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Pragyambu

cGanga
Centre for Ganga River Basin Management and Studies

The purpose of this quarterly digest brought out by the Centre for Ganga River Basin Management and Studies (cGanga) led by the Indian Institute of Technology Kanpur is to disseminate valuable traditional and scientific knowledge assimilated from national and international sources on various aspects of management of water and river restoration and conservation among concerned institutions and citizens.

NOW IT'S TIME TO GIVE A NEW LEASE OF LIFE TO WATER...

Shrinking, disappearing rivers, thirsty lands and increasing urban populations. How to turn these challenges into opportunities and protect coming generations from future water crises. A few months ago, problems in daily water in Bengaluru, Chennai and Delhi featured regularly in the news. Problems in water supply in summer in our cities is not new, but the struggle of common Indians for water is becoming increasingly difficult over the years. There are many reasons for this. First is that groundwater levels are falling in the country. The country's capital Delhi tops the global chart in decline of groundwater. According to a study done by IIT Gandhinagar, between the year 2002 and 2020, groundwater was exploited so much in Delhi that it will take 15 years to bring groundwater back to normal level.

The second reason is that our rivers are facing grave challenges. The first challenge is the increasing pollution in the rivers. On the other hand, due to the decline in groundwater levels and extinction of local water sources, the tendency to overexploit river water is increasing. The main resource of the river is water. If this resource is overexploited, then ultimately its ill effects will be seen on the rivers. Rivers are also drying up due to falling groundwater levels in river basins. There is an interrelationship between groundwater and river water levels. When the level of groundwater in a river basin is satisfactory, only then the water level of the river improves. It is a common concept that groundwater reaches a river through subsurface routes. Conversely, if the level of groundwater in the river basin and nearby areas falls, then the water of the river slowly moves into groundwater through the subsurface routes and the river water level declines. There is plenty of evidence available to confirm this fact. The drought-affected villages of Maharashtra are an example of this process. In the drought-affected areas of Marathwada, the groundwater level first reduced to a minimum. Dam projects were therefore implemented to provide relief from this crisis. But today, many dams in the state are running dry and there are 27 dams whose reservoirs have no water at all. It is obvious that when there is no water in the river, the dams will be of no help. But where did the river water go? Water leaked into the dry lands of the basin and so the dams went dry. Last year, there were 4 such dams in the state where water levels became negligible in summer.

There is a solution to overcome these problems – to treat urban wastewater and establish a system for reuse of the treated water. If we are able to do this, there will be two benefits. Firstly, rivers will be free from pollution; on the other hand, if treated sewage is used in homes, industries, construction etc., then there will be less pressure on rivers and groundwater to meet water needs. Let us examine whether the implementation of this solution, which seems correct in theory, is possible? On hearing the word treated sewage, a question arises whether it is possible to reuse water containing human waste, household dirt, soap, phenol, medicines and dirt from washing clothes and utensils. The answer is yes. Today we have such technologies available with which it is possible to clean wastewater.

Singapore fulfills 40 percent of its drinking water demand through treated wastewater. A large part of its population also uses this water for drinking purposes. Singapore is situated on a small island in the middle of the ocean, so there are few sources of water. Here people save water as a valuable resource. India's situation is comparatively better; nature has given us rivers and glaciers and forests that fill the rivers with water. Our geographical conditions are not such that we have to invest labour and resources in treating sewage and converting it into drinking

water. Our times and conditions demand that untreated water should not directly mix with rivers or other water sources. In such a situation, the better option is to first treat the wastewater and later use it in industry, cleaning of public places, maintenance of urban green belts and drain it into old ponds, lakes or small rivers of the cities, so that on one hand these waterbodies can develop as surface water sources and an ecosystem can develop on their banks with the help of plants, bushes, butterflies and birds. The first positive effect of developing surface waterbodies will be on the groundwater of the area and gradually the groundwater level will start increasing in the area. But let us first understand how sewage, i.e. wastewater, is treated. How wastewater will be treated depends on the source of wastewater. The method of treating domestic wastewater is different from that of treating industrial wastewater. Joint treatment of industrial waste and domestic waste is not possible. Wastewater can be treated at four levels. At the primary level, the solid particles present in the wastewater are separated. At the secondary level, the organic elements dissolved in water are separated from water by chemical or biological treatment methods. After being treated at the secondary level, the water becomes suitable for release into the environment but this water is not potable. After this, the remaining impurities are cleaned at the tertiary level with the help of ultraviolet rays and the help of chemicals is also taken to make the water infection free. The quality of this water is very good. Apart from this, if required, water can be treated at the fourth level also to achieve a very pure state of water. The level to which the wastewater is to be treated depends on where the treated wastewater will be released or for what purpose it will be used.

Efforts to reuse wastewater are being made in many states of the country. Let us take a look at such efforts and their results. The first example is of Kolar district of Karnataka where 137 dried up ponds of the district were recharged with treated wastewater (treated sewage or treated waste water). This water was also used for irrigation in the fields. As a result, the crop yield in the fields improved and the groundwater level of the area also went up. Kolar was among the most drought-affected areas of Karnataka. In the last two decades (from 1990 to 2017), this area has continuously faced droughts due to low rainfall. In view of the drought-affected conditions, a project was prepared in the year 2018, under which treated water (treated up to secondary level) from the sewage treatment plant of Bangalore was used to fill the dried up lakes and ponds in various development blocks of Kolar district. Actually, there were many ponds and lakes in this district which were fed by rainwater, which were also an important means of recharging groundwater. A large part of the population of this area depends on agriculture for livelihood. When the lakes and ponds here started drying up due to less rainfall, groundwater started being exploited for irrigation. The situation became so bad that people dug borewells up to a depth of 2200 to 2500 feet to get water for irrigation. Consequently, groundwater level was badly affected and the salinity of water also increased. After recharging the ponds and lakes, when the Bangalore-based academic and research institute IISc evaluated this project, it found that due to this project, the groundwater of the area had increased by 58 to 73 percent. The main objective of this project was to recharge groundwater indirectly. Therefore, water treated at the secondary level was used to fill the ponds and lakes. The loamy soil of the area also acted as a natural filter and the groundwater level started rising once again in the land that had dried up due to overexploitation of water. The IISc study also revealed that not only did the groundwater level in the area go up but the quality of groundwater also improved. Monitoring was an important part of this project. Secondary treated water was pumped into the ponds, so strict monitoring was done to ensure that people did not come into direct physical contact with this water (drinking, bathing, swimming).

In Gwalior city of Madhya Pradesh, treated wastewater is also being used for irrigation. There is a sewage treatment plant with a capacity of 145 MLD (million liters per day). The treated water coming out from here is used for irrigation. Similarly, in Nagpur, treated wastewater is being used in the thermal power plant working under the state government. In this project, up to 90 percent of the treated wastewater obtained after treatment of wastewater coming out of the city is being used.

East Kolkata Wetlands is an excellent example of wastewater utilization in Kolkata city. Spread over an area of 12000 hectares, this wetland treats 90 percent of the city's wastewater. In this area rich in aquatic and terrestrial vegetation, the wastewater first reaches a large pond, where biochemical reactions lead to the production of plankton

and aquatic vegetation, which becomes food for fish, and the livelihood of many fishermen of the area depends on the fish. The treated water from this large pond reaches the nearby fields and gardens through canals, where vegetables and paddy are cultivated. There are paddy fields, marshlands, ponds, canals, fields, gardens in this entire area and this biodiversity-rich area is also a refuge for many birds and reptiles. It not only treats wastewater but is also the source of livelihood for 20 thousand families of its neighbourhood that depend on this wetland.

In Bangalore, the local administration has made it mandatory to build sewage treatment plants in residential apartment buildings having 100 or more apartments. According to the data of Bangalore's local administration, 3500 flats in the city have sewage treatment plants. The treated water from these is tested in laboratories every month. The treated water is used in parks, green belts etc. of residential areas. According to the local administration, after the example of Kolar district came to be known, some resident committees have offered to provide the treated water to dry areas like Kolar. Treated water is available in excess in these residential areas.

These are just a few examples, but according to the report released by the Central Pollution Control Board in 2021, only 30 percent of the total wastewater available in India is treated, the remaining water reaches rivers, ponds, seas etc. in an untreated state and causes pollution. According to this report, 72,368 MLD sewage is generated daily in urban India. According to a report by the Council of Energy, Environment and Water, 80 percent of the total sewage generated is suitable for reuse after treatment. Unfortunately, STPs across the country are not able to treat all the wastewater. The speed at which urbanization took place in the country, and dams built to provide water to the increasing city populations, the wastewater treatment facilities could not be developed at that speed and in that proportion, and this wastewater has become a threat to our water sources; and today the situation is such that without treating it, we cannot even think about water security and food security in the country.

THE ROAD IS LONG AND PROGRESS IS SLOW

There are only ten states in the country where a policy has been framed for reuse of treated wastewater. In other states water reuse is not picking up pace due to lack of policy. However, in states that have framed a policy in this regard, rules have been made as per this policy, which are promoting the use of treated wastewater. Industries are buying it, thereby generating revenue for the government, besides reducing the pressure on clean water sources. However, there is another aspect to this problem, which is that even in states where water is available in abundance, neither the government nor the general public are paying attention to this important issue.

THERE ARE OTHER OPTIONS TOO

Wastewater can be used not only for irrigation but also in brick kilns, power generation and industries that require water for cooling. These applications of wastewater should be encouraged. There are two reasons for this. First, for irrigation, water must be germ-free, which will increase both the cost and time of treatment. Second, in these factories,

PUBLIC AWARENESS IS ALSO IMPORTANT

Along with active governments and the development of technical capability in institutions responsible for water management and wastewater treatment, it is necessary to develop public awareness on this aspect and spread public education. Even today people are skeptical about reusing treated wastewater. The most famous and successful example of reusing treated wastewater is Kolar district of Karnataka. But when treated water was released into the ponds there, even there people opposed it despite the water crisis. Some people even appealed in court against this venture. It is only when all laboratory tests failed to find any environmentally harmful component in the water that this project could move forward and today it is a shining example of use of treated wastewater.

Before starting any such project, it is very important that the wastewater is treated as per the prescribed rules and standards, the quality of the treated water is checked at regular intervals, and the results of the checks are made public. Only by doing this systematically will public hesitation towards the use of this water end and its acceptance will increase. Due to the presence of nitrogen and phosphorus in treated wastewater, its use in irrigation is encouraged. But some precautions are necessary before using this water for irrigation. The National Framework of Safe Use of Treated Wastewater has released a list of edible and non-edible crops for which treated wastewater can be used for irrigation. Along with this, guidelines have also been given for the quality of water in this framework.

EFFECTIVENESS IN FLOOD MANAGEMENT

Recharging surface water sources will also prove to be helpful in flood management. Surface water sources will recharge groundwater at a natural pace, and when the groundwater aquifers are recharged, their water-holding capacities will also increase. Hence, when there is good rain in the monsoon, the rate of water absorption will increase. The water which used to flow away and get wasted will seep into the ground and enrich the land. On the other hand, the major reason for floods in our cities is the blockage of the drainage routes of rain water. When surface water sources like lakes and ponds come alive again, then these will prove to be better options for water storage. Small rivers are facing encroachments and many other challenges due to their drying up; when these rivers are recharged with treated wastewater, then rain water will also get pathways to drain into rivers. Instead of blocking roads and streets, this water will reach big rivers through natural routes. Apart from this, water treated at the secondary level can be connected to the Arth Ganga project in small cities and towns. In the recent past, many examples of commercial use of water hyacinth have come to light. The water treated at the secondary level is perfectly suitable for cultivating water hyacinth. After extracting the primary commercial products of water hyacinths, the remaining parts can be used as fertilizer.

water will undergo ultra-high temperature processes, so infectious organisms will be automatically destroyed, and this water will not enter our food chain directly or indirectly.

PROBLEMS AND SOLUTIONS

For reuse of treated wastewater in the Indian context, we will have to build many small STPs in every city. At present, there are only few sewage treatment plants in a city, and the entire system of treatment is centralized. In centralized systems, bringing wastewater to an STP and taking the treated water from the STP to the place of need is a long and expensive process. Much energy is spent in this, so it cannot be justified from the environmental point of view. We will have to decentralize this entire process and build STPs in every locality. The treated water from here can be locally reused. After the revival of surface water bodies in the same locality, the water from these reservoirs can be used in toilets in homes. Similar arrangements can be made at places like students' hostels, railway stations and airports, where the demand for water is high and the amount of wastewater coming out from there is also very high. At present, this concept may seem unimaginable to you, but it will have to be adopted to improve water management in India. The biggest problem in making new STPs and reservoirs is the availability of land. But just as we allocate land for building new airports, bus stations, and private universities, we will have to give priority to STPs and reservoirs and allocate land to increase our water resources.

DEMAND, MARKET AND ETHICS

A market is being created to encourage the reuse of treated wastewater. Now if we analyse the ethical aspect of this process, the best use of this water is for surface water recharge. This is because water is not only a human right, other living beings also have a right over it. By releasing this water in surface waterbodies like ponds and lakes, water will also be available to other living beings. When this water reaches groundwater by seeping through the soil, it will be treated by natural processes, and thus nature will play a supportive role in this process. As per our current socio-economic conditions, this seems to be the best option to save the time, labour and money required otherwise to arrange treatment facilities at the tertiary level. Governments can allocate money and labour but the most important thing in water management at this juncture is time.

NEW PROBLEMS, NEW SOLUTIONS

It is not that all environmental and water-related problems will be solved after treating the wastewater. After such treatment, sludge (like solid wastes) wil remain as residue in the treatment plant. When the rate of wastewater treatment increases, then the amount of sludge residues will also increase. Generally, it is advised to use this sludge as landfill or manure. But the presence of germs, viruses and bacteria in this sludge cannot be ruled out. How to deal with the problem of this residue, we shall discuss in the next issue of *Pragyambu*.

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