UCR Project Concept Note & Monitoring Report (PCNMR)

Project Name: Bundled ETP Wastewater Recycling by SIIPL, Pune, India

PCNMR Version 2.0

Date of PCNMR: 24/08/2023

1st RoU Crediting Period: 01/01/2014 to 31/12/2022 (09 years, 00 months)

1st RoU Monitoring Period: 01/01/2014 to 31/12/2022

UCR RoU Scope: Scope 5

UNDP Human Development Indicator: 0.645 (India)

National Water Security Index: 2 (India)

RoUs Generated During 1st Monitored Period: 4,983,000 RoUs

A.1 Location & Details of Project Activity

Title	**<u>Bundled ETP Wastewater Recycling by SIIPL, Pune, India</u>**	
Type and Scope of RoU Project Activity	Small Scale Project Type *Scope 5: Conservation measures taken to recycle and/or reuse water, spent wash, wastewater etc across or within specific industrial processes and systems, including wastewater recycled/ reused in a different process, but within the same site or location of the project activity. Recycled wastewater used in off-site landscaping, gardening or tree plantations/forests activity are also eligible under this Scope.* The project activity recycles wastewater from 2 (two) ETPs and reuses the same for captive gainful industrial use (e.g. cooling towers, boilers and gardening purposes). The wastewater from both ETPs are further purified to generate water quality equivalent to safe drinking water standards and complies with all national and international standards like USEPA/WHO/BIS-10500. The project activity showcases efficient reuse of industrial wastewater as a key corporate environmental intervention towards a more water secure India.	
Number of ETPs	2	
Address of Project Activities	**ETP Hadapsar** Serum Institute of India Pvt Ltd (SIIPL) Village : Hadapsar Latitude: 18°30'12.4"N Longitude: 73° 56'44.9"E	**ETP Manjri** SEZ Biotech Services Pvt Ltd Village: Manjri Taluka: Haveli Latitude: 18°30'56.1"N Longitude: 73° 57'47.2"E
State	Maharashtra	
District	Pune	
Country	India	
Block Basin/Sub Basin/Watershed	Pune city is located in the North Bhima River Basin	
Project Commissioning Date	2012	
Rivers and water bodies near the project activity	Mula and Mutha Rivers originate in the Sahyadri ranges and traverse across Pune, the location of the project activity. The two rivers further meet and upon their confluence Mula-Mutha river is formed which further drains itself into the Bhima River. The total length of these three rivers traversing through Pune Municipal Corporation is 44km approximately. Out of this, 22.2km is Mula River, 10.4km is Mutha River and 11.8km is Mula Mutha River.	

SDG Impacts	1 – SDG 1 End poverty in all its forms everywhere 2 – SDG 3 Ensure good health and well-Being for all at all ages 3 – SDG 6 Ensure access to water and sanitation for all 4 – SDG 7 Ensure access to affordable and clean energy for all 5 – SDG 8 Promote economic growth and decent work for all 6 – SDG 11 Make cities and settlements sustainable 7 – SDG 17 Strengthen global partnership for sustainable development 8 – SDG 13 Climate Action
Climatic Conditions	Annual Mean Maximum Temperature: 39°C Annual Mean Minimum Temperature: 12°C Annual Mean Maximum Rainfall: 722 mm
Calculated RoUs per year	(see table below)

Year	Total RoUs (1000 litres) /yr UCR Cap (1 million RoUs/yr)
2014	396000
2015	396000
2016	396000
2017	577500
2018	577500
2019	577500
2020	577500
2021	742500
2022	742500
Total RoUs	**4,983,000**

A.2. Project owner information, key roles and responsibilities

Project Proponent (PP):	**Project Owner**: Serum Institute of India Pvt Ltd (SIIPL), Pune, Maharashtra
UCR Project Aggregator	**Aggregator**: Egis India Consulting Engineers Pvt Ltd **UCR ID**: 467947294
Contact Information:	Email: sneha.k@egis-india.com
Date PCNMR Prepared	24/08/2023

External Links and Reports	Bassi, Nitin, Saiba Gupta, and Kartikey Chaturvedi (2023): *Reuse of Treated Wastewater in India: Market Potential and Pointers for Strengthening Governance*. New Delhi: Council on Energy, Environment and Water. Hussain Inayath, Sajid (2020): *Report on guidelines for recycle, reuse and zero liquid discharge of treated industrial and domestic wastewate*r

Purpose of the project activity:

Serum Institute of India Pvt Ltd (SIIPL), the project proponent (PP), is an Indian biotechnology and biopharmaceuticals company founded in 1966 and since then it has established itself as the world's largest manufacturer of vaccines.

The project activity involves the bundling of 2 (two) effluent treatment plants (ETPs) owned and operated by the PP involving similar wastewater recycling treatment technologies and gainful end use of the treated effluent.

In the absence of the project activity, the PP could have installed bore wells that would have depleted the local groundwater resources and/or continued to use existing drinking water resources in the surrounding area and/or discharged the ETP effluent without recycling the same for gainful captive purposes.

The following are the key details of the project activity:

Location	Hadapsar ETP	Manjri ETP
ETP Capacity	ETP plant capacity: 1.5 MLD (from 2012 to 2020) ETP plant capacity: 2.5 MLD (from year 2021)	ETP plant capacity: 1.0 MLD (from 2017 to 2022)
Quantity Effluent Recycled and Reused	2012-2020: 1.2 MLD 2021-2022: 1.7 MLD	2017-2022: 0.55 MLD
Gainful End Use	Cooling towers / Boilers / Gardening / Landscaping	

The facilities at the Manjri and Hadapsar ETPs generate wastewater from process washings, utilities, domestic and wastewater from other units within both project boundaries. The two

(ETPs) consist of equalization tanks from where the wastewater is sent for primary, secondary and tertiary treatment. The ETP effluent is then further treated and reused within each facility.

The project activity qualifies under the UCR RoU program since the PP has undertaken water conservation measures to recycle and reuse wastewater for gainful end use. Wastewater is a highly potential source of water for various purposes and is highly underutilized in the country. If India can utilize 80% of its untreated wastewater from 110 of its most populous cities, then 75% of the projected industrial water demand can be met by 2025 (*source: Whitepaper URBAN WASTEWATER SCENARIO IN INDIA, August 2022, by IITB, AIM-NITI Aayog, ICDK and NMCG*).

While it is mandatory for any industrial unit to have a suitable ETP for industrial wastewater treatment to meet the required discharge standard, recycling and reusing industrial effluents in the same industry or in industries or establishments nearby post treatment (as per the prescribed discharge standard) is costly, and hence is not the norm in the industry. There is no incentive today for any industry or centralized ETP (CETP) for implementation of Zero Liquid Discharge (ZLD) other than getting environmental clearance or avoiding complaints on pollution issues from public and courts.

The design principles of most ETPs do not consider the possibility of recycling and reusing the treated ETP wastewater. Inevitably, in all industries, the wastewater discharged is seldom suitable for reuse within the industry, though industry expects users to reuse its wastewater because it is 'treated'. Most industries have their water intake points upstream of their wastewater discharge points. This itself exemplifies the quality and interest of wastewater treatment by the Indian industry.

The project activity showcases an integrated approach involving wastewater treatment, source reduction, reuse of process water, effluent treatment, recycling of treated ETP effluent and waste-minimisation that is urgently required to be followed by other industries.

The project activity showcases clean and advanced process technologies which can help industry reduce its industrial water demand. By selling water credits from such conservation and recycling activities, industries (even those outside the pharmaceutical industry) can overcome the cost barrier to successful implementation and scale of such water conservation and recycling projects. For instance, by replacing the conventional bleaching process with totally chlorine bleaching process, pulp and paper companies can almost close their water cycle, however the treatment methods for the same are costly, and hence water credits can be used as an added incentive for such industries to adopt cleaner wastewater treatment technologies.

Even in the context of wastewater generated across India, a majority comes from the Indian Thermal Power Plants (TPPs) via their cooling processes. In once-through cooling system approximately 100 litres of water is required to produce 1 Kwh electricity. In badly managed TPPs this could go up to 200 litres. By comparison, in a closed-cycle system, about 2-3 litres water is required to generate 1 Kwh electricity. The UCR RoU makes such closed cycle systems eligible to generate water credits as opposed to the common and wasteful once-through cooling system. There is a trade-off between the cost of water technology and the water that could be saved, however, with revenue from water credits, such barriers can be overhauled. Such recycling measures, especially for the power industry, are crucial since studies have showcased that in India, water consumption, for relatively low growth future projections, would lead to two and-a-half-fold rise as compared to 2015 levels, whereas a higher growth projection situation would lead to approximately four folds rise. If environmental mandates to improve cooling tower water recycling technologies are not implemented or enforced in the power generation sector, then water withdrawals will significantly rise from 34 billion cubic metres (bcm) in 2015 to 145 bcm in 2050 (source). This increase reflects the increase in power production for meeting the electricity demands of an increasing population and GDP. Water consumption also increases at a similar rate across all industrial sectors. The project activity by the PP is one such positive step in the adoption of cleaner recycling wastewater treatment technologies required to build scale at the speed the climate crisis demands before 2030.

The project, **Bundled ETP Wastewater Recycling by SIIPL, Pune, India** is located at the following locations:

- Hadapsar ETP: Village: Hadapsar, District: Pune, State: Maharashtra, Country: India
- Manjri ETP: Village: Manjri, District: Pune, State: Maharashtra, Country: India.

The 1st ETP by the PP (i.e. Hadapsar ETP), was commissioned in 2012. **Between 2014 and 2022, the project activity has reused 4983 million litres of recycled wastewater from both ETPs successfully**. The PP highlights the catalytic role that corporate India must play in reducing industrial water consumption as well as water pollution per unit of industrial output.

This wastewater from both ETPs are further purified through Ultrafiltration + Reverse Osmosis + UV to generate water quality equivalent to safe drinking water standards. This treated wastewater complies with all national and international standards like USEPA/WHO/BIS-10500. The project activity showcases **best-in-class wastewater treatment technologies that can replace the equivalent freshwater demand in different sectors for non-potable purposes, while reducing the proportion of untreated wastewater and substantially increasing recycling and safe reuse in India.**

The project activity is an example of local stakeholders, especially corporates to build positive sustainable water conservation action. For any vaccine production, water is the most widely used substance, raw material or starting material in the production, processing and formulation of pharmaceutical products. As the neighboring area to the project activity are residential, the PP did not want to reduce the drinking water level by diverting huge quantities water daily either through bore well or approvals from PMC. Further, the digging of numerous bore wells in the absence of the project activity would have also created acute ground water shortage for the local residents of Hadapsar and Manjri, Pune.

Hence the project activity is pre-approved under the UCR RoU program for the following scope:

- *Scope 5: Conservation measures taken to recycle and/or reuse water, spent wash, wastewater etc across or within specific industrial processes and systems, including wastewater recycled/ reused in a different process, but within the same site or location of the project activity. Recycled wastewater used in off-site landscaping, gardening or tree plantations/forests activity are also eligible under this UCR Scope.*

Wastewater Usage Scenario:

While there is a scarcity of freshwater resources in India, it is observed that a potential source of water, which is wastewater, is largely underutilised. According to reports, if India reuses 80 per cent of its untreated wastewater from 110 of its most populous cities, 75 per cent of projected industrial fresh water demand can be met by 2025 replacing fresh water use. The UN Waste Water Assessment Programme report states that high-income countries treat approximately 70% of the wastewater that is generated. The ratio drops to 38% in upper-middle-income countries, 28% in lower-middle-income countries and 8% in low-income countries. This only adds up to around 20% of the wastewater being treated globally.

Toxic foam formation from industrial discharge by industries in various areas under the jurisdiction of Maharashtra industrial development corporation (MIDC), Pune (Feb 2023).

The industrial sector is the second highest user of water after agriculture. India's annual fresh water withdrawals were about 500 billion cubic meters and the Indian industry consumed about 10 billion cubic meter of water as process water and 30 billion cubic meters as cooling water • As per the World Bank studies, the water demand for industrial uses and energy production will grow at a rate of 4.2 percent /year, rising from 67 billion cubic meter in 1999 to 228 billion cubic meter by 2025. Therefore, according to World Bank the current industrial water use in India is about 13 per cent of the total fresh water withdrawal in the country. Cost of water supply varies widely and can be in the range of Rs. 0.09 to 50.0 per cubic meter (source)

In India, the sewage generation in the urban centres, as per the recent assessment by Central Pollution Control Board (CPCB), was 72,368 Million Litres per Day (MLD) for the year 2020-21. Currently, the installed sewage treatment capacity is 31,841 MLD, but the operational capacity is 26,869 MLD, which are much lower than the load generated. Of the total urban sewage generated, only 28% (20,236 MLD) was the actual quantity of wastewater treated. This implies that 72% of the wastewater remains untreated and is disposed of in rivers/lakes/groundwater. There are some increases in infrastructure e.g., another 4,827 MLD sewage treatment capacity, has been proposed. If this is added to the existing installed capacity, even then, there is a gap of 35,700 MLD (i.e., 49%) between the wastewater generated and the capacity available for treatment (CPCB, 2021b).

The key disadvantages are related to the operational process complexity and the cost for installation for recycling and reuse, hence the PP hopes that the sale of RoUs from this project activity will offset the installation costs and help make such projects viable for the industrial sector.

A.2.1 UCR RoU Scope & Project Details

UCR **RoU Scope 5**	*Conservation measures taken to recycle and/or reuse water, spent wash, wastewater etc across or within specific industrial processes and systems, including wastewater recycled/ reused in a different process, but within the same site or location of the project activity. Recycled wastewater used in off-site landscaping, gardening or tree plantations/forests activity are also eligible under this Scope.*

The PP initiated the ETP in 2012 at Hadapsar. Being the world's largest vaccine manufacturer and socially responsible corporate with excellent ESG credentials, the PP decided not to consume/burden the city's existing clean drinking water resources or construct deep bore wells to further deplete the surrounding groundwater aquifers, but instead opted to voluntarily treat, recycle and reuse wastewater for its captive water requirements. In the absence of the project activity, the PP would have installed bore wells that would have depleted the local groundwater resources and/or continued to use existing drinking water resources in the surrounding area and/or discharged the ETP effluent without recycling for gainful captive purposes.

The PPs daily water requirement is as follows:

Activity	Water Requirement (KL/d)
Potable water (for further purification)	2000
Cooling Tower	1800
Boiler	500
Domestic Use (washrooms, canteen, drinking)	150
Gardening	600
Total	**5050 KL/d (~5MLD)**

Baseline scenario

The baseline scenario is the situation where, in the absence of the project activity, the PP would have discharged the ETP effluent without further treatment, recycling and reuse.

Hence the baseline scenario is:

"the net quantity of treated ETP effluent / wastewater that would be discharged directly into the local drain/sewer without being further recycled and/or reused post treatment per year"

The project activity achieves the following key water and sanitation related Sustainable Development Goals under the United Nation (UN-SDGDs):

- ensures universal and equitable access to safe and affordable drinking water for all by 2030,
- ensures halving the proportion of untreated wastewater and substantially increasing recycling and safe reuse globally by 2030,
- substantially increases water-use efficiency across all sectors and ensures sustainable withdrawals and supply of freshwater to address water scarcity and substantially reduce the number of people suffering from water scarcity by 2030, and;

- expands capacity-building support within India in water and sanitation-related activities and programs, including water efficiency, wastewater treatment, recycling and reuse technologies by 2030.

Water hyacinth and untreated sewage choke the Mula River at various locations

Water Conservation Limitations within Industry:

The following are the highlights from CPCB's latest presentation on industrial wastewater ETPs:

- Indiscriminate water uses in most of the industries
- Inadequate control on quantity of water used and wastewater discharged from industries
- Lack of pollution tax except for water cess
- Low water cess rates do not tempt industry for water conservation
- Lack of penalty on defaulters

The city of Pune generates 750 MLD of wastewater. Pune Municipal Corporation (PMC) is responsible to provide water supply and sewerage services to the city. PMC has so far established 10 Sewage Treatment Plants (STPs) in the city with a total treatment capacity of 567 MLD. However, 535 MLD of wastewater is actually being treated through secondary treatment technologies like activated sludge process, modified activated sludge process, sequential batch reactor etc. Out of 535 MLD of the total treated wastewater, around 400 MLD is reused for irrigation purposes as per requirement from irrigation department. Wastewater is also reused for various other purposes like construction, road cleaning etc. wherein tankers are sent to different STPs in the city to facilitate the water requirements. The local municipal corporation has announced plans in 2023, to build 11 new sewage treatment plants and their capacity will be around 850 MLD per day. Therefore, 100 percent of the wastewater generated in the city due to old and new projects will be treated and released into the Mula-Mutha river in the coming years.

Most Industrial Effluents have high salinity/TDS- polluting industries such as Pharma, Pulp & Paper, Tanneries, Textile Dyeing, Chemicals, and Power Plants etc. The TDS content is well above the statutory limit of 2100 mg/l. Discharge of saline but treated wastewater pollutes ground and surface waters. The conventional 'Physico-chemical-biological' treatment does not remove salinity in the treated effluent. This requires membrane processes like Reverse Osmosis (RO) and Nano Filtration (NF). This also means that the membrane reject also need to be managed. Achieving COD of 250 mg/l at the secondary treatment stage is also a challenge as most polluting industry wastewaters are not easily biodegradable. This requires additional tertiary treatment like Advanced chemical oxidation systems or electro-oxidation etc. Assistance to Pharmaceuticals Industry for setting up ETPs under common facility centres is currently available in the form of grants of 70% of project cost (of Rs. 20 crore), which is less from Dept. of Pharmaceuticals, Govt. of India.

Many of the industrial polluting companies fall under the SME category and some are even in the tiny sector. Therefore the capex towards ZLD can be a burden. However, the additional cost for treatment does not justify the expensive treated wastewater from being discharged in many small scale industries, hence UCR water credits can provide the much needed incentive for recycling and reusing post providing expensive treatment systems to achieve such discharge standards.

The project activity showcases best-in-class wastewater treatment technology that can replace the equivalent freshwater demand in different sectors for non-potable purposes while reducing the proportion of untreated wastewater and substantially increasing recycling and safe reuse in India.

Economic and market potential of treated wastewater (TWW) reuse:

Almost 11,622 million cubic metres (MCM) is the estimated amount of treated wastewater that was available in India for reuse in 2021. Based on projected sewage generation and treatment capacities in the future, this will become 15,288 MCM by 2025 and 35,178 MCM by 2050. Nine times the area of New Delhi could have been irrigated using the available TWW in 2021. Based on studies, about 8,603 MCM of treated wastewater was available for reuse in the irrigation sector in 2021; which could have replaced the equivalent freshwater demand for irrigation. It had the potential to irrigate 1.38 million hectares (Mha) of land, which is equivalent to about nine times the area of New Delhi. By 2050, this would is estimated to increase by up to about twenty-six times the area of New Delhi. **Reusing TWW for irrigation in 2021 could have generated INR 966 billion in revenue.** Reusing TWW in irrigation could have reduced greenhouse gas (GHG) emissions by 1.3 million tonnes in 2021. Studies suggests that the available treated wastewater would have irrigated 1.38 Mha in 2021, which would have reduced pumping in 3.5 per cent of the groundwater-irrigated area. Further, this would have led to a reduction of 1 million tonnes of GHG emissions. Additionally, on account of the inherent nutrient value of TWW, fertiliser consumption would have reduced, resulting in further reduction of GHG emissions by 0.3 million tonnes. INR 630 million would have been the market value of treated wastewater in 2021. The UCR RoU is the only alternate viable voluntary water credits program for the PP in the current scenario to generate revenue to build climate resilience before 2030.

Despite the overall apparent shortage of water, there are few incentives for efficient use of water in many parts of the world, the UCR RoU program is the only voluntary water incentive program for such project activities. Most countries have not developed instruments (either regulations or economic incentives) and related institutional structures for reallocating water between sectors, or for internalizing the externalities which arise when one user affects the quantity and quality of water available to another group.

There are a significant number of nallas like Ambill Odha, Bhairoba Nalla, Nagzari Nalla, Erandwana Nalla, etc. which bring untreated sewage into the rivers. Many of these nallas are in natural state, while some are also channelized.

The urban development along the river has taken place in a haphazard manner and at quite a few locations, nallas are getting encroached by the urban development, resulting into spillover of water during the rainy season.

Additionally, piped outfalls discharge untreated water from STP into the river directly, thereby polluting it. There are 88 piped outfalls and more than 50 natural outfalls on the Mula, Mutha & Mula-Mutha River terminating into the river. Of these, outfalls in the Mutha river are 14, that in the Mula river are 19 and in Mula- Mutha are 17.

Studies have shown that polluted rivers emit more greenhouse gases and in 2018, the Mula-Mutha river was found to be the second-most polluted river in the state by the Maharashtra Pollution Control Board.

The sewage network in Pune has been laid obstructing the natural drainage (Streams / Nallah). Even in case of the existing trunk lines leading to STPs in Pune, outfalls are not connected to it and open directly into the river, as seen in the case of trunk sewer mains connected to Vitthalwadi STP.

Nalla near Agriculture College (Model Colony)&Piped outfall near Bund Garden

Nalla near Mhatre Bridge on Mutha River&Erandwane STP outfall

The situation of the river stream is highly polluted due to the abutting slums discharging sewage into the nallahs. Ambil odha, a major Nallah connecting to Mula-Mutha, is polluted due to the discharge from the slums.

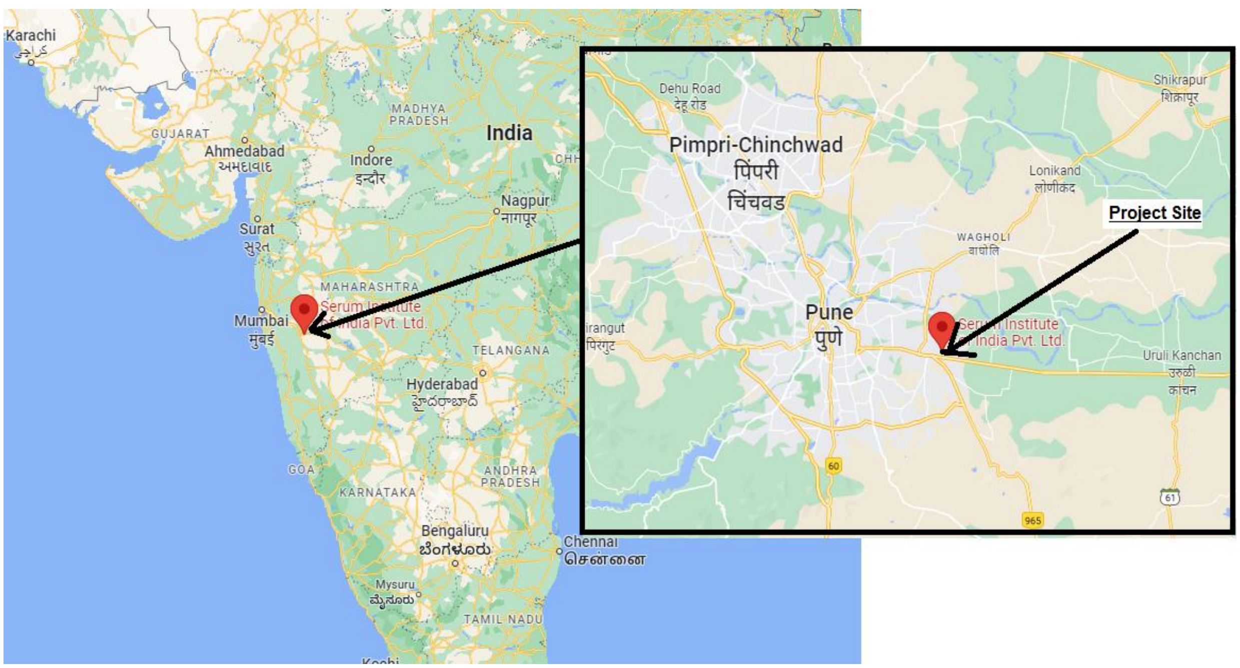
The maintenance of the discharge networks is also not being carried out periodically which causes the sewer mains to overflow at peak discharge. During the monsoon, the sewage network gets flooded due to the runoff connected to the sewage network. This flooding discharges the sewage water into the river. The natural drainage is connected to the river without any treatment as seen in the newly developed suburbs like Warje, Wadgaon. The reason for the same may be insufficient treatment facility and inadequate drainage networks.

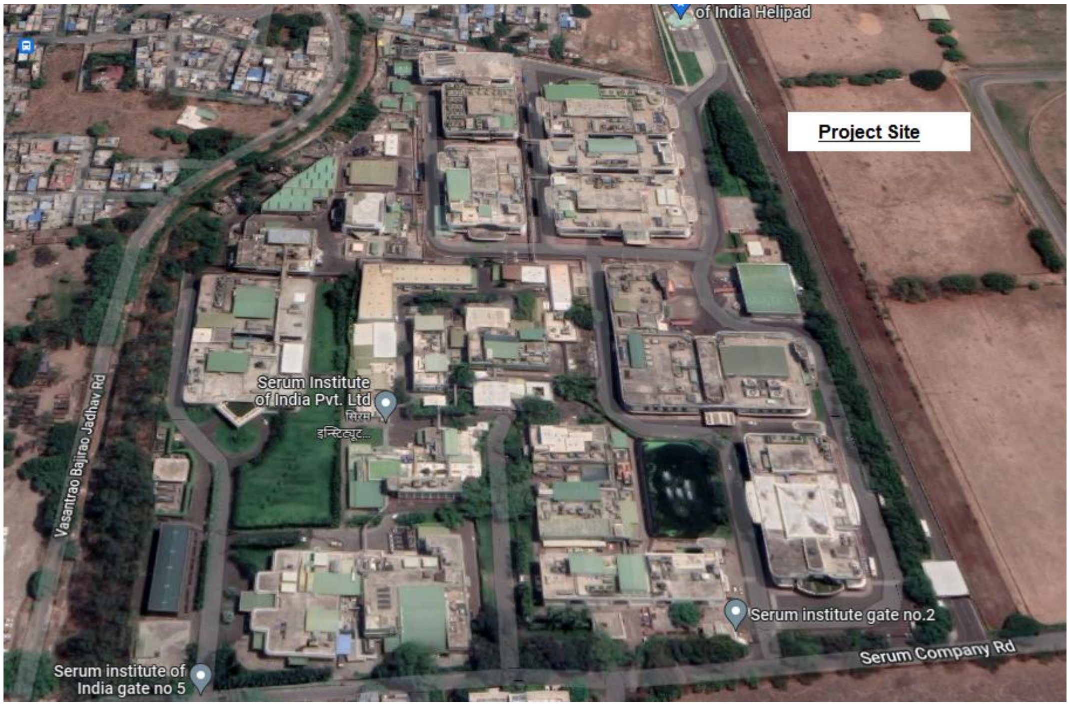
The diversity of native fish species & other aquatic life, in both Mula and Mutha rivers, has gone down significantly due to pollution and loss of habitat. The fish diversity loss has been observed for last 2 decades (*source: https://greentribunal.gov.in/sites/default/files/news_updates/Part-2%20Affidavit%20in%20Reply%20of%20R-1%20in%20Appeal%20No.%2012-2020%20(page%20nos.%20679-1048).pdf*).

Past Studies of Water Quality Parameters of Mula-Mutha River (river and water body closest to project activity)		
Title/Authors	**Date of Publication**	**Conclusion**
Pali Sahu,Sonali Karad and et.al	2015	The study was done for pH, total hardness, DO, BOD, COD. Study concluded that due to domestic sewage and industrial effluents the river water quality has deteriorated totally which shows the increasing load of pollution in the river.
A.B.More, C.S.Chavan and et.al	2014	As per the study analysis, it was observed that due to agricultural run-off through non point sources, the river Mula was polluted. Also due to addition of domestic sewage and industrial effluents river Mutha was polluted. And, hence after merging with each other, both the rivers are polluted.
Vinaya Fadtare and T T Mane	2007	The physico-chemical study found that prior to the river entrying the city area, the river water was tested to be safe for drinking and other applications, but post city entry, there was discharge of pollutants into the river water. This led to decreasing DO levels and increasing the levels of sodium, chlorides, nitrates, sulphates and TDS in the river.

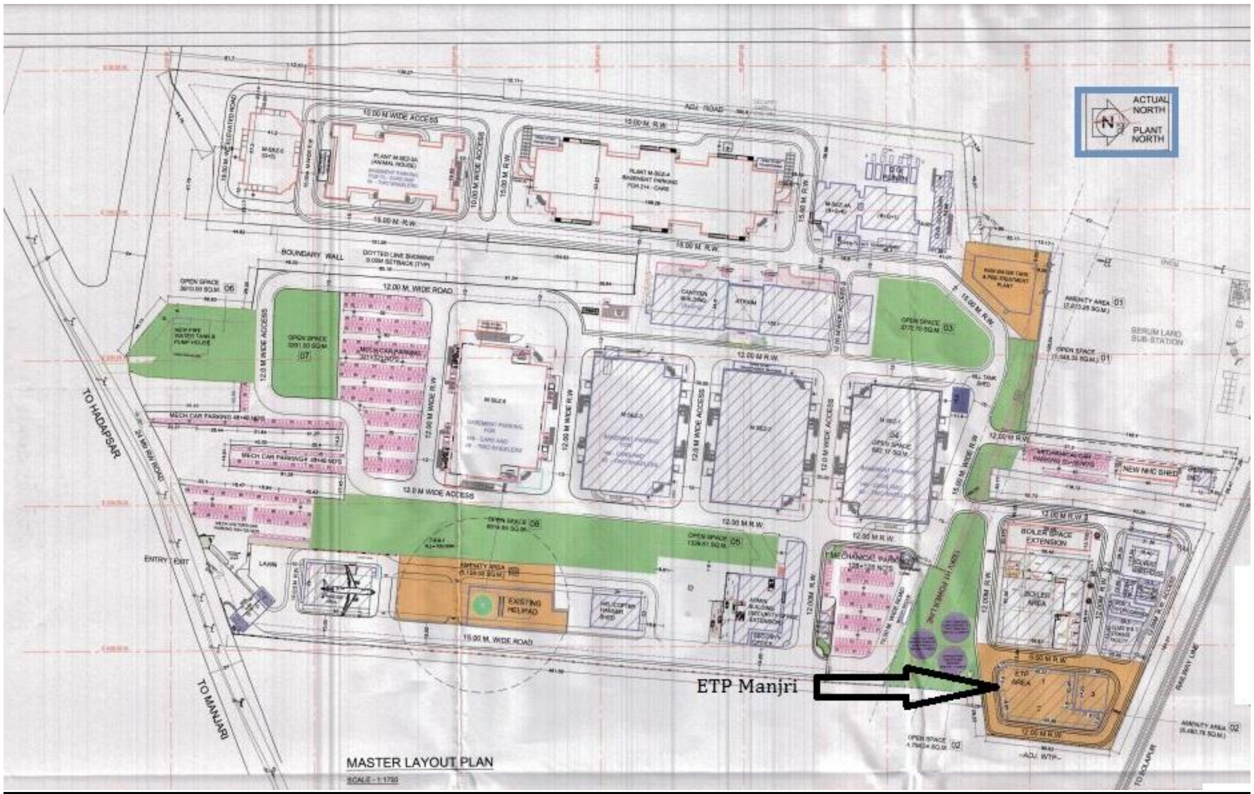
Mula-Mutha River (river and water body closest to project activity) EIA Report June 2018, PMC	
Dissolved Oxygen	< 4 mg/L
pH	6.94 to 8.06
Biochemical Oxygen Demand	6-14 mg/l
Total Coliform MPN/100 ml	350-1600
Faecal Coliform MPN/100 ml	110-540

Project Location





Hadapsar ETP



A.3. Land use and Drainage Pattern

NA

HYDROGEOLOGY

NA

WATER LEVEL

NA

A.4. Rainfall

NA-The project activity is not a rainwater harvesting project.

A.5. Alternate methods to the Project Activity

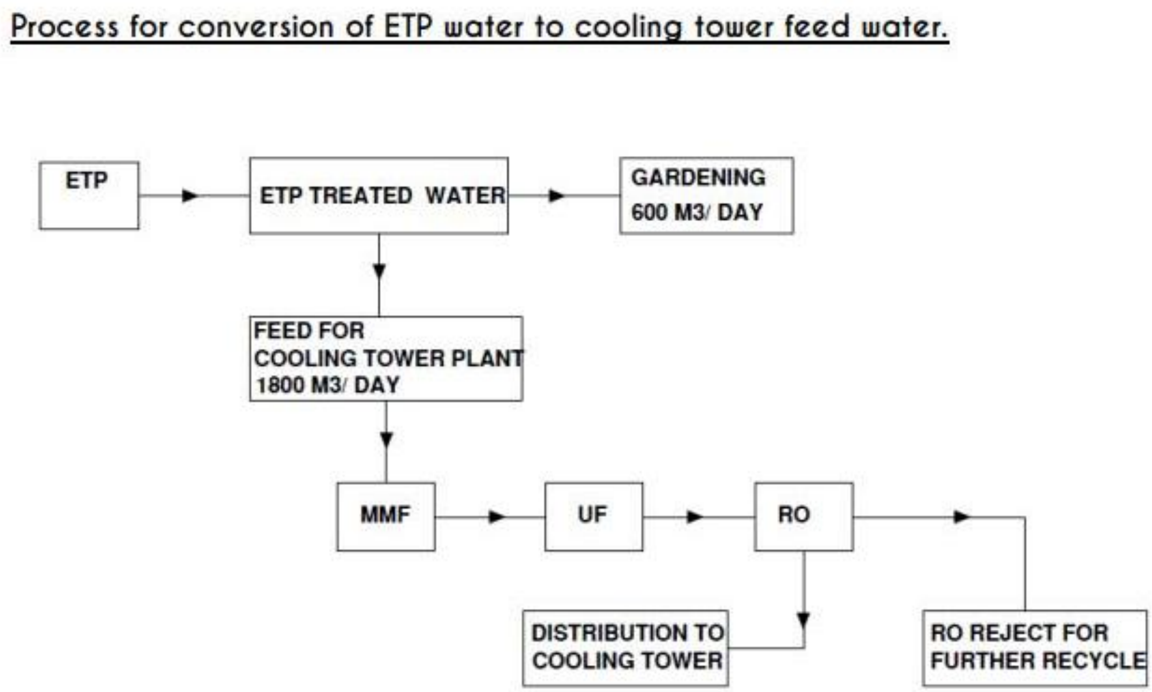
Pune is one of the major cities of Maharashtra with urban population of 31 Lakhs (as per 2011 census) living in 243.96 Sq. km of municipal corporation area. The city generates 750 MLD of wastewater. Pune Municipal Corporation (PMC) is responsible to provide water supply and sewerage services to the city. Out of 535 MLD of the total treated wastewater, around 400 MLD is reused for irrigation purposes as per requirement from irrigation department. Wastewater is also reused for various other purposes like construction, road cleaning etc. wherein tankers are sent to different STPs in the city to facilitate the water requirements. New Naidu STP, Bopodi STP and Erandawane STP have been presented as successful recycle and reuse of wastewater projects in Pune.

Industrial units in Pimpri-Chinchwad are finally getting a common effluent treatment plant (planned after post 2023) for 100 odd industrial units, under as a viable alternative with the PCMC agreeing to bear 65% of the total project cost, the MIDC and MPCB will contribute 20% and 5% respectively and the industrial units will contribute the remaining 10% of the project cost.

An initiative by the Mahratta Chamber of Commerce, Industries and Agriculture has seen PCMC, MIDC and MPCB come together to address the needs of hundreds of industrial units in the Pimpri-Chinchwad-Bhosari MIDC areas. The industrial belt of Pimpri Chinchwad is a major manufacturing hub in Maharashtra and India. There are over 4,000 small and big companies in Pimpri-Chinchwad-Bhosari areas. As per the data received from the Maharashtra Pollution Control Board, about 1,000 industrial units are categorised as 'red' and 'orange' and generate hazardous effluents and waste. However, these units do not have a facility to dispose of hazardous effluents and waste in a legal and environmentally friendly manner. This situation is contributing to soil and water pollution in Pune (source). In order to build scale, the UCR RoU program can provide water credits trading as an incentive to existing ETPs.

In 2022, the high courts directed some state pollution control boards to act strictly against the industrial units that illegally discharge trade effluents into the sewer network, damaging the STPs (source). Though wastewater reuse is endorsed in many policies and programmes, there is a lack of clear guidelines and frameworks to support the implementation of such projects. As a result, the reuse of reclaimed water for non-potable purposes continues to face challenges. The problem is further exacerbated by limited enforcement of the restriction to extract groundwater for non-potable purposes. More detailed policies and stronger enforcement is needed for wastewater reuse projects to be viable (source). **The revenue for the PP from the UCR RoU program would encourage similar high quality treatment alternatives for recycling and reusing wastewater for industrial units in the country.**

A.6. Design Specifications



Treatment Process

Cooling towers operated by the PP at both project sites, are an essential component in the industrial processes, however, recycling cooling tower water improperly can have a significant impact on the environment if not treated properly.

The effluent from cooling towers is often contaminated with suspended solids, dissolved solids, and microorganisms, which must be removed before discharge or recycling within the processes.

MMF: In contrast to a "**sand filter**," which normally employs one grade of sand alone as the filtration media, multimedia filtration (MMF) refers to a pressure filter vessel that uses three or more distinct media. During the "settling" cycle of a single media filter, the finest or smallest media particles remain on top of the media bed, while the bigger and heavier particles stratify proportionally to their mass down in the filter. As a result, almost all filterable particles are caught at the very top of the filter bed or within 1-2 inches of the top, where the filter media particles have the least space between them.

For multimedia filtration, multi-media water filters generally use three layers of media: anthracite, sand, and garnet. Because of the substantial variances in density, these media are frequently chosen for use in multimedia filters. Anthracite is the lightest per unit volume filtering medium, followed by sand and garnet.

The idea behind using different mass media is that during backwashing, the lightest media with the largest particles (anthracite) will naturally stratify at the top of the filter, while the medium sized media (sand) will settle in the middle, and the heaviest media with the smallest particles (garnet) will settle at the bottom.

The filtration bed's stacking enables the biggest impurities to become caught in the first layer of the filter, with smaller particles sifting farther down into the lower levels. This method of capturing impurities enables for more efficient turbidity removal and longer run periods between backwash cycles. A basic sand filter can be anticipated to remove particles as small as 25-50 microns, but a multimedia filter can remove particles as small as 10-25 microns.

Operating at a larger pressure differential has the potential to force particles so far into the media bed that backwash cannot remove them all. Deep dirt build-up in the filter will result in shortened filter runs and increased differential pressures over time. Air scour may be used in filter backwash to assist remove compacted dirt in the media bed. When this phase is included in the backwash cycle, it is preceded by a "drain down" interval during which water is drained out of the filter vessel.

UF: Ultrafiltration (UF) is a membrane filtration process similar to Reverse Osmosis, using hydrostatic pressure to force water through a semi-permeable membrane. The pore size of the ultrafiltration membrane is usually 103 - 106 Daltons. Ultrafiltration (UF) is a pressure-driven barrier to suspended solids, bacteria, viruses, endotoxins and other pathogens to produce water with very high purity and low silt density.

UF is a variety of membrane filtration in which hydrostatic pressure forces a liquid against a semi permeable membrane. Suspended solids and solutes of high molecular weight are retained, while water and low molecular weight solutes pass through the membrane. Ultrafiltration is not fundamentally different from reverse osmosis, microfiltration or nanofiltration, except in terms of the size of the molecules it retains.

A membrane or, more properly, a semi permeable membrane, is a thin layer of material capable of separating substances when a driving force is applied across the membrane. Once considered a viable technology only for desalination, membrane processes are increasingly employed for removal of bacteria and other microorganisms, particulate material, and natural organic material, which can impart color, tastes, and odors to the water and react with disinfectants to form disinfection byproducts (DBP).

RO: Reverse Osmosis is a filtration process that produces 80-85 % pure water from wastewater. The pressurized effluent is forced through semi permeable membranes of size 0.0001 micron to the fresh water recovery side. The membrane rejects the salt ions present in the effluent water and allows the pure water to pass through the thin membrane material.

Hence all wastewater from the ETPs are further purified to create water quality equivalent to safe drinking water standards that complies with all national and international standards such a like USEPA/WHO/BIS-10500.

RO Process

TÜV INDIA
TÜV NORD GROUP

TUV INDIA PRIVATE LIMITED
TUV India House,
Survey No: 42, 3/1 & 3/2,
Sus, Tal. Mulshi,
Dist. Pune - 411 021
CIN : U74140MH1989PTC052930
Tel. : 020 - 67900000 / 01
Toll free : 1800-209-0902
Email : pune@tuv-nord.com
Website : www.tuv-nord.com/in

TEST REPORT

Report No : TUV(I)/9685/22-23/0102202995
Date : 03 Nov 2022

Name & Address of Customer	: Serum Institute Of India Ltd 212/2,Off Soli Poonawalla Road, Hadapsar,Pune Pin Code: 411028
Reg No.	: 9685/22-23
CA No.	: 0102202995
Date of sample receipt	: 19 Oct 2022
Date(s) of analysis	: 20 Oct 2022 - 03 Nov 2022
Sample Drawn by	: Customer

SINo	Test Name	Results	Unit	LOQ	Test Method
	Sample Name : RO Permeate Water Discipline : Chemical				**CA No : 0102202995** Product Category : Water
Non Accredited Tests					
	Minerals				
1	Phosphate	0.4	mg/L	0.1	As per APHA 3125 23 rd Edition
	Water Analysis				
2	Total organic carbon (TOC) **	0.00019	%	0.0001 (LOD)	HS/NABL/WA/13a (Titration Method)
3	Conductivity	88.8	µS/cm	-	IS 3025 Part 14 (RA 2002)
4	Reactive Silica	1.7	mg/l	-	IS 3025 Part 35
5	COD	< 10	mg/l	-	IS 3025 Part 58 (2006)
6	BOD	< 10	mg/l	-	IS 3025 Part 44 (2003)

LOQ-Limit of Quantification, LOD – Limit of Detection
** - Test is subcontracted.

Authorized by

Atulkumar Rajage
Manager – Instrumentation Department

Note - This is Electronically Generated Report Copy

TC-5298

TUV INDIA PRIVATE LIMITED
TUV India House,
Survey No: 42, 3/1 & 3/2,
Sus, Tal. Mulshi,
Dist. Pune - 411 021
CIN : U74140MH1989PTC052930
Tel. : 020 - 67900000 / 01
Toll free : 1800-209-0902
Email : pune@tuv-nord.com
Website : www.tuv-nord.com/in

TEST REPORT

Report No : TUV(I)/9685/22-23/0102202995
Date : 03 Nov 2022
ULR-TC529822000024808F

Name & Address of Customer	:	Serum Institute Of India Ltd 212/2,Off Soli Poonawalla Road, Hadapsar,Pune Pin Code: 411028
Reg No.	:	9685/22-23
CA No.	:	0102202995
Date of sample receipt	:	19 Oct 2022
Date(s) of analysis	:	20 Oct 2022 - 03 Nov 2022
Sample Drawn by	:	Customer

SlNo	Test Name	Results	Unit	LOQ	Test Method
	Sample Name : RO Permeate Water Discipline : Chemical				**CA No : 0102202995** Product Category : Water
Accredited Tests					
	Heavy Metals				
1	Iron	< LOQ	mg/L	0.1	As per APHA 3125 23 rd Edition
2	Calcium	0.43	mg/L	0.1	As per APHA 3125 23 rd Edition
3	Magnesium	< LOQ	mg/L	0.1	As per APHA 3125 23 rd Edition
	Water Analysis				
4	Colour	< 1	Hazen	-	IS 3025 Part 4 (RA 2017)
5	Total Hardness as CaCO3	10.1	mg/l	-	IS 3025 Part-21 (RA-2014)
6	Chloride	8.2	mg/l		IS 3025 Part-32 (RA-2014)
7	Total Dissolved Solids	63	mg/l	-	IS 3025 Part 16 (RA 2017)
8	Total Alkalinity	31.2	mg/l		IS 3025 Part-23 (RA-2003)
9	Ammonical Nitrogen	< LOQ	mg/l	0.1	IS 3025 Part 34 (RA 2014)
10	pH	8.03	-	-	IS 3025 Part 11 (RA 2017)
11	Total Suspended Solids (TSS)	< 10	mg/l	-	IS 3025 Part 17 (RA 2017)
12	Ammonia	< LOQ	mg/l	0.1	IS 3025 Part 34 (RA 2014)
13	Nitrates as NO3	< LOQ	mg/l	0.1	APHA 23 rd Edition 4500 No3-B
14	Sulphate as SO4	1.0	mg/l	-	IS 3025 Part 24 (RA 2014)

Authorized by

Atulkumar Rajage
Manager – Instrumentation Department

Lab Test Reports-Water Quality Report

Daily Operation Record sheet (Sample Data Sheet)

ANNEXURE - 1

SERUM INSTITUTE OF INDIA PVT. LTD.

Cyrus Poonawalla Group

DAILY RECORD SHEET FOR 1.2 MLD ETP RO PLANT

RO - 1 permeate Conductivity	NMT 200	µs/cm	62.10	62.17	60.10	58.13	57.10	57.17	56.25	58.10
RO - 2 permeate TDS	NMT 120	ppm	-	-	-	-	-	-	-	-
RO - 2 permeate Conductivity	NMT 200	µs/cm	43.10	43.11	40.10	40.13	38.14	38.15	36.53	36.51
RO permeate pH	7.5 - 8.5	-	7.0	7.3	7.2	7.1	7.3	7.1	7.0	7.2
RO - 1 permeate flow	27 - 30	m^3	28	28	28	28	28	28	28	28
RO - 1 reject flow	10 - 13	m^3	12.5	12.5	12.5	12.5	12.5	12.5	12.5	12.5
RO - 1 Reject Recirculation	2.0 - 4.0	m^3	-	-	-	-	-	-	-	-
RO - 2 permeate flow	27 - 30	m^3	29	29	29	29	28	28	28	28
RO - 2 reject flow	10 - 13	m^3	12.5	12.5	12.5	12.5	12.5	12.5	12.5	12.5
RO - 2 Reject Recirculation	2.0 - 4.0	m^3	-	-	-	-	-	-	-	-
Chack All Chemical Tanks Level			ok	ok	ok	ok	ok	ok	ok	ok
Done By			[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

	Initial	Final	Total
DMF Inlet Reading	963400	965454	2054
RO - 1 Permeate	287528	288126	598
RO - 2 Permeate	315778	316362	584
Total RO Permeate = 1182	RO Run Hrs - 20.35 Hrs		Recovery = 57.54 %
Chemicals Prepared			Stock Remaining
Sodium Hypo Chioride (NaOCL) DMF			
Sodium Meta Bi Sulphate (SMBS)	20 kg		
Antiscalant (9001/9002/8115)	10 Ltr		
Sodium Hypo Chloride (NaOCL) UF CEB			
HCL			
Caustic (NaOH) UF CEB	10 kg		
Caustic (NaOH) RO Permeate			
RO Cartridge Filter Changed			

Remark:
* Finding Rotamitter cleaning केला.

Checked By: ______________

Page of

A.7. Implementation Benefits to Water Security and/or SDG Impact

Access to safe water, sanitation and hygiene is the most basic human need for health and well-being. Billions of people will lack access to these basic services in 2030 unless progress quadruples. Demand for water is rising owing to rapid population growth, urbanization and increasing water needs from agriculture, industry, and energy sectors.

Several states in India are water stressed 54% of India faces High to extremely high water stress and 54% of ground water wells are decreasing (source WRI). The report also says that there would be no ground water for irrigation by 2025 in Delhi, Rajasthan and Haryana. UNESCO Report says India holds the number 1 spot for the annual Ground water extraction at 251 cu.km as against 112 cu.km in China and USA, a distant second. Competing demands for water from agriculture and domestic use has limited industrial growth (source).

At present Ministry of Textiles provides 50% grants towards ZLD CETP up to a ceiling limit of 75 crores under the Integrated Processing Development Scheme (IPDS). The earlier MoEF scheme for CETPs is not available any more. Ministry of Commerce under the Assistance to States for Infrastructure Development of Exports (ASIDE) scheme provides for CETPs including ZLD. However, there seems to be no funding support for individual ETPs/ industry. Therefore, the UCR water credits incentive model can provide fiscal support via the voluntary water offset and footprint market.

Sustainable Development Goals Targeted	Most relevant SDG Target/Impact	Indicator (SDG Indicator)
13 CLIMATE ACTION 13 Climate Action (mandatory)	13.2: Integrate climate change measures into national policies, strategies and planning	Recycling and reusing wastewater is an effective solution for climate change adaptation because it helps mitigate the impacts of droughts, floods, and other extreme weather events that are becoming increasingly common due to climate change. The quantity of wastewater recycled and reused by the PP is the SDG indicator.

 1 - End poverty in all its forms everywhere	1.4: By 2030, ensure that all men and women, in particular the poor and the vulnerable, have equal rights to economic resources, as well as access to basic services, ownership and control over land and other forms of property, inheritance, natural resources, appropriate new technology and financial services, including microfinance	The PP prevents unequal distribution of natural groundwater resources- which prevents poverty of natural economic resources (groundwater). The PP ensures that the citizens of Pune get a chance to preserve their natural groundwater resources for future generations since PP recycling and reusing wastewater for gardening and captive processes, which is currently unutilized by the local industry. The PP could have alternately dug fresh borewells or used existing drinking water sources for their captive water and gardening requirements.
 3 – Ensure healthy lives and promote well-being for all at all ages	3.9: By 2030, substantially reduce the number of deaths and illnesses from hazardous chemicals and air, water and soil pollution and contamination	The PP showcases how recycling and reusing wastewater can prevent depletion of natural water reserves and prevent water scarcity during droughts. The PP ensures water availability in water-scarce zones that help promotes healthy lives and well-being.
 7- Ensure access to affordable, reliable, sustainable and modern energy for all	7.a by 2030 enhance international cooperation to facilitate access to clean energy research and technologies, including renewable energy, energy efficiency, and advanced and cleaner fossil fuel technologies, and promote investment in energy infrastructure and clean energy technologies	The PP facilitate access to clean energy research and technology and promotes investment in energy infrastructure and clean energy technologies related to water and wastewater treatment.

11-Make cities and human settlements inclusive, safe, resilient and sustainable	11.A**:** Support positive economic, social and environmental links between urban, peri-urban and rural areas by strengthening national and regional development planning	The PP enhancing inclusive and sustainable urbanization via the project activity.
6-Ensure access to water and sanitation for all	6.3: By 2030, improve water quality by reducing pollution, eliminating dumping and minimizing release of hazardous chemicals and materials, halving the proportion of untreated wastewater and substantially increasing recycling and safe reuse globally	The PP has showcased recycling and safe reuse of 4983 million liters within the industry during this monitored period.
8 – Promote inclusive and sustainable economic growth, employment and decent work for all	8.5: By 2030, achieve full and productive employment and decent work for all women and men, including for young people and persons with disabilities, and equal pay for work of equal value 8.6 By 2020, substantially reduce the proportion of youth not in employment, education or training	Number of jobs created Number of people trained

17 PARTNERSHIPS FOR THE GOALS 17 – Strengthen the means of implementation and revitalize the global partnership for sustainable development	17.7: Promote the development, transfer, dissemination and diffusion of environmentally sound technologies to developing countries on favourable terms including on concessional and preferential terms, as mutually agreed	PP will monetize the water credits via the virtual water footprint market internationally.

Several states in India are water stressed 54% of India faces High to extremely high water stress and 54% of ground water wells are decreasing– WRI. The report also says that there would be no ground water for irrigation by 2025 in Delhi, Rajasthan and Haryana. UNESCO Report says India holds the number 1 spot for the annual Ground water extraction at 251 cu.Km as against 112 cu.km in China and USA, a distant second. c. Competing demands for water from agriculture and domestic use has limited industrial growth.

Decades of misuse, poor management, over extraction of groundwater and contamination of freshwater supplies have exacerbated water stress worldwide. In addition, countries are facing growing challenges linked to degraded water-related ecosystems, water scarcity caused by climate change, underinvestment in water and sanitation and insufficient cooperation on trans boundary waters.

The project activity also encourages companies, especially large and transnational companies in the biotechnology and biopharmaceuticals sector, to adopt similar sustainable practices in regards to captive water requirements and groundwater management.

A.7.1 Objectives or Outcomes

The impact assessment or objectives of this project activity can generally be enumerated as follows:

- The project activity highlights the catalytic role that corporate India must play in reducing industrial water consumption as well as water pollution per unit of industrial output.
- The PP has showcased technology that **creates safe drinking and industrial grade water from an effluent source and has overcome the challenges faced by the alternate methods implemented and/or being proposed for the same.**
- The PP has showcased the successful wastewater treatment of industrial effluent, thus saving millions of liters of safe drinking water for the city dwellers from existing resources.
- The project activity showcases best-in-class wastewater treatment technology that can replace the equivalent freshwater and industrial demand in different sectors for non-potable purposes while reducing the proportion of untreated wastewater and substantially increasing recycling and safe reuse in India.

A.7.2 Interventions by Project Owner / Proponent / UCR Member

The National Guidelines on Zero Liquid Discharge developed by CPCB, India, for industrial sectors highlights the zero effluent discharge norms. The CGWB Master Plan for Artificial Recharge to Ground Water in India, 2013 emphasizes careful monitoring for regarding the treated urban wastewater in order to avoid any possibility of contamination of ground water. The Prime Minister's Krishi Sinchayi Yojana emphasises exploring the feasibility of reusing treated municipal used water for peri-urban agriculture. The vision expressed in the National Framework on the Safe Reuse of Treated Water, 2021 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 socio-economic benefits by adopting a sustainable circular economy approach" (MoJS, 2020) and accordingly requisite recommendations are made in the framework. The intervention by the PP meets the National Framework on the Safe Reuse of Treated Water, 2021 guidelines.

The ancient river, Mula-Mutha, has been battered by floods, encroachments, and rampant constructions causing massive environmental damage. Turned into a sewer and a dumping site over the years, the neglected river is heavily polluted and filthy, according to published news reports. As the river enters Pune city, it is suffocated and reduced to a large sewer with a tell-tale stink. The city's domestic waste, industrial waste, raw sewage and religious waste are directed into it. Under the Sangam bridge and Kalyani Nagar bridge, methane bubbles and surf are regular sights, plastic and cloth rags stuck on rocks and overhanging branches are a common sight. Black-winged stilts, one of the few birds still spotted in the Mula-Mutha, stand as ecological markers of pollution with their slender pinkish red legs wading through blackish-green water. The once bird-populated banks and islands within the river have only a few species such as spot-billed ducks, the occasional heron or pair of storks, sandpipers, a few cormorants, and black kites. The Mula-Mutha river, that flows along a 22-km stretch through Pune city, was Maharashtra's second-most polluted river (2018), containing human and animal excreta three times more than the safe limit, according to the Maharashtra Pollution Control Board (MPCB) (*source:* *https://www.hindustantimes.com/india-news/excreta-in-mula-mutha-three-times-above-safe-limit-mpcb/story-f1IOlpTOAtKYJakNIV6LQK.html*.)

The project activity hence achieves the sustainable management and efficient use of India's natural resources since the PP had the option to install bore wells that would have depleted the local groundwater resources and/or continued to use existing drinking water resources in the surrounding area. The PP has instead intervened and chosen to treat and reuse ETP effluent voluntarily at significant costs, thus saving millions of liters of safe drinking water for the city.

Increase in population density and improvement in quality of life has resulted in an increase in demand of natural resources like water. Groundwater being the major source of water supply catering to about 85% of rural water supply, the stress on groundwater is ever increasing. It has resulted in over-exploitation of the resources at places. The situation demands for a reorientation of the strategy for its development and management.

The intervention of the PP has had a direct impact on the water security of the area. Over-development of the ground water resources results in declining ground water levels, shortage in water supply, intrusion of saline water in coastal areas and increased pumping lifts necessitating deepening of ground water structures and increase in power costs.

A.8. Feasibility Evaluation

The installed ETP and recycling systems by the PP are robust and can handle wastewater effluent fluctuations in load easily.

A.9. Ecological Aspects:

The project activity achieves the sustainable management and efficient use of India's natural resources since the PP had the option to install bore wells that would have depleted the local groundwater resources and/or continued to use existing drinking water resources in the surrounding area. The PP has instead chosen to treat and reuse the ETP effluent, thus saving millions of liters of safe drinking water for the city.

The project activity also encourages companies, especially large and transnational companies in the biotechnology and biopharmaceuticals sector, to adopt similar sustainable practices in regards to captive water requirements and groundwater management.

Ecological Issues addressed by the project activity in terms of	
Inundation of habitated land	The project does not lead to inundation of residential land.
Creation of water logging and vector disease prevention mitigation	The ETP effluent is purified through a combination of ultrafiltration, reverse osmosis and UV light to create safe drinking water that complies with all national and international standards such a like USEPA/WHO/BIS-10500
Deterioration of quality of groundwater	By avoiding the use of borewells the project activity does not deplete aquifers and hence prevents the depletion of groundwater resources.

A.10. Recharge Aspects :

NA.

A.10.1 Solving for Recharge

Water Budget Component	Typical Estimated Uncertainty (%)	Description
Surface Inflow	NA	The total quantity of treated ETP wastewater is measured via flow meters and recorded daily.
Precipitation	NA	NA
Surface Outflow	NA	NA.
Evapotranspiration	NA	NA
Deep Percolation	NA	NA

A.11. Quantification Tools

Baseline scenario

The baseline scenario is the situation where, in the absence of the project activity, the PP would have **one or all** of the below options:

- (a) installed multiple bore wells within the project boundary which would have depleted the local groundwater resources (aquifers); ***and/or***
- (b) diverted existing safe drinking water resources from the surrounding residential area; **and/or**
- *(c) discharged the ETP effluent without further treatment, recycling and reuse.*

Hence the baseline scenario applicable is:

"the net quantity of treated ETP effluent / wastewater that would be discharged directly into the local drain/sewer without further being recycled and/or reused daily post treatment per year"

The net quantity of treated water used is measured via flow meters installed at the site. For conservative purposes, the working days or operational days have been assumed at **330 days** in a year during the 1st monitoring period.

Location	Hadapsar ETP	Manjri ETP
ETP Capacity	ETP plant capacity: 1.5 MLD (from 2012 to 2020) ETP plant capacity: 2.5 MLD (from year 2021)	ETP plant capacity: 1.0 MLD (from 2017 to 2022)
Quantity Recycled and Reused	2012-2020: 1.2 MLD 2021-2022: 1.7 MLD	2017-2022: 0.55 MLD
Gainful End Use	Cooling towers / Boilers / Gardening / Landscaping	

Year	Total ETP Capacity Installed (MLD)	Total ETP Effluent Treated (MLD)	Quantity Recycled and Reused in Process Cooling (MLD)	Total Quantity Reused for cooling and gardening (MLD)
2014	1.5	0.9	0.6	1.2
2015	1.5	0.9	0.6	1.2
2016	1.5	0.9	0.6	1.2
2017	2.5	1.5	1.0	1.75
2018	2.5	1.5	1.0	1.75
2019	2.5	1.5	1.0	1.75
2020	2.5	1.5	1.0	1.75
2021	3.5	2.9	1.6	2.25
2022	3.5	2.9	1.6	2.25

Quantification

Year	Total RoUs (1000 litres) /yr UCR Cap (1 million RoUs/yr)
2014	396000
2015	396000
2016	396000
2017	577500
2018	577500
2019	577500
2020	577500
2021	742500
2022	742500
Total RoUs	4983000

A.12. UCR Rainwater Offset Do No Net Harm Principles

According to the UCR RoU Standard principles, the project activity accomplishes the following:

• *Increases the sustainable water yield in areas where over development has depleted the aquifer*
According to the data released by the Central Groundwater Board in 2021, the total amount of groundwater that can be utilised in India in a year is 398 billion cubic meters (BCM), of which, approximately 245 BCM is currently being utilised, which is about 62 per cent of the total. But the level of exploitation of groundwater is very high in States like Punjab, Rajasthan, Haryana, Delhi and Tamil Nadu. This project activity was commissioned in 2012, and the PP has reduced the proportion of untreated wastewater that future generations would need to recycle and has showcased recycling and safe reuse within the industry from unutilized water resources. Revenue from the sale of UCR RoUs will enable scaling up of such project activities.
• *Collect unutilized water or rainwater and preserve it for future use*
In India, at the district level, in 24 states/UTs, as many as 267 districts had stages of groundwater extraction more than 63 per cent, ranging from 64 per cent to 385 per cent (source: https://www.business-standard.com/article/current-affairs/from-58-to-63-india-pumped-more-groundwater-between-2004-and-2017-121122101377_1.html). This project activity serves as an example to recycle and reuse wastewater and encourages companies, especially large and transnational companies in the biotechnology and biopharmaceuticals sector, to adopt similar sustainable practices in regards to captive water requirements and groundwater management.
• *Conserve and store excess water for future use*
The project activity decreases the dependence on groundwater, thereby preventing excessive depletion. Between 2014 and 2022, the project activity has reused **4983 million litres** of ETP effluent successfully post treatment with gainful end use of the same.

MAHARASHTRA POLLUTION CONTROL BOARD

Phone : 4010437/4020781 /4037124/4035273
Fax : 24044532/4024068 /4023516
Email : enquiry@mpcb.gov.in
Visit At : http://mpcb.gov.in

Kalpataru Point, 3rd & 4th floor, Sion- Matunga Scheme Road No. 8, Opp. Cine Planet Cinema, Near Sion Circle, Sion (E),
Mumbai - 400 022

Consent order No :- Formate1.0/ BO/CAC-Cell/ EIC No PN-19789-13/2nd *CAC/* CAC-4630
Date- 17/05/14
To,
M/s. Serum Institute of India Ltd,
Off Soli Poonawalla road,
Plot No 212/2,Pune-Solapur Road,
Hadapsar, Tq. Haveli, Dist. Pune

Subject: Renewal of consent RED category.
Ref : 1. Earlier Consent granted vide no. BO/PAMS/R/EIC NO.PN-16264-12/CAC-814 dated 24/01/2013.
2. Minutes of CAC meeting held on 28.04.2014

Your application: CR1311000018
Dated: 07/11/2013
For: Renewal of consent
under Section 26 of the Water (Prevention & Control of Pollution) Act, 1974 & under Section 21 of the Air (Prevention & Control of Pollution) Act, 1981 and Authorization under Rule 5 of the Hazardous Wastes (M, H & T M) Rules 2008 is considered and the consent is hereby granted subject to the following terms and conditions and as detailed in the schedule I, II ,III & IV annexed to this order:

1. The consent is granted for a period from 01.01.2014 to 30.04.2015.
2. The actual capital investment of the industry is Rs. 1268.69 Crs. (As per C.A. Certificate).
3. The Consent is valid for the manufacture of

Sr. No.	Product Name	Maximum Quantity
1	Bacterial Vaccines	5.6 lac vials per day
2	Viral/hepatitis B Vaccines	5.6 lac vials per day
3	Loan License/Pharma Products	4.0 lac vials per day

4. Conditions under Water (P&CP), 1974 Act for discharge of effluent:

Sr. no.	Description	Permitted quantity of discharge (CMD)	Standards to be achieved	Disposal
1.	Trade effluent	1204	As per Schedule –I	60% Recycle in the process and remaining shall be used for gardening purpose/ drained into local drainage
2.	Domestic effluent	96	As per Schedule –I	

5. Conditions under Air (P& CP) Act, 1981 for air emissions:

Sr. no.	Description of stack / source	Number of Stack	Standards to be achieved
1	Boiler (8 nos)	8	As per Schedule -II
2	Incinerator	1	As per Schedule –II
3	DG set (17 nos)	8	As per Schedule –II

M/s Serum Institute of India SROPune/I/R/L/21137000 Page 1 of 10

MPCB Consent for Hadapsar ETP

MAHARASHTRA POLLUTION CONTROL BOARD

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/4037124/4035273
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Visit At : http://mpcb.gov.in

MAHARASHTRA

Kalpataru Point, 3rd & 4th floor, Sion-Matunga Scheme Road No. 8, Opp. Cine Planet Cinema, Near Sion Circle, Sion (E), Mumbai - 400 022

Consent order No.:- Format 1.0/BO/CAC-Cell/UAN No. 0000054760/E/6th CAC- 1903000697
Date- 13|03|2019

To,
M/s Serum Institute of India Pvt. Ltd. (PBP-I),
S. Nos. 105/1A, 109, 110, Manjari,
Tal. Haveli, Dist. Pune - 400 705.

Subject: Grant of combined Consent to Establish and Biomedical Authorization under Red/ LSI category.
Ref.: 1. Minutes of Consent Appraisal Committee meeting held on 07/12/2018.

Your application UAN Nos. 0000054760 & 0000017436
dtd: 18/08/2018
For: for grant of combined Consent to Establish & Biomedical Authorization under Section 25 of the Water (Prevention & Control of Pollution) Act, 1974; under Section 21 of the Air (Prevention & Control of Pollution) Act, 1981; Authorization under Rule 6 of the Hazardous & Other Wastes (Management & Transboundary Movement) Rules 2016; and Authorization under Biomedical Waste Management Rules 2016 is considered and the Consent is hereby granted subject to the following terms and conditions and as detailed in the schedule I, II, III, IV & V annexed to this order:

1. **The Consent to Establish is granted for a period up to commissioning of the industry or up to 5 year whichever is earlier.**
2. **The Capital investment of the industry is Rs. 215.44 Crs as per undertaking submitted by industry.**
3. **The Consent is valid for the manufacture of –**

Sr. No.	Product / By-Product Name	Maximum Quantity & UOM
1	Biotech Product	1,350 Million Dozes Nos./A

4. **Conditions under Water (P&CP), 1974 Act for discharge of effluent:-**

Sr. No.	Description	Permitted quantity of discharge (CMD)	Standards to be achieved	Disposal
1	Trade effluent	1,900	As per Schedule-I	To Common ETP provided by the developer M/s SEZ Biotech Services Pvt. Ltd. for the treatment & disposal.
2	Domestic effluent	235	As per Schedule-I	To Common STP provided by the developer M/s SEZ Biotech Services Pvt. Ltd. for the treatment & disposal.

"M/s Serum Institute of India Pvt. Ltd. (PBP-I)", SRO Pune II/ UAN No. 0000054760 *Page 1 of 12*

MPCB Consent for Manjri ETP

A.13. Scaling Projects

While cities in India are facing water supply and demand issues, India's water sources – groundwater, rivers and other water bodies – are facing contamination from domestic and industrial pollution leading to deteriorating water quality. Direct disposal of untreated wastewater and fecal sludge into the open, increases the burden of cities to provide drinking water supply to its residents.

The Central Pollution Control Board (CPCB) has identified 351 polluted river stretches on 323 rivers across the county that do not meet the water quality criteria. According to CPCB's national inventory of Sewage Treatment Plants (STP) published in March 2021, urban India treats only 37 per cent of the 72,368 million liters of sewage generated every day, with about two-thirds of the wastewater ending up polluting the environment.

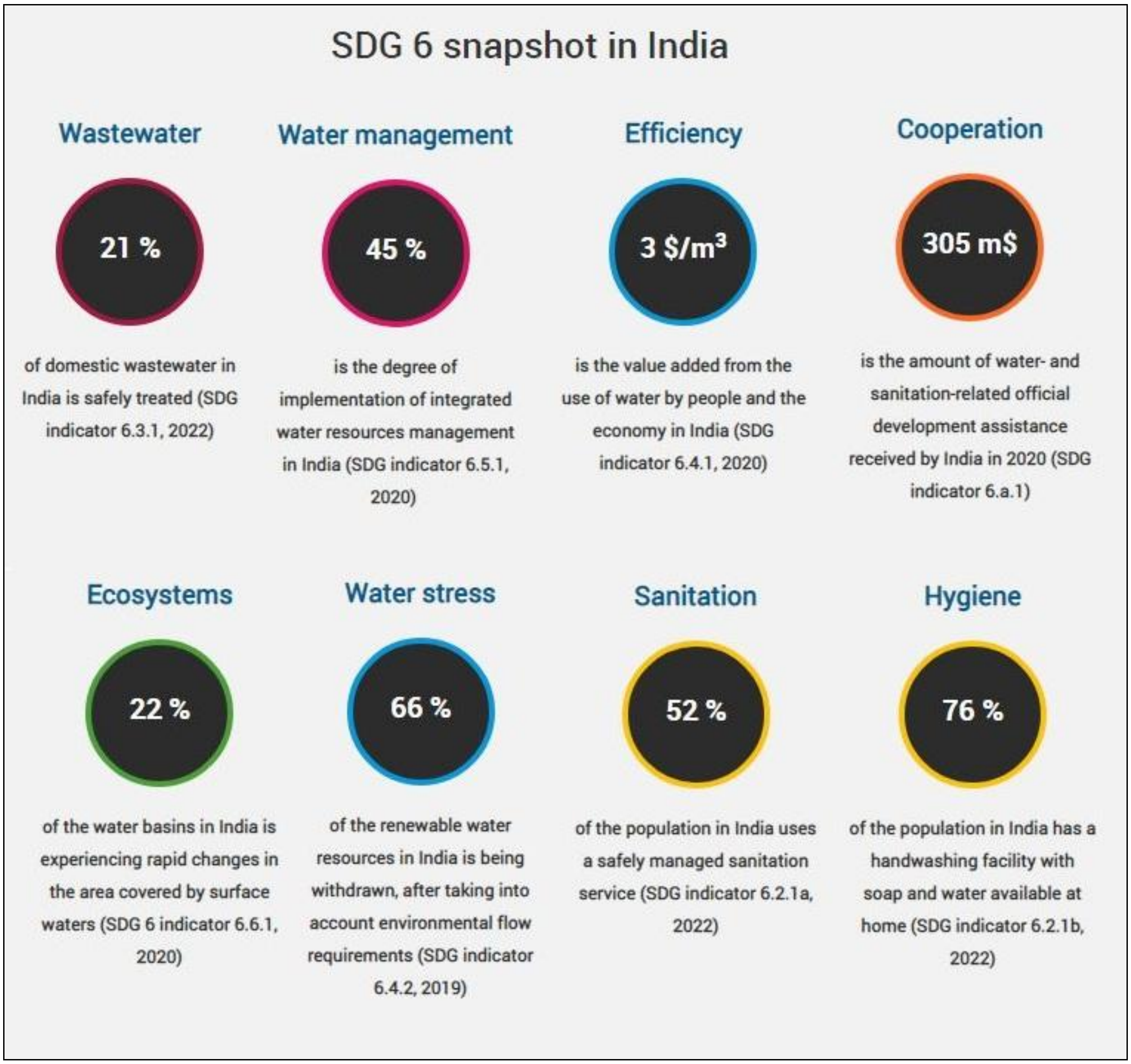
If India could implement 100 percent treatment and reuse of treated wastewater and fecal sludge from Indian cities by 2025, it can potentially meet over 70 percent of water requirement of industry and energy sector and irrigate 2 to 6 million hectares of land annually while yielding benefits from reduced fertilizer usage. Nutrient recovery from wastewater can yield up to 4,000 to 5,500 tons per day which can meet the demand for integrated nutrient management for about 400,000 ha of farmland annually. Reuse of wastewater in agriculture has the potential to reduce greenhouse gas emissions by over 2 million tons of CO_{2e} annually through decreased groundwater pumping and replacing chemical fertilizer (source: *https://timesofindia.indiatimes.com/blogs/voices/wastewater-and-faecal-sludge-reuse-to-address-indias-water-and-food-security/?source=app&frmapp=yes*)

While several studies highlight the potential of various water–demand management interventions (*Chakraborti, Kaur, and Kaur 2019*), one area that researchers have begun to explore only of late is the reuse of treated wastewater (*Goyal and Kumar 2022*). It is receiving increasing traction given that India generates about **72,368 million litres of wastewater per day** in urban areas alone (CPCB 2021); if treated (to the desired quality standard) and reused, this offers tremendous potential in addressing the water supply and demand gap on one hand and reducing the pressure on freshwater resources on the other.

However, the reuse and recycling of treated wastewater has still not become mainstream in India. Only a few Indian states have framed policies and guidelines to promote the reuse of TWW (Goyal and Kumar 2022). Further, a national-level framework on the safe reuse of treated water that provides guidelines on preparing reuse policies was launched only as recently as January 2023. Therefore, the existing state policies might also require a thorough revision to make them comprehensive and channel the financial and technical support available through national programmes, such as the Atal Mission for Rejuvenation and Urban Transformation (AMRUT) and Namami Gange. While the augmentation and rehabilitation of the existing sewerage systems and recycling of water for beneficial purposes, including the reuse of TWW, are important components of AMRUT, creating additional sewerage treatment capacity in the states sharing the Ganga river basin is a priority under the Namami Gange programme.

In the developing world, cities in Brazil, Mexico, Kuwait, and India have constructed or are planning projects, for potable water reuse. Their possibilities to succeed are limited as projects would have to be implemented within regulatory, institutional, governance, management, financial and technological frameworks that are robust and promote innovation, and utilities would have to ensure technical, managerial and financial capacities in the long-term. A serious limitation is that water management in general, and collection and conventional treatment of municipal and industrial wastewater in particular, are still challenging; often water quality standards and monitoring are poorly enforced, and risk assessment frameworks are lacking. Irrespective of how important potable water reuse is for clean water and sanitation goals at local, regional and national levels, challenges remain for its extended implementation.

Revenue from water credits (RoUs) provides a much needed incentive to encourage voluntary treatment and reuse of similar ETP effluents across industries, enabling them to be built at the scale and speed demanded by the present climate and global heating crisis.



Source

Appendix 1

Human Development Index (HDI) Ranking

From the 2020 Human Development Report

India

-	Rank	Country	HDI value (2019)	Life expectancy at birth (years) SDG3	Expected years of schooling (years) SDG 4.3	Mean years of schooling (years) SDG 4.6	Gross national income (GNI) per capita (PPP $) SDG 8.5
	131	India	0.645	69.7	12.2	6.5	6,681

Source: **Human Development Report Office 2020.** • Created with **Datawrapper**