



Potential reuse of treated wastewater and sludge from FSTPs in Maharashtra

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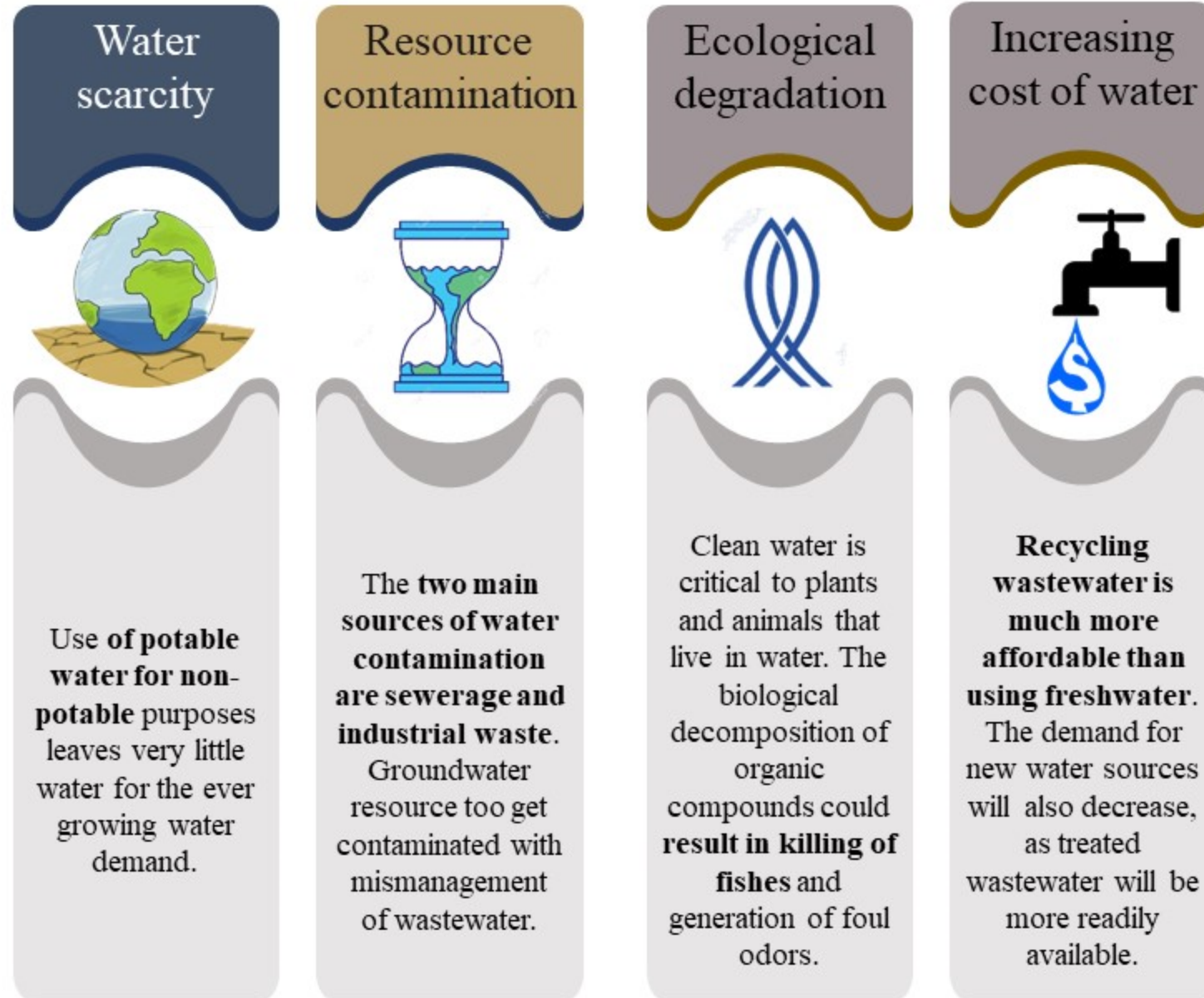
Guided by – Aasim Mansuri | Jigisha Jaiswal

Date :- 22/05/2020

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It was carried out towards partial fulfilment of the requirements for the award of a Master’s Degree at the Faculty of Planning, CEPT University, Ahmedabad, India.





Globally, over 80% of all wastewater is discharged without treatment

- [2017 UN World Water Development Report, Wastewater: The Untapped Resource](#)

Lower middle-income countries

treat about **28%** of the municipal and industrial wastewater they generate - [2017 UN World Water Development Report,](#)

[Wastewater: The Untapped Resource](#)

More than **70 %** urban population in India is dependent on onsite sanitation systems with improper **management of septage generated**

[Centre for Science and Environment \(CSE\).](#)

Daily, **1.7 million tons of fecal sludge** has negative consequences on the environment, creating water pollution and killing off marine life.

[Centre for Science and Environment \(CSE\).](#)

By 2030, India's **water demand to be twice** the available **supply**

[The economic times Last Updated: Jun 21, 2018, 01:26 PM IST |](#)

As per the CPCB report received on 30th April 2019 states that **323 out of 351 rivers were polluted.**

[CPCB BULLETIN VOL.-I](#)

RECYCLING IS THE ANSWER TO INDIA'S WATER WOES

- [By T V Venkateswaran, Jyoti Singh 20 July 2017](#)



Sustainable Development Goals

GLOBAL NATIONAL



Advisory on septage management MoUD



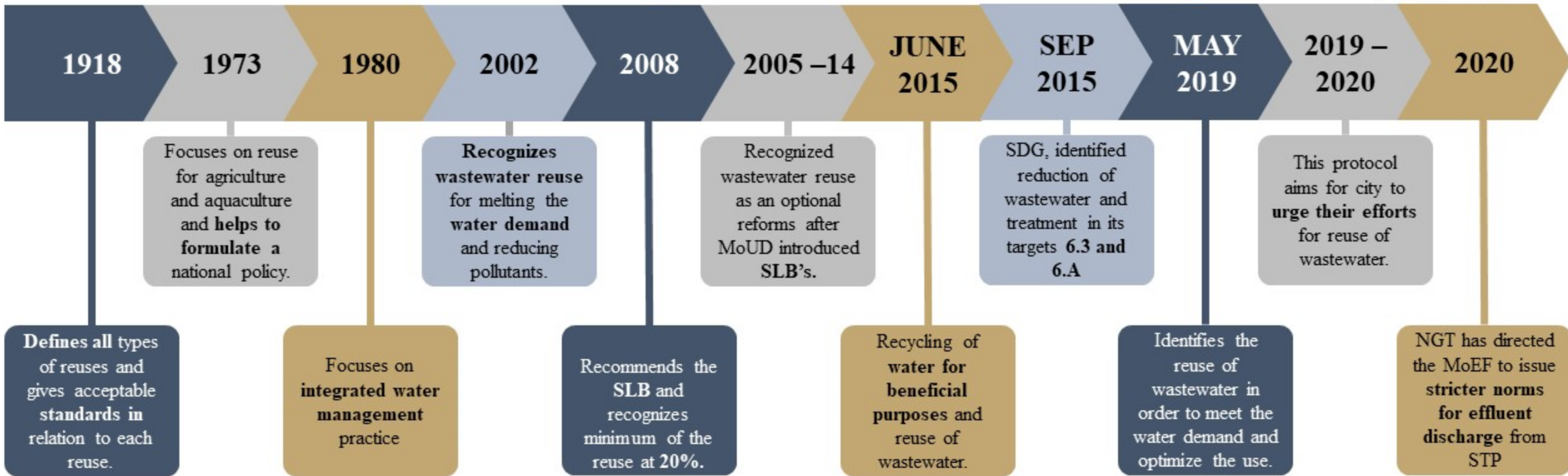
National urban faecal sludge and septage management policy

Primer on faecal sludge and septage management

Water Plus Protocol



SWACHH SURVEKSHAN 2020



- Mostly all the policies on wastewater and sludge reuse focus on reuse through STPs.
- Though most **small and medium towns** in India find it **difficult to build and operate a centralized sewerage system** and hence GoI focuses on FSSM, with this many small and medium towns are now building FSTPs.
- Additionally, The FSSM policies focus more on the collection and treatment part, not a lot of **focus is on reuse of wastewater and sludge through FSTPs**
- As per Article 24 of the **Water (Prevention and Control of Pollution) Act**, it is necessary to treat the wastewater generated from the urban areas hence, **many states including Maharashtra have formed a wastewater reuse policy in November 2017.**

The current wastewater reuse [policy of Maharashtra](#)



Reuse of treated wastewater produced in MLDs through STPs, whereas FSTP cities produces treated wastewater in KLD.

Since, Maharashtra having 311 upcoming FSTPs, there is a clear need to have a dedicated policy which focuses on wastewater and sludge reuse through FSTPs

Map showing the constructed FSTPs in Maharashtra

Maharashtra has **393** ULBs.

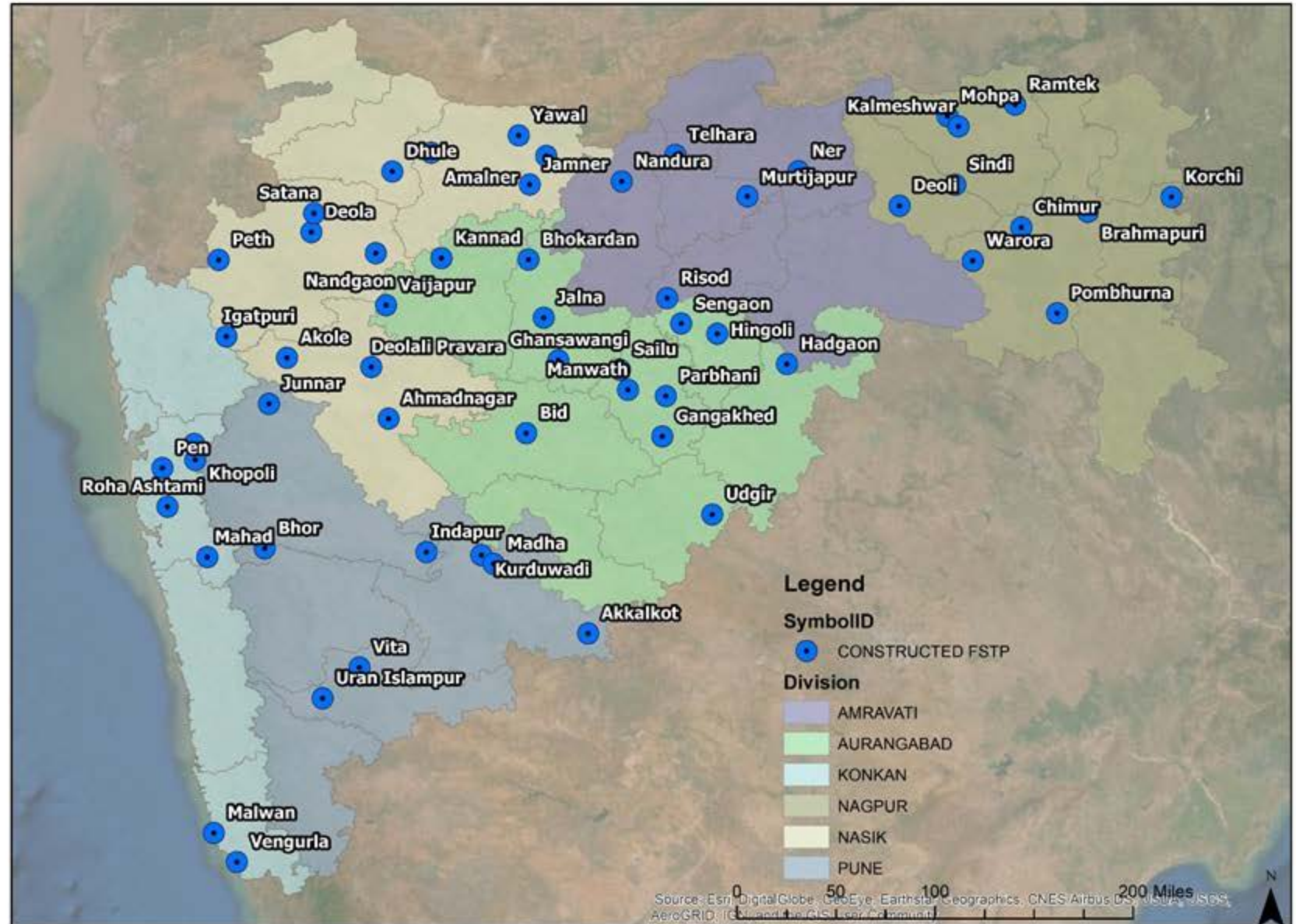
311 Cities which have an existing or upcoming FSTP

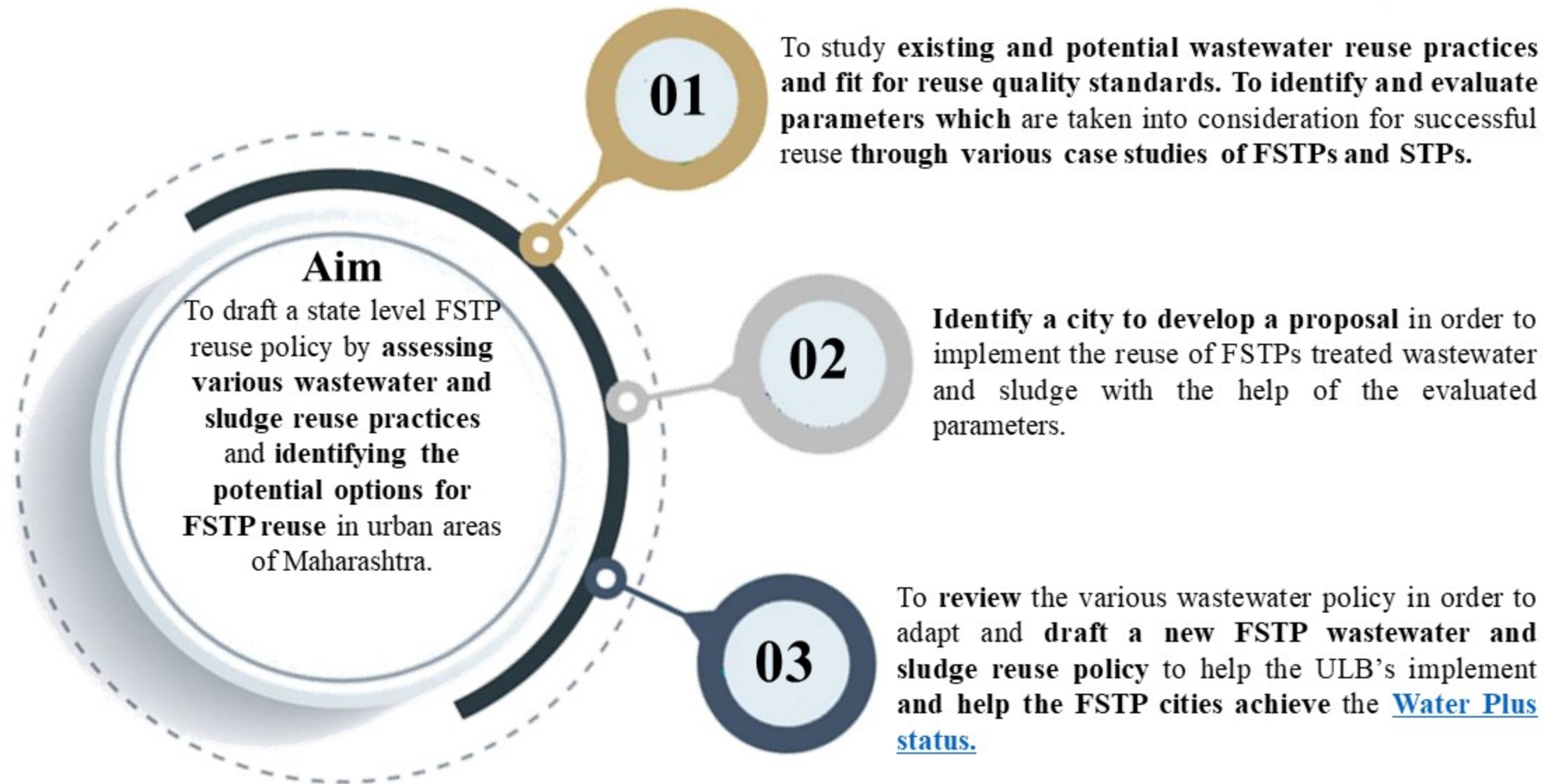
59 Cities have constructed FSTPs

101 under construction FSTPs

Since, these FSTPs are newly constructed and ULBs do not have a reuse plan.

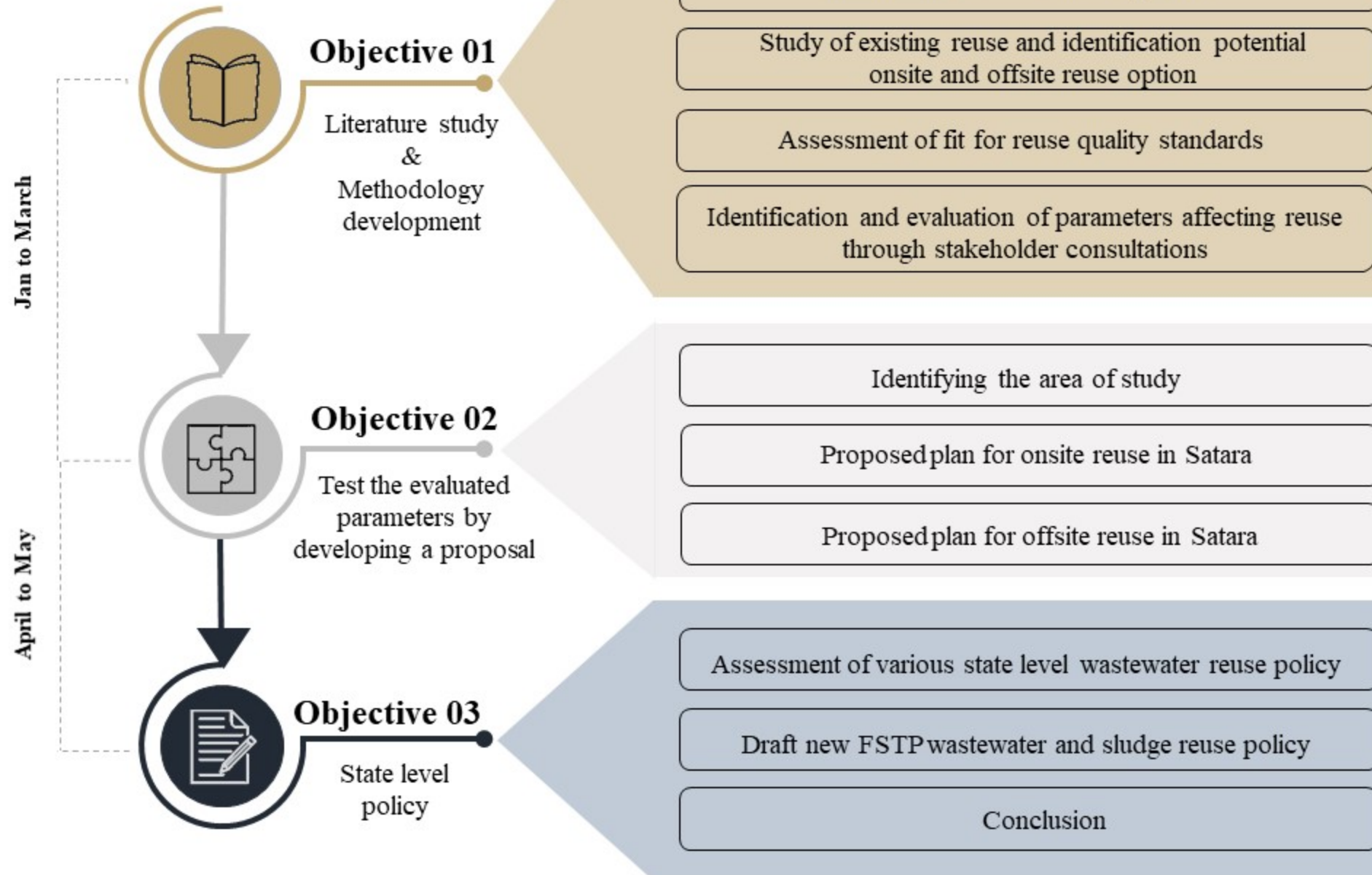
The policy would guide the ULBs to develop a reuse plan.





Limitation :- This study **does not** take into account the **greywater for cities** that are dependent on **onsite sanitation system.**

METHODOLOGY FOLLOWED





Objective 01

Literature study & Methodology development

- Literature study
- Identification of Aim and Objectives
- Study of existing reuse and identification potential onsite and offsite reuse option**
- Assessment of fit for reuse quality standards
- Identification and evaluation of parameters affecting reuse



Objective 02

Test the evaluated parameters by developing a proposal

- Identifying the area of study
- Plan for onsite reuse in Satara
- Plan for offsite reuse in Satara



Objective 03

State level p

- Assessment of various state level wastewater reuse policy
- Create new FSTP wastewater and sludge reuse policy
- Conclusion

Co-composting SWM site

Sakhipur, Bangladesh, Kampala & Malaysia

Agriculture

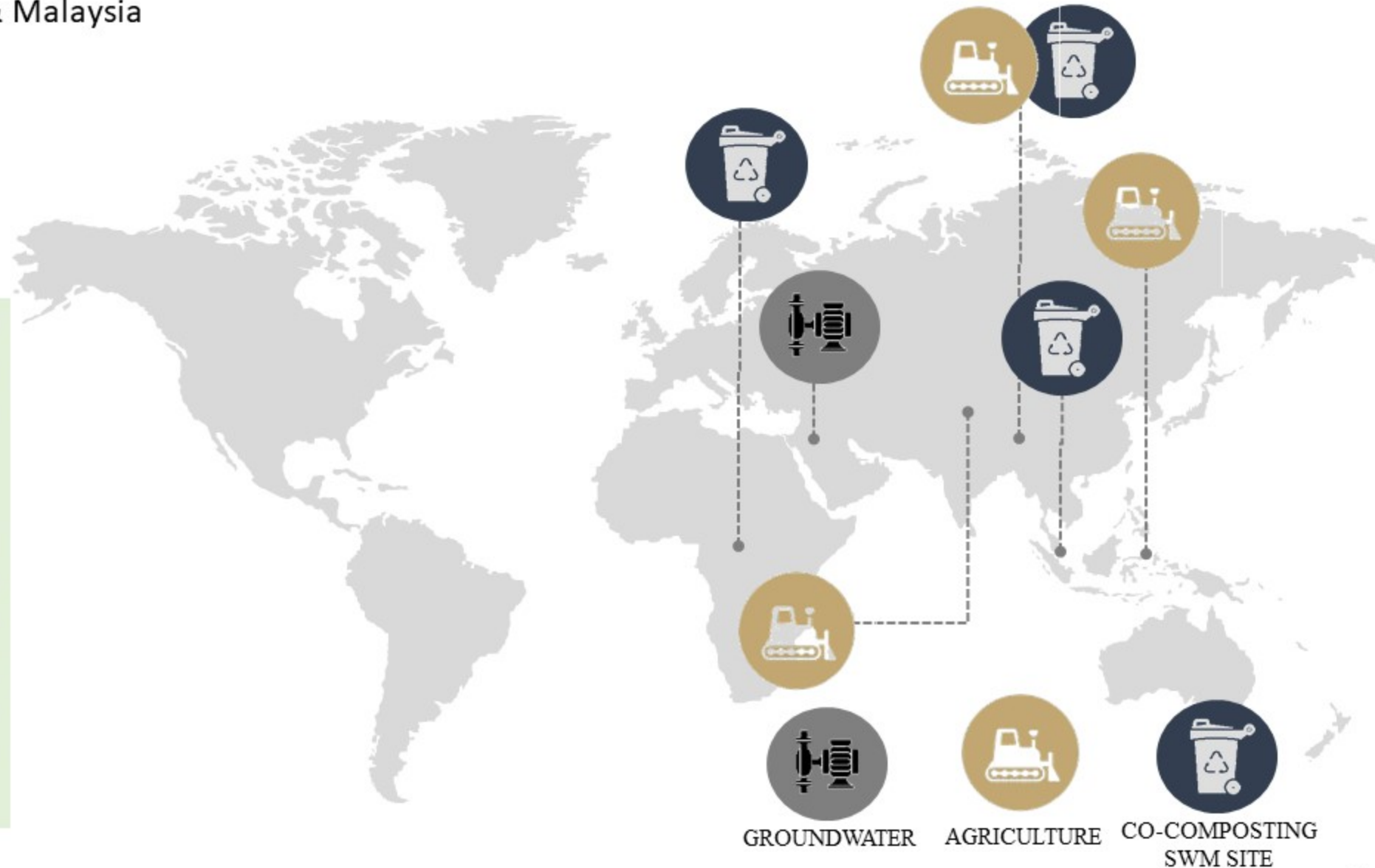
Nepal, Bangladesh, Balikpapan, Indonesia, Durban, south Africa

Groundwater Recharge

Jordan

In order to set the priority of wastewater and sludge reuse in Maharashtra, case studies from all over the world where done.

These case studies included wastewater and sludge reuse practices from cities having STP and FSTP both as the reuse practices from FSTP were majorly concentrating to agriculture and gardens etc.



GROUNDWATER

AGRICULTURE

CO-COMPOSTING
SWM SITE

Co-composting SWM site

Massachusetts, U.S and Haiti

Agriculture

Egypt, Israel, Mexico, Kuwait

Industries

Durban, South Africa

Water body rejuvenation

Restoration of Meguro River, Japan

Urban reuse (Road cleaning, landscaping & construction)

Seoul, Korea ; Grande Brazil;
Republic of Korea ; Bangkok, Hawaii

Used in Townships

Bangkok

Toilet Flushing

Kobe and Tokyo




GROUND COOLING /
ROAD CLEANING


GARDENS /
PUBLIC SPACES


BUILDING
CONSTRUCTION


TOWNSHIPS


WATER BODY
REJUVENATION


INDUSTRIES


AGRICULTURE


CO-COMPOSTING
SWM SITE

NATIONAL REUSE PRACTICES THROUGH FSTP

Landscape at FSTP site

Wai (70 KLD), Sinnar (70 KLD), Wayanad (10 KLD), Periyanaickenpalayam (25 KLD), Berhampur (40 KLD), Devanahalli (6 KLD), Karunguzhi (23 KLD), Bhubaneswar, Jhansi.

Co-composting SWM site

Devanahalli, Ambikapur (5 KLD), Adigaratti, Dhenkanal (27 KLD)

Ground water recharge

Devanahalli, Kity, Tamil Nadu

Gardens / Nursery

Sakhipur (8 KLD), Leh (12 KLD)

Agriculture

Unnao, Uttar Pradesh

Social / Urban forestry

Sinnar

SWM Site Fire Fighting

Wai (only done once)

Vehicle Washing

Sinnar (Occasionally)



AGRICULTURE



FIRE



NURSERY /
HORTICULTURE



GARDENS /
PUBLIC SPACES



RECHARGE



LANDSCAPE /
URBAN FORESTRY



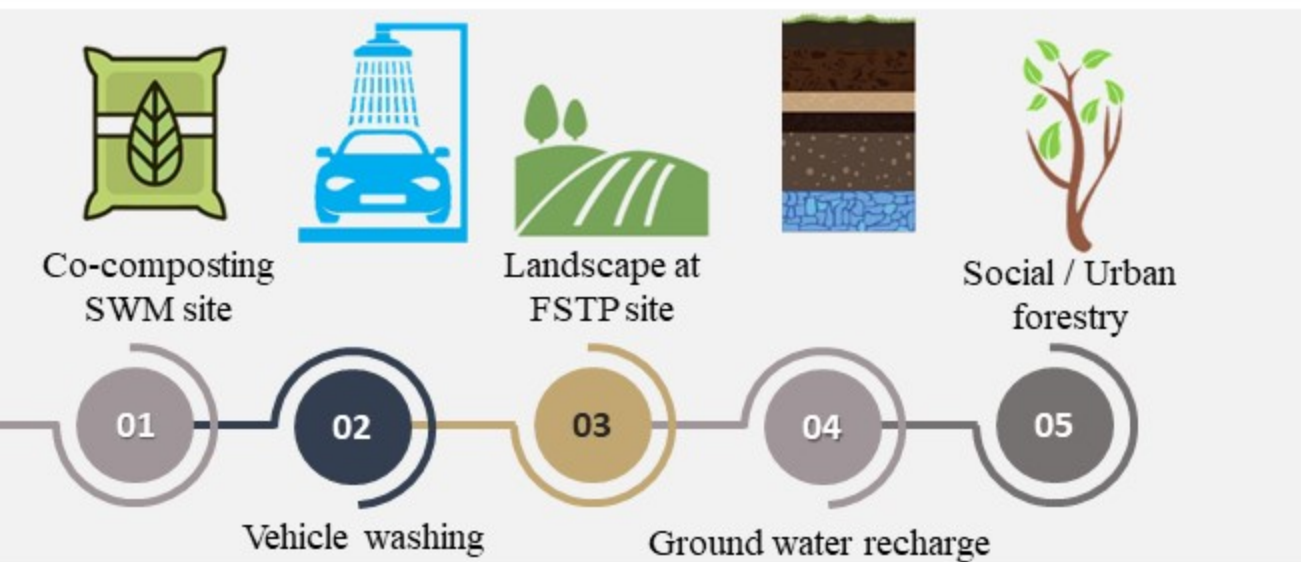
VEHICLE
WASHING



CO-COMPOSTING
SWM SITE

NOTE - Figure in bracket shows the FSTP plant capacity

ONSITE – Reuse within the FSTP site



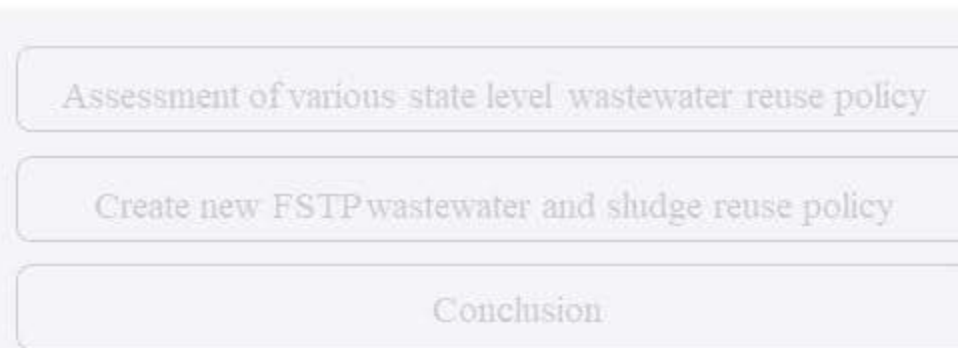
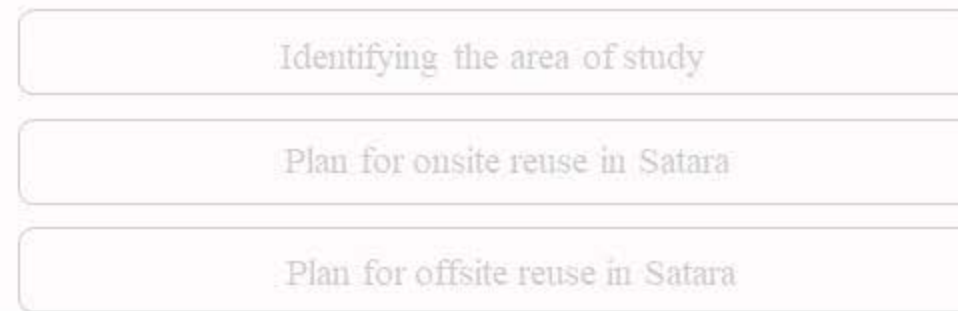
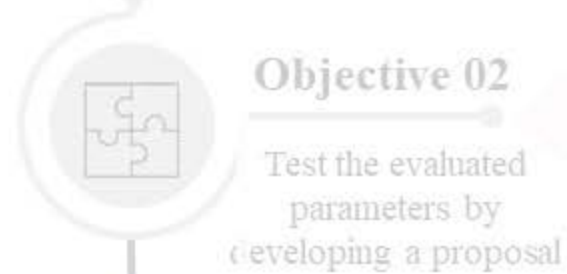
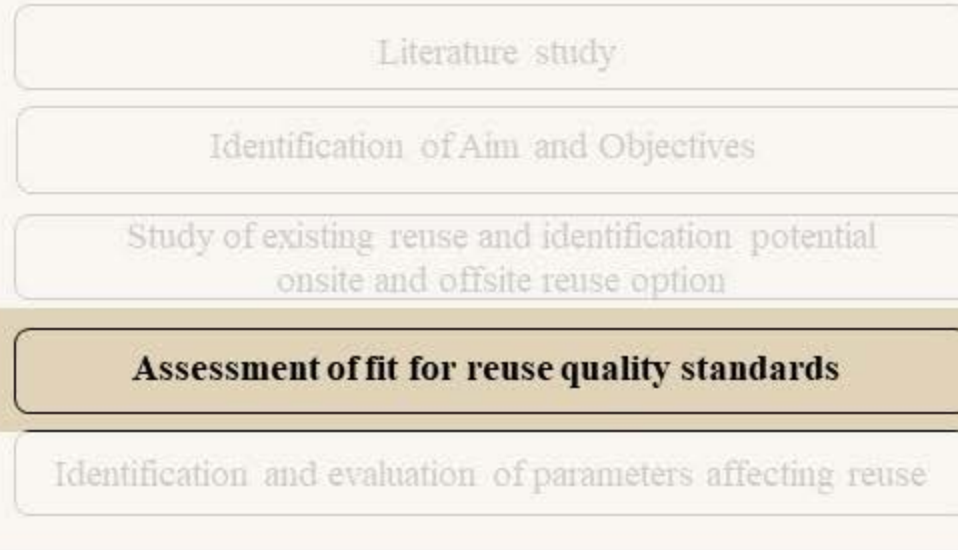
Identified reuse options suitable for cities in Maharashtra having FSTP

Reuse priority set for Maharashtra on the following factors:-

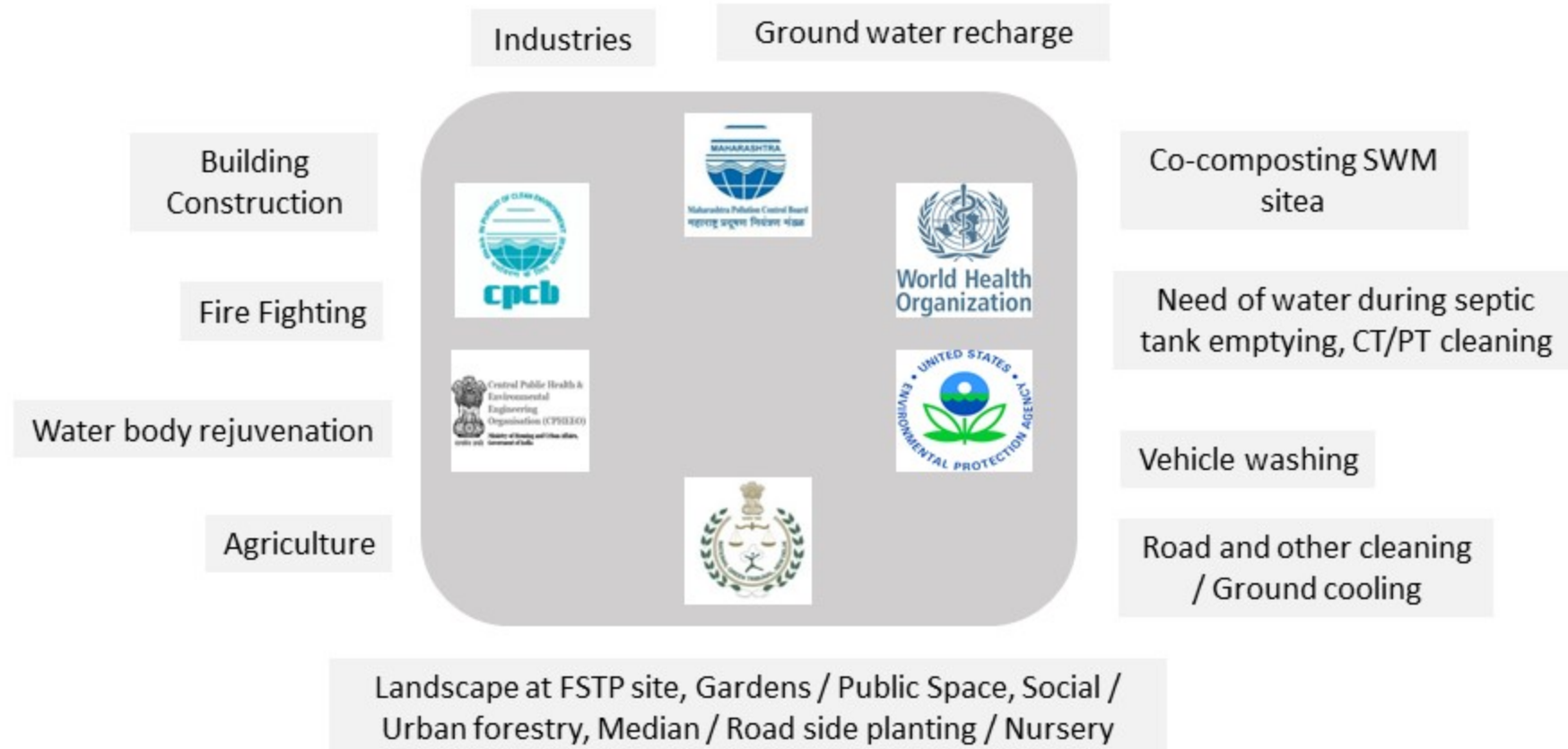
- Onsite & Offsite
- Human contact (H) or No Human contact (NH)
- Require water Daily (D) or intermittently(I)
- [\(NH-D, H-D, NH- D/I, H-D/I, NH-I\)](#)

OFFSITE - Reuse outside the FSTP site where the treated wastewater needs to be transported





Since the fit for reuse standards are for Maharashtra and the ULBs would come under MPCB monitoring's, the first priority considered is the quality norms prescribed in MPCB, followed by CPCB, CPHEEO, NGT, WHO and USEPA respectively.



	MPCB 1st	CPCB 2nd	CPHEEO 3rd	NGT 4th	WHO 5th	USEPA 6th
Agriculture	✓	✓	✓		✓	✓
Vehicle washing	✓	✓	✓			✓
Landscape at FSTP site, Gardens / Public Space, Social / Urban forestry, Median / Road side planting / Nursery	✓	✓	✓		✓	✓
Ground water recharge				✓		✓
Need of water during septic tank emptying, CT/PT cleaning	✓	✓				✓
Industries	✓	✓				✓
Building Construction	✓	✓				✓
Water body rejuvenation			✓			✓
Road and other cleaning / Ground cooling	✓	✓				✓
Fire Fighting	✓	✓	✓			✓
Co-composting SWM site	✓	✓				✓

Source: USEPA. (2010). Technology-Based Effluent Limitations. *NPDES Permit Writers' Manual*, (September), 1–49. Retrieved from https://www.epa.gov/sites/production/files/2015-09/documents/pwm_chapt_05.pdf ; The Council of European Communities. (1991). EU Council Directive on Urban Wastewater Treatment. *Official Journal of European Communities*, pp. 40–52. Retrieved from <https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:31991L0271&from=en>. Member, J., & Member, E. (2019). *Applicant(s) Respondent(s)*. (04), 1–14. ; Venugopal, K., Advocate, S., Sikri, E., & Gayatri, M. K. (2018). *Item No . 06 BEFORE THE NATIONAL GREEN TRIBUNAL PRINCIPAL BENCH , NEW DELHI Original Application No . 1069 / 2018 Nitin Shankar Deshpande Versus Union of India & Ors . Date of hearing : 21 . 12 . 2018 .* ; CPHEEO. (2013). Chapter 7: Recycling and reuse of sewage. *Manual on Sewerage and Sewage Treatment Systems*, 7.1-7.53. ; *Designated Best Use Water Quality Criteria*. (n.d.). 2250. ; CPCB Sewage Discharge Standards (n.d.). Retrieved from https://www.modernstp.com/legislation/cpcb_sewage_discharge_standards ; MPCB Water quality standards for best designated usages (n.d.). Retrieved from http://www.mpcb.gov.in/water-quality/standards-protocols/water-quality-standards_1

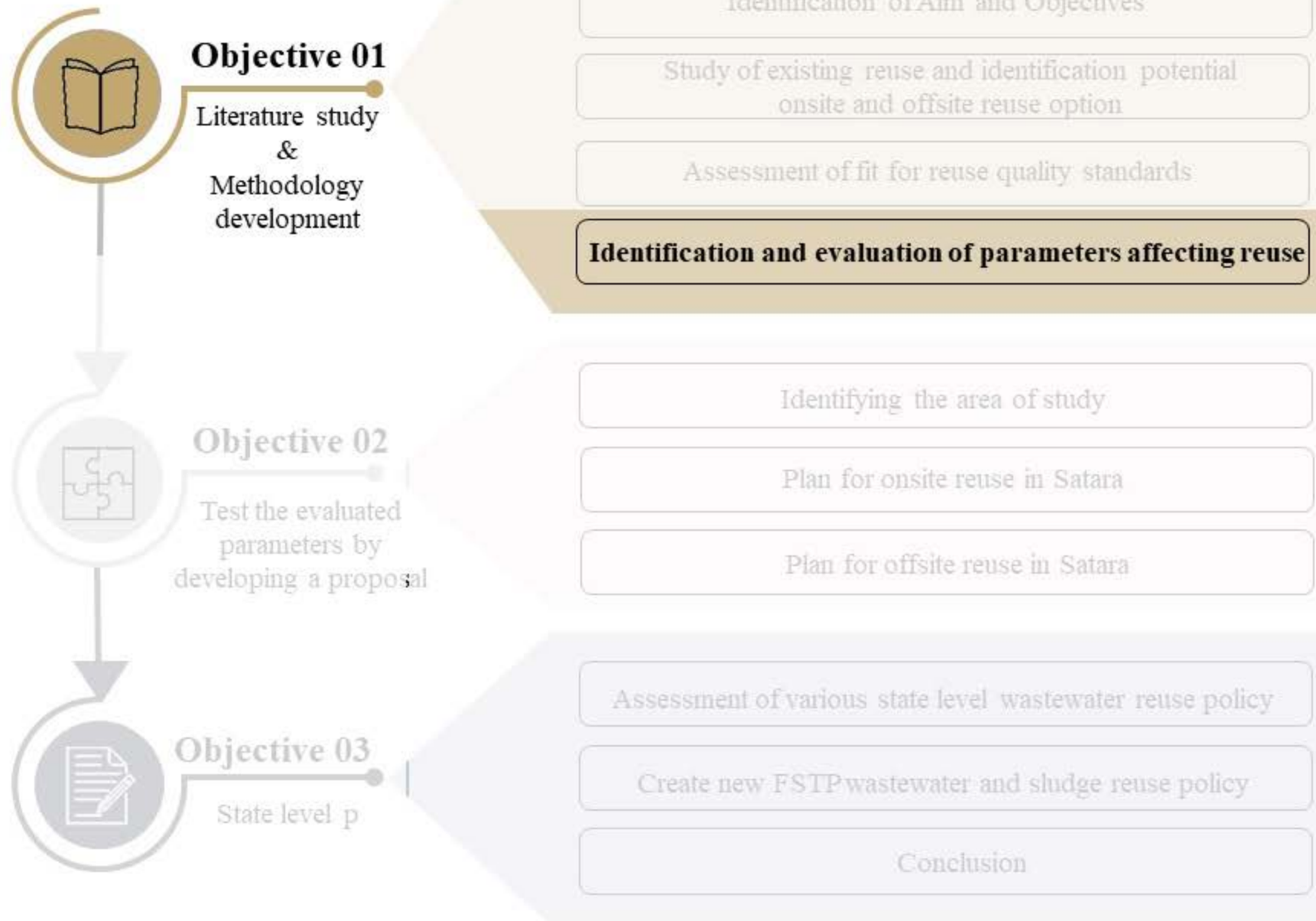
	MPCB 1st	CPCB 2nd	CPHEEO 3rd	NGT 4th	WHO 5th	USEPA 6th
Agriculture	✓	✓	✓	NGT norms are overarching, most stringent and it does not have fit for reuse standards hence not considered.		
Vehicle washing	✓	✓	✓			
Landscape at FSTP site, Gardens / Public Space, Social / Urban forestry, Median / Road side planting / Nursery	✓	✓	✓			
Ground water recharge						
Need of water during septic tank emptying, CT/PT cleaning	✓	✓			✓	
Industries	✓	✓			✓	
Building Construction	✓	✓			✓	
Water body rejuvenation			✓		✓	
Road and other cleaning / Ground cooling	✓	✓			✓	
Fire Fighting	✓	✓	✓		✓	
Co-composting SWM site	✓	✓			✓	

Source: USEPA. (2010). Technology-Based Effluent Limitations. *NPDES Permit Writers' Manual*, (September), 1–49. Retrieved from https://www.epa.gov/sites/production/files/2015-09/documents/pwm_chapt_05.pdf ; The Council of European Communities. (1991). EU Council Directive on Urban Wastewater Treatment. *Official Journal of European Communities*, pp. 40–52. Retrieved from <https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:31991L0271&from=en>. Member, J., & Member, E. (2019). *Applicant(s) Respondent(s)*. (04), 1–14. ; Venugopal, K., Advocate, S., Sikri, E., & Gayatri, M. K. (2018). *Item No . 06 BEFORE THE NATIONAL GREEN TRIBUNAL PRINCIPAL BENCH , NEW DELHI Original Application No . 1069 / 2018 Nitin Shankar Deshpande Versus Union of India & Ors . Date of hearing : 21 . 12 . 2018 .* ; CPHEEO. (2013). Chapter 7: Recycling and reuse of sewage. *Manual on Sewerage and Sewage Treatment Systems*, 7.1-7.53. ; *Designated Best Use Water Quality Criteria*. (n.d.). 2250. ; CPCB Sewage Discharge Standards (n.d.). Retrieved from https://www.modemstp.com/legislation/cpcb_sewage_discharge_standards ; MPCB Water quality standards for best designated usages (n.d.). Retrieved from http://www.mpcb.gov.in/water-quality/standards-protocols/water-quality-standards_1

	MPCB 1st	CPCB 2nd	CPHEEO 3rd	NGT	WHO	USEPA
Agriculture	✓	✓	✓			
Vehicle washing	✓	✓	✓			
Landscape at FSTP site, Gardens / Public Space, Social / Urban forestry, Median / Road side planting / Nursery	✓	✓	✓			
Ground water recharge	✓	✓	✓	✓		✓
Need of water during septic tank emptying, CT	✓	✓	✓			
Industries	NOT MENTIONED	NOT MENTIONED	NOT MENTIONED	<ul style="list-style-type: none"> BOD <10 mg/L COD – 50 mg/L Fecal coliform - <100 	NOT MENTIONED	<ul style="list-style-type: none"> Site specific and use dependent
Building Construction	✓	✓	✓			
Water body rejuvenation	✓	✓	✓			
Road and other cleaning / Ground cooling	✓	✓	✓			✓
Fire Fighting	✓	✓	✓			✓
Co-composting SWM site	✓	✓	✓			

Since MPCB are not available NGT norms may be considered. **India has more stringent** wastewater quality norms for reusing in **ground water recharge** as compared to international norms.

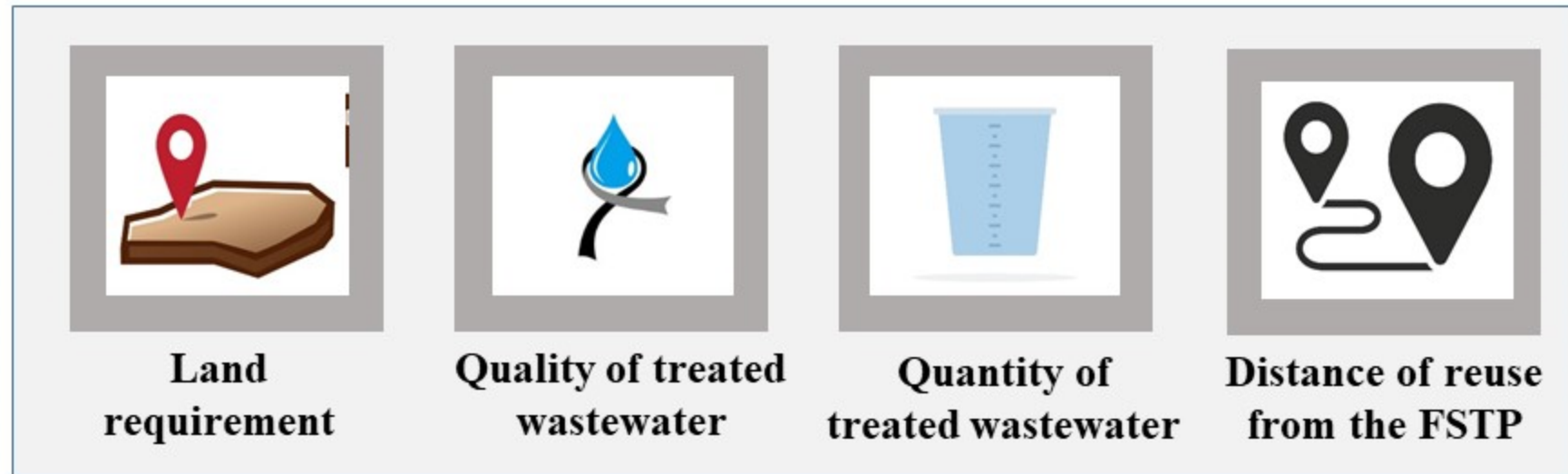
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IDENTIFIED PARAMETERS FOR FSTP REUSE

The following are the adapted parameters from various case studies which are considered in order to reuse the wastewater and sludge successfully.

Physical components



Financial Category

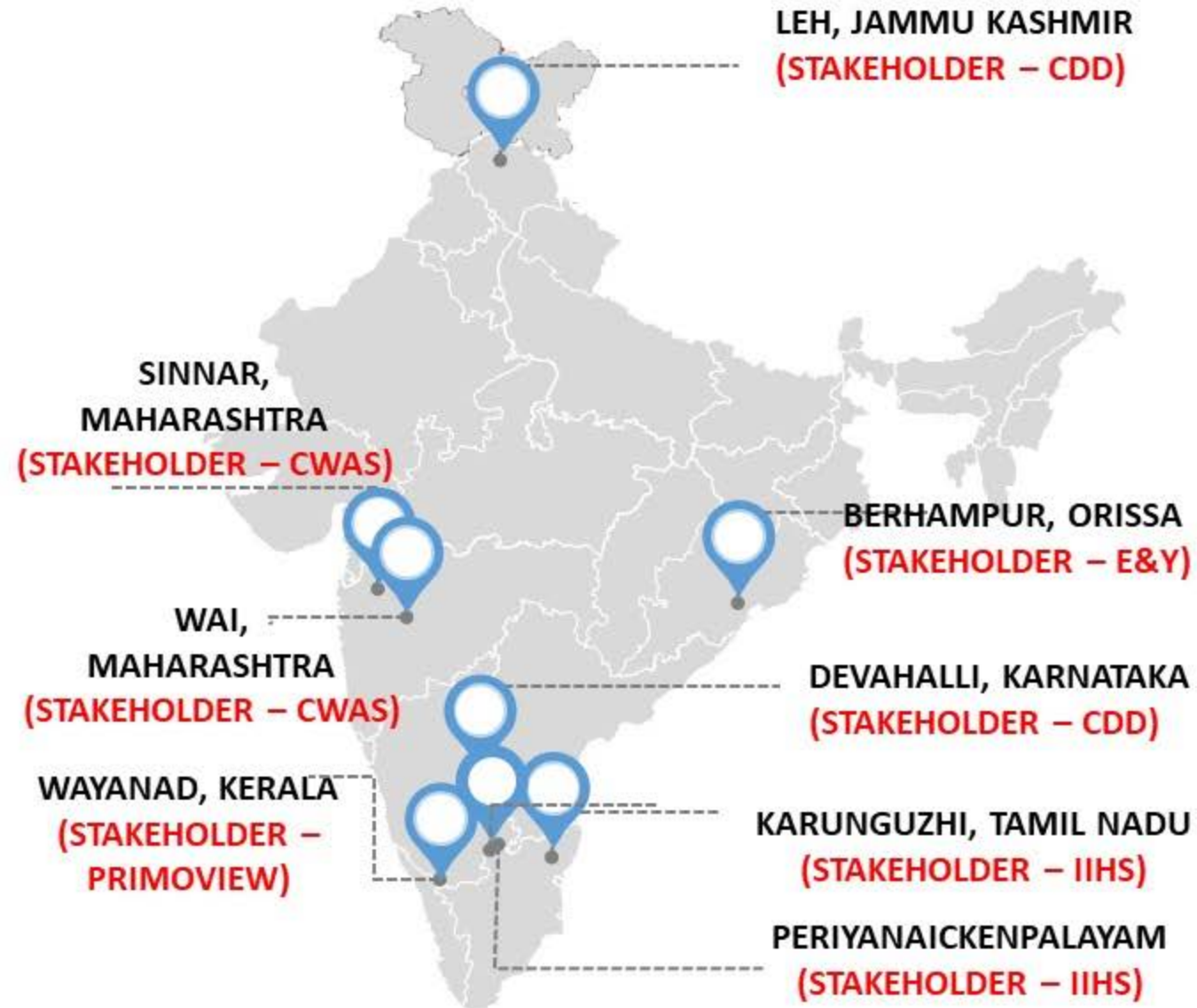


User Perspective



PROCESS FOLLOWED FOR EVALUATION OF PARAMETERS

APPROACH FOLLOWED



- The cities are selected on basis of availability and reuse type

Onsite - Multiple reuse

Case study	Reuse of wastewater	Reuse of sludge	FSTP capacity	Treated Wastewater generated and reused	Treated Sludge generated and reused	Why was this option chosen	Why were other options not chosen
Devanahalli	- Internal Landscape - Co-composting - Percolation Trench	Bio-solids	6 KLD Capacity	4.2 KLD	600 kg / day	- Recharge groundwater - Aesthetic purpose	- High conveyance cost - Less Quantity
Leh	- Nursery - Gov. Golf course - Dry toilets	Bio-solids	12 KLD Capacity	4 to 5 KLD	200 to 300 kg / day (Not reused)	- Unsure quality - Aesthetic purpose	- Capital cost of tanker - Less quantity

Onsite – Single reuse

Case study	Reuse of wastewater	Reuse of sludge	FSTP capacity	Treated Wastewater generated and reused	Treated Sludge generated and reused	Why was this option chosen	Why were other options not chosen
Berhampur	- Landscape	Co-composting with SWM	40 KLD Capacity	40 KLD	1200 kg / day (Not reused)	- Less permissions from authorities	- Less permissions from authorities
Wayanad	- Coffee plantation	Manure	10 KLD Capacity	3 KLD	Nominal (Not reused)	- Less quantity - No conveyance cost	- Co-composting involves higher human contact
Karunguzhi	- Landscape	To be used for co-composting	23 KLD Capacity	16 KLD	200 to 300 kg / day (Not reused)	- Resource park	- Less quantity - Provision made in future
Periyanaickenpalayam	- Landscape	To be used for co-composting	25 KLD Capacity	23 KLD	200 to 300 kg / day (Not reused)	- Followed Tamil Nadu operating guidelines	- Less quantity - Provision made in future

Onsite - Multiple reuse

Case study	Reuse of wastewater	Reuse of sludge	Land requirement	Distance of reuse from the FSTP	Quality	Quantity	Demand from users	Capital Cost	O&M cost	Human Contact	Revenue
Devanahalli	- Internal Landscape - Co-composting - Percolation Trench	Bio-solids									
Leh	- Nursery - Gov. Golf course - Dry toilets	Bio-solids									

Onsite – Single reuse

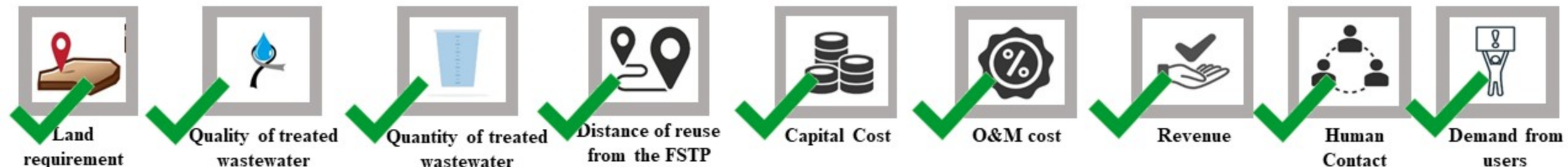
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Berhampur	- Landscape	Co-composting with SWM									
Wayanad	- Coffee plantation	Manure									
Karunguzhi	- Landscape	To be used for co-composting									
Periyanaickenpalayam	- Landscape	To be used for co-composting									

Onsite & Offsite reuse

Case study	Reuse of wastewater	Reuse of sludge	FSTP capacity	Treated Wastewater generated and reused	Treated Sludge generated and reused	Why was this option chosen	Why were other options not chosen
Sinnar	<ul style="list-style-type: none"> - Urban forestry -Landscaping - Desludging vehicles 	Manure	70 KLD Capacity	20 KLD	Nominal	<ul style="list-style-type: none"> - Water scarcity - Urban forest has less maintenance 	<ul style="list-style-type: none"> - High conveyance cost
Wai	<ul style="list-style-type: none"> - Landscape - Burial ground - Fire extinguishing 	Biochar	70 KLD Capacity	20 KLD	5 to 10/ kg per day	<ul style="list-style-type: none"> - Less maintenance - Less quantity - No human contact 	<ul style="list-style-type: none"> - High conveyance cost - Less quantity

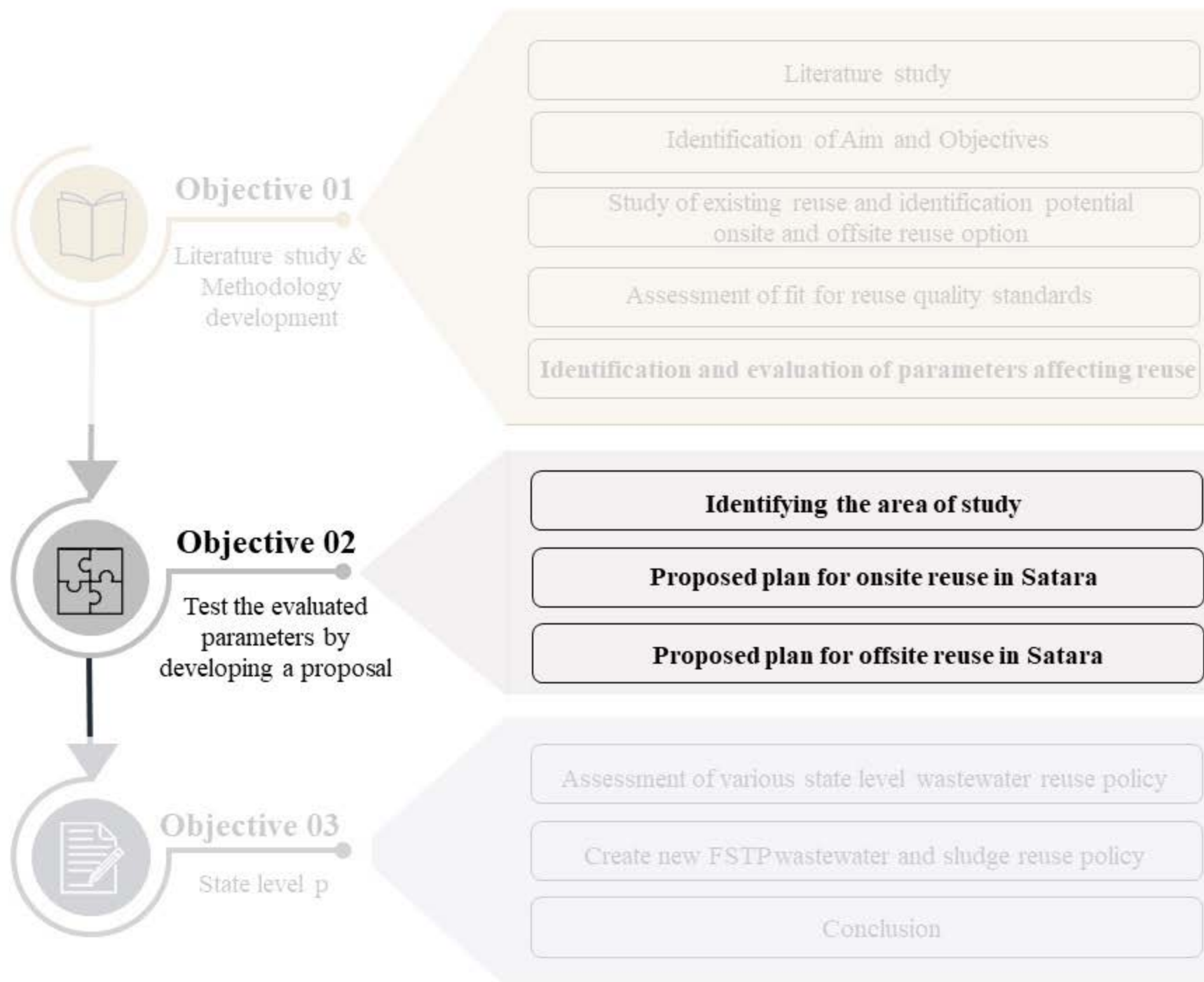
Onsite & Offsite reuse

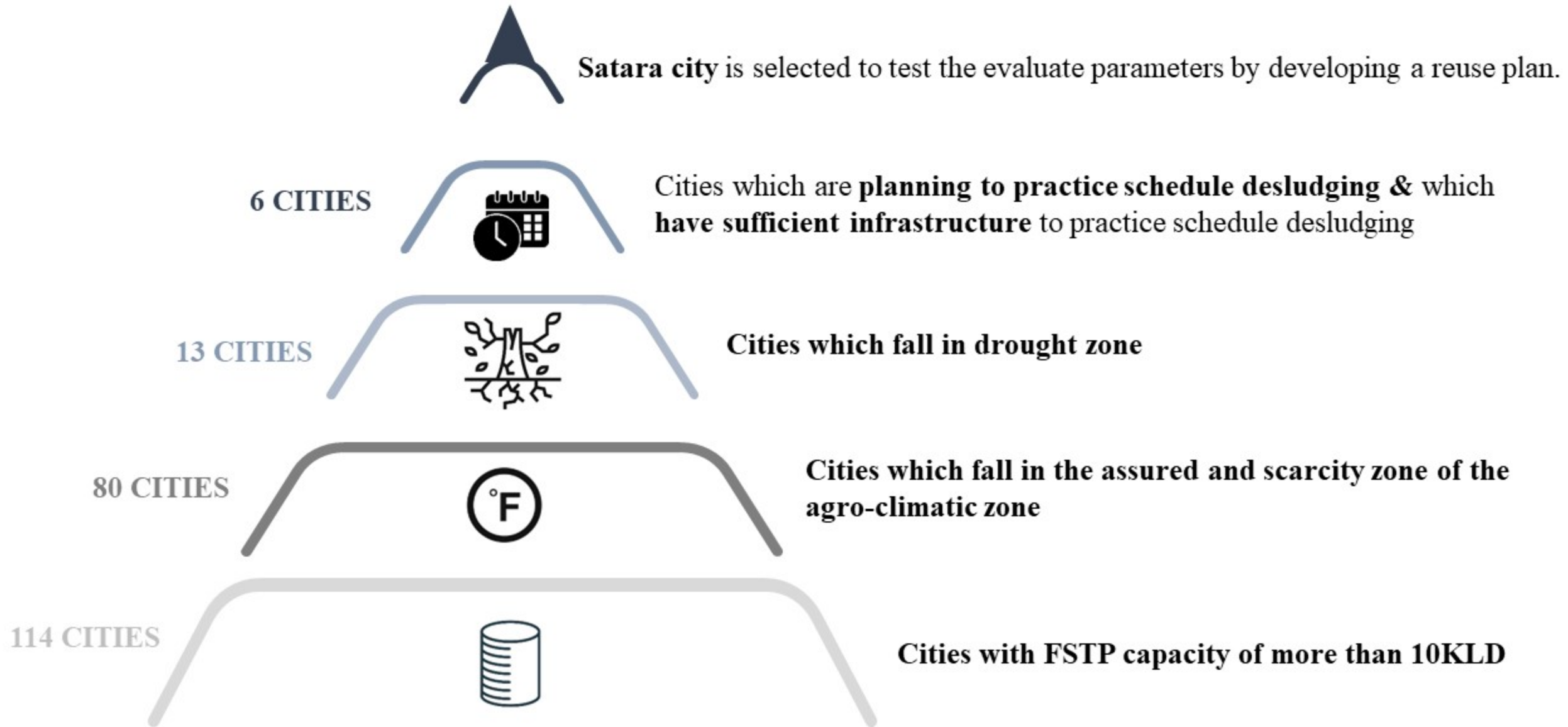
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Sinnar	- Urban forestry - Landscaping - Desludging vehicles	Manure									
Wai	- Landscape - Burial ground - Fire extinguishing	Biochar									



- Revenue is not considered by a few but because the FSTP would need O&M expenditure we have considered this parameter ahead in our proposals too.

- Distance of FSTP is considered for cities planning to practice offsite reuses due to high conveyance cost.





- A total of **114 cities** are existing or upcoming FSTP planned in Maharashtra having a capacity of more than 10KLD.

72 CITIES – 10 KLD

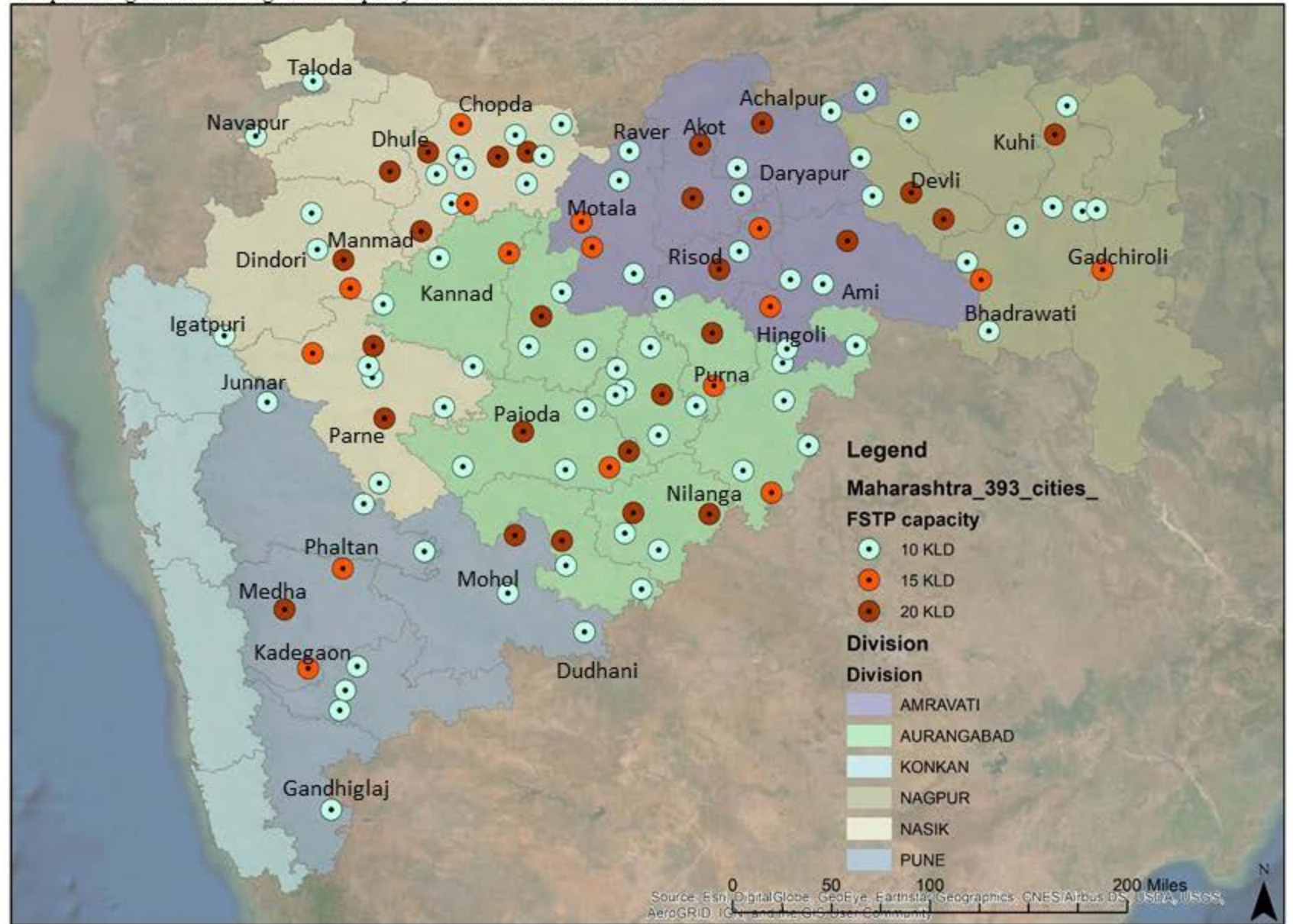
16 CITIES – 15 KLD

26 CITIES – 20 KLD

- The distribution of the cities are as follows:

Number of Cities	Division
50	Amravati
74	Aurangabad
35	Konkan
60	Nagpur
50	Nasik
38	Pune

Map showing the cities having a FSTP capacity of more than 10 KLD in Maharashtra

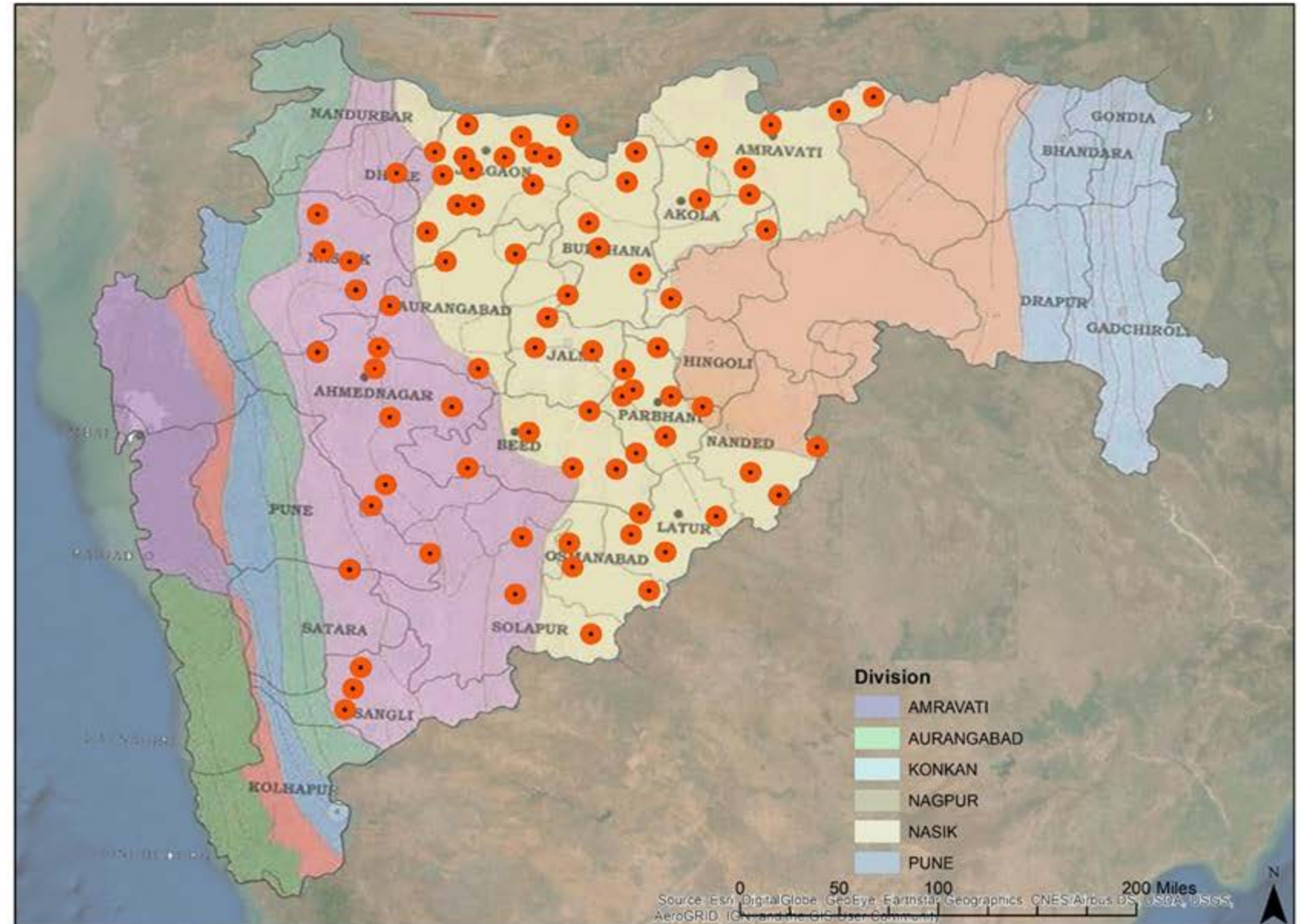


CITIES WITH FSTPs IN CRITICAL CLIMATE ZONE

Map showing the FSTP cities in the scarce and assured water supply zone in Maharashtra

- **80 cities** in Maharashtra fall in **critical climatic zone**. Of which **25 Cities – Scarcity zone** and **55- Assured climate zone**.
- **Scarcity zone** – Low rainfall of 500 to 700 mm/year in 45 days and 2 to 10 weeks of dry spells.
- **Assured Rainfall zone** - Low rainfall of 700 to 900mm/year.
- The distribution of the cities are as follows:

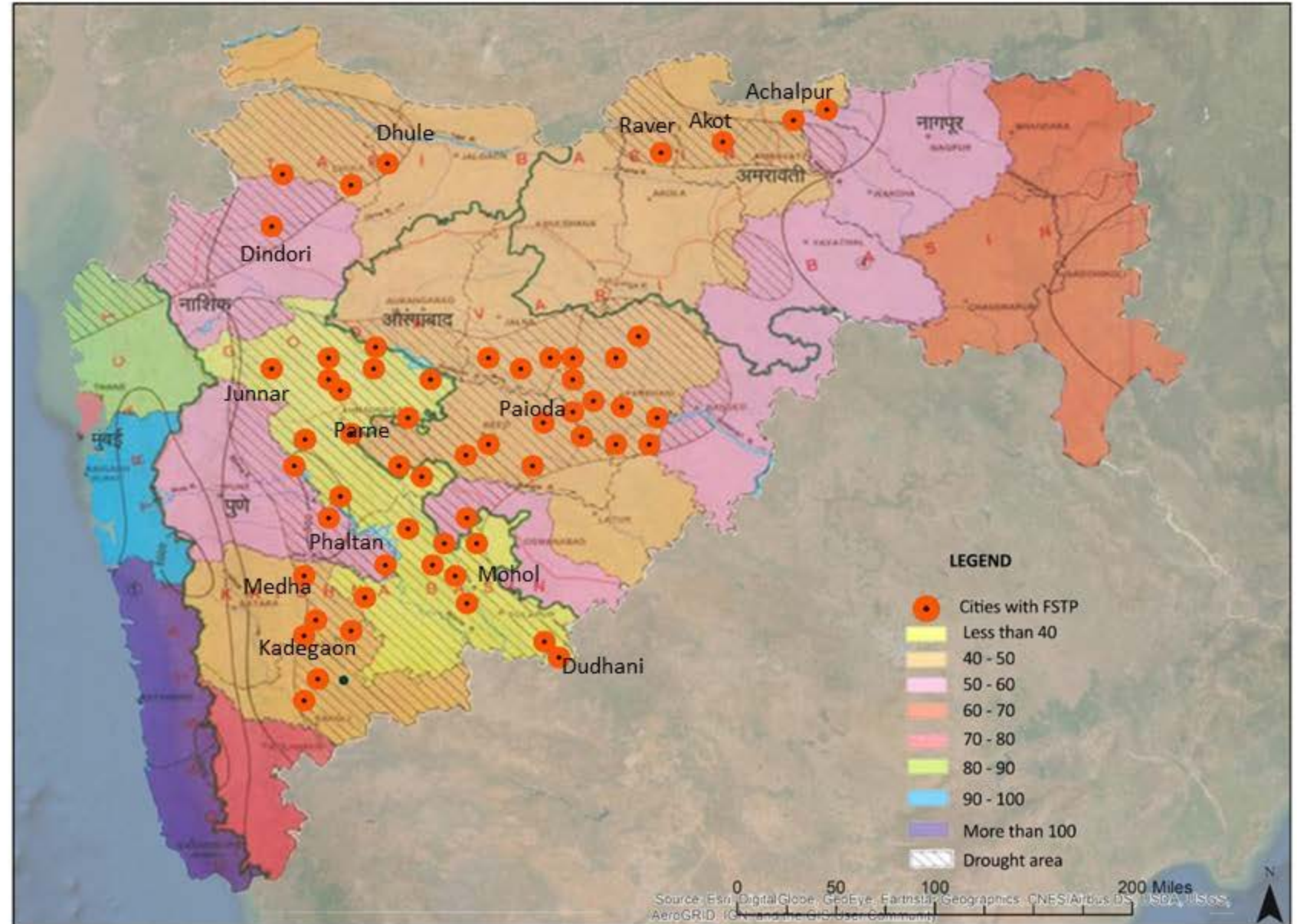
Number of Cities	Division
20	Amravati
49	Aurangabad
30	Nasik
27	Pune



According to drought study , a total of **61 cities** in Maharashtra fall in drought zone.

The distribution of the cities are as follows:

Number of Cities	Division
4	Amravati
18	Aurangabad
15	Nasik
27	Pune

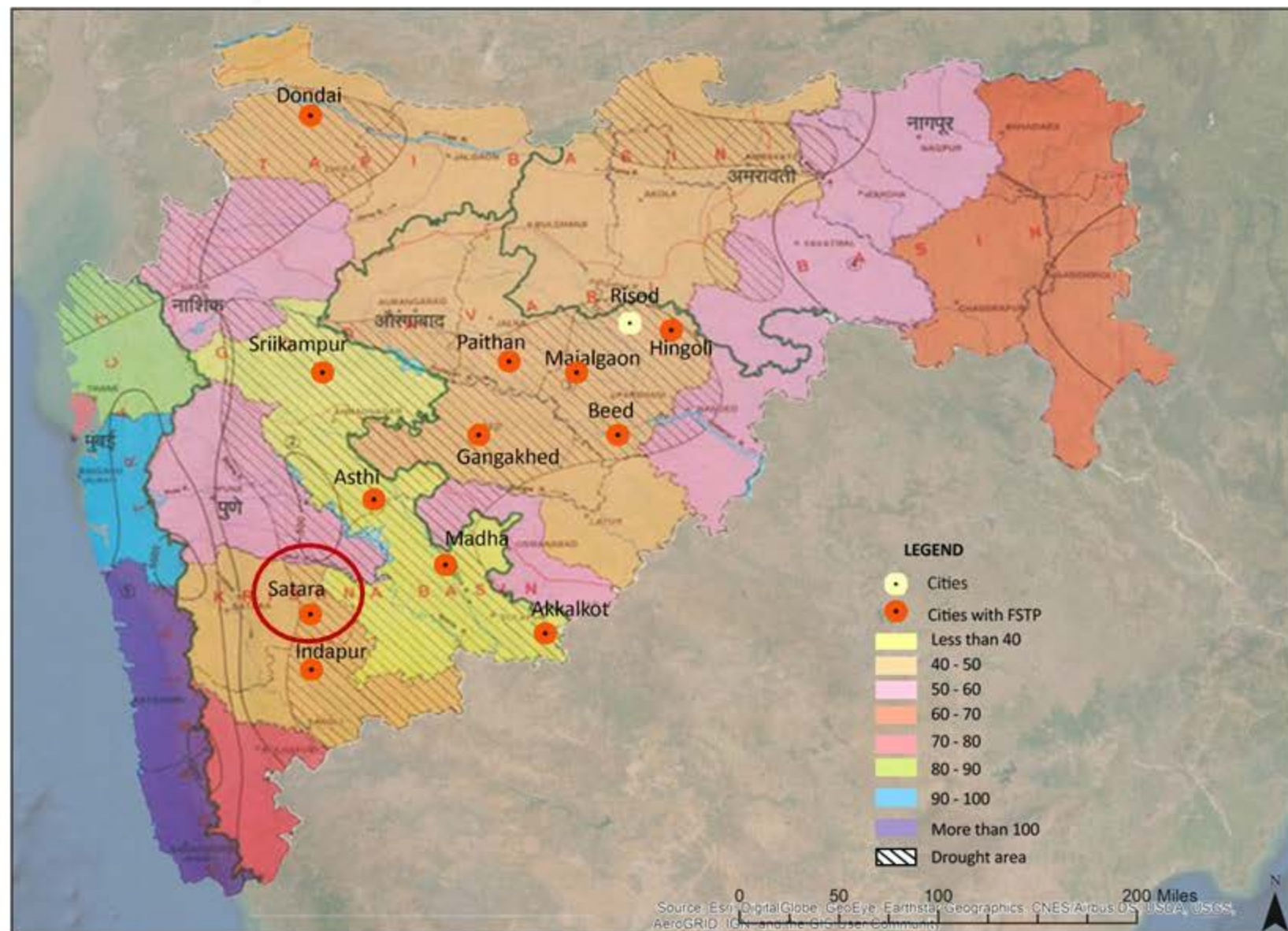


CITIES PLANNING TO PRACTICE SCHEDULE DESLUDGING IN DROUGHT ZONES

Cities **planning to practicing and are in drought zone** schedule desludging as per names suggested by State :-
12 cities in Maharashtra

Identified cities who **can practice schedule desludging with the existing infrastructure and are in drought zone** :-
1 cities in Maharashtra

Number of Cities	Division
6	Aurangabad
3	Nasik
4	Pune



Featured

As Drought Looms, Villages in Satara Are Migrating to a Cattle Camp

Even as villages have gone dry, the government has not yet extended any support. The camp is also struggling to cope with the exodus.

Feb 06, 2019 | Sukanya Shantha



Key Map



It is a **district capital** that has all the major administrative offices and also has well maintained historical beauty. The topography of the city is such that it has a **gentle slope from South-West to North-East**. Which acts as a natural drain where all the **storm water gets discharged into the river Vienna**.

DEMOGRAPHICS

- **Class A municipal council**
- Population – **1,42,043**
- Households – **34,091 HH**
- Area - **8.15 sq.m**
- **39 Wards**
- **Number of slums - 14**



WATER SUPPLY

Satara imports 19MLD of water from far away sources to meet its daily fresh water requirement i.e. **three different sources** which are **Kas Dam, Urmodi River** at Shahpur, and **Krishna River** at Mahuli.

Hence, **SATARA** has huge potential to reuse its own water.



Major water sources WTPs

Source – CWAS, April 2020

SANITATION

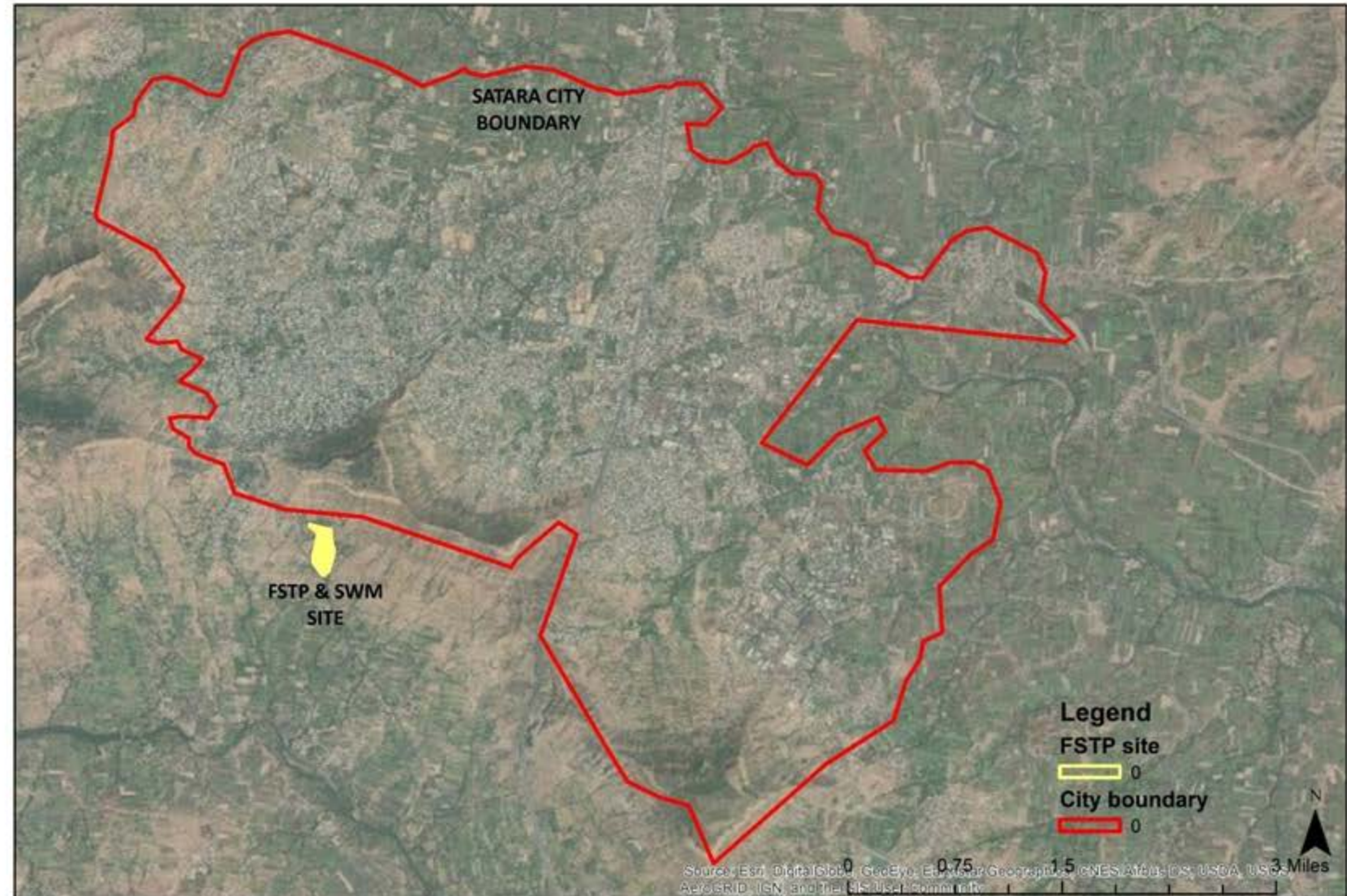
- FSSM action plan officially notified on 4/5/2019
- FSTP site under construction with the SWM site at songaon
- Distance of FSTP plant to the city center – 1 km
- HH's with septic tank – 28,346 HH
- IHHL coverage - 80 %

COMMUNITY TOILETS

- Functional CT – 77 blocks
- O&M of CT – SMC

PUBLIC TOILETS

- Functional PT – 6 blocks
- O&M of PT – Private Agency



Source – CWAS, April 2020

Picture showing the 20 KLD FSTP under construction at Songaon



Source – CWAS, April 2020

Present FSTP capacity – 20 KLD

FSTP technology - SDB, ABR, PGF, chlorination tank

Existing FSTP plant area – 600 sq. m

AFTER SCHEDULE DESLUDGING:-

Estimated capacity of FSTP – 102 KLD

Proposed FSTP plant area * – 3000 sq. m

Estimated quantity of treated wastewater produced – 72 KLD *

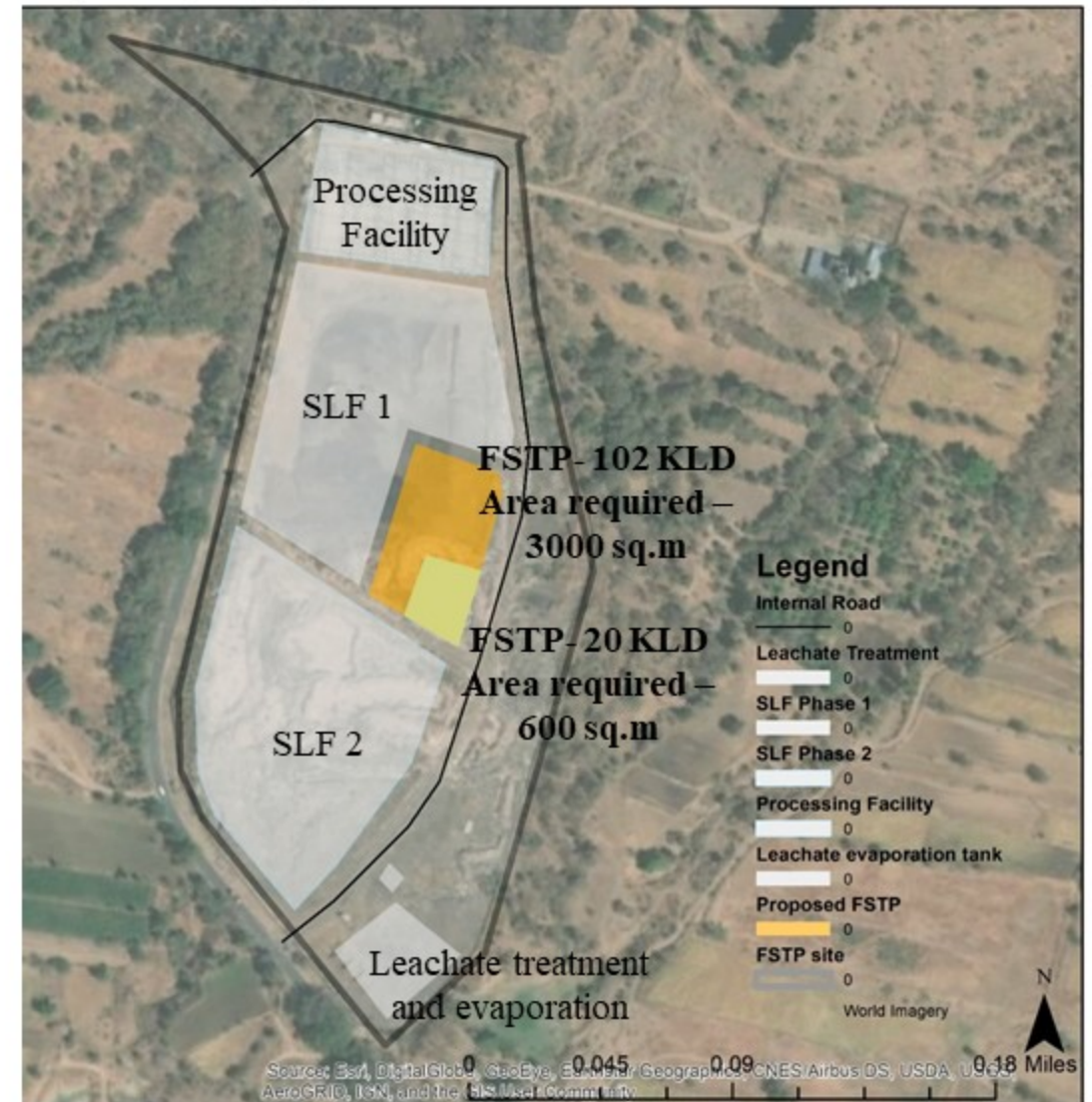
Estimated quantity of treated sludge produced– 18 to 20 kg/
daily*

Estimated quality of wastewater – MPCB norms

ASSUMPTIONS :-

- The estimated area for FSTP is calculated with respect to Unit size + 20 percent area.
- As per stakeholders consultations held in wayand, devanahalli, wai and karunguzhi, the treated wastewater is 70 percent of the daily faecal sludge treated.
- As per stakeholders consultations held in devanahalli the treated sludge is 10 percent of the daily faecal sludge treated.

Map showing the proposed FSTP and SWM site



Since, Satara is planning on doing schedule desludging its estimated daily quantity of treated waste water would be **72 KLD**.

Hence, Satara has a high **POTENTIAL OF REUSE** due to its sufficient quantity of wastewater generated daily.

Also, Satara would **NEED TO DISPOSE** the treated wastewater and sludge more efficiently.

As on March 2017 the volume II of DPR was proposed to the Swach Bharat Mission, GoM.

The DPR proposes the following things which relate to onsite wastewater reuse option through the FSTP located on the same site :-

- Composting pits – 380 sq.m
- Onsite plantation – 10,594 sq.m
- Vehicle washing platform - 48 sq.m

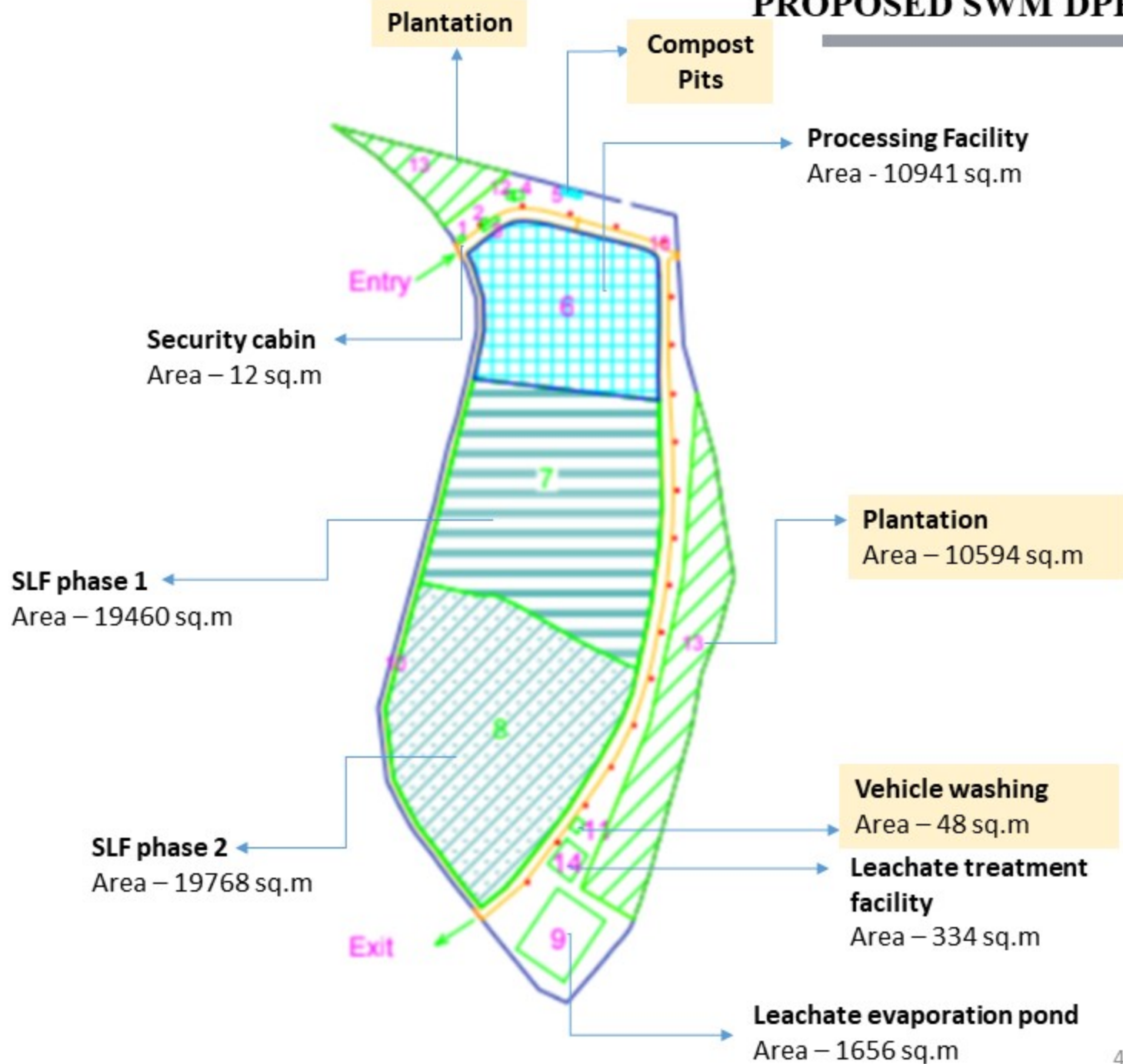
SWM

Total solid waste generated (as per CPHEEO) - **48 TPD**

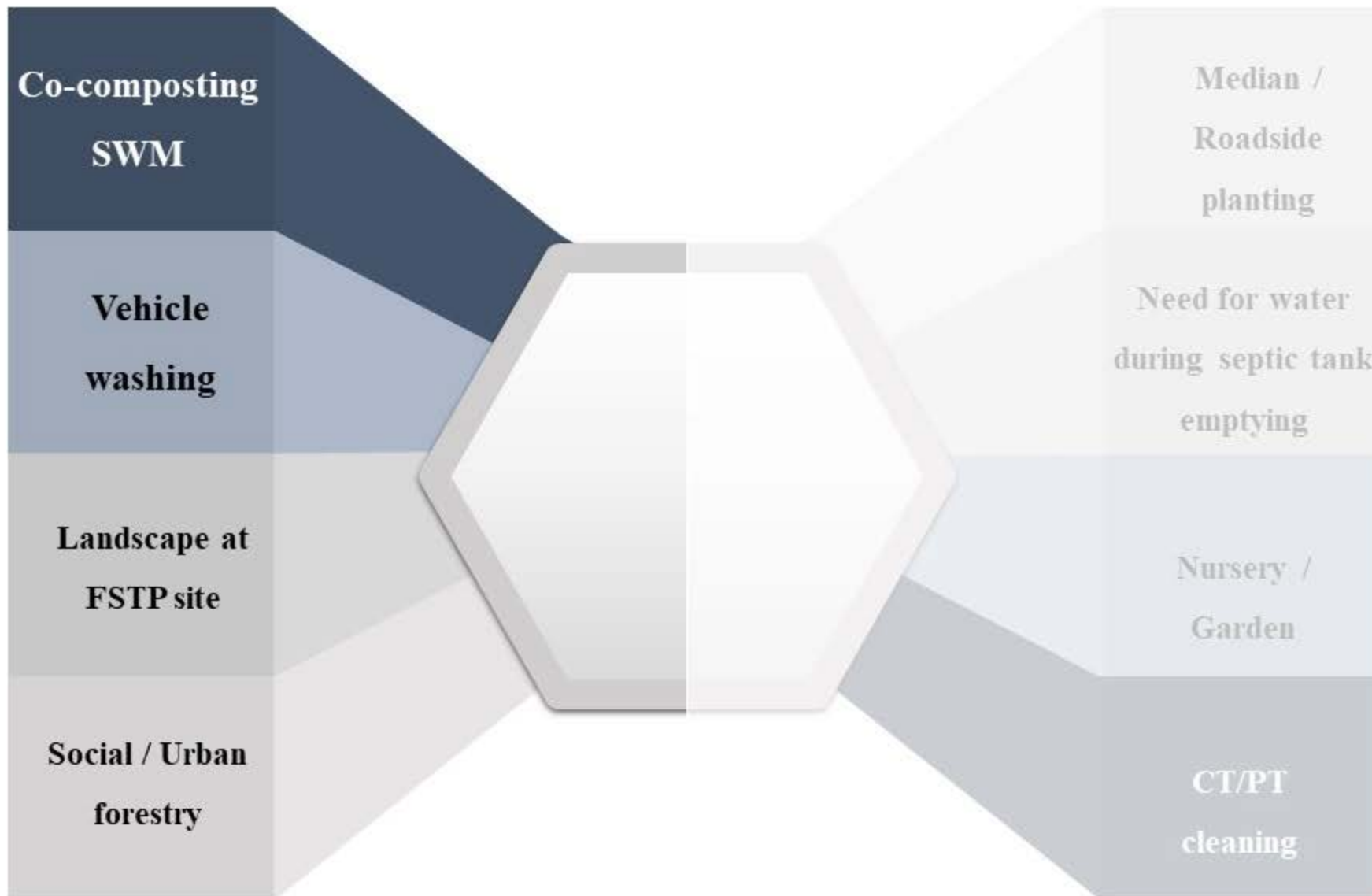
Total solid waste generated – **48 TPD**

Total wet waste generated – **23 TPD**

Site area – **79,987 sq.m**



ONSITE OPTION



NOTE – The [Groundwater recharge](#) option was not considered because Satara's depth of groundwater is about 2 to 10 mgbl as per the study conducted CGWB, central region, Nagpur

Requires wastewater **Daily**

No human contact

Wet waste produced through functional processing facilities – **23.9 TPD**

Area allocated in
SWM DPR
360 sq.m

Treated Wastewater
27 KLD *

Compost
produced
9,560 Kg/month *

CAPEX (200 M long
PVC pipe, storage
tank, pumps)
Rs. 90,200

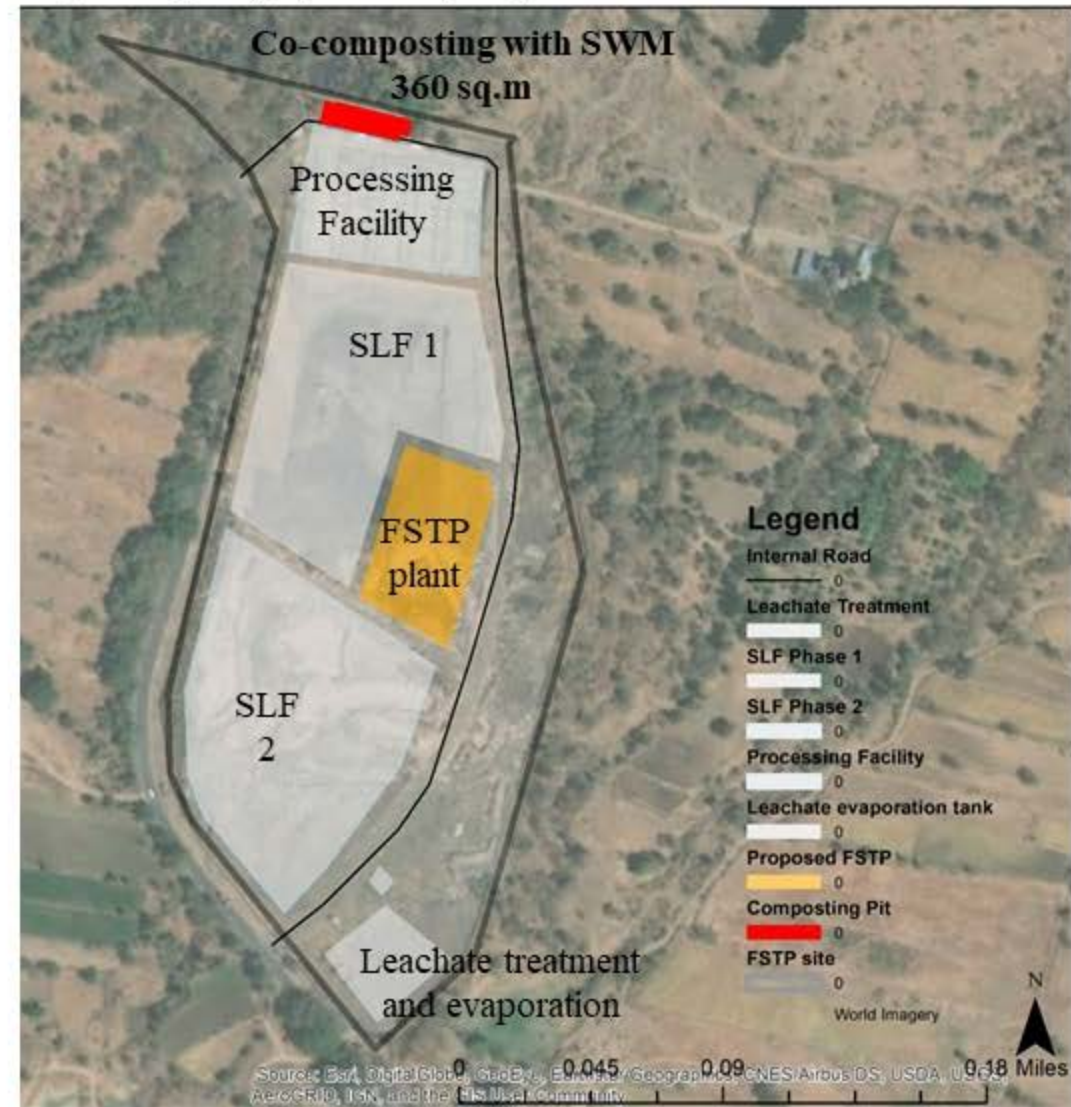
OPEX
**Explored to be borne
with SWM DPR**

Revenue
Rs. 38,240/ month *

ASSUMPTIONS

- **Water quantity required** :- 5000 KLD for 4.5TPD , adapted from stakeholders consultations with site operator at Wai
- **Compost produced using 20 KLD sludge**– 40% of the total wet waste, adapted from stakeholder consultations at Karunguzhi
- **Cost of compost** : Rs. 4/ Kg, adapted from stakeholder consultations at Devanahalli and the fresh cost of compost in market is Rs.5/kg to Rs.25/kg

Map showing the proposed Composting unit



Requires wastewater **Daily**
No human contact

Area allocated IN
 SWM DPR
48 sq.m

Number of vehicles
 considered – **4**
desludging truck*
 and **41 SWM trucks**

Treated Wastewater
 required
11 KLD *

CAPEX
 (Construction of
vehicle washing
platform, 100 M long
PVC pipe, storage
tank)
Rs. 94, 978

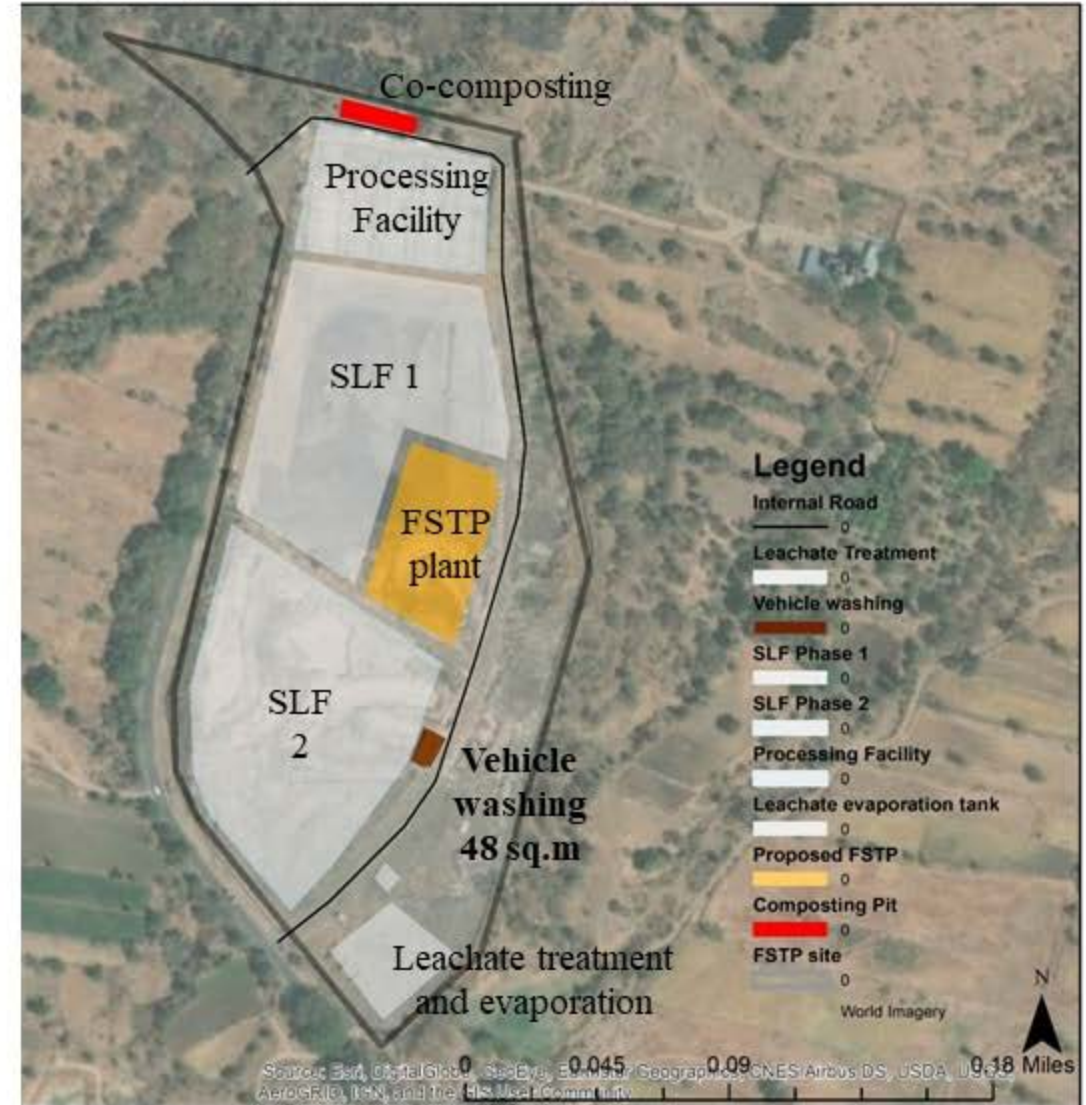
OPEX
Explored to be borne
with SWM DPR

Revenue
Saves the cost of
freshwater

ASSUMPTIONS

- **3 trucks of 5000 liters** capacity and **1 truck of 3000 liters**.
- **Water quantity required :-** 200 to 250 lit/vehicle, adapted from stakeholders consultations at Wai

Map showing the proposed Vehicle washing platform



Requires wastewater **Daily**
No human contact

Area
600 sq.m *

Treated Wastewater
 required
6 KLD *

CAPEX
 (200 M long PVC
 pipe, Landscape,
 storage, pumps)
Rs. 1.8 Lakhs

OPEX
 (Maintenance of
 landscape, motor
 pumps and repairs)
Rs. 10,076 / monthly

Revenue
**Saves the cost of
 freshwater**

ASSUMPTIONS

- **Area allocated onsite** :- 20 % area of the FSTP site.
- **Water quantity required** :- 5000 - 6000 lit manually / 600 sq.m, adapted from stakeholder consultations at sinnar

Key Map



Image showing onsite landscaping in Sinnar



Requires wastewater **Daily**
No human contact

Area
8092 sq.m *

Treated Wastewater
 required
20 KLD *

CAPEX
 (Urban forestry
 plantation, 300 M
 long PVC pipes, drip
 irrigation)
Rs. 10 Lakhs*

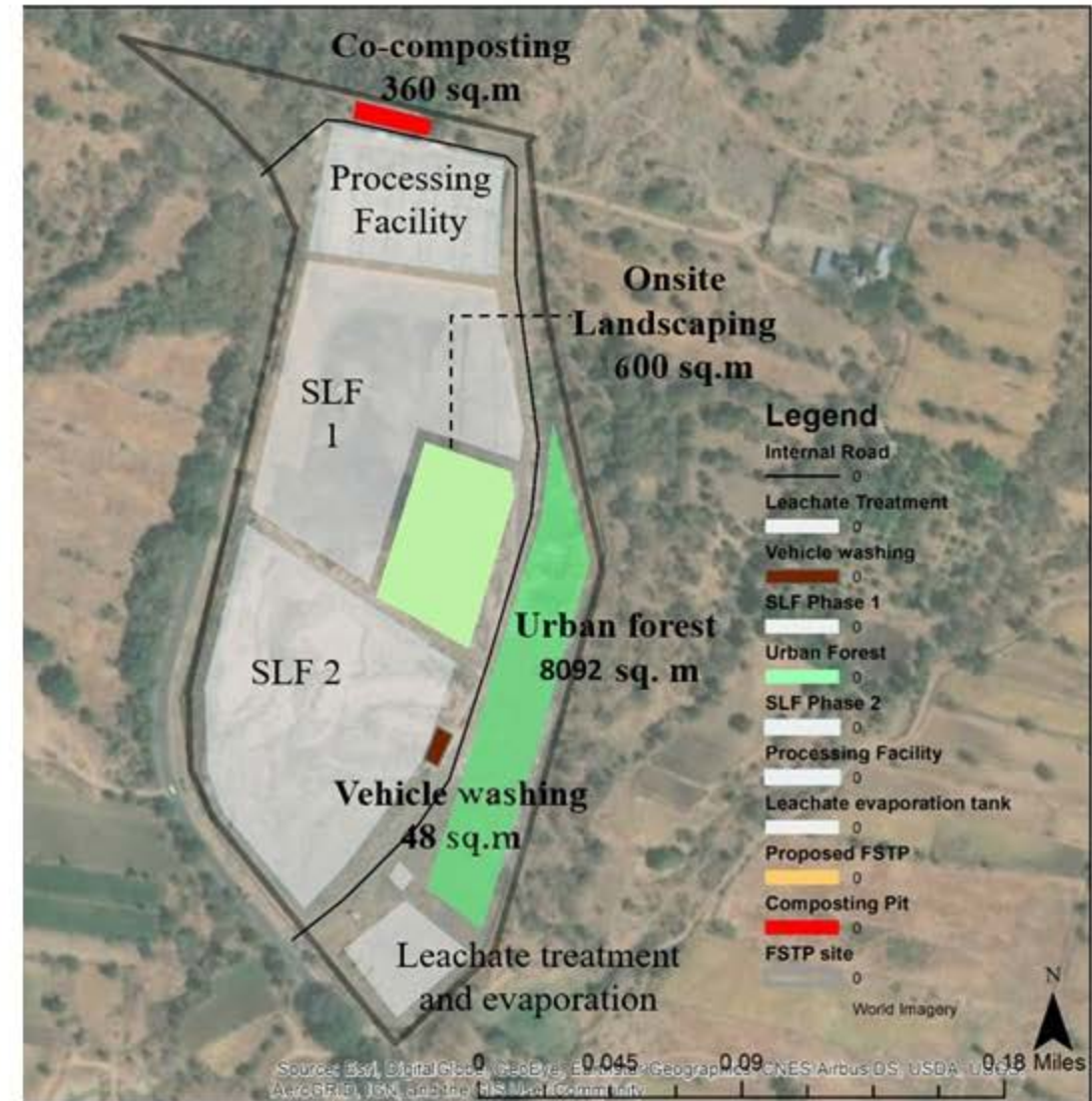
OPEX
 Cost included **within**
the landscape O&M
cost.

Revenue
Saves the cost of
freshwater

ASSUMPTIONS

- **Area allocated onsite** :- Proposed landscape area of 10,594 sq.m in the SWM DPR of satara and no additional land required.
- **Water quantity required** :- 4000 - 5000 lit manually / 2000 sq.m, adapted from stakeholder consultations at sinnar
- **Capital cost** –Adapted from stakeholder consultations at sinnar and wai

Map showing the proposed onsite landscaping



Co-composting
SWM site



27 KLD

Vehicle washing



11 KLD

Landscape at FSTP
site



6 KLD

Social / Urban
forestry



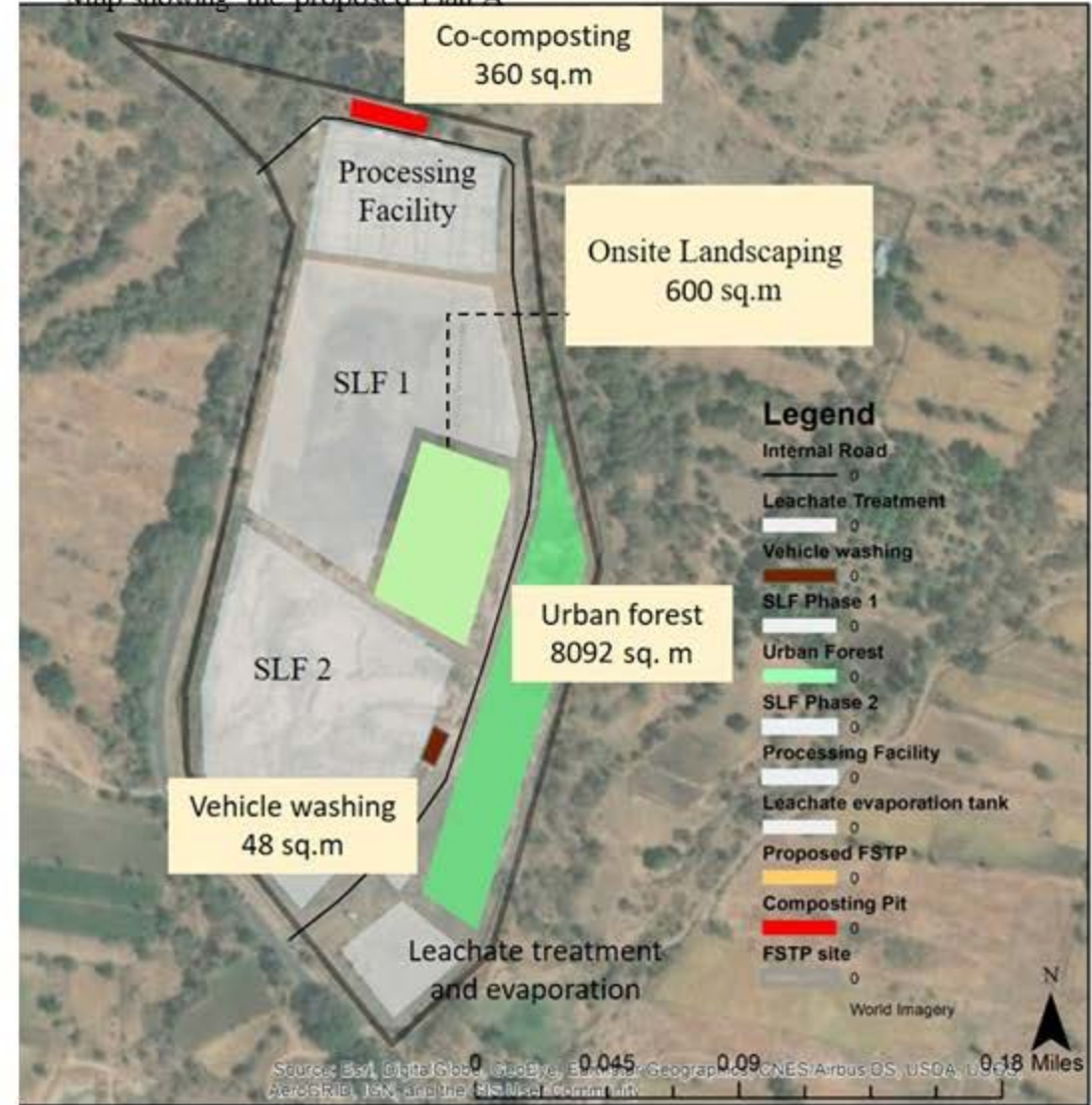
20 KLD

**Requirement of WW per day
as per Plan A is 64 KLD**

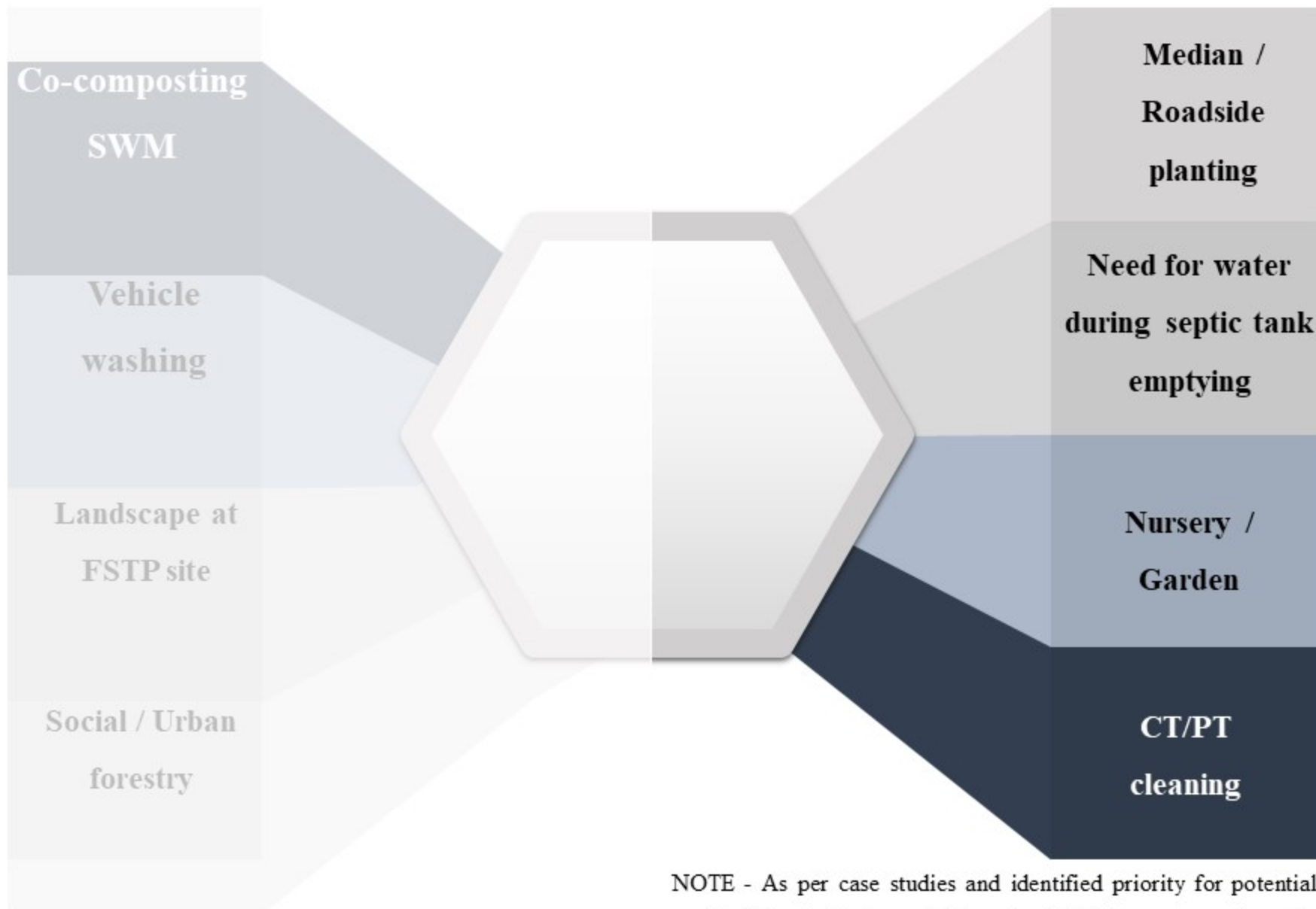
Costing Details

Capital Cost	O&M Cost	Revenue
Rs. 14.4 Lakhs / -	Rs. 10,076/ month	Rs. 38,240/ month

Map showing the proposed Plan A



ONSITE OPTION



NOTE - As per case studies and identified priority for potential reuse options the quantity required for **Agriculture, Industries, Building construction, Waterbody rejuvenation, and Firefighting** are high hence they are not considered.

OFFSITE REUSE OPTION 1 – MEDIAN

Requires wastewater **Daily**
No human contact

Length of road
5 km *

Distance from FSTP
plant
2 to 7 KM

Treated Wastewater
required
7 KLD *

CAPEX
(1 Additional tankers)
Rs. 14 lakhs *

OPEX
(Petrol, Labor, O&M)
Rs. 33,885/month

Revenue
**Saves the cost of
freshwater**

ASSUPTIONS

- Only main road with median in the city
- **Water quantity required** :- 1.7km length along main road / 2500 liters, adapted from stakeholders consultations with site operator at Wai

Key Map



Map showing the median on the 5 km marked main road



Requires wastewater **Daily**
No human contact

Number of households with septic tanks
28346 HH

Number of septic tanks emptied in a day
34 septic tanks *

Treated Wastewater required
21 KLD *

CAPEX
Same water tanker would be used for all offsite reuse.

OPEX
 (Petrol, Labor, O&M for 20 trips)
Rs. 58,550 / monthly

Revenue
Saves the cost of freshwater

ASSUMPTIONS

- **Numbers of septic tank emptied in a day** - Assuming 3 years of emptying cycle and 280 working days.
- **Water quantity required** :- 5 septic tanks / 2000 to 3000 liters, adapted from various stakeholders consultations with site operator at Wai



Source – Taken from stakeholder consultations at Sinnar

Requires wastewater **Daily**
Human contact happens

Nursery &
 Garden

Distance of
 Nursery from the
 FSTP **3 KM**

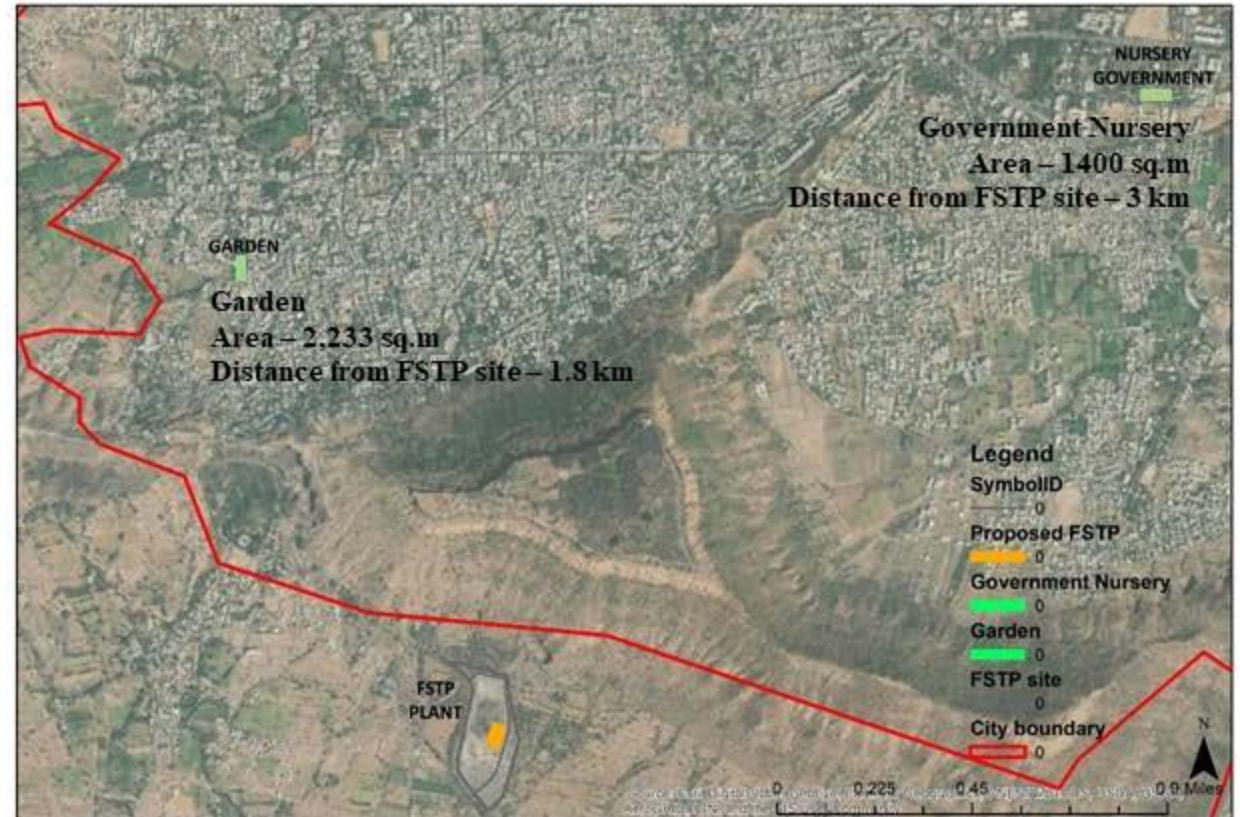
Treated Wastewater
 required
42 KLD *
 (for 3600 sq.m)

CAPEX
Same water
 tanker would
 be used for
 all offsite
 reuse.

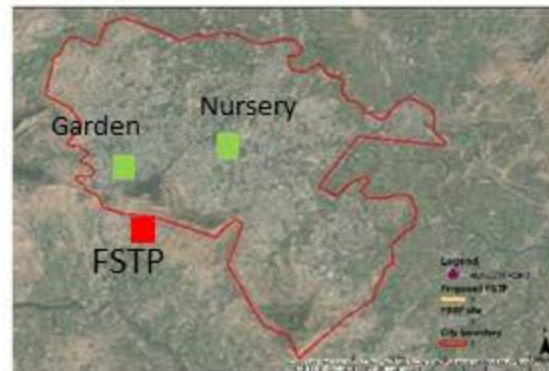
OPEX
 (Petrol, Labor,
 O&M for 8 trips)
**Rs. 22,625 /
 monthly**

Revenue
**Saves the cost of
 freshwater**

Map showing the location of garden and government nursery



Key Map



ASSUMPTIONS

- Water quantity required :-** 5000 - 7000 lit manually / 600 sq.m , adapted from various stakeholders consultations with site operator at Sinnar

Requires wastewater **Daily**

Human contact happens

CT/PTs
selected
36 blocks

Wastewater
required to clean all
the CT/PTs
72 KLD *

CAPEX
(2 Additional
tanker would
be required)

OPEX
(Petrol, Labor,
O&M for 7 trips)

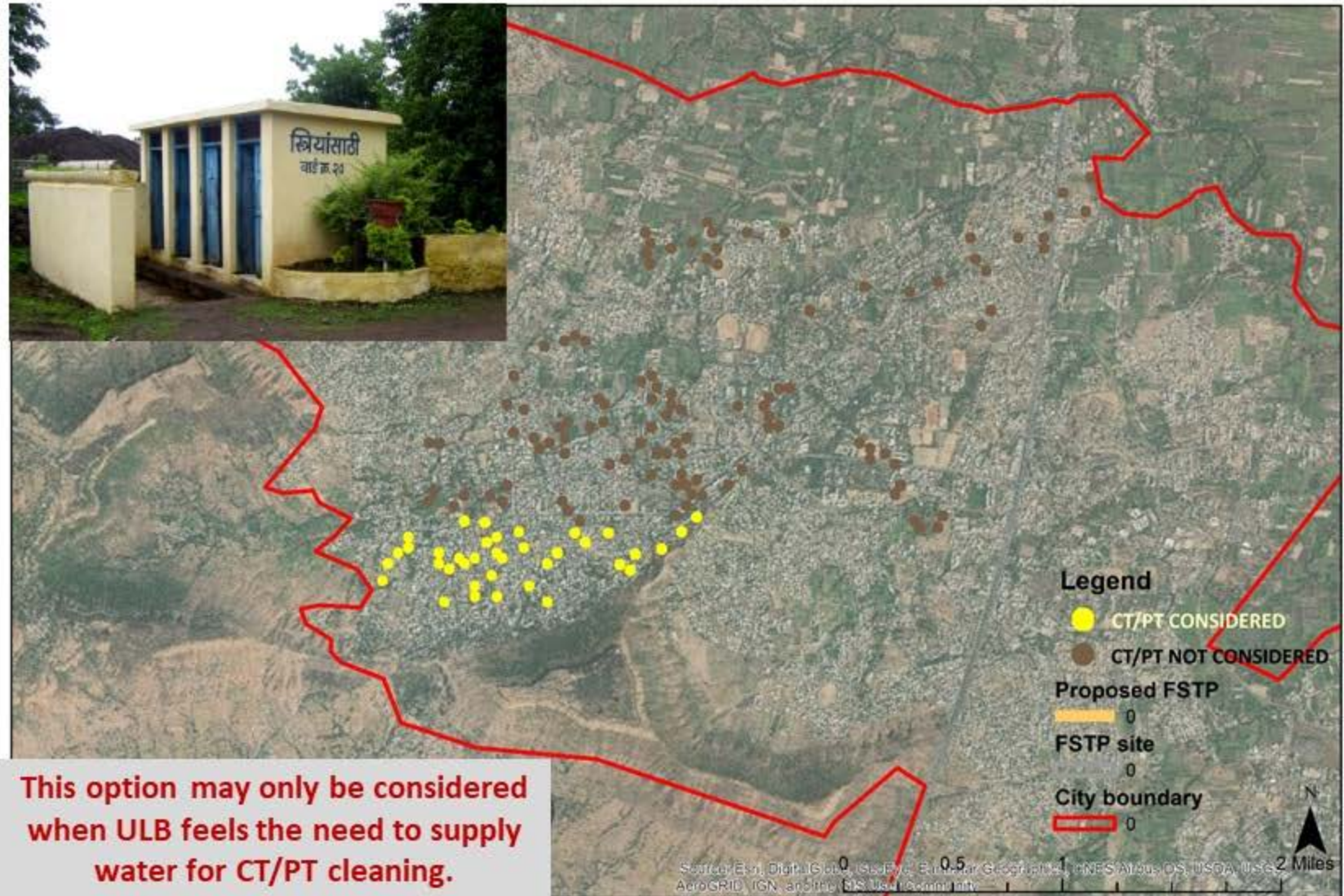
28 Lakhs

Rs. 50,700 / month

ASSUMPTIONS

- **Water quantity required** :- 2000 lit for each block of CT/PT, adapted from various stakeholders consultations with site operator at Wai

Map showing all the functional CT/ PTs in Satara



Source – CWAS, April 2020

OFFSITE OPTION 1

Median / Road side planting



7 KLD

Septic tank emptying



21 KLD

Nursery & Garden



42 KLD

Requirement of WW per day as per Offsite Plan option 1 is 70 KLD

Costing Details – Option 1

Capital Cost	O&M Cost	Revenue
Rs. 14 lakhs	Rs. 1.1 Lakh/ per month	Saves fresh water cost

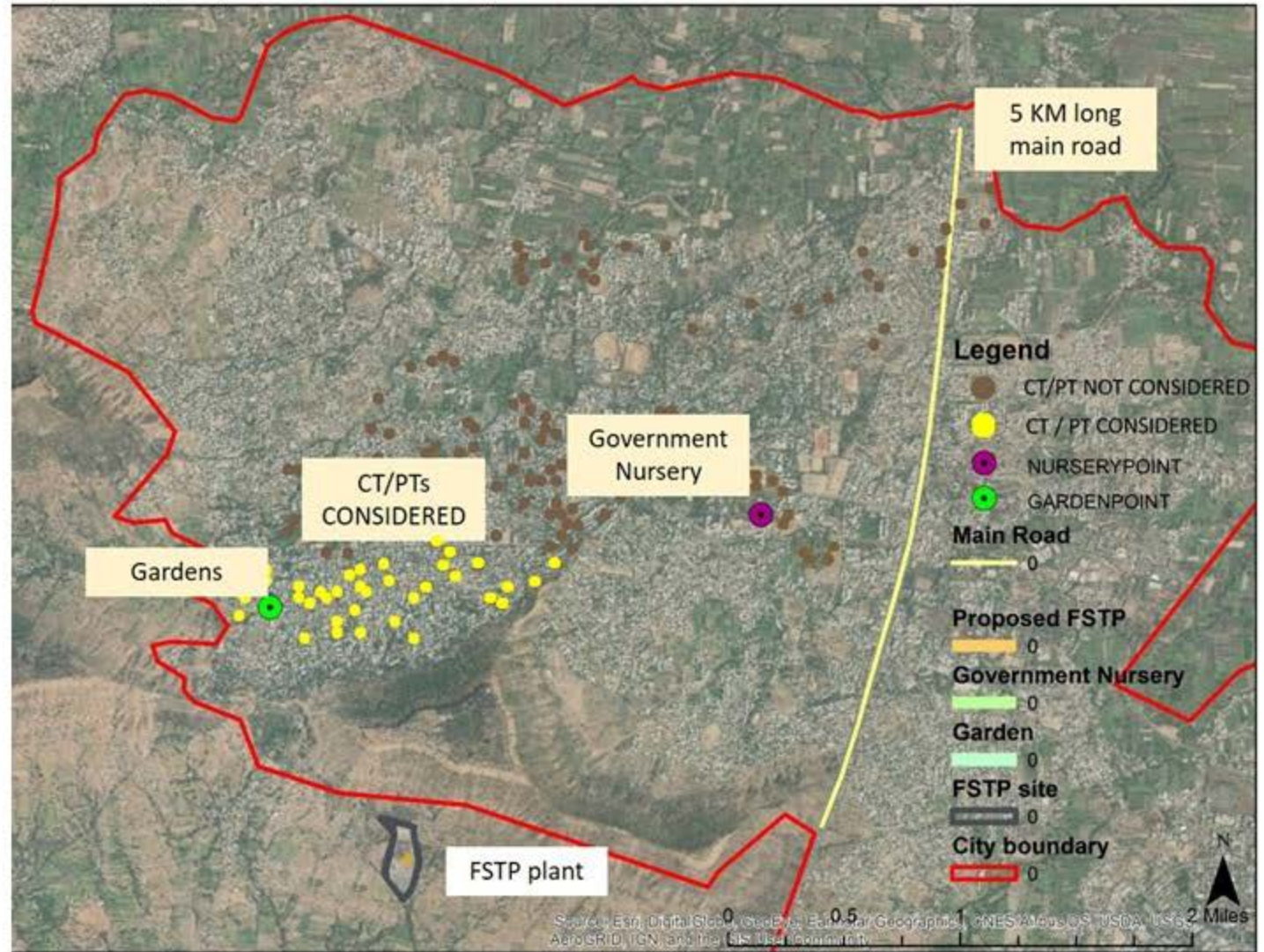
OFFSITE OPTION 2

CT/PT cleaning



72 KLD

Map showing the proposed Offsite reuse plan



	Quantity of waste water reused	Capital Costs	O&M Costs/ month	Revenue
Onsite	64 KLD	14.4 Lakhs	Rs. 10,076/month	Rs. 38,240/month
Offsite option 1	70 KLD	14 Lakhs	Rs. 1.1 lakhs/month	Saves the cost of freshwater
Offsite option 2	72 KLD	28 Lakhs	50,700/month	

Since **ONSITE REUSE PLAN** has higher costing due to the **urban forestry and onsite landscape** and **OFFSITE REUSE PLAN** would required various **stakeholder permission and no direct revenue generation to meet its O&M needs.**

Hence, A COMBINED PLAN

ONSITE – 38 KLD

Co-composting
SWM site



27 KLD

Vehicle washing



11 KLD

OFFSITE – 28 KLD

Median / Road
side planting



7 KLD

Septic tank
emptying

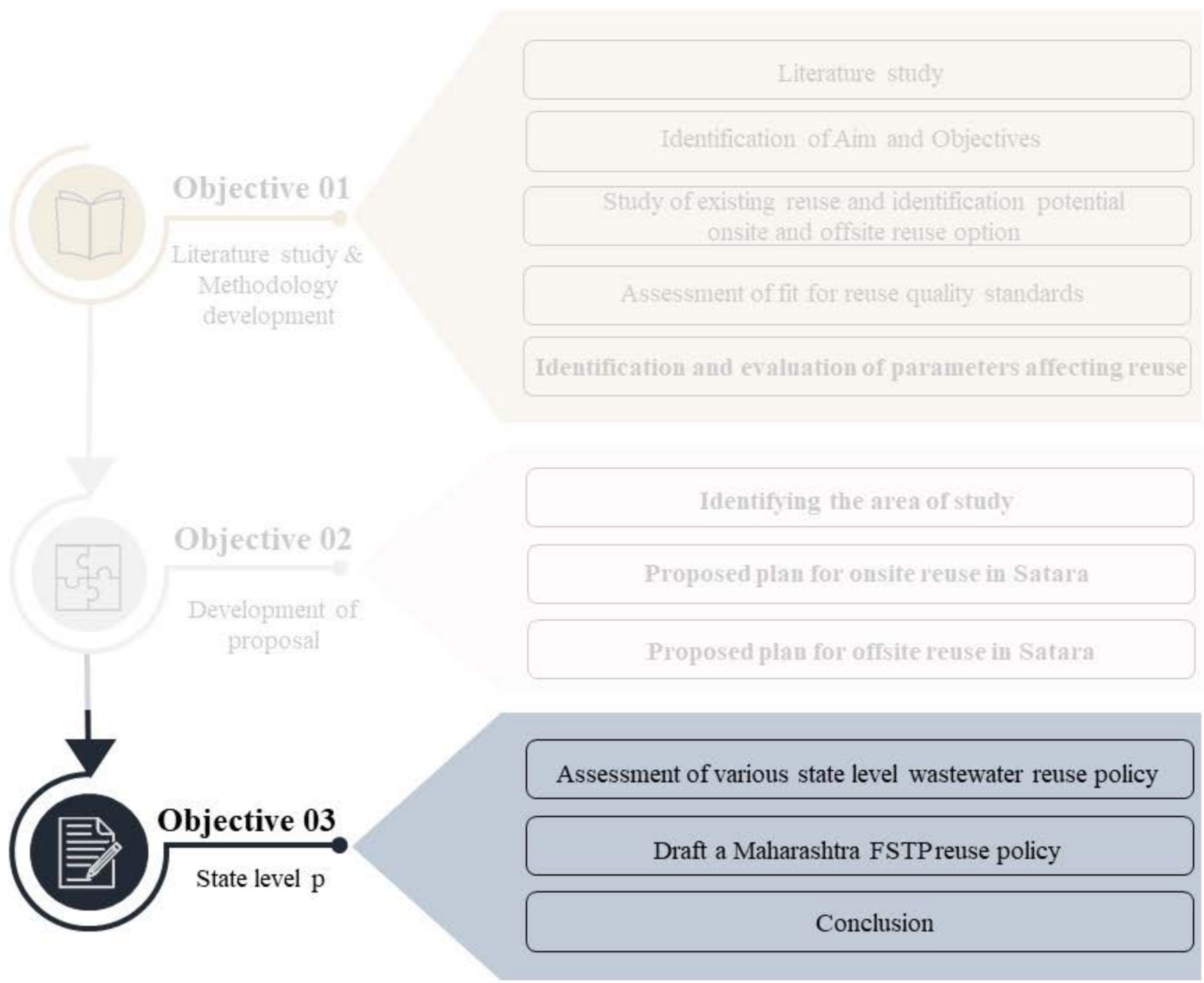


21 KLD

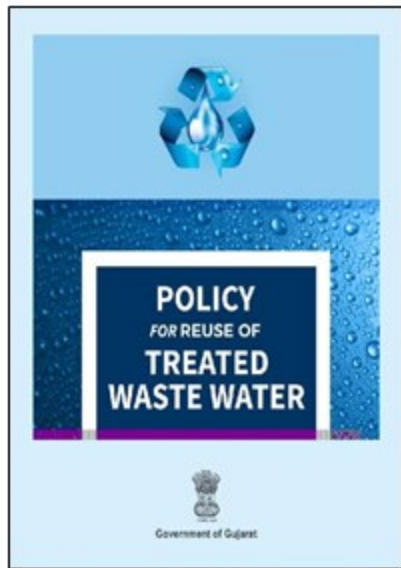
COSTING DETAILS - COMBINED PLAN

Capital Cost Invested	O&M Cost	Revenue
Rs. 15.8 lakhs	Rs. 92,435/per month	Rs. 38,240 + Saves fresh water cost

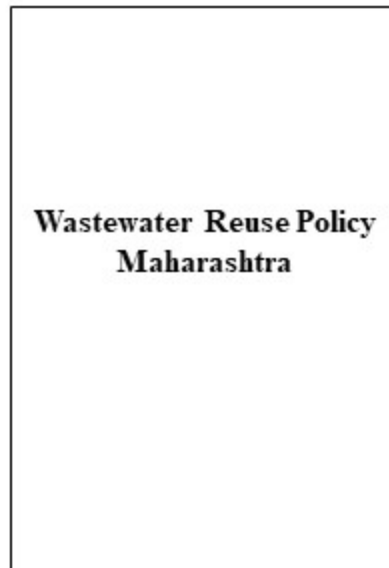
Requirement of WW per day 66 KLD



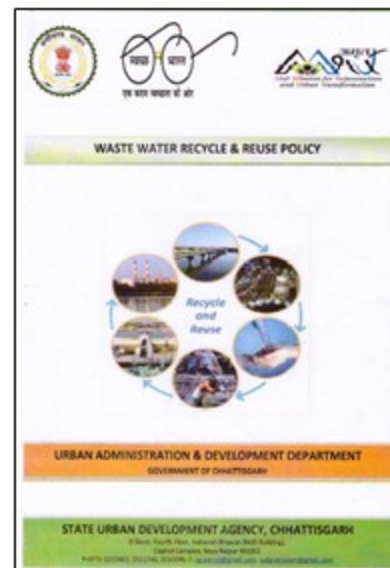
For the purpose of this study, the following five the state level wastewater policies were reviewed:



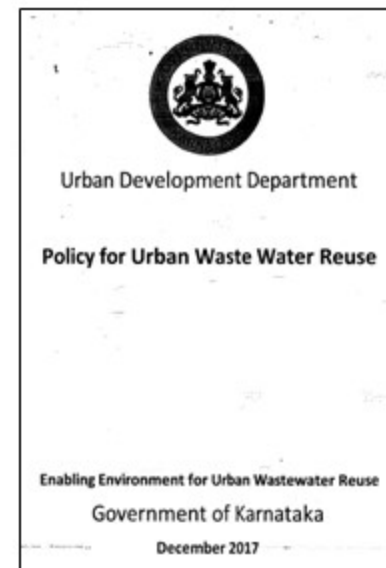
GUJARAT



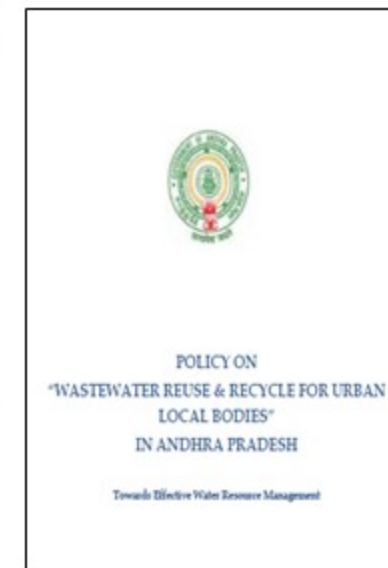
MAHARASHTRA



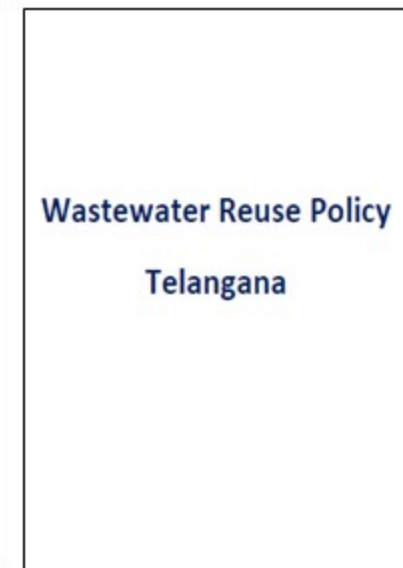
CHHATTISGARH



KARNATAKA



ANDHRA
PRADESH



TELANGANA

POLICY OBJECTIVES AND TARGETS

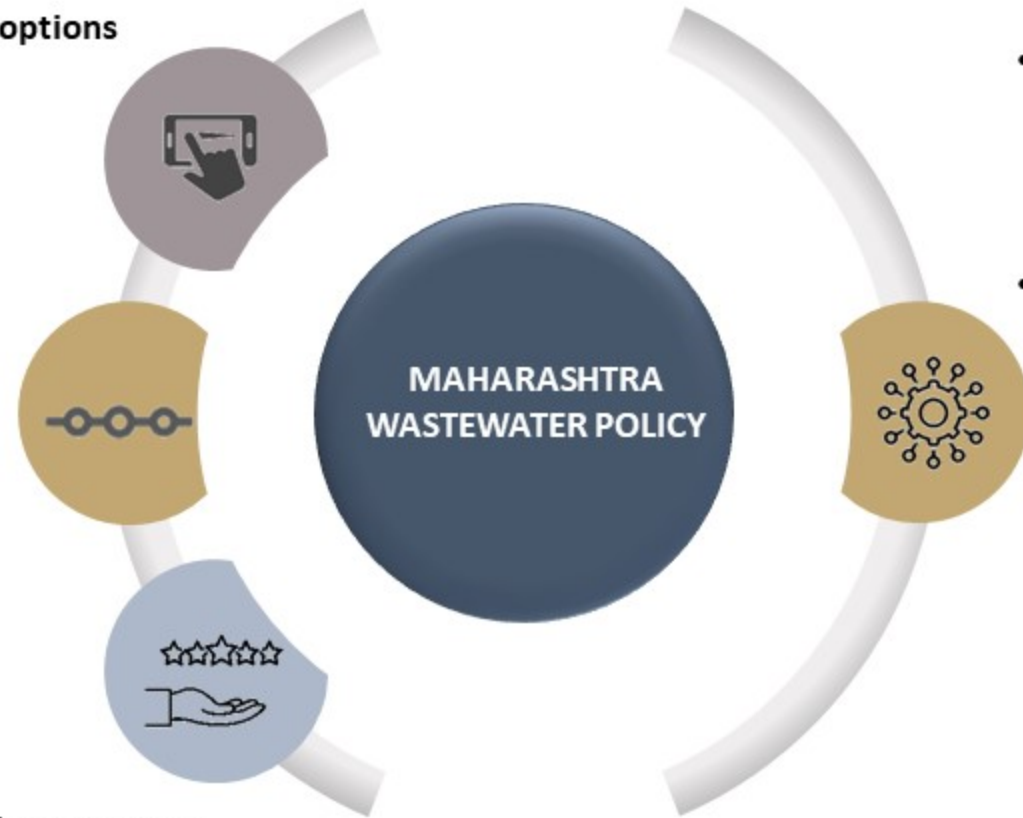
- **Zero disposal** of faecal sludge in freshwater sources
- Strengthen the **participation of local communities**
- Identify **innovative reuse options**

TIMELINE

- For cities practicing **schedule desludging - onsite or offsite reuse within 1 year**
- Cities practicing **demand desludging - onsite reuse plan within 1 year.**

MANDATORY REUSE

- Cities having **functional FSTP must immediately reuse**
- **Freshwater consumed within the FSTP site must be reuse**



STAKEHOLDERS RESPONSIBILITIES

ROLE OF STATE:-

- The state government should look into the **overall guidance, coordination and interpretation** of this Policy.
- It should also look out to cooperate with **Ministry Of Agriculture (MOA) to Sensitize farmers** for encouraging **reuse of sludge**

ROLE OF ULB:-

- It is the primary responsibility of the ULB, **to plan and implement** and look into the entire **administrative need.**
- Develop **strong connections** with corporates, academic institutions, private consultant, NGOs, CBOs and conduct **training programs for them.**

THE PRIORITY OF REUSE FOR WASTEWATER

ONSITE

- Reuse in **Co-composting on SWM site**
- Reuse for **Vehicle washing**
- Reuse for **Onsite Landscaping**
- Reuse to recharge the **Ground water table**
- Reuse to plant **Social / Urban forestry**

OFFSITE

- Reuse to water the **Medians / Road side planting**
- Reuse for **Septic tank desludging**
- Reuse in a **Nursery / Horticulture**
- Reuse for **Agriculture**
- Reused to clean **CT/PT in the city**
- Reused in **Townships**
- Reuse in **MIDC**
- Reuse for **Building Construction**
- Reuse to **rejuvenate a Water body**
- Reuse in **Gardens / Public Space**
- Reuse in **Road and other cleaning / Ground cooling**
- Reuse for **Fire Fighting**

PRIORITY OF SLUDGE

- **Fertilizer**
- **Soil conditioner**
- **Land filling**
- **Road construction and tile construction** (It is mandatory to meet the construction standards mentioned in the CPHEEO guidelines)



PARAMETERS FOR CREATING A REUSE PLAN

- **Physical parameter** such as land requirement, quality, quantity and distance of reuse from FSTP.
- **User perspective** such as No human contact, Demand from users
- **Financial category** such as Capital costing, Operational costing and revenue generation.

FIT FOR REUSE STANDARDS

- For reusing treated wastewater to **recharge groundwater**, **NGT norms** should be followed.
- For reusing treated wastewater to **rejuvenate the water body**, **CPHEEO** fit for reuse norm should be followed.
- For all the **other onsite and offsite** reuse practices **MPCB** reuse standards should be followed.

PUBLIC ACCEPTANCE

- The state and the ULB should conduct **educational campaigns**.



MONITORING AND DATA COLLECTION

- Maintain an **online portal** for **quality monitoring** of the treated wastewater and sludge.
- The **State**, should also **maintain an online portal** to record the database of **cities practicing reuse**.

FINANCING & TARIFFS

- As stated in the [Maharashtra regulatory authority](#), the **ULB should themselves decide the tariff** of the treated wastewater and sludge.

Successful implementation of the FTSP policy would,

Socially, help in **recovering of the depleting resources in Maharashtra** and achieve the **SDG target 6.3.1** (*Proportion of wastewater safely treated*)



SBM Water +

311 cities with FSTPs in Maharashtra will efficiently dispose their treated wastewater and sludge and achieve the **water plus status**.

Economically,

It would indirectly **save the cost of freshwater for cities**.

Hence, the drafted reuse policy for FSTP is most essential and shall be adopted by the state Government of Maharashtra

1. Discuss the policy with ULB's and State for feedbacks and know the level of acceptance
2. Study the cost required to achieve the prescribed standards for each type of reuse
3. Study the fiscal measures and funding required for successful implementation of this policy.
4. Assess citizen's participation for implementation through qualitative surveys and FDGs

THANK YOU

BACK UP SLIDES

- **LEGAL FRAMEWORK FOR WASTEWATER IN INDIA–**

As per **Article 24 of the Water (Prevention and Control of Pollution) Act**, it is necessary to treat the wastewater generated from the urban areas.

The nodal agency for implementing various legislations relating to the environmental protection is the **MoEF**.

As per the **74th CAA and municipal legislations** defining the roles and responsibilities of ULB, the **wastewater treatment facility provision is a discretionary function of the Urban Local Body** on the basis of the availability of the funds.

As per Maharashtra waste water policy, along with treating the wastewater being generated in the urban areas of the State, it shall be **the primary responsibility of the respective local urban bodies to recycle and reuse the wastewater**.

NH –D

1. Medians/road side trees
2. Emptying of septic tank

H –D

1. Agriculture
2. Nursery/Horticulture
3. Used in townships
4. CT/PT cleaning

NH –D/I

1. MIDC

H –D/I

1. Gardens/ Public space
2. Building construction
3. Water body rejuvenation

NH-I

1. Road cleaning
2. Ground cleaning
3. Fire fighting

The project proponent/s shall also mandatorily provide for:-

Areas proposed for integrated township development should be having an area of atleast **40 hectares (100 acres) or more at one place.**

Water supply – 90 litres /per day supply exclusive of fire fighting and gardening

- The project proponent/s would be required to **develop proper internal distribution with double pipe plumbing for reuse of treated water** at appropriate places and maintenance system along with smart metering and shall specially undertake rain water harvesting, ground water recharge and wastewater recycling within the project.
- Provided the **project proponent/s should not use the ground water as a source of water** to meet the above requirement.
- The project proponent/s shall provide area for **recycling waste water** and rain water harvesting **within the project itself.**
- **The recycled water shall be used for flush system, gardening, carwash and industrial use.**

1. NATIONAL URBAN SANITATION POLICY, (2008, Updated in 2012) – by MoUD

The vision for Urban Sanitation in India is: **All Indian cities and towns become totally sanitized, healthy and liveable and ensure and sustain good public health and environmental outcomes for all their citizens with a special focus on hygienic and affordable sanitation facilities for the urban poor and women.** NUSP recommends the SLB defined by MoUD and recognizes a minimum of the wastewater reuse at 20%.

2. NATIONAL WATER POLICY (2002)–This policy concentrated more on groundwater development and recognizes wastewater reuse as one of the sources for meeting the water demand and reducing pollutants.

• INSTITUTIONAL STRUCTURING –

	CENTER LEVEL	MAHARASHTRA	CITY LEVEL
POLICY MAKER	MoUD – (NUSP/ CPHEEO)	DEPARTMENT OF URBAN DEVELOPMENT – GOM (WW REUSE POLICY)	-
IMPLEMENTATION	-	-	ULB's
MONITORY	CPCB	MPCB	-
OPERATION AND MAINTENANCE	--	-	ULB's
RESEARCH AND DEVELOPMENT	NEERI, SPCB NIUA	MPCB	-

CPHEEO MANUAL

Parameter	MoEF Standards (A)	Recommended Values
BOD, mg/L	30	Less than 10
SS, mg/L	100	Less than 10
TN, mg/L	100	Less than 10
Dissolved P, mg/L	5	Less than 2
Faecal Coliforms, MPN/100 mL	Not specified	Less than 230

CPCB NORMS

S. No.	Parameters	Parameters Limits (standards for New STPs Design after notification date)*
1.	pH	6.5-9.0
2.	BOD (mg/l)	Not more than 10
3.	COD (mg/l)	Not more than 50
4.	TSS (mg/l)	Not more than 20
5.	NH ₄ N (mg/l)	Not more than 5
6.	N-total (mg/l)	Not more than 10
7.	Fecal Coliform (MPN/100ml)	Less than 100

NGT GUIDELINES

Sr. No.	Parameters	Old Norms 1986	Draft Norms Nov., 15	MoEF & CC Notification October 2017
1.	Biochemical Oxygen Demand (BOD) (mg/l)	<30	<10	<30 and <20 (metro cities)
2.	Chemical Oxygen Demand (COD) (mg/l)	<250	50	No limit
3.	Total Suspended Solids (TSS) (mg/l)	<100	<20	<100 and <50 (metro cities)
4.	Total Nitrogen (mg/l)	<100	<10	No limit
5.	Ammonical Nitrogen (mg/l)	<50	<5	No limit
6.	Total Phosphorus (mg/l)	No limit	No limit	No limit
7.	Fecal Coliform MPN/100 ml	No limit	<100	<1000

The CPHEEO MANUAL also specifies the following:

Toilet flushing

- It is necessary that such reuse shall be only after activated carbon and ultra filtration membranes.
- Persuasion shall be adopted, than mandating in layouts and confined condominiums and multiplexes and encouragement and persuasion shall be adopted, than mandating

Horticulture

- The TDS limit shall not exceed the TDS limit of the groundwater at any time.

Under the Maharashtra Water Resources Regulatory Authority Act, 2005 – Maharashtra water resource regulatory authority is established. This authority is responsible to establish a water tariff system, and to fix the criteria for water charges at sub-basin, river basin and State level after ascertaining the views of the beneficiary public, based on the principle that the water charges shall reflect the full recovery of the cost of the irrigation management, administration, operation and maintenance of water resource project.

- The water tariff in Maharashtra were **not revised since 2011** meanwhile the cost inflation index increased by 60%
- Hence, “Maharashtra Water Resources Regulatory Authority (Fees, Charges and Other receipts) Regulations, 2019” was passed. This regulation revises the **bulk water tariff for the period of 2018-2020 for agriculture, irrigation, domestic, industrial purpose as follows :-**

Volumetric rates for Flow Irrigation

Sr. No.	Season	For Registered Water User Associations (Paise per Cum)	For individual beneficiaries (Paise per Cum)
(1)	(2)	(3)	(4)
1	Kharif	3.38	4.50
2	Rabi	6.75	9.00
3	Hot Weather	10.13	13.50

Standard rates for domestic water use

Sr. No.	Category	Source & Type of Supply	Standard Rates for Domestic Water Use (Rs. per m ³)		
			Gram panch ayats	ULBs	Municipal Corporations
(1)	(2)	(3)	(4)	(5)	(6)
1	Assured Water Supply	Water Supply from Reservoir	0.15	0.18	0.25
2	Regulated Water Supply with conveyance loss	River reach downstream of dam, canals & K. T. weirs (*)	0.30	0.36	0.50
3	Partly Assured Water Supply	Water use through natural stream without any releases from up-stream reservoir, canal etc.	0.08	0.09	0.13
4	If water user entity has constructed a storage of at least 8 months of its water use and is also maintained at its own cost	Water supply through water user entity's own dam or has shared the cost in proportion to its water use	0.02	0.03	0.04

Standard rates fixed for Industrial use

Sr. No.	Category	Water Supply Type and Source	Standard rates for Industrial Use (Rs. per Cum)	
			Process	Raw Material
(1)	(2)	(3)	(4)	(5)
1	Assured Water Supply	Water use from Reservoir	4.80	120.00
2	Regulated Water Supply with conveyance loss	Water use from regulated river reach below dam, canal / K.T. weirs with backup reservoir	9.60	240.00
3	Partly Assured Water Supply	Water use from exclusively from unregulated rivers without releases from any reservoir / canal	2.40	60.00
4	Reservoir constructed for capacity of at least 8 months requirement by the water use entity at its own cost and maintained at its own cost	Water supply from a private reservoir or from reservoir proportionate cost of which infrastructure and management has been shared by the water user entity	0.77	19.20

As per the wastewater recycle and reuse water policy dated 30th November 2017, **the rights of fixing tariff for reuse of treated wastewater is vested upon the ULB's themselves.**

Hence, the Maharashtra water resource regulatory authority in its Section 12 (5) of the ACT is consciously supporting the policy stating – **the person who pollutes shall pay.**

However, the authority states to compile the following provisions while implementing the policy :-

- The treated wastewater should be transported from STP location of its reuse, **through concealed pipelines.**
- The rate of treated wastewater to be reused for irrigation purpose shall not be more than **60% of applicable rates for flow irrigation**
- If the treated wastewater is discharged in canal/ natural river – nalla then regulations of such water shall be done as per the provision in the section 11(1) of Maharashtra irrigation Act 1976 – which states that the water will be used only after the authority's approval or any notification issued by them only after 3 months.
- **Rates of treated water to be discharged in canal/ natural river – nallas should be as much as fresh water.**

FIT FOR REUSE QULAITY NORMS FOR WAYER BODY REJUEVENATION

MPCB	CPCB	CPHEEO	NGT	WHO	USEPA
NOT MENTIONED	NOT MENTIONED	<ul style="list-style-type: none"> pH- 6.5 – 8.3 BOD - 10 mg/l TDS – 2100 Nitrate Nitrogen – 5 mg/l Chlorine - 0.5 mg/l 	<ul style="list-style-type: none"> BOD <10 mg/L COD – 50 mg/L Fecal coliform - <100 	NOT MENTIONED	<ul style="list-style-type: none"> pH - 6.0-9.0 BOD ≤ 10 mg/l No detectable fecal coliform/100 ml Chlorine - 1 mg/l

The CPHEEO norms for water body rejuvenation are the most stringent as compared to international norms.

pH

CPHEEO > USEPA

BOD

CPHEEO = NGT = USEPA

Chlorine

CPHEEO > USEPA

'>' stands for more stringent

FIT FOR REUSE QULAITY NORMS FOR GROUND WATER RECHARGE

MPCB	CPCB	CPHEEO	NGT	WHO	USEPA
NOT MENTIONED	NOT MENTIONED	NOT MENTIONED	<ul style="list-style-type: none"> BOD <10 mg/L COD – 50 mg/L Fecal coliform - <100 	NOT MENTIONED	<ul style="list-style-type: none"> Site specific and use dependent

In the absence of MPCB norms, **NGT** focuses on the effluent quality for discharging in ground water.

USEPA provides the norms for **non-potable discharge** but they are more **site specific and use dependent**.

'>' stands for more stringent

FIT FOR REUSE QULAITY NORMS FOR AGRICULTURE REUSE

MPCB	CPCB	CPHEEO	NGT	WHO	USEPA
<ul style="list-style-type: none"> • pH - 6.5 to 9.0 • BOD – 30 mg/L • COD – 150 mg/L • Electrical conductivity - 3000 x 10⁻⁶ mhos 	<ul style="list-style-type: none"> • pH - 6.0 to 8.5 • Electrical Conductivity - Max.2250 	Cooked crops <ul style="list-style-type: none"> • Ph- 6.5 – 8.3 • BOD - 20 mg/l • COD – 30 mg/L • TDS - 2100 • No detectable fecal coliform/230 ml 	<ul style="list-style-type: none"> • BOD <10 mg/L • COD – 50 mg/L • Fecal coliform - <100 	<ul style="list-style-type: none"> • E.coli per 100 ml ≤ 10 mg/l • Helminth eggs per liter ≤ 1 	Food Crops <ul style="list-style-type: none"> • pH = 6.0-9.0 • BOD ≤ 10 mg/l • No detectable fecal coliform/10 0 ml

The **MPCB norms** for **agriculture reuse** are the **most lenient** as compared to other norms.

- pH** MPCB = USEPA
CPCB & CPHEEO > MPCB.
- BOD** MPCB = 3 USEPA / 3 NGT
- COD** MPCB = 3 NGT / 5 CPHEEO / 15 USEPA
- Fecal coliform** NGT & USEPA > CPHEEO

'>' stands for more stringent

FIT FOR REUSE QULAITY NORMS FOR INDUSTRIAL REUSE

MPCB	CPCB	CPHEEO	NGT	WHO	USEPA
<ul style="list-style-type: none"> • pH - 6.5 to 9.0 • BOD – 30 mg/L • COD – 150 mg/L • Electrical conductivity - 3000 x 10⁻⁶ mhos 	<ul style="list-style-type: none"> • pH - 6.0 to 8.5 • Electrical Conductivity - Max.2250 	NOT MENTIONED	<ul style="list-style-type: none"> • BOD <10 mg/L • COD – 50 mg/L • Fecal coliform - <100 	NOT MENTIONED	<ul style="list-style-type: none"> • pH- 6.0-9.0 • BOD ≤ 10 mg/l No detectable fecal coliform/20 0 ml

The **MPCB norms** for **industrial reuse** are the **most lenient** as compared to other norms.

- pH** MPCB = USEPA
CPCB > MPCB.
- BOD** MPCB = 3 USEPA / 3 NGT
- COD** MPCB = 3 NGT
- Fecal coliform** NGT > USEPA

'>' stands for more stringent

FIT FOR REUSE QUALITY NORMS FOR ONSITE LANDSCAPE, GARDENS / PUBLIC SPACE, URBAN FORESTRY, MEDIAN / ROAD SIDE PLANTING

MPCB	CPCB	CPHEEO	NGT	WHO	USEPA
<ul style="list-style-type: none"> pH - 6.5 to 9.0 BOD – 30 mg/L COD – 150 mg/L Electrical conductivity - 3000 x 10⁻⁶ mhos 	<ul style="list-style-type: none"> pH - 6.0 to 8.5 Electrical Conductivity - Max.2250 	<ul style="list-style-type: none"> pH- 6.5 – 8.3 BOD - 10 mg/l TDS - 2100 	<ul style="list-style-type: none"> BOD <10 mg/L COD – 50 mg/L Fecal coliform - <100 	<ul style="list-style-type: none"> E.coli per 100 ml ≤ 10 mg/l Helminth eggs per liter ≤ 1 	<ul style="list-style-type: none"> pH - 6.0-9.0 BOD ≤ 10 mg/l No detectable fecal coliform/100 ml

The **MPCB norms** for landscape reuse are the **most lenient** as compared to other norms.

pH	MPCB = USEPA CPCB & CPHEEO > MPCB.
BOD	MPCB = 3 USEPA / 3 NGT / 3 CPHEEO
COD	MPCB = 3 NGT
Fecal coliform	NGT = USEPA

'>' stands for more stringent

FIT FOR REUSE QUALITY NORMS FOR VEHICLE WASHING, SEPTIC TANK CLEANING, CT/PT CLEANING, BUILDING CONSTRUCTION, ROAD CLEANING, FIRE FIGHTING

MPCB	CPCB	CPHEEO	NGT	WHO	USEPA
<ul style="list-style-type: none"> pH - 6.5 to 9.0 BOD – 30 mg/L COD – 150 mg/L Electrical conductivity - 3000 x 10⁻⁶ mhos 	<ul style="list-style-type: none"> pH - 6.0 to 8.5 Electrical Conductivity - Max.2250 	<ul style="list-style-type: none"> pH = 6.5 – 8.3 BOD - 10 mg/l TDS – 2100 <p>(Only for vehicle washing and fire fighting)</p>	<ul style="list-style-type: none"> BOD – <10 mg/L COD – 50 mg/L Fecal coliform - <100 	NOT MENTIONED	<ul style="list-style-type: none"> pH - 6.0-9.0 BOD ≤ 10 mg/l (unrestricted) ≤ 30 mg/l (restricted) No detectable fecal coliform/200 ml

The **MPCB norms** for **vehicle washing** are the **most lenient** as compared to other norms.

pH	MPCB = USEPA CPCB & CPHEEO > MPCB.
BOD	MPCB = USEPA CPHEEO > MPCB
COD	MPCB = 3 NGT
Fecal coliform	NGT > USEPA

'>' stands for more stringent

FIT FOR REUSE QUALITY NORMS FOR CO-COMPOSTING SWM SITE

MPCB	CPCB	CPHEEO	NGT	WHO	USEPA
NOT MENTIONED	<ul style="list-style-type: none"> pH - 6.0 to 8.5 Electrical Conductivity - Max.2250 	NOT MENTIONED	<ul style="list-style-type: none"> BOD <10 mg/L COD – 50 mg/L Fecal coliform - <100 	NOT MENTIONED	NOT MENTIONED

The **CPCB norms** for co-composting reuse are **more lenient** as compared to NGT.

OVERVIEW OF EVALUATED PARAMETERS

Case study	Onsite / Offsite	Reuse of wastewater	Land requirement	Distance of reuse from the FSTP	Quality	Quantity	Demand from users	Capital Cost	O&M cost	Human Contact	Revenue
Devanahalli	Onsite	- Internal Landscape - Co-composting - Percolation Trench									
Leh	Onsite	- Nursery - Gov. Golf course - Dry toilets									
Berhampur	Onsite	- Landscape									
Wayanad	Onsite	- Coffee plantation									
Sinnar	Onsite & offsite	- Urban forestry - Landscaping - Desludging vehicles									
Wai	Onsite & Offsite	- Landscape - Burial ground - Fire extinguishing									
Karunguzhi	Onsite	- Landscape									
Periyanaickenpalayam	Onsite	- Landscape									

PHYSICAL COMPONENTS



Land requirement

For all the onsite reuse planning, **availability of land** is the first parameter consider.



Quality of treated wastewater

Leh consider onsite reuse options because of being **unsure about the quality** of effluent and sludge.



Quantity of treated wastewater

Leh, Devanahalli, Wai considered to reuse the wastewater and sludge **onsite due to less quantity** of produce.



Distance of reuse from the FSTP

Devanahalli, Wai, Sinnar, Wayanand, Leh didn't consider various offsite options as the plant is **located far away from the city center**. Hence this parameter was added.



FINANCIAL CATEGORY



Capital Cost

Each reuse was planned keeping in mind the **capital cost**.

Leh, didn't consider the offsite golf course option as it demanded a **separate tanker** which was an addition to the **capital cost**.

Sinnar chosen reuse in **urban forestry** also due to lower **O&M cost**

Sinnar, Wai , Wayanad didn't consider offsite options due to **high conveyance cost**.



O&M cost



Revenue

Devanhalli is already generating revenue through reuse. Others are **hoping to generate revenue** in order to meet its O&M cost in future.



USER PERSPECTIVE



Human Contact

All reuse were planned keeping in mind minimum to **zero human contact**. Though some technology make it difficult to achieve



Demand from users

Leh could not reuse the produced wastewater for **Government golf club** as the **required quantity** from the users was higher.



COMPARISION OF POLICIES

PARAMETERS		MAHARASHTRA	ANDHRA PRADESH	TELANGANA	KARNATAKA	CHHATISGARH'S
GENERAL	Policy Targets	Yellow	Red	Red	Green	Green
	Policy Rationale	Yellow	Green	Green	Green	Green
	Policy Objectives	Red	Green	Green	Green	Green
	Policy Issues	Red	Red	Red	Green	Green
INSTITUTIONAL AND FINANCE	Institutional and Administrative Arrangements	Green	Green	Green	Green	Green
	Legislative and regulatory context	Yellow	Green	Green	Green	Green
	Financing Plans	Yellow	Red	Green	Green	Green
REUSE	Wastewater reuse options	Green	Green	Green	Green	Yellow
	Decentralized wastewater system and reuse	Red	Red	Green	Green	Red
	Water quality standards	Green	Green	Green	Green	Yellow
	Sludge reuse	Red	Red	Green	Red	Yellow
	Resource management	Red	Green	Red	Red	Red
CAPACITY BUILDING AND MONITORING	Monitoring and evaluation	Yellow	Red	Green	Green	Green
	Capacity Building, Research and Development	Red	Green	Green	Green	Green
	Public acceptance	Red	Green	Red	Red	Green

Not Considered
 Considered
 Scope to improve

OBJECTIVES (TELANGANA)

- Define the roles and responsibilities of key stakeholders such as **ULBs, private sector, civil society organisations and citizens** for effective implementation of recycled water use in the state.

ISSUES (KARNATAKA)

- Maharashtra's policy may **adapt the issues** faced by ULB's in implementing it.

TARGETS (GUJARAT)

- To **reuse 25%** of wastewater by **6 months** from the date of start of STP.
- To **reuse 70%** by 2025.
- To **reuse 100%** by 2030

GENERAL

REUSE

INDIRECT POTABLE REUSE (TELANGANA)

- The treated sewage is disposed of into surface or groundwater and is used at the downstream as a source of water.

DECENTRALIZED REUSE (TELANGANA)

- Treatment of grey water can also be done at **decentralized level** in a city. **MoUD provides guidelines** for decentralized wastewater management.

SLUDGE REUSE (TELANGANA)

- Wastewater **sludge** can be applied on land as **soil conditioner and as fertilizer also land-filling, road and paving tile construction**. **CPHEEO provides guidelines** on the usage of treated sludge.

INSTITUTIONAL (CHHATISGARH)

- **State - level guidelines** would be formulated that will include **Operating Procedures for ULBs, Manuals, models, drawings/DPRs/Bid Documents, technological options**, etc.
- A **strong network of partners** in various sectors would be established, including renowned specialists/ experts, Corporates, Research/Academic Institutions, Civil Societies/ NGOs, private service providers, Donor agencies, etc. for **knowledge in the sector**.



**INSTITUTIONAL
&
FINANCE**

FACILITATION

FINANCE (TELANGANA, CHHATISGARH)

- **Innovative modalities for financing** like PPP, CSR funds, Guarantee funds, Donor grants, Water and Sanitation Pool Fund (WSPF) etc.
- ULBs should fix appropriate **tariffs to be self sufficient**.

MONITORING

- A **data management and information system (TELANGANA)**
- A **performance based system of incentives and penalties** may be devised (CHHATISGARH)
- The **residents would become active participants** in the implementation and monitoring process, while all **stakeholders would be sensitized** and sufficiently made aware of the processes, procedures, components etc. (CHHATISGARH)

CAPACITY BUILDING

- State government should **undertake training and capacity building programmes for ULB officials and stakeholders. (TELANGANA)**
- At the state level a '**resource center**' is established to act as an **information and implementation facilitation cell (KARNATAKA)**

PUBLIC ACCEPTANCE. (ANDHRA PRADESH)

- **Awareness and educational programs** shall be implemented with **citizens, farmers, industries**.

3.7

Whether plans are in place to reuse/recycle the waste water to reduce the burden on fresh water?

Marks
40

WHY

Acknowledging the shortage of fresh water and efforts to conserve fresh water, ULBs need to consider reuse and recycling of waste water. Waste water can be re-used for irrigation, horticulture etc.

Details required for supporting progress claimed

On-line MIS: Data/progress updated by 5th day of the following month

- Has Action plan been developed to treat waste water(Y/N).
- Has Action plan been developed to reuse waste water (Y/N)
- Capacity of waste water treatment plants(MLD)
- Quantity of waste water being treated (MLD)
- Quantity of waste water reused (MLD) after treatment

Note: Re-use of wastewater shall be for non-potable applicable with appropriate care.

Note: Only total count is required for the above parameter

Scheme of Marking	Marks
Yes, Plan in place and >30% waste water is reused/recycled	40
...between 20% - 29% waste water is reused/recycled	30
..between 10% - 19% waste water is reused/recycled	20
<10% waste water is reused/recycled	10

SBM Water +

Definition

SBM Water +

A city/ward/circle/zone can be declared as Water Plus provided all wastewater released from households, commercial establishments etc. is treated to a satisfactory level (as per CPHEEO norms), before releasing the treated wastewater to the environment.

Indicative conditions

Wastewater (black water) from all toilets discharged into a sanitary outlet i.e. a covered sewer or a septic tank with soak pit / twin pit latrine (TPL).

Sufficient designed capacity of sewage treatment plant to treat wastewater through decentralized or centralized treatment plant for the number of households connected to sewer

Operations and Maintenance costs of sewer networks / STPs / FSTPs are being recovered through dedicated revenue streams

The city shall be eligible for Water Plus provided that all conditions of ODF++, ODF+ and ODF protocol have been adhered



Self Declaration by City followed by Third Party Inspection :
In an event of failed assessment, the reassessment would be conducted after a cooling-off period of one month from the date of failed assessment. If the ULB fails for the second time, the next assessment would be conducted after six months from the date of second reassessment

Other Necessary conditions for Water +

Cities that satisfy ODF++ conditions will be eligible to declare themselves as Water + and request Water + verification by third party

1. **De-sludging vehicles are available** for meeting demands of de-sludging all Septic Tanks in the city
2. Septage treatment facility is available in the city:
 - a) *By way of co-processing at an STP and adequate capacity is available (as per CPHEEO norms) to treat the number of septic tanks which are de-sludged every day.*
 - b) *Treated at a standalone FSTP with capacity equivalent to the total volume of septage to be de-sludged every day.*
3. Only **mechanical cleaning** of Sewer and septic tanks (*any manual entry done only with adequate PPE and due approval*)
4. Sewerage networks and maintenance holes cleaned periodically and drains well maintained
5. All **septic tanks de-sludged** at least once **every three years**
6. All manholes to be covered to avoid any accident and garbage dumping
7. Storm water drains should be cleaned pre and post monsoon and scheduled desilting to be done
8. No garbage is visible in storm water drains and bar screens should be placed at the junctions of major secondary to primary drains and primary drains and major water bodies/rivers.
9. After treatment, minimum 10% wastewater is being reused at city level, viz. horticulture, agriculture, industrial use, cleaning roads etc.
10. No waste water overflowing from wastewater conveyance system and manholes
11. All Swachhata / local app complaints pertaining to **choked sewers, leakage of sewage, water logging, septic tank cleaning, uncovered manholes, drain cleaning** - addressed within SLA



Water +

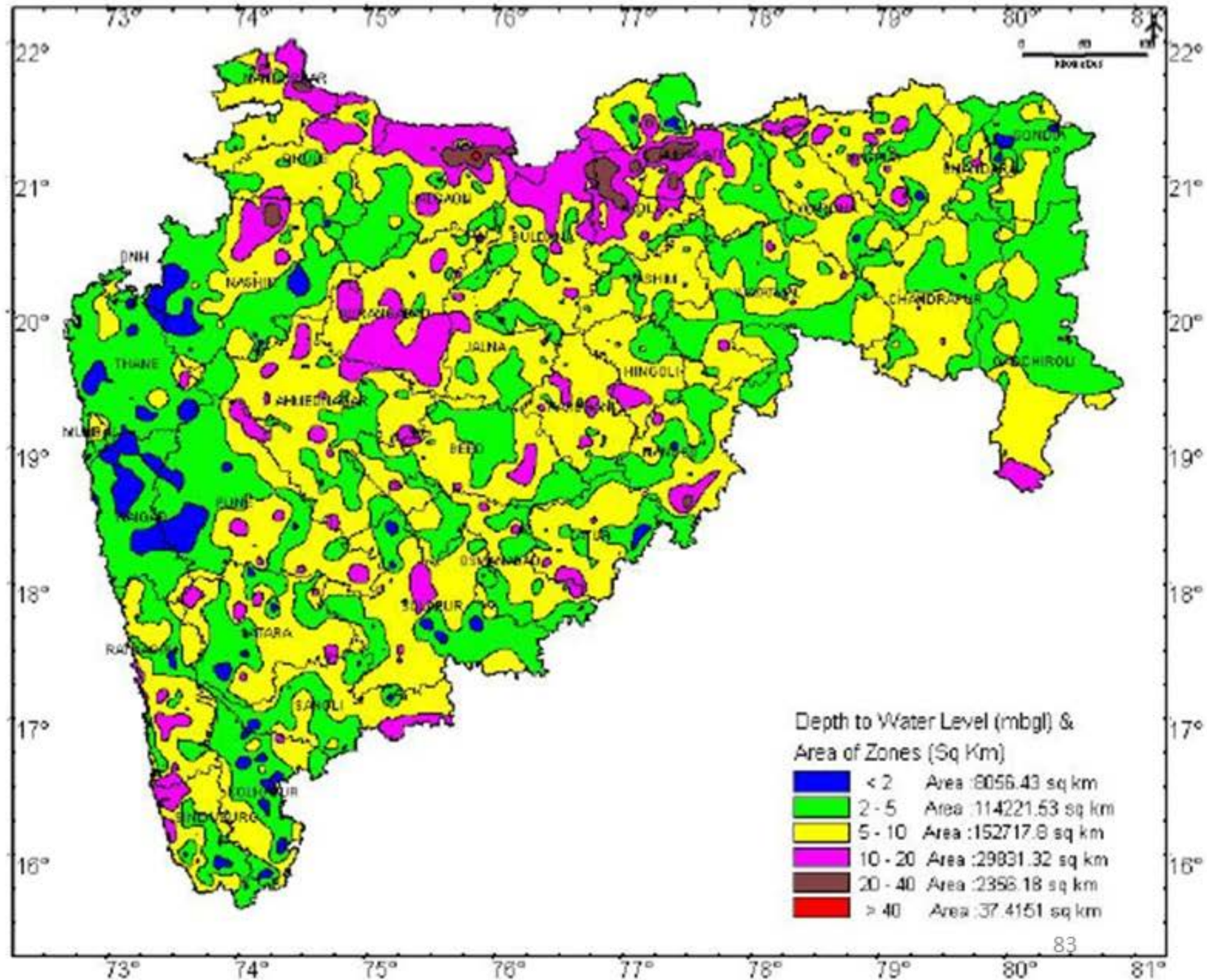


ONSITE OPTION A5 – GROUND WATER RECHARGE

The principal aquifer in Satara is Basalt, but as per the CGWB study, Satara's depth of ground water is from 2 to 10 mgl.

Hence, the option of reuse of treated wastewater for ground water recharge is not considered.

DEPTH TO WATER LEVEL, MAHARASHTRA AND DADRA & NAGAR HAVELI (JANUARY 2017)



Reuse Option	Daily / Intermittent	Capital components	Capital cost	O&M components and cost			
				Plants	Labor	Repairs	Total O&M cost
Co-composting SWM site	Daily	200 M long PVC pipe, storage tank, pumps	90200	NA	No additional labor required.	800 / month	Covered in DPR
Vehicle washing	Daily	Construction of vehicle washing platform, 100 M long PVC pipe, storage tank	94978	NA	No additional labor required.	800 / month	Covered in DPR
Landscape at FSTP site	Daily	200 M long PVC pipe, landscaping, storage, pumps	1,80,000	9794	No additional labor required.	800 / month	10,076 / monthly
Social / Urban forestry	Daily	Urban forestry plantation, 100 M long PVC pipes, drip/ sprinkler irrigation	10,80,200	Covered in landscape cost	No additional labor required.	Covered in landscape cost	Covered in landscape cost
TOTAL			Rs. 14,45,378				

- **For Pipes** - SOR 2018 -2019 for PVC pipe of 110 dia - Rs. 94 Rmt + Labour - Rs 427 Per day + raw material
- **For Vehicle washing platform** - SOR 2018 -2019 , PCC - M 100 complete rate 3751 cum
- **For all storage tanks** - Sintex's Metallic Grey Zincalume Steel Water Tank (Rs. 2/ Liter) for 30,000 Litres - Rs. 60,000 (Indian mart)
- **For all pumps** - Crompton Pump Rs. 8000 (Indian mart)
- **For sprinkler irrigation** - Irrigation cost adapted from Sinnar – 2 lakhs
- **For Landscape** - Rs. 600/sq.m



Sub work Number 21: Miscellaneous Utilities required for development of dumpsite at Songaon, Satara (Water + Electricity + Green Belt Development)

ABSTRACT SHEET

Item No.	Item Description	Unit	Quantity	Unit Rate	Amount (Rs.)
1	Miscellaneous items (Water and electricity requirement) This includes electrification of various civil infrastructure buildings, sheds and also the installation of transformer)	lumpsum	1		3000000
2	Green Belt	Nos.	500	385	193000
	Grand Total				3193000

Need to discuss this in order to calculate the cost of freshwater saved

OFFSITE - COSTING DETAILS

Reuse Option	Daily / Intermittent	Capital components	Distance from FSTP plant	Capital cost	O&M components and cost			
					Petrol	Labor	Repairs	Total O&M cost
Median / Road side planting	NH -Daily	1 Additional tankers	2 to 7 KM	14 Lakhs	8085 / monthly	25000 / monthly	800 / monthly	33,885/monthly
Septic tank emptying	NH - Daily	Same tanker to be used - 20 rounds a day to cover 34 septic tanks with a capacity of 3 KLD per septic tank	127 km (Road length)	0	57,750 / monthly	0	800 / monthly	58,550 / monthly
Nursery / Horticulture	H - Daily	Same tanker to be used	3 KM	0	21,825 /monthly	0	800 / monthly	22,625 / monthly
Gardens / Public Space	H - Daily / Intermittent		1.8 KM					
CT/PT cleaning	H - Daily	1 Additional tankers	3 KM	28 lakhs	24,900 / monthly	25000 / monthly	800 / monthly	50,700 / monthly

Cost of Petrol: Rs.77/lit

Tanker capacity: 5000 lit

Tanker average: 8-10 km/lit

Labor cost: Rs. 15000/month (Driver) + Rs.10000/month (Helper)

Maintenance: Rs. 800/month

The total cost is calculated considering above factors, distance, no. of trips and area of land

Tanker rent (2000/day/tanler)

Tanker buying cost – 14 lakhs

For Pipe - SOR 2018 -2019 for PVC pipe of 110 dia - Rs. 94 Rmt + Labour - Rs 427 Per day + raw material

महाराष्ट्र जीवन प्राधिकरण
जल व्यवस्थापन विभाग, सातारा
सातार पाणी पुरवठा केंद्र, सातारा

पाणी आकारणी देयक

ग्राहक क्र. SA11831 तांत्रिक शुल्क अकारण 500 सिली मीटर : 1 जोडी मीटर : 0

नाम	SOU. ARTI MANOJ GUJAR					जन्म	सातारा	
पत्ता	RAJIBROSALI HEIGHTS POWAI NAKA, SATARA					प्रवेशक प्रकार	घरगुती	
मो. क्र.	०६					प्रवेशक मीटर	15	
मीटर क्र.	Current Reading m3	Previous Reading m3	Total Meter Reading	Rate Calculation	Total Amount	मिटर स्थिती	TAMPER	
०	TAMPER	295	TAMPER	30 x 17.3 30 x 26 9 x 34.6	1018	डोस	PC2	
जोडी मीटरचे रकम अ. Paid Amount Rs.							दिवसाचे अंतिम	Aug-Sep-2019
रकम अकारण दिवसाचे Paid Amount Date							दोस अकारण अंतिम दि.	25/12/2019
सातार देयक अ. Current Bill Rs.	1018							
जोडी मीटरचे अ. Previous Bill Rs.	17650							
मिटर शुल्क अ. DPC Rs.	4880							
संपूर्ण रकम अ. Net Due Rs.	23557							
इतर अकारण अ. Other Charges Rs.								
Total Amount to be paid before due date अंतिम दिनांकापर्यंत भरावयाची रकम	23557							
Delay payment charges @12% PA मिटर शुल्क अकारण अ.	373							
अंतिम दिनांकापर्यंत भरावयाची रकम	23930							

जोडी मीटरचे अ. 0 अकारण दिवसाचे अंतिम दि. 25/12/2019

जन्म : सातारा अकारण दिवसाचे अंतिम दि. 25/12/2019

महाराष्ट्र जीवन प्राधिकरण अकारण क्र. १ अकारण **पाणी देयक**, तांत्रिक शुल्क अकारण क्र. 0

ऑफिस / बँक स्थळ प्रत

मिटर क्र.:	294846	ग्राहक क्र.:	SA11831
नाम	SOU. ARTI MANOJ GUJAR	सातार देयक	1018
		जोडी मीटरचे अ.	17650
		मिटर शुल्क अ.	4880
		संपूर्ण रकम अ.	23557
		दिवसाचे अंतिम	Aug-Sep-2019
		दोस अकारण दि.	25/12/2019

*** पाणी देयक आकारणी तक्ता ***
(दि. १/०७/२०१८ पासून सुधारित)

पाणी वापर प्रतिमाह	घरगुती (₹. प्रतिहजार लिटर)	संस्था (₹. प्रतिहजार लिटर)	विपर घरगुती (₹. प्रतिहजार लिटर)
१५,००० लिटरपर्यंत	१७.३०/-	२६.६०/-	३६.५०/-
१५००१ ते २५००० लि.	२६.००/-		
२५००१ लिटरपेक्षा	३४.६०/-		

सातारा पाणी पुरवठा केंद्र

१. पाणी देयक अकारण दिवसाचे अंतिम दि. २५/१२/२०१९

२. पाणी देयक अकारण दिवसाचे अंतिम दि. २५/१२/२०१९

३. पाणी देयक अकारण दिवसाचे अंतिम दि. २५/१२/२०१९

४. पाणी देयक अकारण दिवसाचे अंतिम दि. २५/१२/२०१९

५. पाणी देयक अकारण दिवसाचे अंतिम दि. २५/१२/२०१९

६. पाणी देयक अकारण दिवसाचे अंतिम दि. २५/१२/२०१९

७. पाणी देयक अकारण दिवसाचे अंतिम दि. २५/१२/२०१९

८. पाणी देयक अकारण दिवसाचे अंतिम दि. २५/१२/२०१९

९. पाणी देयक अकारण दिवसाचे अंतिम दि. २५/१२/२०१९

१०. पाणी देयक अकारण दिवसाचे अंतिम दि. २५/१२/२०१९

११. पाणी देयक अकारण दिवसाचे अंतिम दि. २५/१२/२०१९

१२. पाणी देयक अकारण दिवसाचे अंतिम दि. २५/१२/२०१९

१३. पाणी देयक अकारण दिवसाचे अंतिम दि. २५/१२/२०१९

१४. पाणी देयक अकारण दिवसाचे अंतिम दि. २५/१२/२०१९

१५. पाणी देयक अकारण दिवसाचे अंतिम दि. २५/१२/२०१९

१६. पाणी देयक अकारण दिवसाचे अंतिम दि. २५/१२/२०१९

१७. पाणी देयक अकारण दिवसाचे अंतिम दि. २५/१२/२०१९

१८. पाणी देयक अकारण दिवसाचे अंतिम दि. २५/१२/२०१९

१९. पाणी देयक अकारण दिवसाचे अंतिम दि. २५/१२/२०१९

२०. पाणी देयक अकारण दिवसाचे अंतिम दि. २५/१२/२०१९

- Cost of freshwater in satara :-
- Untill 15KL – Rs. 17.30/ Liters
- 15 KL to 25 KL – Rs. 26 / Liters
- 25 KL above liters – Rs. 34.60 / Liters

TECHNOLOGY

- Along with traditional technology, **innovative technology developed by IIT/NIRI** should preferably be used when implementing the wastewater recycling and reuse projects.

INSTITUTIONAL AND ADMINISTRATIVE ARRANGEMENTS

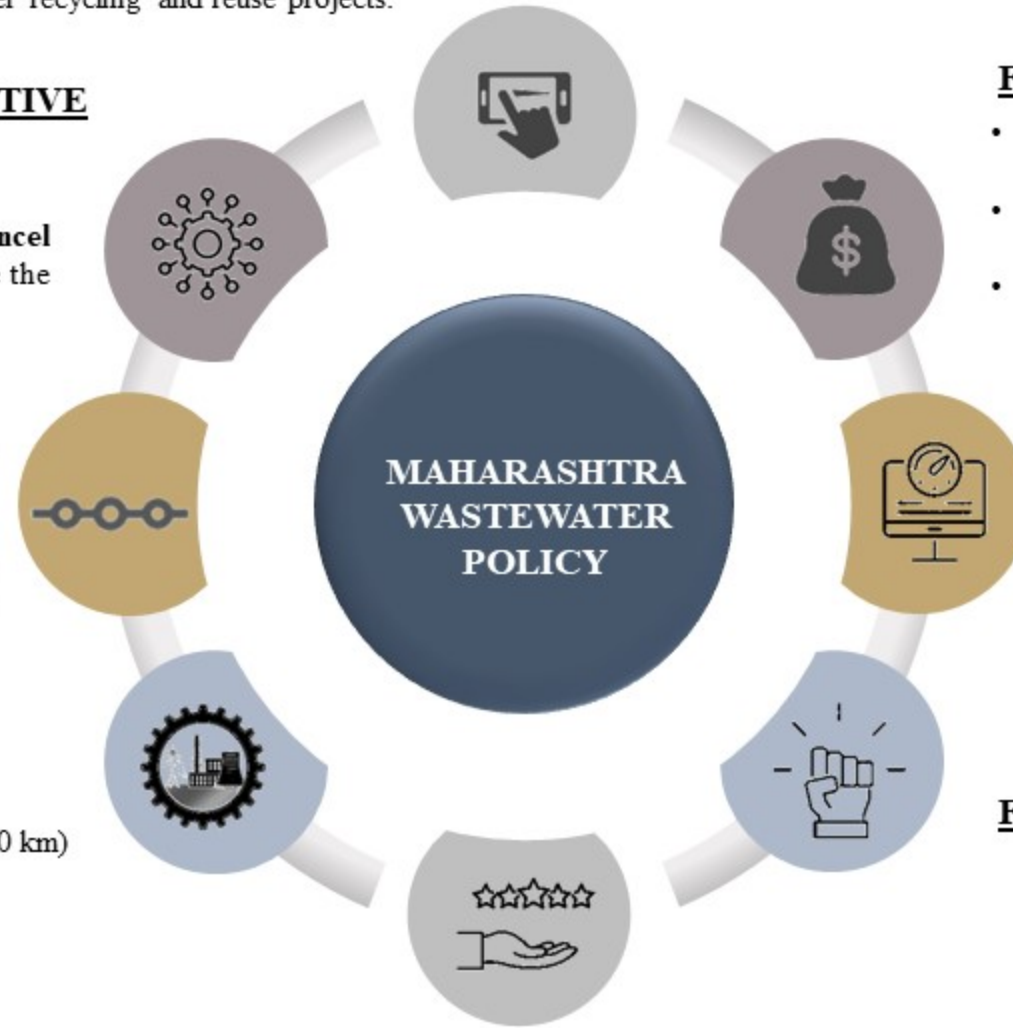
- **ULB's to recycle and reuse the wastewater.**
- **The Water Resources Department** should cancel the natural water supply for industries who use the treated wastewater

TIMELINE

- An **action plan** be formulated for the reuse of the treated water within **one year** of the implementation of the policy
- Reuse of **wastewater for thermal power plants and MIDC's** within 50km of a STP should start within **three years** of the implementation of the policy

PRIORITY OF REUSE

- **Thermal electricity plants** (Mandatory within 50 km)
- **MIDC** (Mandatory within 50 km)
- **Railways or other bulk buyers.**
- **Agriculture.**
- **Non-potable components** (as per MPCB).



REUSE MANAGEMENT

- **Special areas shall be identified** for priority implementation.

FINANCING PLANS

- **Stage wise implementation** of STP's due to limited availability of funds
- Funds shall be raised through the various schemes of **Central as well as State Government or through PPP.**
- **Funds to be allocated** to the ULB after the wastewater reuse plan is completed

MONITORING AND EVALUATION

- State committee to **check the feasibility and cost effectiveness** of the wastewater recycling and reuse projects **before the execution** of these new projects
- If the **ULB's bear 100% of the cost, no need** for the committee to do the checking.

FINANCIAL RIGHTS OF WASTEWATER

- **ULB's treating the water have the financial right** to it.

STAKEHOLDER CONSULTATIONS 1 - DEVANAHALLI, KARNATAKA

Case study	Land requirement	Distance of reuse from the FSTP	Quality	Quantity	Demand from users	Capital Cost	O&M cost	Human Contact	Revenue
Devanahalli	Sufficient land onsite available for landscape and trench was checked.	High transportation cost was considered.	CPCB norms for treated wastewater was followed	Reuse was planned according to its produced quantity		Offsite option was not chosen due to high conveyance cost		No human contact happens	Compost is sold for revenue generation.



6 KLD Capacity

Onsite Reuse

**Stakeholders Consultations :
ULB & Farmers**

**Compost sold at
Rs. 5 / kg for
revenue generation**



Wastewater reuse for onsite landscape, Co-composting and percolation trench

**Quantity
4.2 K liters / day**

CPCB treated water quality norms

Reused Daily



Sludge to be reused as a fertilizer

**Sludge
600 kg / day**

**USEPA standards for sludge
Class B/A**

Reused Daily



Image source - Internet

Why was this option chosen?

- The **idea** was to give the **product back** to the **farmers**.
- **Recharge the groundwater** due to **water scarcity** and topographical benefits
- **Aesthetic** purpose

What were the other options?

- **Agriculture** practice with the treated wastewater along with the farmers

Why were other options not considered ?

- Offsite options are **not chosen** due to **high conveyance cost**
- Also, the **quantity of treated wastewater** produced gets fully used on-site and hence off-site options are not explored.

Who's Who ?

CDD	Plan and implement the reuse
BMGF	Bares the capital cost
ULB	Bares the O&M cost
Government	Provides land
Private operator	Responsible for O&M
Treatment plant operator sends them to a qualified lab for testing	Quality Monitoring

O&M cost & Component

Rs. 8 Lakhs/ per year *
(Cost for whole plant)
General repairs and electricity.

Capital cost & Component

Rs. 15 Lakhs *
Co-composting unit, pecculation pit and pipes, Pumping, Motors

* Difficult to get a separate cost for reuse only.

STAKEHOLDER CONSULTATIONS 2 - LEH

Case study	Land requirement	Distance of reuse from the FSTP	Quality	Quantity	Demand from users	Capital Cost	O&M cost	Human Contact	Revenue
Leh	Sufficient land onsite available for nursery was checked	High transportation cost was considered.	Unsure of the quality of output	Small quantity produced daily.	Gov. Golf course needed a separate tanker and more quantity	Cost of transport is high for offsite uses.	Not a lot due to the natural technological system	No human contact happens	Would be considered in the future



12 KLD Capacity

Onsite Reuse

Stakeholders consulted :
- Commercial establishment
- Golf course (ULB)

NO revenue generation as yet



Wastewater reuse for Nursery

Quantity 4 to 5 K liters / day

Unsure of treated effluent quality

Considered NGT norms

Reused Daily



Sludge to be reused as a fertilizer

Sludge 200 to 300 kg / day

Unsure of sludge quality

Reuse would begin in 2022 - 2023



Why was this option chosen?

- Unsure about the **quality** of effluent
- **Less quantity**
- **Site beautification**

What were the other options?

- Golf course
- Forest Areas

Why were other options not considered ?

- Plant is **10 km** away from the city.
- Government Golf –
 - **Insufficient quantity**
 - **Needed a separate tanker**

Who's Who ?

ULB	Plan and implement the reuse
ULB	Bares the capital cost
Data not available	Bares the O&M cost
ULB	Provides land
BLUE WATER COMPANY (till 2022)	Responsible for O&M
ULB	Quality Monitoring

O&M cost & Component

Data not available
Storage, transportation and testing

Capital cost & Component

Data not available
Pipes, Pumping, Motors and other plumbing cost

STAKEHOLDER CONSULTATIONS 3 - BERHAMPUR, ORISSA

Case study	Land requirement	Distance of reuse from the FSTP	Quality	Quantity	Demand from users	Capital Cost	O&M cost	Human Contact	Revenue
Berhampur	Sufficient land onsite available for landscape was checked.		Wastewater they the same norms as STP	A polishing pond was constructed for the produced quantity of treated wastewater.				Some human contact happens	After the model is tested. Sludge is not sold



40 KLD Capacity

Onsite Reuse

Stakeholders consulted :

1. Women SHG

In future:

1. Department of forestry

2. Directorate of horticulture.

NO revenue generation



Wastewater reuse for landscaping

**Quantity
40 K liters / day**

Treated effluent quality same as STP effluent

Reused Daily



Sludge to be reused as a co-composting for growing crops

**Sludge
1200 kg / day**

No quality norms for sludge

Reuse would happen in future.



Image source - Internet

Why was this option chosen?

- Onsite option was chosen as it **does not** require any **permissions**.

Policy and regulations

- They have created guidelines for urban septage management.
- Also created FSSM regulations which talk about reuse.

What were the other options?

- Offsite options like road site planting or offsite landscaping.

Why were other options not considered ?

- Offsite options are not preferred as they involve **more permissions and approvals from various authority/stakeholders** than the onsite options.

Who's Who ?

E&Y	Plan and implement the reuse
Data not available	Bares the capital cost
Data not available	Bares the O&M cost
ULB	Provides land
Women SHG	Responsible for O&M
Data not available	Quality Monitoring

O&M cost & Component

Data not available

General repairs and electricity.

Capital cost & Component

Data not available

Sprinklers, Shredder and pipes, pumping, motors

STAKEHOLDER CONSULTATIONS 4 - SINNAR, MAHARASHTRA

Case study	Land requirement	Distance of reuse from the FSTP	Quality	Quantity	Demand from users	Capital Cost	O&M cost	Human Contact	Revenue
Sinnar	Sufficient land onsite available for urban forestry, landscape was checked.	High transportation cost was considered.	CPCB norms for treated wastewater was followed	Reuse was planned according to its produced quantity				No human contact happens	Sludge is given to farmers for free



70 KLD Capacity

Onsite Reuse

Stakeholders consulted for reuse:
Municipal council

In future:
SHG and Kids

NO revenue generation as yet



Wastewater reuse for urban forestry, landscape, vehicle washing

**Quantity
20 K liters / day**

CPCB treated water quality norms

Reused Daily



Sludge to be reused as fertilizer

Sludge is given to farmers for free

No quality norms for sludge

Reused Daily



Image source - Internet

Why was this option chosen?

- **Water scarcity** in the city
- **Urban forestry has less maintenance** after 2 to 3 years
- Stakeholder's wanted a resource park.

What were the other options?

- Cleaning of **community toilets**

Why were other options not considered ?

- Did not consider cleaning of community toilets due to **high transportation cost**.

Who's Who ?

CWAS	Plan and implement the reuse
CWAS	Bares the capital cost
ULB	Bares the O&M cost
ULB	Provides land
ULB	Responsible for O&M
Council officers and Plant operator	Quality Monitoring

O&M cost & Component

**Rs. 900 / pm
(only pumping)**

General repairs, maintenance of plants and electricity, safety equipment's.

Capital cost & Component

**Rs. 1.5 lakh *
(only drip irrigation)**

Drip irrigation system, compound wall, platform for vehicle cleaning, urban forestry, motors, pump and pipes.

* Have to add the cost of landscaping, resource center, urban forest – plantation

STAKEHOLDER CONSULTATIONS 5 - WAI, MAHARASHTRA

Case study	Land requirement	Distance of reuse from the FSTP	Quality	Quantity	Demand from users	Capital Cost	O&M cost	Human Contact	Revenue
Wai	Sufficient land onsite available for landscape was checked.	High transportation cost was considered.	MPCB norms for treated wastewater was followed	Offsite options were not considered due to lower quantity of produce.	MIDC demand is higher and still in discussion.		Onsite options were chosen due to lower O&M	No human contact happens	To be considered in future



70 KLD Capacity

Onsite Reuse

Stakeholders consulted for reuse:
Farmers
ULB officials

NO revenue generation as yet



Wastewater reuse for landscape and SWM site fire. In future – Urban forest

Quantity
20 K liters / day
(Max 55k litres/day)

MPCB treated water quality norms

Reused Daily



Sludge to be reused as Biochar, co-composting with organic waste

Quantity of sludge
5 to 10/ kg per day

No quality norms for sludge. It is been sent for testing though.

Reused Daily



Image source - Internet

Why was this option chosen?

- These two options were most feasible as it requires **very less maintenance**
- **Less monitoring**
- The **quantity was sufficient**
- No **additional permissions required**
- Has **no human contact**

What were the other options?

- Median/ Road side planting
- Burial ground
- MIDC

Why were other options not considered ?

- Did not consider Median/ Road side planting or supplying water to the Burial ground due to **high transportation cost.**
- In order to reuse the wastewater for MIDC the **quantity produced** daily was not sufficient.

Who's Who ?

CWAS & TIDE	Plan and implement the reuse
TIDE	Bares the capital cost
Data not available	Bares the O&M cost
ULB	Provides land
ULB & TIDE	Responsible for O&M
TIDE	Quality Monitoring

O&M cost & Component

Data not available

General repairs, maintenance of plants and electricity, safety equipment's.

Capital cost & Component

**Rs. 6,600*
(Pipes)**

Underground storage tank, pipes, motors, pumps

* Have to add the cost of underground storage tank.

STAKEHOLDER CONSULTATIONS 6 - WAYANAND, KERALA

Case study	Land requirement	Distance of reuse from the FSTP	Quality	Quantity	Demand from users	Capital Cost	O&M cost	Human Contact	Revenue
Wayanand	Sufficient land onsite available for coffee plantation and gardening was checked.	High transportation cost was considered for reuse.	NGT norms for treated wastewater and WHO guidelines for sludge	Quantity produced was sufficient only for onsite purpose.				No human contact happens	Would be considered in the future to meet the O&M cost.



10 KLD Capacity

Onsite Reuse

Stakeholders consulted for reuse:

Data not available

NO revenue generation as yet



Wastewater reuse for coffee plantation and gardening

Quantity 3000 liters / day

NGT treated water quality norms

Reused Daily



Sludge to be sold to farmers as manure

Quantity of sludge was nominal

WHO guidelines

Compost to be sold to the farmers in future for Rs. 3 to 7/ Kg



Image source - Internet

Why was this option chosen?

- Onsite option was chosen as the **quantity of effluent** produced is sufficient for on-site and does not involve additional **commuting cost**.

What were the other options?

- Co-composting SWM site
- Vehicle washing
- Public garden
- Cleaning of floor

Why were other options not considered ?

- Did not consider **co-composting** as the process involves **high human contact** due to manual handling of sludge.
- Vehicle washing was not considered as the FSTP site is **far away** from the main city.
- Water **quantity is less**

Who's Who ?

Consultant and UNICEF field coordinators	Plan and implement the reuse
UNICEF, INDIA	Bares the capital cost
Data not available	Bares the O&M cost
ULB	Provides land
ULB & Consultant	Responsible for O&M
Data not available	Quality Monitoring

O&M cost & Component

Data not available

General repairs and electricity, safety equipment's.

Capital cost & Component

Data not available

Two storage tanks of 5kld each, Rising mains, pipes, pumping, motors compound wall

KEY LEARNINGS FROM KARUNGUZH, TAMIL NADU

Case study	Land requirement	Distance of reuse from the FSTP	Quality	Quantity	Demand from users	Capital Cost	O&M cost	Human Contact	Revenue
Karunguzhi	Sufficient land available onsite for landscaping was checked.		CPCB norms – wastewater MSW management standards – compost	Wastewater is completely reused on site due to less volume of produce.		Natural Biological based treatment was chosen keeping in mind the capital and O&M cost.		Yes, due to sludge drying bed technology.	Plan to sell the co-compost after satisfied with quality.



23.4 KLD Capacity

Onsite Reuse

Stakeholders consulted for compost reuse:

- Farmers
- Commercial vendors
- Co-operative society
- Nursery owners

No revenue generation as yet



Wastewater reuse for landscaping

Quantity
16 K liters / day

CPCB treated water quality norms

Reused daily or alternate day



Sludge to be reused as co-composting.

Quantity of sludge by each bed
200/300 kg/ pm

Quality for sludge
MSW management standards
Pathogens – USEPA & WHO

Not yet reused



Source - Internet

Why was this option chosen?

- **Co-composting** was adapted recently with learnings from Devanahalli and other places.
- Reuse of wastewater for **landscape** was decided by following the design standards mentioned in **Tamil Nadu Operating Guidelines**.

What were the other options?

- **None** of the Offsite reuse options were considered.
- Within the site it is **experimented with various plants** and landscaping.

Why were other options not considered ?

- **Quantity of wastewater** generated is less.
- Though **provision is made** to reuse the treated wastewater for **offsite purpose** in future once the quantity of production is higher.

Who's Who ?

Tamil Nadu Government	Plan and implement the reuse
Tamil Nadu Government	Bears the capital cost
Town Panchayat	Bears the O&M cost
Town Panchayat	Provides land
NGO – Hand in Hand (In future)	Responsible for O&M
NGO (In future)	Quality Monitoring

O&M cost & Component

Data not available

General repairs and electricity, Overall plant maintenance, human resources.

Capital cost & Component

Data not available

Storage tank for sludge and sump for wastewater, pipes, pumps and motors.

KEY LEARNINGS FROM PERIYANAICKENPALAYAM, TAMIL NADU

Case study	Land requirement	Distance of reuse from the FSTP	Quality	Quantity	Demand from users	Capital Cost	O&M cost	Human Contact	Revenue
Periyanaicke npalayam	Sufficient land available onsite for landscaping was checked.		CPCB norms – wastewater MSW management standards – compost	Wastewater is completely reused on site due to less volume of produce.	Demand study was conducted for compost quality			Human contact happens.	Plan to sell the co-compost after satisfied with quality.



25 KLD Capacity

Onsite Reuse

Stakeholders consulted for compost reuse:
- Farmers
- Big corporates

No revenue generation as yet



Wastewater reuse for landscaping

Quantity
23 K liters / day

CPCB treated water quality norms

Reused daily or alternate day



Sludge just started trials of co-composting

Quantity of sludge
200/300 kg/ day

Quality for sludge
MSW management standards
Pathogens – USEPA & WHO

Not yet reused

Why was this option chosen?

- It is located in a resource recovery park with a SWM site
- **Quantity** was sufficient only for onsite reuse.

What were the other options?

- **None** of the Offsite reuse options are considered as it is located in a **resource recovery park** and the **FSTP is newly commissioned**

Why were other options not considered ?

- **Quantity of wastewater** generated is less.
- Though **provision is made** to reuse the treated wastewater for **offsite purpose** in future once the quantity of production is higher.

Who's Who ?

TNUSSP	Plan and implement the reuse
BMGF grants	Bears the capital cost
1 year O&M – BMGF Post that – Town Panchayat	Bears the O&M cost
ULB	Provides land
TIDE	Responsible for O&M
Yet in process	Quality Monitoring

O&M cost & Component

FSTP is still in trial stage and the details of the O&M operator are being finalized

Capital cost & Component

Data not available

Pipes, pumps and motors.