Landscape Review and Strategic Roadmap for Used Water Management in Maharashtra

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Landscape Review and Strategic Roadmap for Used Water Management in Maharashtra

Used water management strategy for Maharashtra was prepared by the Center for Water and Sanitation (CWAS), at the Centre for Research and Development Foundation (CRDF), CEPT University in partnership with Urban Innovation lab to support State and Local government of Maharashtra to strengthen the ecosystem for usedwater reuse.

Acknowledgements

In 2021, the Government of India launched SBM 2.0, bringing a special focus on used water management in Indian cities. There's an increasing focus on environmental, social, and financial sustainability in urban sanitation. Cities are expected to design and implement solutions for treatment and reuse of used water. The challenges are multi-fold in class II and class III towns, with limited infrastructure and resources. The Government of Maharashtra (GoM) is keen to explore ways in which measures for reuse of used water can be implemented more effectively, especially in towns with a population of 1,00,000 or less.

The Centre for Water and Sanitation (CWAS) at CEPT Research and Development Foundation (CRDF), CEPT University has been working closely with the Urban Development Department (UDD), Government of Maharashtra (GoM) in the areas of urban water and sanitation. CWAS in partnership with Urban Innovation conducted a landscape study of reuse of used water in the state of Maharashtra. The purpose of the study is to understand lessons and challenges associated with reuse in class II and III cities. It suggests policy, programme and project level measures that state and local governments can undertake.

The study included reviewing and analyzing the policy and regulatory ecosystem at central, state and ULB levels; assessing potential reuse; examining case studies of reuse at national and global levels; examining opportunities and issues associated with the reuse in terms of policy, technology, finances, institutional structure, and contractual framework, among others; and creating a strategy and roadmap for Reuse of Used Water.

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Center Heads, CWAS

Abbreviations

AMRUT	Atal Mission for Rejuvenation and Urban Transformation
CPCB	Central Pollution Control Board
CPHEEO	Central Public Health and Environmental Engineering Organisation
CSR	Corporate Social Responsibility
FSSM	Faecal Sludge and Septage Management
FSTP	Faecal Sludge Treatment Plant
GOI	Government of India
IEC	Information, Education and Communication
JJM	Jal Jeevan Mission
KL	Kilo Litre
M&E	Monitoring & Evaluation
MLD	Million Litres per Day
MOHUA	Ministry of Housing and Urban Affairs
MSME	Ministry of Micro, Small & Medium Enterprises
NGT	National Green Tribunal
NMCG	National Mission for Clean Ganga
O&M	Operation & Maintenance
PPP	Public Private Partnership
SBM	Swachh Bharat Mission
SDG	Sustainable Development Goal
SLBs	Service Level Benchmarks
SPCB	State Pollution Control Board
STP	Sewage Treatment Plant
TDS	Total Dissolved Solids
TSS	Total Suspended Solids
TUW	Treated Used Water
ULB	Urban Local Body

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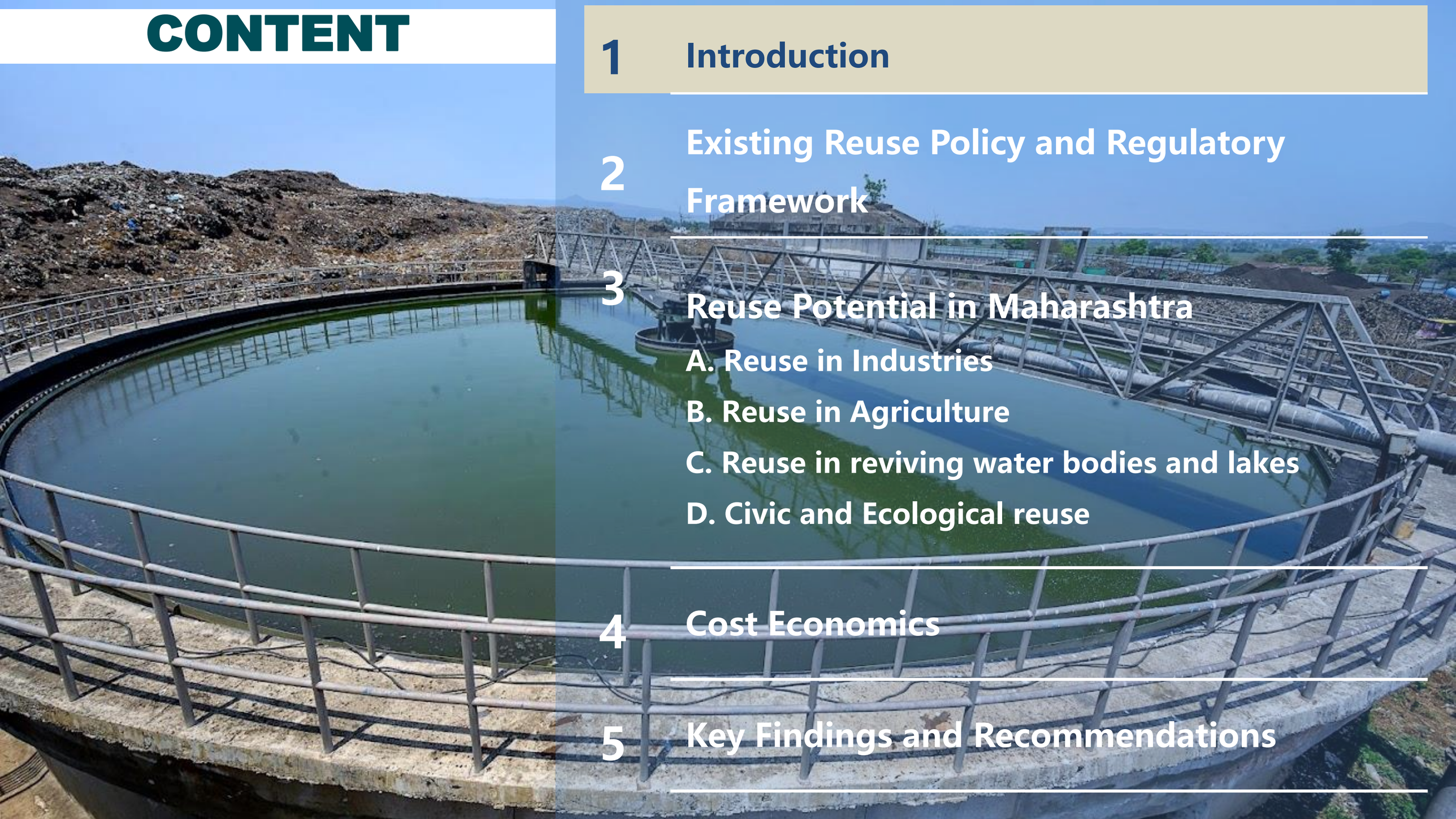


Background and Context

Maharashtra is home to 9% of India's population. The urban and rural areas, along with agriculture and industries are dependent on freshwater and groundwater resources. Agriculture is the major consumer of water with net demand of 84 billion cubic meters (bcm) per year which is about 95% of the total water demand, followed by potable water demand (urban and rural) at about 4%, and industrial sector demand at 1%.

Maharashtra is facing a water emergency of unprecedented proportions. Following years of drought, the rivers' currents have ebbed, water in dams and reservoirs has depleted and over-exploitation of groundwater has raised concerns over the long-term availability of water. Record number of tankers are sole source of water in large parts of state. It has resulted in late monsoons following a deficit year, depleting groundwater in 279 talukas, under 10% live storage in 13 key reservoirs.

24 of 34 districts

face water shortage in Maharashtra

2,500+

Tankers deployed in water scare regions

Only 5.5%

Of the live capacity of 17 major reservoirs (14.073 bcm) is stored.

3m lesser than average

Out of Maharashtra's 353 talukas, 279 have experienced depletion in ground water levels.

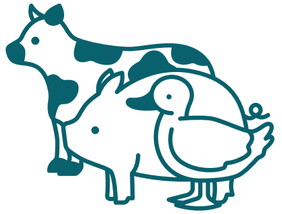
27% Rainfall shortage experienced in Maharashtra.

15,000+

Villages and hamlets affected

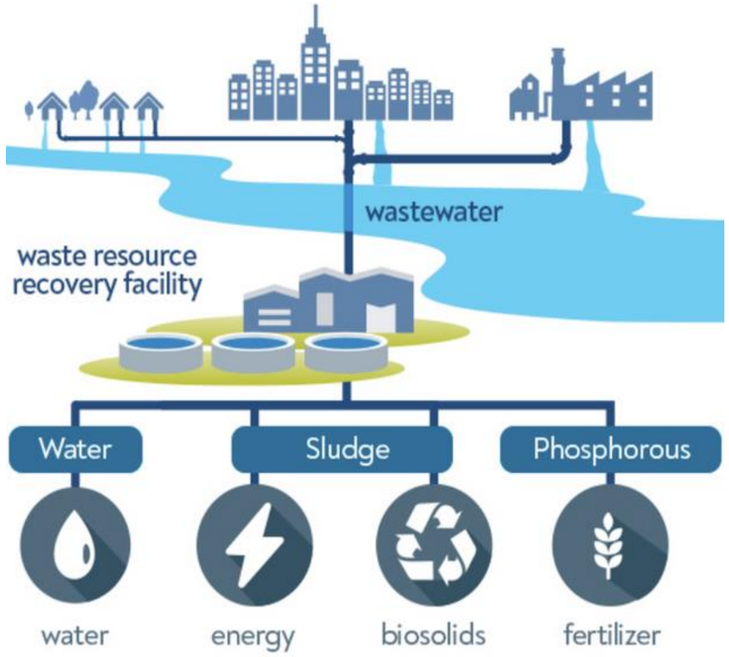
Over 11 lakh

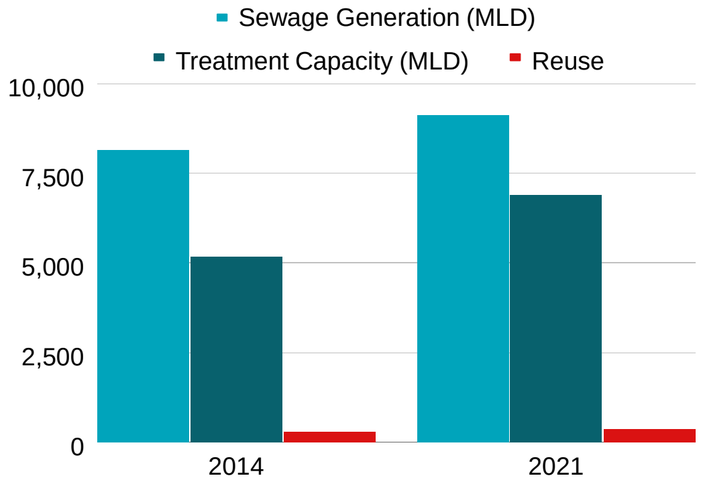
Livestock affected due to water shortage



Need for Used water Management Plan

Used water management can combat challenges of water stress. Used water is seen as a burden, whereas it is a resource to tackle water scarcity and security challenges. Not just used water, but it's byproducts can also be used for many residential, industrial, and agricultural uses (World Bank, 2020).





But, used water is not properly collected, treated or reused in Maharashtra. Maharashtra treats 18% more of its used water than national figures, but reuses 1% lesser than India, and 7% lesser than global figures.

Region	Number of STPs	Treated %	Reuse %
World	58,502	52%	11%
India	1,631	28%	5%
Maharashtra	154	46%	4%

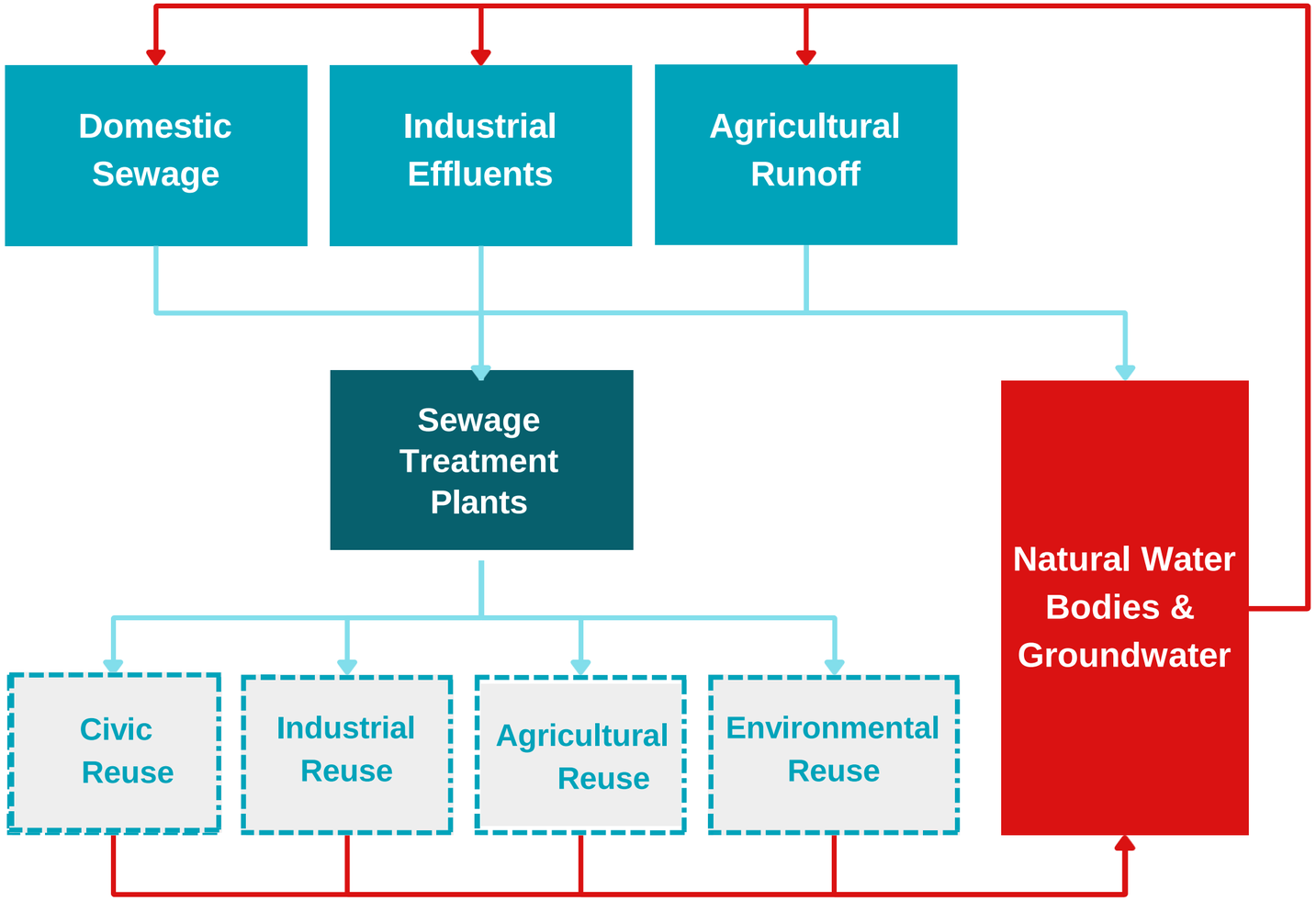
Need and Opportunity for Reuse

The problem is, users do not find an incentive to use treated used water against freshwater. There is also no regulatory mandate that necessitates reuse of treated used water.

There is a policy gap for a distinct regulatory framework which leads to water resources mismanagement. There are also no predetermined consequences.

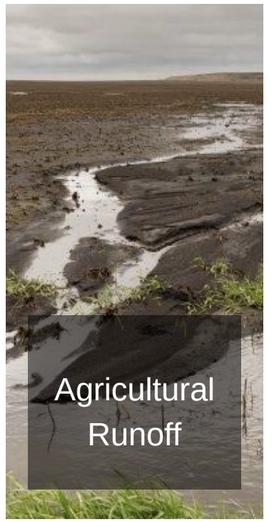
The social, economic, and ecological effects from usedwater open up a plethora of challenges, which has the power to not only cripple the economy but also pose major health risks and cause mayhem to the environment. For these reasons, a strategic roadmap for used water management is required.

Used Water Cycle in Maharashtra



1. **Domestic Sewage** from ULBs is either treated at Sewage treatment plants or dumped in natural drains or water bodies
2. **Industrial Effluents** are either treated within industries (ZLD), or are dumped into natural water bodies.
3. The **Agricultural Runoff** is collected and gets dumped into natural water bodies.
4. **STPs** collect used water from natural drains or sewage pipes to treat and send for reuse, or throw it back to natural water bodies.
5. **Treated Water** reaches to civic users (bulk users like construction, airport, railways, etc.), industrial users (cooling towers for power plants, textiles, automobiles, etc.), agricultural reuse, and recharge of natural water bodies and groundwater.
6. Fresh water from **Natural water bodies and groundwater** is extracted for use for different purposes .

Sources and Types of Used Water in Maharashtra

Sources of Used Water	Households, Offices and Institutions	Hotels, Railways, Construction	Commercial Establishments	Stormwater	MSMEs	Heavy Industries and Power Plants	Irrigation and Agriculture
Types of Used Water	 9107 MLD* Domestic Sewage				 1706 MLD Industrial Effluents		 Agricultural Runoff

* Million Litres per Day (MLD)

Only 4% of total used water generated is being reused in Maharashtra!

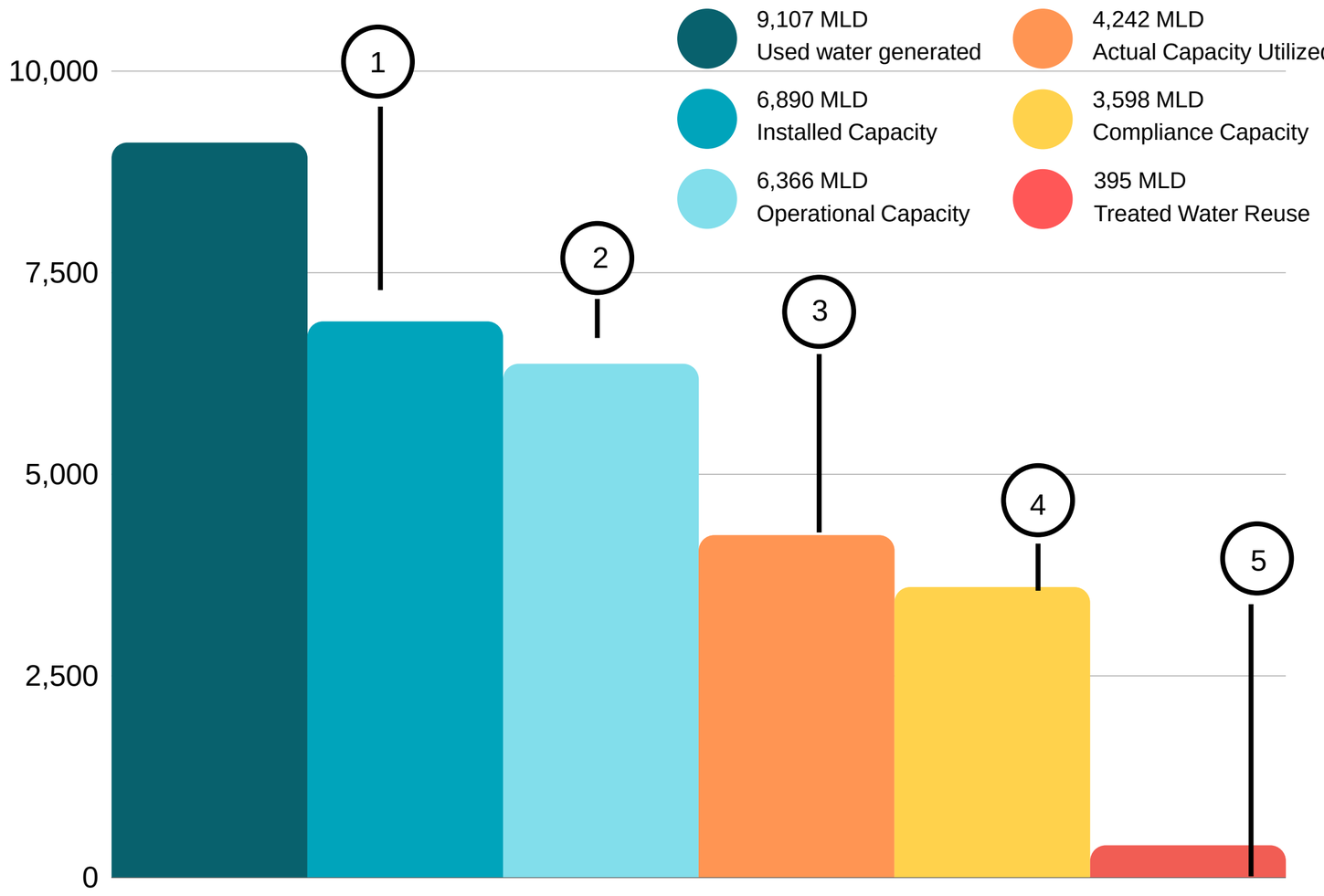
55% of used water in Maharashtra goes untreated and dumped in natural water bodies like nearby nallahs or rivers.

By observing the graph, there are five visible gaps with treatment capacities and reuse.

1. Installed capacity can collect 76% of total used water generated.
2. 92% of installed capacity is operational.
3. 66% of operational capacity is actually utilized.
4. Estimated 84% of actual treated used water (105 STPs) is compliant with MPCB norms.
5. Only 4% of used water generated is reused.

The reused water is being utilized for irrigation, gardening, and road cleaning.

Other states like Delhi -12.5%, Haryana- 16%, Madhya Pradesh- 4%, Tamil Nadu- 6.6%, Chandigarh- 16%, Puducherry- 26% are reusing water for various purposes.



Used Water Statistics for Maharashtra 2021

SOURCE: CPCB, 2021 National Inventory of Sewage Treatment Plants Pg-41 Link

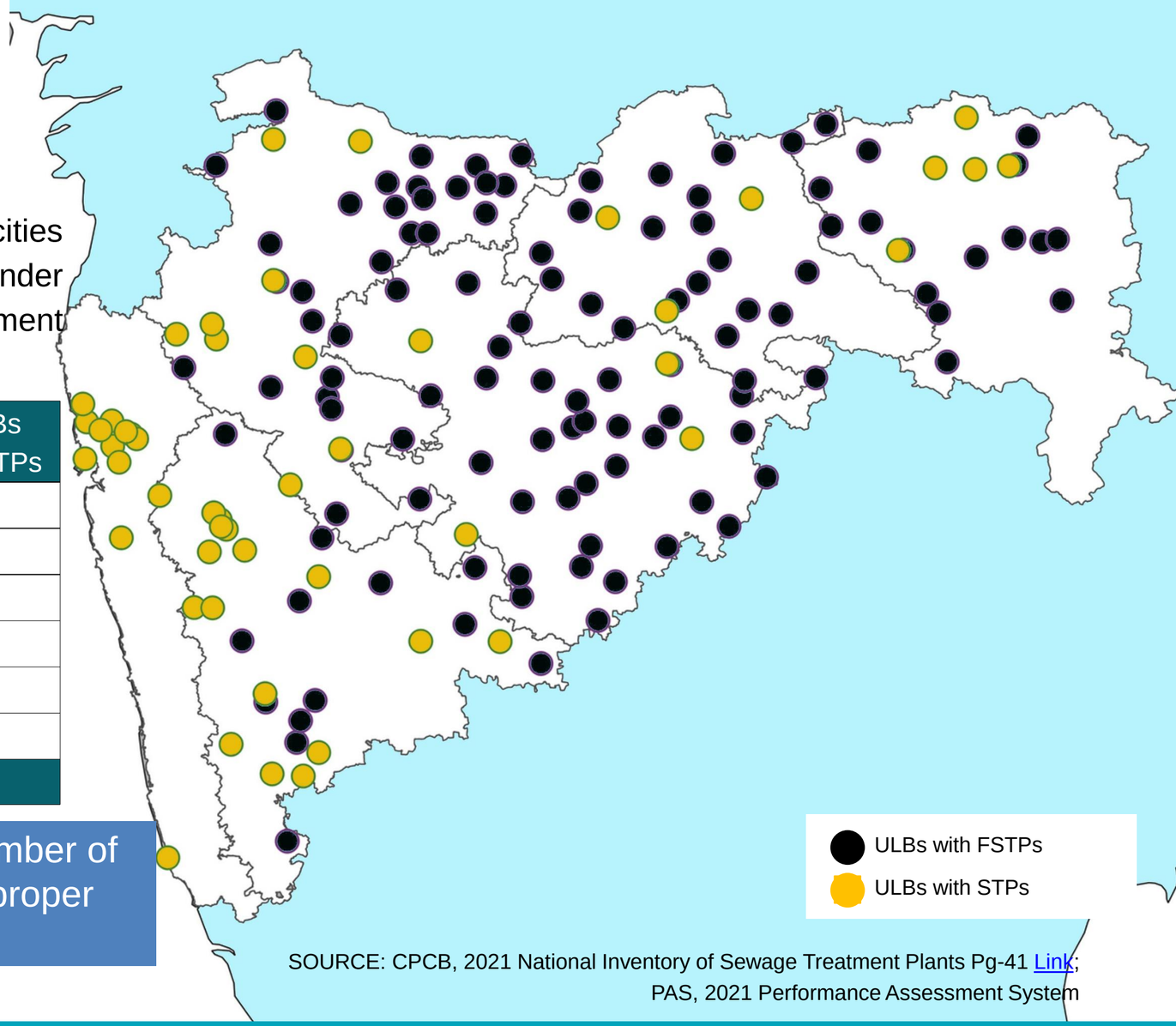
50 ULBs in Maharashtra have an existing STP, whereas 311 ULBs have an existing or proposed FSTP.

311 of 414 ULBs have an existing or upcoming FSTP. 219 cities have already constructed FSTPs and 47 cities have FSTPs under construction. There are existing 41 cities with Sewage Treatment Plants (STPs) and other 9 cities have STPs under proposal.

Division	ULBs with STPs	ULBs with FSTPs	Total ULBs	% ULBs with STPs	% ULBs with FSTPs
Amravati	3	50	58	5	86
Aurangabad	4	74	79	5	94
Konkan	12	35	66	18	53
Nagpur	5	60	72	7	83
Nashik	9	54	67	13	80
Pune	17	38	72	24	52
Total	50	311	414	12	75

Maharashtra is doing better than other states with large number of small urban local bodies (ULBs) covered with FSTP and proper treatment and reuse of septage and sludge .

ULBs with STPs and FSTPs in Maharashtra, 2021



SOURCE: CPCB, 2021 National Inventory of Sewage Treatment Plants Pg-41 Link;
PAS, 2021 Performance Assessment System

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Water and Used Water is a state subject

7th Schedule (Article 246)
List II - State List
Entry 17: Water, that is to say, water supplies, irrigation and canals, drainage and embankments, water storage and water power subject to the provisions of entry 56 of List I.

List I - Union List
Entry 56: Regulation and development of inter-state rivers and river valleys to the extent to which such regulation and development under the control of the Union is declared by Parliament by law to be expedient in the public interest.

12th Schedule (Article 243W)
Entry 5: Water supply for domestic, industrial and commercial purposes.
Entry 6: Public health, sanitation conservancy and solid waste management.

Water (and used water) is a state subject

Parliament can legislate regulation and development of inter-state waters in the larger public interest. State retains the autonomy to frame laws regarding the use of water within the State on matters like water supply, irrigation, drainage and embankments, water storage, etc., if and only if it aligns with the legislation of Parliament.

Role of central government comes into play on inter-state matters.

Central government can play role of an enabler through funding, policy and programmes. However, central government cannot direct implementation of local measures.

ULBs have functional mandate but lack fiscal powers.

The Bombay Provincial Municipal Corporations Act, 1949 clearly defines the roles and responsibilities of corporations for used water management, and also gives powers to establish and maintain the drainage systems. However, there is no mention of any fiscal power.

There is also a significant lack of funds from sewerage tax for STPs.

There are insufficient funds to carry out functions in used water management.

STP Costing	Cost (crores)
Capital Cost (1 crore/MLD)	9,102
O&M Cost (630.6 PCOM/annum)	7,876
Municipal Finance for Maharashtra	
Sewerage/Drainage Tax (2019 - 20)	1,367

The existing legal framework is more provisional than regulatory.

Acts, Bills and Rules Policies, Programmes and Plans

1974	Water (Prevention and Control of Pollution) Act
1977	Water (Prevention and Control of Pollution) Cess Act
1985	Ganga Action Plan I
1986	The Environment (Protection) Act
1988	Water (Prevention and Control of Pollution) Amendment Act
1989	The Environment (Protection) Rules
1993	Ganga Action Plan II
2006	The National Environment Policy
2006	Service Level Benchmarks (SLBs) of MoHUA
2008	National Urban Sanitation Policy
2011	The National Water Mission
2012	National Water Policy of India
2015	Namami Gange
2016	The Model Bill for Regulation of Groundwater Development
2016	Guidelines of National Building Code
2016	Tariff Policy
2017	National Faecal Sludge and Septage Management Policy
2021	Atal Mission for Rejuvenation and Urban Transformation 2.0
2021	National Framework on the Safe Reuse of Treated Water
2022	Swachh Bharat Mission-Urban 2.0

There is no specific national policy for ‘Reuse of used water’.

There are various acts and policies that address issues related to water pollution, incentivization of STPs, and prescription of sewage discharge standards. But none specifically discusses how to address or ensure used water management (NITI Aayog, 2022). Out of an estimated 33,000 MLD of sewage generated, only 7000 MLD is being collected and treated (India Water Portal, 2020). The National Water Policy also suggests integrating and executing urban water supply and sewage treatment schemes simultaneously. It does not recognize used water management process.

However, SBM 2.0 and AMRUT 2.0 have triggered new funding support for used water management.

The latest policies have allocated central and state funds for sewerage and septage management projects in India.

Used Water Management Parameter	AMRUT 2.0	SBM 2.0
Recognizes Used Water Management	Yes	Yes
Allocated central and state funds	Yes	Yes
Roles of Centre, state and ULBs identified	Yes	Yes
Target for reuse	20% city; 40% industry	Not below 20%
Used water management projects elgible	Yes	Yes
Mission Sanctioning and Monitoring Process	Yes	Yes
Implementation Strategy	Yes	Yes
Treatment Technology	No	Yes
Reuse process and management	No	No

SOURCE: Urban Wastewater Scenario in India, NITI Aayog 2022

Global and national indices have also not helped to emphasize used water

Reuse is not an indicator for the SDG Index.

In the SDG India Index report prepared by NITI Aayog, there are no indicators that specifically discuss used water management, extent reuse, reuse options and practices, or any other indirect indicator that emphasizes used water management.

The only indicator in the index is percent of industries complying with CPCB treatment norms. It would have been useful to understand STPs in India that comply with norms and standards of respective pollution control boards.

Performance Indicators for Maharashtra 2019 - 2020, SDG India Index 3.0

SDG 6: Clean Water and Sanitation	2019	2020
Rural population getting drinking water within premises through PWS (%)		64.39
Rural population having improved source of drinking water (%)	96.20	99.70
Individual household toilets constructed against target (%)	100.00	100.00
Districts verified to be ODF (%)	100.00	100.00
Schools with separate toilet facility for girls (%)	99.01	96.80
Industries complying with CPCB waste water treatment norms (%)	84.49	92.36
Ground water withdrawal against availability (%)	54.62	54.62
Blocks/mandals/taluka over-exploited (%)	3.12	3.12

Box 4

Composite Water Management Index.

The National Institute for Transforming India (NITI) Aayog has developed the Composite Water Management Index (CWMI) to enable effective water management in Indian states in the face of this growing crisis. The Index comprises nine themes (each having an attached weight), covering groundwater and surface water restoration, major and medium irrigation, watershed development, participatory irrigation management, on-farm water use, rural and urban water supply, and policy and governance.

In theme 8: Urban water supply and sanitation, there are four indicators that recognize used water related aspects.

- 23 (a): Total estimated generation of waste water in the urban areas.
- 23 (b): Capacity installed in the state to treat the urban waste-water as a percentage of the total estimated waste water generated in the urban areas.
- 24 (a): % waste-water treated during financial year 2015-16.
- 24 (b): % waste-water treated during financial year 2016-17.

The overall observation of the country against these indicators are that:

- Several states struggled to collect data against this indicator.
- Most states did not provide details on capacity installed to treat waste water.
- The information available in the public domain doesn't match with the submitted data.
- The percentage of waste water treated is also unavailable w.r.t each treatment plant and city as the water resource department faced difficulties in coordinating with the urban department to obtain this information.

SOURCE: SDG India Index 3.0, 2020; Composite Water Management Index, 2018

The ongoing initiatives of Government of India are now integrating used water

SBM 2.0

स्वच्छ भारत
एक कदम स्वच्छता की ओर

More emphasis on **reuse**

Ensure **Optimal reuse of usedwater before disposing in waterbodies**

AMRUT 2.0

अमृत
Atal Mission for Rejuvenation and Urban Transformation

Encourage reuse of usedwater management

- **20% of freshwater demand**
- **40% of industrial demand**
- Promote **circular economy** of water

Funding for used water management projects for cities <1 lakh population

Reuse Initiatives by GoI

भारत सरकार
GOVERNMENT OF INDIA
सत्यमेव जयते

National framework on safe reuse of treated water by NITI aayog (2022)

GoI Power Tariff Policy 2016 mandated Thermal Power Plants to use the treated sewage water within 50kms STPs

Reuse indicators are part of GoI Service Level Benchmarks (SLBs)- Extent of reuse and recycling of used water

Source: SBM 2.0 guidelines, 2021, AMRUT 2.0 guidelines, 2021, SLB handbook, NiTI Aayog (2022) National framework on safe reuse of treated water, Tariff policy (2016) pg-12 (link)

Used water management requires integration across different levels

Ministry of Jal Shakti, Dept. of Water Resources	Ministry of Housing and Urban Development	Ministry of Environment, Forest and Climate Change	Ministry of Commerce and Industry	Ministry of Panchayati Raj	Ministry of Agriculture and Farmers' Welfare	Namami Gange Mission
Central Ground Water Board	Central Public Health and Environment Engineering Organisation	Central Pollution Control Board	National River Conservation Directorate	Central Water Commission	Food Safety and Standards Authority of India	NITI Aayog
Maharashtra Urban Development Department	Maharashtra Public Health Engineering Department	Maharashtra Jeevan Pradhikaran (Water Supply and Sanitation)	Maharashtra Pollution Control Board	Department of Agriculture, Maharashtra	Maharashtra Water Resources Regulatory Authority	Maharashtra Industrial Development Corporation
Urban Local Body	District Pollution Control Board	End users	Private Sector	Panchayati Raj Institutions	NGOs/CSOs	Agriculture Universities

Central Level State Level ULB Level

Function	Central	State	ULB
Law, policy, and regulation making	■	■	
Infrastructure gap assessment and planning		■	
Financing and resource mobilization	■	■	■
Development, operations, and management		■	■
Monitoring, review, and enforcement	■	■	■
Quality control and compliance	■	■	■
Advocacy and communications		■	■
Capacity building and training	■	■	■
Research and innovation		■	■

There is a need for inter-agency coordination, specifically for used water management.

The state and ULBs are heavily entrusted with used water management functions. There is more than one institution playing roles. There is a need to have inter-agency coordination at all levels.

Although a decentralized approach is needed for better assessment and redressal of usedwater issues, but for the efficient functioning of policies and overall development of water bodies, water governance needs to be addressed coherently at all levels. We also cannot precisely point to the stakeholder that should be accountable.

SOURCE: Urban Wastewater Scenario in India, NITI Aayog 2022

The Maharashtra State Water Policy requires operational mechanisms.

The Maharashtra State Water Policy of 2019 makes some provisions for reuse of used water. However, it lacks a clear operational and implementation mechanism.

The state water policy includes a mention of:

- Minimum 30% of the recycled water shall be reused to reduce the fresh water demand in next 5 years (Pg-9).
- The state will promote use of treated and recycled water for thermal power plants (pg-13).
- All thermal power plants within 50 km from STPs must switch over to treated STPs (pg-13).
- Collection and treatment of all sewage using cost effective technological innovations (pg-9).
- Used water should use specified standards and incentivized through a proper tariff system (pg-20).
- To monitor maximum recycling and reuse of water, a high-power apex body needs to be formed, under the Environmental Department of the state (pg-10).
- Private sector participation in used water management shall be promoted, wherever feasible (pg-21).

Box 5

Maharashtra rural water schemes.

Some of the rural water schemes undertaken in Maharashtra did attempt to bring a focus on used water collection, treatment, and management:

Maharashtra Sujal and Nirmal Abhiyan

Because of the golden jubilee year of the State, the Government has initiated exclusive and qualitative service of water supply and sanitation under profitable service charges and is aiming at an objective of providing technical, economical, and administrative improvement under this scheme. The primary objective of this scheme is to overcome water scarcity and growing demand by providing potable water and good sanitation facilities to all citizens.

Rural Water Supply ‘Aaple Pani’ Project

With the financial assistance from the German Government Development Bank, Rural Water Supply Project ‘Aaple Pani’ is being implemented in three districts, namely, Pune, Aurangabad, and Ahmednagar. The main objective of the project is to improve health and sanitation standards through sustainable water supply, development of watershed areas, exhaustive planning of ground water, etc. It also involves strengthening of the local bodies for their active involvement in the project.

Maharashtra Suvarna Jayanti Nagarotthan Mahabhiyan

Government of Maharashtra launched this programme for the development and augmentation of various urban infrastructure as per the standards prescribed by the Government, and to develop infrastructure facilities related to education and health.

SOURCE: Maharashtra State Water Policy, 2019; JICA, 2012

The Maharashtra Reuse Policy (GR) requires implementation mechanisms.

The GR planned to reuse 6,888 million liters of daily sewage generated across 71 urban areas by 2020 (India Water Portal, 2016). This was not achieved with the existing policy norms.

Priority of reuse

- Thermal power plants (mandatorily in 50km; preferentially in 100km)
- Businesses or Industries in MIDC (preferentially in 100km)
- Railways or other bulk buyers
- Agriculture
- Non-potable to ULBs (as per MPCB)

Responsibility of ULBs

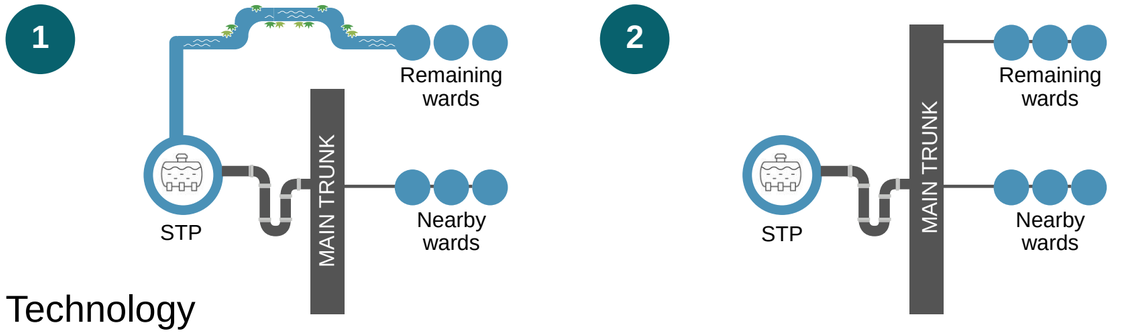
Treat used water; Create used water management plans; Prepare and implement an action plan for the recycle and reuse of the used water as per the available funds (The responsibility to plan for used water reuse lies with the thermal electricity plants and MIDC.)

Financial rights over used water

ULBs have total financial right if water treated by ULBs is flown into the natural resources of water and if other villages / cities /government departments/systems on the banks are earning profits on a commercial basis.

STP projects implemented phase-wise as per funds.

- Phase 1: Sewage treatment system to be built as per existing generation and future requirement
- Phase 2: Network of drainage lines to be built and connected to existing sewage treatment system.



Technology

Along with traditional technology, innovative technology developed by IIT/NIRI should preferably be used when implementing second and third level projects for processing the usedwater in the city.

Financing Plans

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

SOURCE: GR Number: Misc-2016/P.No.259/UD-33

What Maharashtra Reuse Policy can adopt mechanisms from other states

Although there has been an effort, there are still many opportunities for improvement

1. **Planning and implementation:** Some state policy documents align the treated usedwater reuse projects with existing city master plans, which is a welcome step especially from the planning perspective. Some states have provided time bound targets pertaining to usedwater treatment and reuse in their policies. Karnataka has set a target of developing water reuse plans in 10 major cities by 2020, and in all cities by 2030. Further, it targets reuse of 20% of treated sewage by 2020, and 50% reuse by 2030. Gujarat has set a target of reusing 75% of treated usedwater by 2025, and 100% by 2030.

2. **Pricing of treated water:** Most state policies have defined the criteria for determining the price for Treated water reuse for different sectors. While Gujarat seeks to price treated usedwater lower than freshwater, Karnataka requires that treated usedwater tariffs be comparable to freshwater rates. In addition, there is a need to include provisions for incentives for the end users that can promote the reuse of treated water.

3. **Standards for quality of treated water for different reuse purposes:** : Quality standards in many state policies are limited to CPCB/SPCB discharge standards. However, the quality standards for Treated water reuse as a function of the specific purpose of use are not defined.

4. **Monitoring:** Many States have defined performance monitoring for quality standards of treated water, but no clear institutional structure is defined for regular monitoring and reporting back.

5. **Business Models**: Many State policies discuss the scope of exploring PPP models for the development of usedwater treatment and reuse projects. However, they do not specify the criteria for the selection of appropriate business models for effective implementation.

SOURCE: Policy for Reuse of Treated Wastewater for Maharashtra, Gujarat, Chhattisgarh, Jharkhand, Karnataka, Punjab, Telangana

CONTENT

Reuse Potential for Used Water and Sludge for Maharashtra

Industrial Reuse

Cooling Towers | Data Centers and IT | Chemical Manufacturing | Textile Industries | Automobiles

Agricultural Reuse

Irrigation | Fertilizer Substitute | Horticulture | Fisheries

Ecological Reuse

Gardening & Landscaping | Groundwater Recharge | Social and Urban Forestry | Water Bodies and Tanks Recharge | Other Public Spaces

Civic Reuse

Railways | Construction | CT and PT Cleaning | Fire Department | Others (vehicle washing, roads, etc.)

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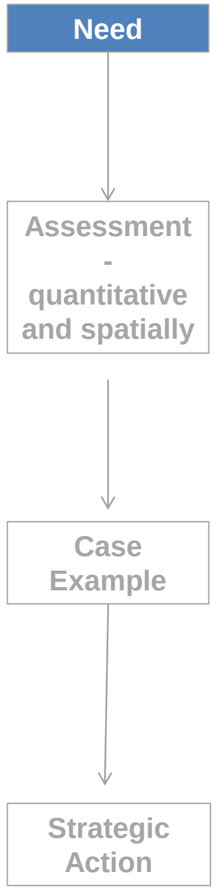
Need for reuse of treated water in Industries



- In its reuse policy, Maharashtra has given highest priority to the reuse of treated water in industries. Used water can be reused in industries especially thermal power plants and MIDCs.
- Approximately 70% of the water consumed by power plants is primarily used for industrial cooling purposes. To address this significant water demand, there is a potential opportunity to replace fresh water with treated usedwater.
- The Maharashtra Industrial Development Corporation (MIDC) was also examined to assess potential for using treated usedwater for industrial purposes.
- By utilizing the untreated treated water from these STPs, industries can minimize their reliance on freshwater sources and contribute to water conservation efforts.
- Examples of Nagpur and Surat are showing best practice cases for reuse of used water in industries.

Demand for Industrial water demand is localized in the coastal and eastern regions of Maharashtra

Need

Assessment - quantitative and spatially

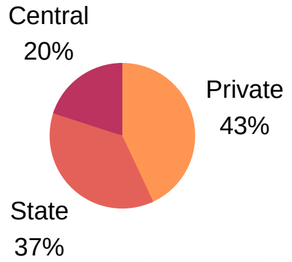
Case Example

Strategic Action

The total water demand from industries is 3,232 MLD (75% of total treated water from STPs/FSTPs in MH).

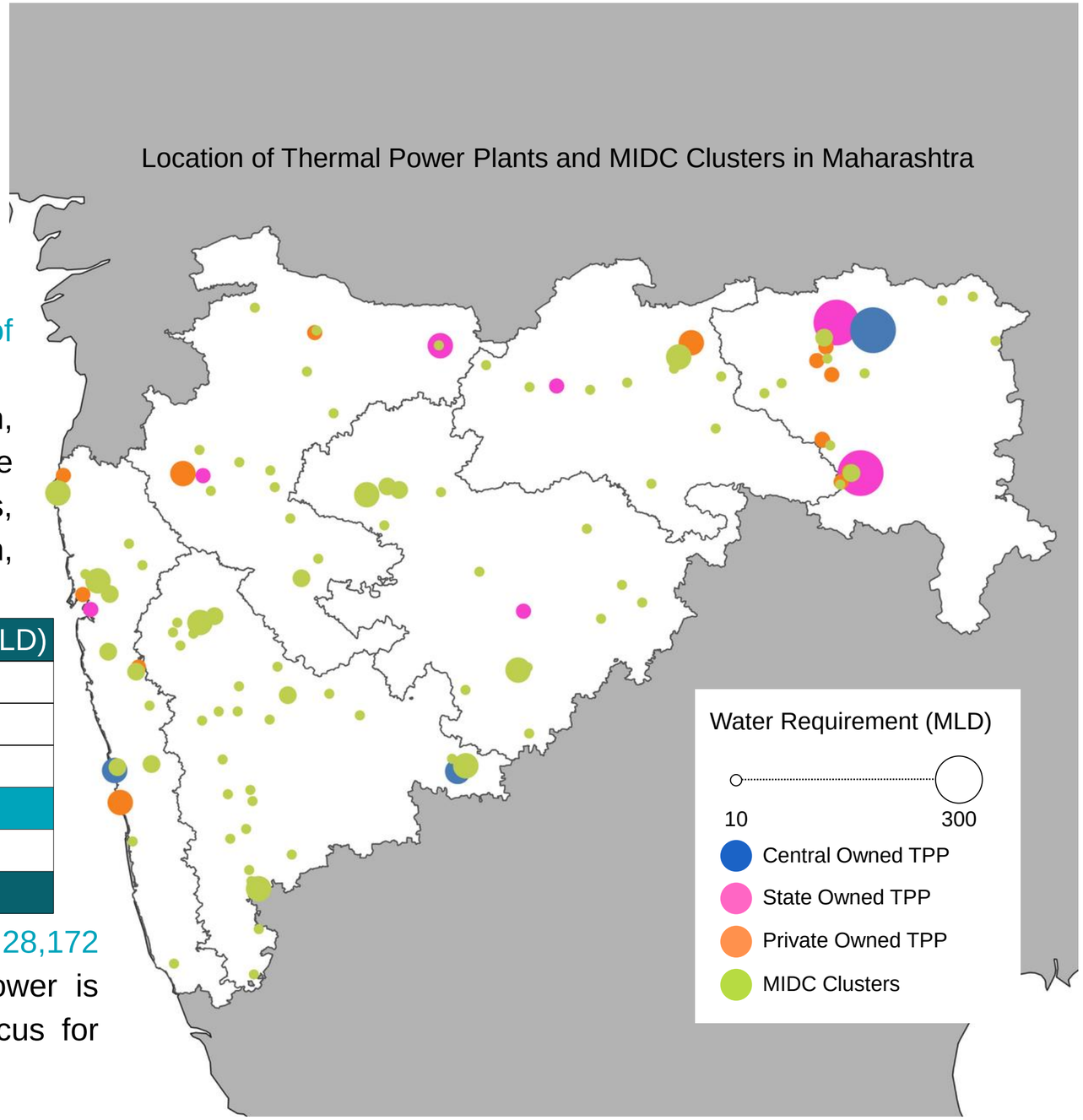
Most of the thermal power plants are located in Konkan, Nashik, Pune, and Nagpur divisions. MIDC clusters in the same divisions having water-intensive industries like textiles, automobiles, engineering, food processing, steel production, etc.

Industry Type	Number	Water Requirement (MLD)
Central Owned TPP	3	467
State Owned TPP	8	869
Private Owned TPP	15	1,012
Total TPP	26	2,348
MIDC Clusters	89	884
Total	115	3,232



The total power generated in the state is 28,172 MWH Out of this, 43% of the total power is private owned, making it the priority focus for using treated used water.

Location of Thermal Power Plants and MIDC Clusters in Maharashtra



SOURCE: CPCB, 2021

The districts with high industrial demand have less numbers of ULBs with STPs.

Need

Assessment - quantitative and spatially

Case Example

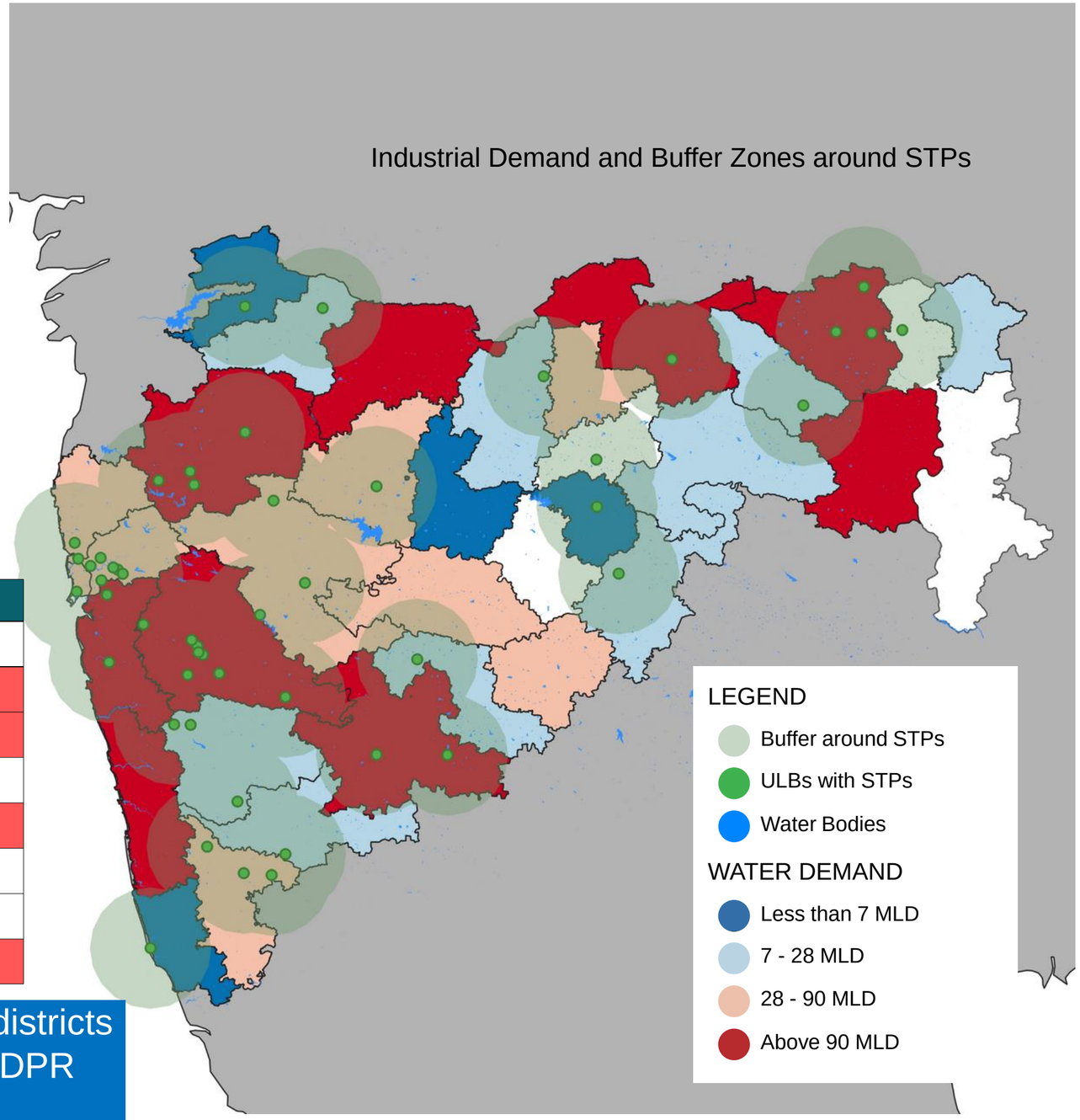
Strategic Action

Existing STPs are located in the western parts of the state.

29 STP ULBs are located in Konkan and Pune divisions. The total coverage of STPs is 70% of the state of Maharashtra. Despite STPs being in close proximity to industries, there is still no treated used water that is taken from STPs for industrial use. The highest industrially demanding districts have less than 4 STP ULBs.

District	Water Demand (MLD)	STP ULBs in District
Nagpur	626	3
Chandrapur	426	1
Ratnagiri	308	0
Nashik	181	4
Amaravati	161	1
Solapur	158	2
Raigad	152	2
Jalgaon	109	0

STPs under planning or construction stage in these districts should include reuse with nearby industries in the DPR stage itself



SOURCE: CPCB, 2021

Case example- Nagpur

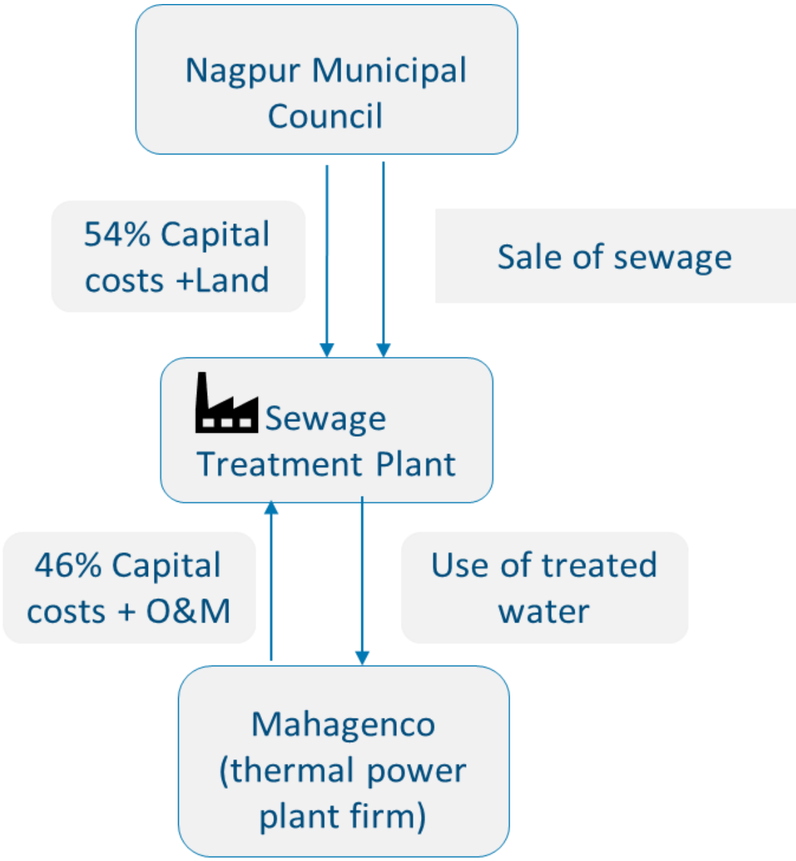
Need

Assessment - quantitative and spatially

Case Example

Strategic Action

- Mahagenco – a thermal power plant firm in Nagpur, purchases sewage water from the Nagpur Municipal Council. The STP along with secondary and tertiary treatment are constructed, operated and maintained by private provider.
- The private provider then uses this treated usedwater for industrial uses, instead of other sources of water.
- Capital cost – INR 193 crores; Local government- 46% of capital cost and land for STP; Private provider- 54% of capital cost and O&M cost
- Private provider pays local government a fixed amount of INR 15 crore (US$ 2.25 million) a year for the raw wastewater (110 million liters a day).
- The project reduces net freshwater extractions by the power sector, freeing up freshwater resources for other uses ie. around 47 Mm3 per annum
- Increased urban usedwater treatment capacity resulted in cleaner and healthier water bodies, with the associated; environmental and social benefits. The project serves as model for other cities and states to follow.



Learning

The model was a success because of shortage of freshwater demand for industrial purpose and mutually agreeable business model between government and industry.

Case example- Anjar and Gandhidham

Need

Assessment - quantitative and spatially

Case Example

Strategic Action

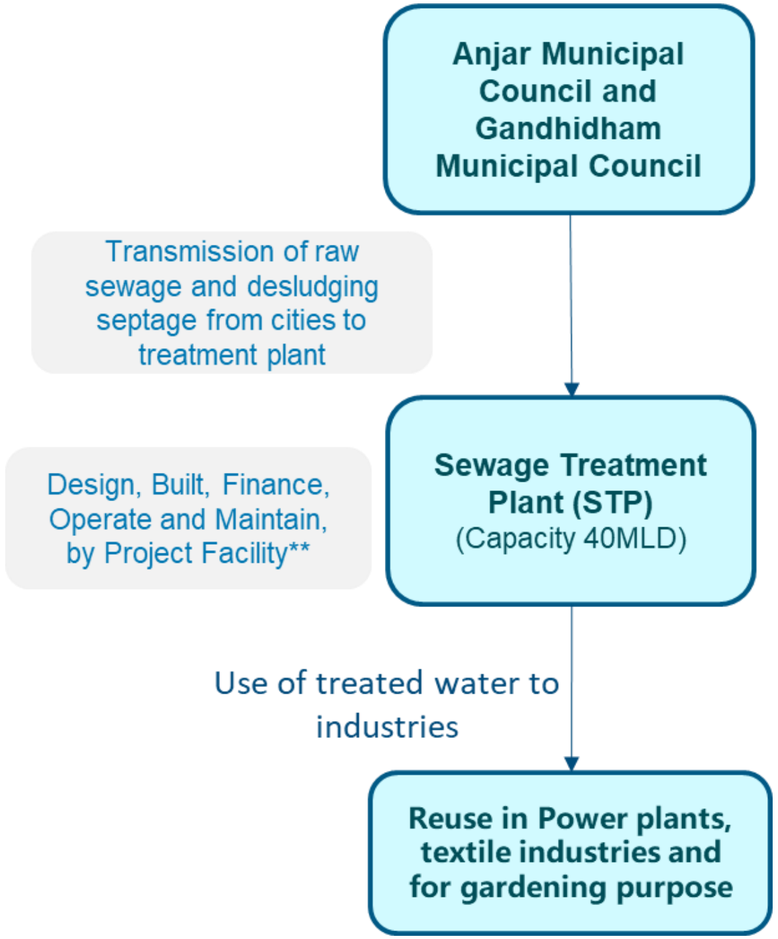
Frequent droughts Due to the persistent occurrence of droughts in Gujarat, the water bodies in the region began to progressively dry up, resulting in water scarcity in Kutch District of Gujarat.

Located next to water scarce area Anjar & Gandhidham ULBs are located adjacent to each other in drought-prone Kutch District of Gujarat. This gave no options for freshwater.

Increased sewage discharge to sea The environmental and community health impact of the pollution caused by discharge of urban sewage into the sea was extreme. Around 600 MLD of sewage water was discharged.

Treatment Plant Welspun India Limited commissioned a 23 MLD STP to reuse the urban sewage water, generated by Anjar & Gandhidham ULB, as high-quality clean water for industrial use. Welspun Ltd. lifts raw sewage from pumping station in Gandhidham and Oxidation Pond in Anjar and pays Rs.0424/Kl to ULBs.

Increased Revenue Anjar and Gandhidham earns a total revenue of about Rs 30 lakhs by selling treated sewage water to Welspun Ltd. About 23 MLD of treated water is reused as non-potable water in various industrial clusters, landscaping, and sprinkling at disposal sites.



Learning

The model was a success because of common interests and coordination between government and industry. Welspun achieve zero freshwater usage for industrial applications at its manufacturing unit in Anjar while mitigating the environmental and community health impact of the pollution caused by discharge of urban sewage into the sea.

Case example- Surat

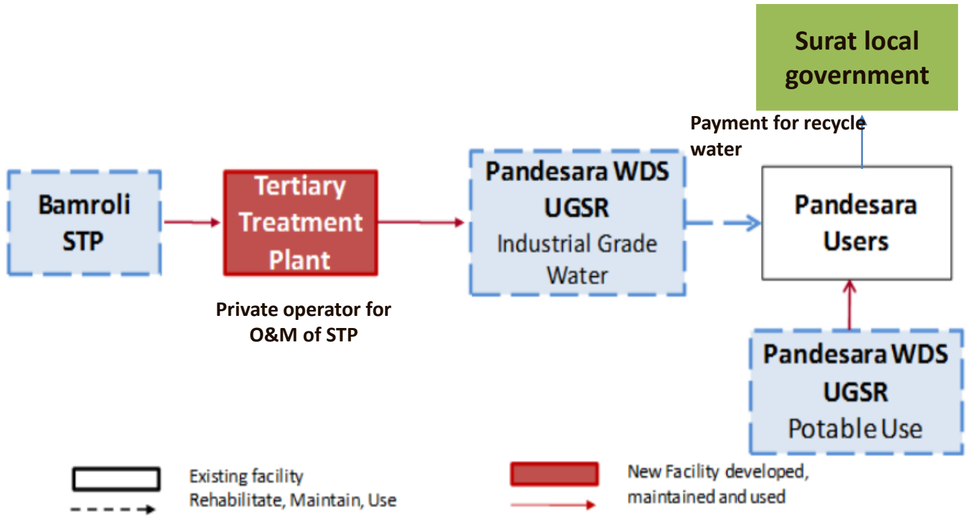
Need

Assessment - quantitative and spatially

Case Example

Strategic Action

- Fresh water shortage and high industrial water demand was key factors for considering this PPP project in Surat.
- Bamroli-Vadod STP to supply treated municipal sewage water to the Pandesara cluster as Industrial Grade water. From August 2014, SMC supplied treated water to industries in the Pandesara cluster
- Present Fresh water cost to Industries : Rs. 23/KL; Recycle water cost to Industries : Rs. 19.84/KL
- Private Operator responsible for O&M of STP and delivery of used water to industrial estate along with network performance.
- SMC earns revenue of about Rs 140 crores per year by selling treated sewage water to the industry. In Surat, about 200 MLD of treated water is reused as non-potable water in various industrial clusters, landscaping, and sprinkling at disposal sites.



Impetus to new policies

The Surat model acted as a driving force to incorporate two new policies for the state: The Gujarat State Water Policy (2015) and SMC's Reuse & Recycle of Treated usedwater Action Plan (2019) to support usedwater reuse.

Learning

The model was a success because of common interests and coordination between government and industry. The "Surat Model" was borne out of necessities as well as proactive collaboration and decision-making between the government and industry.

Strategic action- Providing treated used water to thermal power plants and MIDCs/industrial units

Need

Assessment - quantitative and spatially

Case Example

Strategic Action

Action: Identify Industries within vicinity of STPs and develop plans to reuse treated used water and develop financial feasibility. It is worth noting that around 37% of power generation in Maharashtra is controlled by state-owned thermal power plants. Among these state-owned plants, there are eight facilities with a combined water demand of 869 million liters per day (MLD).

Location: Our analysis on industrial clusters in Maharashtra produced nine districts in the state with high industrial demand for water. Also, power plants are located in districts such as Nagpur, Amravati, Gondia, Chandrapur, and Jalgaon, all of which fall within a 50-kilometer radius.

Impact:

- Increased water availability for industries
- Lesser requirement of pure grade treated water, thereby reducing infrastructure costs.

Costing: Detailed feasibility needs to be assessed at city and local area level to assess financial viability. The cost to lay pipeline and pumping charges can be calculated based on distance of industrial units/ thermal power plants from STP. This cost to be borne by the industrial units or thermal power plants.

Key pain points why industrial reuse has not scaled up yet despite reuse policy and successful case of Nagpur:

- No mandate or incentives for industries to reuse treated water
- Freshwater through bulk purchase or groundwater is easily available and at low cost. No regulations on groundwater abstractions by industries.
- No infrastructure in place for tertiary treatment of used water and conveyance of treated water till industrial units – Main question who will bear the capital cost for setting up these infrastructure?
- Industries not sure of quality standards of treated water and its continuous monitoring.

CONTENT

Need for reuse of treated water and sludge in Agriculture

Need

Assessment - quantitative and spatially

Case Example

Strategic Action

- Many farmers in peri-urban and rural areas adjacent to urban centers irrigate their farms with used water, either treated or untreated. While there are no national estimates on land area cultivated with used water, studies by the IWMI-Tata Program in 17 locations in five States (Gujarat, Maharashtra, Karnataka, Jammu and Kashmir, and Tamil Nadu) reported more than 57,000 ha of such land.44 The total area irrigated by used water in India is likely to be several times this number.
- The treated used water in existing STPs can be provided for non-edible crop in Maharashtra. The Maharashtra Water Resources Department estimates that a considerable portion of this treated water, approximately 50% to 70%, can be safely utilized for irrigation purposes.
- Over-extraction of groundwater for agricultural purposes has led to the depletion of aquifers in many parts of the Maharashtra state. Reusing treated water can reduce reliance on groundwater, helping to preserve this resource.
- In addition, treated sludge can be used as compost in agriculture/horticulture development thereby saving an cost spend on fertiliser/manure.
- Biosolids are nutrient-rich resources that can reduce reliance on and extraction of freshwater, supplant demand for chemical fertilizers, and remediate poor quality soils
- Treated water and sludge through proper treatment and reuse can contribute to maintaining soil health by providing essential nutrients. This is especially beneficial in areas where soil fertility is declining due to continuous cultivation. This can also lead to better crop yields and food security.

The agricultural sector has a large water demand of 2,30,000 MLD

Need

Assessment - quantitative and spatially

Case Example

Strategic Action

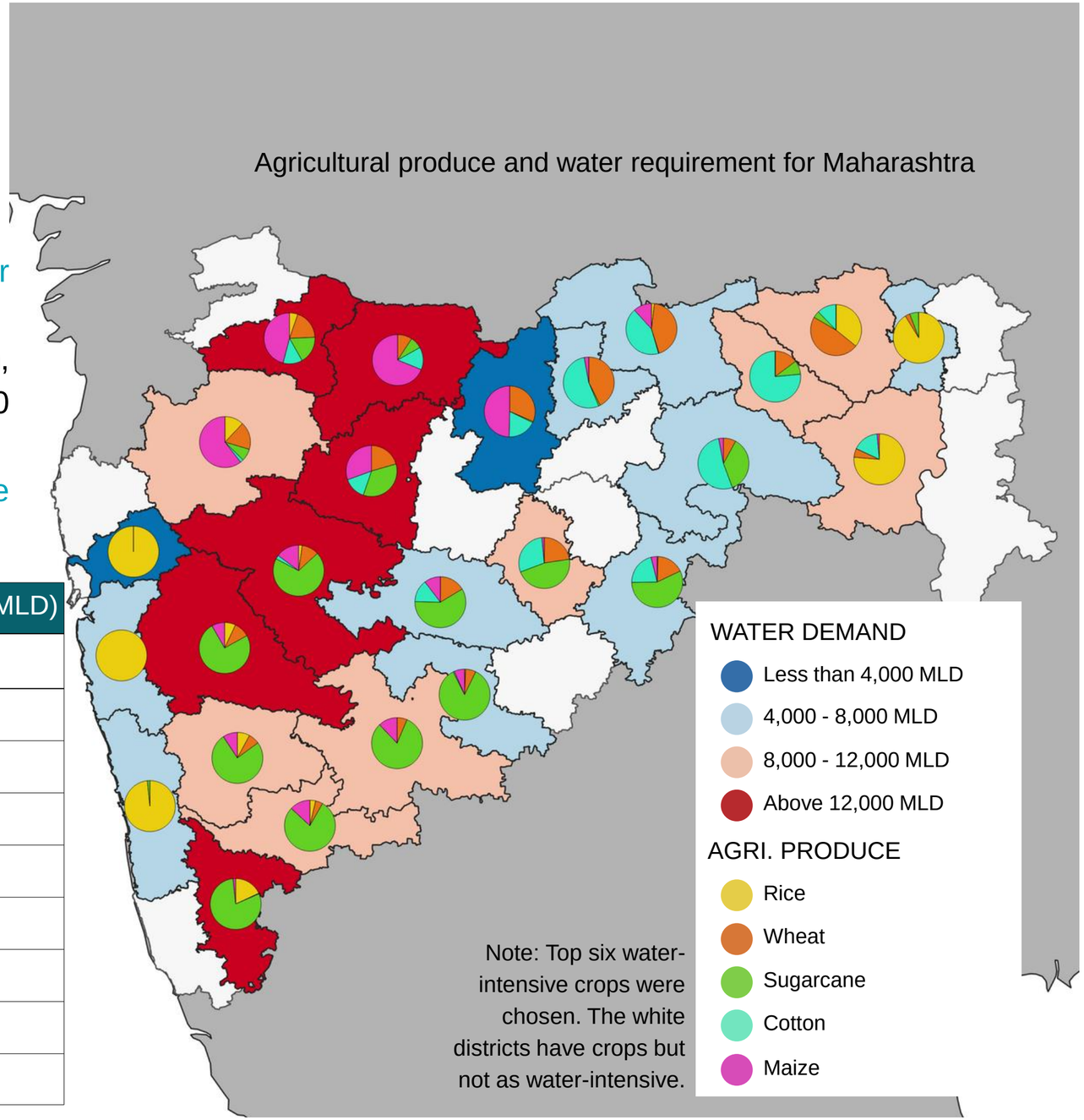
6 out of 36 districts in Maharashtra have agricultural water demand above 12,000 MLD.

The districts of Ahmednagar, Aurangabad, Dhule, Jalgaon, Kolhapur and Pune have water requirement above 12,000 MLD.

Sugarcane and cotton are the most water-intensive agricultural products of Maharashtra.

District	Most Water-intensive crops	Water Demand (MLD)
Jalgaon	Cotton, Maize	17,622
Kolhapur	Sugarcane, RIce	16,964
Ahmednagar	Sugarcane, Cotton	16,231
Pune	Sugarcane, Wheat	15,351
Dhule	Cotton, Maize	13,841
Aurangabad	Cotton, Sugarcane	13,497
Nasik	Maize, Wheat	11,647
Solapur	Sugarcane, Wheat	10,362
Nagpur	Cotton, Wheat	10,348

Agricultural produce and water requirement for Maharashtra



Note: Top six water-intensive crops were chosen. The white districts have crops but not as water-intensive.

SOURCE: ICRISTAT, 2017

Practice of untreated used water in irrigation

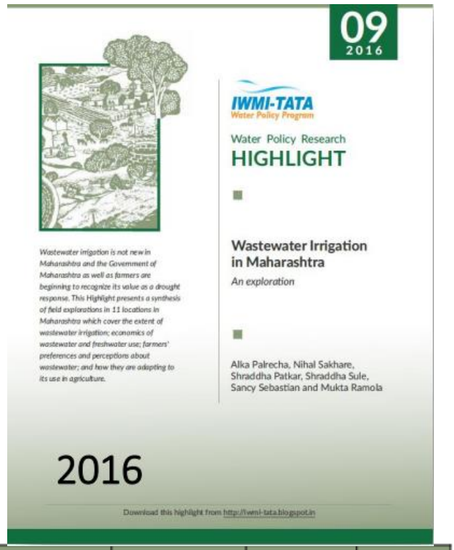
Need

Assessment - quantitative and spatially

Case Example

Strategic Action

- Maharashtra has since long been practicing Irrigation using untreated used water, but little is known about the quantum of water getting used and how are the farmers channeling in the used water to their farms.
- Percent of net sown area with usedwater is as **high as 92 %** in some parts of Maharashtra(Marathwada region)
- Kolhapur, Miraj Sangli , Ichalkaranji, Jalgaon, Nashik,Nagpur, Dhule, Pune, and Aurangabad are the districts practicing untreated usedwater irrigation
- In Sangli, Miraj, Ichalkaranji, Aurangabad, Kolhapur, Nashik and Dhule, **fodder crops and sugarcane** were cultivated using usedwater
- Farmers using untreated used water are either **not aware of the health risks** associated with used water use or did not perceive them to be significant.
- The biggest challenge in untreated used water in agriculture arise due to
  - its potential health impacts.
  - Ready availability of freshwater in most places
  - Lack of awareness amongst the farmers related to nutrient content of the latter



Location	No. of Villages	Sample size	Net Irrigated Area (ha)	Net WW Irrigated Area (ha)	% Net WW Irrigated Area	Gross WW Irrigated Area (ha)	Cash Profit per ha (₹/ha.)
Kolhapur	Urban Area	8	1,172	77	7	113	₹ 2,07,792
Miraj	2	10	1,405	120	9	190	₹ 1,17,500
Sangli	3	12	1,115	130	12	220	₹ 1,21,308
Ichalkarangi	4	15	2,851	375	13	510	₹ 1,96,667
Jalgaon	2	6	5,435	1,232	23	N.A.	₹ 43,019
Nashik	8	18	2,113	925	44	1,560	₹ 45,405
Purandar LIS	4	12	49,941	25,498	51	N.A.	₹ 41,768
Nagpur	29	17	5,375	3,186	59	9,557	₹ 6,84,650
Dhule	4	12	476	350	74	868	₹ 77,143
Pune	9	2	7,223	5,579	77	N.A.	₹ 94,820
Aurangabad	15	9	1,128	1,036	92	2,072	₹ 5,82,046
TOTAL	**76+**	**121**	**76,044**	**38,507**	**51**		**₹ 1,19,970**

SOURCE:IWMI (2016), wastewater irrigation in Maharashtra: An exploration, Alka Palrecha, Nihal Sakhare, Shraddha Patkar, Shraddha Sule, Sancy Sebasan and Mukta Ramolan

Case example- Kolhapur

Need

Assessment - quantitative and spatially

Case Example

Strategic Action

Agricultural fields in the vicinity of the STP

- The treated used water is reused for agriculture purpose everyday except in the rainy season. Farmers themselves pump the water through the treated water discharge line connecting the STP.
- Also, the dewatered sludge from the STP is taken by farmers for use as compost in agriculture fields.
- A group of farmers around both the STPs formed a union/society to meet their irrigation needs. Kolhapur has four such formal societies which supply safe and sufficient water for irrigation to farmers while others have their own borewell.
- Most of the societies meet their irrigation needs from either pumping water from the Panchganga river or treated usedwater line or through borewells.
- They install pump set in the period of December to May every year and remove the system in the month of June.
- After discussing with the the societies, it was found that farmers **are willing to reuse the treated usedwater,** provided the treated usedwater **quality norms are met by KMC.**

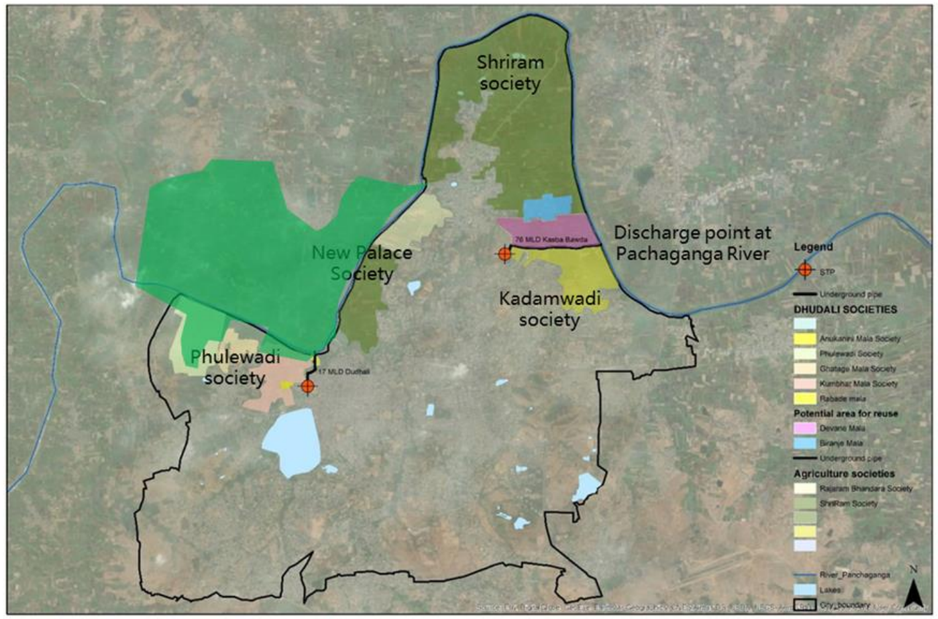


Figure: Map showing agriculture societies in Kolhapur

SOURCE:CWAS (2022), Reuse of treated wastewater in Kolhapur, study done under HTPF project. Access at https://cwas.org.in/cwas-resources/reuse-plan-for-treated-wastewater-and-sludge-at-kolhapur-and-satara

Case example- Others (1/2)

Need

Assessment - quantitative and spatially

Case Example

Strategic Action

Aurangabad- For example, in the district of Aurangabad, a pilot project was implemented to supply treated usedwater from the Aurangabad Municipal Corporation's STP to non-edible crop farmers. It not only provided an additional water source for farmers but also helped in conserving freshwater resources. As a result, farmers reported improved crop yields and reduced dependence on freshwater irrigation.

Agra- Treated usedwater is passed through effluent channel of approximately 7 km in length to river Yamuna. Approximately 100 MLD wastewater is being reused for irrigation and horticultural purposes from this channel. Currently, no revenue is generated from the reuse of usedwater.

Pune- Treated usedwater from all the 10 STPs in the city are released to Mula and Mutha river. Pumping stations are constructed at the downstream to pump the water into irrigation canals. This was done in 2015 to meet the water demand for irrigation. As per requirement from Irrigation Department, around 400 MLD of treated usedwater is supplied for agricultural purposes thereby saving the fresh water. The generated sludge is used as fertiliser in Agriculture/horticulture department.

SOURCE: MoHUA and CPHEEO (2021) COMPENDIUM OF RECYCLE AND REUSE OF WASTEWATER In 54 Million Plus Cities link.

Case example- Others (2/2)

Need

Assessment - quantitative and spatially

Case Example

Strategic Action

Indore- Reuse of usedwater from Kabitkhedi 245 MLD plant is done through pipe line network of around 34 km. Reuse sump is constructed for supply of treated water by pumping to nearby 6 villages covering the area of around 5000 hectares. Treated sludge is used as fertiliser thereby saving an amount of Rs.3.6 lakh per month (including wet waste) as it is mixed with wet waste at compost plant to produce compost.

Coimbatore: From the Ukkadam STP, the treated usedwater to the tune of 0.30 MLD is supplied to Golf Club and 0.95 MLD is being supplied to group of companies and 20 MLD is used for irrigation and agricultural purposes. The treated water is let into 5km stretch of Nalla before using for irrigation, agriculture and plantation. The sale of treated usedwater has generated an income of Rs. 35 Lakh per year to the ULB.

Prayagraj- Prayagraj Municipal Corporation has established 7 Sewage Treatment Plants (STPs) in the city with a total treatment capacity of 268 MLD. Out of the treated 268 MLD, approximately 40 MLD of treated usedwater is reused for agricultural purposes in the city.

SOURCE: MoHUA and CPHEEO (2021) COMPENDIUM OF RECYCLE AND REUSE OF WASTEWATER In 54 Million Plus Cities link.

Strategic action- Providing primary treated water and sludge for irrigation

Need

Assessment - quantitative and spatially

Case Example

Strategic Action

Action: Identify areas and develop plan in target area where treated used water could be used for irrigation purposes.

Location: Our analysis on agricultural produce in Maharashtra produced four districts in the state that produce the highest amount of water-intensive non-edible crops, like cotton. These districts are Jalgaon, Dhule, Aurangabad, and Nagpur.

District	Non-edible water-intensive crop	Water Demand (MLD)
Jalgaon	Cotton	17,622
Dhule	Cotton	13,841
Aurangabad	Cotton	13,497
Nagpur	Cotton	10,348

Impact: Water availability for non-edible crop farmers; Freshwater sources left to use by edible crop farmers; Drought mitigation

Costing: The cost to lay pipeline and pumping charges can be calculated based on distance of area from STP. This can be borne by the respective urban local bodies or agricultural users depending upon feasibility.

Key action points:

- Identify agriculture areas (non-edible crops only) nearby vicinity of STPs where treated water and sludge can be reused.
- Discussion with farmers for willingness to used treated water and possible business model for the same.
- Reuse Plan- Identify infrastructure requirement and finance for supply of treated water and sludge till agricultural fields.
- Maintenance and monitoring of treated water quality ensuring proper and safe reuse of treated water for irrigation.
- The institutional arrangement is important with involvement of departments of agriculture or local universities, farmer groups or civil society organisations working with the farmers.

CONTENT

Need for reuse in reviving water bodies and lakes

Need

Assessment - quantitative and spatially

Case Example

Strategic Action

- The treated used water in existing STPs can be used to replenish dried up lakes and ponds. It can also replenish aquifers and groundwater tables in Maharashtra.
- Treated water can be used to revive water bodies and lakes that have been adversely affected by pollution or over-extraction. This promotes the restoration of aquatic ecosystems, preserving biodiversity and enhancing overall environmental health.
- Several districts in Maharashtra experience severe water scarcity. Reuse of treated water can help revive water bodies and increase availability of water for various non-domestic purposes.
- Treated water can also be used for groundwater recharge but extreme care to be taken to ensure treated water quality meets standard as it can irreversibly pollute groundwater sources. It requires stringent quality standards, monitoring and compliance measures. A cautious approach needs to be followed both in terms of quality of treated water and also type of recharge system. Treated water should not be directly injected in ground but recharged through using wells, surface spreading, and riverbank filtration (RBF).

Several districts in Maharashtra experience severe water scarcity

Need

Assessment - quantitative and spatially

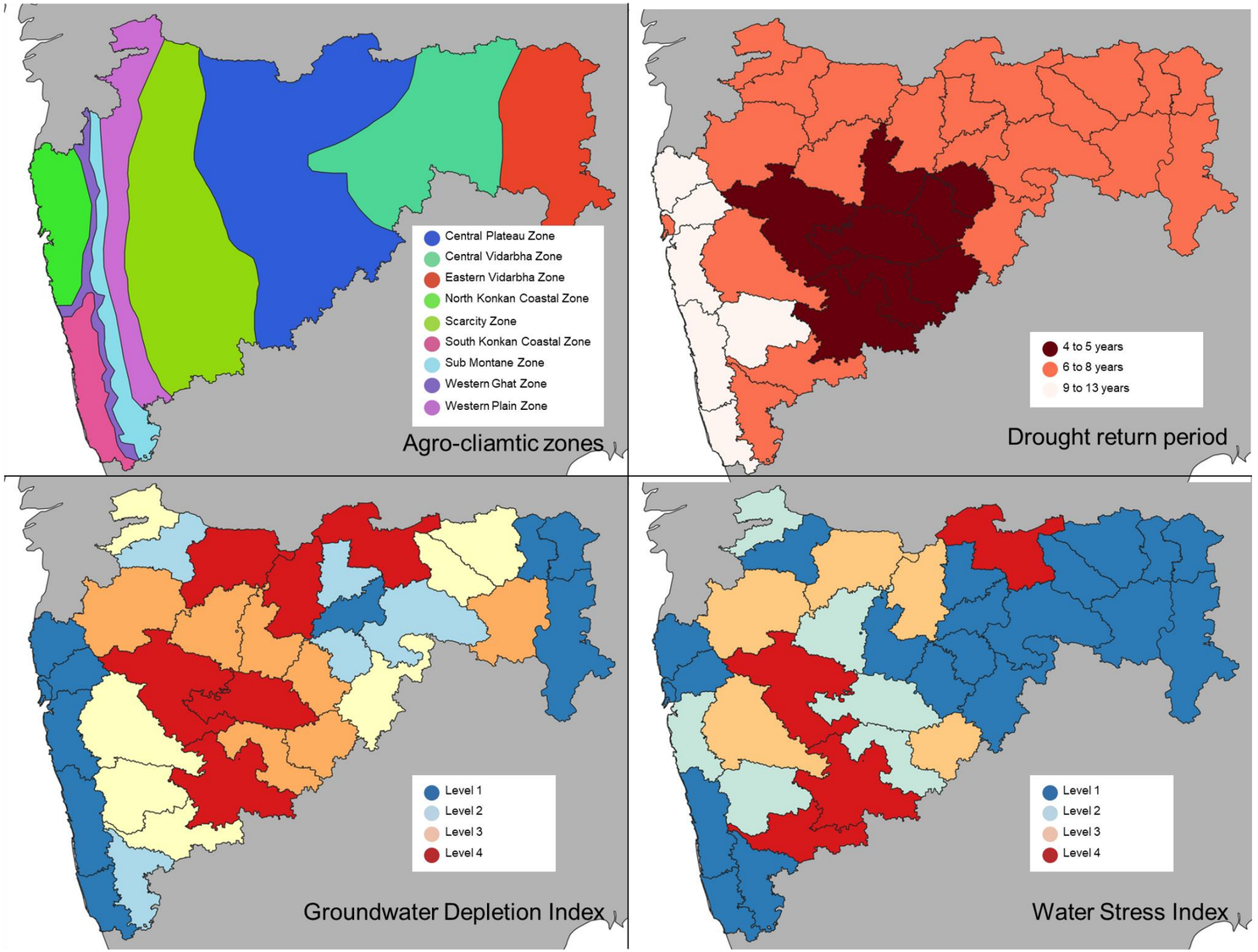
Case Example

Strategic Action

The state of Maharashtra witnesses frequent drought conditions. Almost, 42.5% area of the state is drought prone. Half of the state's population is dependent upon agriculture for their livelihood. The increasing population reduced the per capita water availability in the state.

From the analysis, it was observed that five districts, namely Ahmednagar, Amravati, Beed, Osmanabad, and Solapur are:

- the most prone to severe droughts
- highly water stressed
- depleting in groundwater levels
- present in water scarce zones.



SOURCE: Amrit, K., Soni, A. R., Mishra, S. K., Vijay, R., & Kumar, R. (2020). Assessment of frequency and severity of droughts in Maharashtra state of India. Arabian Journal of Geosciences, 13(24), 1-14.

7 out of 36 districts have high water demand and could be explored reuse of treated usedwater

Need

Assessment - quantitative and spatially

Case Example

Strategic Action

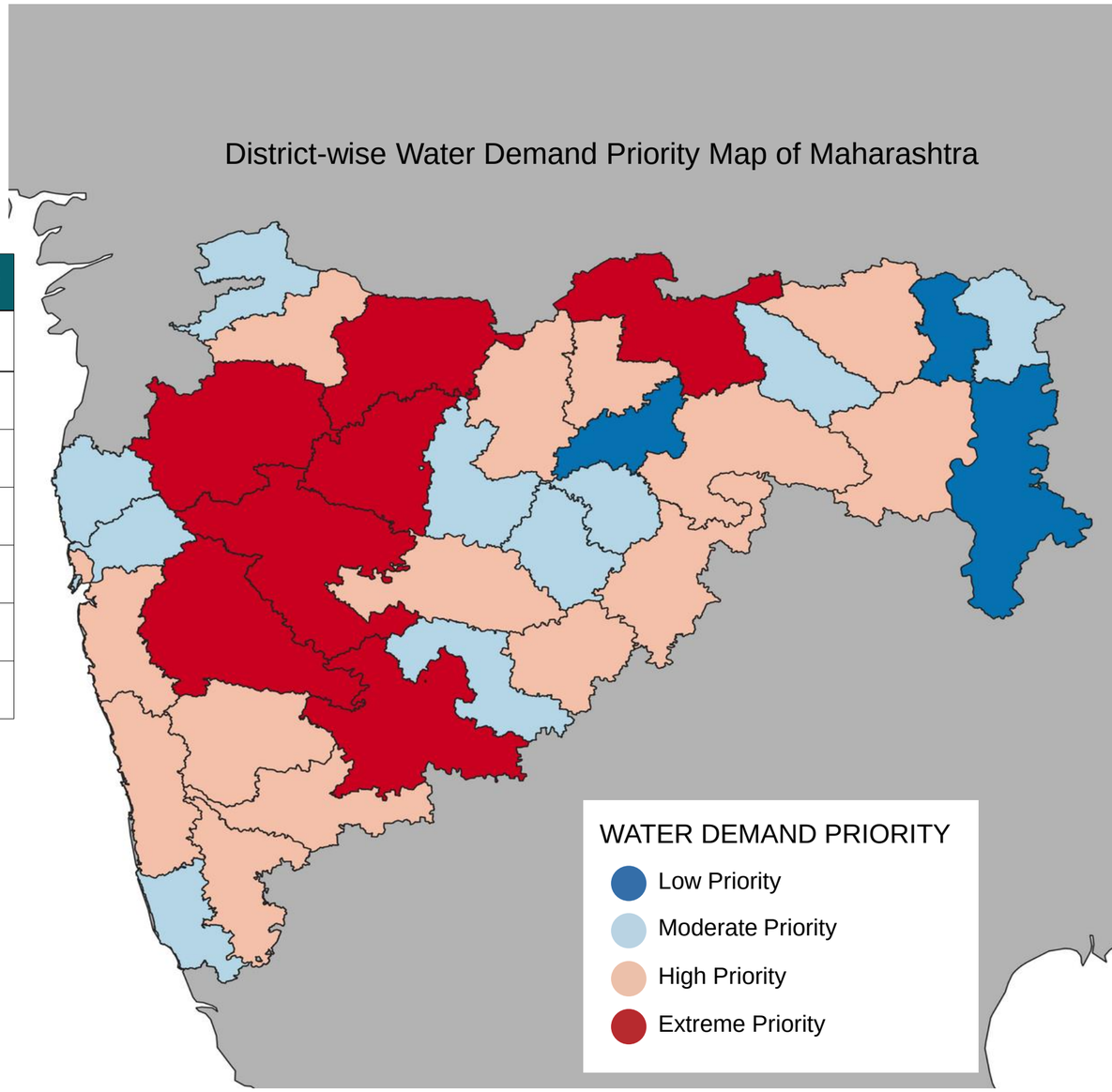
The methodology for the map followed super-imposing the following parameters, and a weighted-ranking for each.

Parameter	Weight
Water Scarcity (combination of agro-climatic zones, groundwater availability, water stress and drought return-period)	4
Industrial Demand	3
Agricultural Demand	2
Domestic Demand	1

District	Score
Solapur	38
Ahmednagar	37
Jalgaon	36
Nasik	34
Auranagabad	32
Pune	32
Amravati	31

The scores were calculated and categorized as follows:

- Extreme Priority (30 - 40)
- High Priority (20 - 30)
- Moderate Priority (10 - 20)
- Low Priority (0 - 10)



SOURCE: GIS Analysis

Case Example - Revival of Amani Doddakere tank, Bangalore (1/2)

Need

Assessment - quantitative and spatially

Case Example

Strategic Action

Strategic Context

In Hoskote, Bengaluru, the water demand for domestic and irrigation purposes were not met, with very low groundwater levels.

Problem Statement

A plan to lift water from Yelemallappa Shetty tank (YMST) to the nearby Amani Doddakere tank (ADT) at Hoskote was implemented in 2011. But YMST was extremely polluted, and the plan aimed to recharge the 20-year old dried-up ADT. The pipeline from YMST to ADT also attracted illegal tapping, reducing the outflow at ADT.

Solution

Transformation of urban usedwater into an asset for peri-urban farmers and households through inter-sectorial water transfer for groundwater recharge.

Value Proposition

Providing reliable access to water for irrigation and other needs through tank revival and groundwater recharge with significant livelihood benefits.

Project Costing

- Current irrigation water charges for horticultural crops generate maximal USD 930 per year, or 2–3% of the annual O&M costs if all transferred water will end on farms which are charged and not be lost/redirected on the way to Hoskote.
- These charges are much lower than what farmers are willing to pay, which could cover up to 25% of the ongoing operation and maintenance costs.

Project Cost	Cost (USD)
YMST lift irrigation system	579,000
Pipeline, canal, receiving tank, etc.	95,000
TOTAL	674,000
Operations and Management Cost per month	3,000 - 3,500

SOURCE: Danso, G. K., Naidu, D. R., & Drechsel, P. (2018). Revival of Amani Doddakere tank (Bangalore, India)-Case Study.

Case Example - Revival of Amani Doddakere tank, Bangalore (2/2)

Need

Assessment - quantitative and spatially

Case Example

Strategic Action

Benefits and Impact

- The recharged groundwater appeared to be of excellent quality and public perception very positive.
- The water transfer allows farmers to cultivate more land or more than one crop per year, or crops with a higher return on the urban market.
- More than 60,000 household beneficiaries enjoy 9.37 MLD of treated used water.
- The new tank revived dairy development and local fish farming and lured various species of birds to the revived wetland, creating a regional hot spot for birding.

Learnings

- Despite no financial breakeven, the social and environmental benefits surpassed economic returns.
- Farmers were ready to pay much more water charge, provided treated water quality and flow is guaranteed.
- The technology is a natural and cost-effective method.
- The recharged groundwater at Hoskote appears to be of excellent (potable) quality, but the quality was required only by two beneficiaries.

Technology

- The water is subjected to physical, chemical and biological processes of natural water treatment (sedimentation, filtration, sun exposure, etc.) from YMST to ADT.
- The 6.2 km long used water transfer occurs partly piped, partly open.
- Before the water enters ADT, it is filtered, percolating through 200m of rock to reach the groundwater table.
- About half of the passage requires pumping, half follows gravity flow. The water is not running continuously as pumping is sometimes stopped over hours or days.

Scalability and Replicability

- Water scarcity and high water demand catalyzing public investments.
- Strong policy support for lake conservation and development.

SOURCE: Danso, G. K., Naidu, D. R., & Drechsel, P. (2018). Revival of Amani Doddakere tank (Bangalore, India)-Case Study.

Case example - Others (1/2)

Need

Assessment - quantitative and spatially

Case Example

Strategic Action

Pune- the treated water from STPs in Pune were successfully utilized to revive several lakes in the surrounding areas, including the Katraj Lake and Pashan Lake. A study conducted by Maharashtra Jeevan Pradhikaran found that the introduction of treated water significantly increased the water levels in multiple dried-up lakes by an average of 2 to 3 meters.

Mumbai- A pilot project implemented in Mumbai in collaboration with Maharashtra Groundwater Survey and Development Agency demonstrated successfully infiltrated of treated usedwater into the ground to recharge aquifers.

Nagpur- Dayanand Park is a multi-utility public garden spread over seven acres of land. About 1,500-2,000 People use the garden daily and the water requirements to maintain the garden are approx. 100 m3/d. Treated water will be reused for park irrigation. In past, groundwater from a nearby dug well was used for irrigating the garden. However, due to the depletion of the groundwater level, water was not available for irrigation between February and June. Therefore, during the summer season untreated sewage was used for irrigating the garden which poses a huge health risk for the park users. The sewage treatment and reuse project aim to treat needed water before reusing it in the park in order to improve the safety and health of the park users. The solution were natural treatment technologies integrated into the existing landscape. Such solutions can then be replicated at other gardens.

SOURCE: MoHUA and CPHEEO (2021) COMPENDIUM OF RECYCLE AND REUSE OF WASTEWATER In 54 Million Plus Cities link.

Case example- Others (2/2)

Need

Assessment - quantitative and spatially

Case Example

Strategic Action

Delhi- Three artificial lakes at Nilothi in west Delhi will recharge aquifers using the treated usedwater from the sewage treatment plant in the area. The three lakes spread over 10.5 acres can hold 255 million litres of water. Around 25 million litres of treated water is being released into them every day. The main objective of the project is to increase the groundwater level in the area along with the restoration of the local ecosystem. The lake is being filled with treated water from the sewage treatment plant here. Piezometers will also be installed in the lake to keep a check on the groundwater level.

Bangalore- In 2008, Bengaluru Development Authority rejuvenated the Jakur lake by constructing a wetland in the lake to filter water from a storm water drain inlet and ensured that nitrates, phosphates and heavy metals did not enter the main water body. But, as years progressed, due to garbage dumping, the lake's water quality worsened. In 2014, the lake restoration work began. The lake now recharges groundwater, open wells, and borewells around it. The lake helps in recharging groundwater of at least seven million litres per day (MLD). There are around 20 open wells and 200 borewells around the lakes which get recharged by the lake. Lake now also houses more than 500 species of flora and close to 200 species of fauna. Similar efforts were done in other lakes in city. The use of treated water for horticulture purpose in Cubbon Park (300 acres) and Lalbagh (240 acres) gardens has saved the consumption of fresh water to the tune of 5.5 MLD saving approximately Rs.2.2 Lakh/day.

SOURCE: https://timesofindia.indiatimes.com/city/bengaluru/bengalureans-win-award-for-reviving-and-protecting-jakkur-lake/articleshow/71319835.cms and https://timesofindia.indiatimes.com/city/delhi/artificial-lake-to-recharge-groundwater-says-bharti/articleshow/102242598.cms,

Strategic action - Reviving natural water bodies and Replenishing aquifers and groundwater table

Need

Assessment - quantitative and spatially

Case Example

Strategic Action

Action: The unused treated used water in STPs can be used to revive dried-up natural water bodies and replenish groundwater tables within 50km of STP.

Location: Our analysis on groundwater depletion in Maharashtra produced six districts in the state with alarmingly low groundwater levels. These districts are Ahmednagar, Amaravati, Beed, Buldhana, Jalgaon and Solapur. The above districts can be selected to revive natural water bodies and replenish groundwater tables for increased water availability and supply for various purposes.

Impact: Increased water availability and supply for agricultural and non-potable purposes; Drought mitigation; Biodiversity conservation

Costing: The cost to lay pipeline and pumping charges can be calculated based on distance of water body/ground water recharge areas from STP. This can be borne by the respective urban local bodies. Funding from CSRs can be explored depending upon feasibility.

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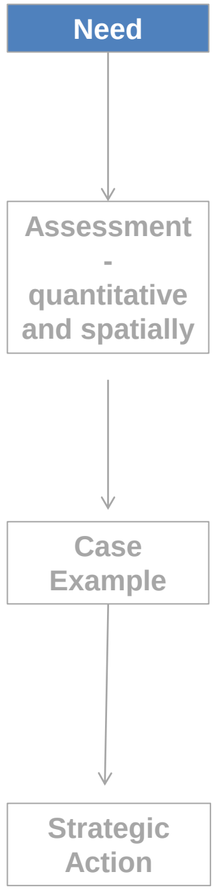
Key action points:

- The lakes and water bodies are to be developed into landscaped tourist spots and to be fed year around with treated water from existing STPs.
- Check that storm water drains carrying clean rainwater were connected to lakes and water bodies.
- Pipelines to be laid to conveyed treated water from STPs to lakes/water bodies.
- Groundwater recharge wells to be constructed near these water bodies to increase recharge capacity which will eventually increase groundwater table.
- Solid waste and sludge to be removed regularly from lakes to keep them clean.
- Regular monitoring of water quality in lakes.

CONTENT

Need for civic and ecological reuse options within city areas



- SBM 2.0 has promoted recycle and reuse of treated used water for various non-potable purposes like flushing toilets, gardening, Horticulture purposes; Industrial purposes; Municipal purposes like dust mitigation, road washing, construction activity, etc. Efforts may be made to utilize as much used water as feasible, but not less than 20%.

- The Guidelines of National Building Code 2016, emphasizes the reuse of treated sewage and sullage in commercial or residential multi-storeyed complexes for flushing of toilets, horticulture and fire-fighting purposes.

- Maharashtra reuse policy also states that treated water can be used for Fire fighting purpose and various municipal purposes like community/public toilet cleaning, median water, gardens, solid waste site, construction works, etc

- Such reuse option can be easily adopted at municipal level without large investment and infrastructure. This can help in reduction of freshwater demand especially in summer months in water stressed areas of city.

Civic and ecological reuse options in city

Road Washing and Median watering

Washing vehicles: Bus station and car service stations

Community toilets and Public Toilets cleaning

Watering Public parks and gardens

Water bodies and lake recharge; fisheries and pisiculture

Construction works

Case examples- Maharashtra

Need

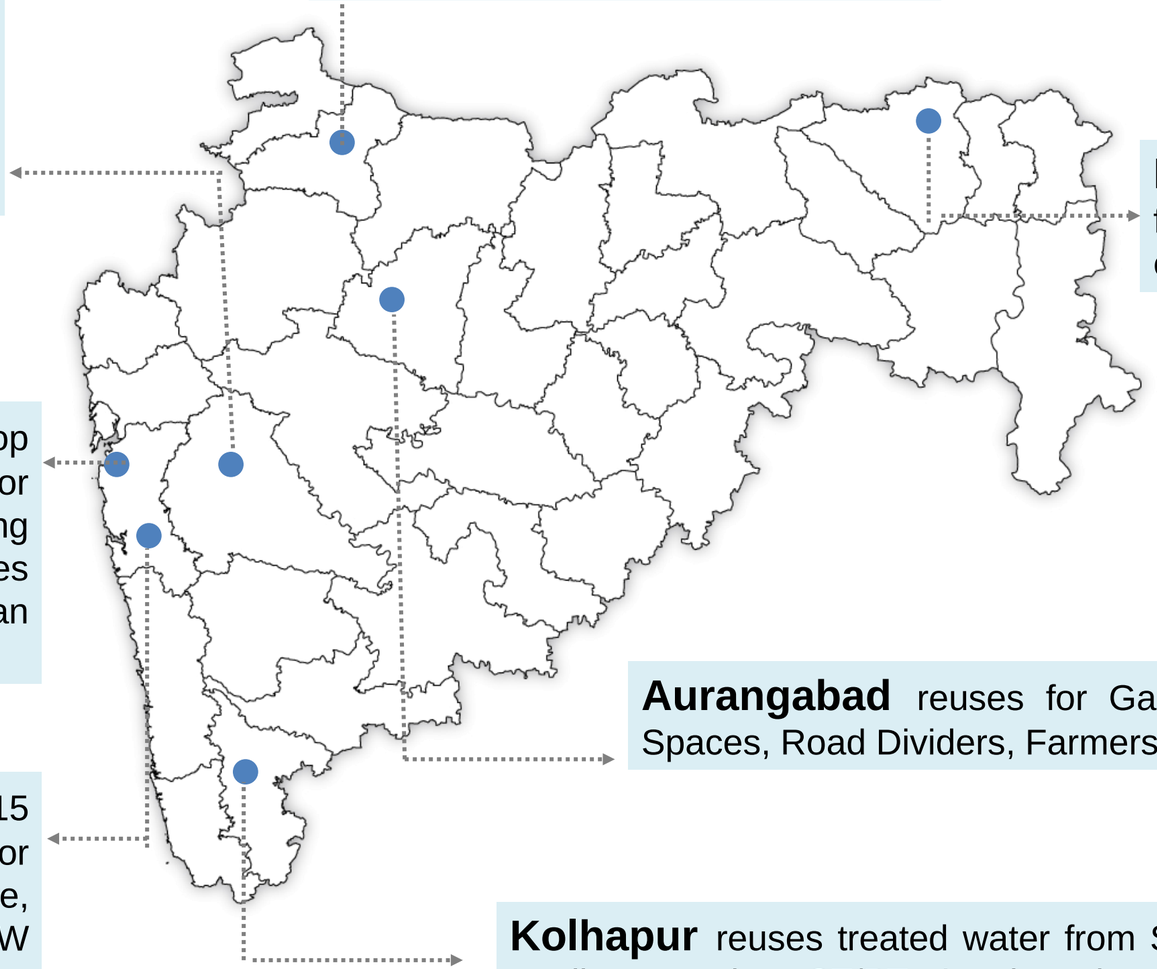
Assessment - quantitative and spatially

Case Example

Strategic Action

- **Dhule** is reusing treated water for Farms/ Garden; Agriculture activity; Compost, fountains, self-utilized by ULB in cleaning activities

Pune- Treated water is reused for various other purposes like construction, road cleaning etc. wherein tankers are sent to different STPs in the city.



Nagpur reuses treated water from STP for landscaping and construction purposes

Greater Mumbai- at Charkop STP treated water is reused for gardening purpose and fire-fighting purpose, STP at Dadar supplies treated water to Pramod Mahajan Garden for gardening purpose.

Aurangabad reuses for Gardening, Green Spaces, Road Dividers, Farmers.

Navi Mumbai- Out of treated 215 MLD, 65 MLD is reused in the city for different purposes like horticulture, construction and washing of MSW Machines and vehicles.

Kolhapur reuses treated water from STP for median watering, CT/PT cleaning, dust control at SWM site and landscaping within STP campus

Case examples- India

Need

Assessment - quantitative and spatially

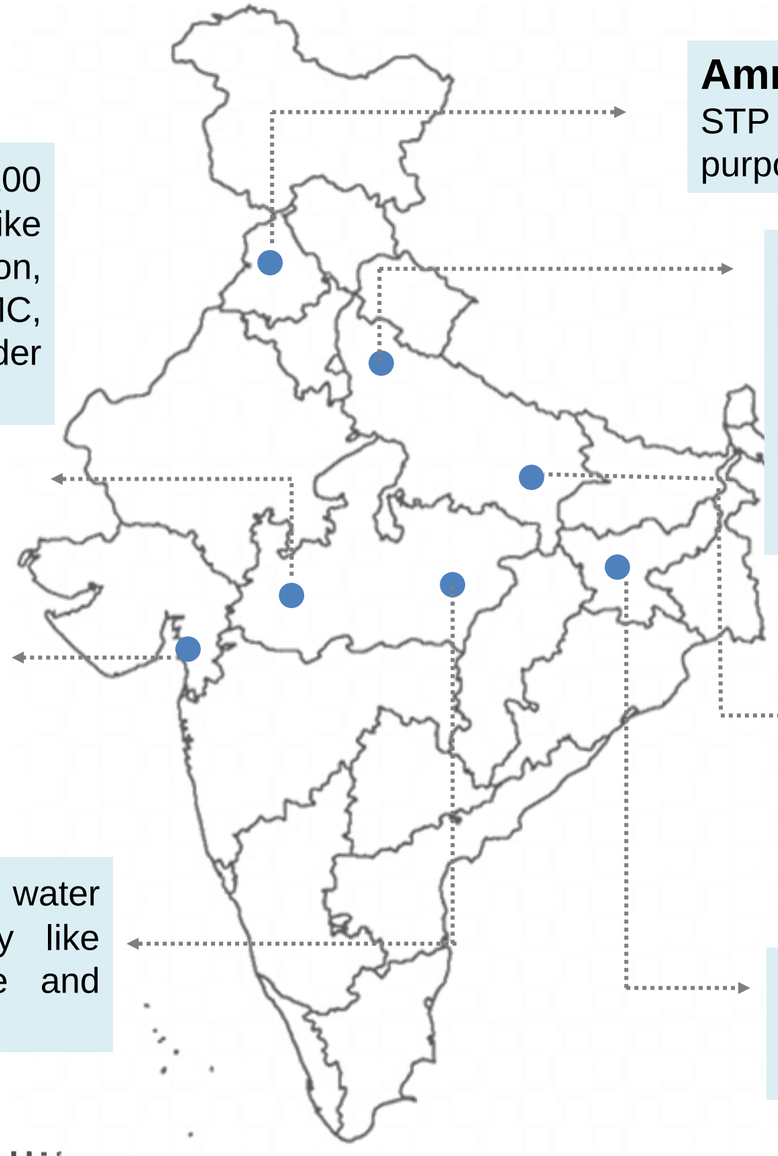
Case Example

Strategic Action

Indore- reuses around around 100 MLD for different purposes like horticulture, landscaping, irrigation, construction, vehicle washing in IMC, urinal washing, fountains, divider washing, footpath cleaning, etc

Surat reuses for industrial clusters, for gardening purposes at STPs & road dividers, for sprinkling at MSW disposal site and in sewer jetting machines

Jabalpur reuses 17 MLD treated water for various purposes in the city like agriculture, horticulture, landscape and constructional purposes.



Amritsar reuses treated water from STPs inside STP premises for **gardening and horticulture** purposes thereby saving fresh water

Ghaziabad reuses 18 MLD for agricultural purposes, 12 MLD for horticultural purposes, 26 MLD for construction purpose and in highway construction, and 19 MLD is reused for other purposes like spraying on the roads, watering trees and plants alongside the roads etc., totalling to 80 MLD.

Varanasi reuses 50 MLD of treated usedwater for irrigation, landscaping , horticultural purposes and sprinkling on road for dust control in the city. Feasibility of usage of treated usedwater for cleaning of Rail Coaches/ Wagons are also being explored.

Ranchi reuses 7 MLD of treated usedwater for agriculture, horticulture, landscaping and washing of vehicles.

SOURCE: MoHUA and CPHEEO (2021) COMPENDIUM OF RECYCLE AND REUSE OF WASTEWATER In 54 Million Plus Cities link,

Strategic action - Civic and ecological reuse options within city areas

Need

Assessment - quantitative and spatially

Case Example

Strategic Action

Action: Treated water can be utilised for municipal uses like landscaping, parks, toilet flushing and fire-fighting with quality norms advised by MPCB, CPCB and CPHEEO depending on the reuse option within city limits.

Location: Such option should be promoted in all cities with STPs or FSTPs. There are 29 cities with STP and 311 cities with FSTP in Maharashtra which can take up civil and local reuse and reduce dependence on freshwater sources for non-potable purposes. This reuse options also does not involve high infrastructure investments. In gated colonies, apartment complexes and institutions that are required to have treatment plants, Treated water can be reused for landscaping and for flushing toilet water by implementing dual plumbing systems.

Impact: Increased water availability and supply for non-potable purposes.

Costing: This can be borne by the respective urban local bodies. Existing tankers of ULB or construction sites can be used for this purposes. Private vendor with tanker can be contracted for this depending on different feasible options.

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Key action points:

- Assessment of potential end-users that required treated used water within city limits;
- Inventory of amount of treated water required, quality of water needed etc
- Assess conveyance distance and explore possible mode of transportation of treated water (tankers, pipelines, etc)
- Explore possible business models- eg: Private performance contract for watering median and dust control at roads, revenue sharing model with construction sites, fire department, etc.
- Develop Monitoring mechanism and performance tracking mechanism for such reuse options.
- Public Awareness and Education.

Key inferences

- ✓ **Cities should prepare reuse action plan considering available reuse options within and in vicinity of city limits.**
- ✓ **Cities should prioritise civic and bulk water users to reduce freshwater usage for non-portable purposes like constructions, washing vehicles, fire fighting, etc.**
- ✓ **Several projects have been implemented in many states, including Maharashtra which showcases its possibility of scaling up across all cities of Maharashtra.**
- ✓ **Cities should explore possible business models considering endusers and financial viability.**
- ✓ **Reuse projects should be plan upfront with sanitation infrastructure projects and not after construction of STPs, so that financing for conveyance till endusers is included in project cost.**
- ✓ **Proper Monitoring mechanism and performance tracking for treated usedwater quality is required for reuse projects.**
- ✓ **Capacity building trainings and awareness drives are required to promote reuse of treated water among all stakeholders.**

CONTENT

Cost Economics: Cost of Water Supply for Industrial Use in Maharashtra

	Case 1	Case 2	Case 3	Case 4	Case 5	Case 6
Cases	Water extraction through borewell (unauthorized)	Water extraction through borewell (authorized)	Bulk Water Supply by MWRRA	Water Supply by MIDC	Raw sewage tapped at nallah	Tertiary treated used-water supplied at industrial location at 18.5 kms distance
Water Tariff (in Rs/KL)	2.75	5.5	11	13 - 39.5	3.75	7.09

Case 1
A typical cotton industry uses 200KL of water to produce 1 ton cotton fiber. The electricity and miscellaneous cost of extracting water from borewell at a depth of 60m in 8 hours has been calculated. Taking a value of Rs. 8.4 per kWh of electricity, it turned out to be Rs. 550 per 200KL or Rs. 2.75 per KL.

Case 2
If Bulk Water User Entity (BWUE), is dependent on the wells within influence zone or distance from the boundary of the canals as stated in Section 26 of Maharashtra Ground Water (Development & Management) Act, 2009 then 50% of applicable rate will be charged. (50% x 11 = Rs. 5.5)

Case 3
Assured water supply for Processing industries is supplied by MWRRA in Bulk at a Tariff off Rs. 11 /KL

Case 4
MIDC supplies water to industries at differing rates according to 28 zones. Lowest Tariff is Rs. 13, highest is Rs. 39.5 and average tariff is Rs. 18/KL.

Case 5
Purchase price of raw sewage from Nagpur Municipal Corporation by Mahagenco in 2008.

Case 6
Cost of treated sewage fit for purpose for industrial cooling in Mahagenco plant in 2008. Lifecycle cost includes purchase cost of sewage, annual O&M costs and capital cost of intake works, tertiary treatment plant, pumping and conveyance.

Scenario 1: Source: Table no.2 Waster use standards for industries dated Sept 2017 - https://mwrra.maharashtra.gov.in/wp-content/uploads/2022/08/Criteria-for-Non-Irrigation-Dec-2018.pdf
Scenario 2 and 3: Source: Annexure 3 of the Bulk water tariff order dated 29th March, 2022 https://mwrra.maharashtra.gov.in/en/wp-content/uploads/sites/2/2022/08/Bulk-Water-Tariff-Order-2022English.pdf
Scenario 4 Source: Present water rates levied by MIDC dated Sept 2021 - https://www.midcindia.org/wp-content/uploads/2021/11/Water_Rates_Revised.pdf
Scenario 5 and 6: Source: MAHAGENCO-NAGPUR MUNICIPAL CORPORATION WASTE WATER REUSE PROJECT AT NAGPUR WATER SUPPLY FOR (3X660 MW) KORADI TPS Presentation
https://mohua.gov.in/upload/uploadfiles/files/2_%20Mahagenco%20NMC%20Revised%20presentation%201(C)%20130%20MLD%20STP%20(1)06.pdf

Cost Economics: Cost of Water Supply for Industrial Use in Different Cities

(in Rs/KL)	Chennai[2]	Nagpur[1,6]	Bengaluru[1]	Surat[5]	Delhi[1,3]	Gurgaon[1,4]
Industrial / Commercial Water Tariff (Freshwater)	60	9.6	60	23	28-281	10-12
Treated usedwater Tariff for Industrial / Commercial Use	45	7.09	12	19.84	4	4

Source:

1. *WSP Guidance Note - Approaches to capital Financing and cost Recovery in Sewerage Schemes implemented in iIndia (2016) Page-35-36 - https://documents1.worldbank.org/curated/en/658201467618250938/pdf/106668-WP-add-series-PUBLIC.pdf*
2. *Water in Circular Economy and Resilience (WICER) – A Case of Chennai (2021) page – 4 https://documents1.worldbank.org/curated/en/737251622708324921/pdf/Water-in-Circular-Economy-and-Resilience-WICER-The-Case-of-Chennai-India.pdf;*
3. *https://djb.gov.in/StaticContent/Tarrif.pdf;*
4. *https://hsiidc.org.in/sites/default/files/media/E%20Documents/C%20%26%20D%20-WATER%20TARIFF%20POLICY%20AND%20GUIDELINES%20REGARDING%20RELEASE%20AND%20BILLING%20OF%20WATER%20AND%20SEWER%20CONNECTION.pdf*
5. *https://www.thegpsc.org/sites/gpsc/files/26._industrial_water_supply_surat_municipal_corporation_india.pdf*
6. *MAHAGENCO-NAGPUR MUNICIPAL CORPORATION WASTE WATER REUSE PROJECT AT NAGPUR WATER SUPPLY FOR (3X660 MW) KORADI TPS Presentation https://mohua.gov.in/upload/uploadfiles/files/2_%20Mahagenco%20NMC%20Revised%20presentation%201(C)%20130%20MLD%20STP%20(1)06.pdf*

Economic viability of reuse of usedwater: Key Inferences

1. **Ground water is the cheapest source of water for industries**. In an unregulated environment, it is used quite commonly use because of the cost advantage (almost 90% of blocks in Maharashtra fall under safe limits as per assessment by CGWA-2011). Ground water extraction monitoring systems are weak and permissions are also quite relaxed.

2. Current water tariffs for industrial use in Maharashtra are **higher than the cost of treated used water**. It encourages the use of treated used water (but only in a **regulated environment**).

3. Small and medium industries either depend on underground water or piped water / tanker supplies from MIDC. If MSMEs have to switch to treated used water, a **last-mile connection needs to be established, and treated used water must be supplied to the doorstep of the enterprise.**

4. **Need to review existing industrial water tariffs in Maharashtra as compared to other states** in India.

5. Agricultural users are using downstream usedwater to irrigate their farms. ULBs must ensure that usedwater disposed of in water bodies is fit for agricultural use prior to disposal and maintain standards. As seen in Karnataka, ULBs may charge the farmers for the treated usedwater.

Economic viability: Quick win suggestions

1. For reuse projects to be successful, financial viability is the key factor that needs to be considered during project design and structuring itself. One of the important aspect for this is “**effective pricing mechanism**”- The treated water should be cost-competitive when compared to alternative options like ground water, bulk water purchase that are available to endusers.

2. **Differential pricing** shall be applied based on the type of end use and the ability to pay for treated used water. For example higher price for industries and lower price for farmers.

3. **Large number of power plants in Maharashtra are moving towards 100% reuse of usedwater within vicinity of urban local bodies.** Focus should now be on MIDC and other industrial clusters.

4. Most of the industries either rely on underground water (whether regulated or unregulated) or on fresh water supplied by MIDC. To encourage usedwater reuse, **MIDC regional estates shall partner with ULBs** in order to provide treated used water to industries instead of fresh water. Several projects have been implemented in many states, including Maharashtra, that demonstrate its economic viability.

5. ULBs must establish a supply chain system (water tanker etc.) in order to supply treated usedwater at the doorstep of bulk water users like construction sites, fire tenders, etc. at rates lower than the commercial tariff for fresh water.

CONTENT

Key Findings in Used Water Management in Maharashtra (1/2)

1. **Policy and institutional structure:** There is a reuse policy but no clear regulatory mandate for reuse of treated water. There needs to be a very clear mandate for used water reuse. Maharashtra also needs to established rules and regulations for reuse. Reuse accountability needs clear delineation of roles and responsibilities. Inter-governmental coordination is needed.

2. **Planning and financing:** Used water management should be considered upfront while planning sanitation projects and not after constructing STPs. Financing for used water management is available under AMRUT 2.0 but cities need to include reuse withing existing sanitation DPR.

3. **Infrastructure:** Higher capital and Operational investments are required for setting up of tertiary level STPs and conveyance for reuse. The cost bearer for transporting treated used water from STPs to reuse points is unclear. Urban local government are not ready for bearing such high cost of conveyance.

Key Findings in Used Water Management in Maharashtra (2/2)

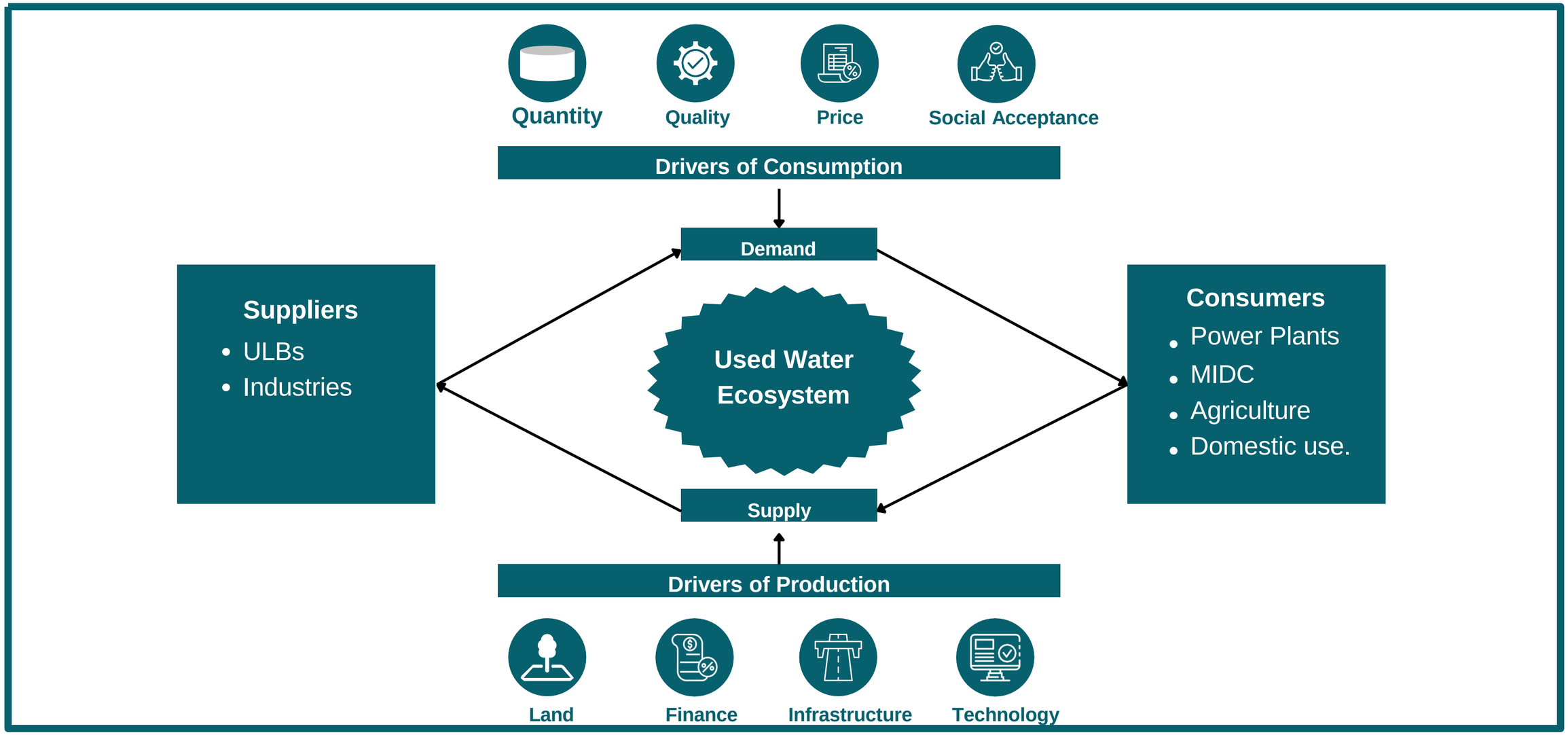
4. Standards of treated water quality: The quality of treated used water produced at STPs does not match requirements or standards at reuse points, especially for industries and agriculture reuse. Used water should also reach standards required by end-users. This will require tertiary level treatment and additional cost associated with it.

5. Pricing for treated water as compared to alternative sources: The used water should be cost-competitive when compared to alternative options like ground water, bulk water purchase that are available to end-users.

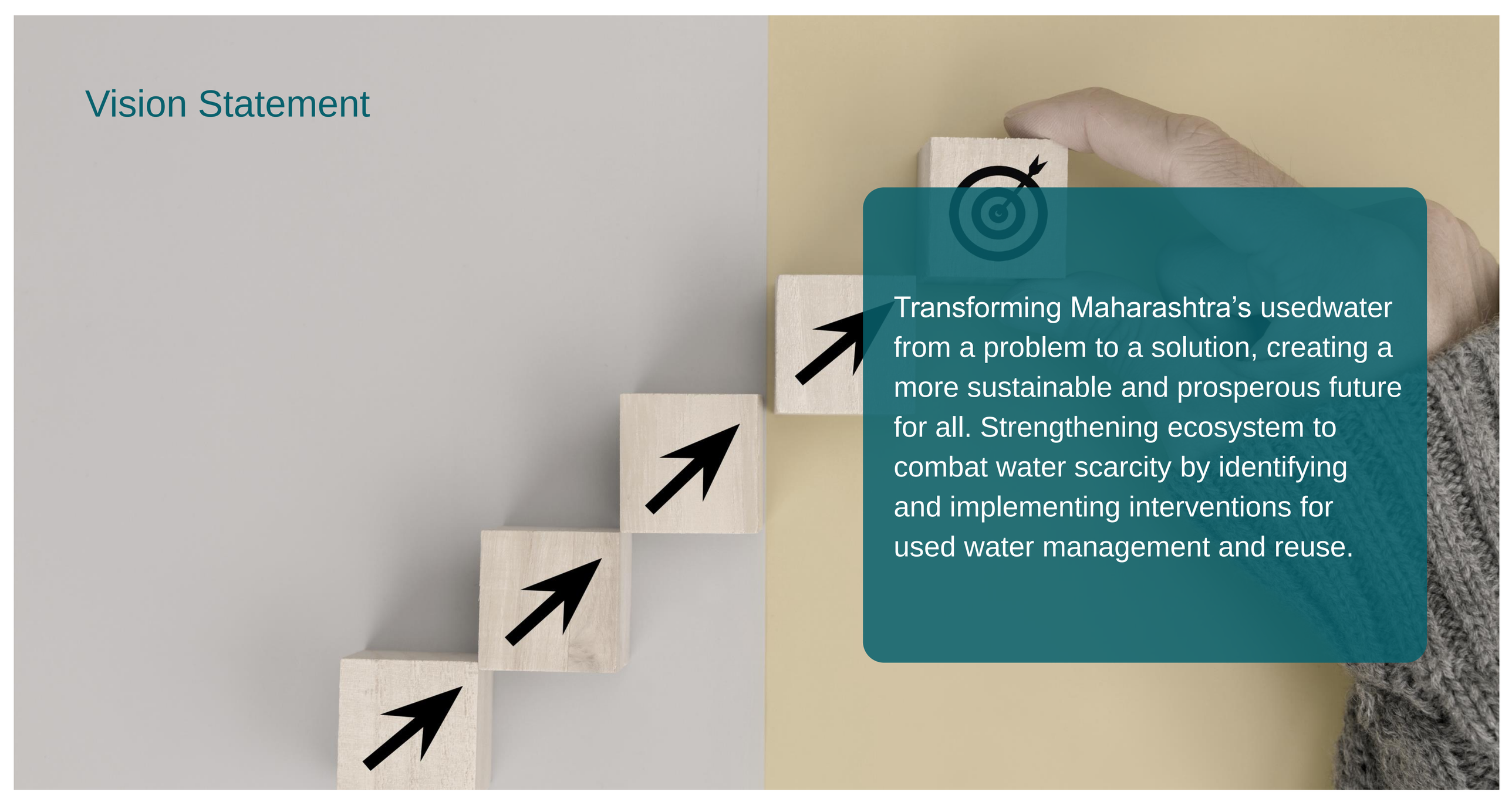
6. Incentives to end users: Currently, there are no incentives for end-users for using treated usedwater. Incentives in form of tax rebate or waiver will promote reuse.

7. Awareness: People are reluctant to use reclaimed water for both civic and industrial purposes due to perception issues. Need to create awareness about used water reuse to break perception barriers among end users.

Supply and demand drivers for used water management



Vision Statement



Transforming Maharashtra’s usedwater from a problem to a solution, creating a more sustainable and prosperous future for all. Strengthening ecosystem to combat water scarcity by identifying and implementing interventions for used water management and reuse.

Suggested strategies for reuse of treated used water

1. **Fostering partnership at state level**
2. **Introducing Regulations and Enforcement**
3. **City level reuse action plan**
4. **Delivering targeted awareness programs**
5. **Monitoring and Evaluation frameworks**

1. Fostering partnership at state level

The strategy focuses on creating an institutional setup through formation of a State level Working Group for used water management. They shall be responsible for overall implementation, review and monitoring of the reuse activities.

Roles and Responsibilities

- Approve Safe Disposal and Reuse Action Plans and accord administrative approval of Detailed Project Reports (DPRs).
- Advise State on Operations & Maintenance of sewage treatment plants and sewage networks erected under Mission and Rules.
- Monitor Mission including progress of projects, capacity building, IEC campaign and reform implementation, etc.
- Recommend proposals for release of funds for projects.
- Finalize State and ULB share of funds for project implementation.
- Encourage and facilitate start-ups and private entrepreneurs to participate in Mission.
- Approve plans for capacity building, issue notifications, etc. for speedy implementation and mission milestones.

Collaboration and Partnerships with experts

State committee shall partner with research institutes, NGOs, experts, private sector and industry experts to develop practical solutions to deal with used water management issues, including development of local capacity to implement reuse projects. This would require public-private partnerships and co-investment opportunities to find solutions.

The state level working committee will consist of

- Additional Chief Secretary (Finance)
- Additional Chief Secretary (Industry)
- Principal Secretary (Energy)
- Principal Secretary (Water Resources)
- Principal Secretary (UD-2)
- Member Secretary, Maharashtra Jeevan Pradhikaran
- Member Secretary, Maharashtra Pollution Control Board
- Respective Municipal Commissioners / N.P. Collectors

Establish Maharashtra State Used Water Management & Reuse Mission

Target under AMRUT 2.0

Create a 'new tap of water' through recycle of treated used water to meet at least 20% of total city water demand.

The Mission will focus on 40% in Maharashtra.

Fund Allocation

Out of total ₹66,750 Crore of central fund allocation for AMRUT projects,

₹9,285 (14%) Crore is allocated for sewage projects in Maharashtra.

Mission Strategy Approach

1. The Mission Approach should aim to **achieve 40% of reuse** by sanctioning and funding projects for establishing STPs and reuse pipeline systems.

2. A **Safe Disposal and Reuse Action Plan** should be created at State and ULB Level. The plans would detail out the targets, number of STP and reuse pipeline projects, and institutional and funding mechanisms for implementing the plans.

3. The projects mentioned in the action plans would be funded by the AMRUT scheme through a '**performance-based funding**' method. ULBs can avail the funding depending on performance indicators laid down in the action plans of states.

Role of State and ULBs

Expected to prepare and submit **Safe Disposal and Reuse Action Plans**.

Majorly covers status of water sources, water demand and supply in the city and existing gaps.

Milestones

Mission Term - 5 Years

Year 1	Target Reuse - 5%
Year 2	Target Reuse - 10%
Year 3	Target Reuse - 20%
Year 4	Target Reuse - 30%
Year 5	Target Reuse - 40%

2. Introducing Regulations and Enforcement

- Develop appropriate regulatory measures and enforcement mechanism to formalize and systematize the used water management sector.

- Establish a regulatory framework with by-laws to support the new institutional arrangements- Used water management requires sustained focus and commitment of significant state and ULB resources. This can be facilitated by developing strong and dedicated institutional arrangements, with a clear mandate to implement the used water management strategies with delineated responsibility, staff and budget.

- Regulation should include violations and penalties for mismanagement and hazardous discharge of used water.

State level responsibilities
• Setting up an state level working committee representative of different sectors to oversee uptake of reuse of used water management.
• Developing a State level regulations and enforcement on reuse of used water within States. Setting up the institutional structures for implementation
• Undertaking a mapping of supply and demand covering the sources and potential users across the State and initiate an awareness raising and support programme to match the production of used water with potential users.
• Developing guidelines for end-use water quality standards.
• Establishing pricing policies, incentives and penalties. Establishing State programmes for financial support that complement existing programmes.
• Encouraging Research and Development. Prepare Training Modules incorporating best practices
• Establishing a state monitoring system to track implementation and provide online reporting.

2. Introducing Regulations and Enforcement

- Develop regulatory regulations and byelaws to formalize and standardize treatment and discharge guidelines for the used water management sector.
- These regulations should align with the requirements of potential end-users and ensure the safe management of used water, minimizing health, safety, and environmental risks.
- Incentivize reuse for various uses. Establishing pricing policies for financial support especially for upgradation of STPs to meet reuse standards and laying of conveyance pipeline from STP to end-users.
- Capacity building of city officials for used water management.

Treated water discharge norms

Used Water	BOD	COD	TSS	N	P
Sewage	110 - 400	250 - 1000	100 - 350	20 - 85	4 - 15
CPCB Norms	< 30	< 250	< 20	-	-
NGT Norms	< 10	< 20	< 50	< 10	-
Low-end Industrial Use (from ASP and SBR)	< 5	< 50	< 10	< 10	< 1
High-end Industrial Use (from low-end and MBBR)	< 5	< 50	< 10	< 10	< 1
ASP	< 30	< 250	< 30 - 50	45	5
SBR	< 5	< 50	< 10	< 10	< 1
MBBR	< 5	< 50	< 1	< 10	< 1

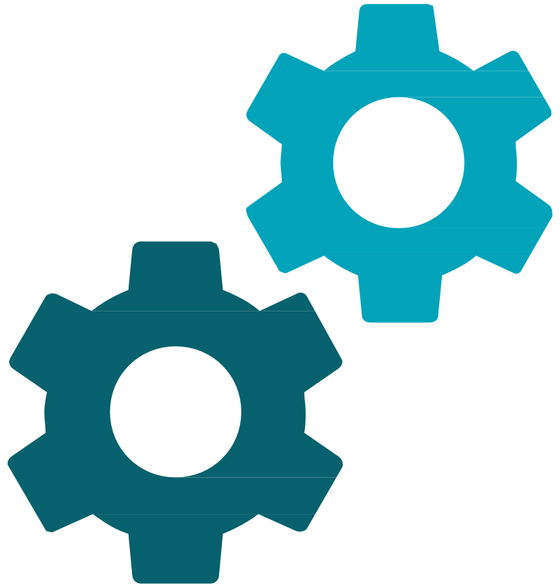
Renewable Purchase Obligation (RPO) is the obligation mandated by the Maharashtra Electricity Regulatory Commission (MERC) under the Act, to purchase minimum level of renewable energy (25%) out of the total consumption by the Obligated Entity. A similar Obligation can be mandated to purchase minimum treated used water out of total water used in cooling towers by Thermal Power Plants.

3. City level reuse action plan

- A Safe Disposal and Reuse Action Plan should be created at ULB Level. Cities should plan to maximize reuse of treated water from STPs within dedicated timeframe (e.g. 2-3 years) . Used water reuse should be considered upfront while planning sanitation projects and not after constructing STPs.
- The key components of such a plan should include:
  - Assessment and inventory of potential end-users that required treated used water within vicinity of STPs.
  - Inventory of each STPs within city limit: Amount of water treated, output quality achieved, sludge generated, etc.
  - Assess conveyance distance and quality of treated water needed with respect to end-users. Assess upgradation of STP if needed.
  - Assess financing requirement and funding mechanisms for implementing the plans
  - Assess institutional set-up (e.g. PPP) for implementing reuse projects.
  - Develop Monitoring mechanism and performance tracking mechanism for such projects.
  - Public Awareness and Education: Implement campaigns to educate the public about the importance of resource reuse.
  - Promote community engagement and participation in reuse programs.
- Actions plans to be submitted to state working committee for approval and funding.

Reuse of Used Water from

4% to 40%



4. Delivering Targeted Awareness Programs

To promote awareness and encourage the reuse of treated used water, consider implementing the targeted awareness programs:

- Awareness programs: Deliver clear and targeted education and awareness programs to meet the needs of the community, farmers, industry and other users of treated used water. Host education programs, seminars, functions, events to increase awareness among public. Organize competitions and challenges with incentives for intelligent reuse solutions.
- Best practice and pilot demonstrations: Introduce a best practice used water management demonstration program at strategic locations in Maharashtra to raise awareness of the community, including awareness raising programmes and activities related to health and safety aspects of sewage water.
- Engage with Education sector: Work with the education sector to introduce zero used water education in the school curriculum.
- Information Campaigns: Launch informational campaigns using various media channels, including TV, radio, newspapers, and social media, to disseminate information about the treatment process and the potential uses of recycled water.
- Community Participation: Promote community engagement and participation in reuse programs.

5. Monitoring and Evaluation Frameworks

- Monitoring and evaluation of reuse of used water is required to:
  a) Track performance targets of reuse as set out by the State.
  b) Ensure compliance on outcome, process and service standards in reuse projects.
  c) Evaluate pricing of treated used water, incentives and penalties/sanctions, and
  d) Ensure transparent reporting mechanisms

- At the national level, MoHUA has developed Service Level Benchmark (SLBs) on used water management to assess performance of citywide sanitation. The benchmark currently has provision for the indicator on reuse of treated used water and it shall be updated to capture additional indicators based on local reuse.

- State governments will be responsible for monitoring the performance and shall devise data collection and reporting systems using the indicators developed for SLBs.

- Urban local body will be responsible for leading monitoring and compliance of outcome, process and service standards on reuse projects implemented within their jurisdiction.

- Manual monitoring can be replaced with automatic digital monitoring for time and cost efficiency, and real-time alerts.

Source: National framework on safe reuse of treated water, 2022, access at https://nmcg.nic.in/writereaddata/fileupload/32_SRTW%20Framework_Final_23_11_2021%20(1).pdf

Summary- Quick wins initiatives for used water management

- ✓ **Executive order to direct ULBs to include provision of infrastructure for usedwater reuse in the respective DPR of STPs and FSTPs.**
- ✓ **Executive Order to clarify bearer for cost of laying infrastructure from existing treatment plant to end user.**
- ✓ **Rationalization of bulk water tariff and appropriate subsidy and incentives to promote usedwater reuse. Power plants and heavy industries should be prioritized for developing used water reuse projects.**
- ✓ **ULBs must establish a supply chain system (water tanker etc.) in order to supply treated treated water at the doorstep of bulk water users like construction sites, fire tenders, etc. at rates lower than the commercial tariff for fresh water.**
- ✓ **Amendment in municipal bye-laws for using treated water for civic uses (road washing, construction, CT/PT cleaning, etc.) and ecological uses (median watering, public gardens and parks, reviving of lakes and waterbodies, etc.) within urban areas**
- ✓ **Intelligent process automation for monitoring of water quality at STPs and its reuse reaching end-users. Review and monitoring of reuse projects and achievements.**

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Thank You

CWAS acts as the catalyst to provide access to every household to safe water and safely managed sanitation

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About us

The Center for Water and Sanitation at CEPT University carries out various activities – action research, training, advocacy to enable state and local governments to improve delivery of services.

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