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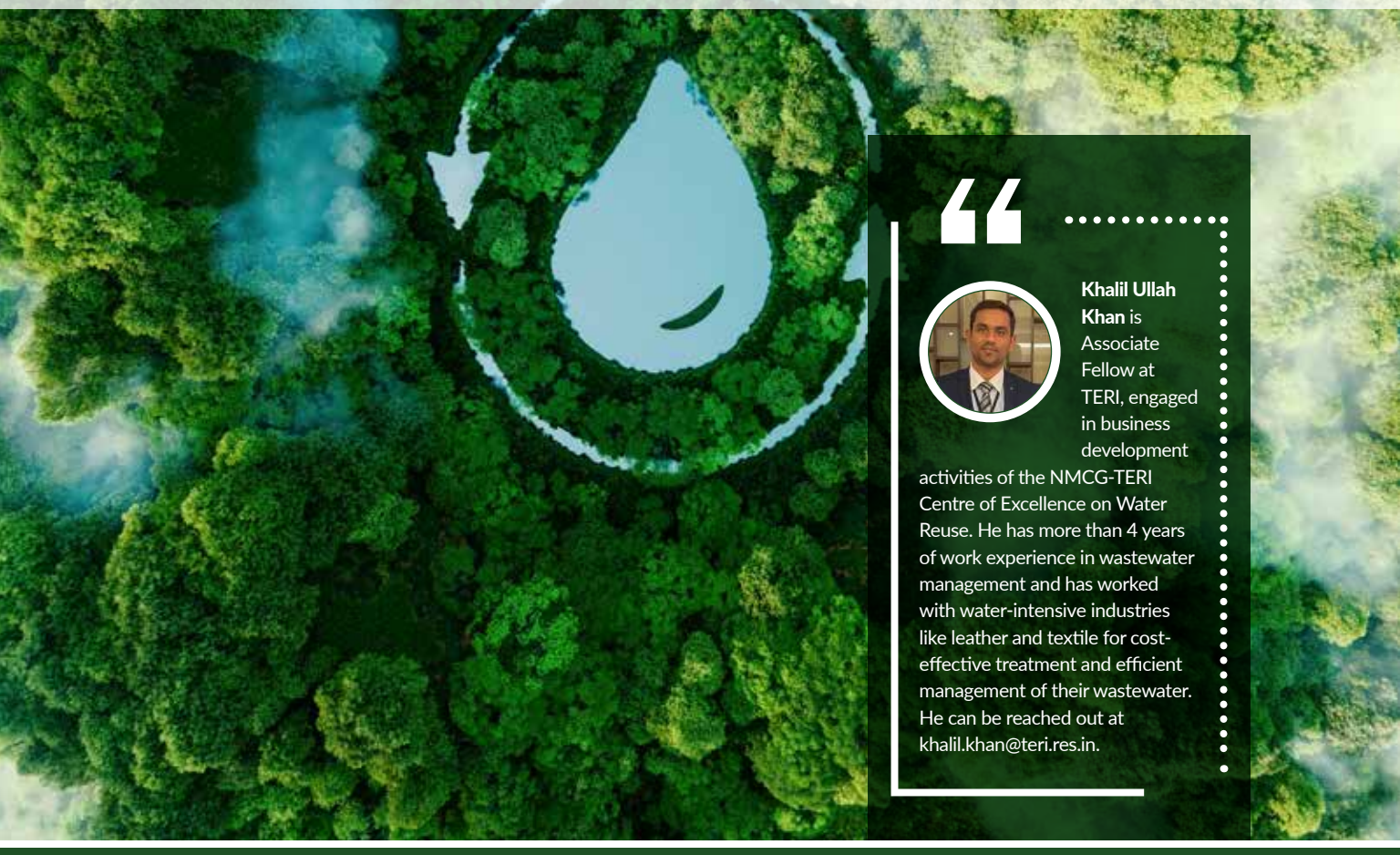
Wastewater Reuse: Linear Economy to Circular Economy



Khalil Ullah Khan is Associate Fellow at TERI, engaged in business development activities of the NMCG-TERI Centre of Excellence on Water Reuse. He has more than 4 years of work experience in wastewater management and has worked with water-intensive industries like leather and textile for cost-effective treatment and efficient management of their wastewater. He can be reached out at khalil.khan@teri.res.in.

Water is a common ingredient of many activities in our daily life, be it drinking, domestic, industrial, or any other. The water generated once the activity is complete, is known as wastewater. In this article, **Khalil Ullah Khan**, throws light on the significance of wastewater treatment and enlightens us how circular economy in wastewater can ensure water security and generate business models. Wastewater is not an end—it is a means to end—water.

Growing Global Water Challenge

Have you ever wondered, how life would be without water. Let me give you a vivid illustration of the same. There would be no food to eat, there would be nothing to drink, the industrial production will come to a halt and the life on earth as we know will become non-existent. Increasing population, industrialization, and unplanned urbanization is incessantly increasing the stress on earth's freshwater resources when 2 billion people are already living in water-stressed areas (UN Water 2021). The World Bank estimates that the world's water demand is projected to exceed supply by 40% by 2030 (UNESCO 2021). Therefore, the growing water scarcity and related challenges need to be identified and addressed promptly in an integrated manner. It is only through careful planning and management of water resources that we can ensure water security.

Wastewater

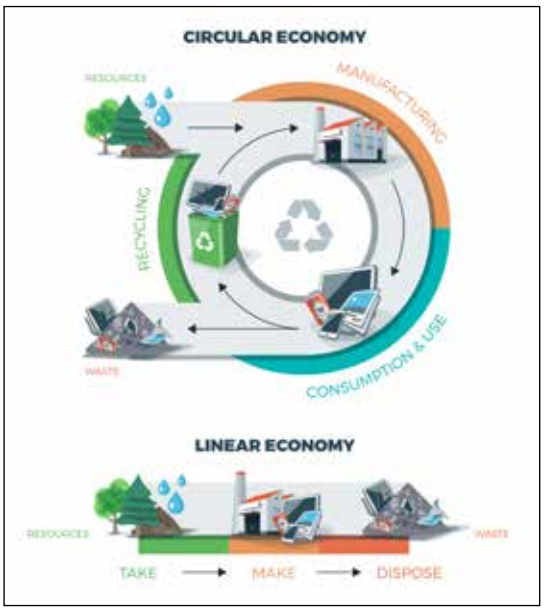
Water is used for many activities in our daily life, be it drinking, domestic, industrial or any other. The water generated once the activity is complete, is known as wastewater. Wastewater may contain energy, water, organics, phosphates, nitrogen, cellulose, rare earths, and other resources depending on the type of wastewater. These resources can be recovered for reuse if the wastewater is effectively collected and efficiently treated.

As per Central Pollution Control Board (CPCB), India generates about 29,129 million litres per day (MLD) of sewage against which the installed sewage treatment capacity is 6190 MLD, remaining 22,939 MLD (~79%) goes untreated into the environment which further creates various water-related challenges. Numerous water-borne diseases and water problem are result of untreated or inadequately treated wastewater. The data states that there is a huge need of investment in water treatment infrastructure to capture its potential fully. The size of municipal water and wastewater market in India is estimated to be US$2 billion in FY 2020 (EY–ASSOCHAM 2019).

Paradigm Shift: Linear to Circular Economy

In linear economy, the emphasis is given on simply treating the wastewater to meet regulatory norms and discharge. The linear approach of abstracting water, utilizing, collecting, treating and discharging is not sustainable.

Owing to high capital and operational cost and lack of incentives for reuse, the wastewater is considered a liability and burden by both industry and municipality in India, instead of a resource.



Wastewater can be treated to different qualities, depending on the need of the user to satisfy the demand and can be reused. Treated wastewater reuse will reduce stress on freshwater sources and can be a potential solution towards a water secure India. Therefore, it is important to include wastewater reuse in the hydrological cycle as a potential source of water.

As per Ellen McArthur Foundation, “A circular economy is an industrial system that is restorative or regenerative by intention and design. It is an economic system aimed at minimizing waste and making the most of resources.”

Wastewater is an untapped resource and incorporating principles of circular economy in wastewater management is that “maximum resource recovery and reuse of treated wastewater can change a costlier treatment system into a system which is financially sustainable and generate value for investors”. Resources recovered in the forms of energy, reusable water, biosolids, and other resources from wastewater treatment, can generate revenue for the treatment plant to cover the operation and maintenance cost of the plant partially or fully.

The circular economy approach in wastewater treatment is also essential to achieve the Sustainable Development Goals which focus on improving water-use efficiency, reducing number of individuals suffering from water scarcity, and restoring water-related ecosystems, among other relevant targets.

In India, the policies target municipal corporation for development and operations of wastewater treatment infrastructures which in most cases lack the techno-financial capability to supply services satisfactorily. Therefore, private sector involvement through various public–private partnerships is necessary to improve the treatment infrastructure of the country. Currently, the private sector is reluctant to invest in this field due to almost negligible returns and

remarkably high risk, however, the change to circular economy will open new streams of revenue, enabling business models which will promote and attract private sector investment to close the funding gaps.

As the urbanization increases and the availability and distribution of water resources is being altered by climate change, in near future it will become extremely difficult to meet the demand for water. Therefore, future development in India requires methodologies that reduce freshwater consumption, promote reuse of treated wastewater, and focus on resource recovery under principles of circular economy. Currently, there is nearly total absence of regulatory framework for water reuse and resource recovery from wastewater in India. However, Indian Governments new programme, Arth Ganga, promotes reuse of treated wastewater for irrigation, industries and revenue generation for urban local bodies (ULBs).

To achieve the goals of circular economy, wastewater initiatives, policies and regulatory frameworks need to be planned at distinct levels keeping the demand of different sectors in focus and the paradigm shifts from linear to circular economy will need to overcome numerous institutional, economic, regulatory, social, and technological challenges. One of the biggest problems which will be the most challenging to overcome, is that the water in India is highly undervalued. The reuse of water will remain a challenge till the time treated water does not become cheaper than freshwater.

Water scarcity is a global concern and cannot be neglected. It is time, we start considering wastewater a resource and wastewater treatment facilities as 'water resource recovery facilities'.

Case Study: San Luis Potosi, Mexico

A case from San Luis Potosi State of Mexico can help illustrate the significance of reusing wastewater. The State is a water-scarce region. Rapid urbanization and intensive industrialization led to rapid aquifer depletion. But the state government recognized the value of wastewater and started utilizing it rather than disposing it. The state government built seven wastewater treatment plants in the region with an objective to treat 100% of the wastewater. The treated water is provided to industries at 33% cheaper rate than the groundwater which has benefitted both industry and the plant. The intervention has also resulted in reduction of groundwater extraction by 48 million m^3 in six years, resulting in restoration of aquifer. The business model with extra stream of revenue also attracted the private sector to partially fund the capital cost of the plant under PPP agreement. (Wastewater: From waste to resource, The case of San Luis Potosi, Mexico, World Bank Group)

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