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CENTRAL POLLUTION CONTROL BOARD
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MINISTRY OF ENVIRONMENT, FOREST & CLIMATE CHANGE, GOVT. OF INDIA

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CIRCULAR

CPCB has prepared a draft "Guideline for reuse of treated sewage in reference to item of Circular Economy" and uploaded on CPCB website (i.e., https://cpcb.nic.in/).

Comments/suggestions, if any, on the above draft guidelines are invited and the same may please be provided to CPCB by email to eepkm.cpcb@nic.in and vishalgandhi.cpcb@nic.in , so as to finalize the guidelines.

The last date of submission the suggestions/comments is 19/02/2024.

08/02/24

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GUIDELINES FOR REUSE OF TREATED SEWAGE IN REFERENCE TO ITEM OF CIRCULAR ECONOMY

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DEFINITIONS

Circular Economy	**:**	Circular Economy (CE) is a sustainable development approach that works on the waste management strategy of reduce, reuse, recycle, and recover. Considerable work has been performed on CE in various sectors such as in electronic sector, construction sector, automotive sector, etc.
Sewage	**:**	Effluent from any sewerage system or sewage disposal works and includes sullage from open drains
Wastewater Treatment	**:**	Wastewater treatment is a process used to remove contaminants from wastewater and convert it into an effluent that can be returned to the water cycle.
Demineralised Water (DM water)	**:**	Water used in the boilers for generating steam is demineralised. DM Water comes at a higher cost as compared to cooling tower water and its use is limited for specific function.
Cooling Tower Water	**:**	Water used in the cooling towers of Thermal Power Plants.
Make-up Water	**:**	Water used to compensate the loss due to evaporation of water in the cooling tower of Thermal Power Plants.
Potable Water	**:**	Water used for drinking water for the plant and the colony is known as potable water.
Non-potable water	**:**	Water that is not of drinking quality, but may still be used for many other purposes, depending on its quality.

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EXECUTIVE SUMMARY

Water is one of the vital need for all life forms on earth. Nowadays, water is the stressed commodity as Annual per capita per annum fresh water availability estimated to be reduced from 1816 m3 in 2001 to 1228 m3 by 2051. In India, 20% of groundwater blocks are critical or over-exploited. India is home to 17% of world's population while it holds only about 4% of global water stock. Considering the rapid rate of increasing population and the surging demand of water, there is an urgent need to supplement the current water supply with secondary sources of water. Agriculture is the major consumer of water in the country with net demand of 688 billion cubic meters (bcm) per year which is about 85% of the total water demand. It is followed by industrial sector demand at 9%, while the potable water demand (urban and rural) is assessed to be about 6%. As per the National Inventory of STPs (CPCB, 2021), estimated sewage generation from urban centres is 72,368 MLD. At present, sewage treatment capacity utilization is only 20,235 MLD and remaining quantity of 52,133 MLD is discharged as untreated sewage.

Considering significant gap of demand and availability of water and resulted environmental impact due to discharge of untreated sewage, there is need to realize sewage as a resource which can be treated as per requirement and utilized for non-potable purposes and industrial utilities.

In order to promote reuse of treated wastewater of STPs, this guideline is prepared to provide comprehensive action plan for the management of treated sewage water with a circular approach in different waster demanding sectors such as (i) agriculture (ii) thermal power plants (iii) pulp and paper industry (iv) textile industry and; (v) municipal uses (potable & non-potable uses). This guideline includes regulatory framework and standard availability, challenges with using treated sewage water, relevant case studies of Tamil Nadu, Gujarat, Rajasthan & Maharashtra with their economic aspects, guiding principles in terms of usage, roles and responsibilities of different Ministries/Organizations/Departments and also suggested way forward for moving towards circular economy.

1.0 INTRODUCTION

Water is vital for all life forms on earth. Though it is an abundant and renewable natural resource, yet only 3% of all the water on our planet is freshwater, and less than 1% is available for drinking purposes. The era of surplus river basins, high water tables and generously yielding underexploited aquifers, plentiful dispersed water availability, certainty of supplies and conservative lifestyle is fast transforming into a less certain future with increasing demand, emerging limits of available supplies, infrastructure constraints, competing users contesting the finite resource and consumptive lifestyle.

In India, 20% of groundwater blocks are critical or over-exploited, while untreated sewage flows amount to 37,000 MLD. By 2050, the freshwater abstraction by industries will be 10.1 percent. All these factors make a strong case for a circular economy pathway in the wastewater sector.

The Circular Economy (CE) is the concept in which products, materials (and raw materials) should remain in the economy for as long as possible, and waste should be treated as secondary raw materials that can be recycled to process and re-use. This distinguishes it from a linear economy based on the, 'take-make-use-dispose' system, in which waste is usually the last stage of the product life cycle. CE is a concept promotes sustainable management of materials and energy by minimalizing the amount of waste generation and their reuse as a secondary material.

With rising water scarcity and increasing water prices, wastewater treatment has the potential to mature as a profitable intervention. Instead of treating it as a waste to be disposed of, wastewater should be considered a resource for recycle and reuse. A paradigm shift from "use and throw" to a "use, treat, and reuse" approach is required. Such closed loop systems, and an approach that considers waste as a resource, also known as Circular Economy, when applied to the wastewater sector in India could yield significant positive impacts towards better water management in the Country. In this context, considerable research is performed in the field of water conservation, wastewater reduce, reuse, recycle, reclamation, recovery, and restoration, contextualizing these

efforts from CE perspective is needed. Thus, "6Rs" relevant to the water sector to achieve CE implementation are illustrated below:

S. No.	'R's	Definition
1	Reduce	Decrease in the consumption of freshwater by creating awareness in consumer, by applying efficient fixtures or appliances, reducing leakages, thereby reducing wastewater generation
2	Reuse	Reuse of used water in its crude form (no treatment/processing involved) for multiple purposes inside or outside the loop
3	Recycle	Use of treated wastewater within the same loop or in the same process
4	Reclaim	Treatment of wastewater and its use outside the loop/process
5	Recovery	Extraction of valuable resources (e.g. energy, material) present in wastewater
6	Restore	Replenish the water resources through artificial interventions (e.g. managed aquifer recharge, rainwater harvesting, afforestation, rejuvenation of water bodies)

The reuse of treated sewage water can decrease the water demand from aquatic sources like rivers, ponds, lakes and as well as groundwater sources and less consumption of raw water will help in conserving natural water resources. In recent past, different ULBs and concerned authorities focused on reuse of treated sewage and initiated reuse of treated sewage in horticulture, irrigation, washing activities (road, vehicles and trains), fire-fighting, industrial cooling, toilet flushing, gardening, non-contact impoundments and utilization for industrial activities. Central Public Health and Environmental Engineering Organisation (CPHEEO) has prescribed standards for re-use of treated sewage for different purposes like horticulture, irrigation, non-contact impoundments and washing.

Presently, use of treated water is practiced in India on a relatively small scale, and mostly in isolated cases & reuse of treated sewage is an issue which hasn't assumed much importance in the policy planning of many State Governments. In 07 States /UTs namely Delhi: 405 MLD (12.5%), Gujarat: 60 MLD (1.55%), Haryana:192 MLD (16%), Madhya Pradesh: 84 MLD (4%), Tamil Nadu: 211 MLD (6.6%), Chandigarh: 27-40 MLD (10-16%) and Puducherry: 15.3 MLD (26%), domestic wastewater is treated and re-used for different purposes like horticulture, irrigation, non-contact impoundments, washing (Roads, Vehicles, Trains), Construction and Industrial Activities. The Delhi Government has set a target to increase their reuse to 60% from 12.5% (CPCB Report, 2021). Consequent to rapid growth in population and increasing water demand, stress on water resources in India is increasing and per capita water availability is reducing day by day, therefore, there is an urgent need to supplement the current water supply with secondary sources of water, i.e., tertiary treatment.

As per the National Inventory of STPs, 2021 prepared by CPCB, sewage generation estimated from urban centres of Country is 72,368 MLD. With the rise in population and water demand, the sewage generation is estimated to increase to 1,20,000 MLD by 2050. At present, capacity utilization is only 20,235 MLD and remaining quantity of 52,133 MLD is let-out as untreated sewage. Considering such gap of untreated sewage, there is need to realize sewage as a resource which can be treated as per requirement and utilized for non-potable purposes and industrial utilities. Utilization of sewage has following positive impacts:

i. Re-use of treated sewage will allow to decrease the water demand from aquatic sources like river, ponds, lakes and also groundwater resources.

ii. Less consumption of raw water will help in conserving natural water resources.

2.0 WATER DEMANDING SECTORS & THEIR WATER QUALITY REQUIREMENT

As mentioned by Ministry of Housing & Home affairs (MoHUA), India is home to 17% of world's population while it holds only about 4% of global water stock.

This stock is consumed by urban and rural areas for meeting its agriculture and industries requirement. Agriculture is the major consumer of water in the country with net demand of 688 billion cubic meters (bcm) per year which is about 85% of the total water demand. It is followed by industrial sector demand at 9%, while the potable water demand (urban and rural) is assessed to be at about 6%. (*Source: MoHUA Report on Circular Economy in Municipal Solid Waste and Liquid Waste, 2021*).

In order to promote reuse of treated wastewater of STPs, the potential users have been identified such as (i) for irrigation (ii) for rejuvenation of water bodies such as wetlands (iii) for other non-potable purposes such as (a) Industrial sectors (b) Aquaculture (c) Urban landscaping & Green belts (d) Construction activities (e) Domestic Reuse (Flushing, cleaning, lawns, etc.) (f) Sprinkling for dust control (g) Washing of railway tracks (h) Fire brigades /hydrants.

In 2010, the water demand of industry and energy sectors was 17 billion cubic meters (bcm) which was expected to increase to 63 bcm in 2025 and 130 bcm in 2050. Conventional 'once through' type thermal power plants are expected to be the principal consumers among industries. The thermal power plants take up almost 88% of water needs of the industry. Almost 90% of India's thermal power generation is dependent on freshwater for cooling. Other major water guzzling industries are pulp and paper (2.2%), textiles (2%), steel, (1.3%), sugar (0.5%), fertiliser (0.2%) which have a combined intake of less than 5% of the overall water consumption.

Some of the sector and their water demand are mentioned below:

2.1 Agriculture (including forestry, horticulture & aquaculture)

In rural and urban areas of most emergent countries, the application of wastewater for irrigation is a regular practice. Use of treated wastewater for crop growth is a centuries old practice that is getting renewed attention due to rising shortage of freshwater resources in many arid and semiarid regions of the globe.

In 2010, the agricultural irrigation sector consumed 688 billion cubic metre (BCM) (1885 Billion litres per day) compared to wastewater generation of just 72,368 Billion litres per day. This sector is expected to remain the highest water consuming sector even in the future, despite improved irrigation techniques. It is estimated that agricultural irrigation will require 910 and 1,072 BCM of water in 2025 and in 2050, respectively. The share of agricultural sector in overall water demand is 88%. Around 25% of this irrigation demand- in areas adjacent to urban centres and in fields catering for crops not to be eaten raw can easily be met and which will exhaust the entire treated municipal wastewater discharge and treated water can also be ponded and stored for dry weather use.

Sewage water after secondary treatment should be used for irrigation purposes. Central Public Health and Environmental Engineering Organisation (CPHEEO) has recommended norms of treated sewage quality for specified activities at point of use. It also has norms for Dissolved Phosphorus, Nitrogen and Faecal Coliform. Upto these prescribed standards/norms, treated sewage-water (without any advanced treatment) may be used in horticulture practices, golf courses, for irrigation of non-edible crops and also for crops which are eaten in raw form or cooked **(ANNEXURE-I)**. The tolerance limit for irrigation, industrial cooling or controlled water disposal are summarized in **Table 1**.

Table 1: Tolerance limit for Irrigation, industrial cooling or controlled water disposal as per ISI-IS: 2296-1982

S. No.	Parameters	Tolerance limits for Irrigation, industrial cooling or controlled water disposal as per ISI-IS: 2296-1982
1	pH	6.0-8.5
2	Electrical Conductance at 25°C, µS, Max	2250
3	Sodium Adsorption Ratio, Max	26
4	Boron (as B), mg/l, Max	2.0

5	TDS (inorganic), mg/l, Max	2100
6	SO_4, mg/l, Max	1000
7	Chlorides (as Cl), Mg/l, Max	600
8	Sodium Percentage, Max	60
9	Alpha emitters, µc/ml, Max	10^{-9}
10	Beta emitters, µc/ml, Max	10^{-8}

2.2 Thermal Power Plants

Water is a key component in Thermal Power Plants (TPPs) and is required for multiple processes. It is used for ash handling, cooling tower, make-up tower, Demineralised Water (DM water), potable water and for service uses like firefighting, cleaning etc. It is said that the thermal power sector accounts for the highest share of freshwater use in the industrial sector, which take up almost 88% of water needs of the industry.

Over the past few decades, there has been a decline in freshwater water availability for TPPs. There is also a growing realisation amongst the plant owners to conserve water and minimise the use of freshwater through water harvesting, wastewater treatment and reuse of treated wastewater. Some of the larger TPPs have potential to consume almost 400-500 MLD of recycled water per day.

In 2016, water shortages for coal power generation had become acute and due to that, several plants were reportedly shut down for many months. To address such issues, Tariff Policy, January 2016 was issued by Ministry of Power, wherein, under the clause 6.2 (5), thermal power plant(s) including the existing plants located within 50 km radius of STP of Municipality/local bodies/similar organization shall in the order of their closeness to the STP, mandatorily use treated sewage water produced by these bodies fid the associated cost on this account be allowed as a pass through in the tariff. Such thermal plants may also ensure back-up source of water lo meet their requirement in the event of shortage of supply by the STP. The associated cost on this account shall be factored into the fixed cost so as not to disturb the merit order of such thermal

plant. The shutdown of the STP will be taken in consultation with the developer of the power plant. It was also mentioned in the policy as per the present arrangements the cost of the STP is borne by the Urban Local Body, and the cost of tertiary treatment, the pipeline for transport of water and the pumping system for this purpose is to be borne by the Thermal Power Plant (*Source: Tariff Policy, 28/1/2016)*.

Keeping all circumstances in view, treated sewage water (after secondary treatment) is used in different stages of TPPs such as sprinkling in ash ponds & coal stockyards, cooling towers, horticulture and may also be used in DM plant by adopting advanced treatment technology, i.e., Tertiary Treatment Reverse Osmosis Plant (TTRO Plant), to avoid scaling.

2.3 Pulp & Paper Industry

The pulp and paper industry is the second major consumer of water within industrial sector. Approximately 72% of India's pulp and paper industries are concentrated in Andhra Pradesh, Gujarat, Odisha, Karnataka, Maharashtra and West Bengal.

Agro-based pulp and paper mills in India are one of the most polluting industries; in addition, they are high consumers of raw water. Growing scarcity of high quality freshwater as well as stringent regulatory standards is compelling these units to explore appropriate water management options.

Generally, paper manufacturing is required freshwater, however, there are several processes in the agro-based industry, wherein secondary treated water can be accepted, such as wet washing of raw material and preparation of piles of bagasse (storage of raw material). The tolerance limit for water for pulp and paper industry at different stage of manufacturing are attached as **Annexure II.**

2.4 Textile Industry

Textile Industry is the third largest consumer of water of industrial sector. Major textile processing hubs in India are located in Surat, Saurashtra,

Ahmedabad, Tirupur, Coimbatore, Erode, Ludhiana, Kanpur, Solapur, Ichalkaranji, etc.

Sewage water after secondary treatment may be used in different stages of textile industry. Tolerance limit for water for textile industry at different stage of manufacturing are attached as **Annexure III**.

2.5 Municipal Uses (Non-Potable)

The reuse of treated wastewater for various non-potable purposes such as domestic reuse (flushing, cleaning, lawns, etc.), institutional use, offices, shopping malls, housing societies, sprinkling for dust, landscape irrigation & Impoundments/ lakes, construction activities, recreational activities viz., watering of green belts & parks, sports grounds, golf courses and other uses such as washing of vehicles, dust suppression on roads, flushing of toilets, firefighting, social forestry, and road-side plantations needs to be promoted by MCDs, local authorities and Department of Housing & Urban Planning on priority basis. Sector wise water demand is as under:

(i) Construction activities within cities (buildings townships, roads, railways, and metro-rail, bus depots, and airports) has a potential to use recycled/ treated water.

(ii) Additionally, recycled water can be supplied for other non-potable uses in railways and airports etc. The total real estate stock added in India during 2019 was 200 million sq.ft.7.

(iii) The total estimated water demand of the real estate sector in India was 37.2 million m^3 in 2019 (101.9 MLD). Ready mix concrete plants (RMC), utilised 6,740 Million Litres of water to achieve estimated concrete production of 22,46,262 cum/month in India.

(iv) Landscape irrigation is a major consumer of treated wastewater in modern growing urban centres and smart cities. With an aim to increase the green-blue spaces in urban centres, treated wastewater in bulk can be consumed in such developments along with urban impoundments and lakes.

2.6 Municipal Uses (Potable)

(i) Many municipal (non-potable) uses are under ULBs' control where they can make it mandatory to use recycled water.

(ii) States while issuing Environmental Clearance for construction projects, can mandate use of recycled water for construction related activity.

(iii) User-based reuse standards are provided in CPHEEO manual 2013, which needs to be revisited

3.0 REGULATORY FRAMEWORK & STANDARD AVAILABILITY

According to the Constitution of India, water, sanitation and used water are State subjects. In relation to use of treated wastewater, they are influenced by a number of National Laws/standard/programmes/guidelines, including:

(i) The Water (Prevention and Control of Pollution) Act, 1974 that emphasizes to maintain and restore the 'wholesomeness' of aquatic resources by not discharging sewage or pollutants into water bodies including lakes.

(ii) 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.

(iii) Central Govt of India has notified General Discharge Standard for discharge of Environmental pollutants – Effluents (Part A) and waste water generation discharge standards (Part B) under Schedule-VI of Environment (Protection) Rules, 1986, wherein standard for discharge into irrigation is notified.

(iv) Effluent discharge standards for treated effluent of Sewage Treatment Plants are notified by Ministry of Environment Forest & Climate

Change (MoEF&CC). Apart from Notification, NGT also advocated to notify stringent norms for STPs discharge. The standards are summarized in **Table 2**.

Table 2: Effluent Discharge standards for treated effluent of Sewage Treatment Plants

S. No.	Parameters	Norms as per NGT direction dated 30/04/2019 in the matter of OA No 1069 of 2018	MoEF&CC Notification dated October, 2017	
			Cities (more than 10 lakh population)	Areas / regions other than mentioned above
1	pH	5.5-9.0	6.5-9.0	
2	BOD, mg/L	10	20	30
3	COD, mg/L	50	-	-
4	TSS, mg/L	20	50	100
5	NH4-N, mg/L	-	-	-
6	N-Total, mg/L	10	-	-
7	Faecal Coliforms, MPN/100 mL	100 Desirable 230 Permissible	1000	

Note:
Metro Cities*, all State Capitals except in the State of Arunachal Pradesh, Assam, Manipur, Meghalaya Mizoram, Nagaland, Tripura Sikkim, Himachal Pradesh, Uttarakhand, Jammu and Kashmir and Union territory of Andaman and Nicobar Islands, Dadar and Nagar Haveli Daman and Diu and Lakshadweep

*Metro Cities are Mumbai, Delhi, Kolkata, Chennai, Bengaluru, Hyderabad, Ahmedabad and Pune.

Pre-requisite for use of treated wastewater is the desired quality at point use. The end user requirement varies depend upon its usage. The General Standards for discharge allowing BOD- 100 mg/l to use for irrigation purpose. Different IS standards are notified by BIS to meet water quality requirement of industrial sector and agriculture purpose.

4.0 CHALLENGES

- About 80% of water supply to municipalities flows back into the ecosystem as untreated wastewater, which is a critical environmental and health hazard.

- India has the capacity to treat approximately 36,668 million liters per day (MLD), against a daily sewage generation of approximately 72,368 MLD.
- Most wastewater treatment plants do not function at maximum capacity. They do not follow the standards prescribed under the environmental protection rules for discharge into streams.
- There are social, political, technical and financial challenges which have impacted efficient management of wastewater management plants and the sector as a whole.
- Instead of treating it as a waste to be disposed of, wastewater should be considered a resource for recycle and reuse. A paradigm shifts from "use and throw" to a "use, treat, and reuse" approach is required.

5.0 CASE STUDIES & ECONOMICAL ASPECTS

Recently, some progressive ULBs and concerned authorities have been trying to focus on planned reuse of treated wastewater in horticulture, irrigation, industrial processes, construction activities etc. State Governments of Gujarat, Haryana, Maharashtra, Rajasthan, Chhattisgarh, Karnataka, and Madhya Pradesh have either adopted, or are moving forward with, treated wastewater reuse policies that seek to reduce dependency on freshwater resources. Few exemplary wastewater recycling projects of Tamil Nadu, Gujarat, Rajasthan & Maharashtra on reuse of treated sewage via Tertiary Treatment Reverse Osmosis (TTRO) Plant for industrial activity are enclosed as **Annexure V**. Treated water is supplied to the industrial sectors units which has eliminated the discharge of untreated sewage into water bodies, fresh water abstraction reduced by 85%, production of sold and used in agriculture, improvement of water quality of several river & lakes. Detail of TTRO Plant is as under:

1. Pre-chlorination, Rapid Sand Gravity Filters
2. Secondary treatment stage: Basket strainers, Ultrafiltration system
3. Tertiary treatment stage: Cartridge filters, Reverse Osmosis system and Ozonation

Based on the case studies economical aspect is calculated:

If capital cost for 40 MLD plant is Rs. 85.10 Cr, O&M cost per year Rs. 18.64 Cr, revenue generation is Rs 248.95 Cr for 8 years and cost of treated sewage water is Rs 32/KL; then estimated (i) capital cost/lit shall be Rs 21.27 (ii) O&M cost/lit: Rs 4.66 (iii) treated sewage water cost/lit: Rs 0.032 and (iv) revenue generation/lit Rs 7.77, respectively.

Henceforth, the use of treated sewage is not only saving the natural resource of water but also giving the economic benefits.

6.0 GUIDING PRINCIPLES

Though the possibilities of using treated sewage for various uses in other parts of the world are inspirational, still a blanket adoption in India needs to be tempered with local factors of affordability, sustainability and above all public acceptance. Moreover, each situation needs to be evaluated on its own and beyond the secondary treatment, all technologies are necessity driven are discussed hereunder and much less the treatment chain is utility purpose driven. As such, there is a need to have a set of guidelines for the mentioned reuse prospects.

6.1 Agriculture: Key Principles

Following key principles should be paid attention before deciding use of treated sewage for agriculture:

- Being an agrarian economy, this is a very compelling use for India, but should never be used for edible crops or plants that produce millets, etc.
- The use of untreated sewage for whatever form of agriculture leads to a situation where the treated sewage entering another basin from its parental basin creates issues of water rights and as far as possible, inter basin transfer of such reuse are not to be encouraged.
- Agricultural use being more pertinent in rural settings, local sewage is best treated with stabilization ponds followed by maturation ponds.

- Rotational crop pattern shall be investigated for an all the year round utilization and designed such that the runoff of treated sewage in summer is minimized.
- As far as possible, manual direct handling shall be avoided and field channels are better suited as compared to sophisticated drip irrigation etc.

Application of treated sewage in agriculture are advisable subject to osmotic effects, toxic effects, sodium hazard, organic solid and other constituents. The concentration may be referees from Section 7.3.3 of Chapter 7 of CPHEEO Manual on Sewerage and Sewage Treatment Systems, 2013.

The quality of water for irrigation is determined by the effects of its constituents both on the crop and the soil. The deleterious effects of the constituents of the irrigation water on plant growth can result from:

(i) direct osmotic effects of salts in preventing water uptake by plants,
(ii) direct chemical effects upon the metabolic reactions in the plant and;
(iii) any indirect effect through changes in soil structure permeability and aeration.

6.2 Horticulture: Guiding Principles

Guiding factor for application of treated sewage is total dissolved solids (TDS).

6.3 Toilet Flushing: Guiding Principles

Considering that the Indian water closets when flushed can sprout and splash the flush water above the rim and onto the foot rest areas, it is necessary that such reuse shall be only after activated carbon and ultra-filtration membranes. It shall not be made mandatory in layouts and confined condominiums and multiplexes and encouragement and persuasion shall be adopted, then a collision course or mandating it which is not justifiable by any means for if nothing else, sentimental reasons which rule high in Indian way of life. Similarly, small layouts being mandated to provide STP is to be viewed as decentralized sewerage and the sustainability of these by the proposed number

of plot owners shall be assessed before sanctioning them, as otherwise, the policy of septic tanks on-site followed by twin drain shall be encouraged as a practical possibility. In any case, small layouts shall not be forced to erect reuse practices as absence of proper O&M can only create a mini epidemic of sorts.

6.4 Fish Culture: Guiding Principles

Recognizing that Kolkata city is unique in having fish as an acceptable food and thus, the demand being steady. Fish ponds otherwise referred to as pisiculture cannot be looked upon as a method of stand-alone sewage treatment. However, treated / diluted sewage if used for pisiculture on the lines of the on-going East Kolkata wetlands, this needs to be strictly monitored by Department of Health and Department of Environment / SPCB and also the social acceptability.

6.5 Public Education

Education is the key to overcoming public fears about a reuse system, particularly fears that relate to public health and water quality. A broad, in-depth public relations programme and a demonstration project are especially helpful when the reuse project is the first of its kind in the state.

7.0 ROLES & RESPONSIBILITIES

Ministry/Organizations/Deptt	Responsibilities
Ministry of Agriculture & Farmers Welfare (MoAFW)	✓ Develop mandate for use of treated sewage in irrigation based on requirement of crop pattern ✓ Create awareness among farmers on reuse of treated wastewater for irrigation
State Pollution Control Boards (SPCB)	✓ Regulation of STPs ✓ Implementation of discharge standards for STPs suitable for their appropriate reuse

Ministry/Organizations/Deptt	Responsibilities
	✓ Explore the feasibility of reusing the treated sewage of nearby STPs for industries to meet their water demand.
Central Public Health and Environment Engineering Organisation (CPHEEO)	✓ Provide technical and planning support to States and ULBs including technical guidelines and training modules that can be adapted by States
Department of Soil & Water Conservation	✓ Develop creating requisite infrastructure for utilization of treated wastewater of all the small & medium size STPs for irrigation purposes after conducting a detailed feasibility analysis based on the location of the STPs and availability of adequate command area. ✓ Design the project as per the standards ✓ Follow up with various funding agencies to arrange funds
Municipal Corporations & Local Authorities	✓ Develop infrastructure for supply of treated sewage water for industrial clusters ✓ Operation & management of various STPs to ensure regular supply of treated wastewater as per prescribed norms
Ministry of Power/ Department of Power	✓ Implementation of direction given by Ministry of Power, Govt. of India, which made mandatory for Thermal Power Plants (TPP) located within a 50 km radius of a STP to use treated water of STP for cooling purposes. The direction has been issued vide Tariff Policy notified by Govt. of India on 28th January, 2016 under para 6.2(5).

8.0 PAYBACKS FROM SEWAGE RECYCLE AND REUSE

- Contribution towards reducing the dependency on conventional resources of water and thus promoting conservation of vital fresh water resources.
- In industrial areas, especially where water intensive industries are located, recycling and reuse of sewage will reduce the diversion of drinking water for non-potable purposes.
- Providing sewage recycle and reuse facilities at industrial sites has manifold advantage like reducing burden on Municipalities for treatment and revenue generation. Industries are benefitted by getting treated sewage at lesser price than fresh water supply and conservation of natural resources is an added advantage.
- Stopping the discharge of polluted water in to surface bodies and thus helping restoration / rejuvenation of natural water resources.
- Trading of treated sewage will generate revenue for the local bodies which can be utilized for other activities of environment protection.

9.0 WAY FORWARD

- Utilities and government authorities should integrate water and wastewater management at strategic, planning and implementation levels.
- Build awareness around wastewater management. The government can help in designing acceptable solutions, certifications, and authorisation. Also, financial institutions can help through long-term patient capital.
- Establish blended finance model or viability gap funding to boost public-private partnership, where the private sector could work under BOOT mode, sharing equal risks.
- The government should provide financial and land resources and create an enabling atmosphere for the wastewater management techniques.
- Sector wise requirement of reclaimed/treated water in terms of quality and desired quality standards.

- As stated earlier, 20,236 MLD of treatment capacity is utilized and treating the sewage upto secondary sewage. 20,236 MLD of treated sewage can be utilized for irrigation purpose at nominal cost subject to the availability of conveyance system.
- Identification of responsible Government Department for implementation of proposed plan, w.r.t infrastructure, adequate treatment of wastewater and conveyance for water supply.
- Funding Mechanism for execution of proposed project which may help in planned collection and adequate treatment of wastewater.
- To replace the existing source of raw water
- The payment of electricity bill is required to be regulated by fixing the responsibility of the concerned department and funds for this purpose need to be made available with the STP operating agency.
- The farmers need to be educated and made aware about the advantages of use of treated wastewater for irrigation purpose.
- Sewage water after secondary treatment should be used for irrigation purposes and water polluting industries which are located in critically polluted area assessed during CEPI evaluation, 2018.
- Reclamation of treated sewage should be made mandatory in OCS categories (Over-exploited, Critical and Semi-critical areas) as per CGWB report on "*National Compilation on Dynamic Ground Water Resources of India, 2022*" (**Annexure IV**).

Annexure I

CPHEEO RECOMMENDED NORMS OF TREATED SEWAGE QUALITY FOR SPECIFIED ACTIVITIES AT POINT OF USE

S. No.	Parameter	Toilet flushing	Fire protection	Vehicle Exterior washing	Recreational use (bathing etc.)	Non-contact impoundments	Landscaping, Horticulture & Agriculture			
							Horticulture, Golf course	Non edible crops	Crops	
									crops which are eaten	
									Raw	Cooked
1	Turbidity (NTU)	<2	<2	<2	<2	<2	AA	AA	AA	AA
2	SS	AA	AA	AA	AA	AA	AA	AA	AA	AA
3	TDS	2100								
4	pH	6.5 to 8.5								
5	Temperature ° C	Ambient								
6	Oil & Grease	10	nil	nil	nil	nil	10	10	nil	nil
7	Nitrate Nitrogen as TN	10	10	10	10	10	AA	AA	AA	AA
8	BOD	≤6	10	≤6	≤6*	10	≤6 – 10 (≤6 preferred)			
9	COD	AA	AA	AA	AA	AA	AA	AA	AA	AA
10	Total Phosphorous as TP	1	1	1	1	1	AA	AA	AA	AA
11	Minimum Residual Chlorine	1	1	1	≤0.5	0.5	nil	nil	nil	nil
12	Faecal Coliform in 100 ml	nil	nil	nil	≤50	100	nil	100	nil	≤50
13	Helminthic Eggs/ litre	AA	AA	AA	AA	AA	AA	<1	<1	<1
14	Colour	Colourless						AA	Colourless	
15	Odour	Aseptic which means not specific and no foul odour								

All values are in mg/l except for Turbidity, pH, Temperature, Fecal Coliform, Helminthic Eggs, Colour and Odour.

AA-as Arising when other parameters are satisfied.

*CPCB prescribes BOD less than 3 mg/l in water body for recreational purpose. Adequate storage shall be maintained in the water body for dilution to maintain 3 mg/l.

Annexure- II

TOLERANCES FOR WATER FOR PULP & PAPER INDUSTRY (Clause 2.2)

S. No	Characteristic	Tolerance For					Method of test (Ref to Cl No. IN IS: 3025-1964) 1961 1960
		Ground Wood Paper	***Kraft Paper Bleached***	***Kraft Paper Unbleached and Pulp Unbleached***	***Soda and Sulphite Paper***	***High Grade Paper***	
1	Colour (Hasen units), Max	20	15	100	10	5	5
2	Turbidity (silica scale units), Max	50	25	100	15	10	6
3	Total Dissolved Solids, mg/l, Max	500	300	500	300	300	12
4	Total Hardness (as $CaCO_2$),mg/l, Max	200	100	200	100	100	16
5	Iron (as Fe), mg/1, Max	1.0	0.25	1.0	0.25	0.25	32
6	Manganese (as Mn), mg/l, Max	0.5	0.1	0.5	0.05	0.05	35
7	Iron (as Fe) and Manganese (as Mn), mg/l, added together, Max	1.0	0.25	-	0.25	0.025	32 and 35
8	Total residual chlorine (as Cl), mg/l, Max	2.0	5.0	-	2.0	2.0	45

Annexure-III

TOLERANCES FOR WATER FOR TEXTILE INDUSTRY

S. No	Characteristic	Tolerance For			Method of Test, Ref to
		General Purposes	***Bleaching, Dyeing & Subsequent Processing***	***Wool Scouring***	
1	Colour (Hazen units),Max	20	5	70	IS 3025 (Part 4) : 1983
2	Turbidity, NTU, Max	2	2	2	IS 3025 (Part 10) : 1984
3	pH,	----------6.0 to 8.5----------			IS 3025 (Part 11) : 1983
4	Total Hardness (as $CaCO_3$) mg/I, Max	50 (see Note 2)	2	2	IS 3025 (Part 21) : 1983
5	Iron (as Fe), mg/I max	0.25	0.1	0.1	32 of IS 3025 : 1964
6	Manganese (as Mn), mg/I, Max	0.10	0.10	0.10	35 of IS 3025 : 1964
7	Iron (as Fe) and Manganese (as Mn) added together, mg/I, Max	0.25	0.1	0.1	32 and 35 of IS 3025:1964
8	Aluminium (as Al), mg/I, Max	0.1	.01	0.1	31 of IS 3025 : 1964
9	Sulphate (as SO_4), mg/I, Max	100	--	--	IS 3025 (Part 24) : 1986
10	Chloride (as CI), mg/I, Max	100	--	--	IS 3025 (Part 32) : 1988
11	Total alkalinity (as $CaCO_3$), mg/I, Max	150	150	150	IS 3025 (Part 23): 1986

Notes:

1. *When dark or medium dark dyeing is done, a relaxed maximum limit 20 may be permissible, but for whites and delicate shades the limit shall not be relaxed.*
2. *For processes which are not sensitive to hardness salts or internal sequestering agents are used, a maximum limit of 2 permissible*

Annexure IV

CATEGORIZATION OF BLOCKS/MANDALS/TALUKA IN INDIA, 2022

S. No.	States/Union Territories	Total No. of Assessed Units	Safe		Semi-Critical		Critical		Over-Exploited		Saline	
	States		**Nos.**	**%**	**Nos.**	**%**	**Nos.**	**%**	**Nos.**	**%**	**Nos.**	**%**
1	Andhra Pradesh	667	598	89.7	19	2.8	5	0.7	6	0.9	39	5.85
2	Arunachal Pradesh	11	11	100.00								
3	Assam	28	27	96.43	1	3.57						
4	Bihar	535	469	87.66	46	8.60	12	2.24	8	1.50		
5	Chhattisgarh	146	116	79.45	24	16.44	6	4.11				
6	Delhi	34	4	11.76	8	23.53	7	20.59	15	44.12		
7	Goa	12	12	100.00								
8	Gujarat	252	189	75.00	20	7.94	7	2.78	23	9.13	13	5.16
9	Haryana	143	36	25.17	9	6.29	10	6.99	88	61.54		
10	Himachal Pradesh	10	10	100.00								
11	Jharkhand	263	241	91.63	11	4.18	6	2.28	5	1.90		
12	Karnataka	234	139	59.40	35	14.96	11	4.70	49	20.94		
13	Kerala	152	122	80.26	27	17.76	3	1.97				
14	Madhya Pradesh	317	226	71.29	60	18.93	5	1.58	26	8.20		
15	Maharashtra	353	272	77.05	62	17.56	7	1.98	11	3.12	1	0.28
16	Manipur	9	9	100.00								
17	Meghalaya	12	12	100.00								
18	Mizoram	26	26	100.00								
19	Nagaland	11	11	100.00								
20	Odisha	314	300	95.54	8	2.55					6	1.91
21	Punjab	153	17	11.11	15	9.80	4	2.61	117	76.47		
22	Rajasthan	302	38	12.58	20	6.62	22	7.28	219	72.52	3	0.99
23	Sikkim	6	6	100.00								
24	Tamil Nadu	1166	463	39.71	231	19.81	78	6.69	360	30.87	34	2.92
25	Telangana	594	494	83.00	80	13.60	7	1.20	13	2.20		
26	Tripura	59	59	100.00								
27	Uttar Pradesh	836	557	66.63	169	20.22	47	5.62	63	7.54		
28	Uttarakhand	18	14	77.78	4	22.22						
29	West Bengal	345	232	67.25	31	8.99	22	6.38			60	17.39
30	Andaman And Nicobar	36	35	97.22							1	2.78
31	Chandigarh	1			1	100.00						
32	Dadra & Nagar Haveli	1							1	100.00		
	Daman $& Diu	2							2	100.00		
33	Jammu & Kashmir	20	19	95.00	1	5.00						
34	Ladakh	8	7	87.50	1	12.50						
35	Lakshadweep	9	7	77.78	2	22.22						
36	Puducherry	4	2	50.00			1	25.00			1	25.00
	Grand Total	**7089**	**4780**	**67.43**	**885**	**12.48**	**260**	**3.67**	**1006**	**14.19**	**158**	**2.23**

Note:

Block- Bihar, Chhattisgarh, Haryana, Jharkhand, Kerala, Madhya Pradesh, Manipur, Mizoram, Odisha, Punjab, Rajasthan, Tripura, Uttar Pradesh, Uttarakhand, West Bengal

Taluks- Goa, Gujarat, Karnataka, Maharashtra

Mandals- Andhra Pradesh, Telangana

District –Arunachal Pradesh, Assam, Meghalaya, Nagaland, Sikkim, Dadra & Nagar Haveli, daman & Diu, Jammu &Kashmir

Valley- Himachal Pradesh, Ladakh

Islands- Andaman &Nicobar, Lakshadweep

Firka- Tamil Nadu

Region - Puducherry

UT- Chandigarh

Tehsil- Delhi

Source: CGWB report on "National Compilation on Dynamic Ground Water Resources of India, 2022"

Annexure V

RECYCLE / REUSE OF SEWAGE: CASE STUDIES

1. CHENNAI METROPOLITAN WATER SUPPLY AND SEWERAGE BOARD (CMWSSB)

Chennai Metropolitan Water Supply and Sewerage Board has installed 02 TTRO plants at Koyambedu and Kodungaiyur of capacity 45 MLD each to meet the raw water requirement of Industrial areas. Details of TTRO plant at Koyambedu and Kodungaiyur are mentioned below:

i. 45 MLD Capacity TTRO Plant at Koyambedu

Work Awarded: M/s WABAG – IDE Consortium, Chennai- Rs 396.50 Crore towards construction cost and Rs 197.59 Crore towards Operation and Maintenance cost for 15 years.

Project Plan: Construction of TTRO plant of capacity 45 MLD and MS Transmission main for conveying product water including construction of Intermediate storage tanks at Pillaipakkam, Vallam Vadagal and Oragadam for onward supply to the SIPCOT industries located at Irungattukottai, Sriperumbudur and Oragadam by SIPCOT.

The TTRO product water from TTRO plant at Koyambedu is being supplied to the SIPCOT industries located at Irungattukottai viz. Hyundai, Schwingstetter, Hwwin, etc., at Sriperumbudur viz. Saint Gobain, Capro, Samsung Mobiles, etc., and at Oragadam viz, Apollo tyres, Nissan Kone Elevators, Mando, Yamaha & Enfield, etc., and to all other small scale industries located at Pillaipakkam and Vallam Vadagal from 18.12.2019 onwards.

a) **Details of TTRO Plant** treatment stage: Pre-chlorination, Rapid Sand Gravity Filters
b) Secondary treatment stage: Basket strainers, Ultrafiltration system
c) Tertiary treatment stage: Cartridge Filters, Reverse Osmosis System and Ozonation.

Benefits

a) Saving of Fresh Water-Due to the commencement of the supply of TTRO water to SIPCOT industries, the quantity of fresh water of around 20MLD which was being supplied to them for industrial use from Chembarambakkam has now been diverted for drinking water purpose of the Chennai city people

b) Revenue- The rate / tariff for the supply of TTRO water to the SIPCOT industries from TTRO plant at Koyambedu is fixed as Rs.65/- per KL. The total Revenue Generated is Rs 19.67 Crores.

ii. 45 MLD Capacity TTRO Plant at Kodugaiyur

Work Awarded: M/s BGR Energy Systems Limited, Chennai- Rs235 Crores towards construction cost and Rs205 Crore towards Operation and Maintenance cost for 15 years

Project Plan: Construction of TTRO plant of capacity 45 MLD and laying DI conveying main to supply product water to the industries at Manali – Ennore Corridor and Manali – Minjur Corridor, Chennai.

Details of TTRO Plant

a) Pre-treatment stage: Pre-chlorination, Rapid Sand Gravity Filters
b) Secondary treatment stage: Basket strainers, Ultrafiltration system
c) Tertiary treatment stage: Cartridge filters, Reverse Osmosis system and Ozonation

Benefits

a) Saving of Fresh Water-Due to the commencement of the supply of TTRO water to the industries, the quantity of fresh water / desalination water of around 20MLD which was being supplied to them for industrial use has now been diverted for the drinking water purpose of the Chennai city people.

b) Revenue- The rate / tariff for the supply of TTRO water to the SIPCOT industries from TTRO plant at Koyambedu is fixed as Rs.80/- per KL. The total Revenue Generated is Rs48.17 Crores.

2. SURAT MUNICIPAL CORPORATION (SMC)

As per information from GPCB, total sewage generation of Surat city is about 1100 MLD. There are 11 STPs with a total treatment capacity of 1546 MLD. Surat Municipal Corporation (SMC) has started recycling and reuse of sewage in 02 STPs. The 115 MLD of sewage after tertiary treatment is supplied to about 220 industries (mostly textile) in Sachin and Pandesara industrial estates. The details of 02 STPs are as follows:

(i) 167 MLD Dindoli STP: The STP is having total 167 MLD treatment capacity. Out of 167 MLD, the STP has been recycling and reusing 40 MLD of sewage. The treatment Scheme comprises of:

a. Primary treatment
b. Secondary treatment (Sequential Batch Reactor)
c. Tertiary Treatment [Activated Carbon Filter (ACF)]
d. Ultra-filtration (UF) &;
e. Reverse Osmosis (RO)

(ii) 215 MLD Bamroli STP: The STP is having total 215 MLD treatment capacity. Out of 215 MLD, the STP has been recycling and reusing 75 MLD sewage under 02 streams of 40 MLD and 35 MLD. Treatment Scheme comprises of:

a. Primary treatment
b. Secondary treatment (100 MLD based on UASB & 115 MLD based on Sequential Batch Reactor + UV)
c. Tertiary treatment [Activated Carbon Filter (ACF)
d. Ultra-filtration (UF) &
e. Reverse Osmosis (RO)

The RO reject from both STPs is treated in Flash Mixer followed by Clariflocculator (i.e. chemical treatment followed by settling) and finally discharged at the outlet stream of secondary treatment for final disposal in to creek of Arabian Sea. RO Permeate is distributed to the member industries in Pandesara and Sachin GIDC in accordance with the booked quantity of individual industry. In Pandesara GIDC, the permeate is collected in an underground tank of about 5 Million Litre and then pumped to member industries through distribution pipe network of SMC. In Sachin GIDC, the RO Permeate is pumped in to an overhead tank of 4 Million Litre and then distributed to member industries by distribution pipe

network of SMC through gravity. Flow meters are installed at the entrance of each industry for measuring the quantity.

ECONOMICAL ASPECTS: The financial aspects of 40 MLD Dindoli STP are as follows:

Date of commencement	**Capital Cost**	**O&M Cost / Year**	**Revenue incurred up to October 2022**
May, 2020	Rs 125 Cr	Rs 9.03 Cr	Rs 56.45 Cr

The financial aspects of 75 MLD (40 + 35 MLD) Bamroli STP are as follows:

Date of commencement	**Capacity**	**Capital Cost**	**O&M Cost / Year**	**Revenue incurred up to October 2022**
February, 2014	40 MLD	Rs 85.10 Cr	Rs 18.64 Cr	Rs 248.95 Cr
March, 2020	35 MLD	Rs 104.00 Cr	Rs 12.66 Cr	Rs 65.81 Cr

Treated water cost started with Rs. 18.20 per Kilo Litre in the year 2014 which is now raised to Rs. 32 per Kilo Litre. It is worth to mention that in Sachin GIDC, the irrigation water supply cost is Rs. 42 – 45 per Kilo Litre.

3. UTILIZATION OF TREATED SEWAGE IN GANDHIDHAM, GUJARAT

The industry M/s Welspun India Ltd., Taluka Anjar, District Kutch, Gujarat is receiving the untreated sewage from the pumping stations of Municipal Corporation. The industry has created 30 kms pipe line to convey the sewage from 05 pumping stations to its STP. The STP is built and operated by the industry. The installed capacity of STP is 40 MLD, however presently the average utilized capacity is 25 MLD. Treated sewage is used for production activities at various units of M/s Welspun Group viz. Welspun India Ltd, Welspun Corp Ltd, Welspun Captive Power Generation ltd, Welspun Metallic Ltd. And Welspun DI plant Ltd. situated at Welspun City, Anjar.

Treatment Scheme

(i) Primary treatment
(ii) Secondary treatment
(iii) Deep Media Filtration

(iv) Chlorination and De-chlorination
(v) Microfiltration ☐ Ultra-filtration
(vi) Reverse Osmosis (RO)

Economic Aspects: The capital cost of Rs. 250 Crores is invested by Welspun India Limited only. The operation and maintenance cost of Rs. 11 Lakh for 25 MLD i.e. Rs. 44 / KL. This includes sewage pumping cost and STP Operation cost. Welspun India Ltd is giving almost Rs. 45 Lakhs per annum as Royalty charges to Municipalities for the supply of untreated sewage.

Average cost of fresh water supply of Narmada water for all domestic activities is Rs. 52 / KL. Approximately Rs. 5-7 / KL is the cost saving to the industry by utilizing treated sewage when comparing with GWIL Narmada Water.

4. UTILIZATION OF TREATED SEWAGE- UDAIPUR & BHILWARA, RAJASTHAN

Project	**Treatment of municipal sewage by STP in M/s Hindustan Zinc Ltd, Udaipur**	**Treatment of municipal sewage by STP in M/s Jindal Saw Ltd, Bhilwara**
Location	Eklingpura, Udaipur	Bhilwara
STP Capacity	20 MLD + 25 MLD (Feb, 2019)	10 MLD
Sewage conveyance pipeline	80 Km	
Treatment Technology	Moving bed biofilm reactor (MBBR) and Chlorination	Cyclic Activated sludge/ Sequential batch reactor (SBR) and Chlorination
Benefits	▪ Discharge of untreated sewage into water bodies eliminated ▪ Treated effluent used for industrial production ▪ Fresh water abstraction reduced by 85%	▪ Conserving water resources ▪ Treated effluent used for industrial production ▪ Reduction in Fresh water consumption

	▪ Production of Manure (120 tons/yr approx.) sold and used in agriculture ▪ Water quality improvement of Ahar River, Pichola & Udaisagar Lakes and conserving biodiversity	
Reutilization	In Hindustan Zinc Rajpura Dariba Mining & Smelting complex	In plant operation, Mining, Mineral Beneficiation, Dust Suppression, Cooling, Horticulture/ Plantation Sludge being used as compost in JSAW

5. UTILIZATION OF TREATED SEWAGE IN NAGPUR, MAHARASHTRA

Project	**130 MLD Sewage reuse Project for water supply to 3x600 MW Koradi TPS Expansion**
Location	Bhadewadi, Nagpur
STP Capacity	130 MLD
Sewage conveyance pipeline	16.2 Km
Treatment technology	Deep Bed Multi-Media Filtration, Chlorination
Project Cost	180 Cr
Treatment cost	▪ Raw sewage purchased - Rs 15 Cr/yr ▪ STP O&M Cost - Rs 1.5 Cr/yr
Benefits	▪ Saving fresh water ▪ New STP of 130 MLD has improve ecology and environment of surrounding water bodies ▪ Reliable and economic water supply for power plant ▪ Power generation from STP Sludge is envisaged to make the power requirement of STP

Reutilization	▪ Treated wastewater supplied to (Maharashtra State Power Generation Corporation Ltd) MAHAGENCO Power Plant ▪ (Cost of treated water is Rs 3.40 per Cum whereas cost fresh water from Irrigation Dept is 1.20 to 9.60 per Cum)

6. UTILIZATION OF TREATED SEWAGE IN TROMBAY, MAHARASHTRA

Project	**Sewage Treatment Plant at Rashtriya Chemicals and Fertilizers Trombay unit to treat and reuse sewage of Mumbai City**
Location	Trombay, Maharashtra
STP Capacity	23 MLD
Treatment Technology	Ultra filtration and Reverse Osmosis
Benefits	▪ Saving 18 MLD water for citizens in Mumbai in case of shortage in supply of water ▪ Reduction in cost of disposal of 32 MLD sewage to sea ▪ Assured supply of process water to plants in RCF, Trombay ▪ Reduction in blow down from process plants due to better quality of water
Reutilization	▪ 80 – 90% water requirement by factory met by in-house STP ▪ RO reject used in cleaning, washing & gardening ▪ Natural pond developed for Rain water harvesting

TIMELINE FOR FINALIZATION OF

"GUIDELINES FOR REUSE OF TREATED SEWAGE IN REFERENCE TO ITEM OF CIRCULAR ECONOMY"

Items	Months (September, 2023 to February, 2024)					
	September	October	November	December	January	February
Preparation of Draft Guideline						
Consultation with stakeholders and comments incorporation						
Finalization of Guideline						
Wide circulation of the Guideline						
Notification						

Note: *Stakeholders ((MoHUA, MoEF&CC, Ministry of Agriculture & Farmers' Welfare, Ministry of Textiles, Ministry of Power, ULBs/RLBs etc)*