site

Source: Primary analysis and data collection



ULB dumping in pit at depot



Private desludger dumping in farmlands



Plantation at Depot



Evaporation Pond

Current practice of dewatered sludge reuse at FSTP (1/2)

The Kachra Vechak Sangh follows a **particular process** for getting an effective compost from dewatered sludge.

1. When the sludge is 50-70% dried it is removed & kept on the platform for further drying.



Wet waste compost shade is used for drying

2. Dewatered sludge is mixed and rotated on alternate days or once in a week for quick and better drying.



The women sanitation worker mixing and rotating dried sludge on platform

3. Further the dried sludge is sieved and for better results, the wet waste compost is mixed with dewatered sludge in the ratio of 60:40



Dried sludge is further sieved for better quality compost

4. The mixture is then packed in small sizes of 1 to 2 kg and then sold as per the requirements.



Some farmers get their own tractor trolley if demand is huge and compost is directly transferred to their farms

Source: Primary site survey

Current practice of dewatered sludge reuse (2/2)

- Sanitation workers group has approached the local shop owners of fertilizers, in order to **understand the demand, market rates, customer feedback on dried sludge**.
- According to the farmers, **the dewatered treated sludge has provided good results on yields**.
- **Proper quality tests have been conducted and feasibility was assessed**
- Dried sludge is packaged under Harit brand in sizes of 1 and 2 kg bags and sold at price of **Rs. 12-15 per kg**.
- Dried sludge is reused as compost for landscaping, SMC gardens and purchased by citizen for gardening purpose.
- Treated sludge is taken by farmers for reuse in agriculture fields on random basis.
- However, still more awareness and market needs to be created for the reuse of sludge.



Source: Primary site survey

Quality of treated wastewater and sludge at the FSTPs are within standard limits

- The treated WW quality results are within or near to the given MPCB standards/limits.
- The treated dewatered sludge has good NPK values which will be beneficial for preparing compost.



Quality test results of treated waste water at the FSTP

From Aug 2020 to Oct 2020

Standard Norms by MPCB	5.5 - 9.0	<30 mg/l	<150 mg/l	<50 mg/l	100-1000 MPN/100ml
	pH	BOD	COD	TSS	Fecal coliform
11-Aug-20	7.3	8	45	85	-
11-Sep-20	7.9	8.2	43	89	-
11-Oct-20	7.4	8.9	49	87	-

Quality test results of Dewatered Sludge

Date	pH	C:N ratio	Phosphate as P2O5	Nitrogen as N	Potassium as K2O
Standard Norms by FCO	6.5-7.5	<20	0.4 Min	0.8 Min	0.4 Min
13-Sep-21	8.93	24.54	2.48	1.03	1.2

TEST REPORT

Sample / Report No.	P/08/20/087	Report Date	12/08/2020
Name and address of Customer:	Chief Officer Satara Municipal Council, 1, Kesarnar Path, Satara, 415001		
Sample Collected by	Customer	Sample Description / Type	Effluent (Group: Pollution & Environment)
Sampling Location:	FSTP Plant - Satara	Date - Receipt of Sample	11/08/2020
Sample Quantity / Packing:	1 L * 1 No. plastic bottle outlet	Date - Start of Analysis	11/08/2020
Order Reference	Verbal Discussion	Date - Completion of Analysis	12/08/2020

Sr. No.	Parameter	Result	Unit	Method
CHEMICAL TESTING				
1	Biochemical Oxygen Demand (3 days, 27°C)	08	mg/l	IS 3025 (Part 44):1993, RA 2019
2	Chemical Oxygen Demand	45	mg/l	APHA 23 rd Edition, 2017, 5220-B, 5-18
3	pH	7.3	--	APHA 4500 H+ B
4	Total Suspended Solids (T.S.S)	85	mg/l	APHA 2540 D
* - Performed under NABL Accredited Scope.				
		  Authorised Signatory		

The results relate only to the samples tested in laboratory.
This report shall not be reproduced in part or full, without written approval of Lotus Water Testing & Analytical Laboratory.

Figure: Logbooks showing TWW quality from the FSTP

Source: Primary data collection



Contents

- 1** Executive Summary

- 2** Introduction

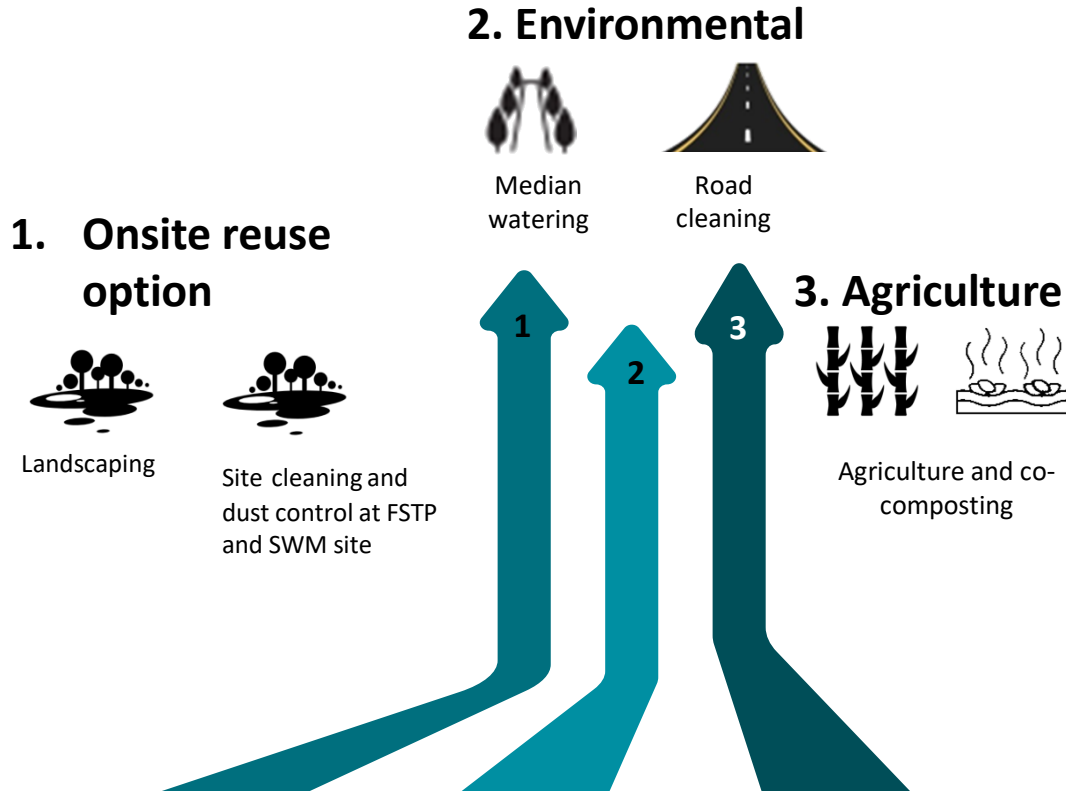
- 3** Current treated wastewater and sludge reuse practice in Satara

- 4** Potential reuse options for Satara

- 5** Way Forward

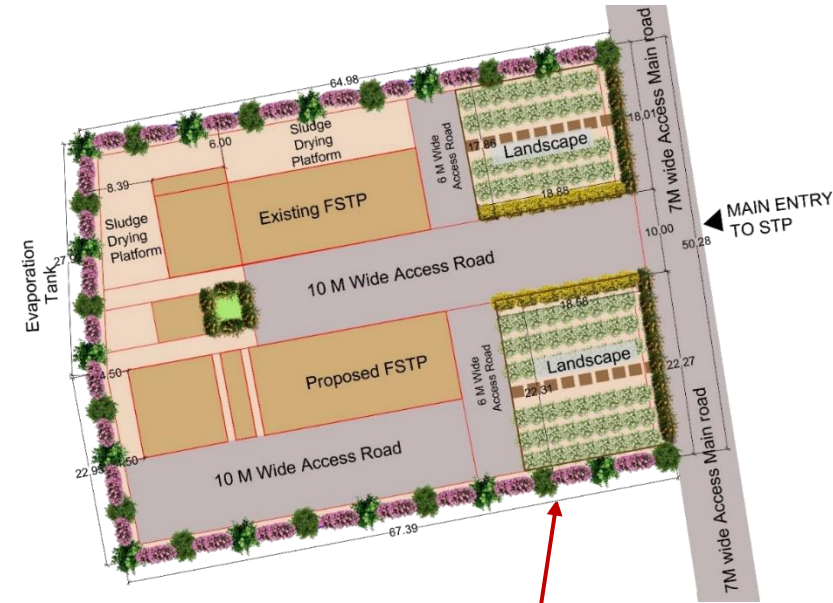
Probable reuse options for Satara

As per the study on treated wastewater and sludge reuse, the following options are shortlisted considering the scenario in Satara.



Onsite reuse for landscaping and site cleaning

- Treated wastewater will be used mostly for **landscaping the plants** around the FSTP site and SWM site. The landscape area at front side of FSTP has been kept for flowering plants, which can **generate revenue** for FSTP sanitation workers.
- Treated wastewater will also be reused for **cleaning screens, FSTP surroundings and dust control at SWM site**. It will also be supplied as required for **SWM composting**.
- This will be best suited option for Satara Municipal Council as well. The **reuse will be completely onsite** and will not require additional machinery. One time investment can be made in the pipeline system.
- Area under landscaping is **138 sq.m**



Key Map



Reuse of treated wastewater for medians, road cleaning and landscapes

- The treated wastewater can be reused for **watering the medians, junction landscapes**, etc. Currently, Satara has approximately **5 km** of medians within its city boundaries.
- The treated wastewater can also be reused for **cleaning and washing of the roads** along SWM depo, **dust controlling** in different parts of cities and **watering the trees around the road** as suggested by the SMC officials.
- Except monsoons, approximately **10KLD** of treated wastewater can be reused.
- Currently, SMC has hired local contractor for watering medians and trees around the city. Based on discussion with SMC officials and local contractor, one tractor can be dedicated to supply treated wastewater.

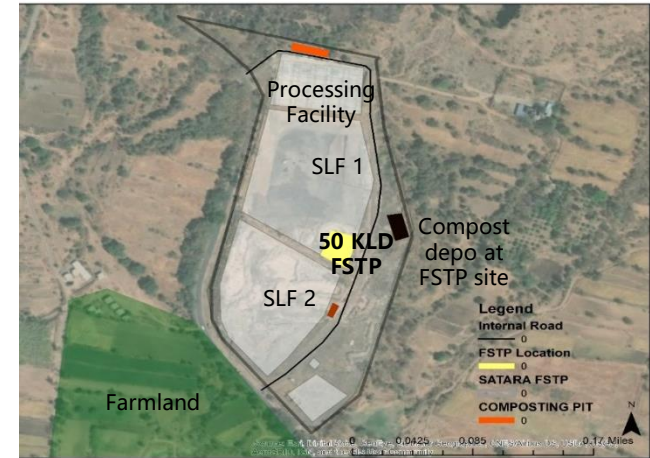


Map showing the median on the 5 km marked main road



Reuse of treated sludge in agriculture and gardens

- Existing reuse of dried sludge is done considerably well by sanitation workers of Satara FSTP. This can be improved further by following measure.:
- Dried sludge should be mixed with SWM compost** and sold to farmers and nearby agriculture fields. There is a large agricultural land available around the FSTP where the **treated sludge can be used for agriculture purpose.**
- As per discussion with SMC officials, dried sludge will also be reused in **public gardens** in Satara. There are **16 gardens** where sludge can be reused.
- In addition, dried sludge can also be reused as **backfilling material for road work** around FSTP and SWM site.
- Discussions are ongoing with agriculture department of Satara to conduct research study on reuse of sludge for various type of agriculture produce and test quality of resultant yields. This will help further increase scope of reuse of sludge in agriculture.



Compost from treated sludge



Contents

- 1 Executive Summary**

- 2 Introduction**

- 3 Current treated wastewater and sludge reuse practice in Satara**

- 4 Potential reuse options for Satara**

- 5 Way Forward**

Way forward

- In order to generate market and create social awareness on treated sludge, the followings steps may be taken:-
 - Meet the farmers and try giving them free samples to test.
 - Generate market through various social media platforms
 - Prepare a video and circulate the same to increase awareness
- SMC should explore reuse of treated wastewater for landscape and plantation around city areas, road medians etc.
- SMC should also explore mixing treated sludge with SWM compost for further commercial sale.
- SMC should start monitoring the reuse practices through various mechanisms - log books, daily checking at FSTP site, online monitoring systems.

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.



cwas.org.in
pas.org.in



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



[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)