Water Conservation and Reuse Policy

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Introduction

Water is the prime source of the existence of mankind. Living beings need water for most of their activities like agriculture, industries, and domestic purposes such as bathing, washing, drinking, etc. Unfortunately, access to safe freshwater has become quite challenging these days. Throughout the world, the availability of water is threatened because of population growth, climatic variations, and changes in land and water use patterns. The water cycle is also affected by human activities like the reduction of forest areas and grasslands, urbanization, etc. causing reduced groundwater recharge, overexploitation of groundwater resources, seawater intrusion, pollution of surface water resources due to the discharge of untreated industrial and municipal wastewater, etc. It can be said that water availability is becoming scarce in many regions worldwide, especially in developing countries like India.

India is imminent to be the most populated country in the world which will lead to higher water demands. The geographical area of India covers approximately 329 million hectares containing 4% of the world's water resources. Though the average annual water resources potential is 1869 billion Cubic Metres (BCM), the amount of water that can be actually used beneficially is much less i.e. 1123 BCM due to severe limitations posed by physiographic, topography, political issues, and the present state of technology to harness water resources economically. India receives an annual rainfall of approximately 4000 BCM which is more than enough to fulfill the water demand. However, only a small portion of this rainfall could be used effectively owing to its variability over time and space, limiting the water availability and available surface and groundwater storage.

The water problems in India mainly comprise of spatio-temporal variation of water resources leading to lesser water availability even for the present population, exhausting surface and groundwater resources and highly polluted water bodies. It has been estimated that by the year 2030, the annual demand will be much higher as compared to the available water supply. Research indicates that there will be an expected gap of approximately 50% between the water demand and supply.

To address the existing and anticipated water shortages, water resource planners are in search of alternative sources to enhance the limited freshwater resources at a global level. One of the alternate management approaches is the use of recycled or reclaimed water, most known as, reuse of treated wastewater.

While discussing water reuse, it is very important to define three similar terms i.e. water recycling, water reclamation and water reuse. The terms "reused" and "recycled" are often used interchangeably. Recycled Water generally refers to treated domestic wastewater that is used more than once before it passes back into the water cycle. Reclaimed water is not reused or recycled until it is put to some purpose. It can be reclaimed and be usable for a purpose, but not recycled until somebody uses it. Water reuse is defined as the use of water which is generated from wastewater and that

achieves, after treatment as necessary, a quality that is appropriate (taking in account the health and environment risks) for its intended use such as irrigation, industrial or civil (municipal) in general.

Concept of Water Reuse

Wastewater is a growing resource that needs to be managed and used efficiently. Water reuse can serve as an alternative to existing water supplies and be used to enhance water security, sustainability, and resilience. Reuse of treated wastewater has emerged as an environmentally sustainable option that has helped many global communities significantly in managing wastewater and augmenting their water supplies.

Water reuse offers the following benefits:

- Augmentation of existing sources
- Environment friendly
- Dependable and assured source of supply
- Revenue generation options
- Resource recovery and energy savings
- Helps in increasing the quality of life, well-being, and health by improving of urban environment (e.g. urban parks and fountains).

Need for Water Reuse

The main driver to reuse water is a shortage of freshwater availability or water scarcity but due to differences in baseline climatic conditions, existing water resources, and level of economic and social development, local circumstances also contribute towards the need to reuse wastewater. In India, the major driving factors emphasizing water reuse are given below.

- Rising population
- Industrialization
- Urbanization
- Agro economy
- Irrational water tarrifs
- Climatic variations
- Technological developments
- Depleting water resources

Challenges for Water Reuse

India is still in the initial phases of wastewater reclamation and reuse. There are many barriers associated with the implementation of treated wastewater reuse projects, limiting the growth of wastewater reclamation and reuse in the country.

Generally, the set of challenges involves technical such as, physical and chemical treatment processes involved, distribution pipelines, waste disposal systems etc., financial such as funding for water reuse projects covering planning, design, construction, operation, and implementation, social and political/institutional.

A general lack of awareness, both of problems and of solutions, affects water reuse projects at all stages. Some of the challenges that have stigmatized water reuse and hindered its implementation in the country are discussed as follows.

- Backlog in laying affordable and scalable wastewater collection and treatment networks.
- Lack of effective and low-cost treatment technologies and monitoring processes to ensure adequate water quality.
- Lack of coordination between various sectors responsible for water supply and wastewater management
- No strict policies or guidelines regarding the reuse of treated wastewater
- Little attention towards public engagement and outreach

Scope of Water Reuse in India

Due to its high population, India is on the verge of being one of the most severely water-scarce countries in the world. There is a lot of potential for reuse of treated wastewater in the country. Being an agro-economic developing nation, its water resources, especially groundwater, are under stress to supply water for both agricultural and industrial activities.

To ensure a sustainable supply of water for such purposes, reclaimed water plays a major role. Recycling and reuse of treated wastewater is quite favorable as it provides an opportunity for environmental restoration by keeping the wastewater discharge out of water bodies along with providing an assured supply of water to meet the increased water demands, thereby, reducing the pressure on freshwater resources.

Nowadays, the global wastewater reuse market is being shifted to Asia. Industrial reuse of treated wastewater has boomed in response to the degradation of water resources in China and India. India is now the fastest growing market in the region, with new environmental legislation as one of the drivers.

Technology Used for Water Reuse

For safe and effective reuse of treated wastewater, it is very important to treat the wastewater confirming the desired water quality. With the development in technology, the efficacy of the treatment processes has also enhanced.

The level of treatment required is directly linked to the cost and the intended use. The higher the quality of water required, the higher the treatment costs.

Initiative for Various Policies in India

A strong legal framework serves as the backbone of an effective water reuse scheme. The overall planning, implementation, and success of reuse projects depends highly on the policies, institutional framework, and regulations. The water sector in India is governed by policies of central and state Governments as well as local bodies governing rural and urban regions. Over a period of time, many initiatives have been taken by the authorities, at both central and state levels to promote the reuse of treated wastewater as shown below.

- **2008:** National Urban Sanitation Policy; National Action Plan on Climate Change
- **2011:** National Water Mission
- **2012:** National Water Policy
- **2013:** Guidance Manual on recycling and reuse of sewage
- **2014:** Namami Gange programme; Swachh Bharat Mission
- **2016:** Ministry of Power Gazette notification; National Water Framework Law
- **2018:** Individual State Water reuse policies e.g. Gujarat, J&K, etc

Initiative by Shoolini University

Our university is working on the clean water and sanitation indicators and progressively following the different parameters. We have a system where we calculate the total inflow and usage of the water in the university and also water consumption per person. We are measuring the supply of total water from various resources. In our university, we are using a total of 290 m^3D water from three resources including six bore wells (160 KLD), IPH water supply (100 KLD), and Spring water supply (30 KLD). The total peak residential population including students and staff at the campus is 6000 persons and the floating population of the campus is about 1000 persons. The total peak water requirement is 400000 Liters (400 KLD or 57.4 Lts/person). This is less than the water requirement as specified by NBC (135 Lts/person).

We also have a water treatment plant for the reuse of the water and utilizing the treated water for various purposes. We have a Sewage Treatment Plant (STP) with the capacity

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of 400 KLD in which we have adopted the biological treatment and tertiary treatment technology. In biological treatment we are following the Activated Sludge Process for the treatment of organic material by Microorganisms in a bioreactor and generating the nutrient enriched sludge. In tertiary treatment, the effluent from the bioreactor (which may contains dissolved organic matter) is further undergo for the secondary treatment using pressure filters through sand and activated carbon. The extracted water again treated with sodium hypochlorite for the removal of bacteria. Our STP system is further being upgraded to the capacity of 550 KLD for the future load. We are reusing the water after the treatment (through STP) for the specific purpose such as irrigation in horticulture department and for the construction work. Wastewater from various labs i.e., chemistry, biology, biotech etc., is being treated at ETP which is connected to the main sewage treatment plant. Load varies depending upon the functioning of the labs. University also has a process to prevent the polluted water entering water system. The polluted water from the laboratories and other waste water is properly going to the STP by a suitable scientific mechanism. The polluted waste water is further treated at the STP adopting the biological treatment and tertiary treatment technology. In biological treatment we are following the Activated Sludge Process for the treatment of organic material by Microorganisms in a bioreactor and generating the nutrient enriched sludge. In tertiary treatment, the effluent from the bioreactor (which may contains dissolved organic matter) is further undergo for the secondary treatment using pressure filters through sand and activated carbon. The extracted water again treated with sodium hypochlorite for the removal of bacteria. The treated water is further utilized for the purpose of irrigation in horticulture crops, watering the gardens and construction work.

Our university is providing purified and quality approved free drinking water for students, staff and visitors. To ensure the hygiene of drinking water, 3M filters are installed in each building block. These are environment friendly as filters don't waste a single drop of water and also, they don't need any electricity to operate. Chlorination through dosing pumps is also done. There are total 60 Nos of 3M Filters installed at various locations in the campus. The cleaning and inspection of 3M filters is done once in every month, and the quality of water is verified for drinking purpose once in three months. The water is tested for chemical and biological parameters from time to time by the Department of Estate. To minimize the water use we have constructed our buildings in a way to harvest the rain water and paneled with the facility for rain water supply to the building for specific purposes. Our buildings also support the draining of rain water to the underground after filtration and treatment which helps in increasing and maintaining the ground water level. We also have very successful model for the landscape plantations. We have plantation of drought tolerant plants as well to minimize the usage of water and also support the water conservation. The images of the drought tolerant plants with landscape plantations at the various places of the university are provided.

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Apart from the working on clean water and sanitation inside the university campus, we also have explored our activities to the off campus for the water conservation and reuse and also awareness generation. Rainwater harvesting is also adopted in the vicinity of university campus. Harvested rainwater is used for landscaping and recharging of the bore well pits. Water is collected in rainwater harvesting tanks from the roof tops and roadside drain. From collection points, it is being used for the various purposes. We also have camps off the campus for the cleaning and conservation of water resources. We have our SES REC action plan recognized by Ministry of Education, Govt of India where we are providing educational awareness to the local communities for good water management.

While working on our parameters of clean water and sanitation inside the campus as well as outside the campus we are also co-operating the Government and following the norms for an organization. We are operating under the consent of HP state Pollution Control Board. We have "consent to Operate" u/s 25/26 of Water (Prevention & Control of Pollution) Act, 1974 certificate from the state government of Himachal Pradesh.

Methods Adopted by Shoolini University for Water Reuse and Water Conservation

- Implementing new water efficient fixtures in its new constructions, ensuring 100% treatment and recycling of sewage, and rainwater harvesting.
- We have set up the rainwater harvesting system at different locations to treat and reuse the water.
- A Sewage treatment plant (STP) in the University premises has been established which recycles sewage to gardening-suitable water. After treatments we frequently checked the quality of treated water and further reuse for the irrigation, washing and construction purposes. Our STP is working as per the rules and regulations of the State pollution control board.
- Designing of buildings for water conservation
- Awareness generation for water conservation
- We have adopted the landscape plantation and plantation of draught resistant plants for water conservation.

Goals and Plans:

- Ensuring improvement of the water and water-dependent natural resources at surrounding areas in the campus.
- We have planned to install big water storage tanks from natural resources as the population in the University is a continual increment process.
- Maximize water usage efficiency and minimize wastage of water.
- AII existing buildings to be used for water conservation and rainwater harvesting.
- Our aim is to develop the mechanisms for the improvement of groundwater level.

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- Promote investment in and maintenance of efficient water infrastructure and green infrastructure in all future development plans.
- Promote appropriate innovative water and wastewater management technologies and services.
- Ensure awareness about the water conservation policy of the University among all the stakeholders.
- Further improvement in the research areas for water conservation and water purification technologies development.
- Increase the involvement of students and local communities for water conservation through intervention of small-scale projects, awareness generation etc.
- Build relationships between environmental, societal leaders and policy makers to identify obstacles and opportunities to increase the role of conservation and efficiency in making the water supply systems sustainable.

Conclusion

Shoolini University is focusing on the water conservation throughout the whole campus. We have a planned system for the water conservation and reuse through STP, rain water harvesting, landscape designing and plantations, awareness generation etc. We are working under the norms of the state and central government and participating in the issue of national importance of water conservation.

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