Reuse Ecosystem

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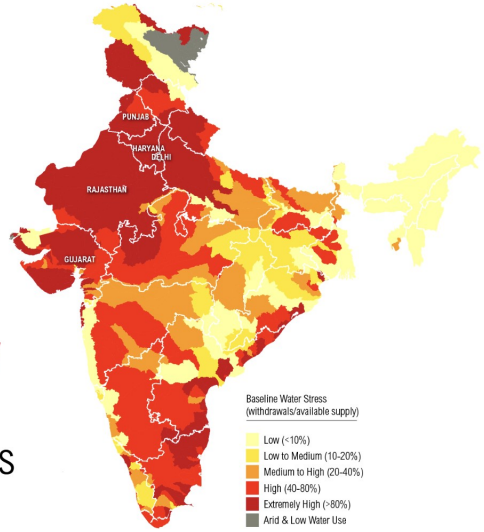
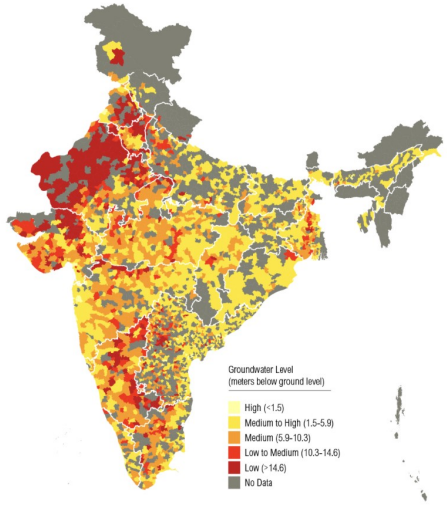
State of India's Growing Water Risk

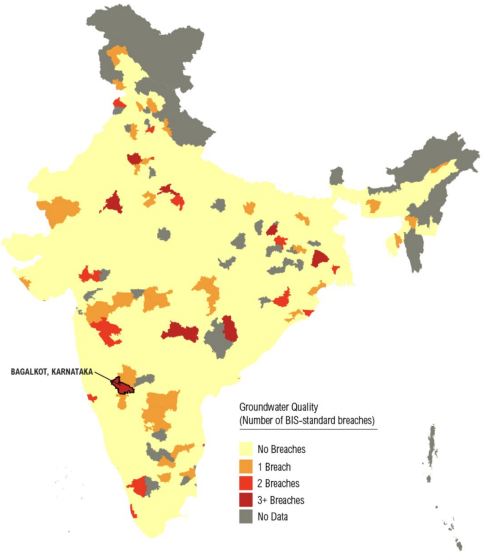
54% of India Faces **High** to **Extremely High** Water Stress



54% of India's Ground-water Wells Are Decreasing



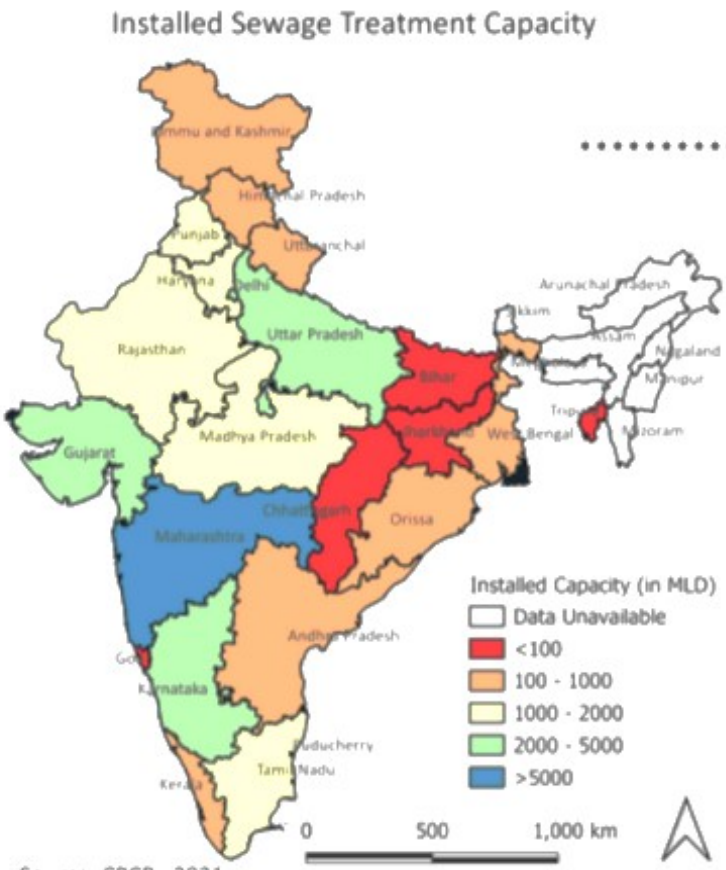
More than **100 MILLION** People Live in Areas of Poor Water Quality



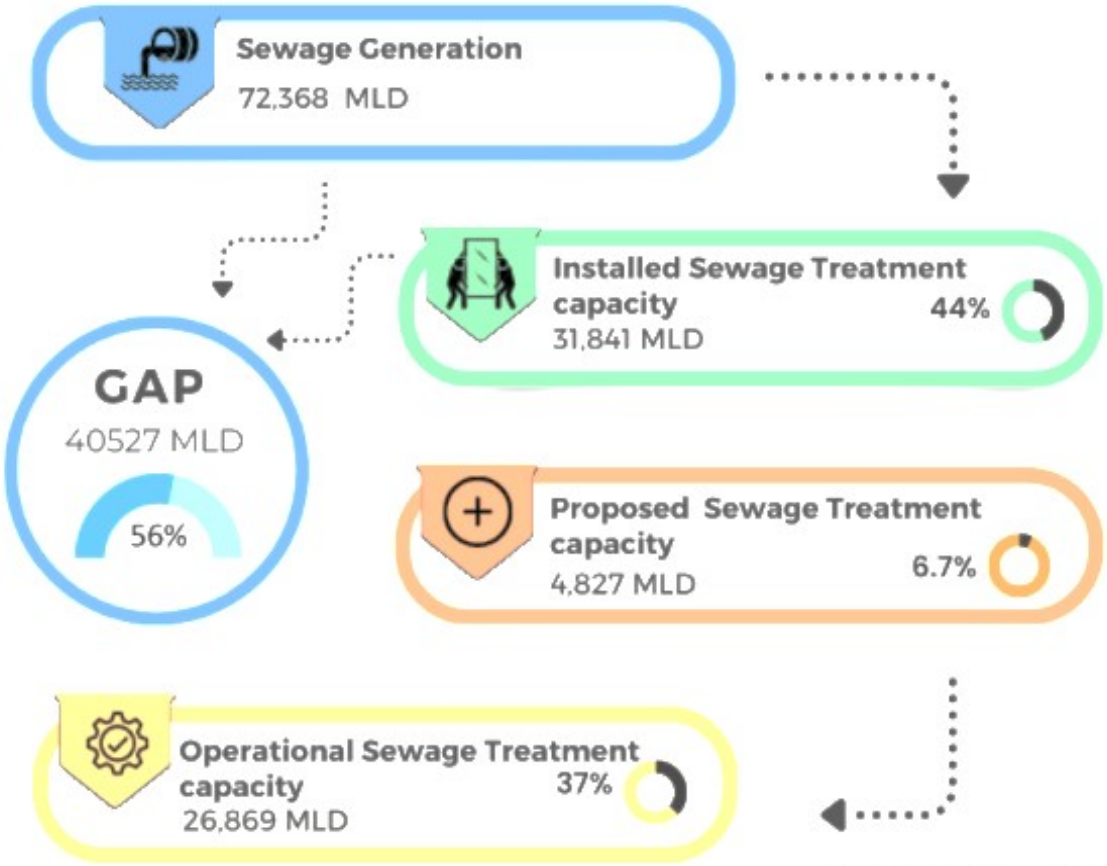
- India has 18 per cent of the world's population - More than half of the country faces **high** to **extremely-high** water stress
- About 60 Cr. people in India suffer the consequences of growing water risks.
- India is considered one of the most water-stressed countries in the world.

Source: WRI 2015

Used Water Scenario in India



Source: CPCB , 2021



Source: CPCB (2020-2021)

Govt. Missions on Reuse of treated wastewater

The government of India is promoting a circular economy, which is essential for achieving a sustainable and climate-resilient future and for managing the ever-growing demand for freshwater.

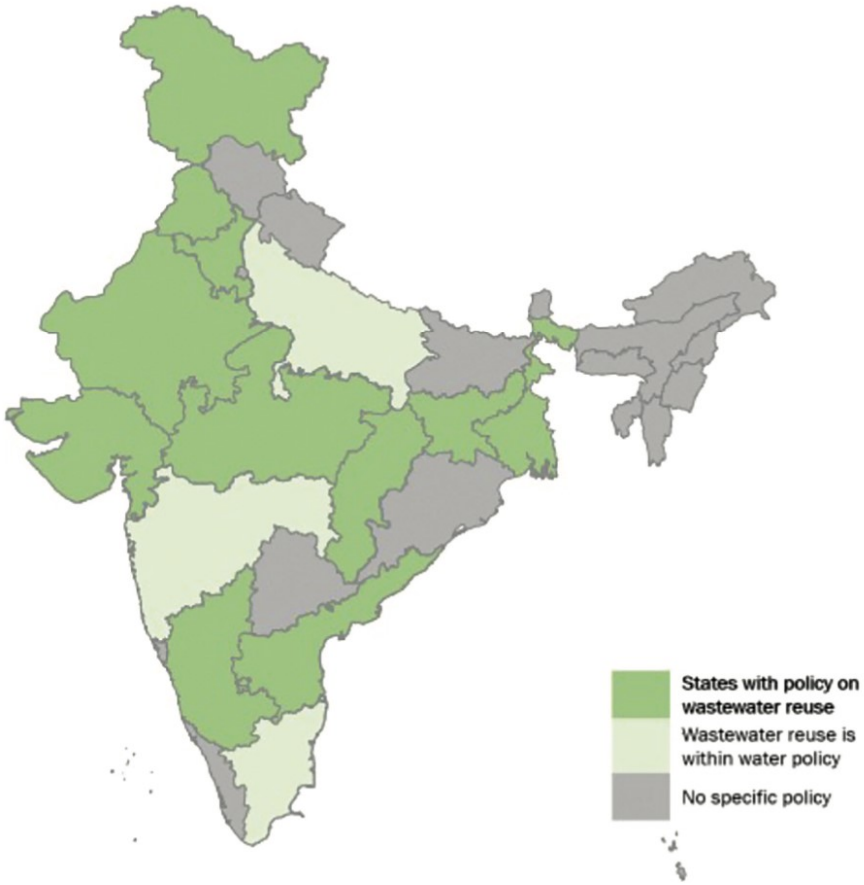
- **SBM 2.0** mandates that cities with populations under 100,000 must reuse at least 20 per cent of their treated wastewater as much as feasible.

- **AMRUT 2.0** aims for cities to recycle 20 per cent of their total water demand and 40 per cent of industrial water demand through treated wastewater.

- **NMCG's** (SRTW framework)
  - Operational Sewage Treatment Plants (STPs)—require 50 per cent reuse by 2025 and 100 per cent by 2050.
  - Non-operational STPs are not yet operational, the targets are 30 per cent by 2030, rising to 50 per cent by 2035 and 100 per cent by 2050.

State level policies for Reuse of treated wastewater

Map 1: Map showing states with and without policy on used water reuse[22]



11 States have a policy on Wastewater Reuse

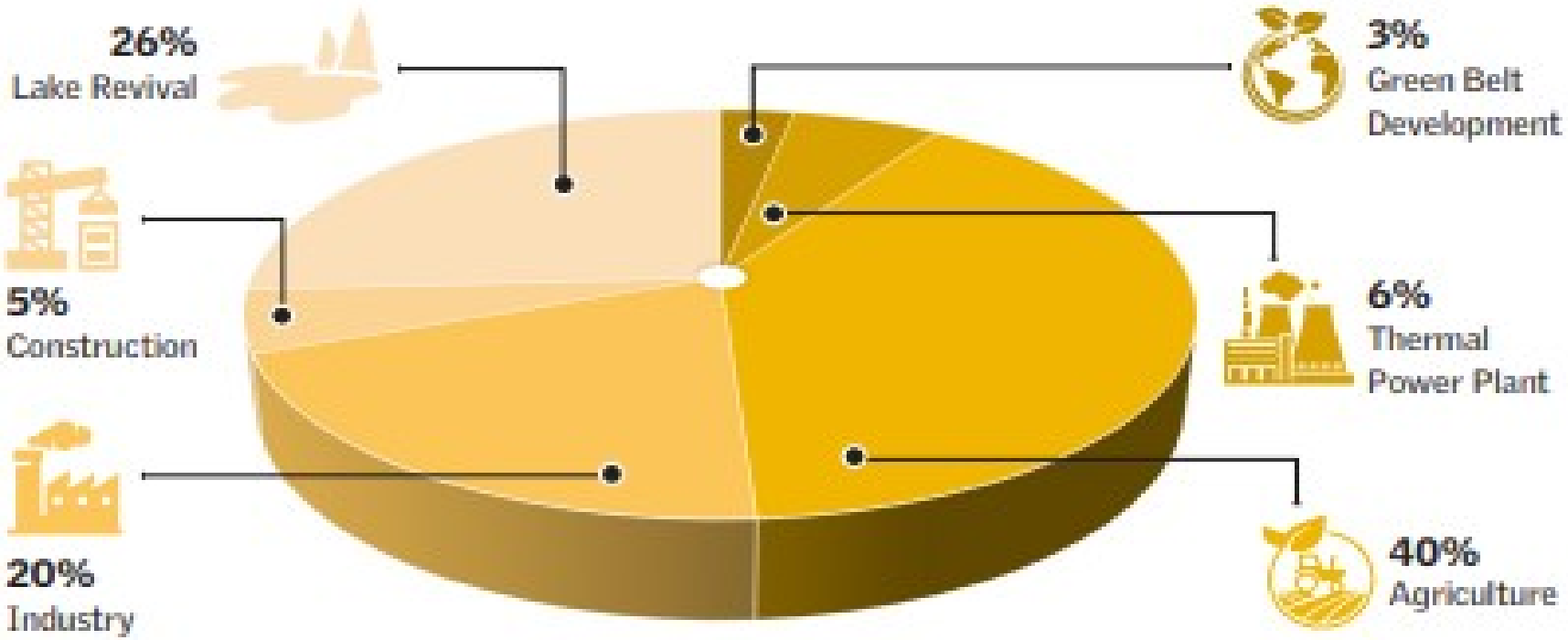
3 States have a policy within a Water policy

Waste to Worth study by CSE: major trends

State	Town	No. of STPs	Sewage generation (MLD)	Treatment Capacity (MLD)	Actual utilization (MLD)	Gap in Sewage generation and treatment (%)	Reuse of Treated Wastewater (%)
Haryana	154	180	1655	1965	1373	17	15
Delhi*	0	37	3600	3033	2587	28	49
Uttar Pradesh**	764	139	5500	4175	1100	80	NA
Rajasthan	210	118	1550	1299	950	39	29
Karnataka	281	I 77	3356	2677	2054	39	43
Tamil Nadu	528	104	3938	2350	1093	28	17
Maharashtra	400	152	10,547	7490	4317	59	17
			100%	76%	44%		

Waste to Worth study by CSE: reuse

Major reuse happening in agriculture followed by lake revival and industry.



Source: Based on CSE analysis

Reuse case study: Delhi

Reuse of treated wastewater under City of Lake Programme in Delhi.

Lake Recharge Programme Delhi

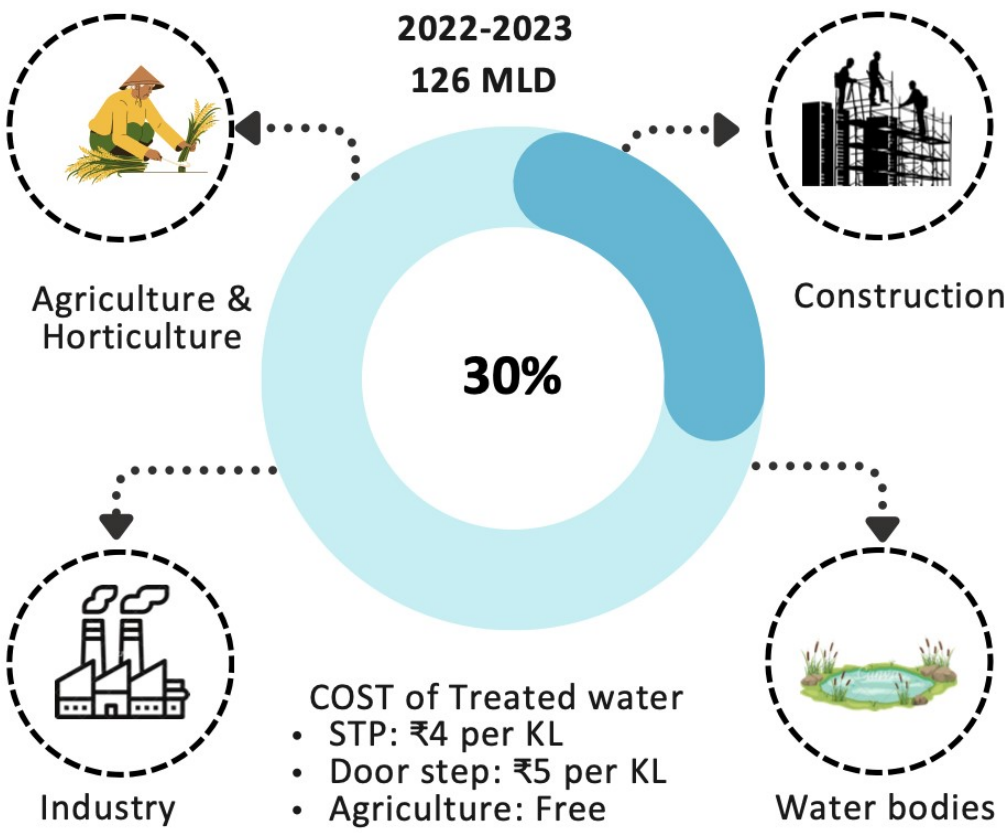
1. Pappankalan Sewage treatment Plant

Instead of discharging recycled water back into the Najafgarh drain, it was diverted to fill Pappankalan lakes 1 and 2, which can hold up to 55 million gallons of water.

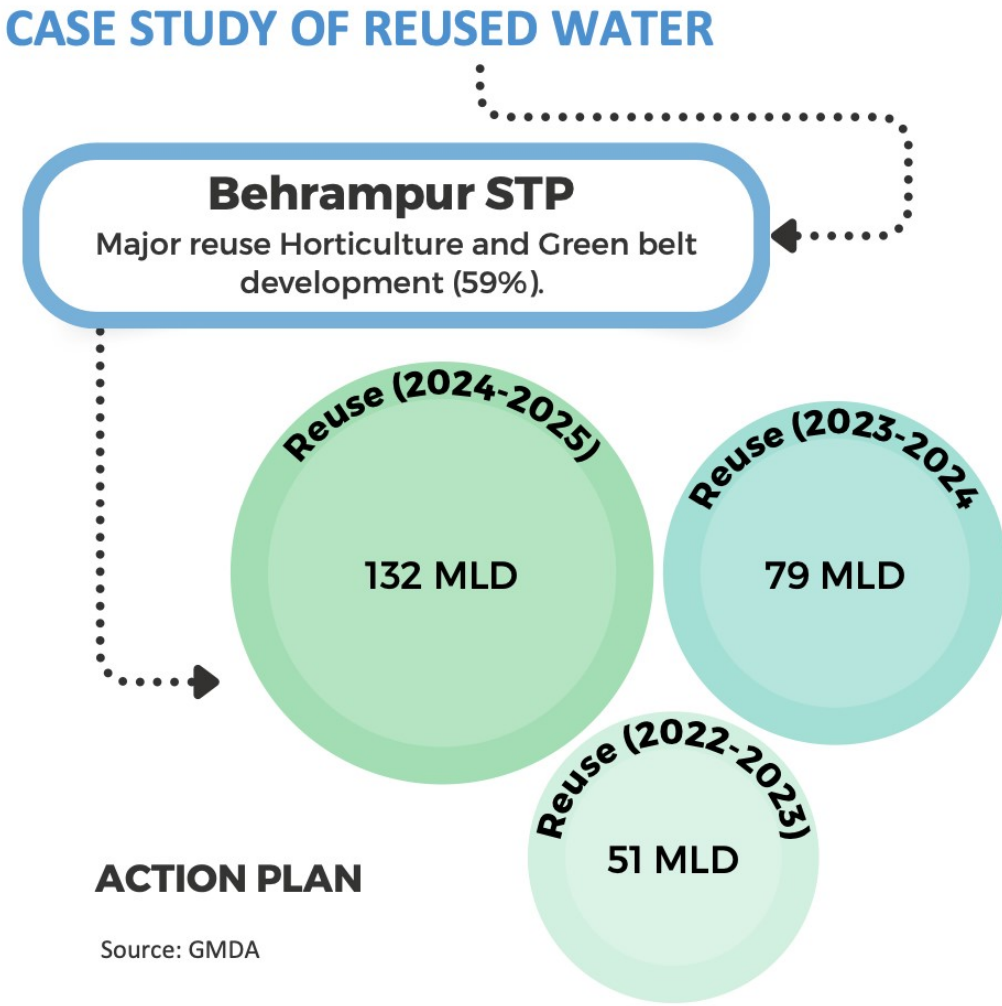
2. Nilothi Sewage treatment Plant

There are 3 lakes 3 lakes of 3.5 acres area, with total water holding capacity of 10 million galloons which is fed by Nilothi STP .

Reuse case study: Gurugram



Source: HWRA Order 15-07-2022



Source: GMDA

Reuse case study: Uttar Pradesh

Kanpur: Jajmau STP, 130 MLD and 43 MLD –

AGRICULTURE

10 villages for the agriculture purpose to irrigate 1,800 acres of farmland.

Due to the escape canal's elevation, the treated water reaches the fields of nearby farmers through gravity alone. Consequently, nearby farmers save on electrical/diesel pumping energy cost.

Mathura: Lakshmi Nagar STP, 14.5 MLD, 20 MLD and 16 MLD –

Lakshmi Nagar STP

Case study on re-use of treated water

The 8 MLD treated water from Laxmi Nagar STP is supplied at a rate of 8.7 Rs/KL to the IOCL refinery.

Reuse case study: Rajasthan

Beawar: Beawar STP, 5 MLD and 1.5 MLD –

Beawar Sewage Treatment Plants

Case study on re-use of treated water for for Industry and Agriculture

Reuse of Treated Water by Shree Cement Limited (SCL)

Earlier: SCL was Reliant on harvested water from abandoned open-cast mines, along with rainwater and groundwater borewells.

5 MLD Sewage Treatment Plant, Beawar, Rajasthan

Now: Treated water from Beawar STP I is stored in a 2 MLD capacity overhead tank within the SCL plant premises from where the water is pumped by SCL for their usage.

Reuse of Treated Water by Local Farmers

Treated water from Beawar STP II is supplied to nearby farmers through an escape channel and stored in a pond. During rainy season when no water is required for irrigation the treated water overflows and meets the Makreda river.

Udaipur: Eklingapur STP, 20 MLD, 25 MLD

Eklingpura Sewage Treatment Plant

Case study on re-use of treated water for Industrial use

Earlier: Domestic sewage was flowing unchecked into the Ahar River, a vital tributary of the Berach River.

Inlet point for receiving sewage water at Eklingpura STP, Kaladwas village, Udaipur

Now: Eklingpura STP (20+25 MLD) after treatment is storing TWW in two underground holding tanks, each with a capacity of approx. 2.5 MLD, after that TWW is pumped and transferred to the Dariba and Dorba Smelting complexes.

Hindustan Zinc Industrial complexes

Reuse case study: Karnataka

Bengaluru: K&C Valley STP, Madivala STP and Kadabesena Halli STP

- The wastewater is pumped from the 5 treatment plants through closed pipes,
- Covering a distance of approx. **53** km to reach Lakshmisagara Lake.
- From there, the wastewater follows the natural stream network, reaching subsequent lakes.
- The water is then stored in approx. 122 rain-fed tanks in the arid Kolar district

Re-use of treated water for Shallow Aquifer Recharge through lake recharge

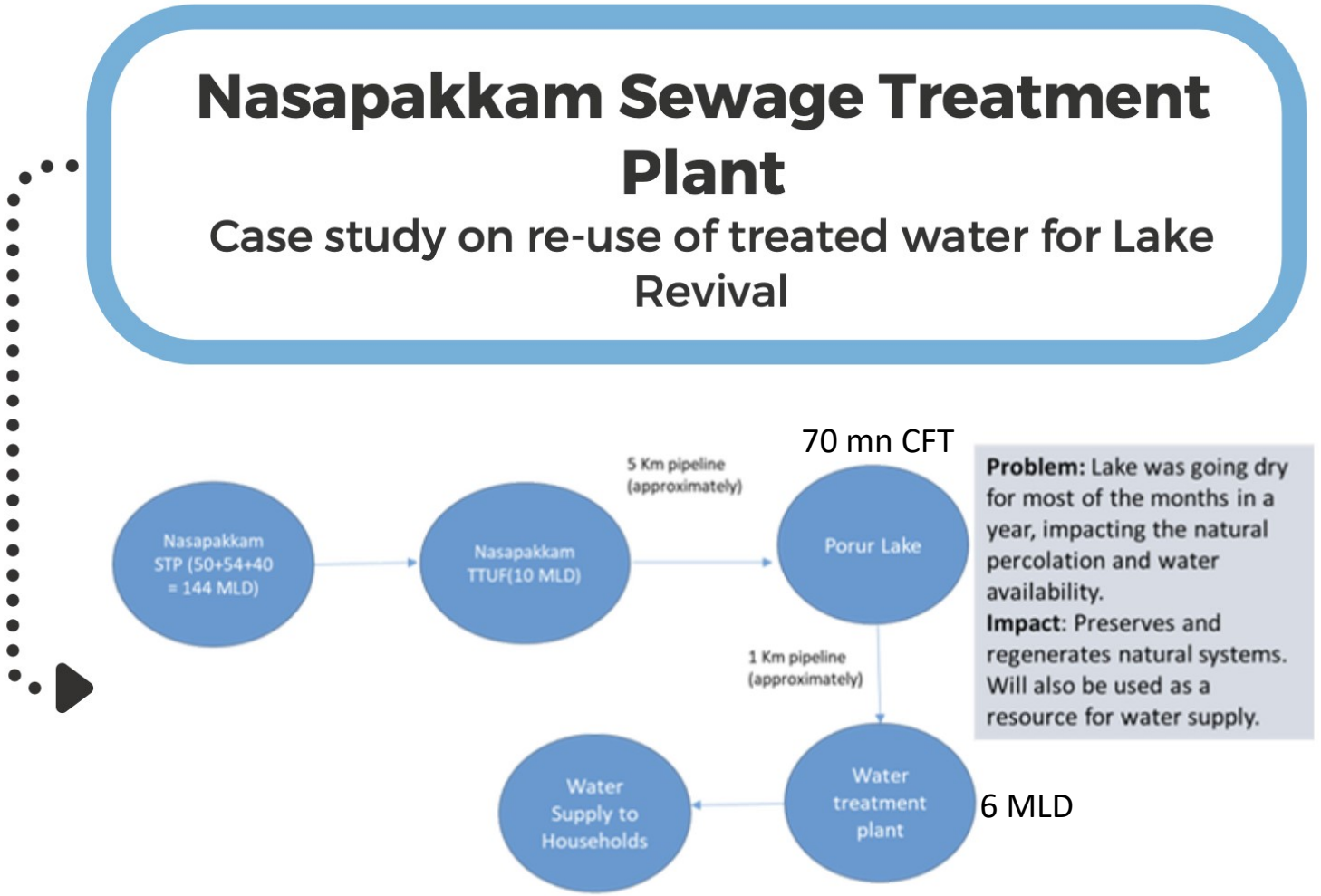
Koramangala-Challaghatta (KC) Valley Projects

Objective: To treat 440 million litres of sewage water per day and utilize it to recharge groundwater in the drought-prone districts of Kolar and Chikkaballapur.

Reuse case study: Tamil Nadu

Chennai: Nasapakkam STP, 10 MLD

CMWSSSB – strategy for ensuring water sustainability



Reuse case study: Maharashtra

Nagpur: Bhandewari STP, 130 MLD and 200 MLD –

NMC (sewage) + MAHAGENCO (payment) +NWWMPL(capex+opex) collaboration

Bhandewadi I STP

Case study on re-use of treated water for Thermal Power Stations

A total of 320 MLD of treated water is used by thermal power stations for the Koradi 660 MW units, old Koradi units, and Khaperkheda units.

·From 130 MLD – Entire treated wastewater is used by Koradi TPS.

·From 200 MLD STP – 90 MLD to Koradi TPS and 100 MLD Khaparkheda TPS and 10 MLD discharged to river.

Thermal Power Stations

Bhandewadi II STP

Case study on re-use of treated water for Thermal Power Stations

The project aims to supply the treated sewage to nearby thermal power plants (TPPs) for non-potable use.

Standards

S. no.	Parameters	General norms[1] 1986				Draft norms November 2015**	MoEFCC Notification, October 2017**	NGT order 2019** (for mega and metropolitan cities)
		Inland surface water	Public sewers	Land irrigation	Marine coastal areas			
1	BOD [mg/l]	30	350	100	100	< 10	< 30 < 20 (metro cities)	<10
2	COD [mg/l]	250	–	–	250	50	Not more than 50 (for new STP design)	< 50
3	TSS [mg/l]	100	600	200	100 process water 10% of influent cooling water	< 20	< 100 < 50 (metro cities)[2]	< 20
4	TKN [mg/l]	100	–	–	100	< 10	Not more than 10 (for new STP design)	< 10
5	NH3-N [mg/l]	50	50	–	50	< 5	Not more than 5 (for new STP design)	–
6	Dissolved phosphorus [mg/l]	5	–	–	–	–	–	<1
7	Faecal coliform [MPN/100ml]	–	–	–	–	< 100	< 1000	Permissible < 230

Source: NGT 2019, MoEFCC 1986, 2015 and 2017

1. The standards set in 1986 cover 33 parameters, which are not depicted in this table.
2. Metro cities, all state capitals except for the states of Arunachal Pradesh, Assam, Manipur, Meghalaya Mizoram, Nagaland, Tripura Sikkim, Himachal Pradesh, Uttarakhand and Jammu and Kashmir and the Union Territories of Andaman and Nicobar Islands, Dadar and Nagar Haveli Daman and Diu and the Lakshadweep areas/regions.

** Standards applicable for discharge into waterbodies and land disposal/applications, while reuse is encouraged.

Sl. No.	Industry	Parameters	Standards (Applicable to all mode of disposal)			
1	2	3	4			
	Sewage Treat-ment Plants (STPs)		Mega and Metropolitan Cities	Class I Cities	Others	Deep Marine Outfall
		pH	5.5-9.0	5.5-9.0	5.5-9.0	5.5-9.0
		Bio-Chemical Oxygen Demand (BOD)	10	20	30	30
		Total Suspended Solids (TSS)	20	30	50	50
		Chemical Oxygen Demand (COD)	50	100	150	150
		Nitrogen-Total	10	15	-	-
		Phosphorus-Total(For Discharge into Ponds, Lakes)	1.0	1.0	1.0	
		Fecal Coliform (FC) (Most Probable	Desireable-100 Permissible-	Desireable-230 Permissi	Desireable-1000 Permissible-	Desirable-1000 Permissibl
		Number per 100 mililiter, MPN/100 ml	230	ble-1000	10,000	e-10,000

Note:

(i) Mega-Metropolitan Cities have population more than 1 crore, Metropolitan Cities-Population more than 10 Lakhs and Class-1 Population more than 1 Lakh.

(ii) All value in mg/l except for pH and Fecal Coliform.

(iii) These standards will be applicable for discharge into water bodies as well as for land disposal/applications.

(iv) These Standards shall apply to all new STPs for which construction is yet to be initiated.

(v) The existing/under construction STPs shall achieve these standards within 07 years from the date of notification.

(vi) In case where the marine outfall provides a minimum initial dilution of 150 times at the point of discharge and a minimum dilution of 1500 times at a point 100m away from discharge point, then norms for deep sea marine discharge shall be applied.

(vii) Reuse/Recycling of treated effluent shall be encouraged.

(viii) State Pollution Control Boards/Pollution Control Committees may make these norms more stringent taking into account the local conditions.

"

Standards

Norms of treated sewage quality for specified activities at point of use (modified) (CPHEEO)- Dec 2023

S. No.	Parameter	Toilet Flushing	Fire protection	Vehicle Exterior washing	Recreational use (bathing etc.)	Non-contact impoundments (tanks, lakes etc.)	Landscaping, Horticulture & Agriculture			
							Horticulture, Golf course	Non edible crops	Crops	
									Crops which are eaten	
									Raw	Cooked
1	Turbidity (NTU)	<2	<2	<2	<2	<2	AA	AA	AA	AA
2	SS	AA	AA	AA	AA	AA	AA	AA	AA	AA
3	TDS	2100								
4	pH	6.5 to 8.5								
5	Temperature	Ambient								
6	Oil & Grease	10	nil	nil	nil	nil	10	10	nil	nil
7	Total Nitrogen as TN	10	10	10	10	10	AA	AA	AA	AA
8	BOD	≤6	10	≤6	≤6*	10	≤6-10 (≤6 preferred)			
9	COD	AA	AA	AA	AA	AA	AA	AA	AA	AA
10	Total Phosphorous as TP	1	1	1	1	1	AA	AA	AA	AA
11	Minimum Residual Chlorine	1	1	1	≤0.5	0.5	nil	nil	nil	nil
12	Faecal Coliform in 100 ml	nil	nil	nil	≤50	100	nil	100	nil	≤50
13	Helminthic Eggs/ litre	AA	AA	AA	AA	AA	AA	<1	<1	<1
14	Colour (Colour or Hazen units)	Colourless						AA	Colourless	
15	Odour	Aseptic which means not specific and no foul odour								

All values are in mg/l except for Turbidity, pH, Temperature, Faecal Coliform, Helminthic Eggs, Colour and Odour.

AA- as Arising when other parameters are satisfied.

*CPCB prescribes BOD less than 3 mg/l in water body for recreational purpose. Adequate storage shall be maintained in the water body for dilution to maintain 3 mg/l.

Learning and recommendation

Treatment, Compliance and Monitoring

- Significant gap of 49% remains between wastewater generation and available treatment capacity.
- 17% of the total treated capacity complies with established treatment standards.

Standards for Reuse

- the absence of reuse of treated water standards is a major hurdle towards reusing of treated water.
- Standards for reuse should be tailored to the specific purpose of use, and not on a one-size-fits-all approach.

Potential and constraints of scaling up of reuse of treated wastewater

- Only a limited number of states have made significant progress in promoting reuse practices that too in big cities
- Gurugram - 50% of the total treated water generated, 69% is being reused only in in Bengaluru, Chennai alone accounts for 58% of the treated water reuse

Need for appropriate State-Level Policies developed through public engagement

- States need to define re use priorities first, have extensive public outreach and consultation processes in place,

Learning and recommendation

Defining re use priorities, action plans – potential and constraints

- State policy on reuse when complemnented with action plan has proven to be an effective strategy

Standards for Reuse

- the absence of reuse of treated water standards is a major hurdle towards reusing of treated water.
- Haryana reuse at 80% by 2030, Delhi 80% by 2027.

Effective governance model needed

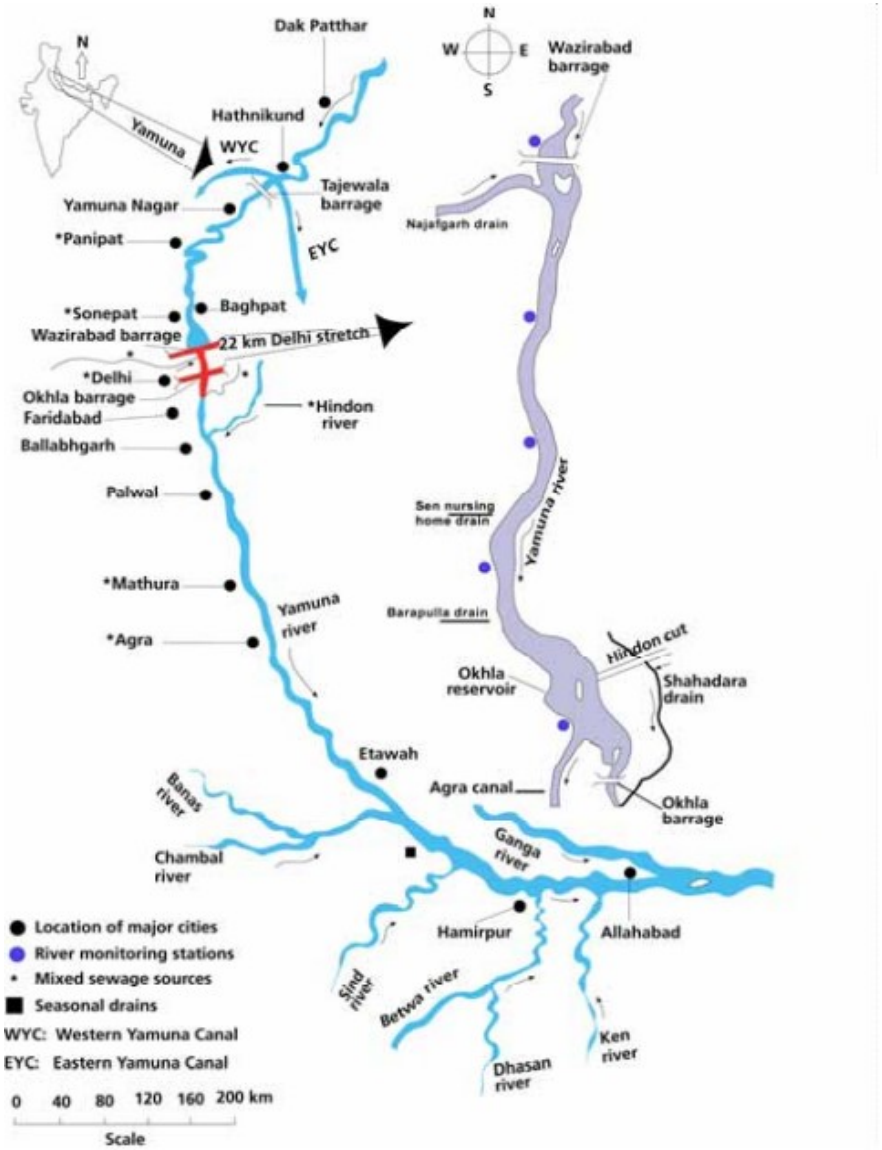
- effective and transparent institutional set up is required

Local treatment and local reuse priority

- The case studies of Delhi and Bangalore demonstrate the implementation of decentralized STPs located in different parts of the cities.
- eliminates the necessity for constructing extensive and often costly reuse infrastructure.

The Yamuna Story

- **1376 km long**
- **22-km** stretch of the Yamuna in Delhi - barely two per cent of the total length of the river basin
- Contributes over 80 per cent of the pollution load in the entire river
- High on Govt. priority: Rs 6857 crore in just 4-5 years (2017-2022) – much more



High on government priority

Yamuna Action Plan 2025: all elements covered and included

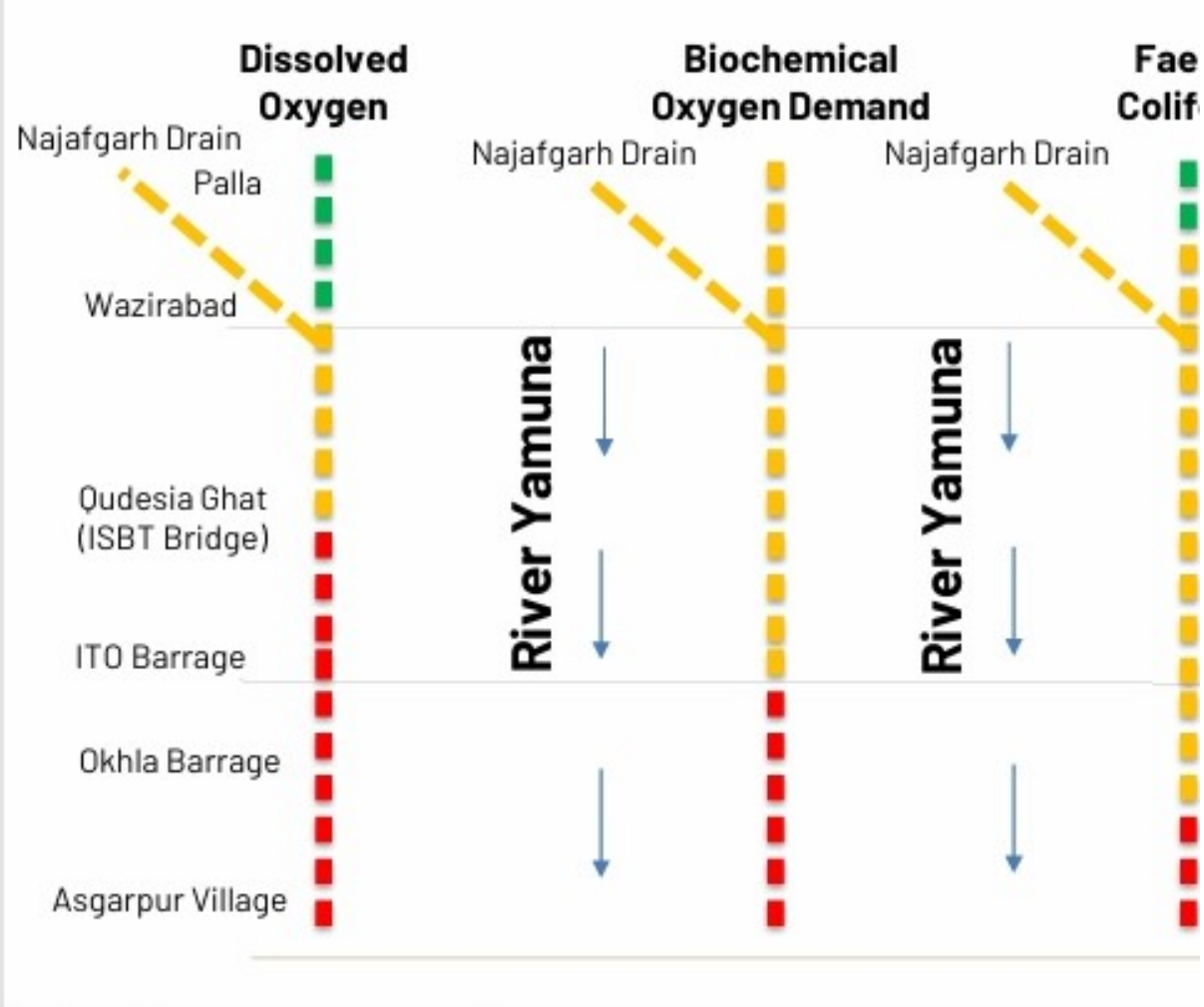
The focus of the Yamuna Action Plan is as follows:

1. Build Sewage Treatment Plants (STPs) so that domestic wastewater is intercepted and then treated at these plants
2. Improve the quality of treatment so that STPs discharge 'clean' treated water
3. Build interceptor sewers to tap drains and divert sewage
4. Lay sewage pipelines in unauthorized colonies
5. Treat industrial waste in common effluent treatment plants

All good ideas; all needed. Then why is Yamuna polluted?

No visible improvement in river quality

- When Yamuna enters Delhi it is alive – dissolved oxygen (DO) is close to standard prescribed
- By the time it reaches first monitoring station at ISBT it is 'dead' – DO is zero
- Delhi Pollution Control Committee (DPCC), 2024 record says dissolved oxygen in midstream and downstream areas was nil even during monsoons
- Biochemical oxygen demand (BOD) was 40-50 times higher than the permissible limit at these points
- Faecal coliform (FC) counts reached over two lakh in the downstream point during dry spells



Then, what is the problem

Problem	
1. Estimation of 100% wastewater	• Population * X lpcd • Water loss • Unauthorized settlements
2. Does not account for sewage from unauthorized and informal settlements	• Governance / FSSM • Register/track all desludging vehicle movement etc.
3. Mixing of treated and untreated sewage in drains	• Reuse plan
4. Technology upgradation	• Quality vis-a-vis reuse: only after the reuse plan is ready
5. Treating all drains equally	• Prioritise drains with high load/contribution

Recommendations

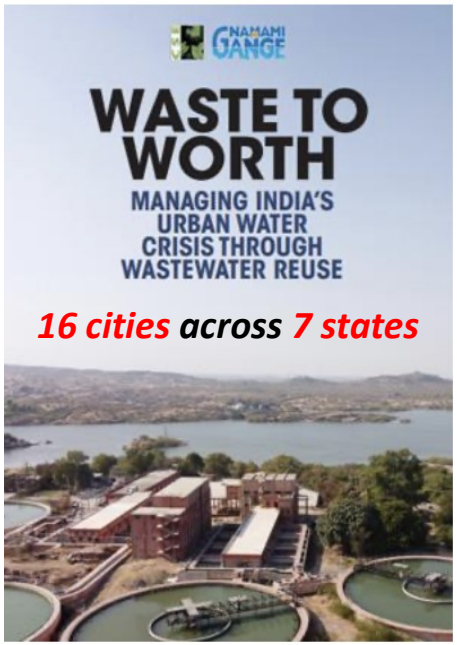
- Ensure wastewater of all households is treated – 100%
  - interception/drains or tankers
- Make plan for each STP treated water – where it is going/focus on reuse
- Only if the treated wastewater is discharged directly into the river, then should standards be stringent
- Focus on the outlet of each drain – do not measure only quality but also quantity, as load matters.

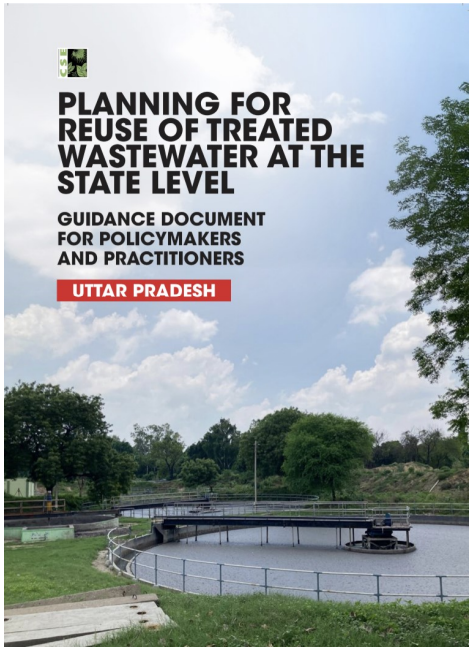
We all live downstream

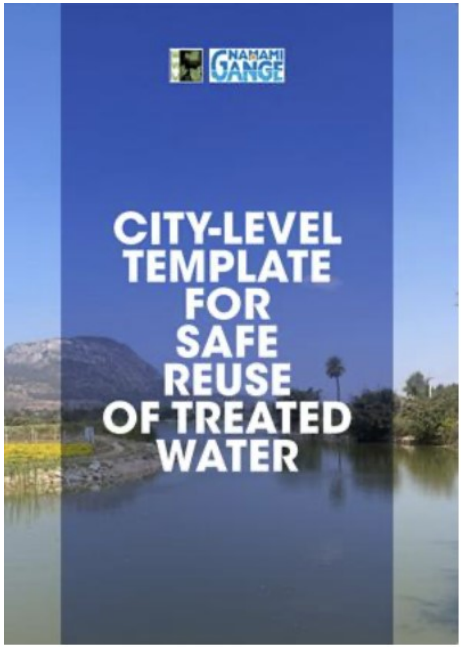
What we do to our downstream
Our upstream will do to us

CSE's work on the Reuse of treated wastewater

Support to States in preparing Policy on Reuse of Treated Water







Thank you

Our priority

1. Recognise treated wastewater as a critical resource to address urban water stress,
2. Integrate wastewater reuse into climate adaptation strategies,
3. Integrate scope of reuse from the inception phase of planning any STP
4. Scale decentralised systems to bridge gaps in existing infrastructure and
5. Encourage stakeholder collaboration to develop actionable frameworks