Treated Wastewater Re-Use Across Sector

WABAG

sustainable solutions. for a better life.

PROTECTING ENVIRONMENT
POWERING ECONOMIES

100 SUSTAINABLE YEARS

WABAG GROUP. SINCE 1924



Shailesh Kumar
Chief Executive Officer – India Cluster
VA TECH WABAG LIMITED

© WABAG 2024

GLOBAL PRESENCE

DELIVERING SUSTAINABLE WATER SOLUTIONS WORLDWIDE

WABAG
sustainable solutions. for a better life.

~2,000 Employees

3 Continents

>25 Countries

>30 Companies & Offices

The world's **3rd** largest private water operator.*

The world's **3rd** in top desalination plant suppliers.**









Clean Water for Communities

Sustainable Growth for Economies

Innovative Solutions for a Resilient Future

* WABAG is ranked 3rd among the World's top 50 private water operators (GWI, December 2024) serving >95 million people.
** Ranked 3rd globally among the world's top desalination plant suppliers in GWI's latest annual survey (November 2024).



Water for a Better Tomorrow

Preserving Resources. Protecting Environment. Powering Economies.

Manufactured Water – Usage & Avenue

CONVERTING TREATED WASTEWATER INTO A VALUABLE RESOURCE

WABAG
sustainable solutions. for a better life.

Advanced treatment stage to remove residual solids, nutrients, pathogens, dissolved impurities, colour and trace contaminants using filtration, membranes, adsorption and disinfection.

Produces high-quality water for reuse in industrial, irrigation or potable applications, while meeting stringent standards, protecting health/environment, and conserving freshwater.



Existing STP Plant
Treated secondary effluent

Treated Water



Tertiary Treatment Plant
(e.g. Tertiary Filtration, UF/RO, AOP, Disinfection)

Pure Water

High-Quality Treated Water
Safe, Reliable, Fit for Reuse



Data Centres
Cooling water, non-potable uses



Office Spaces
Cooling, landscaping, non-potable uses



Industries
Process water, cooling, boiler feed (as applicable)



Institutions
Educational, healthcare and public facilities

Cleaner Environment
Reduces pollution load in rivers and lakes

Conserves Freshwater
Augments water availability and resilience

Protects Public Health
Removes pathogens and emerging contaminants

Supports Sustainable Growth
Reliable water for industry, agriculture and urban needs

Enables Circular Economy
Turning waste into a valuable resource

Preserving Resources. Protecting Environment. Powering Economies.

The Organizing Idea

WABAG
sustainable solutions. for a better life.

The treatment ladder: fit-for-purpose, not maximal

Right treatment for the right use | Better value | Greater water security

TIER 1 Essential Treatment	**Secondary treatment + Disinfection + Media Filtration** Remove suspended solids, basic pathogens		Restricted irrigation, dust suppression, firefighting
TIER 2 Enhanced Treatment	**+ Micro Filtration & stronger disinfection** Remove fine solids, bacteria, improve clarity		Unrestricted irrigation, parks, flushing, general industrial process water
TIER 3 Membrane Treatment	**+ Membrane filtration ± RO** Remove colloids, organics, dissolved impurities (partial)		Industrial cooling, data centre cooling, boiler feed water
TIER 4 Advanced Purification	**UF/MF ± RO** High removal of suspended solids, pathogens and most dissolved impurities		Groundwater recharge (indirect potable reuse)
TIER 5 Ultra-Pure Treatment	**+ RO + AOP** Remove trace organics, micropollutants, colour and achieve highest water quality		Direct potable reuse











Resource Efficient
Treat only as much as needed

Lower Lifecycle Cost
Optimised capex & opex

Environmental Protection
Better water reuse, healthier ecosystems

Fit for Purpose
Right quality for the right application

Greater Water Security
More value from every drop

Preserving Resources. Protecting Environment. Powering Economies.

Wabag Expertise in Re-use

Proven Solutions for a Water Secure and Sustainable Future

WABAG
sustainable solutions. for a better life.

Conserving Freshwater Resources | Enabling Circular Economy | Supporting Sustainable Industrial Growth | Building Healthier Communities



CLEANER WATER BRIGHTER TOMORROW

Koyambedu TTRO, India

Treated Wastewater for a Greener Tomorrow

- 45,000 m³/d Capacity
- 536 Automotive industry users
- ~ 1500 to 70 TDS reduction
- 2019 Start-up
- DBO 15 years O&M



Koyambedu TTRO, Chennai

Treatment Process

Filtration → Ultrafiltration → Reverse Osmosis → Ozonation

Treated Water for Reuse

Automotive Industry



~ 536 users

Converting Wastewater into Value for a Sustainable Tomorrow

Ghaziabad TTRO, India

A Landmark Project for a Cleaner, Greener Tomorrow

- 40,000 m³/d Capacity
- 1,445 Automotive industry users
- ~ 1500 to <500 TDS reduction
- 2025 Start-up
- HAM 15 years Concession Period



Ghaziabad TTRO

Treatment Process

Filtration → Ultrafiltration → Reverse Osmosis

Treated Water for Reuse

Automotive Industry



~ 1,445 users

India's FIRST GREEN BOND PROJECT | Setting a new benchmark in sustainable infrastructure

Preserving Resources | Protecting Environment | Powering Economies

WABAG EXPERTISE in Re-Use

Turning Used Water into a Reliable Resource for a Sustainable Tomorrow

WABAG
sustainable solutions. for a better life.

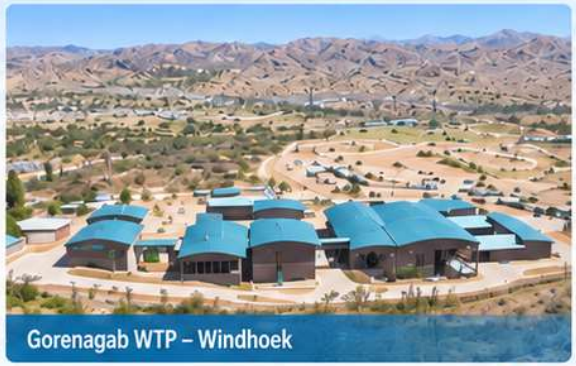
In arid regions, municipal used water is often an important, additional – or the only available – resource.



The New Gorenagab WTP, WINDHOEK, NAMIBIA

World's First Direct Potable Reuse Plant


Intake & Pumping System


Gorenagab WTP – Windhoek


Advanced Treatment System (UF/RO)

21,000 m³/d
Capacity

9 Treatment Steps
Advanced multi-barrier system

2002
Start-up

Designed, built and operated by WINGOC (WABAG JV)

Treatment Process (Multi-Barrier)

Pre-treatment → Filtration → Ultrafiltration → Reverse Osmosis → Disinfection → Potable Water

DPR provides a sustainable, climate-independent, local source of supply for communities.

Key Highlights

- Drinking water from municipal used water (pre-treated)
- No health risk
- Climate-independent, reliable water source
- Supply to local communities
- Global benchmark in water reuse



WABAG has the technologies needed to convert municipal used water into drinking water – and has built ***the 1st plant in the world***

Preserving Resources | Protecting Environment | Powering Economies

WABAG EXPERTISE in Re-Use

Delivering Innovative Water Reuse Solutions Across Municipal & Industrial Sectors

WABAG
sustainable solutions. for a better life.



Used Water.
Greater Possibilities.
A Sustainable Tomorrow.

- Advanced Membrane Technologies
- Resource Recovery & Reuse
- Sustainable Industrial Growth
- Cleaner Communities Healthier Lives

Panipat Naphtha Cracker, India

Reuse, DBO

India's FIRST & SECOND reclamation plants for refinery used water recycling system based on membrane technology.



Clarifier



Treatment System

Key Data

Technology
Clarification, Filtration, Ultrafiltration, Reverse Osmosis & Demineralisation

Type
DBO

Capacity
21.6 MLD & 21 MLD

Start-up
2006 & 2010

Recycling for reuse as boiler feed water

Industrial Reuse Projects

Refineries & Petrochemicals

Dahej Refinery, Gujarat, India



Key Data

- **Technology** UASB, MBR, UF & RO
- **Capacity** 36,000 m³/d
- **Reuse** As utility water
- **Start-up** 2014

Dangote Refinery & Petrochemical Project, Nigeria



Key Data

- **Technology** MARAPUR® (MBR), UF & RO
- **Capacity** 26,400 m³/d
- **Reuse** Process water (demineralized water)
- **Start-up** 2022

Comprehensive water treatment, recycling and reuse for a more resource-efficient industry

MENA & International Reuse Projects

Madinaty Stage I & II, Cairo, Egypt



Key Data

- **Purpose** Water reclamation plant for new satellite city
- **Capacity** 2 x 40,000 m³/d
- **Reuse** Irrigation & landscaping
- **Model / Start-up** DBO, O&M since 2018 (Stage I: 2018, Stage II: 2022)

Jazan Economic City, Saudi Arabia



Key Data

- **Purpose** Further reclamation of industrial and municipal effluents
- **Capacity** STP: 40,000 m³/d 10,000 m³/d recycled
- **Reuse** TSE Network for irrigation
- **Technology / Start-up** Filtration, Dual Media Filtration & Post Chlorination 2022

Beni Messous WWTP, Algeria



Key Data

- **Scope** Turnkey realization of line 2 & common tertiary treatment plant for both lines
- **Capacity** 100,800 m³/d / 500,000 PE
- **Reuse** Agricultural irrigation
- **Execution / Start-up** EPC, turnkey execution 2016

Municipal used water – too valuable to be discharged!
Creating value for people, industry and the environment.

- Preserving Resources
- Protecting Environment
- Powering Economies
- Building a Water Secure Future

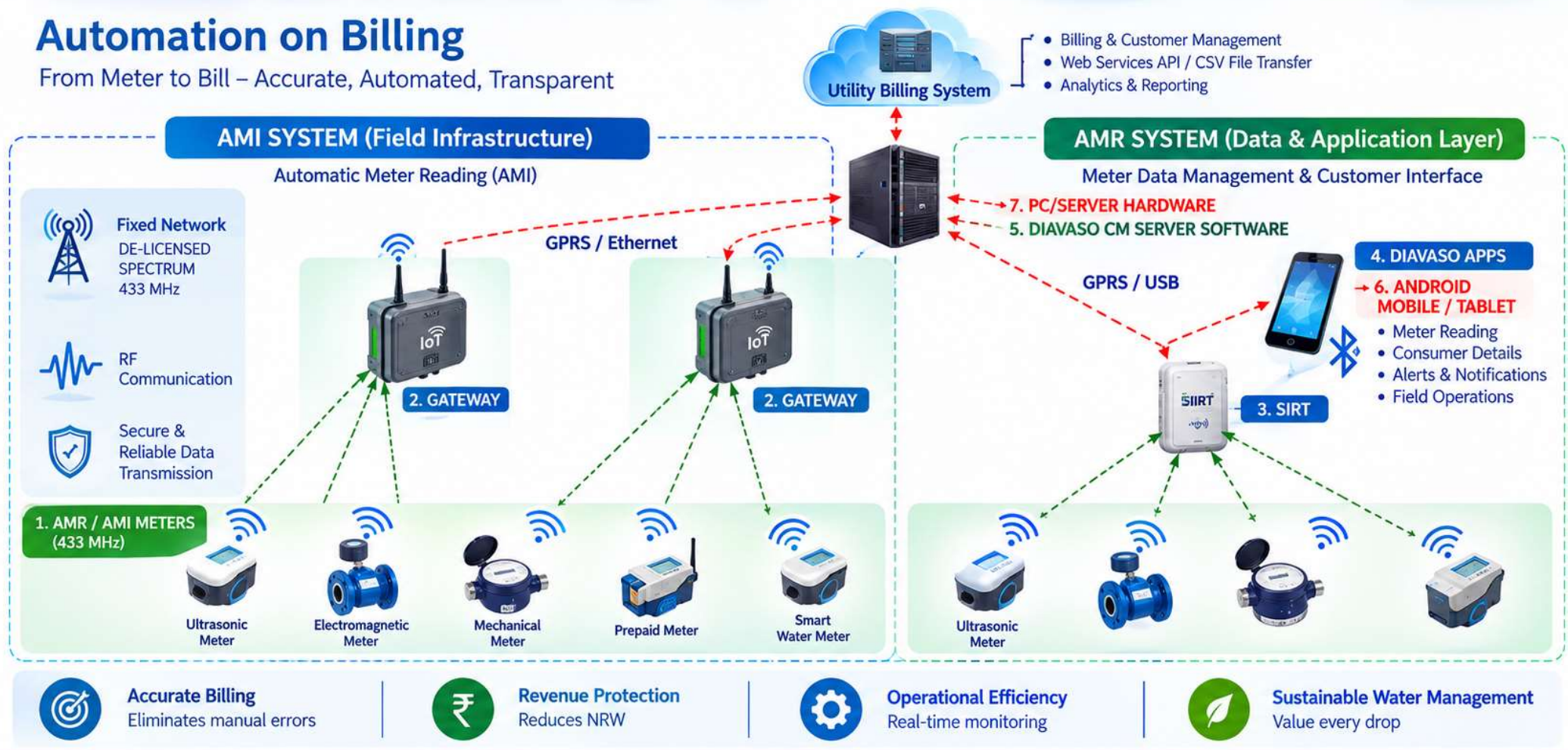
Water should be priced at its true cost

SMART METERING. REAL-TIME DATA. TRANSPARENT BILLING.

WABAG
sustainable solutions. for a better life.

Automation on Billing

From Meter to Bill – Accurate, Automated, Transparent



Accurate Billing
Eliminates manual errors

Revenue Protection
Reduces NRW

Operational Efficiency
Real-time monitoring

Sustainable Water Management
Value every drop

Preserving Resources. Protecting Environment. Powering Economies.

India's Treated Wastewater: Reuse Potential & Opportunity

WABAG
sustainable solutions. for a better life.

Where Water Stress Will Be Highest by 2050

Projected ratio of human water demand to water availability (water stress level) in 2050*



Source: World Resources Institute (WRI) – Aqueduct 4.0, 2050 projection
*Ratio of total water withdrawals to renewable water supply

23,500 MLD
Treated wastewater in India
(STP installed capacity)

16,500 MLD @ 70%
Potential for reuse
(from treated wastewater)

< 800 MLD ~ (3%)
Tertiary treatment
(current, estimated)

170K MLD
Domestic water demand
(India, estimated)

Why Reuse is more Important for India



~18%
Of global population

High population share increases demand for water.



~4%
Of global freshwater resources

Limited freshwater resources relative to population.



~60%
Of irrigation from groundwater

Groundwater dependence adds pressure on aquifers.



1,486 BCM
Annual water demand

Demand pressure highlighted in government projections for 2030.

Water Security for Future Generations

A More Resilient Economy

Healthier Communities & Ecosystems

Sustainable Growth for a Water-Secure India

Preserving Resources. Protecting Environment. Powering Economies.

Global Spectrum in Water Recycle & Reuse

DIFFERENT PATHWAYS. A CLEANER, MORE RESILIENT TOMORROW.

WABAG
sustainable solutions. for a better life.

Every city makes the same trade — differently

Turning Wastewater into Water Security, Economic Value and a Sustainable Future

CITIES TODAY
A CLEANER
TOMORROW

Singapore
CLOSING THE LOOP



~40%
of national demand met by NEWater today; targeted at 55% by 2060

From Wastewater to NEWater
A resilient and water-secure nation

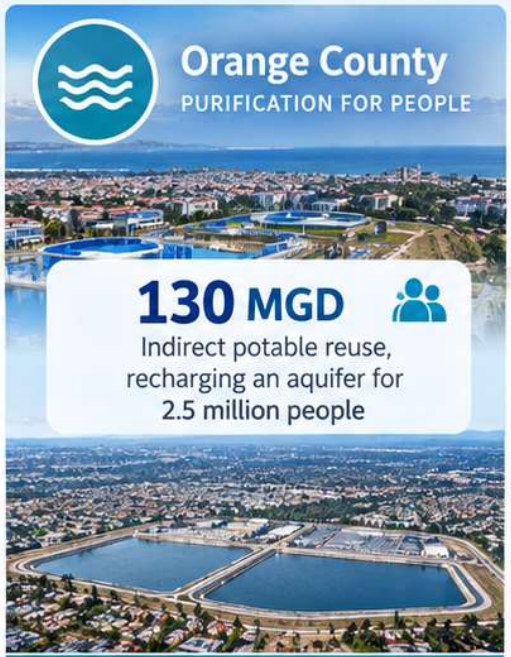
Israel
A WATER-SECURE NATION



85–90%
of treated wastewater reused — mostly for agricultural irrigation.

Wastewater Fuels Agriculture
Turning scarcity into opportunity

Orange County
PURIFICATION FOR PEOPLE



130 MGD
Indirect potable reuse, recharging an aquifer for 2.5 million people

Purified Water. Stronger Communities
Building drought-resilient cities

Windhoek, Namibia
A PIONEER IN DIRECT REUSE



>25%
Direct potable reuse meeting ~25% of drinking water

Direct Reuse for a Safer Tomorrow
Innovative solutions for water-stressed regions

CLEANER ENVIRONMENT
Less pollution. Healthier ecosystems.

GREATER WATER SECURITY
Reliable supply for future generations.

STRONGER ECONOMIES
New opportunities. Sustainable growth.

HEALTHIER COMMUNITIES
A better quality of life.

Preserving Resources. Protecting Environment. Powering Economies.

Reuse Potential & Opportunity – Delhi NCR

WABAG
sustainable solutions. for a better life.

Turning Delhi's Wastewater into a Sustainable Water Resource

~3,600 MLD
Estimated sewage generation (Delhi)

~3,610 MLD
Installed STP capacity (37 STPs)

~3,222 MLD
STP inlet flow (Latest – 2025)
(Actual sewage treated)

5,683 MLD
Domestic water demand (1,250 MGD)
(Excludes horticulture, agriculture & industrial demand)



Waste to Resource – Flow & Quantities (MLD)

Sewage Generation (Delhi)



~3,600 MLD

STP
(Secondary Treatment)
(37 STPs)



Inlet ~3,222 MLD

~2,900 MLD
Outlet from STPs
(~ 90% recovery)

TTRO
(Tertiary Treatment + RO)



Inlet ~3,900 MLD

~2,030 MLD
TTRO Treated Water
(~ 70% recovery)

~870 MLD (30%)
Concentrate to ZLD or disposal

High-Quality Recycled Water (for Reuse)



~ 2,030 MLD
Available for Reuse

Potential Reuse (of STP treated flow)



- Data Centres (Emerging Demand)
- Industry
- Horticulture & Green Areas
- Construction & Other Non-Potable Users
- Groundwater Recharge

Why Scale-Up TTRO Reuse?

TTRO Recycled Water (Indicative End-User Tariff)
₹ 50 – 80 / kL
Depending on quality, volume, conveyance & supply model

DJB Average Tariff to Industrial
₹ 87.85 / kL

MORE TTRO → MORE REUSE → HIGHER WATER VALUE
Convert treated wastewater into a reliable, revenue-generating water resource

Four avenues for Delhi

Recharging Drinking Water Sources



Advanced-treated water into over-exploited aquifers

Large-Scale Public Irrigation



Parks, green belts & the Yamuna floodplain

Utility & Industrial Water



Power, construction, vehicle/road washing and firefighting

Data Centres (Emerging Demand)



A new, fast-growing demand Delhi can get ahead of

Key Takeaways

- **~ 2,030 MLD** high-quality recycled water can be made available for multiple uses.
- Reduces pressure on fresh water sources.
- Supports sustainable urban development, improved water use efficiency, and industrial growth.
- **TTRO + ZLD enables** near zero liquid discharge and a circular water economy.

STP Recovery (from inlet to outlet) : **~ 90%** | TTRO Recovery (to treated water) : **~ 70%** | Concentrate to ZLD / Disposal : **~ 30%**

Preserving Resources. Protecting Environment. Powering Economies.

Government Reuse Policy in Power Sector

WABAG
sustainable solutions. for a better life.

"Thermal Power Plants within 50 Km of STP are mandated to use treated sewage water"

(As per Tariff Policy, 2016 – Applicable to all Thermal Power Plants – Central, State and Private)

Tariff Policy, 2016 – Key Provisions

सत्यमेव जयते

Thermal power plants, including existing plants, located within **50 km radius** of STP of Municipal / Local Bodies shall, in order of closeness, **mandatorily use treated sewage water.**

Applicable to **existing and new plants.**

Notified under Government of India Tariff Policy on 28.01.2016.

Thermal Power Plants within 50 km of STP – All India



Total 33 Thermal Power Plants within 50 km of STP

8 Plants operating with STP-treated water **(9,239.2 MW | 589 MLD)**

2 Plants under implementation **(3,580 MW | 90 MLD)**

23 Plants yet to be implemented **(potential ~2,300 MLD*)**

Water Reuse – Current and Potential (All India)

589 MLD Currently utilized (8 plants)

~90 MLD Under implementation (2 plants)

~2,300 MLD (est.) Potential from 23 plants yet to be implemented*

Total Potential ~2,979 MLD (589 + 90 + 2,300)

* Potential based on 2017 Ministry of Power mapping of 29 plants within 50 km (2,303 MLD). Includes additional identified plants; subject to updated assessment.

From Sewage to Sustainable Power



Municipal STP (Treated Sewage Water)



Treated Water Supply (Through Pipeline)



Thermal Power Plant (For cooling and other non-potable uses)

Benefits of Reuse

- **Conserve freshwater resources**
- **Enhance** water security for power sector
- **Lower environmental footprint**
- **Support national sustainability goals**

Turning Wastewater into a Valuable Resource for a Water-Secure and Energy-Secure India

Preserving Resources. Protecting Environment. Powering Economies.

Source: CEA Annual Report 2023–24; Ministry of Power (2017 mapping); NMCG communications. Note: Plant locations and potential are indicative.

Policy and Governance – Wastewater Reuse

WABAG
sustainable solutions. for a better life.

"India Has the Foundation — Now We Need to Scale Reuse"

Foundation in Place

- **Policy & Guidelines**
  NWP, CPCB, AMRUT 2.0
- **Thermal Power Opportunity**
  50-km framework
- **Multiple Agencies & Programmes**
- **Growing STP Capacity**
- **Multiple Potential Users**
  Industry, agriculture, cooling, landscaping
- **Reuse Projects Emerging**



Scale-Up Priorities

- **Mandatory Reuse Targets**
  States & cities
- **Scale Industrial Reuse**
  Power, data centers & industries
- **Integrated Governance**
  Clear roles & accountability
- **Tertiary Treatment + Reuse Networks**
- **Assured Off-take**
  Long-term reuse contracts
- **Viable Pricing + Incentives**
- **Implementation & Enforcement**

TTRO is **not a cost** — it is an **investment** in circular water management, economy, and future.

TTRO project aligns for **sustainable urban development, improved water use efficiency, and industrial growth.**

"India has treatment capacity and policy — the missing link is reliable, economically viable and enforceable reuse."

Preserving Resources. Protecting Environment. Powering Economies.


100
SUSTAINABLE
YEARS
WABAG GROUP. SINCE 1924
WABAG
sustainable solutions. for a better life.
THANK YOU
FOR YOUR ATTENTION!
www.wabag.com