

NATIONAL WORKSHOP ON WASTEWATER RECYCLE AND REUSE

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VIGYAN BHAWAN; NEW DELHI

Background:

India is home to about 17% of world population but only 4% of world water resources. The Indian economy and society face daunting challenges in the water sector. The demands of a rapidly industrialising economy and urbanising society come at a time when the potential for augmenting supply is limited, water tables are falling and water quality issues have increasingly come to the fore. Both our rivers and our groundwater are polluted by untreated effluents and sewage continuing to be dumped into them. Climate change poses fresh challenges with its impacts on the hydrologic cycle.

Urban water requirements are expected to double, to 52 BCM by the year 2025. The 2030 Water Resources Group (2009) estimates that if the current pattern of water demand in the Country continues, about half of the demand for water will be unmet by 2030. As such, efforts are required for effective and efficient water management to satisfy the various sector needs in the years to come. Wastewater recycle and reuse provides an opportunity to alleviate some of this stress.

A direct measure of water availability is the annual availability per capita according to which geographical regions are classified as water sufficient, water stressed and water short when the annual per capita availability of utilizable water is calculated to be – in excess of 1500 cum; between 1500-1000 cum and less than 1000 cum respectively. By this yardstick, as per provisional 2011 census total of 1210 million, the availability of water reduces to 928 Cubic metres per capita which is water short. In reality however, many sub-regions in the country are much more severely water-short due to uneven distribution of water.

The increased demand for drinking water from urban centers, increasing water footprint of these locations and continued pollution of freshwater sources due to inadequate capture and treatment of the return flows, is a statement of challenge and also a window of opportunity - to

use the wastewater for productive use. Technological advances over the last two decades have demonstrated the feasibility of treating wastewater to necessary quality levels at competitive costs. The increasing costs of alternative sources seem to suggest that the time has come to examine wastewater reuse as a potential option and view wastewater as an asset.

As per assessment made by the Central Pollution Control Board (CPCB) on the status of wastewater generation and treatment in Class I cities and Class-II towns during 2009, about 38,255 MLD of wastewater is generated in Class I cities and Class II towns in India (housing more than 70% of urban population). The wastewater treatment capacity developed so far is ONLY 11,788 MLD accounting about 31% of total waste water generated in these two classes of urban centers. Consequently 70% of the wastewater generated in Class I and II urban towns and cities is discharges on land or in various water bodies without any treatment, resulting in large scale environmental pollution and creating a health hazard for the population at large.

Waste water recycling and reuse

Water recycling is reusing treated wastewater for beneficial purposes such as agricultural and landscape irrigation, industrial processes, toilet flushing, and replenishing a ground water basin (ground water recharge). Water recycling offers resource and financial savings. Wastewater treatment can be tailored to meet the water quality requirements of a planned reuse. The use of grey water at decentralized sites for landscape irrigation and toilet flushing reduces the amount of potable water required for these applications.

Water reuse accomplishes three fundamental functions:

- Treated wastewater is used as a water resource for beneficial purposes,
- Treated effluent is kept out of streams, lakes, etc, reducing the pollution of surface and ground water, and
- Protects public health.

Recycled water has many applications and can be used to fulfil most types of water needs, subject to the level of treatment provided to the waste water. Some common uses of recycled water are in:

- agriculture
- landscape

- public parks
- golf course irrigation
- cooling water for power plants and oil refineries
- processing water for mills, plants
- toilet flushing
- dust control,
- construction activities
- concrete mixing
- artificial lakes

Cities need to implement reuse and recycling options when designing their waste water treatment plants. The efforts so far have been very limited. Industrial use is a promising reuse sector but the large geographical size of Indian cities can be a challenge for safe conveyance of water for reuse or recycled water. Cities like Rajkot and Nagpur have developed models for reuse of treated waste water and Surat is also implementing. Before progressing to reuse, cities also need to ensure proper treatment of sewage generated. As mentioned earlier, presently the Central Pollution Control Board estimates that 70% of sewage generated goes into the environment without treatment.

[Initiatives by Ministry to support Wastewater Recycle and Reuse](#)

[Capacity building efforts](#)

Indian cities have unique characteristics and there is no single one-size-fits-all solution. The Ministry is enhancing the capacity of cities by showcasing best practices through events like the National Water Awards, Nirmal Shahar Puraskar, knowledge sharing and capacity building through PEARL etc.

The State Governments /Cities need to develop core strength by developing a municipal service cadre. There is also need to bring in private sector participation through concessionaires, management contracts, service contracts etc. The vision is to have efficient service delivery, sustainability of operations, environmentally friendly technologies for treatment and reuse.

Funding support through JNNURM

Cities are being provided assistance under JNNURM for 100% sewage treatment facilities and once 100% treatment has been provided, the water bodies will have better quality water and there will be increased availability of water for lower grade water use.

Guidance on recycle and reuse in the Sewage Manual (2013)

The 2013 Sewage Manual developed by the Ministry incorporates a detailed discussion on the subject of wastewater recycle and reuse. The Manual discusses in detail some of the leading recycle and reuse projects from India and globally, along with design principles, treatment plant schematics, guidance for reuse applications in agriculture, aspects to be considered when using recycled water etc. When preparing this Manual, we have evaluated different reuse and recycle options, and have provided guidance for each type of intended use, along with precautions and key considerations for the use.

Wastewater Recycle and Reuse –Experience from India

The largest potential for reuse in India resides in agriculture and the equally largest misplaced resource is sewage in the habitations. In the “Handbook on Service Level Benchmarking” by MoUD, reuse and recycling of sewage is specified to be at least 20% to begin with, but this is a distant reality for most utilities in India.

In India, treated sewage has historically been used for a variety of applications such as Farm Forestry, Horticulture, Fish culture and Indirect and incidental uses. The municipal waste water and industrial effluent are occasionally also being treated up to tertiary level and used for various purposes other than drinking by various industries and cities as part of dispersed initiatives. Some of the noteworthy initiatives are discussed below:

1. In Chennai, the CMWSSB has been promoting the growth of farm forestry in Chennai from the 1980s and this helps to promote a micro climate in a city environment. Water intensive industries in Chennai such Chennai Petroleum corporation are buying the treated waste water from the Chennai Metro Board and treating them further to meet their process water needs.

2. The Indian Agricultural Research Institute, Karnal has carried out research work on sewage farming and has recommended an irrigation method for sewage fed tree plantations.
3. The University of Agricultural Sciences, Dharwad, Karnataka has found that sewage could be used in producing vermicompost to be used for tree plantations provided its details with respect to composition of toxic substances are known.
4. Chandigarh is using treated sewage for horticulture needs of its green areas.
5. Delhi has put in place planned reuse of treated sewage for designated institutional centres.
6. The Government of Karnataka has issued an official directive to take all necessary steps to ensure that only tertiary treated sewage is used for non-potable purposes, like all gardening including parks, resorts and golf course. The Bangalore Water Supply and Sewerage Board will make all arrangements including construction of filling points, installation of vending machines at STP for supply of tertiary treated sewage in multiples of thousand litres and that non-compliance of the directions attracts penal provisions
7. In major metropolitan cities like Delhi, Mumbai, Bangalore and Chennai treated grey water is being used for toilet flushing in some of the major condominiums and high rise apartment complexes on a pilot scale.
8. Secondary treated sewage is purchased and treated for use in cooling water makeup in the industrial sector from as early as 1991 in major industries like Madras Refineries, Madras Fertilizers, GMR Vasavi Power plant in Chennai as also in Rashtriya Chemicals and Fertilizers in Maharashtra and most recently in the Indira Gandhi International Airport in Delhi and Mumbai International Airport.
9. In Kolkata, the Mudiali fish farm occupying an area of 400 hectares is used for growing fish, which is then sold for human consumption.
10. The UNDP conducted a detailed study in the 1970s and identified a sand basin on the coast of Bay of Bengal, where secondary treated sewage of the Chennai city can be infiltrated through percolation ponds and extracted for specific industrial use in the nearby petro-chemical complex. However, this project has not been implemented.
11. The Bengaluru city is facing a freshwater crisis and it has been considered to study a pilot model of the Singapore NEWater for indirect augmentation of water by advanced treatment of secondary facilities.

Wastewater Recycle and Reuse – International experience

Treated wastewater is recycled and reused for various uses throughout the world. Some significant applications are discussed below:

1. **Agriculture:** It is used for irrigation in certain places in Africa, Israel, Mexico and Kuwait.
2. **Farm Forestry:** Treated sewage is used for watering urban forests, public gardens, trees, shrubs and grassed areas along roadways in certain places in Egypt, Abu Dhabi, Woodburn in Oregon USA. It is also used for timber plantation in Widebay Water Corporation in Queensland, Australia. It is used for alfalfa plantation in Albirch Palestine.
3. **Horticulture:** Certain places in Elpaso in Texas, Durbin Creek in Western California in USA.
4. **Toilet flushing:** Certain locations in Chiba Prefecture, Kobe City, and Fukuoka City and Tokyo Metropolitan in Japan. Part A: Engineering 7 - 3 CHAPTER 7: RECYCLING AND REUSE OF SEWAGE
5. **Industrial and commercial:** essentially used for cooling purposes in Sakaihama Treated Wastewater Supply Project, Japan, Bethlehem Steel mills, USA. Sewage reclaimed as high quality water is supplied to Mondi Paper Mill and SAPREF Refinery in Durban, South Africa. Landscape and golf course irrigation in Hawaii,
6. **Fish culture:** It is used in fish hatcheries / fish ponds in Vietnam and in Bangladesh
7. **Groundwater recharge:** Orlando and Orange County Florida, Orange County California, Phoenix (Arizona), Santa Rosa (California) Recharge Project all in USA.
8. **Indirect recharge of impoundments:** Restoration of Meguro River in Japan, NEWater project in Singapore, Windhoek in Namibia, Berlin in Germany
9. **Other uses:** Coach cleaning, subway washing and water for building construction is being practised in Jungnang, Nanji, Tancheon, Seonam in Seoul and treated sewage sprinkled on the water retentive pavement that can store water inside paving material at Shiodome Land Readjustment District (Shio Site) in Tokyo and this reduces the surface temperature.

About the Waste water recycle and reuse workshop

Ministry of Urban Development; Government of India with the Water and Sanitation Program of the World Bank is jointly organizing the workshop on Wastewater recycle and reuse on April 07,2014 at Vigyan Bhawan in New Delhi. The workshop will have participation from various Government, technical and industry partners such as ULBs, water intensive companies practicing recycle and reuse, industry bodies such as CII and FICCI etc.

The workshop is expected to be attended by local, State and Central Government officials engaged in the decision making, planning and management of water and sanitation services from across the Country, national and international consultants' and technology providers along with technical experts and sector professionals.

The purpose of this workshop is to promote ongoing wastewater reuse efforts and to raise awareness amongst the policy makers, donors, civil society and other stakeholders on the value of wastewater and the need to promote wastewater recycle and reuse, especially in cities who are developing city sanitation plans.

The specific of the workshop are as following:

1. Showcase wastewater recycle and reuse projects in India and share best practices and learnings from projects implemented in India
2. Understand the drivers and policy initiatives / incentives of successful wastewater recycle and reuse programs.
3. What can we learn and what can the government do promote wastewater recycle and reuse in India?
4. The need for India specific wastewater recycle and reuse guidelines document.