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Pragyambu

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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.

URMP: INFORMED UNDERSTANDING IS KEY TO EFFECTIVE PLANNING

The role of cities and villages in affecting the health of rivers is different. In many instances, it has been observed that the health of the river deteriorates after passing through big cities. The condition of Yamuna before entering Delhi and after passing through Delhi is proof that we have to seriously consider urban river management and take some concrete steps to improve urban river management. In the previous issue of our newsletter (*Pragyaambu* 18), we have already discussed urban river management. Taking that discussion forward, in this issue we will try to understand this subject in more detail. In the previous issue, we learned about the city and river related information required to make an urban river management plan. In this issue, we will know about the various points which should be described in detail in this plan. First of all, let us understand the Urban River Management Plan (URMP) in simple language. Urban River Management Plan (URMP) is a plan whose objective is to manage human activities in the city (a geographical unit, which has distinct administrative boundaries). Its primary goal is to conserve and rejuvenate rivers within that geographical unit. The scheme aims to ensure that when rivers leave the city, their ecological status – as indicated by the river fauna (native to the river, not brought into the river for commercial reasons) thriving in them – is no worse than what it was when they entered the city, and, if possible, is better.

Small rivers flowing through several cities in our country have turned into sewage drains due to years of neglect. These rivers are part of the basin or sub-basin of other major rivers including the Ganga. If we do not pay attention to these rivers today, we will have to pay the price for it in the future. On one hand, the polluted water of these rivers will continue to pollute a major river, and on the other, due to neglect of small rivers, the pressure of water supply on major rivers will increase. The severity of the crisis looming over the existence of major rivers will increase due to excessive water extraction. Similarly, there is a need to adopt a responsible attitude towards these rivers in the cities through which major rivers are passing. For the ground implementation of the positive ideological concept of the public and the administration towards rivers, we need to make an urban river management plan for every city through which a river passes. Let us discuss the various components that should be included in this plan.

COMPONENTS OF URBAN RIVER MANAGEMENT PLAN:

An effective URMP should include the following important components to ensure a symbiotic relationship between the health of the river and the city:

1. **Plan for collection and treatment of liquid waste from residential places:** This component ensures efficient collection and proper treatment of domestic sewage and other liquid waste generated from urban areas, so that untreated waste does not fall directly into rivers. While making this plan, special care has to be taken that in no way the untreated waste reaches the path of rainwater flow, nor reaches any drain or other sloping place from where it is likely to reach the river directly.
2. **Plan for management and regulation of storm water drainage during monsoon:** This component focuses on effectively managing the surface runoff/storm water generated during monsoon. This includes improving existing drainage systems and interlinking of surface water bodies to control flooding and ensure regulation and transfer of storm water and treated water.
3. **Maintenance of major drains and control structures**: There should be a detailed plan with a schedule for completion of works such as widening, deepening, desilting etc. of the city's major drains and local surface water bodies including water control structures such as barrages, gates etc. This also includes development or renovation of control structures such as barrages and gates to regulate water flow and improve water quality.
4. **River Area Conservation Plan:**

This includes planning for the conservation of the river area and the surroundings of water bodies, including protection and creation of habitats for riverine biota, spaces for river-people interaction, and activities along the banks of surface water bodies. This component focuses on protecting the natural environment of the river and its surroundings. It includes creation and protection of habitats for riverine biota, as well as creating spaces where people can connect with rivers and carry out various activities along their banks

5. **Collection and Treatment of Solid Waste and STP Sludge:** This is an important component that deals with the management of solid waste generated in the city and sludges from sewage treatment plants (STPs). It aims to collect these wastes scientifically, transport them to intermediate transfer stations, process them, reuse them, and safely dispose of any remaining residue, while ensuring that harmful overflows and leachates do not enter water bodies.
6. **Plan for final journey and cremation/ burial:** This component focuses on the management of traditional cremation and burial sites along rivers. It aims to improve existing facilities (cremation grounds and burial grounds) and develop new, environment friendly facilities to prevent rivers from getting polluted.
7. **Planning for Conservation and Development of Blue and Green Infrastructure:** This plan focuses on developing and preserving the city's "blue" and "green" infrastructure. This includes planning for the proper distribution and quantity of surface water bodies, wetlands, and a variety of vegetation (grasses, shrubs, plants, trees) that are important for the city's ecological health.
8. **Multipurpose Use of Surface Water Bodies:** This component ensures multipurpose use of rivers and their surrounding areas. It includes planning for using rivers for cultural and religious practices, recreation, navigation, and other socio-economic activities. While preparing this plan, it should be kept in mind that the facilities, rules and activities should be such that they do not have any adverse effect on the ecological health of the river.
9. **Control of algae/weed growth and eco-friendly removal:** This component focuses on controlling excessive algae and weed growth in water bodies. Its aim is not only to remove them but also to use them for the production of valuable resources like manure or biogas.
10. **Any other scheme:** Apart from the above components, any other relevant schemes can also be included in the URMP based on the specific needs and challenges of the city.

ESTIMATION OF WATER DEMAND:

The water demand in any geographical unit should not be seen in proportion to population growth, industrial demand or irrigation water. Instead, it depends mainly on evaporation and evapotranspiration. This is because apart from evaporation/transpiration, all the water remains within the unit, only its quality changes. Thus, it is a matter of managing water quality and reusing the used water to meet other demands including ecological requirements like providing water to surface water bodies and recharging groundwater. This requires closing the water loop at an appropriate scale in a geographical unit. The larger the circumference of the water cycle, the more energy and time it takes to complete the cycle. To make the circumference of the water cycle smaller, we also have to decentralise some important loops of this cycle.

WHAT DOES IT MEAN TO COMPLETE THE WATER CYCLE AT AN APPROPRIATE SCALE?

The purpose of completing the water loop at an appropriate scale or smaller circumference is to ensure water supply for all local water bodies within a geographical unit (such as an urban center or a district). This is done through reuse of used water after appropriate quality upgrades. In this system, the only net input annually is rainfall/ precipitation/snowfall, and the net output is the equivalent amount through evaporation/transpiration, thereby maintaining the stock of salts and nutrients.

This concept can be understood by the example of Desert Cooler, where the net requirement of water is equal to evaporation. The salts entering through water get deposited and need to be flushed out regularly. In the context of a geographical unit, the salts entering through various routes are carried back to the oceans by rivers, which acts as an important link in completing the global salt cycle on an annual basis.

MEANING OF DECENTRALIZATION IN THE CONTEXT OF STP:

Decentralization in the collection and treatment of sewage means making maximum use of the existing sewer network and avoiding the construction of any additional large sewer lines. Instead, STPs (Sewage Treatment Plants) should be set up at places where existing sewers directly join them and the treated water is released into a large natural drain that is built to carry storm water. By doing this, there will be water in the drain throughout the year, which can get rid of problems like encroachment. Its purpose is to ensure that improperly treated liquid waste (treated water quality is not in accordance with the needs of indigenous flora and fauna) is not released into the rivers. Along with this, the sludges coming out of the STP should be managed according to the master plan of the respective city.

ECONOMIC BENEFITS OF REJUVENATION OF URBAN WATER BODIES AND ROLE IN GDP GENERATION

Conservation and rejuvenation of water bodies, especially in urban areas, is not just an environmental necessity but also a sound economic investment that can contribute significantly to the Gross Domestic Product (GDP). Though it requires heavy investment in creation of infrastructure and operation and maintenance (O&M) for collection, conveyance, storage, treatment, reuse and disposal of solid and liquid waste, its long-term economic and socio-economic benefits make this investment far more worthwhile.

1. **Increase in water security and productivity:** Conservation of urban water bodies ensures local availability of water. Water demand in a city does not increase only in proportion to population, industrial or agricultural requirements but depends primarily on evaporation/ transpiration. Apart from evaporation / transpiration, all the water remains within the unit, only its quality may change. Therefore, proper management and reuse of used water, including providing water to surface water bodies and recharging groundwater, enhances water security.

a) ***Industrial productivity:*** Industries need to have access to reliable and quality water supply. Reuse of treated wastewater can provide a stable and low-cost source of water for industries, reducing dependence on fresh water and reducing operating costs.

b) ***Agricultural productivity:*** Agricultural areas around cities can benefit from reuse of treated water, reducing pressure on potable water for irrigation and increasing productivity of agricultural produce.

c) ***Availability of drinking water:*** Protected and rejuvenated water bodies can become important sources of drinking water for cities, thereby alleviating water scarcity and improving public health.

2. **Health benefits and reduction in health expenditure:** Clean water bodies are directly related to public health. Reduction in water-borne diseases reduces expenditure on health services.

a) ***Workforce health:*** Availability of clean water reduces diseases, which keeps the workforce healthy and increases their productivity, which ultimately contributes positively to GDP.

b) ***Reduction in child mortality:*** Water-borne diseases reduce child mortality, thereby preserving human capital.

3. **Development of Tourism and Recreation:** Clean and beautiful water bodies create new opportunities for tourism and recreation in urban centers.

a) ***Tourism Revenue:*** Developed ghats, riverfronts, parks and cultural sites along the river attract tourists, thereby boosting the local economy and increasing revenue.

b) ***Recreational Activities:*** Activities such as boating, fishing, bird watching and nature walks improve the quality of life of citizens and create opportunities for local businesses.

4. **Increase in Property Values:** The value of riverfront properties often increases when the river and its surrounding area are clean, accessible and ecologically healthy. This can increase property tax revenue for local governments.
5. **Disaster Risk Reduction:** Conservation of water bodies, especially floodplains and wetlands, reduces flood risk.

a) ***Flood Control:*** If river floodplains are kept empty and protected before the monsoon, flooding in cities can be experienced as a natural phenomenon rather than a disaster. This gives the river space to perform its natural functions and reduces property damage.

b) ***Infrastructure protection:*** Reduction in flood damage protects roads, bridges, and other urban infrastructure, saving costs on repairs and reconstruction.

6. **Monetization of ecosystem services:** Healthy water bodies provide many ecosystem services, such as natural water

ADMINISTRATIVE COMMITMENT AND TRANSPARENCY

There should be transparency in the urban river management plan. The plan should clearly and in detail mention that if the urban river management plan is implemented, then what will be the benefit to the environment and natural resources of the city? What will be the benefit to the biodiversity of the city and what will be the benefit to the city dwellers? This will increase the interest of the general public towards river conservation and river management. On the other hand, the accountability of the planners and those responsible for implementation can be fixed? If the declared objectives are not achieved after implementation, questions can be asked under the democratic system? Along with this, when the urban river management plan is prepared, it should be made public at the same time whether the implementation of the river management plan will be done in a single phase or in a phased manner (second phase, third phase). If it is a phased plan, then the timeline of each phase should be declared at the initial stage itself and kept in public knowledge.

purification, nutrient cycling, and support of biodiversity. Although difficult to measure directly, these services create long-term economic value for the city, improving the overall health of the environment.

7. **Promotion of innovative technologies and job creation:** Construction, operation, and maintenance of infrastructure (such as STPs, decentralized treatment systems) required for conservation and rejuvenation of water bodies creates a large number of employment opportunities. This involves both skilled and unskilled workers in engineering, construction, water treatment, IT, and environmental management. The sector also promotes research and development, leading to the development of new technologies and innovations in water management, which ultimately open up a new sector for the economy.
8. **Government subsidy and fiscal efficiency:** Currently, water services are heavily subsidized by the government. Conservation of water bodies and reuse of reclaimed water reduces dependence on fresh water, thereby reducing the burden of government subsidy. Also, reuse of waste can generate income (such as biogas or composting), which can partially cover operating costs and improve fiscal efficiency.

CONCLUSION:

Conservation and rejuvenation of urban water bodies is not just an environmental or social duty but a strategic economic investment. It ensures water security, improves public health, promotes tourism, enhances property values, reduces disaster risks, and promotes new industries and job creation. While the initial investment is significant, its long-term and multi-dimensional benefits contribute directly and indirectly to the GDP, creating a sustainable and prosperous future for both the city and the nation. It is a visionary approach that enables nature and the economy to grow together.

FUTURE PREPARATION

In cities developing or revising master plans, the river should be placed at the heart of the vision—even if it currently appears lifeless. Positioning the river centrally goes far beyond beautifying ghats or riverbanks. It requires conserving the river's biotic ecosystem—restoring it where it is degraded, and safeguarding it where it remains functional.

Master plan should be integrated with urban river management strategies to create a forward-looking framework. This framework must address anticipated population growth and include:

- Planning and land allocation for new sewage treatment plants (STPs);
- Strategies for treating, reusing, and distributing STP treated water to households, industries, green spaces, and agriculture;
- Detailed designs for separate infrastructure, such as dual-pipe systems and reuse networks.

Such detail in the master plan is essential. For large rivers, cultivating a culture of treated water reuse reduces pressure on freshwater withdrawals. For smaller rivers, it helps curb groundwater over-extraction.

Global concerns over future water availability are driving action in many countries—especially those whose urban growth turned them into concrete jungles. There is growing demand to reintegrate natural systems: from grasslands to manually powered wooden boats on rivers. The primary motivation is water conservation. Governments and NGOs are working to ensure that residents of high-rise urban centers continue receiving reliable water irrigation in coming decades.

In several countries, plans are underway for dual water distribution systems: one network for drinking water, and another—for treated wastewater—dedicated to non potable uses like cleaning and irrigation. This approach avoids using high quality drinking water for tasks like flushing toilets or washing buildings, thereby promoting more economical and sustainable water use while increasing public acceptance of reused water.

Water management experts from Australia, New Zealand, and Singapore stress that cities should avoid reliance on a single water source. Instead, they advocate for diversified supply portfolios that draw from rivers, groundwater, rainwater harvesting, and recycled water. This was common in Indian cities up to the 1990s, when different neighborhoods drew from local groundwater, ponds, and rivers. But large dam projects shifted supply to centralized, river based systems—creating vulnerability, over dependence, and neglect of local sources.

Promoting decentralized water supply infrastructure—including reuse schemes and local reservoirs—can reduce cost and stress on major rivers, and maintain ecosystem resilience.

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