Clean Water and SanitationWater Reuse Policy

Reuse of Treated Wastewater

Reusing wastewater after appropriate treatment can successfully solve the emergency situations that may happen in regions withinsufficient water resources. Household drains, as well as municipal or industrial, can be recycled. Reuse is allowed if full environmental safety is ensured (i.e. no harm to the existing ecosystem, soil and cultural plants), and any sanitary risk for the local population will be eliminated. This requires strict following of existing regulations in protecting health and safety and current codes for industry and agriculture.

Reusing wastewater after its treatment may be a good alternative for regions that lack pure water or have limited access to water resources. Reuse technologies may be applied to municipal and industrial wastewater. Reuse of wastewater is only possible if sanitary and environmental safety is provided with no hazard to the current ecosystem. That fact requires strict fulfilment of laws and regulations. To be reused, wastewater must follow a certain sequence of treatment procedures to reduce the concentration of pollutants in it. That might be traditional methods (waste separation, sedimentation), methods of removal of certain components (nitrogen and phosphorus), and disinfection.

Water security is an imminent issue in India. As per our analysis using the Central Water Commission (CWC) estimates on basin-wise water availability (CWC 2021), 11 out of the 15 major river basins in India will experience water stress by 2025, with annual per capita renewable water availability below 1,700 cubic meters. Hence, it is essential to explore alternative water sources to address the demand–supply gap. India treats only 28 per cent of the total sewage it generates per day from urban centres (CPCB 2021). Out of the 72,368 million litres per day (MLD) of sewage produced in urban centres, the actual treatment is only 20,236 MLD (CPCB 2021). Class I cities (those whose population is above 1,00,000) and class II cities (with populations of 50,000– 99,999), which represent a major share (72 per cent) of the total urban population, produce an estimated 38,254 MLD of sewage, of which only 30 per cent is actually treated (CPCB 2021). The untreated wastewater is then

discharged into freshwater bodies, such as rivers. Given the exponential amount of wastewater generated in the country, India has immense potential to meet the growing water demand across different sectors and improve the water environment with proper management. Through this study, we intend to estimate the market potential for the reuse of treated wastewater (domestic sewage) at the national scale and make recommendations to strengthen the existing governance on reuse.

Economic and market potential of TWW reuse

- 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, 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 our analysis, about 8,603 MCM of treated wastewater was available for reuse in the irrigation sector in 2021; this could have replaced the equivalent freshwater demand for irrigation. It could irrigate 1.38 million hectares (Mha) of land, equivalent to about nine times the area of New Delhi (Figure ES1). By 2050, this would go 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. We estimate that 28 million metric tonnes (MT) of the produce of selected horticulture crops could have been generated using the available treated wastewater for irrigation in 2021. This produce could have further generated revenue of INR 966 billion
- Around 6,000 metric tonnes (MT) of nutrients could have been recovered from the available TWW in 2021, generating savings of INR 50 million. As per our estimates, the nutrients supplied by currently available TWW (for irrigation use in 2021) amount to more than 6,000 tonnes. Further, considering the market value of the nutrient load, we estimate that the total savings from the reduction in fertiliser use through irrigation using TWW would have been more than INR 50 million.
- Reusing TWW in irrigation could have reduced greenhouse gas (GHG) emissions by 1.3 million tonnes in 2021. Our analysis 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, further reducing GHG emissions by 0.3 million tonnes.

INR 630 million would have been the market value of treated wastewater in 2021. Our analysis suggests that the market value of the treated wastewater available in 2021 (11,622 MCM) would have been over INR 630 million if we had the mechanism to sell treated wastewater to different sectors for reuse. The market value will substantially increase to over INR 830 million in 2025 and INR 1.9 billion in 2050 at the current market rate.

Advantages of Reuse of Treated Wastewater

1. Improvement of the economic efficiency of investments in wastewater disposaland irrigation
2. Conservation of freshwater resources
3. Recharge of aquifers through infiltration water (natural treatment)
4. Use of the nutrients of the wastewater (Nitrogen & Phosphate)
5. Reduction of the use of synthetic fertilizer
6. Improvement of soil properties
7. Reduction of treatment costs
8. Beneficial influence of a small natural cycle
9. Reduction of environmental impacts

The treated wastewater from the percolation ponds in Vel Tech premises is used for recharging the groundwater and irrigating the gardens and cultivable landfall or growing crops.

Total Benefits Accrued (Tangible & Intangible)

The collection of treated wastewater and rainwater and the effective management of groundwater resources have a huge impact on the environment and the economy's growth.

Tangible Benefits

1. The wastewater is treated and utilized for gardening and crop cultivation
2. The treated wastewater is used for groundwater recharge
3. Rainwater harvesting is also used for groundwater recharge
4. There is a saving on electricity

Intangible Benefits

1. The protection of the environment in the sense of reducing water pollution and maintaining the fertility of the land for cultivation.
2. The treated wastewater becomes unhazardous to living beings. The above contributes directly to the Nation Building.

What Vel Tech Institutions have done for wastewater treatment, the technique of rainwater harvesting, storing treated wastewater in a percolation pond, and the effective utilization of treated wastewater is innovative and creative. The same can be done by any organisation or an individual interested in preserving natural resources, namely water.