



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.

WHY DID THE STREAM STOP FLOWING?

In the fifth issue of *Pragyambu*, we shall discuss the continuity of rivers (or river flows). Now, as soon as a river is mentioned, the image of a free-flowing stream of water emerges in our mind. But free-flowing rivers are now becoming history with many large rivers of our country turning into a series of ponds/ lakes. The stasis of a flowing river is against the innate nature of rivers. In order to understand the continuity and stagnation of river

flows, this issue of *Pragyambu* is dedicated to various aspects related to the flow of rivers –

The shortest and simplest definition of a river is that of a stream that reaches its destination from its origin of its own accord – sometimes flowing from melting ice, sometimes descending from mountains, sometimes cutting through rocks – rivers thus complete their journey. Nature has made river flows

continuous, but human activities have had many direct and indirect effects on river systems which have affected the continuity of river flows. Hence free-flowing rivers are now more often seen in literature, history and imagination than in reality. Let us try to understand the reasons that impede or obstruct river flows.

BARRAGES AND DAMS

Dams were built on rivers all around the world for supplying water and electricity to cities. India was also not untouched by this phenomenon, and here, too, dams were built on the rivers. The function of a dam is to dam or stop a river. Dams benefited vast populations in a big way, but the continuity of rivers was hampered in the process.

DIMINISHING WETLANDS

Wetlands are found naturally near rivers. These wetlands prove to be a protective shield for the life of the people living near the river in the event of floods. On the other hand, in summer, when the water level in the river goes down, the water seeping from the wetlands gets into the rivers, which helps maintain the water level and flow of the river. These wetlands are very important not only for supplying water to river in dry seasons, but also for maintaining the biodiversity of an area. The number of wetlands is decreasing rapidly in our country. Due to urbanization and changes in

OVER-EXPLOITATION OF WATER

River waters are heavily exploited to meet various human needs due to which the continuity of river flows is affected. A minimum amount of water is essential to maintain the flow in a river, just as a human being requires minimum quantity of blood for survival. But sometimes humans demand more than they need, and so much water is abstracted from rivers that the remaining river water is inadequate to maintain its flow.

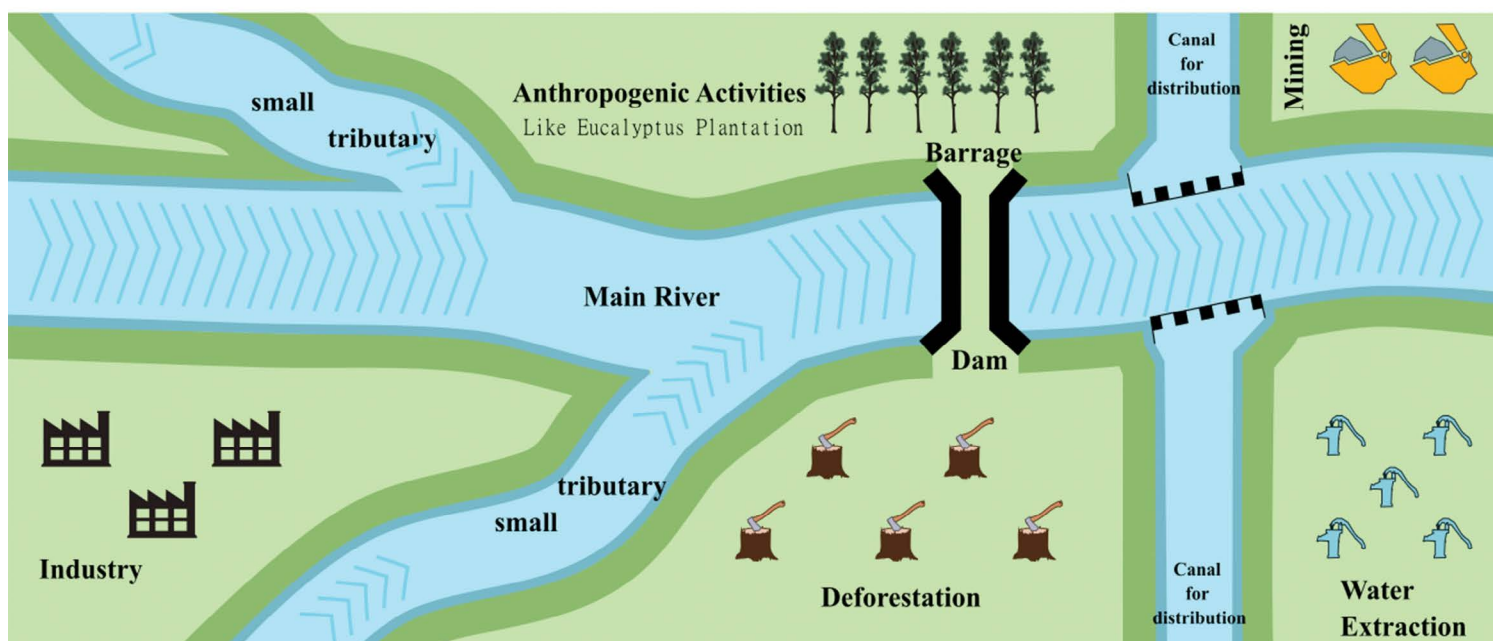
NEGLECTING THE SMALL RIVERS

For various cultural and religious reasons, we revere big rivers and treat them responsibly and wisely but do not consider small rivers as rivers. This neglect allows such streams to get polluted, or to dry up, or become extinct. Hence, their flows do not reach the main river, which affects both the quantity of water and flow of the receiving river.

WATER DIVERSION IN CANALS

On the one hand the tributaries of the rivers started drying up, on the other hand its water was carried out through canals to distant villages and farms to get maximum benefit from the river. So the water levels of the river began to decrease continuously. If we compare the present-day water levels and flows with those 50-years earlier in major rivers of the country, then we will find that the water level of every river has gone down and their continuity has been disrupted.

Potential Reasons of River Fragmentation



land use norms and rules, the area of wetlands of many rivers is diminishing. There used to be beautiful wetlands spread over an area of about 300 sq km around the Jhelum river in Kashmir. Some documents from 1911 attest to the existence of these wetlands. In the nineteenth century it was probably Asia's largest freshwater wetland zone, much of which has today been converted to agricultural land. Today, if the hydrograph of that area is studied, then the change in the landscape is clearly visible. In that area, where water available was plentiful, the signs of water scarcity are clearly visible today.

TAMPERING WITH THE NATURAL SYSTEM

There are many activities that do not take place near a river but affect the river and its flow continuity. One such activity is the clearing of forests in an area. Commercial construction on the mountains, changes in the vegetation. There are many rivers in our country which do not originate from the Himalayas, so water from snowmelt is not available in these rivers unlike

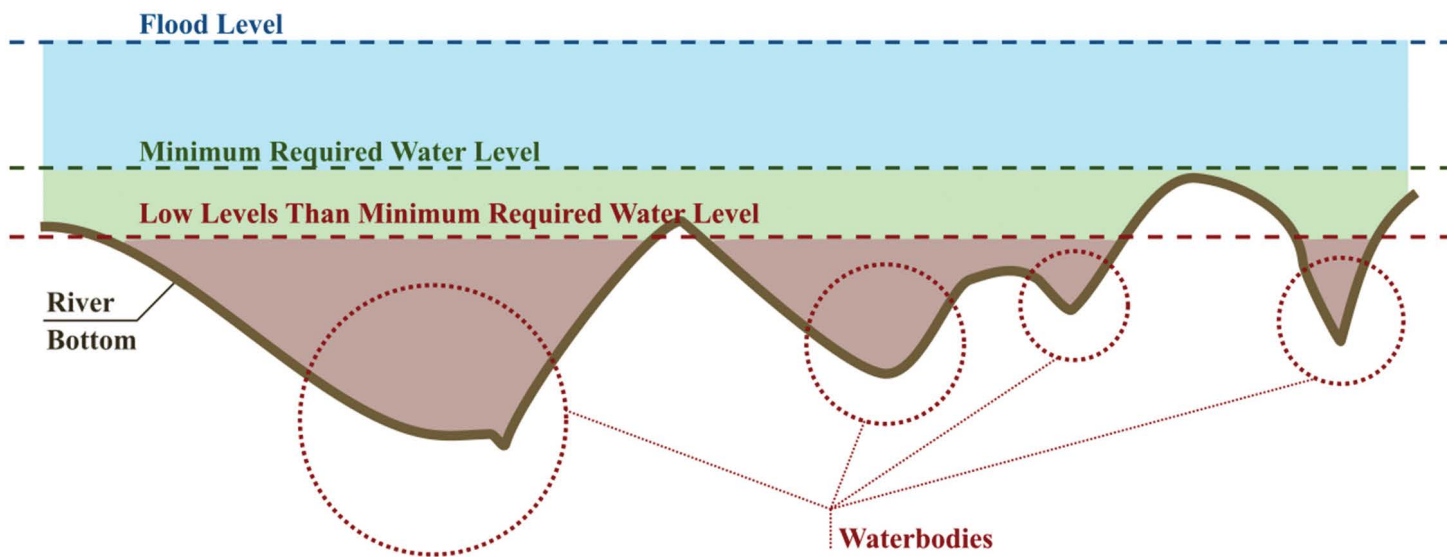
Himalayan rivers.

These rivers are supplied with water by forests and trees. Root zone in dense forests hold water during the rainy season and gradually this water is drained out, which then flows into the rivers through internal subsoil routes. This whole process is not visible to the eye but is very important for rivers. In the last two decades, many changes have taken place in our mountains and forests, whose effect is visible on the rivers today. Not only this, there has also been a change in the vegetation found in every state and every region. For example, a botanical study conducted in Madhya Pradesh describes the effect of eucalyptus trees introduced in the state. These trees have a tendency to draw groundwater, so they are grown in swampy areas where they help to dry up the swamps. But this type of tree in the plateaus of Madhya Pradesh have adverse effect on groundwater levels in some areas. At the same time, the number of Banyan, Peepal, Kabit and Jamun trees, which are helpful in raising groundwater levels, decreased continuously.

But it is not only the above activities, even when there is excessive groundwater exploitation in a river basin, the amount of water reaching the river reduces, which ultimately affects the flow continuity of the river.

NEGLECT OF LOCAL WATERBODIES

With increasing urbanization, local water sources have been neglected in all cities. Given the existence of large dams and the use of modern technology, almost all major cities are getting their drinking water from big rivers located 100 to 150 km away. Thus huge volumes of water are extracted from rivers every day. For instance, the Narmada river quenches the thirst of big cities of Madhya Pradesh, while Bangalore city draws water from Kaveri river 100 km away, and the same story is repeated for Hyderabad. Over-exploitation of river water can be avoided if local waterbodies are properly conserved and managed. For this, there is need for a balanced framework to control and regulate the exploitation of both groundwater and river water.



WHAT HAPPENS WHEN RIVER FLOWS ARE INTERRUPTED

Obstructing the continuity of rivers adversely affects river ecosystems. The proportion of elements in deposited sediments and silt carried by the river does not reach the lower reaches. The silt that flows along the river is very useful for agriculture, and when it does not reach the downstream areas, it adversely affects the agriculture of the area.

When the natural flow of the river is obstructed, fish and other river animals are unable to adapt to this change. There are many species of fish whose adults live in deep water but migrate to shallow waters at the time of breeding or laying eggs. When the continuum of rivers is broken, then the river's natural structure (variably shallow and deep regions and wide and narrow sections of the river bed) is affected, which affects the reproduction, habitat and food of these animals. There are many aquatic animals that depend on aquatic plants for food that are found in different parts of the course of the river in different seasons, when the flow of the river and its "aviralta" (continuum)

are obstructed, the silt and nutrients coming with the flow are also affected. Hence the natural cycle of aquatic plants is disrupted and the animals dependent on them face a food crisis. Not only do the effects of disrupting aviralta affect aquatic animals, but birds travel hundreds of kilometers that are dependent on rivers are also affected. Both local birds and migratory birds that fly from miles away take shelter near river banks and ponds in different seasons in India. The reduction in the number of aquatic animals and fish living in the river reduces the food availability of these birds. Thus, overall, obstructions in the river continuum not only affects riverine animals but also the fauna beyond.

Disruption of the river continuum also damages the downstream river deltas when requisite amounts of sediments do not reach the delta, thereby disrupting its ecology. In most countries of the world, the most fertile agricultural lands are found in river deltas, which is important for the production of rice, and where fisheries also flourish. If the natural flow of the river does not reach the ocean, then

the delta starts shrinking. As a result, the ocean starts moving inland and the delta begins to sink in the ocean. This situation can cause many natural calamities in the delta region.

When the flow of the Mekong River, which formed a delta in Vietnam after flowing down from neighboring China, was stopped in China, it affected the river delta grievously. This area, which was a treasure trove of biodiversity, has faced the problem of coastal erosion in the last few years. Other countries of the world are also facing such problems.

The river and its resources, the aquatic and terrestrial life in and around the river, the river ecosystem – for everything to be safe and prosperous it is necessary that rivers flow continuously. Perhaps our ancestors understood the importance of the continuity of rivers, so many of our religious rituals are said to be performed only in running waters. Science, nature and culture, all three are guiding us to the conclusion that we have to save not only the river waters, but also rivers' aviralta (continuity).



Maintaining river continuity is a pressing question at present. Modern developmental pressures are continuously increasing anthropogenic demands for water and electricity. Increasing urbanization and deforestation are all adversely affecting rivers and their continuity. Maintaining the continuity of rivers is therefore a challenge for both science and social science. River continuum is an essential resource for both rivers and human beings. Hence we have to adopt some measures to address this question, namely:

PUBLIC PARTICIPATION: Everyone has a right to rivers, hence saving them and their aviralta is everyone's responsibility. For conservation of our small rivers that are struggling for

existence, public participation should be ensured. When common people themselves come forward to save their rivers, then the implementation of river conservation schemes will be better.

ADMINISTRATIVE INITIATIVES: The work of restoration and conservation of many small rivers being carried out through the MNREGA scheme in Uttar Pradesh is a highly commendable initiative. In this endeavor workers are getting employed and rivers are getting restored. These restoration efforts in Uttar Pradesh included some rivers even whose names had been forgotten such as Tedhi, Sasur Khadedi, etc. A great deal of undocumented information and knowledge about these rivers is embedded in the lives of local people. Such knowledge needs

to be documented for use in future water policy-making. On the lines of Uttar Pradesh, local administrations of other states should also use available resources and schemes for river conservation. By saving regional rivers, the conservation of large rivers can become easier.

CHANGE IN ATTITUDE: To make rivers continuous, we also need to change our attitude towards rivers. We must understand that everyone has a right to rivers, not just human beings. Fishes, birds and forest animals also have their rights to rivers. When this is understood, our development plans will be centered on the interests of rivers. Only then shall we succeed in passing on nature's gift in the form of rivers to coming generations.

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