

Some Thoughts on Water Resource Issues and Management in India

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Background

India is endowed with a rich and vast diversity of natural resources, with water being one of them. Its development and management play a vital role in agricultural production. Integrated water management is vital for poverty reduction, environmental sustainability, and sustainable economic development. The National Water Policy of India envisages that the water resources of the country should be developed and managed in an integrated manner.

The Ministry of Jal Shakti (Government of India) was created to deal with all matters relating to water at one place in an integrated manner. It is responsible for laying down policy guidelines and programmes for the development and regulation of the country's water resources. The vision of the ministry includes optimal sustainable development, maintenance of quality, and efficient use of water resources to match the growing demands on this precious natural resource of the country.

The issue is not one of water availability but of converting that availability into supply. Tube wells, which were a boon at one point in time, have become a bane.

Many states have their own state water policy. For example, policies for ground water management, rainwater harvesting, and ground water recharge in the state of Uttar Pradesh are available at <http://upgwd.gov.in/MediaGallery/Salient%20Points-English.pdf>

Drinking Water

- The project authorities should reserve enough water in each reservoir for drinking purposes during hot weather, and only the remaining water available during the year should be released for irrigation and other uses. This is easily accomplished by establishing a drinking water rule curve. When the reservoir water level falls below this level, water should only be supplied to meet drinking needs.
- If the drinking water requirement is "reserved" in all reservoirs as per the National Water Policy and waste water management is made scientific and part of the accounting system, there may not be any crisis for drinking water. Many parts of the country are vulnerable to Day Zero conditions because of the unabated use of water for crops with high water requirements without leaving a small fraction for drinking water.

Crops

- ❖ We need to incentivize less water-consuming crops. Of course, water-intensive crops like rice and sugarcane may be promoted in high-rainfall areas.
- ❖ If the available water is used for less water-guzzling crops, the area under irrigation can be increased.

- ❖ Pharmaceutical wastes that enter the food chain are the most dangerous.

Subsidy

- Farmers in many states receive free or heavily subsidised electricity. So, a farmer in Punjab, who was not growing paddy before the 1980s, is now growing paddy in abundance.
- Many farmers in Punjab keep their tube well switches turned on. The government releases the supply of electricity for a few hours during the day, and one can see the water gushing out for hours.
- Everyone should pay for the use of electricity. Subsidies could be provided to farmers with small holdings by direct transfer to their bank accounts.

Rainwater Harvesting and Water Conservation

- Rainwater harvesting has two components: surface storage conservation and groundwater recharge. The choice depends on the amount of rainfall, the area available, and the availability of alternate sources. Normally, in arid areas, measures are taken to store (conserve) water. In areas with abundant rainfall, the depth of the groundwater also influences the choice. In shallow water table areas, we opt for conservation in surface water bodies. The overall goal is to reduce groundwater pressure during both monsoon and non-monsoon seasons.
- The focus should be on water conservation and storage in smaller structures. Similarly, the revival of small rivers and rivulets can be targeted.
- Rooftop rainwater harvesting systems are the best and cheapest way to overcome the water crisis in our country because we have ample rainfall.

Rivers

- Rivers are the lifeline of our country. Unfortunately, many of our rivers are in danger of becoming extinct. The major problem being faced by our rivers is the overexploitation of surface water as well as groundwater and the increasing pollution load on them. Over-exploitation of groundwater has a direct bearing on the health of a river, as base flow or lean season flow in any river primarily depends on the flow of water from groundwater aquifers. Encroachment on flood plains is another bane for our rivers.
- We need to rejuvenate our rivers and bring water back to them. Fortunately, a large number of smaller rivers (lower-order tributaries of well-known rivers) are being rejuvenated by the government as well as non-government organisations with the help of people's participation. If government, civil society organizations, and the community come together, they can do wonders.

Flood Management

- It is worth pondering as to why at all the need for "flood control" arises. What we term "flood" is a natural phenomenon of a river or any water body. The term "flood plain" has been born out of this only. When people started moving into the designated flood plains and settled to divert water somewhere else, preventing it from coming to its rightful place (the flood plain), we conveniently cultivated "flood control." A river should be allowed to flow longitudinally as well as laterally. Any kind of obstruction (including dams and barrages) alters its dynamics and ecological integrity. The risk of urban flooding in the event of heavy rainfall is increased by run-off quickly forming due to the lack of natural ground cover and because natural drains have been sealed off by unplanned construction.
- The real problem is the non-implementation of flood plain zoning. Cities today are more flood-prone than rivers because of habitation in floodplains combined with a lack of a proper drainage network. The Central Water Commission has circulated a model floodplain zoning bill to all states for adoption and implementation. After defining flood plain zones, at least people will know about the extent of flood risk associated with their dwellings. Accordingly, suitable structures can be planned.
- Intense population pressure on river basins and floodplains necessitates practical solutions. Given the population pressure, it may not be feasible to leave vast swaths of land uninhabited. Therefore, the option is to resort to engineering measures that will moderate floods, reduce flow velocities, ensure safe deposition of coarser sediments, and contain the floods from spreading overland and inundating low-lying areas. But jacketing rivers may not always be a good method of flood management. The jacketing of the river may cause floods on both sides of the embankment, on one side due to river flow and on the other side due to drainage congestion.

As an example, consider the Kosi River.

- ❖ If one stands on the Kosi embankment during floods, it may be difficult to differentiate between the riverside and the countryside. The problem of the Kosi is not merely the large volume of water in spate but also the large amounts of sediment, more than 50% of which is of the coarse and medium-sized detritus variety, contrary to other rivers where a larger fraction is of finer sediment. Due to its typical geography, the Kosi descends into the plains from very steep Himalayan slopes without the benefit of transitional slopes, as other rivers do.
- ❖ Consequently, when intense rainfall occurs in a high rainfall area, large volumes of water rush through the steeper slopes at great velocity, carrying with them large amounts of sediment and detritus that are deposited in the valleys. This deposit is the curse of Bihar; wherever it passes through fields, it renders them barren and unfit for cultivation. In due course of time, the river starts changing its course owing to these relatively coarse deposits. The literature shows that the migration of the Kosi takes place within a width of about 100 km of land nearer to its confluence with the Ganga.
- ❖ Sediment transport in rivers, especially Kosi, needs to be properly understood. Studies show that dams in Nepal will help only partially since rainfall in India can also cause

flooding due to drainage congestion. There may be no better solution for the Kosi River than embankments in Indian territory to keep the river in a wide enough channel while preventing people from settling between the embankments. The requirement is to properly design the embankments, including provisions for lateral inflows.

Aquifer Mapping

- Aquifer mapping work needs to be completed as soon as possible. The country has approximately 25 lakh square kilometres of mappable area. Out of this, aquifer mapping over an area of 10.8 lakh sq. km. has already been completed. For the remaining area of about 14 lakh sq. km., CGWB has planned to complete aquifer mapping for areas of 5.6 lakh sq. km. and 8.4 lakh sq. km. in the next two years.

Rejuvenation

- We should not concentrate on "river cleaning," but river rejuvenation. River rejuvenation will automatically lead to river cleaning. Rather than concentrating on sewage treatment plants (STP), we need to adopt a holistic approach to river rejuvenation.
- River rejuvenation should be done by bringing more water to the river. This could be done through a series of measures such as afforestation, improving water use efficiency, ground water recharge through suitable structures under MGNREGA (the Mahatma Gandhi National Rural Employment Guarantee Act, 2005), etc.
- All over the country, we had innumerable tanks and ponds. Unfortunately, we had neglected them so much that they had almost become extinct. They are either encroached upon, silted up, or used as a garbage dump. Without the rejuvenation of tanks, ponds, and wells, there can be no water security.

Examples

- Bundelkhand is keeping the drought at bay by recharging wells.
- A strong and favourable public opinion and an equally strong and sustained political consensus and determination made the Sardar Sarovar possible in Gujarat, which has reduced water stress in the Saurashtra and Kutch regions.
- In Haryana, a state known for groundwater overexploitation, demand side management practises like drip irrigation and direct seeding are being adopted for rice.
- 50000 ha of land in Haryana's seven paddy-cultivating districts, viz., Ambala, Yamuna Nagar, Kurukshetra, Karnal, Sonapat, Jind, and Kaithal, have switched to maize and oilseeds under the "*Jal hi Jeewan Hai*" scheme of the state government. The state is supporting the crop change by providing financial assistance of Rs 5,000 per hectare and free insurance. This scheme for alternative crop diversification alone will impact crop patterns in the state, replace paddy with maize, and reduce groundwater abstraction.

- Meghalaya has inspired 2,000 villages to implement water conservation policies. It became the first state to implement such a policy that aims to ensure water security for present and future generations.

- *Lesson from Singapore*

<https://scroll.in/article/926270/singapore-taps-into-innovation-as-water-imports-dry-up>

Singapore has a national master-plan focusing on four "national taps": catching rainfall in reservoirs, recycling water, desalinating water, and imports. Singapore also invested heavily in underground drainage systems and dams. The tiny country now has 17 reservoirs that collect the rain that falls on two-thirds of its land area.

General Solutions

- ❖ We need to manage water in a participatory manner, and the focus has to be on water harvesting and water conservation.
- ❖ Drinking water is the first priority in the National Water Policy of India. Before providing water for "extra production" of sugarcane, we should ensure that drinking water reserves are maintained.
- ❖ We may need to implement some unpopular solutions like rationalising MSP (minimum support price), ending free electricity, and promoting non-water-guzzling crops instead of sugarcane and paddy.
- ❖ We must rejuvenate all our water bodies. Solar-powered pumps with micro irrigation will ensure proper utilisation of water from rejuvenated water bodies.
- ❖ We can have a scheme where we combine renovation of water bodies with a solar or electric powered pump, a piped distribution network, and micro irrigation.
- ❖ We need to fix benchmarks for water use by various industrial sectors, conduct water audits, develop a scheme like PAT (Perform, Achieve, and Trade), etc. The PAT scheme is a programme launched by the Bureau of Energy Efficiency (BEE) to reduce energy consumption and promote enhanced energy efficiency among specific energy-intensive industries in the country.
- ❖ All premises and buildings of various organisations must have functional water harvesting (rooftop rainwater harvesting).
- ❖ A target of improving water use efficiency by 20% was set when the National Water Mission was launched. The global average efficiency is said to be around 52%. Rich countries have about 75%, developing countries have about 40%, and poor countries have about 25%. In India, we estimate it to be between 30 and 40%, but only few studies have been conducted. Improving surface water efficiency will help alleviate pressure on groundwater resources. Benchmarking studies should be undertaken for a few irrigation projects.

- ❖ We have a large number of defunct tube wells all over the country. In some of the states, they seal such tube wells. These defunct tube wells should be utilised to recharge groundwater. Several farmers in Haryana are doing it from their tube wells by removing motors. Through their awareness programs, CGWB has propagated it.
- ❖ Steps for recycling and reuse by water intensive industries can also be a priority area.
- ❖ The Marathwada region should prioritise nutri-cereals (millets). These consume less water, but this will require a change in consumption patterns and also bring at least some of these under the Minimum Support Price (MSP).

Future Vision

- Wider application of nuclear and space technologies in the area of water resources management.
- Scientific re-assessment of flood-prone areas in the entire country.
- Establish a modern real-time flood forecasting and management system for Indian River basins.

Acknowledgement

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