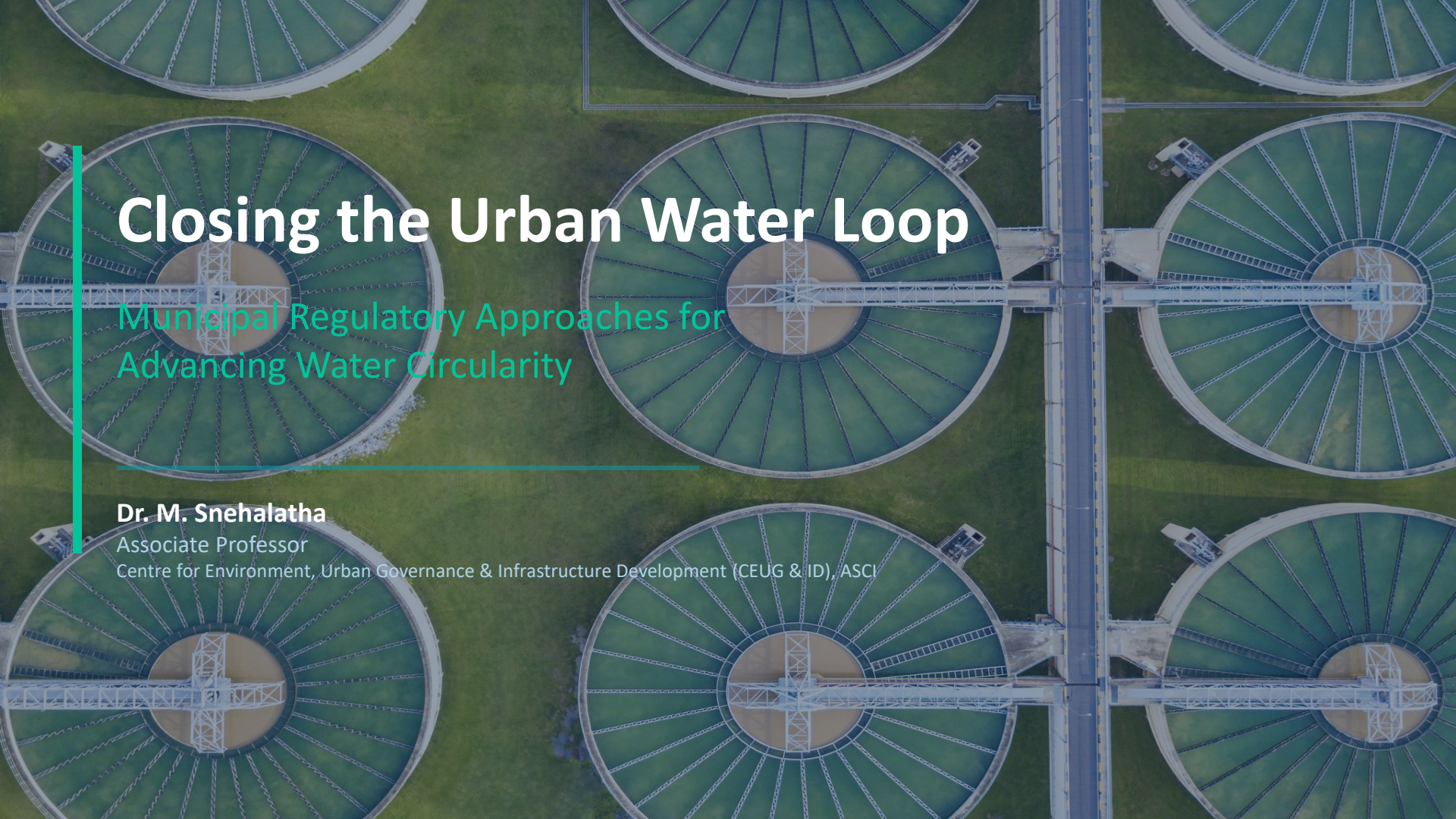

Closing the Urban Water Loop

Municipal Regulatory Approaches for Advancing Water Circularity

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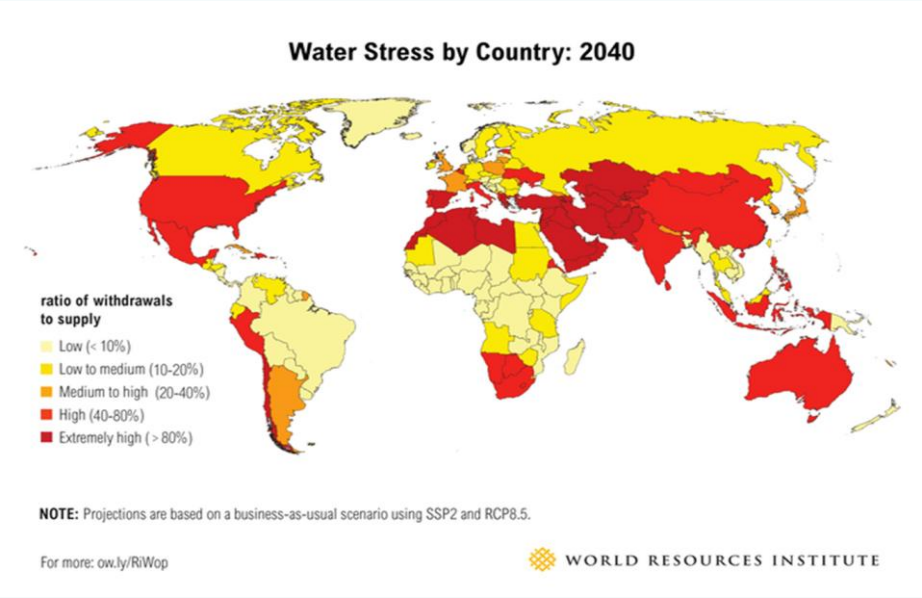
Agenda

1. Global Water Stress: A Worldwide Perspective
2. India’s Critical Water Stress Scenario
3. The Significant Wastewater Recycling Gap in India
4. Robust Policy Landscape for Water Reuse in India
5. Spotlight on Performing Cities Driving Reuse
6. A Proposed Model Municipal Framework for Enhanced Reuse
7. Conclusion

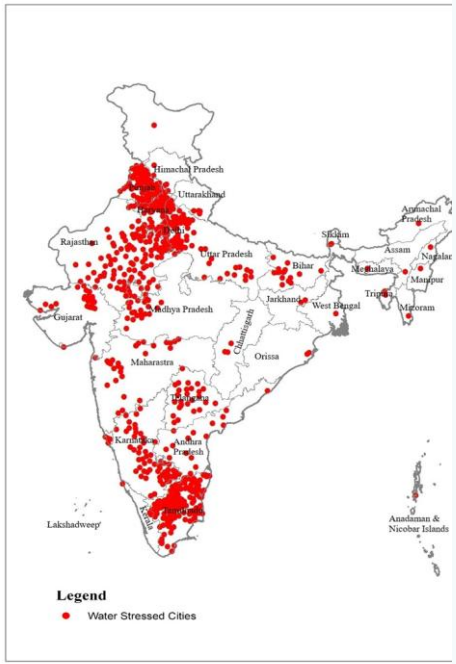
Global Water Stress: A Worldwide Perspective

- Globally, an average of 18–19% of all renewable freshwater resources are withdrawn annually, significantly impacting ecosystems.
- Central/Southern Asia and North Africa are experiencing critical water stress, with annual withdrawals exceeding 25%.
- High withdrawal can lead to depletion of surface and groundwater, degradation of water quality, and severe environmental consequences.

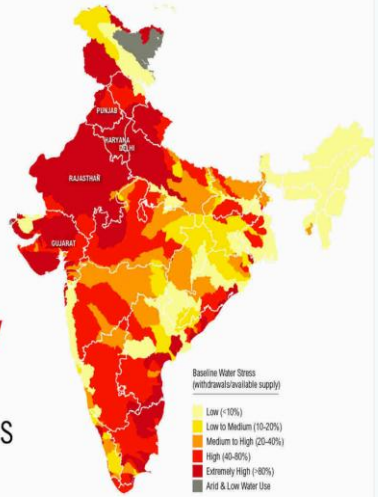


Source: World Resources Institute, Water Stress by Country (2040)

India’s Critical Water Stress Scenario



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



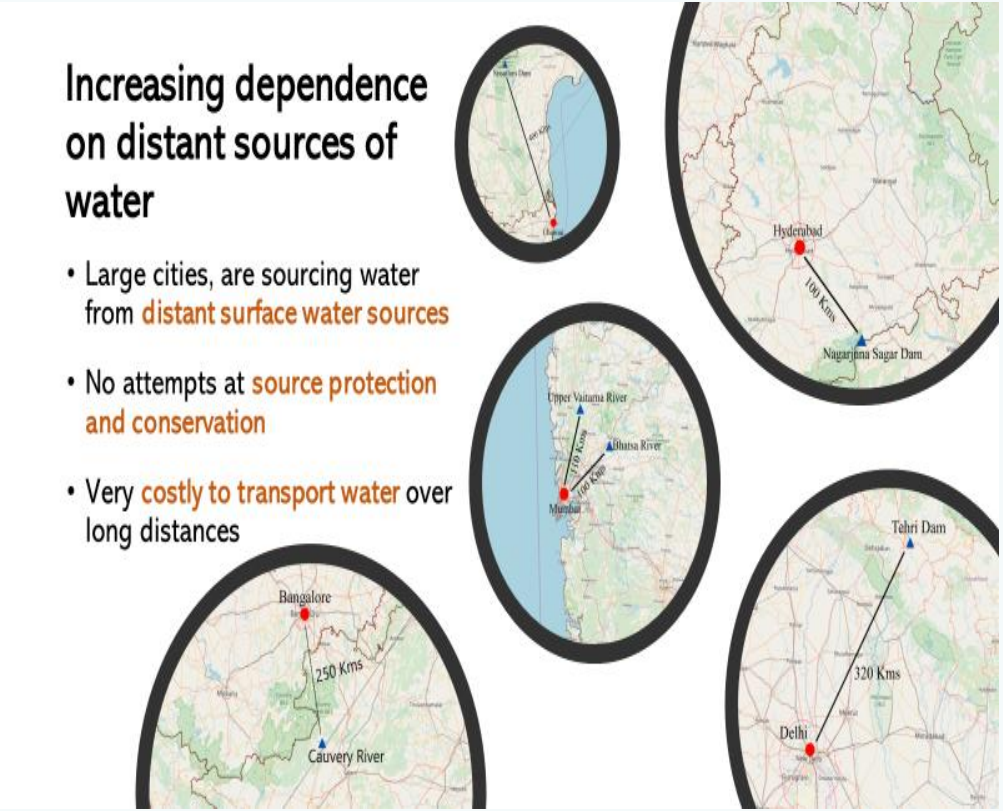
600 Million
Indians face high to extreme water stress

2x by 2030
Projected water demand increase

6% GDP Loss
Annual economic threat if unaddressed

Increasing Dependence on Distant Sources of Water

- Large cities are sourcing water from distant surface water sources
- No attempts at source protection and conservation
- Very costly to transport water over long distances



Can Reuse Be an Option?

Exploring wastewater recycling as a strategic solution for urban water security

Wastewater Recycling Gap in India

72,368
MLD
Generated

→

31,841
MLD (44%)
Installed Capacity

→

26,869
MLD (37%)
Operational Capacity

→

~20,236
MLD (28%)
Actually Treated

44%
Treatment Infrastructure Coverage (Installed)

37%
Operational Treatment Capacity Available

<30%
Actual Reuse of Treated Wastewater

28%
Wastewater Actually Being Treated

Critical Environmental Impact

72%

Of sewage generated in urban areas is released directly into rivers, lakes, and land without treatment

Emphasis on Reuse in National Policies – City Level

National Water Policy (NWP, 2012)	Focus on reducing water pollution; draft revised NWP (2020) embraces recycling and reuse.
National Urban Sanitation Policy (NUSP, 2008)	Focuses on sanitary and safe disposal of human waste; recommends recycle and reuse.
National Environment Policy (NEP, 2006)	Emphasizes recycling sewage and used water from municipal and industrial sources before discharge.
National FSSM Policy (2017)	Leveraging FSSM to achieve 100% access to safe sanitation; mandates strict environmental discharge standards.
National Framework on Safe Reuse (Nov 2022)	Framework for safe reuse of treated wastewater at national level.
Power Tariff Policy (2016)	Thermal power plants within 50 km of STPs must adopt treated wastewater for non-potable uses.

Environmental Impact Assessment (EIA) Notification – 2016 – Building Level

Ministry of Environment, Forest and Climate Change

Category 1	5,000 – 20,000 sq.m built-up area	Can connect to municipal sewer where available; on-site treatment where no sewer exists. Treated effluent to be reused. Excess discharge per CPCB norms.
Category 2	20,000 – 50,000 sq.m built-up area	On-site sewage treatment with 100% capacity required. Treated wastewater reused for landscape, flushing, cooling towers. Sludge collected and disposed per CPHEEO norms.
Category 3	50,000 – 1,50,000 sq.m built-up area	Same as Category 2, plus mandatory separation of grey and black water using dual plumbing system.

Note: Model Building Bye-Laws (MBBL) are not directly enforceable but provide a template for states to revise building regulations.

Six City Analysis

Spotlight on Performing Cities Driving Wastewater Reuse

City Profiles – Wastewater Generation & Reuse

City – State	Population	Wastewater Generated (MLD)	Wastewater Treated (MLD)	Total STPs	% Treated WW Reuse
Surat, Gujarat	75,00,000 (2021 Census)	1,813	1,220	11	70%
Nagpur, Maharashtra	24,05,000	520	340	4	60.29%
Navi Mumbai, Maharashtra	11,20,547	215	215	7	30.23%
Visakhapatnam, AP	18,90,000	290	265	16	27.26%
Bengaluru, Karnataka	84,50,000	1,440	920	32	31.94%

Visakhapatnam: Exemplary Industry-Anchor Driven Reuse

Generation & Treatment	City sewage generation ~225 MLD with existing treatment capacity ~233 MLD; however ~32% wastewater is still discharged untreated.
Municipal Reuse	Includes supply of approx 20 MLD to HPCL industry, 2 MLD to other facilities, and ~8–15 MLD for horticulture/beautification.
Governance	Greater Visakhapatnam Municipal Corporation (GVMC) manages sewerage, with Smart City SPV (GVSCCL) implementing projects.
Current Reuse	Reuse currently for industrial, landscaping, public utility purposes.
Revenue	Municipality may derive revenue via industrial agreements (not widely reported yet).
Policy Alignment	Andhra Pradesh policy supports reuse; Smart City and IFC financing align with national reuse norms.

Surat – Gujarat

- Total sewage generation ~432 MLD; total STP capacity ~202 MLD in the city.
- Surat reuses ~330 MLD of treated water, with ~115 MLD supplied to textile processing industries.
- SMC drives wastewater reuse via integrated fixed-film activated sludge technology.
- Large volume delivered to textile industry and other commercial end-users.
- Generates significant revenue (~₹140 crore annually) from selling treated wastewater.
- Gujarat targets 100% reuse by 2030 with mandates around industrial and agricultural users.

Source: Surat Municipal Corporation

Nagpur – Maharashtra

- Generates ~520 MLD of sewage with treatment capacity ~380 MLD (some STPs reportedly non-functional).
- Reported reuse of ~86% of treated wastewater by Nagpur Municipal Corporation.
- Around 300 MLD of treated water sold to Koradi & Khaperkheda thermal power plants.
- NMC manages sewerage infrastructure with PPP engagement for STPs.
- Claims ~₹300 crore revenue over 9+ years from sale of recycled water to MAHAGENCO.
- Reuse model follows Maharashtra state water policy encouraging reuse.

Source: MoHUA Compendium of Recycle and Reuse of Wastewater in 54 million plus cities

Navi Mumbai – Maharashtra

- Recognised for 100% mechanised sewer lines and high reuse penetration.
- ~30%+ of treated water reused for city gardens, vehicle washing, transport services, road medians.
- Navi Mumbai Municipal Corporation (NMMC) operates with centralised sewer monitoring.
- Urban public sector reuse across municipal services (parks, street cleaning, transport).
- Reuse aligns with Maharashtra policy targets; revenue benefits indirect via reduced potable water demand.

Source: MoHUA Compendium of Recycle and Reuse of Wastewater in 54 million plus cities

Bengaluru – Karnataka

- Bengaluru generates ~1,940 MLD wastewater, with ~77% treated.
- Of treated wastewater, ~43% (approx 642 MLD) is reused.
- BWSSB operates STPs and enables reuse including on-site systems.
- Regulates supply to construction sites, industries, commercial establishments.
- Supplies treated water to commercial users (e.g., Wipro for 0.3 MLD supply).
- Karnataka Urban Wastewater Reuse Policy (2017) mandates reuse and onsite STPs in large complexes.

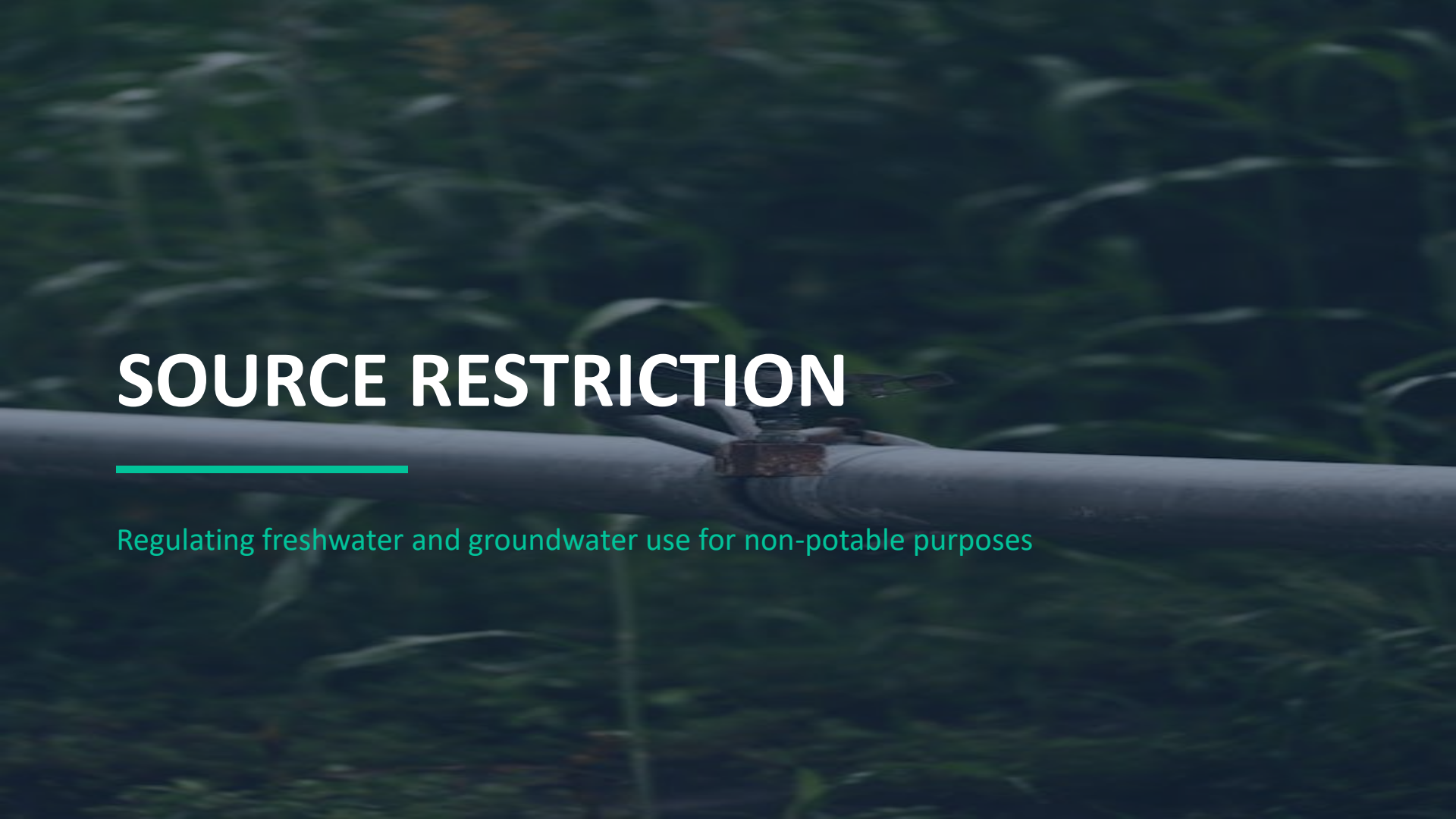
Source: MoHUA Compendium of Recycle and Reuse of Wastewater in 54 million plus cities

Hyderabad – Telangana

- Hyderabad has full treatment capacity for most sewage generated citywide.
- Increasing interest in reuse (e.g., cooling, industrial). Though specific reuse figures are not widely published nationally, state policies encourage reuse in non-potable applications.
- Telangana includes reuse plans within urban water policy, emphasizing integrated sewage networks.
- Regulatory push from state water boards and national reuse targets.

Model Framework

Wastewater Recycling & Reuse Regulations



SOURCE RESTRICTION

Regulating freshwater and groundwater use for non-potable purposes

Source Restriction – New Industries, Existing Industries & New Commercial Entities

New Industries (Non-Potable Use)

- (1) Prohibited from using groundwater or freshwater for non-potable purposes.
- (2) Must use treated wastewater for applications like cooling, landscaping, and cleaning.
- (3) Freshwater/groundwater use allowed only with NOC from competent authority.

Existing Industries (Non-Potable Use)

- One year to transition to alternative water sources if currently dependent on groundwater or freshwater.

New Commercial Entities (Non-Potable Use)

- (1) Prohibited from using groundwater or freshwater for non-potable purposes within the urban and peripheral areas.
- (2) Must use treated wastewater to meet required standards.
- (3) Freshwater/groundwater use allowed only with NOC from competent authority.

Source Restriction – Existing Commercial, Construction & Government

Existing Commercial Entities (Non-Potable)

- Six-month transition period for existing commercial entities to transition to treated wastewater.

New Construction Activities

- Currently using groundwater and private groundwater and tanker water must be transitioned to treated wastewater.

Government Departments

- All government departments must transition from using freshwater for non-potable purposes.
- Must transition within 6 to 18 months.

Source Restriction – Horticulture, Road Development & Groundwater

Horticulture

- Groundwater and freshwater use for parks, private gardens, and other plantations within the urban area and 10 km buffer zone prohibited from using groundwater or freshwater.

Road Development Activities

- All new road development government or private, within the urban area and 10 km buffer zone are prohibited from using groundwater or freshwater.

Groundwater for Non-Potable Uses

- No borewell or groundwater abstraction for non-potable uses within urban area and 15 km buffer zone without prior written approval.

Groundwater Abstraction for Non-Potable Use

- Industries or users currently using freshwater or groundwater must transition to treated freshwater/reuse set by the competent authority.

Mandatory Use

Mandating treated wastewater reuse across sectors

Mandatory Treated Wastewater Reuse – Industries & Commercial Entities

Industries

- (1) Must use treated wastewater for all non-potable purposes.
- (2) Industries relying on groundwater or freshwater must be transitioned to treated wastewater within the prescribed timeframe.

Commercial Entities

- (1) Required to use treated wastewater for all non-potable purposes.
- (2) Entities currently using groundwater must switch to treated wastewater within one year.

New Construction Sites

- All projects with a built-up area over 5,000 sq.m must use treated wastewater for construction and non-potable uses.

Mandatory Treated Wastewater Reuse – Road, Parks & Government

Road Development Activities

- (1) All public and private road construction and medians must use treated wastewater for construction and non-potable uses.
- (2) Parks currently using groundwater are given 12 months to transition to treated wastewater.

Parks & Plantations

- Urban local bodies must use treated wastewater for landscape, horticulture and other non-potable uses.

Governmental Departments & Buildings

- All government buildings must adopt treated wastewater for non-potable uses.
- (2) Six-month transition period for government buildings using groundwater.

Mandatory Treated Wastewater Reuse – Transportation, Waterbody & Other Uses

Department of Transportation & Forestry

- Must use treated wastewater for road washing, dust suppression and maintenance.
- Horticulture departments must use treated wastewater for all plantation activities.

Waterbody Rejuvenation

- Must use treated wastewater meeting prescribed standards for rejuvenation of urban water bodies.

Firefighting Water Requirements

- Fire departments may use treated wastewater for training and non-emergency purposes where feasible.

Non-Potable Uses (Street Washing, etc.)

- All municipal departments must use treated wastewater for street sweeping, drain cleaning and public sanitation activities.

Allocation of Treated Wastewater

Principles of Allocation	Allocation shall follow the principles of sustainability, equity, and fairness to ensure effective distribution & optimal use of treated wastewater.
When Availability Exceeds Demand	All mandatory users will be supplied with the required quantity of treated wastewater. Any excess treated wastewater, after mandatory users, shall be directed to rejuvenating local water bodies and irrigation in nearby areas.
When Availability is Less Than Demand	Treated wastewater will be allocated to mandatory users first, in order of priority. Unmet demand will be fulfilled with treated freshwater at regular tariffs.

Standards – NGT Treated Wastewater Quality

No.	Parameter	Limits
1	pH	6.5 – 8.5
2	Total Suspended Solids (TSS)	< 20 mg/l
3	COD	< 50 mg/l
4	BOD (5 day)	< 10 mg/l
5	Total Nitrogen	< 10 mg/l
6	Ammoniacal Nitrogen	< 5 mg/l
7	Faecal Coliform	< 100 MPN/100 ml

Treated wastewater meeting the NGT standards shall be provided for non-potable industrial, commercial, and horticulture uses.

Implementing Agency: Circular Economy Unit (CEU)

Establishment	A “Circular Economy Unit” (CEU) will be established for planning, marketing, and facilitating the reuse of treated wastewater across the city.
Funding	A corpus of ₹20 Cr will be allocated for the CEU’s operations.
Reporting Structure	The CEU will report to the Managing Director or Nodal Officer of the respective authority.
Leadership	The unit will be headed by a Director.
Staffing	The unit will employ personnel in roles such as Chief General Manager, General Manager, Deputy General Manager, and Manager.
Project Management	The head of the CEU will oversee the establishment of a Project Management Unit (PMU).
PPP Unit	The CEU will include a dedicated team for managing and operationalizing Public-Private Partnership (PPP) projects.

Awareness & Community Engagement

Public Awareness Campaigns

Demonstration programs to promote acceptance and understanding of treated wastewater for non-potable reuse.

Rebranding Treated Wastewater

The competent authority will focus on understanding treated wastewater for its acceptance and adoption.

Public Health & Environmental Assessment

Regular public health and environmental assessment and monitoring on the use of treated wastewater within the city.

Conclusion

- Urban water stress is critical – Rapid urbanization and climate risks demand urgent action.
- Treated wastewater is a strategic resource – It reduces freshwater dependence and enhances resilience.
- Municipal regulation is the game changer – National policies alone are insufficient; city-level mandates and governance matter most.
- Financial sustainability drives success – Differential pricing, bulk supply contracts, and PPP models make reuse viable.
- Institutional capacity is essential – Dedicated Circular Water Economy Units can coordinate supply-demand and compliance.
- Integration into city planning – Reuse targets should be embedded in water security and climate resilience strategies.
- Outcome benefits – Climate resilience, fiscal stability for utilities, and progress on SDG and Amrit Bharat vision.
- Call to action – Municipalities must lead the transition from linear to circular water systems.