



Draft National Policy on the Safe Reuse of Treated Wastewater

Implemented by

giz Deutsche Gesellschaft
für Internationale
Zusammenarbeit (GIZ) GmbH

National Policy on Safe Reuse of Treated Water

First Draft: 12 October, 2020

Message [by the Minister of Jal Shakti]

Foreword [by Secretary, Ministry of Jal Shakti]

Preface [by DG, NMCG]

Abbreviations [to be added]

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1 Terminology

1.1 Glossary

Circular Economy: a model of production and consumption that reduces waste to a minimum by recovering, reusing and recycling materials for productive purposes and thereby reducing the pressure on natural resources.

Emerging Contaminants (ECs): chemicals that had not previously been detected (or were previously found in far lesser concentrations) and pose a risk to human health and the environment including pharmaceuticals, personal care products and endocrine disrupting compounds.¹

Implementing agency: the entity responsible for provision of used water services which includes conveyance, treatment, distribution of treated used water and all other functions related to management of the services. The service is typically provided by the State or Urban Local Body or parastatal agency or Panchayati Raj Institutions and is referred to as the implementing agency.

Safe Reuse of Treated Water (SRTW): the beneficial and safe use of treated used water for a range of purposes as defined in Section 3.3.2 this Policy. (Also referred to in related documents as treated wastewater reuse)

Sewage: is defined as the used water containing human body waste matter (faeces and urine etc.) either dissolved or undissolved; discharged from toilets and other receptacles intended to receive or retain such human body wastes. The effluent coming out of septic tanks or any such facility is also sewage.²

Sewage Treatment Plant (STP): Equipment and structures that treats sewage.

Treated Used Water (TUW): the treatment of used water for non-potable purposes through one or more of a number of primary, secondary and tertiary processes. Also referred to in other documents as treated wastewater.

Treatment:

Primary Treatment: involves screening and grit removal, equalization and the removal of high concentrations of solids that might decrease the efficiency of subsequent treatment processes.³

Secondary Treatment: commonly used to describe any of the following biological processes: activated sludge, extended aeration, trickling filters, aerobic and anaerobic lagoons and anaerobic and facultative (mixed) ponds.⁴ Also referred to as secondary treated water (STW).

Tertiary Treatment: a further stage of treating sewage or effluents, by removing suspended solids and or pollutants. Consequential removal of suspended solids may also remove residual BOD or other pollutants. There are many differing

types of tertiary treatment of effluents, the most common being, Grass Plots, Reed Beds, Upward flow Clarifier. Rapid Gravity Sand Filter, Micro-strainer, Sand Filter, Drum Filter, Lagoons, Nitrifying Filter.⁵

Used Water⁶ a combination of one or more of: a) domestic effluent consisting of blackwater (excreta, urine and faecal sludge) and greywater (kitchen and bathing used water); b) water from commercial establishments and institutions, including hospitals; c) stormwater and other urban run-off; d) industrial effluent, e) agricultural, horticultural and aquaculture effluent, either dissolved or as suspended matter.⁷ This Policy address the reuse of treated used water from sources (a), (b) and (c). 'Used water' is also referred to as wastewater in other documents.

Zero Liquid Discharge (ZLD): refers to installation of facilities and systems which will enable industrial effluent for absolute recycling of permeate and converting solute (dissolved organic and in-organic compounds/salts) into residue in the solid form by adopting method of concentration and thermal evaporation.⁸

1.2 *Apna Jal – Our Water*

Addressing public perceptions about used water and building confidence in the implementation measures proposed in both national and state policies is critical for its uptake. Throughout this Policy the term 'used water' has been adopted rather than 'wastewater' which may have negative connotations even though, after treatment to the required standard it is safe for reuse.

As in the case of other countries, India will adopt terminology that captures the notion of safe and beneficial use of treated used water – *Apna Jal* or 'Our Water'.⁹ Use of this term aims to shift perceptions towards treated used water being a resource and opportunity rather than a liability.

2 Introduction

2.1 Existing situation

In 2019, the total volume of sewage generated by households in urban India was 61,754 MLD.¹⁰ This amounts to an annual volume of 22,540 billion cubic meters or about 5.6 times the annual rainfall in the country.¹¹ Of this amount, the infrastructure capacity to treat sewage to secondary level is only 37% and approximately 40% of that capacity is not fully operational. Current operational capacity for collection and treatment is about 22% of which only a small proportion is reused.¹² Therefore the potential for improvement is significant. The balance of uncollected and untreated water is released into water bodies and the environment leading to contamination and health concerns, particularly where dilution levels of the receiving water body are low.

Directives to ensure separation of industrial and municipal used water are not universally enforced resulting in cross contamination of heavy metals and emerging contaminants, with consequences of bio-accumulation in receiving water bodies' aquatic life. Untreated or primary treated used water is frequently accessed informally by farmers,¹³ particularly in peri-urban areas. Without safeguards in place, this leads to health risks to both the water users and consumers. Although data on such informal use in agriculture is not available, the scale is significant, requiring attention to be paid to the transition to a more structured approach.

Although efforts are underway to increase the percentage of collected and treated used water, the scale of the challenge is large and there are resource and capacity constraints. Until recently, used water collection and treatment has been viewed as part of a 'linear' process, but more recently they are being seen as components of a wider circular economy approach, with waste considered as a resource and able to generate revenues. This shift in approach can facilitate solutions to the prevailing capacity and financial constraints, thereby allowing a faster transition to universal collection and treatment.

Extreme water scarcity across many parts of India is also a major driver for change in perceptions towards used water. Globally India is ranked as the 13th most water stressed country.¹⁴ Groundwater that supplies many urban, commercial and industrial users is classified as stressed across much of India¹⁵ while surface water abstractions are reaching unsustainable levels leading to deterioration of the environment and increasing competition and consequent conflicts between users.¹⁶

In the past few years, several pioneer States have initiated reforms to embrace SRTW by adopting or drafting policies.¹⁷ The underlying principles are common with different emphasis to reflect local conditions and priorities. They provided a wealth of details and experience that has informed development of this Policy.¹⁸

Mandatory targets for SRTW have been set by the pioneer states. The most ambitious is Gujarat with a 100% reuse target by 2030. State policies also prescribe mandatory usage of TUW for industrial estate/zones within a certain distance from a STP. This ranges from 30 km in the case of Karnataka to 50 km in Gujarat, Tamil Nadu and Haryana.

National water quality standards on sewage treatment for discharge into surface water bodies are prescribed by CPCB. This is subject to rulings of the National Green Tribunal that may impose higher standards. Some basic standards for SRTW in India have been set by CPCB and CPHEEO¹⁹ but, with the advent of mandatory use and a wide range of potential end users, greater resolution of reuse standards specific to a specific end-use is required. This will provide clarity to allow selection of the most appropriate and efficient business model and facilitate monitoring and compliance mechanisms. Significant investment in developing the capacity of monitoring systems and laboratories is needed as part of the overall SRTW framework to provide confidence

that prescribed quality standards are being met and address the challenge of monitoring more complex parameters, such as heavy metals, emerging contaminants and bioaccumulation.

International experience

A recent comparative assessment of SRTW policy frameworks in EU countries, Indian State of Gujarat and Haryana and other selected countries including Israel and Singapore identified a number of key principles for consideration in formulating national policy including:

- SRTW has significant potential to improve critical water resource deficits.
- Targeted water reuse could assist in restoring water supply demand balance.
- It is critical to ensure that SRTW strategy and policy protects water users and the environment.
- The challenge will be to ensure wide understanding of the issues and opportunities within the political, policy, regulatory, operational and public communities.
- Adequate funding and incentives are critical prerequisites for success.

Source: IEWP (India-EU Water Partnership). 2019. Review and Comparative Assessment of Policies on Treated Wastewater Reuse (TWWR). Policies and approaches of Indian States, the European Union, selected EU Member States and global examples.

2.2 Need for the Policy

Several factors combine to justify the rationale and urgency for this Policy and the actions it promotes. The high levels of physical water stress in many parts of the country and ever-increasing pressure on freshwater resources are key drivers for utilising all forms of water including used water. This is amplified by increasing demands across water using sectors as the economy grows, higher expectations from a more affluent society for more reliable supplies of water, and a changing climate that brings greater uncertainty in terms of extended periods of drought and variability of supply. In purely financial terms, SRTW provides a local source of water for cities and industry that obviates the need to transfer freshwater sources from ever increasing distances, fostering self-reliance.

The Policy is complementary to other policy instruments on universal sanitation by promoting a self-financing and integrated circular economy approach. In the absence of widespread collection and treatment, there remains a risk that expanded sanitation will have the unintended consequence of greater volumes of untreated water being discharged into water bodies. As a reliable and consistent source, SRTW can generate revenues to make existing treatment capacity more sustainable and has the potential to finance and accelerate expansion of coverage.

The lack of a national policy on SRTW has to some extent constrained implementation of reforms across the States of India due to the lack of a framework for channelling

support programs. The Policy will foster a partnership approach of combined responsibility at National and State levels for meeting SRTW goals through joint programs with participating States.

2.3 Guiding Principles

Key principles to consider in setting SRTW policy and administering financial support programs include:

- adopt participatory planning processes involving stakeholders relevant to the end use of TUW;
- provide clarity on system of prioritization and allocation of TUW based on social, economic and environmental benefits;
- encourage uptake through mandatory re-use provision and high quality of service provision;
- establish water quality standards fit for the purpose of end-use;
- establish the price of TUW to be competitive in respect of alternative supplies and sufficient for sustained O&M;
- adopt a precautionary approach to reuse;
- adopt an incremental approach based on available resources and time to build capacity;
- incentivize compliance;
- address issues related to existing uses of used water;
- encourage projects to adopt a consistent approach with long-term commitments that provide stability for investors and end-users.

3 Objectives and Scope

3.1 Vision

The Vision of the Policy is:

Widespread and safe reuse of treated used water in India that reduces the pressure on scarce freshwater resources, reduces pollution of the environment and risks to public health, and achieves economic benefits by adopting a sustainable circular economy approach.

It heralds a shift from existing perspectives on waste to a new understanding of Our Water, *Apna Jal*.

3.2 Objectives

The main objectives for the Policy are to set the context, priorities and direction for SRTW, raise awareness of its importance and facilitate its implementation through support programs. More specifically, the Policy will:

- Move India on a pathway of mainstreaming SRTW by 2022 by encouraging States to adopt the necessary enabling environment and actively promoting its implementation.
- View SRTW as part of the wider water cycle encouraging multiple cycles of use-reuse.
- Contribute to the Government's commitment to sustainability and achievement of SDG 6.3 on improving water quality through increased recycling and safe reuse.
- Define the roles and responsibilities of various government entities and agencies and of other key stakeholders such as industry and other parts of the private sector, local government, civil society organisations and citizens.
- Establish new funding mechanisms and support synergies among relevant Central Government programs such as AMRUT, NMCG, SBM and Jal Jeevan Mission.
- Support initiatives on river basin planning including the potential for SRTW within the catchment water cycle and clarify entitlements for used water.

3.3 Scope

The Policy covers non-potable reuse of urban and rural used water. It recognizes diversity across the country in relation to levels of economic development and water endowment that call for a context-specific response, particularly in relation to setting priorities for re-use.

The Policy embraces the principle of integration and holistic management of the water cycle by encouraging linkages to existing and proposed policies on sanitation, faecal sludge management, and the re-use of industrial used water, within a broader context of river basin planning and actions to address climate change.

It fulfils three distinct functions for SRTW from national to local level by providing:

- the **mandate for the reuse** of treated used water for a range of non-potable end-uses, setting out the principles to incorporate in the planning and design of SRTW projects and encouraging adoption of national standards for different end-uses;
- a **mechanism to support SRTW** through provision of incentives, including access to funding programs, and disincentives, including the actions at central level to facilitate uptake across the country; and
- a **model policy framework for States** to consider and adapt in the development and enhancement of their own policy, regulatory and implementation instruments, (Annex 1).

It is expected that the Policy will lead to the development of guidance material on successful business models and create an enabling environment for innovation in technologies and institutional arrangements.

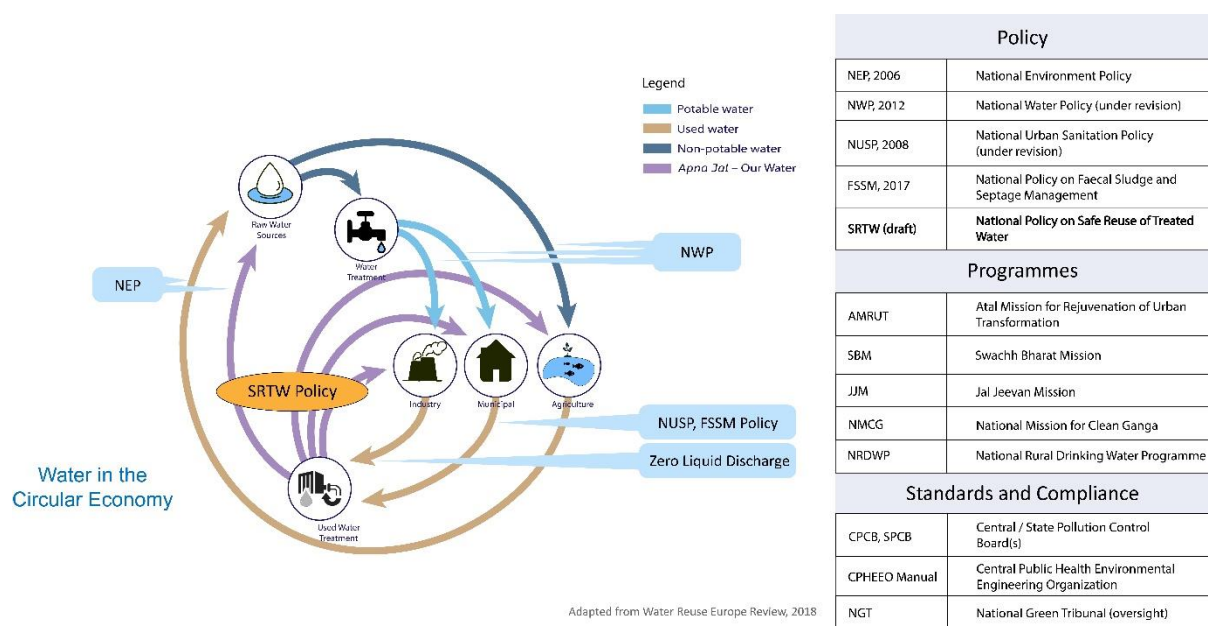


Figure 3.1 SRTW Policy in relation to related policies and programs in the water cycle

3.3.1 Source of water to be reused

The Policy covers used water generated by households and commercial enterprises in both urban and rural settings. This can be used water associated with an STP or an FSTP.

Used water from industry is covered by other policy instruments²⁰ although the Policy recognises that industrial used water is not universally separated from municipal used water flowing into an STP. In such cases, particular emphasis is required on assessing the levels of risk including heavy metals and emerging contaminants. Figure 3.1 shows how the SRTW Policy fits within the wider framework of policies and programs dealing with used water

3.3.2 Potential areas of reuse

SRTW is very context specific, with States having different endowments of natural resources, variations in levels of urbanisation, industrialisation and rural economy, and their own development priorities. Neither is the situation homogeneous within States, with many having regions that can be characterised water scarce or water rich contrasting with the designation of the State as a whole. Similarly, some States with a predominantly industrial-based economy have regions where agriculture dominates and vice-versa. A degree of flexibility is therefore required for setting priorities of reuse.

In general, water-scarce States are likely to view augmentation of freshwater resources by SRTW as more urgent than States with higher water availability. However, there are a range of other benefits to make SRTW an appealing proposition to all States including reduced contamination to the environment, improved public health, and as a revenue stream to improve the financial sustainability of STPs.

There are a wide range of potential non-potable end users for SRTW, including:

- industry (including industrial estates, power generation and railways)
- agriculture (including forestry and horticulture) and aquaculture
- municipal uses (e.g. landscaping, parks, toilet flushing and fire-fighting)
- environment, including discharge into surface water bodies, maintenance of wetlands and environmental flows²¹
- aquifer recharge
- construction
- on-site use within STPs for landscaping and cleaning of desludging vehicles

The general expectation for this Policy is for SRTW to involve treatment to secondary level. Subsequent tertiary treatment will be required and viable for certain reuse applications, where the additional costs are borne by the end-user. In some cases, a single universal treatment process to tertiary level may be more cost effective and this will be assessed during a feasibility study. Limited in field treatment of used water, for example using settling ponds, is sometimes practised in informal irrigated agriculture but should only be promoted where safety concerns to users and potential consumers have been fully addressed, e.g. in non-edible crops. The reuse of untreated used water should be discouraged.

3.4 Milestones

The Policy anticipates a situation where all States in India have adopted and started to implement SRTW policies by the end of 2022, with those States that already have SRTW policies undertaking to review them within the same timeframe and incorporate any relevant provisions necessary to satisfy eligibility criteria for national support programs. Overall, the Policy will contribute to achievement of targets of the 2030 Agenda of Sustainable Development Goals (SDGs).

Specific short to medium term milestones are proposed for consideration in developing State policy:

- States to set targets for 100% collection of used water and 100% treatment of used water collected to enable the achievement of targets for reuse.
- Where collection and treatment capacity already exists, 100% of TUV to be safely reused²² by 2025.
- Where collection and treatment capacity does not yet exist, 50% of used water to be collected, treated and safely reused by 2030 and 100% by 2045. A situation of universal treatment and reuse will effectively lead to ‘zero discharge cities.’

4 Expected Outcomes

As the Policy is implemented incrementally across the country, it is expected to yield significant benefits in terms of:

- **water security** – by using TUV to replace freshwater currently used across a wide range of purposes, thereby reducing pressure on surface and groundwater resources.
- **health benefits** – as a consequence of reduced pollution of water bodies and replacement of contaminated water by treated water.
- **environmental benefits** – by reducing the contamination of surface water bodies and groundwater from pollution by human waste.
- **social benefits** – through improvements in productivity and wellbeing as a consequence of the health and environmental benefits.
- **economic benefits** – by treating waste as a resource and opening up a revenue stream for treating used water, reducing risk and increasing confidence in food safety, and providing green jobs.
- **innovation and more efficient technology** – as research and development flourishes and benefits of scale are achieved.
- **increased capacity** – to implement SRTW projects including cross-sector collaboration

- **reduced climate emissions** - possible savings from reduced pumping of freshwater from aquifers or distant water surface water sources.

5 Legislative and Regulatory Context

5.1 Related Central Laws and Policies

According to the Constitution of India, water, sanitation and used water are State subjects. In relation to SRTW they are influenced by a number of national laws, including:

- **The Water (Prevention and Control of Pollution) Act, 1974 that emphasizes to maintain and restore the 'wholesomeness' of our aquatic resources by not discharging sewage or pollutants into water bodies including lakes.**
- The Ganga Action Plan, 1986 that was launched to protect river Ganga from further pollution, improve the quality of water treatment of the sewage, and to prevent the mixing of the industrial wastes.
- **The Environment Protection Act, 1986 which is an umbrella legislation designed to provide a framework for central government coordination of the activities of various central and state authorities established under previous laws, such as the Water Act and the Air Act.** It relates to the protection and improvement of the human environment and the prevention of hazards to human beings, other living creatures, plants and property.

It is also influenced by the:

- National Water Policy (NWP, 2012²³), that has a focus on reducing water pollution.
- National Urban Sanitation Policy (NUSP, 2008), that focusses on sanitary and safe disposal of human waste and recommends recycle and reuse.
- National Environment Policy (NEP, 2006), that emphasizes recycling sewage and used water from municipal and industrial sources, before discharge to water bodies. NEP emphasizes the need to prepare and implement action plans for major cities for addressing water pollution, comprising regulatory systems relying on an appropriate combination of incentive-based instruments, projects and partnerships.
- National Faecal Sludge and Septage Policy (FSSM, 2017), that focusses on leveraging FSSM to achieve 100% access to safe sanitation, achieving integrated citywide sanitation, safe disposal of faecal waste in urban areas of India, mandates strict environmental discharge standards, and promotes an appropriate, affordable and incremental approach to achieving these standards.

These policies are complementary to Goal 3 of the National Water Mission (NWM) which emphasizes promoting recycling of wastewater for meeting water needs of urban areas.

The Ministry of Power under its 2016 Tariff Policy, requires thermal power plants located within 50 km radius of a sewage treatment plant (STP) of a ULB to mandatorily use TUW.²⁴

Service Level Benchmarks (SLBs) of the Ministry of Housing and Urban Affairs (MoHUA) mandate the extent of reuse and recycling of sewage for gardens and parks in urban areas as 20%.²⁵

The National Water Quality Monitoring Programme (NWQMP) of India, through its network of SPCBs, advises central and State governments on prevention, control, abatement of water pollution and sets standards on water quality in streams and wells.

The Guidelines of National Building Code 2016²⁶, emphasizes the reuse of treated sewage and sullage in commercial or residential multi-storeyed complexes for flushing of toilets, horticulture and fire-fighting purposes. It also suggests separate storage tanks and separate distribution pipes.

The National Guidelines on Zero Liquid Discharge (ZLD) developed by CPCB for 22 industrial sectors have raised the issue that depending on the type of industry, ZLD may cause generation of hazardous solid waste causing disposal issues, higher overall operations cost, capital cost, space requirements and increased carbon footprint.

The CGWB Master Plan for Artificial Recharge to Ground Water in India (2013)²⁷ emphasizes that where TUW is used for recharge, careful monitoring is required to detect any possibility of contamination through a network of monitoring wells. A CGWB notification to regulate and control groundwater requires that, where viable, TUW is used rather than groundwater for purposes like toilet flushing, for irrigating green areas, and use in residential buildings, and infrastructure requiring more than 12.5 m³/d of groundwater.²⁸ In the case of critical and over-exploited areas, it also requires certification from a responsible government agency that TUW is not available within a 10km radius before a groundwater licence can be issued.

Other progressive GoI policies related to SRTW include that of the Ministry of New and Renewable Energy (MNRE) to generate green energy from biogas and covert sludge to manure.

5.2 State Policies and regulations

According to the 73rd and 74th Constitution Amendment Acts of India, 1992 (CAA), the *Panchayati Raj* Institutions (PRIs) and ULBs have been delegated the responsibility of

providing water, sanitation and used water services in rural and urban settings respectively. The ULBs are levying user charges to operate the utilities for collection and treatment of used water, and conservation and augmentation of the water sources.

At the time of preparing the Policy, 12 States had SRTW policies, either approved or at an advanced stage of drafting.²⁹ The majority of these State policies prescribe mandatory usage of TUW for industrial estate/zones within a certain distance from an STP provided the off-take is shown to be viable. Otherwise alternate sources of water for use by industry can be considered.

Most of the States with SRTW policies provide targets to improve the collection of sewage along with treatment and reuse within a defined timeframe based on city size. Along with these, ULBs have set targets ranging from 20% to 25% of TUW, replacing freshwater usage in the initial years. For some States, the target varies by city size. States like Gujarat and Haryana prescribe higher targets in subsequent years, to achieve 100% reuse by 2030 and 2033 respectively, while Karnataka prescribes 50% reuse by 2030.

Most States mandate usage of TUW in agriculture only if surplus quantity is available after meeting the demands of mandatory usage for other purposes.

All the existing State SRTW policies mention that the treatment of used water shall be done according to effluent discharge norms set by the CPCB and SPCBs. The Central Government shall have the prerogative to make more stringent norms as and when required.

The majority of the State SRTW policies have excluded aquifer recharge, whereas some have referred to the CPHEEO Manual (2013) for water quality standards for aquifer recharge, return flows and agriculture use.

A number of States have adopted policies on septage management while others have State septage management guidelines.

6 Roles and Responsibilities

Implementation of the National SRTW Policy involves a wide range of institutions from national to local levels (Table 6.1). It requires considerable levels of coordination and clearly articulated roles, responsibilities and implementation arrangements at the Central, State, ULB and PRI levels. Similarly, the regulatory and operational mandate of water regulators in respect of TUW and ownership of TUW needs to be clearly delineated by each State.

The national level has a number of obligations including ensuring common regulatory standards for water quality, irrigated agriculture and food safety; providing technological guidance on appropriate business models and overall risk management; overseeing performance targets and service level benchmarks; application of incentives

and penalties/sanctions; raising awareness of potential for SRTW; and research and capacity building.

The Ministry of Jal Shakti, Government of India (GoI) will be responsible for the overall interpretation, coordination and guidance of the Policy. It will disseminate the Policy among the State governments and ULB/PRI administrations as well as dovetail it with the Department of Water Resources' Development programmes and national Missions, such as the National Mission for Clean Ganga (NMCG) and AMRUT and SBM under the Ministry of Housing and Urban Affairs (MoHUA). It will also provide the necessary strategic planning and support to the States and ULBs to design, lead and implement a national awareness campaign and capacity building program.

While the National and State level institutions support the regulatory framework, the ULBs and Panchayati Raj Institutions (PRIs) lead in the on-ground implementation of SRTW. It requires strong local level institutions, stakeholders, coordination and partnerships. Each State and city need to formulate its own SRTW strategy and action plan and integrate the same in their respective State and City Sanitation Plans (CSPs) in overall conformity to the Policy. A template for State Level SRTW Policy is given in Annex 1.

Other stakeholders such as industries, farmer communities, Water Users Associations (WUAs), NGOs, CSOs, the private sector (small, medium and large), research organisations, also have a critical role to play in achieving safe and sustainable SRTW.

Table 6.1 Roles of key institutions and stakeholders at the National and State levels

Institutions	Lead Roles
National Level	
National Council on SRTW	<ul style="list-style-type: none"> • Apex body to promote SRTW • Provide a forum for inter-agency cooperation on SRTW at national level • Approve formulation and eligibility criteria for a SRTW Fund – the <i>Apna Jal</i> Fund – and identify sources of funding • Encourage establishment of new and existing programs to accelerate uptake of SRTW, including measures by ministries to streamline administrative mechanisms • Promote a national level information campaign, targeted messaging, consistent awareness and behaviour change campaign for overcoming negative perceptions on SRTW and encouraging support for circular economy solutions. • Coordinate preparation of SRTW guidelines across different end-uses by relevant agencies • Coordinate national level monitoring and reporting on SRTW • Support research and capacity building in the sector
Ministry of Jal Shakti, Dept of Water Resources	<ul style="list-style-type: none"> • Act as Secretariat of National Council on SRTW • Lead national level efforts to support States in adopting and aligning SRTW Policies and programs • Design and administer a national program for funding support and other incentive measures and sanctions needed to encourage SRTW application. • Ensure consistency of SRTW interventions with related water quality, environmental and river basin planning requirements • For Ganga States - NMCG to facilitate implementation of SRTW • Facilitate and coordinate a national program of capacity building for SRTW
MoJS-Dept of Drinking Water and Sanitation	<ul style="list-style-type: none"> • Issue guidelines on reuse of treated greywater in rural areas • Support funding/financing of reuse projects in rural areas • Plan and implement SRTW projects in rural areas under SBM for greywater management • Develop capacity building modules for SRTW in rural areas
Central Ground Water Board	<ul style="list-style-type: none"> • Issue guidelines and notifications to States on overexploited regions and require promotion of SRTW in those regions • Issue guidelines on risk assessment for aquifer recharge in relation to areas with high concentrations of heavy metals, emerging pollutants etc • Monitor TUW in aquifer recharge.
Central Water Commission	<ul style="list-style-type: none"> • Develop capacity building modules through National Water Academy (NWA) or training directorates. • Provide guidelines on allocation of TUW by the State at the basin levels. • Fund research on SRTW.

Ministry of Housing and Urban Development (MoHUA)	<ul style="list-style-type: none"> • Stimulate and coordinate implementation of the SRTW Policy in States and Cities • Link SRTW projects with AMRUT Programme
Central Public Health and Environment Engineering Organisation	<ul style="list-style-type: none"> • Develop guidelines on standards for different types of end uses in partnership with CPCB • Provide technical and planning support to States and ULBs including technical guidelines and training modules that can be adapted by States
Ministry of Environment, Forest and Climate Change (MoEFCC)	<ul style="list-style-type: none"> • Enforce compliance of the relevant environmental laws and rules during the treatment, conveyance and reuse of TUW according to the reuse and discharge norms • Ensure common regulatory standards for water quality and safety of agricultural and aquaculture products in consultation with MoAFW.
Central Pollution Control Board (CPCB)	<ul style="list-style-type: none"> • Issue SRTW end-use water quality standards for each type of reuse for implementation by SPCBs through coordination with related agencies. • Prepare monitoring guidelines on SRTW for different end uses • Prepare standards for biosolids as part of a complementary initiative to the Policy on SRTW
Ministry of Agriculture and Farmers' Welfare (MoAFW)	<ul style="list-style-type: none"> • In consultation with CPCB, ensure common regulatory standards for safety of edible agricultural and aquaculture products, including from bioaccumulation of emerging contaminants • Issue guidance on SRTW in agriculture and aquaculture and the types of crops that can be grown
Food Safety and Standards Authority of India (FSSAI), Ministry of Health and Family Welfare	<ul style="list-style-type: none"> • Monitor and ensure compliance of food safety standards, including for the export of agricultural produce from India • Clarify standards of food products for specific markets within and outside India.
The Ministry of Commerce and Industry (MoCI),	<ul style="list-style-type: none"> • Mandate and promote SRTW in industry clusters in India • Provide incentives for SRTW in order to promote reuse by industries • Monitor uptake of SRTW by industry
Ministry of Panchayati Raj	<ul style="list-style-type: none"> • Liaise with DDWS on implementation of SRTW in rural areas • Stimulate PRI engagement on SRTW programs
NITI Aayog	<ul style="list-style-type: none"> • Tracking progress with regard SRTW for inclusion in the Composite Water Management Index • Alignment of SRTW programs with ongoing efforts and tracking progress of SDG targets

State Level	
State Government	<ul style="list-style-type: none"> • Establish a State Committee on SRTW with representatives from all end-use stakeholders to provide coordination across agencies on developing and implementing the State SRTW policy. • Adopt a State Policy on SRTW reflecting the principles and provisions set out in the national Policy • Create a State funding scheme for SRTW to complement national and local funding
State Committee on SRTW (supported by a Technical Cell)	<ul style="list-style-type: none"> • Approve a State-wide Strategy and Implementation Plan for SRTW • Approve a State-wide TUV pricing • Coordinate STP mapping of TUV supply and demand • Establish a system of tradable certificates for TUV • Coordinate Information, Education and Communication (IEC) activities in the State • Oversee State-level monitoring and reporting on SRTW
State Department of Urban Development	<ul style="list-style-type: none"> • Develop State level SRTW Policy, strategy and implementation Plan • Develop operative guidelines on SRTW • Allocate funding through specifically created State funding schemes for SRTW. • Undertake State level monitoring, evaluation and compliance • Implement measures to encourage private sector participation
State Pollution Control Board (SPCB)	<ul style="list-style-type: none"> • Regulatory role in water quality assessment • Monitoring, evaluation and compliance of WQ standards • Review risk assessments and environmental clearances for SRTW projects
State Department of Agriculture	<ul style="list-style-type: none"> • Develop TUV Guidelines for the crops used for cultivation under SRTW based on national guidance • Develop guidelines for addressing prior utilisation of used water for agriculture in relation to any change of use resulting from new SRTW projects • Monitoring of farms using TUV for bioaccumulation of heavy metals and emerging contaminants
State Department of Water Resources	<ul style="list-style-type: none"> • Review SRTW implementation plans and project proposals from the perspective of State and river basin water balances • Identify areas of high water stress where SRTW projects can be prioritised
State Department of Industries	<ul style="list-style-type: none"> • Mandate industries to meet minimum reuse targets • Ensure compliance by industries to meet minimum reuse targets
Urban Local Bodies (ULBs) (including parastatal agencies and SPVs)	<ul style="list-style-type: none"> • Develop city-based strategy on SRTW, including pricing strategy for TUV • Implement online SRTW monitoring and reporting system and regularly evaluate SRTW strategy and implementation plan • Implement IEC campaigns for behaviour change to engage diverse stakeholders and public acceptance of SRTW • Implement Municipal byelaws for sanitation tax and promoting SRTW at household, apartment complexes, hotels, residential institutions.

<i>Panchayat/ Raj Institutions</i>	<ul style="list-style-type: none"> • Develop a strategy and implementation plan for SRTW in rural areas incorporating guidelines on SRTW prepared by DDWS • Implement IEC for behaviour change campaign to engage diverse stakeholders and public acceptance of SRTW
Private Sector (technology providers, operators)	<ul style="list-style-type: none"> • Finance investments, planning, design, operations and management of SRTW projects including through PPP models • Research and development on new technologies • Assist ULBs in water literacy campaigns
End users (Industries, power plants, agricultural enterprises, municipalities, others)	<ul style="list-style-type: none"> • Proactive engagement in SRTW initiatives • Commitment to adoption of best practice • Contribution to monitoring programs and open reporting of SRTW
NGOs/CSOs	<ul style="list-style-type: none"> ▪ Support training and capacity building of different stakeholders ▪ IEC for behaviour change programmes

7 Water Quality Standards and Environmental Considerations

Treatment of used water is fundamental for human and environmental health protection as used water, whether treated or not, finds its way back into surface water bodies or percolates into the groundwater. Pandemics highlight the potential risk of pathogens and the requirement for improved water supply, sanitation, hygiene and SRTW. The following principles will be important to consider in determining national standards for reuse and formulating State Policy on SRTW.

- A uniform minimum treatment standard is to be achieved in all treatment plants.
- SRTW standards to be ‘fit-for-reuse’ based on the purpose of use, not a one-size-fits-all. The level and type of treatment depends on its intended re-use. Clarity on end-use standards will lead to potential for standardizing design of SRTW systems thereby reducing costs and implementation timeframes.
- Sustainable solutions that respond to future trends of emerging contaminants require more stringent used water discharge norms.
- Water quality specifications for TUW to be monitored for the presence of emerging contaminants, heavy metals, pesticide residues and antibiotic residues. Strict discharge norms on BOD, COD, TSS and TDS are pre-requisite for managing emerging contaminants and mitigating risks in reuse interventions.³⁰
- In parallel with consultative processes to establish national end-use standards for SRTW and to expedite implementation of the Policy, consideration may be given to adopting interim standards based on national and international experience.

- Once established, standards should remain in force for a reasonable period of time to provide a stable environment for SRTW investment. The subsequent raising of standards requiring upgrading of treatment plants to be subject to a phased transition period.

In addition to standards on quality of TUW, service standards on reliability of supply to end users of TUW and process standards on risk mitigating barriers to ensure safety in usage including measures such as sanitation safety plans, need to be provided.

Monitoring and compliance provisions are given in Section 11.

7.1. Standards for industrial use

The Policy promotes the secondary treatment of used water from STPs. For subsequent industrial reuse, the responsibility for treatment to a higher level, depending on industry requirements, rests with the individual industry. A system of open and transparent standards for each category of industrial reuse should be evolved to ensure uniformity and compliance with different industrial groups.

The upcoming Treated Industrial Wastewater Reuse guidelines being drafted by CPCB³¹ is developing water quality standards for reuse of industrial used water and necessary compliance mechanisms. The guidelines are expected to equip the respective SPCBs for developing criteria for water quality standards for reuse of treated industrial used water for end use in industry, agriculture, horticulture and other purposes.

7.2 Standards for agricultural and aquaculture use

TUW can be reused in agriculture, aquaculture, forestry and horticulture. Using TUW for agriculture and aquaculture requires water quality compliance to protect food safety.

CPHEEO Manual 2013³² provides a list of Indian crops with guidelines and safety standards for horticulture, edible and non-edible crops.³³ It also has specifications for Dissolved Phosphorus, Nitrogen and Faecal Coliform.

State PCBs have set minimum standards for the treated sewage, specifically for agriculture and other non-potable uses. Development of more specific national end use standards for agriculture as well as aquaculture will be coordinated by CPCB. Situations with increased risk of bioaccumulation of emerging contaminants, require a comprehensive monitoring system.

The selection of edible and non-edible crops depends upon the available TUW and soil type, ensuring safety to consumers and farm workers against pollution.

National and State standards are to be periodically reviewed against international standards³⁴ for relevance and to be revised as required.

7.3 Standards for non-potable domestic and municipal use

SRTW can be used for municipal uses like landscaping, parks, toilet flushing and fire-fighting with quality norms advised by SPCB, CPCB and CPHEEO depending on the reuse option.

7.4 Standards for groundwater recharge ³⁵

Ground water recharge with TUV of appropriate quality has the potential to contribute in areas that are water stressed and groundwater is overexploited and in coastal areas to reduce saline intrusion. It requires stringent quality standards, monitoring and compliance measures. A cautious approach needs to be followed both in terms of quality of TUV and also type of recharge system. The precautionary principle should be adopted in order to avoid polluting aquifers. Proposals for groundwater recharge using TUV are to be analysed on a case-by-case basis and a risk assessment prepared.

7.5 Standards for release to surface water bodies including environmental use

CPCB has prescribed a minimum water quality standard for municipal used water³⁶ and industrial effluents³⁷ discharged to surface water bodies. Stricter norms for minimum water quality standards may need to set by SPCBs for critical environments, including lakes and wetlands, or where the points of extraction of water for water supply works are close to points of TUV discharge. Guidelines on the proximity of TUV discharge to extraction points for drinking water supply are needed as part of the overall framework of standards.

The existing State SRTW policies require that the treatment of used water shall be done according to the effluent discharge norms set by the SPCBs and CPCB.³⁸

8 Implementation Approach

Implementation of the policy requires an effective institutional arrangement that enables communication *vertically* between the National, State and ULB/PRI levels, and *horizontally* across the sectors, allowing integrated implementation of relevant sector policies. A set of related strategies and action plans guided by cross-agency coordination mechanisms are required to ensure that measures implemented by the mandated body are both consistent with the direction of the Policy and efficient in terms of use of financial resources.

8.1 National-level Implementation

A **National-level SRTW implementation Strategy** will be fully developed within six months of approval of the Policy setting out time-bound measures to coordinate and incentivize the uptake of SRTW across the country. The measures include:

- Establishing a national apex body, the **National Advisory Council on Safe Reuse of Treated Water** (the Council), to promote inter-agency cooperation with the aim of stimulating adoption of SRTW. The Council will facilitate integration of SRTW indicators within existing missions and programs.
- Establishing a national SRTW fund, the **Apna Jal Fund**, to provide financial support for States to implement SRTW (see section 10).
- Developing **end-use water quality standards** suited to the type of reuse (see section 7).
- Preparing **SRTW Technical Guidelines** on a range of topics to provide assistance to States in implementing State policy. These may include aspects related to undertaking feasibility studies, risk assessments and environmental assessments of SRTW projects; risks of bioaccumulation and emerging pollutants; developing criteria for using TUV for aquifer recharge; and other relevant topics identified by the Council.
- Preparing **Training Modules** incorporating best practices in SRTW.
- Encouraging **Research and Development** on SRTW across the range of technical, financing and pricing, procurement, health and environmental aspects.
- Establishing a **national monitoring system** to track implementation and provide online reporting.

8.2 State-level Implementation

States are encouraged to prepare a **State SRTW Implementation Strategy and Action Plan** to support and guide the implementation of SRTW projects. Some States already have SRTW policies, while others are at various stages of developing them. The Strategy and Action Plan sets the framework, objectives and timelines for implementation by ULBs and PRIs. Elements of a Strategy and Action Plan include:

- Setting up an inter-agency **SRTW Committee** representative of different sectors to oversee uptake of SRTW. The Committee will embrace consultative process for the development of policy, including establishing priorities of reuse across the State, setting of mandatory usage criteria, identifying no freshwater zones, implementation targets, and determining pricing policy for TUV. The State may also consider establishing a **SRTW Technical Cell** to support the identification and planning of SRTW projects.
- Developing a **State Policy on Safe Reuse of Treated Water**. For those States that have already adopted a policy, review and update it to ensure it is consistent

with national policy and eligible to access national support programs. Related policies, regulations and by-laws will be reviewed and amended as necessary to ensure consistency.

- Undertaking a **mapping of TUV supply and demand** covering the sources of TUV and potential users across the State and initiate an awareness raising and support program to match the production of TUV with potential users. Planning for SRTW needs to consider trends in the medium to long term and encourage investment by embracing principles of reliability and consistency. Transition arrangements may be required for existing informal uses of wastewater, including agriculture.
- **Setting up the institutional structures for implementing SRTW including responsibility for regulatory functions, coordination and delivery at State level and implementation agencies responsible in municipal and rural areas. This may include a Special Purpose Vehicle (SPV) responsible for sewerage and TUV in cities over 5 lakh population and that do not already have a parastatal agency mandated with those responsibilities.**
- Establishing pricing policies, incentives and penalties.
- Establishing State programs for **financial support** that complement existing programs.
- Planning and financing of **conveyance grids** for TUV based on the types of end-use.
- **Support services** including technical assistance in developing feasibility studies and ensuring environmental clearance; assistance in accessing green finance; preparation of State-level guidelines; SRTW promotion through public information campaigns; and capacity building initiatives.
- Developing a **monitoring and reporting process** linked to national reporting systems.
- Introducing mechanisms for **dispute resolution** in the event of conflicts between end-users or procurement related issues.

8.3 Urban and Rural level Implementation

ULBs and PRIs are encouraged to prepare an **SRTW Action Plan** that demonstrates their commitment to SRTW by:

- Adopting a **Resolution on SRTW** and necessary by-laws to create the enabling environment.
- **Identifying funding opportunities** by engaging with State-level agencies, national agencies and international partners.
- Contributing to the State-wide **mapping of SRTW potential**, identifying promising initiatives and preparing feasibility studies.

- Introducing a structure for **levying charges** based on State pricing policy, including consideration of a special cess/rebate to promote SRTW in their jurisdiction.
- **Exploring the potential for complementary reuse of resources through recovery of nutrients, salts, heavy metals and other recoverable materials or linkage with energy-from-waste projects.**
- Considering **dis-incentive measures** for unsafe disposal of biosolids generated from TUV or partial treatment of municipal /industrial wastewater.
- **Engaging with stakeholders** through open and consultative processes, for example with the involved communities, industries and industry associations, farmers and water user associations, civil society organizations and research institutes as well as the relevant government line departments and representatives of national agencies such as CGWB.
- Implementing IEC and behaviour change campaigns on SRTW
- Introducing **monitoring and evaluation systems** and periodically reporting to the State SRTW Committee.
- Ensuring **compliance** with regulations and standards.

The Action Plan should be consistent with and support provisions in the NUSP for ULBs to have a City-wide Sanitation Plan, including a detailed plan for safe collection, conveyance and treatment of sanitary waste and institutionalized roles and responsibilities of staff for effective service delivery systems. The Plan should also be consistent with provisions of State FSSM policies.

8.4 Linkage with river basin planning

Linkages with the overall water balance and water allocation system within a river basin is necessary to take advantage of the benefits of TUV as an alternative source of water - a resource that has so far been under-utilized. Responsibilities for ensuring TUV is incorporated within wider river basin planning approaches depend on whether the basin is intra-State or inter-State.

8.5 Challenges

Implementation of the Policy faces a number of challenges including:

Public perception and awareness: Although the Policy does not encompass direct potable use of TUV, the discharge of TUV into natural water bodies ultimately sees a proportion of the used water re-enter the water cycle into water supply treatment and distribution system, albeit in a diluted form. For some, it may still

challenge cultural norms and raise questions about public safety. Similarly, SRTW in certain agricultural, industrial and municipal settings may also raise concerns. Overcoming negative perceptions on SRTW and encouraging support for circular economy solutions will require a program of consistent and targeted messaging to end users and the public through water communication programs of the central and State Governments.

Financing and viability: Achieving SRTW targets requires an alignment of interests and incentives amongst the key stakeholders, identifying areas of demand and supply, selecting the most appropriate business model where risks are shared equitably, and designing support programs that are efficient in time and resources.

Compliance with standards: Significant efforts will be required to ensure prevailing standards are met thus reducing risks to public health and the environment. SRTW introduces an additional layer of processes for which compliance has to be assured. A range of approaches is needed including improving the financing and capacity of compliance institutions, introducing transparent self-monitoring systems into business models with sufficient checks and balances, and engaging stakeholders in the process. Food safety is of paramount importance for public health nationally and for export trade. Past international experience has demonstrated the economic impact of non-compliance with food safety standards in relation to foregone export potential. National norms for water safety planning and risk management will be key to expansion of sustainable SRTW in India.

Integration and coordination: SRTW is one step in the circular economy approach for water supply and sanitation. Other policy elements exist, such as for the recovery and reuse of faecal sludge from septic tanks under the FSSM Policy. Others are gaining attention including campaigns to promote recovery and reuse of sludge from STPs for use in power generation or agriculture. Coordination across resource recovery and reuse activities is needed at a range of levels from ULB to National. In the near future, it is expected that SRTW will form part of a wider integrated waste recovery and reuse system. As demand for TWW escalates, competition amongst end-users may arise as in the case of freshwater, requiring an allocation system that prioritizes reuse according to locally relevant economic, social and environmental criteria.

Managing the transition: The scale of the challenge to reach universal sewage treatment and high levels of safe reuse is considerable and will require States to develop and adopt a strategy and action plan that focuses both on realizing early gains where sources of supply and demand are aligned, in parallel with medium term programs to introduce an enabling regulatory and pricing environment that provides incentives for change. In managing the transition, safeguards are also

required to consider pre-existing uses of used water (formal and informal) and ensure the needs of prior users are addressed.

9 Business Models

9.1 Pricing of SRTW³⁹

The price of treated used water shall be determined based on following factors:

- investment cost including conveyance, treatment and distribution infrastructure;
- operation and maintenance cost of the infrastructure;
- quality of water supplied;
- type of end uses;
- availability and prevailing price of alternative water sources;
- other social, cultural and business factors.

Pricing of TUV to reflect the following principles:

- TUV to be considered as a social, environmental and economic commodity. The price set shall maximize social, environmental and economic returns.
- The price of TUV shall encourage its use in comparison to usage of freshwater for all types of acceptable end use. Pricing policy and designation of 'no-freshwater' zones may need to be considered as an integral measure.
- Apportioning and pricing of treated used water and domestic sewage charges together shall aim to achieve economic cost recovery with priority on recovery of operating cost. **The ultimate aim is to achieve full cost recovery of capital and operations cost where ability to pay exists, ensuring that the price of TUV does not make end user business unviable.**⁴⁰
- In achieving cost recovery through pricing of TUV, the following aspects are to be considered:
 - inculcate the practice of payment for TUV with pricing to be structured to incrementally achieve cost recovery over a period of time,
 - the pricing of TUV shall, at the minimum, aim to recover the additional operating costs incurred for treating used water to applicable reuse standards and its delivery to the end user,
 - apportioning and pricing of domestic sewage charges and sale of TUV to be structured to recover the entire operating cost of conveyance of used water, treatment of used water, distribution of TUV, repair, maintenance and overall management including billing for the services. Where viable, part or all of the capital cost of the services shall be recovered,

- in cases where it is viable, full cost recovery shall include:
 - capital cost for the infrastructure – sewer for conveyance of used water, treatment plant and distribution infrastructure for TUV,
 - institutional aspects of the sanitation service e.g. the management information systems, accountancy and finance management, billing and collection, customer services, etc. and oversight activities,
 - operating, maintaining (on a planned maintenance basis), repairing replacing and extending sanitation service physical infrastructure,
 - all other management, operating and maintenance costs.

Additional factors are to be considered in pricing of TUV based on type of end use of TUV and regional context:

- While TUV is to be priced lower than freshwater, existing subsidies on freshwater can impact the viability of a SRTW project. On a case to case basis, State or ULB or parastatal agency or PRI shall intervene to rectify such market failures including consideration of 'no-freshwater zones' (Annex 5).
- Differential pricing shall be applied based on the type of end use and the ability to pay for TUV and cost incurred in accessing freshwater.
- States shall determine payment by farmers for access to TUV based on the groundwater situation in the region (with stringent norms for overexploited zones), costs of accessing canal water and other expenses such as cost of pumps, pipes, etc.
- Farmers currently using untreated used water for informal irrigation may not be able to pay market rates for TUV and thereby risk losing incomes. States will need to assess the extent of prior use and may consider introducing benefit sharing mechanisms in which a portion of the revenues from SRTW is used to finance improvements in farming practices and minimize loss of production.⁴¹
- In determining pricing for industries, States shall ensure industries in the State are not disadvantaged in terms of input costs
- In 'no-freshwater zones' created by the State, pricing incentives shall be provided to promote TUV especially for agriculture and by industries.

The price of TUV shall be fixed for a specific duration and suitable price escalation as decided by the State Committee shall be applied based on different end uses. The Committee shall define the period for reviewing the price of treated used water and set out details of an appeals mechanism.

Users of TUV shall be provided with the purchase agreement⁴² by the implementing agency which shall reflect at the minimum the price, escalation, payment method, quantity and quality of water along with other contract conditions.

The implementing agency shall maintain an escrow account to receive payments from the sale of treated used water and where appropriate, the funds raised from SRTW can be considered to subsidize domestic sewage charges for socially and economically marginalised sections of the society so as to ensure affordability of used water services by them and to finance improvement in service delivery including quality of TUW.

9.2 Guidance on selection of business models and private sector engagement

In the planning of an SRTW project, it is important to develop business models suited to the type of end use. Annex 2 provides brief descriptions of different SRTW business models.

The implementing agency shall develop appropriate business models for setting up of conveyance, treatment and TUW distribution infrastructure along with its operation and maintenance to ensure sustainable implementation of SRTW. The implementing agency shall take into account lessons from implementation in other States with successful examples.

In approving the business models, the implementing agency considers the following items for the entire value chain including conveyance of used water, treatment, and distribution of TUW:

- Appropriate regulations to be developed and applied e.g. used water connection, conveyance coverage, treatment standards, reuse standards, billing and collection protocols, monitoring protocols based on type of end use, penalty mechanisms and reporting.
- Payment of services by customers for used water services and TUW as per the pricing principles in section 9.1 and the process of billing and collection mechanisms.
- Financing mechanism and requirement of funds to meet the establishment of infrastructure for SRTW, including any gap in operating cost of the infrastructure.
- Clear roles and responsibilities of each stakeholder in an SRTW project reflecting their involvement in financing, service provision or regulatory aspects. The implementing agency to identify all relevant stakeholders based on the type of end use of TUW.

The implementing agency may undertake any of the following approaches in implementing the business model: **a) Public procurement, b) Private ownership and c) Public Private Partnerships.** A State owned company or institution may directly purchase secondary treated used water from the utility and, if needed, set up additional treatment infrastructure to meet the required water quality standards. Respective State guidelines on procurement shall be applied. States without procurement guidelines

shall follow national guidelines issued by Department of Expenditure, Ministry of Finance.

The implementing agency shall implement procurement contracts depending upon the most prevalent and successful end use of treated used water and considering highest value of social, environmental and economic returns. The implementing agency shall embrace emerging models and practices as appropriate to their respective context.

In the **Public Procurement Model**, the implementing agency owns and operates the conveyance, treatment and treated wastewater distribution infrastructure. In addition to covering the items described above in defining the business model, the following additional aspects are included in this model:

- The implementing agency engages the services of private agency in procurement of technology. The technology choice may be driven by outcome orientation that defines required performance criteria instead of prescribing select technologies. The implementing agency considers encouraging participation of smaller private players especially for proven well established technology solutions so as to have a larger pool of bidders participating in the tender.
- The implementing agency ensures funding coverage is met by budgetary resources from central, State government and ULBs or PRIs and, where available, funds from external funding agencies.

In the **Private Ownership Model**, the implementing agency provides either secondary treated water to a private entity which is responsible for treatment to any higher required quality standards. Depending on the local context, the infrastructure for distribution of treated used water shall be owned and operated either by a public or private entity. This model is particularly relevant for provision of industrial grade quality of TUW for industry. In addition to covering all the items described above in defining the business model, the following aspects are relevant to this model:

- The procurement models applicable are **a) Build-Own-Operate (BOO), b) Build-Own-Operate and Transfer (BOOT), and c) Build-Operate and Transfer (BOT) with user charges, provided the user charges collection risk by the private entity can be mitigated.**
- The implementing agency shall mandatorily provide the quantity and quality of untreated or treated used water. If not, relevant penalties applicable on the implementing agency will be applied.
- If the infrastructure for distribution of treated used water is owned and operated by the implementing agency, then the private entity responsible for treatment shall be given assurance of minimum guarantee on revenue from the sale of treated used water or offtake of assured quantity of treated used

water at fixed price shall be ensured. The private entity shall be responsible to meet the required reuse water quality standards.

- The implementing agency may require the off-taker of the TUW to be responsible for the costs of distribution.

In the **Public Private Partnerships (PPP) Model**,⁴³ the implementing agency intention is to engage with a private entity to attract private investment, to leverage its efficiency, and to provide quality treatment facility including distribution infrastructure and services at an optimal cost. In addition to covering all the items described above in defining the business model, the following additional aspects are relevant to this model:

- The implementing agency shall implement any of the following PPP models or a combination thereof: a) Design-Build-Operate (DBO), b) Design-Finance-Build-Operate and Transfer (DFBOT) or BOT - annuity, c) Hybrid Annuity Models (HAM), and d) BOT – user charges or end user.
- In contracts where the implementing agency is completely financing the PPP contracts, it shall ensure funding coverage is met by budgetary resources from central government, State government, ULB and PRI along with exploring funds from external funding agencies and banks.
- The implementing agency shall consider Viability Gap Funding (VGF). The guidelines for financial support to PPPs as issued by the Department of Economic Affairs shall be followed for applying VGF. States may provide additional VGF in addition to the funding from central government as per the guidelines.
- In HAM contracts, the financing arrangement sharing ratio between implementing agency and private entity shall be defined. The implementing agency pay their defined financing share after completion of the treatment plant and the remaining portion is paid in the form of annuities.
- **The implementing agency shall apply one or a combination of following criteria in selecting the PPP operator:**
 - Lowest bid in terms of user fee from consumers
 - Royalty paid to ULB per KL of treated used water
 - Highest upfront fees
 - Lowest present value of subsidy
 - Lowest capital cost and operations and maintenance cost for projects
 - Highest equity premium
 - Quantum of State’s support solicited in present value
- **The operations and maintenance period shall be long term but not exceed a 30-year period.**

- A balanced risk allocation and performance-based remuneration shall be applied.

The business models developed by the implementing agency shall be finalised after adequate due diligence and detailed assessment. The final decision on the approval of the business model shall lay with the State Committee on SRTW

9.3 Managing risks

The implementing agency shall identify risks and corresponding mitigation measures before the implementation of SRTW projects. An integrated approach to water resources management, combined with locally appropriate and sustainable risk reduction measures, and active involvement of stakeholders from different sectors shall be established. Table 9.1 provides some of the key high-risk situations and corresponding mitigation strategies.

Risks	Mitigation Strategy
Limited market acceptance on reuse of TUV	<ul style="list-style-type: none"> - The implementing agency undertakes Information, Education and Communication campaign on the benefits of TUV and corresponding regulations - Create “No freshwater” zones and mandate usage of TUV for certain type of end uses - Mandatory use of TUV by industrial zones within a certain distance from Sewage Treatment Plant
Unable to achieve cost recovery based on pricing of TUV	<ul style="list-style-type: none"> - The implementing agency adhere to the pricing principles so that price incentives are there for adoption of TUV - Subsidy on freshwater can impact the viability of treated used water project and the State or ULB or parastatal agency or PRI address these on a case to case basis and may need to revise the subsidy on freshwater
Stakeholders involved in existing practices of using treated and untreated used water can delay the project and make it unsustainable in the longer run	<ul style="list-style-type: none"> - The implementing agency engages with the stakeholders and arrives at an arrangement that benefits all - If the existing users of TUV are farmers and priority is mandated to industries, suitable arrangements for sharing and allocation of TUV should be agreed between the stakeholders. When TUV is supplied to farmers, there needs to be a clear case for growing suitable crops suitable as recommended. - The priority on usage be given to the end user with the highest social, economic and environment returns
Lack of available finance for establishing infrastructure for treatment and distribution of TUV	<p>Depending on the local situation, one of the following approaches to be considered:</p> <ul style="list-style-type: none"> - State consider all budgetary resources available at national, State and ULB or PRI including viability gap funding mechanism

	<ul style="list-style-type: none"> - State creates a Special Purpose Vehicle (SPV) to develop distribution grids - State creates a credit guarantee fund (as part of the SPV) for private entity to finance the investment - Partnership with industry clusters/development board/finance institutions to jointly invest in infrastructure - Depending on project viability, off takers of TUV to be responsible for treatment and conveyance. This to be strictly applied in water scarce regions with water intensive industries - State target investments under Corporate Social Responsibility programs
<p>Delay in project execution due to lack of prioritisation on type of end use of TUV</p>	<ul style="list-style-type: none"> - The implementing agency shall align water availability situation along with the highest returns from the investment from social, environmental and economic perspectives in allocating TUV for different types of end uses
<p>Assurance on quantity and quality of TUV supplied to end user</p>	<ul style="list-style-type: none"> - The implementing agency complies with the purchase agreement - In case the implementing agency are unable to meet the supply requirements, either they will be penalised or required to supply freshwater to the end user - End users of treated used water are recommended to have back up supply alternatives in case of emergency situation
<p>Weak monitoring and enforcement of standards has environment and public health implications from use of TUV for certain end uses</p>	<ul style="list-style-type: none"> - Based on the type of end use, the implementing agency engages appropriate institutions in monitoring environment and public health outcomes and enforcement/compliance of performance criteria - For an end use in agriculture, the implementing agency engages with department of agriculture and agriculture universities in guiding farmers on suitable crops and agronomic practices and the importance of incorporating sanitation safety measures while irrigating and periodic monitoring of soil and farmer's health - For an end use for environment purpose, the implementing agency shall engage research institutions and civil society organisation to monitor the quality of water in waterbodies along with awareness to the public
<p>Insufficient bidders in public and PPP procurement models</p>	<ul style="list-style-type: none"> - Based on the type of services required from the private entity, the qualification conditions shall encourage small private sector players and locals to ensure larger pool in tenders thereby resulting in lower cost and ease of operations managed locally - Technology choice driven by an outcome orientation instead of prescribing select technologies will encourage wider participation

10 Financing

10.1 National programs

The Government of India under the aegis of Ministry of Jal Shakti shall create a Fund (the **Apna Jal Fund**) to promote SRTW and issue guidelines on accessing the Fund. The Fund will be used to partially finance project costs, on a sliding scale up to 50%, depending on eligibility criteria, with the remaining contribution from the State and/or private entity. The eligibility principles for the Fund are given in Annex 4. An additional modality for the Fund is to provide credit guarantee facility for private entities to access finance for investing in SRTW infrastructure.

Contributions to the Apna Jal Fund can be sourced through earmarked contributions from ongoing programs of the Government of India in urban development, e.g. by Atal Mission for Rejuvenation and Urban Transformation (AMRUT), improved sanitation by Swachh Bharat Mission (SBM), pollution abatement of Ganga river through Clean Ganga Fund for Ganga States, and for pollution abatement of rivers in identified stretches by National River Conservation Directorate (NRCD) as well as national budgetary allocation.

For TUW in agriculture, Pradhan Mantri Krishi Sinchayee Yojana (PMKSY) scheme can be applied for treatment of used water and conveyance of TUW. Funds from the Central Finance Commission shall be used for the development of infrastructure.

10.2 State programs

SRTW projects will be aligned to the Government of India programs outlined above along with any other funding available from the State. States shall incorporate reuse of TUW in all its programs where it is relevant, including integrated programs that recover solids and any other by-products from treating used water.

In States where there are no parastatal agencies to provide used water services, the States may consider creating a SPV for cities above 5 lakh population to manage sewage and supply TUW to end users. A SPV may also manage and finance infrastructure for distribution of TUW.⁴⁴ States may also consider providing credit guarantee facility for private entities to finance investments in SRTW projects. States shall mandate all the ULBs and PRIs to ring fence sanitation budget line within their respective budgets. States may provide additional Viability Gap Funding as per the PPP guidelines issued by the Department of Economic Affairs.

Respective State UDDs and PRI departments shall coordinate various funding sources and be responsible for convergence. Financing of both capital and operation and maintenance costs of SRTW projects shall include a combination of:

- Funds provided by Government of India under centrally sponsored schemes.

- Funds from State government program and Urban Development Department budget.
- Funds from Central and State finance commissions.
- Loans take by State Government from international organizations
- Funds deployed by PPP operators.
- Revenue from the sale of TUV and sale of other by-products from the treatment plant.
- Own source of funds of ULB and PRI which would include sanitation tax or user charges levied and sewerage connection fees.

Funding of pre-feasibility and feasibility assessments may be made available from State urban development department budgets, including from ULBs or parastatal agencies.

The implementing agency shall seek funding for SRTW projects from companies under Corporate Social Responsibility (CSR) programs. This may include models where the untreated used water or secondary TUV shall be treated by the industry for internal consumption and the excess TUV is released for environment purpose such as lake or pond rejuvenation.

The implementing agency may raise funds for the SRTW investment using social/development impact bonds and suitable financial instruments used by impact investors to promote TUV.

10.3 Incentives

States may consider applying incentives in the form of tax rebates and waivers of other charges for promotion of SRTW. They include but are not limited to:

- Individual households/apartments/gated colonies treating their used water in a decentralized manner and reusing it onsite (including dual plumbing) as permissible shall be eligible for rebates in property tax as decided by the State or ULB.
- States or ULB may mandate all new apartments/gated colonies which will be constructed to mandatorily treat and reuse the TUV in their premises (including dual plumbing) in which case they can be eligible for rebates in the construction permit fee or other charges as applicable for sanction of building plans.
- States or ULB may mandate all new malls, hotels, industries, clubs, colleges, universities, hospitals, sports stadiums etc. which will be constructed to mandatorily treat and reuse the TUV in which case they can be eligible for rebates in the construction permit fee or other charges as applicable for sanction of building plans.
- The implementing agency may give land on lease to PPP operator.

- States may provide rebate on Goods Services and Tax (GST) on purchase of machinery or equipment for the treatment plant incorporating reuse. The rebate shall be linked to a minimum investment amount.
- The implementing agency may provide electricity rebates for the operations of treatment plants and conveyance of TUW.
- States may provide exemption from payment of GST on pipes for conveyance of TUW.
- State may exempt custom duty on SRTW projects financed by external organisations.
- States may implement a scheme of issuing and trading of TUW reuse certificates (Annex 2) to incentivise ULBs or PRIs and target end users (e.g. industries) to achieve the targets set on SRTW. The certificates can be used as a mechanism to maintain commitment to SRTW by ULBs or PRI and target end users where viability of reuse is uncertain or low.⁴⁵

11 Monitoring, Evaluation, Surveillance and Review

11.1 Principles and responsibilities for M&E

Monitoring and evaluation of SRTW is required to:

- Track performance targets on SRTW as set out by the State,
- Ensure compliance on outcome, process and service standards in SRTW projects,
- Evaluate pricing of TUW, incentives and penalties/sanctions, and
- Ensure transparent reporting mechanisms.

At the national level, the Ministry of Housing and Urban Affairs has developed Service Level Benchmark on wastewater management to assess performance of citywide sanitation. The benchmark currently has provision for the indicator on reuse of TUW and it shall be updated to capture additional indicators as required by this Policy. Consolidation of data captured by the States and ULBs on reuse performance targets shall be done at the national level.

State governments will be responsible for monitoring the performance of the implementing agency in achieving the national targets and targets outlined in their respective State SRTW policies. State governments shall devise data collection and reporting systems using the indicator developed for Service Level Benchmark. The implementing agency shall develop database on approved SRTW projects and reporting format to track compliance on standards.

The implementing agency will be responsible for leading monitoring and compliance of outcome, process and service standards on SRTW projects implemented within their

jurisdiction. Water quality specifications for TUW to be monitored according to CPCB guidelines for the presence of emerging contaminants, heavy metals, pesticidal residues, anti-biotic residues. The implementing agency will engage with SPCBs for monitoring outcome standards. Based on the type of end use, they will engage appropriate institutions and implement appropriate surveillance measures in monitoring outcome standards:

- For an end use for **industries**, where quality standards depend upon the nature of the industry and their water quality requirements, self-compliance mechanisms will be put in place and monitoring by SPCB as part of broader regulatory commitments.
- For an end use in **agriculture**, the implementing agency will engage with departments of agriculture and agriculture universities in guiding farmers on crops developed, incorporating sanitation safety measures on irrigation practices and periodic monitoring of soil and farmer's health
- For an end use for **environment** purpose, the implementing agency will, as appropriate, engage CGWB, research institutions and civil society organisation to monitor the quality of surface and ground water. They may also be engaged to create awareness on TUW amongst citizens.

The State shall monitor related provisions outlined in other policies mentioned in section 5 and as, required, implement sanitation safety plans as risk mitigation barriers along with outcome standards in SRTW projects.

11.2 Information systems

At the national level, Ministry of Jal Shakti will develop and maintain an online information system to track the progress on reuse, type of end uses, quality of surface and groundwater, and number of jobs created/sustained from SRTW projects. The data shall be linked to monitoring and tracking of SDGs by NITI Aayog. The data collected at the national and State levels shall be reflected as an indicator in India's Composite Water Management Index administered by NITI Aayog

States will also develop and maintain their respective information systems which will be integrated with the national online information system. States may request cities to set up online quality monitoring system to monitor efficiency of treatment operations along with details on all treatment facilities, details on capacity utilisation, treated water quality standards and quantity of TUW reused. States will audit the information tracked by cities at periodic frequency as decided by the State Committee on SRTW.

11.3 Periodic review of implementation

States will, through the State Committee on SRTW, periodically assess the implementation of the State policy. This includes evaluation of uptake by end uses, pricing of TUW, incentives, penalties and business models including procurement contracts.

12 Capacity Building and Awareness Generation

12.1 Capacity Building and Training

The National Water Policy (2020, forthcoming) emphasizes the need for capacity building of planners, managers, designers and users at the National, State, ULB and PRI on research, development and promotion of state-of-art technology for effective and economic management of water resources by coordinating academic and research institutes and government agencies. These capacity building and training programmes are to include modules on reuse potential of TUW and implementation modalities.

The Ministry of Jal Shakti will, within a year of Policy approval, formulate a strategy on capacity building programmes for periodic training and re-training of technical and managerial staff for smooth implementation of SRTW in the States, ULBs and PRIs for building capacity at the organizational as well as individual levels for implementing reuse of TUW.

Relevant National institutions are to be identified to provide model training modules for use by State training institutions. National training and research establishments across a range of sectors, such as: agriculture, aquaculture, industry, urban development, groundwater resources and other uses will need to work together to integrate aspects of SRTW into their curricula and applied research activities.

Capacity building programmes need to include training, re-training and quality improvement programme (QIP) for water and sanitation planners and managers at all levels in India, both in public and private sectors. Effective coordination will be required to ensure complementarity across various disciplines.

A training need assessment (TNA) will be undertaken at the State, ULB and PRI on all aspects of operationalization of SRTW including technical, business models and public awareness aspects.

The ongoing in-service training programmes in States, ULB and PRI are to incorporate modules on SRTW for the technical and managerial officials of aligned departments. Specialist agencies of the State Government, academic institutions and private sector organizations with capability to train its State, ULB, PRI personnel and to orientate of elected representatives on aspects related to SRTW are to be identified. These agencies will focus on capacity building (including training and development of systems) and

capacities of ULBs in SRTW, in line with the sectoral reforms that the State may be implementing. ULBs will need to provide training on SRTW to their own staff – using the specialized agency selected by the State Government. ULBs also could utilize ongoing National and State Government Schemes for training and capacity building. Training modules for the implementing agency are to include project preparation, IEC activities, technology, roles, standards, monitoring mechanisms and business models.

Targeted training to be given to a broad range of stakeholders across different sector of end use such as: Departments of Agriculture and Fisheries, farmer communities, industries, industrial board, municipal end users for green spaces, parks, agroforestry, NGOs, private sector players.

12.2 Awareness Generation

Awareness generation programmes for overcoming negative public perceptions on SRTW, based on scientific evidence and early experiences, are to be organized frequently in States, ULBs and PRIs. This may be delivered as stand-alone campaigns or as part of wider water literacy campaigns.

Consistent and targeted messaging are to be included throughout the water and sanitation communication programs of the Central Government. A knowledge base of successful examples will be needed to support the communication efforts.

Annexures

Annex 1: Model Framework for State SRTW Policy⁴⁶

Note: Detailed provisions of the State Policy will be consistent with those of the national policy to facilitate access to support from national level funding programmes.

Cover page

Letter(s) (Minister/Secretary, State Department of Urban Development)

Glossary and Abbreviations

1 Introduction

Describes the current situation in the State related to sanitation provision, treatment of used water and the scale and experiences of SRTW.

2 Objectives of the SRTW Policy

Articulates the objective and vision of SRTW in the State based on the type of sectors driving the State economy and agreed set of priorities for reuse. The State policy will provide timebound targets to be achieved on collection and treatment of used water and on SRTW. The targets are to be consistent with the national service level benchmarks and reuse targets of the national policy. States will introduce mandatory use targets as applicable to the local context and consider designation of associated 'no-freshwater' zones. The policy will also set out the guiding principles governing the planning, design and implementation of SRTW programs/projects in the State.

3 Legislative and Regulatory Context

Describes the framework of related national and State legislation, policies and regulations and municipal rules and regulations within which the State policy will operate.

4 Roles and Responsibilities

Provides a list of all relevant agencies and other stakeholders that will perform roles and assume responsibilities for implementing and overseeing the State policy. It will define the powers and functions of the regulatory authority for SRTW in the State. The focus will predominately be on bodies within the State, including public agencies, local level institutions, end-users, the private sector and civil society and identify the points of interaction with national level agencies and external agencies providing financial and technical support.

5 Water Quality Standards and Environmental Considerations

Sets out the framework of national policy and regulations on water quality standards and other norms related to SRTW as well as defining specific standards and requirements of the State level, including linkages with broader water resources and river basin planning.

6 Business Models

Defines the types of business models that are considered appropriate to fulfil the objectives of the State policy with cross referencing to the National policy

7 Financing SRTW

Sets out the options for financing SRTW projects including links to central and State programs and describes other sources including domestic private-sector financing and sub-sovereign and non-sovereign financing from external funding agencies.

8 Implementation Approach and Timeline

Sets out the requirements for the State, ULBs, PRIs and other relevant bodies to develop coordinated SRTW strategies and implementation plans to operationalize and sustainably achieve the targets of the SRTW policy. Includes public awareness campaigns.

9 Monitoring, Evaluation, Surveillance and Review

Describes the provisions for end-users, SPCBs and other relevant agencies to monitor implementation and performance of SRTW in the State and contribute to State and national level reporting systems. To be included as part of the State level strategy and implementation plan.

10 Capacity Building and Training

Describes the State-wide program of capacity building and training needed for involved agencies and stakeholders to effectively implement SRTW policy and the approach to engaging training institute and other technical agencies for upgrading institutional and human resources capacity of ULBs, PRIs and others on SRTW.

Annexures (Optional)

State level guidelines, M&E framework, outcome and service standards, model purchase agreements, other relevant documents.

Annex 2 Business Models

[Note: Graphics to be included on the different models in subsequent drafts]

There are numerous business models for implementation of SRTW. Some of the successful business models on SRTW implemented in India and globally are provided here as guidance to the implementing agency.

Safe reuse of treated used water in industries

Secondary treated used water from STPs would have to be treated further to produce industry grade water for industry or industrial zone. The business models for SRTW in industry can be implemented in one of the following three approaches:

a) Minimum guarantee and fixed price model: The implementing agency enters into a long-term contract with an industry or industrial zone for bulk consumption of TUW at an agreed price. The implementing agency can set up a tertiary treatment unit and operate it on its own. Alternatively, if the implementing agency enters into a PPP arrangement for design, build and operations of the tertiary treatment unit to a private entity, they will be responsible to monitor compliance by the private entity to supply the agreed quantity of TUW to the bulk consumer. The implementing agency makes a net annuity payment to the private entity to ensure a guaranteed minimum revenue. The private entity responsible for treatment can sell additional TUW to other consumers.

b) Reuse buy-back model: An alternative arrangement is for the implementing agency to enter into a PPP arrangement with a private entity to develop and operate a tertiary treatment unit. The implementing agency pays a fixed O&M cost to the private entity and provides full buy back guarantee for TUW. The implementing agency is responsible to deliver TUW to the industries at a price fixed or as agreed with the industries.

c) Reuse PPP model – investment by end user: In this approach, the industry or industrial board purchases secondary TUW from the implementing agency. The industry or the industrial board is responsible for setting up the infrastructure for tertiary treatment and conveyance of the TUW at an agreed price to participating industries. Alternately the industry could contract operation and management of tertiary treatment unit to an agency and pay them a fixed O&M fee.

Safe reuse of treated used water in agriculture and agroforestry

The business model has high application to treatment plants located at the peri-urban part of a town or city with agriculture in the vicinity or where sufficient land is available for afforestation or for treatment plants in rural areas. The business model is most promising where no alternative water sources are available for agriculture or agroforestry.

Agriculture reuse: The institutional arrangement across the sanitation-agriculture interface is important with involvement of departments of agriculture or local universities, farmer groups or civil society organisations working with the farmers. The model requires a high level of participatory planning and trust building for the recipients of the TUW as well as their customers in its safety. Guidance should be provided to farmers on types of crops cultivated which are safe for consumption and have high demand or provide revenue that meets farmers' expectations. The reuse revenue to the treatment plant comes from sale of TUW to the farmers. The treatment plant operator can also sell treated sludge (biosolids) to farmers that can serve as a soil ameliorant.

Agroforestry reuse: The institutional partnership between treatment plant operator, implementing agency and the forest department is key in this model. The reuse revenue to the treatment plant is from sale of TUW to the forest department.

In both types of end uses, there should be assured commitment from the treatment plant operator on the quantity and quality of TUW supplied. For the conveyance of the treated water, financial contribution from treatment plant, implementing agency and end user of TUW can be explored.

Auctioning of treated used water for reuse in agriculture

The model is a variation to the agriculture SRTW business model. The engagement of institutions across the sanitation-agriculture interface will be the same. The implementing agency along with the treatment plant operator auctions TUW to farmers. The quantity and quality of TUW should be assured by the treatment plant operator. The farmers can organize themselves into small bidding consortiums/groups or as individuals. The opening bid price is generally the last year's auction price, and then the bid amounts are raised gradually upwards through calling the amounts publicly. The implementing agency enters into purchase agreement with the highest bidder. The implementing agency may allow the winner of the bid to trade the reuse water with other farmers. The payment arrangement can be on a quarterly basis or as per the harvest cycle. For the conveyance of the treated water, contribution from treatment plant operator, implementing agency and end user of TUW can be explored.

Treated used water for Aquaculture

The business model is highly applicable for treatment plants with a pond-based system or where secondary treated used water is discharged to ponds or lakes. The model is applicable to both urban and rural treatment plants.

In the case of pond-based treatment system, aquaculture can be integrated in the treatment system and the treatment plant operator enters into a partnership with a private entity involved in sales and marketing of fish. In this case, the treated water can be released safely in the environment or reused for irrigation as per the agriculture reuse business model.

In the case, where TUV is discharged to a pond or lake, the ULB can contract a private entity to undertake aquaculture and the revenue from this contract can be allocated for used water treatment works.

In both scenarios, the institutional arrangement requires a partnership with the department of fisheries or research institution experienced in aquaculture to provide guidance and monitor any contaminant accumulation in the harvested fish.

Water-Swap model for agriculture and industry

This business model addresses the increasing demand for urban water and to manage scarce urban water resource especially during severe periods of drought as an adaptation strategy. With the Jal Jeevan Mission providing drinking water through individual tap connections, this model will increasingly be applicable to rural areas. The model looks at reallocating freshwater from agriculture and/or industries (including construction) to urban or rural domestic use in exchange for TUV within the same basin, and it may help optimize water allocations with sector specific water quality requirements.

The main contract is between the implementing agency and the irrigation department, farmers or farmers group that have access to water rights or with access to canal water in the case of end use in agriculture, or the industry association or relevant industry development board in the case of end use in industry. The model is complex in terms of engagement with multiple partners to get their buy-in and especially ensuring end users of TUV understand the underlying rationale. Water-swap model requires incentivizing end users of TUV to participate in the arrangement and release their surface-or groundwater for urban or rural domestic consumption. The model may require additional treatment infrastructure to address the water quality aspects as required by the end user. In addition, investments in water conveyance will be required. Contracts can be structured either for the entire year for urban and rural areas which face water scarcity and hence address freshwater supply deficit or it can be seasonal which can be invoked in times of severe drought.

The additional freshwater gained through this arrangement can then be sold at a higher price to urban consumers and the obtained revenues can support cost recovery of treatment and conveyance TUV.

Safe reuse of treated used water for improving bio-diversity and managed aquifer recharge

Treated used water can be reused for landscaping, parks, rejuvenation of wetlands, lakes and ponds to improve the bio-diversity within and around urban and rural centres. When reuse of TUV is for wetlands, lakes and ponds, the distance from the treatment plant to the location will require conveyance of the TUV. One option is for the conveyance to utilize

unlined open irrigation channels. Natural filtration processes take place during conveyance in open channels and seepage into the soil leading to aquifer recharge. Over time, surface and ground water reservoirs around such a system will improve. This now becomes a source of renewed fresh water for the urban and rural area. It becomes the responsibility of the ULB or PRI to ensure appropriate management of this source of water which can be harnessed in drier periods.

In most urban towns in India, water tanker operators tap aquifers to supply freshwater to urban consumers. The implementing agency could regulate this market and monetise it for the operations and maintenance of the treatment plant.

Corporate Social Responsibility Model for reuse of treated used water

With the implementing agency constrained in financing of treatment infrastructure, they could approach the private sector to drive corporate social responsibility (CSR) models to fill the required gap. In water scarce regions, private sector CSR could invest in treatment infrastructure and a portion of TUW is exclusively allocated for the private sector for their internal consumption. The balance can be returned for environmental purposes or to improve green spaces in the urban areas.

In the reuse of TUW for agriculture, the implementing agency could engage private companies to train farmers on practices as part of CSR so as to ensure safety of harvested goods for end consumers. The implementing agency can engage with the CSR programmes of supermarket chains to buy back crops from farmers cultivating products using TUW. Wholesalers, traders or supermarkets can support this process through contracts with farmer cooperatives which allow them to secure a reliable crop supply while offering inputs, training or credit.

Tradeable reuse certificates for treated used water

The objective of this trading model is to maintain commitment to reuse of TUW amongst the entities on whom the State has set targets. The model addresses gaps in supply and demand for TUW in different regions of the State⁴⁷ or where cost to supply TUW is high or a project is unviable based on limited ability of pay of end users for TUW.

The entities here will be the utilities treating the used water, ULBs or PRI, and end users of TUW. Targets may be set according to the type of end use that the State wants to promote. In this model the State issues reuse certificates to entities that implement SRTW projects or use TUW. The State creates a platform for trading of certificates. The model works when mandatory targets are set for ULBs to achieve minimum reuse targets. For entities that do not meet the required minimum targets, they can purchase reuse certificates through the platform from entities that have achieved more than the minimum target. This mechanism

can ensure cross-financing of SRTW projects to regions where viability is high and optimises the limited money available to finance such projects.

In implementing this model, lessons can be learnt from other sectors that have implemented similar mechanisms (e.g. renewable energy certificates) by designing the system to avoid unintended consequences such as enforcement of penalties, revision of targets on reuse for future demand for certificates and limited awareness of the certificates.

Onsite reuse of treated used water

SRTW has onsite applications at the same location where the used water gets treated. An objective for a treatment plant along with public and environment outcomes relates to providing a visual appeal and to meet odour standards. Landscaping by lawns and trees should be a critical feature of any treatment plant. TUW can be used to meet the water requirement for maintaining the landscape. TUW can also be used onsite for cleaning of vacuum and suction trucks, cleaning of sewers and desludging of onsite sanitation systems.

In gated colonies, apartment complexes and institutions that are required to have treatment plants, TUW can be used for landscaping and for flushing toilet water by implementing dual plumbing systems.

Annex 3 Technology

In the existing plan of treating used water generated from domestic sources, which is mostly from households in the ULB, used water is treated to standards referred to as secondary treated used water (STW).

In the case of TUW for reuse projects, the quality of treated water will vary based on the type of end use and the related standards prescribed. If the standards prescribed are more stringent than those for secondary treated used water, additional treatment modules/facility will need to be developed. Figure A3 indicates the incremental technology interventions required to achieve different end uses of TUW.

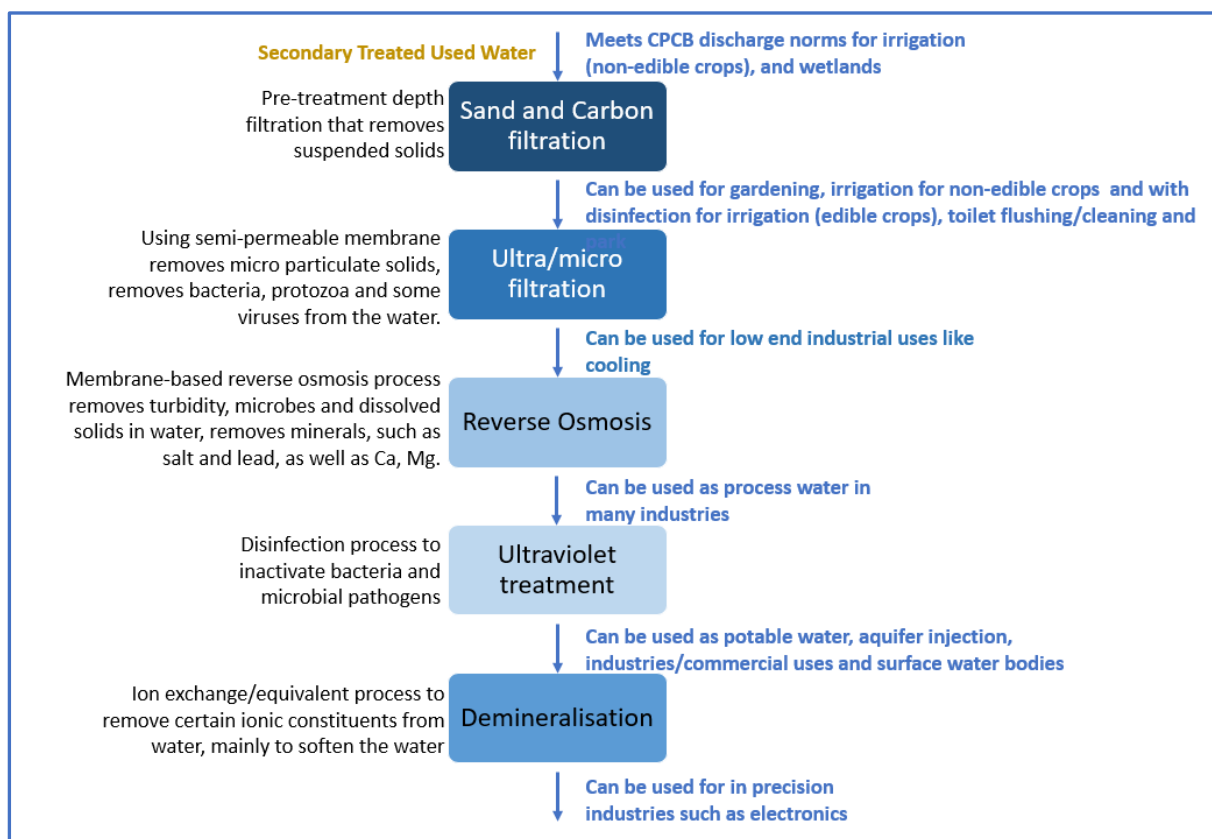


Figure A3: Incremental technology interventions to achieve end use water quality standards

CPHEEO’s Manual on Sewerage and Sewage Treatment Systems (2013), provides details on different treatment technologies as applicable to different conditions.⁴⁸ The manual provides details on the design considerations and operating requirements for the technologies based on type of end usage of TUW.

A compendium of sewage treatment technologies and its assessment was prepared by Indian Institute of Technology, Kanpur and published by the National River Conservation Directorate, Ministry of Environment and Forests. The compendium provides information on the performance of treatment technologies implemented in the country and categorizes

them according to performance, costs, energy and other resource requirements and land requirement.

Technology for industrial reuse: The technology should meet industrial grade water and following advanced treatment technology are recommended:

1. Multi-grade filter, Dual Media Filter, Ultrafiltration
2. Multi-grade filter, Ultra Screen, UV system
3. Multi-grade filter, Ultra Screen, Ozonator

If the STW has higher TDS (> 1,000 ppm), Reverse Osmosis is suggested to be incorporated in each of the above system

Technology for agriculture end use: STW is suggested to disinfect with U-V or ozone. Alternately, including a maturation pond at the STP or at the farm level may also meet the requirement.

Technology for aquifer recharge: For direct injection for groundwater recharge, STW should undergo micro-filtration, followed by reverse osmosis and U-V disinfection before injecting, however for aquifer recharging through surface water spreading method, reverse osmosis can be excluded due to natural filtration processes.

In addition to above list of technologies, the Swachh Bharat Committee periodically meets to review and approve technologies concerning sanitation.

In selecting the technology, the implementing agency shall apply following principles:

- Meets the required standards based on the intended purpose of SRTW
- Low requirement of space
- Low consumption on energy
- Capital and operating cost should not make the project unviable

The State in its policy may recommend select treatment technologies as applicable based on its contextual situation to guide the implementing agency from the list provided by CPHEEO manual, compendium on performance of treatment technologies by IIT Kanpur, additional list provided in this annexure and new technologies approved by the Swachh Bharat Committee.

References

http://cpheeo.gov.in/upload/uploadfiles/files/engineering_chapter7.pdf

https://ejalshakti.gov.in/MISC/InnovationAccrMC_Rep_S.aspx

https://nmcg.nic.in/writereaddata/fileupload/15_Technologies%20Involved.pdf

Annex 4 Eligibility conditions to access the SRTW Fund

The State shall be eligible to access the SRTW Fund under the following conditions:

- States have an approved State specific SRTW policy with measures taken for its implementation.
- States have clearly delineated roles and responsibility on regulation, implementation and monitoring of compliance of SRTW projects.
- States shall apply the funds primarily for tertiary treatment and distribution infrastructure.
- The Fund is available for infrastructure improvement in existing STPs to meet the required reuse standards. The Fund is not available for new STPs.
- The Fund is available to cities that meet the minimum required Service Level Benchmarks in sanitation as defined by MoHUA.
- The Fund is available if the State can demonstrate that the minimum cost recovery principles as per the feasibility study report is achieved and projects that independently can achieve full cost recovery will not be eligible for support from the fund
- The State shall not mix funding from different national program funds to finance the SRTW component of the infrastructure.
- State shall contribute and demonstrate 50% funding which can include funds from private sector. However, for North Eastern states, Jammu and Kashmir and Hill States, funding will be available up to a maximum of 90%.

Annex 5: No-freshwater zone

A 'no-freshwater zone' demarcated by the State or ULB or PRI is to promote TUW and it shall have following features:

- **The strict usage of TUW shall be applicable in the demarcated zone for industry, energy generation, construction, municipal uses and agriculture end use only. The usage of freshwater shall be for potable consumption only.**
- The restriction on usage of freshwater shall not be applicable for households in the zone. There will be a penalty to households that sell freshwater extracted from the zone.
- Crops cultivated by farmers in the zone will be strictly regulated based on water availability and food safety considerations
- Freshwater supplied in the region will be priced at a multiplier of the regular price (except for households) and the pricing of TUW will be either based on pricing principles set out in the Policy or there may be incentives of lower pricing initially to make TUW attractive.
- The implementing agency shall assure provision of an agreed quantity and quality of TUW. If the implementing agency is unable to assure required quantity and quality of water, it shall be responsible to provide freshwater to the end users of TUW
- Groundwater and surface water permits will be issued and strictly monitored on their usage. The zone shall be applied to regions where groundwater is overexploited

Endnotes

- ¹ <https://www.wqa.org/whats-in-your-water/emerging-contaminants>
- ² Defined in the FSSM Policy 2017
- ³ http://cpcbenvvis.nic.in/cpcb_newsletter/sewagepollution.pdf
- ⁴ http://cpcbenvvis.nic.in/cpcb_newsletter/sewagepollution.pdf
- ⁵ http://cpcbenvvis.nic.in/cpcb_newsletter/sewagepollution.pdf
- ⁶ https://www.unwater.org/app/uploads/2017/05/UN-Water_Analytical_Brief_Wastewater_Management.pdf
- ⁷ adapted from Corcoran et al. 2010
- ⁸ CPCB –Guidelines for Techno-economic feasibility of implementation of Zero Liquid Discharge (ZLD) for water polluting industries, Draft Jan 2015, also referenced at <http://www.indiaenvironmentportal.org.in/files/file/Final-ZLD%20water%20polluting%20industries.pdf>
- ⁹ For example, in Singapore, the term NEWater is used.
- ¹⁰ As per May 2019, total sewage generated in India (only urban) was 61,754 MLD; total sewage treatment capacity was 22,963 MLD(source: http://www.sulabhenvvis.nic.in/Database/STST_wastewater_2090.aspx)
- ¹¹ Average annual rainfall in India is 4,000 billion cubic meters, <http://117.252.14.242/rbis/rbis.htm>
- ¹² https://nrcd.nic.in/writereaddata/FileUpload/NewItem_210_Inventorization_of_Sewage-Treatment_Plant.pdf, or http://www.sulabhenvvis.nic.in/Database/STST_wastewater_2090.aspx
- Of this amount 26% is estimated to be reused by industry after taking into account an efficiency losses, meaning that approximately only 6% of used water is currently reused (data to be verified).
- ¹³ World Bank. Water and Sanitation Program (WSP); International Water Management Institute (IWMI). 2016. *Recycling and reuse of treated wastewater in urban India: A proposed advisory and guidance document*. Colombo, Sri Lanka: International Water Management Institute (IWMI). CGIAR Research Program on Water, Land and Ecosystems (WLE). 57p. (Resource Recovery and Reuse Series 8).
- ¹⁴ <https://www.wri.org/news/2019/08/release-updated-global-water-risk-atlas-reveals-top-water-stressed-countries-and-states>
- ¹⁵ 54% of India’s groundwater wells have shown a drop in groundwater levels between 2009 and 2015 with 16% declining by more than 1 m/year, data from WRI Aquastat.
- ¹⁶ This information is available from water composite index report: <https://niti.gov.in/sites/default/files/2019-08/CWMI-2.0-latest.pdf>
- ¹⁷ Chhattisgarh, Gujarat (2018), Haryana (2019 draft), Jammu and Kashmir (2017), Jharkand (2017), Karnataka (2017), Madhya Pradesh (2017), Maharashtra (2019 draft), Punjab (2019), Rajasthan (2016), Tamil Nadu (draft 2019), Uttar Pradesh (draft 2018)
- ¹⁸ Details can be found in the Policy Working Paper prepared for this Policy, dated 24 April 2020.
- ¹⁹ Policy Working paper Annex 3, Table 1
- ²⁰ A related initiative being undertaken by SEIP program under Indo-German Development Cooperation. The status of the policy on industrial water reuse and ZLD will be clarified including status developing guidelines on industrial reuse by CPCB.
- ²¹ See section 7.5
- ²² Reuse in this context includes reuse by the environment provided it has demonstrated beneficial outcomes. Discharging into a river where no assessment has been made of its utility is not considered to be a beneficial use.
- ²³ The NWP is currently under review and this SRTW draft will be aligned with its new provisions once a final draft is available.
- ²⁴ Directive by Ministry of Power, Government of India, No. 17 / 104 I 2075-Th-II (C. No. 2287 521) dated 5 March 2020
- ²⁵ Handbook of Service Level Benchmarks, CPHEEO, MoUD, Govt of India
- ²⁶ National Building code of India, 2016, Bureau of Indian Standards.

²⁷ Masterplan for Artificial Recharge to Ground Water in India (2013), CGWB, Ministry of Water Resources, Govt of India.

²⁸ Guidelines to regulate and control Ground Water Extraction in India (With effect from 01.06.2019), CGWA, MoWR, RD, GR, dated 12.12.2018, effective June 2019.

²⁹ Chhattisgarh (N.D.), Gujarat (2018), Haryana (2019 draft), Jammu and Kashmir (2017), Jharkhand (2017), Karnataka (2017), Madhya Pradesh (2017), Maharashtra (2019 draft), Punjab (2019), Rajasthan (2016), Tamil Nadu (draft 2019), and Uttar Pradesh (draft 2018).

³⁰ For example WHO Sanitation Safety Plan, 2016 and USEPA Guidelines for Water Reuse, 2012.

³¹ in consultation with the Sustainable and Environment-friendly Industrial Production (SEIP) Programme of GIZ

³² *Manual on Sewerage and Sewage Treatment Systems*. CPHEEO, Government of India, 2013.

³³ The specified limits of BOD are currently 10 mg/L for edible crops and 20 mg/L for non-edible crops.

³⁴ Such as WHO standards/ USEPA Guidelines/EU Regulations

³⁵ The USEPA provides norms for the reuse of reclaimed water to recharge the aquifers which are used for potable and non-potable uses.

³⁶ CPCB ENVIS Report: Water Quality Management in India, 2008

(http://cpcbenvvis.nic.in/envis_newsletter/ENVIS_NEWSLETTER_1.pdf)

³⁷ CPCB ENVIS Report 2001

(<http://www.cpcbenvvis.nic.in/scanned%20reports/PCL%204%20Environmental%20Standards.pdf>)

³⁸ The SRTW Policies of Gujarat, Haryana and Karnataka specify that the BOD and TSS of TUW for supply to different users, except for rejuvenation of water bodies or used in agriculture/irrigation, shall not be more than 10 mg/l.

³⁹ Principles on pricing are dependent on those being considered under the revised National Water Policy (under preparation)

⁴⁰ For example, treated wastewater delivered to high water consuming industry in a water scarce region.

⁴¹ For example, where the new TUW is apportioned between existing farmers and higher value users, a cross-subsidy could be included to enable farmers to adopt higher efficiency irrigation methods and maintain production levels with less water. Pricing models would consider how safer and more efficient production of high value produce from TUW would, over time, lead to an increased ability to pay for TUW among farmer groups.

⁴² A model agreement can be part of guidelines to be formulated at national level

⁴³ The model can cover a single universal treatment process – from primary to tertiary level to be more cost effective

⁴⁴ Can be for dispersed end users and also for cluster end users, e.g. in an industrial cluster, sometimes there might not be financial strength within the industries to fund the distribution infrastructure

⁴⁵ This can be done through trading of reuse certificates to cross finance expansion of reuse in regions where viability is high. The trading of reuse certificates requires States to strictly ensure the targets are adhered to and create a mechanism to issue and trade certificates. States shall undertake a detailed assessment and incorporate lessons learnt in implementation of similar approaches in other sectors (e.g. renewable energy certificates) before implementing such a program.

⁴⁶ Draft outline adapted from 2017 FSSM Policy, Annexure 1.

⁴⁷ Consideration could also be given to a system of tradable reuse certificates at national level.

⁴⁸ Chapter 7 of part A



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