

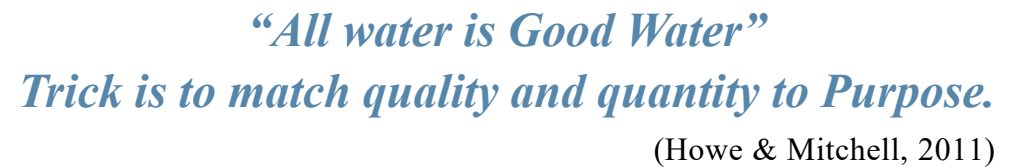


FEASIBILITY STUDY FOR THE REUSE OF TREATED USEDWATER

Enabling Circular Economy In Used Water Management In Rajkot

Infrastructure Project Studio | Monsoon Semester 2024

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*“All water is Good Water”
Trick is to match quality and quantity to Purpose.*
(Howe & Mitchell, 2011)

Why waste? USED WATER

FROM WASTE TO RESOURCE

The completion of the Sanitation value chain is essential for promoting health, preventing environmental pollution, conserving the ecosystem, and recovering and recycling resources in a city.

Rajkot faces significant water scarcity, with heavy reliance on distant and dwindling freshwater sources. So, it is important to look for alternative sources of water such as Treated Usedwater. This will reduce the reliance on imported water and will help in cost recovery of ULB.

Alignment with Sustainable Development Goals (SDGs):



Regulatory Compliance:



Water +

Approx. **6%** of the available treated used water is currently utilized by RMC. As per **Service level Benchmark it is to be 20%** of treated Usedwater. Also, The Gujarat Policy of Reuse of treated Usedwater Envision 100% of reuse of Treated Usedwater by 2030.

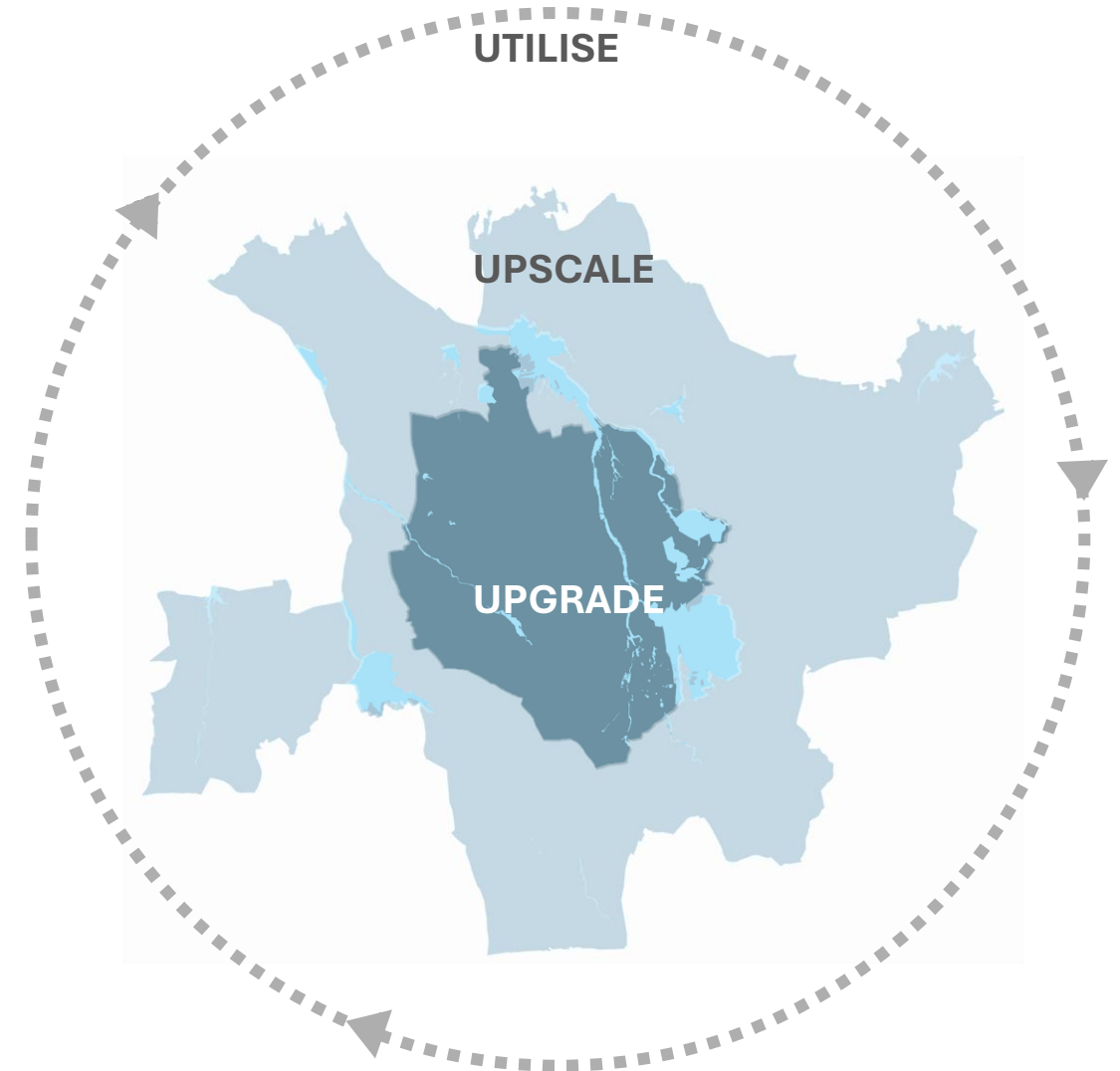
ABOUT THE PROJECT

Aim

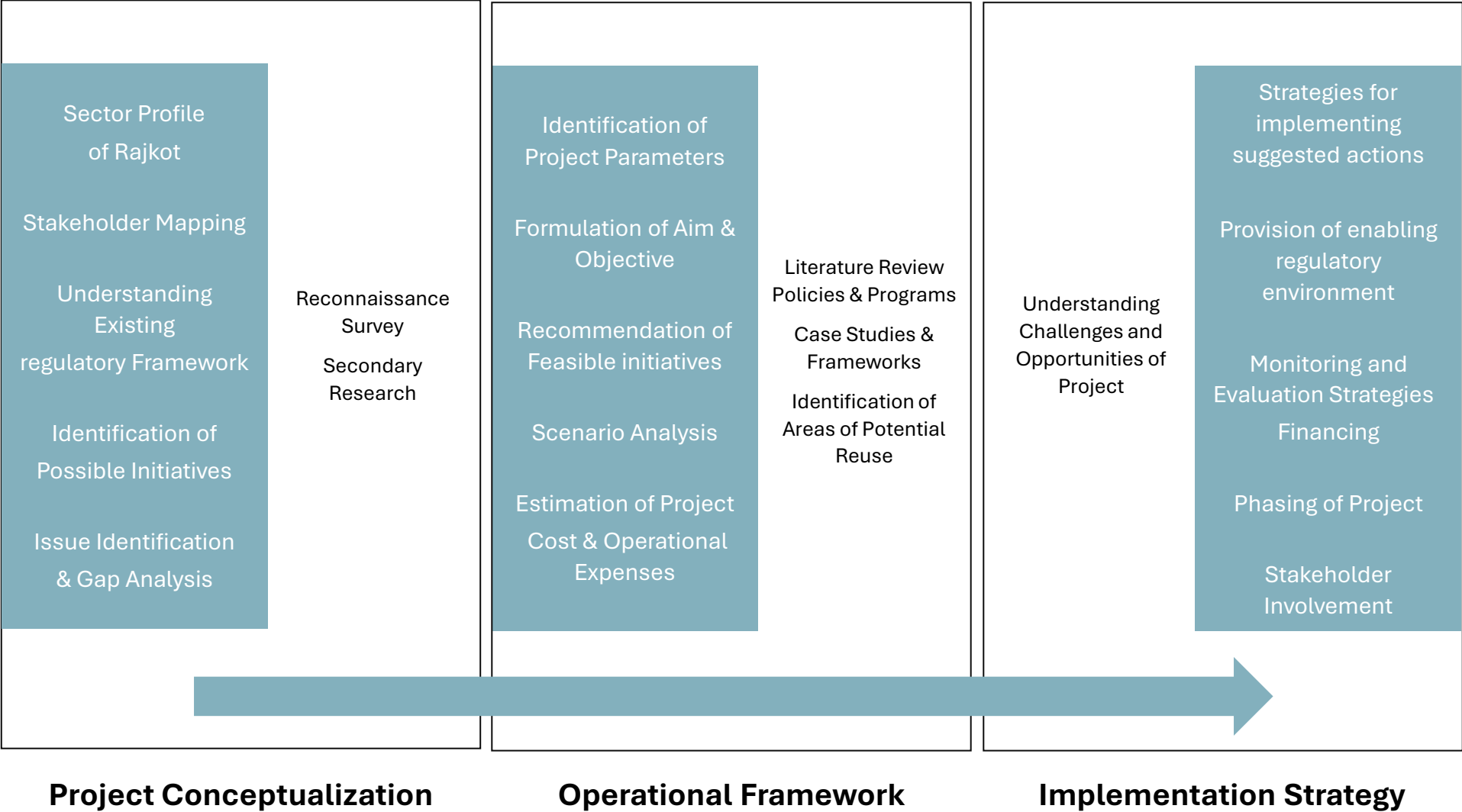
To conduct a feasibility study for the reuse of treated used water in Rajkot, and develop feasible solutions for sustainable reuse of Treated Usedwater in Rajkot

Objective

- Assess current Usedwater reuse practices in Rajkot.
- Assess Documented Good practices on Usedwater Reuse.
- Understanding of various reuse avenues and fit-for-purpose TUW quality standards required
- Understand challenges faced by ULBs and end users in adopting treated water.
- Develop sustainable and scalable feasible options for Usedwater reuse to efficiently meet future demands.



METHODOLOGY



EXISTING SITUATION & POTENTIAL FOR REUSE IN DIFFERENT SECTOR

Data collection method: Secondary Data Collection.



Map of Rajkot City

Usage Type	Current Reuse	Potential Use	Existing Gap
Agriculture	10 MLD through STP	211 MLD – Irrigation Purpose	Farmers favor saline groundwater over treated used water due to crop damage concerns, unreliable supply, and high ULB charges.
Municipal	2 MLD through STP 8 MLD through TTP	6.1 MLD – Parks & gardens. 2.7 MLD – Fire fighting	Inadequate pipelines and distribution which require significant investment in transport and storage.
Residential	0 MLD	274 MLD (Potable & non-potable)	Reliable supply and quality of treated used water require high investment, and it may fall short of residential standards.
Industrial	0 MLD	1084 MLD	High TDS levels in treated used water are key concerns for industries.
Construction	0 MLD	NA	Over 90% of construction projects rely on groundwater as their primary water source.

PROPOSED REUSE ACTION PLAN

Key Areas Covered

Agriculture Use

Construction
Activities

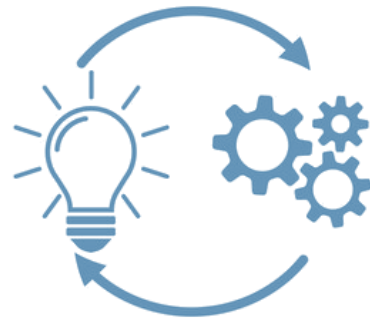
Industrial
Use

Municipal
Use

Residential
Use

Implementable Solution:

- Agriculture Solution
- Construction Solution
- Industrial Solution



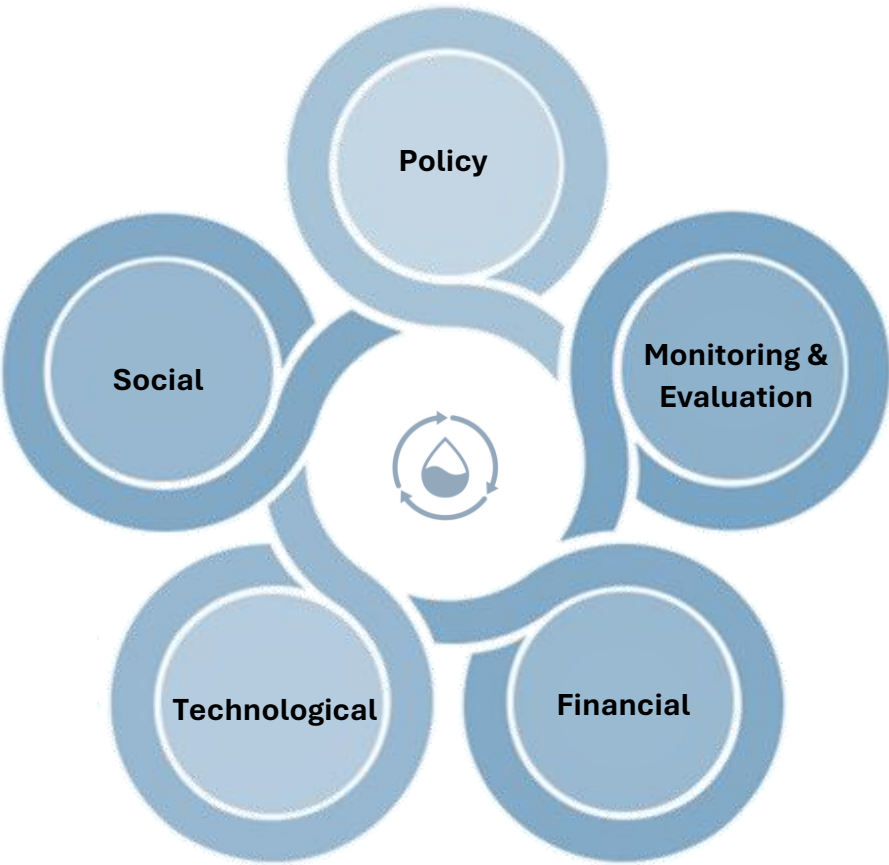
Future Conceptual Solutions:

- Municipal Solution
- Residential Solution





20+ Case studies



The feasibility study for Usedwater reuse identifies a spectrum of approaches categorized into **technological, financial, social, monitoring and evaluation, and policy dimensions** each derived from national and international case studies that illustrate best practices

PROPOSED REUSE ACTION PLAN

In order to achieve a paradigm, shift in the sector, and based on the case studies analysed and the lessons learned in the region, three actions have been identified.

ACTION 1

Feasibility Study for Treated Usedwater Reuse



ACTION 2

Development of Implementable Solution for TUW Reuse



ACTION 3

Develop policies and regulatory measures



ACTION 4

Develop awareness programs, and monitoring system.



ACTION 1: FEASIBILITY STUDY FOR TREATED USEDWATER REUSE

ADVANCE INTERMEDIATE BASIC	Decentralized Treatment Facilities with Dual Plumbing	Climate Financing through Carbon Markets	Engaging SHGs and NGOs in operations and quality monitoring	Integrated Monitoring Systems with Real-Time Data Collection	Comprehensive Water Reclamation and Reuse Mandates
	Establishing New facilities	Private Sector Investments: PPPs, CSR and Venture Capital	Training and Technical Support for Stakeholders	Performance Metrics and Data-Driven Analysis	Financial Incentives to Promote Usedwater Reuse
	Upgrading existing infrastructure with retrofitting of advanced and novel technologies	Government Grants, Subsidies, and Allocations from Central, State, and Local Authorities	Public Awareness Campaigns	Regular Sampling and Water Quality Testing	Mandating Treated Usedwater for Non-Potable Applications
	Technological	Financial	Social	Monitoring & Evaluation	Policy

These approaches provide a strategic framework to guide government decisions on scaling treated Usedwater reuse. For instance, basic-level interventions may suffice for agricultural purposes in Rajkot, while more advanced approaches would be required for residential non-potable uses. This system helps cities choose the most suitable options for each reuse category.

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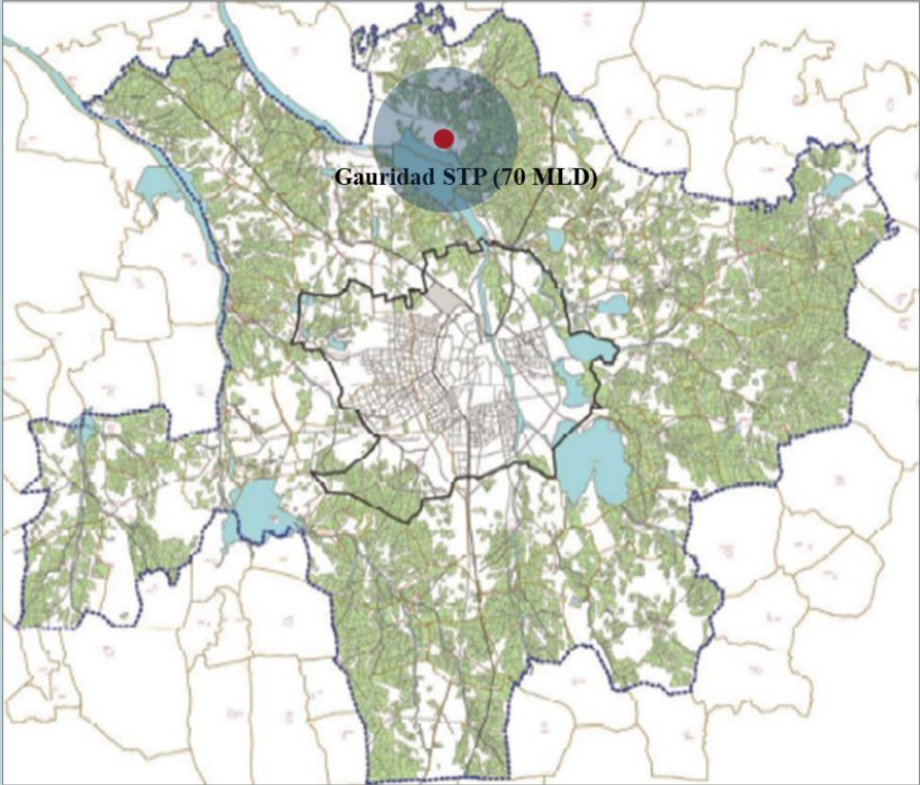
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SOLUTION 1

AGRICULTURE USE



Legend

- Agricultural Areas
- Water Bodies
- RMC Boundary
- RUDA Boundary
- STP

Identification of Pilot Site
Within 5 km of Gauridad STP
Ratanpar, Vijayanagar, and Gauridad Village

Supplying treated Usedwater to farmers within a 5 km radius of Gauridad STP through a 14 km pipeline distribution system.

Pilot Project Estimates

Cost for laying a 14 km pipeline distribution system and constructing a 1 ML storage facility – 5.21 Cr.

Type of Business Model

Built Operate Transfer

(1 year construction and 10 year of O&M)

Key Stakeholders:



Private Partners



Rajkot Municipal corporation



Farmers Communities

Funding Sources

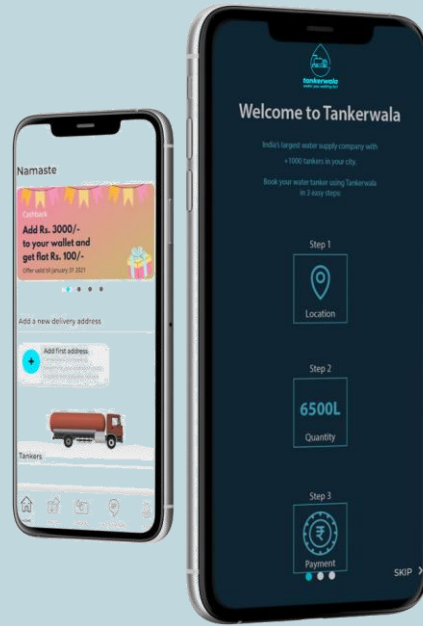
Pradhan Mantri Krishi Sinchayee
Yojana (PMKSY) Scheme
Private Investment (PPP)

Cost Recovery Strategy

User Fees: Farmers will be charged
₹5 per 1,000 liters of TUW
Subsidies: Financial incentives to
early adopters

SOLUTION 2

CONSTRUCTION USE



**Identification of Pilot Site
Within RMC Limits**
All New construction Sites

Supply treated Usedwater from the existing STPs to construction and property development sectors in the city of Rajkot.

Pilot Project Estimates

The costs include setting up a tanker fleet, app development and maintenance, installing a GPS and monitoring system, operation and maintenance (O&M), establishing filling stations, and creating temporary storage facilities – 4.75 Cr

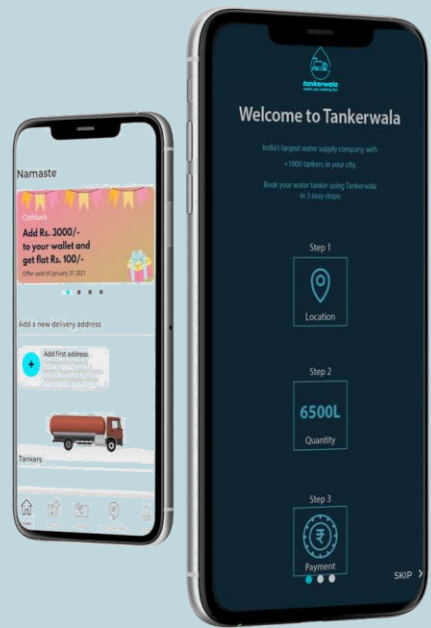
Type of Business Model

Public Private Partnership
(Long term Concession agreement)



SOLUTION 2

CONSTRUCTION USE



Identification of Pilot Site
Within RMC Limits
All New construction Sites

Key Performance Indicators

- **Reduction in Groundwater Use:** Track TUW volume supplied to reduce groundwater dependency and promote sustainability.
- **Average Delivery Time:** Ensure timely deliveries to maintain service quality and customer satisfaction.
- **Revenue per Kilometer:** Optimize route efficiency and profitability by measuring revenue per delivery distance.

Key Stakeholders:



Funding Sources

Viability Gap Funding : Through government grant (SBM 2.0)

Private Investment (PPP)

Cost Recovery Strategy

Pay per Use

Subscription Model : Securing a predetermined volume of water at discounted rates for long-term projects

Penalties for delays or breaches of delivery standards

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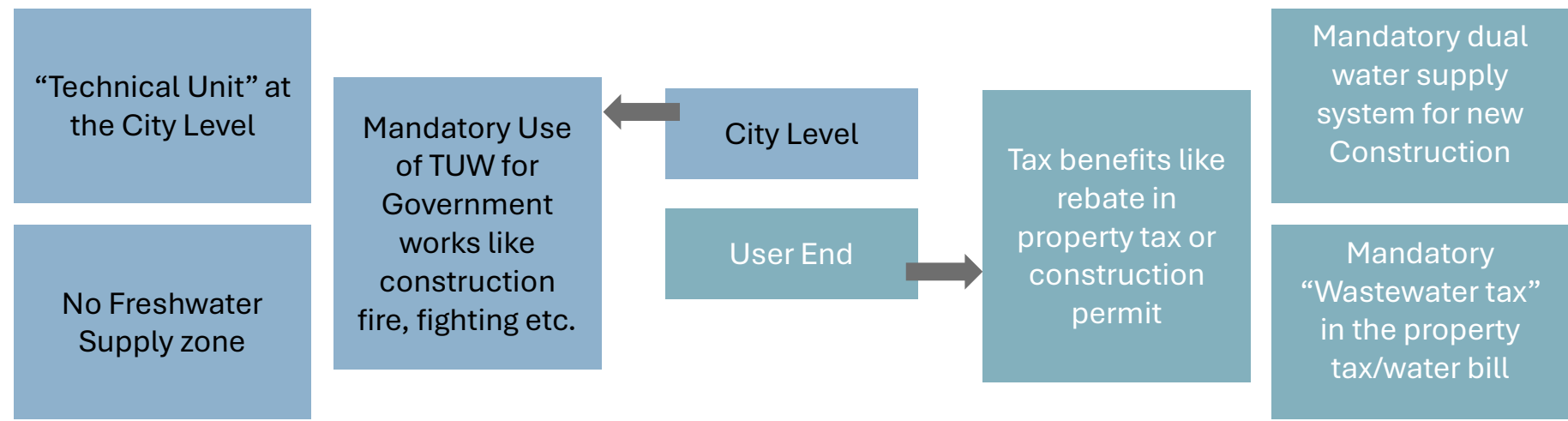
ACTION 4

Develop awareness programs, and monitoring system.



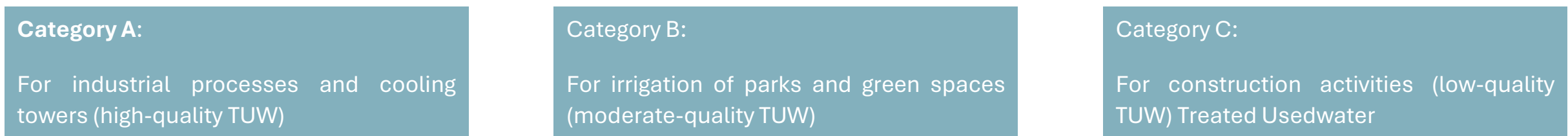
ACTION 3: DEVELOP POLICIES AND REGULATORY MEASURES

To enhance the adoption of TUV reuse in Rajkot, a multifaceted approach involving policy incentives and practical implementation is essential.



In Regulatory Measures, Ensure that TUV meets specific quality criteria for various uses, safeguarding public health and environmental integrity.

Categorization of TUV Uses: Define quality standards based on the intended use



Adherence to National Guidelines: Align TUV quality standards with those set by the Central Pollution Control Board (CPCB) and relevant international standards (e.g., WHO, ISO).

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ACTION 4: DEVELOP AWARENESS PROGRAMS, AND MONITORING SYSTEM

Awareness Program

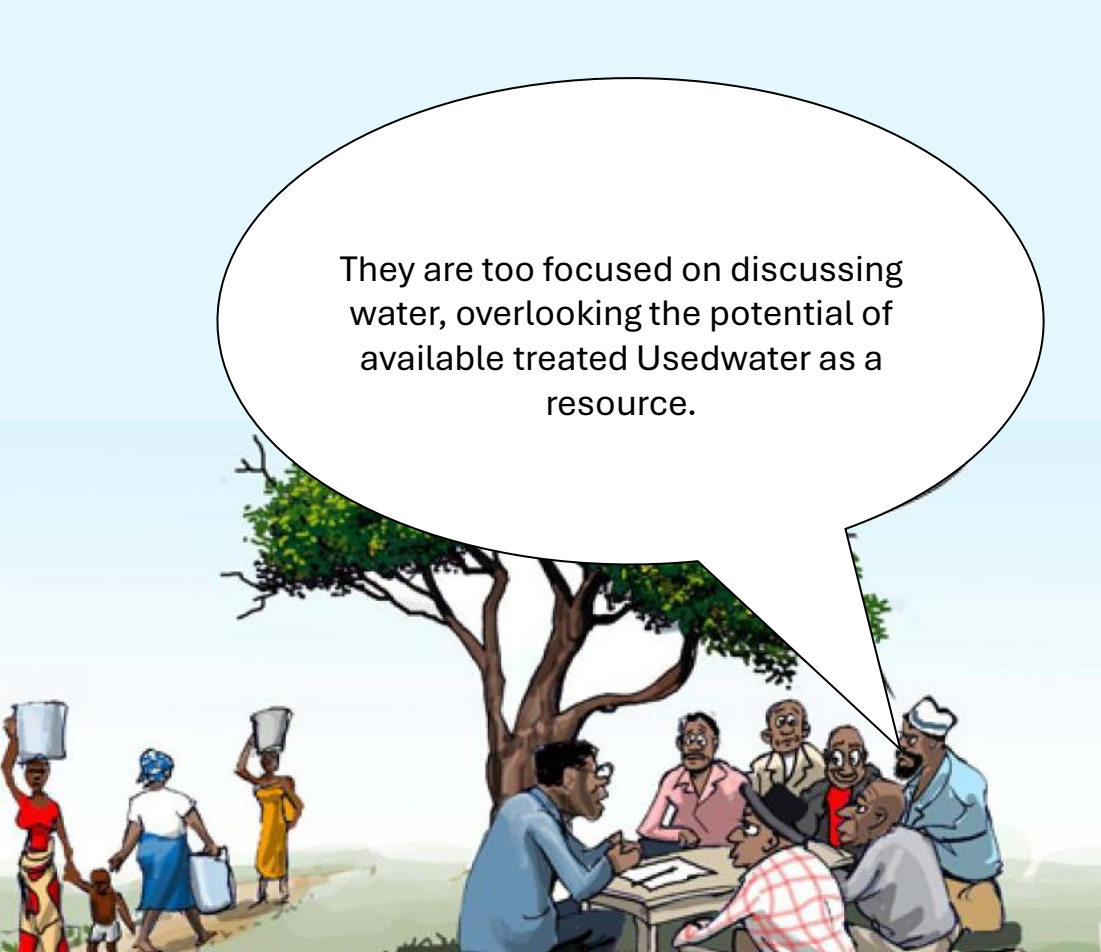


Image Source: Health Social Change and Behaviour Change Network Cartoon Calendar

Key Strategies:



Public Awareness & Capacity Building



Education on Water Conservation



Stakeholder Consultations



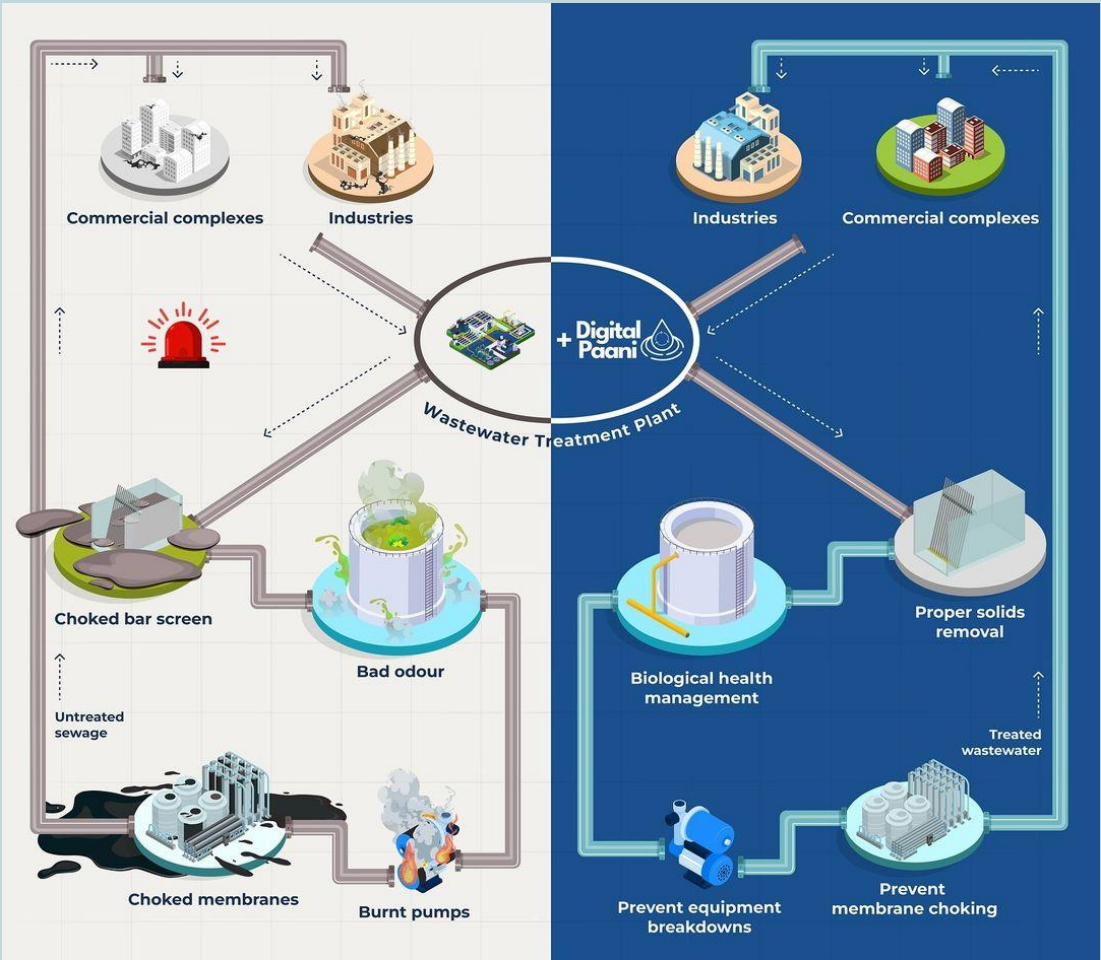
Demonstration of Pilots Projects

Estimated Costing: 50 lakh to 1 Crore.

Funding Sources: SBM-U 2.0

ACTION 4: DEVELOP AWARENESS PROGRAMS, AND MONITORING SYSTEM

Monitoring System



Existing DigitalPaani platform

DigitalPaani can Assist Rajkot in



Performance Tracking



Data Collection and Analysis



Compliance and Quality Control



Stakeholder Coordination

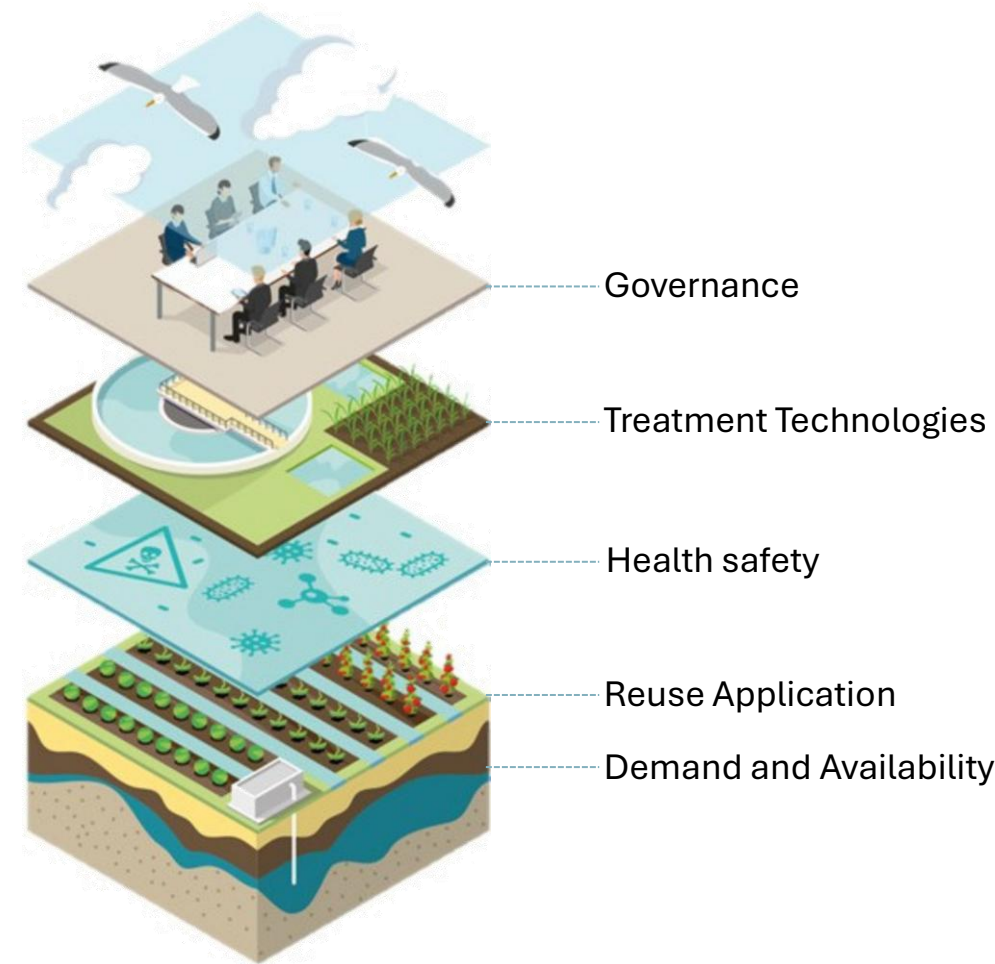
Estimated Costing: 8 to 10 lakhs for One Plant.

Funding Sources: SBM-U 2.0

PROJECT PHASING

Phase	Key Project Activities	SHORT TERM			MID TERM					LONG TERM							
		2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
	Feasibility study																
Phase 1	Initiate community awareness for all sectors																
	Conduct capacity-building workshops																
	Construction Phase for agricultural reuse																
	Develop infrastructure for Construction reuse																
	Install M&E technology at STPs and TTPs.																
Phase 2	Develop infrastructure for Industrial Reuse																
	Develop infrastructure for Municipal Reuse																
Phase 3	Scale-up M&E technology																
	Develop infrastructure for Residential Reuse																
	Total Budget (Approx.) in Crores:																

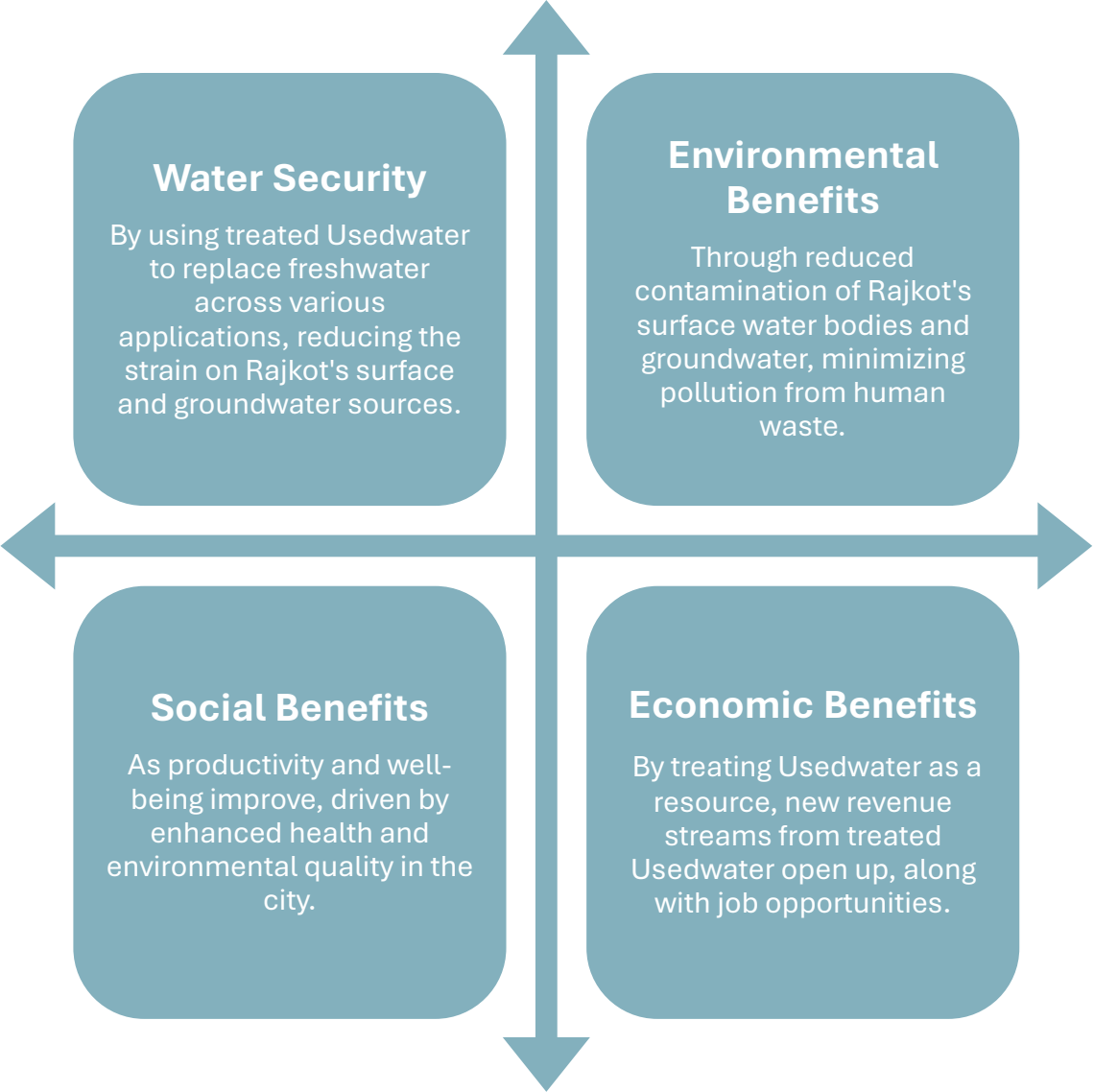
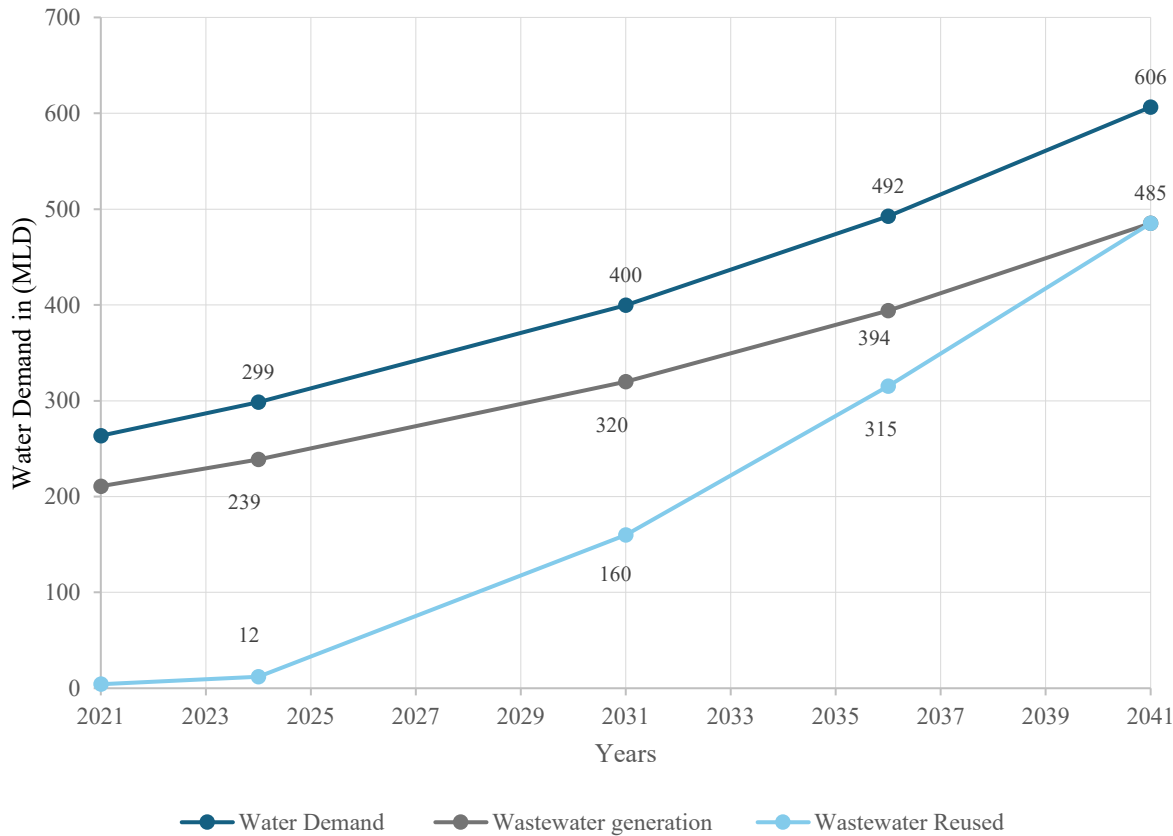
RISK ASSOCIATED



Achieving effective water reuse requires an interdisciplinary approach to mitigate and balance associated risks.

PROJECT IMPACT AND KEY BENEFITS

Projected Trends of Water Demand, Wastewater Generation, and Reuse Over Time



“We must not let the opportunity simply disappear down the drain: it’s time to realize the promise of wastewater as an alternative source of clean water, energy, and important nutrients.”

Thank You