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PRACTICES OF WATER MANAGEMENT: INDIA'S SCENARIO

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ABSTRACT

Water is an important natural resource that maintains ecological balance and its effective management ensures sustainable development. Management of water in different sectors is essential for socioeconomic development of our country. Our shrinking water resources are in stress as they are in pressure to sustain continuously increasing population and only efficient water management practices can counter the scarcity of water that our country is facing. Availability of fresh water for drinking is fundamental requirement of people of any country and it needs to be addressed with sincerity. The much needed development and growing economy of our country is taking us towards rapid urbanisation and industrialisation. The demand for fresh water is increasing and for better utilisation of water resources we need to understand our traditional and modern water management practices. Awareness need to be created among the communities for promoting water conservation techniques as such measures can replenish our depleted water resources. We need to augment the falling per capita availability of fresh water in our country. Even groundwater is being used excessively by different sectors due to rapidly increasing population and this has led to decline in the water table. India is also facing impact of global warming in the form of climate change and this has resulted in depleting the already stressed water resources available in this region.

Keywords: *Natural Resource, Sustainable Development, Water Management Practices, Fresh Water, Water Conservation.*

Introduction

Water is essential for sustaining life on earth and it contributes to every domestic and industrial requirement. Hydrological cycle controls the movement of water on earth and regulates energy transfer by transforming water into different forms. Water on this planet is mostly saline and only around 2.5% is fresh and only 0.26% is utilisable that is available as surface and ground water in different forms in streams, rivers, lakes and aquifers. Most of the fresh water is frozen near the poles and is not easily accessible. This makes water a precious resource and adequate management of fresh water is required for its proper utilisation. Certain water management programs need to be initiated for better long term utilisation of water resources. It also requires low cost effective techniques to replenish the ground water. Traditional ways of restoring water need to be encouraged. Participation of local communities is essential for conserving and reviving water bodies that were traditionally used but are presently abandoned. Such type of traditional water bodies need to be restored and infrastructure for storing water require improvement. Water contamination leads to health and hygiene issues in our country and so wastewater need to be safely disposed to keep water resources clean.

Variation in Rainfall (Availability of Water)

In the Indian subcontinent about 75% of total annual rainfall happens between June and September as South-West monsoon in the form of long rains while 25% happens between October and December as North-East Monsoon in the form of short rains and so sustainable technologies and innovative procedures need to be adopted for achieving fresh water availability throughout the year. The

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resources for fresh water include surface runoff as well as ground water. The average annual rainfall in India is around 118cm. This may fall to around 80cmin extremely dry years leading to drought like conditions and may move to around 135cm in remarkably wet years leading to floods. One or the other type of situation in different regions is commonly seen in our country. The annual distribution of rainfall in India for the last more than 100 years shows considerable variation in different years. It is observed that there are sufficient variations and the rainfall is not evenly distributed. In 2022, just after the end of South-West Monsoon, average rainfall of 92.5cm was recorded in India. It was 6.5% above the normal value of 86.86cmof South-West Monsoon as was given by India Meteorological Department (IMD). In 2021, it was 87.46cm with 0.68% below the normal value. In 2020, this rainfall of South-West Monsoon was 95.67cm with 8.74% above the normal value and in 2019 the actual South-West Monsoon was 10.4% above the normal value as per the data by IMD.

Sustainability Measures (Conservation of Water)

In India 3/4th of the annual rainfall is observed in the form of South-West Monsoon in just four months and major portion of this water is needed to be stored in dams for fulfilling annual demands. According to the National Register of Large Dams (NRLD), up to the year 1900 India had 68 large dams and in the next 50 years up to 1950 around 302 large dams were added. Later between 1950 and 2000 around 4036 large dams were constructed and by the year 2000, dams contributed to about 35% of irrigated land in our country. This contributed to four-fold increase in the food grain production and it reached to about 200 million tonnes. Now we have a total of around 5264 large dams in our country that are completed and about 437 dams are under construction. There are about 65 completed and around 11 under construction large dams in our country that are categorised as dams of national importance that have height of 100m or above with each having 1BCM of gross water storing capacity. India had water storing capacity of little over 15 BCM at the time of independence and now in our completed dams we have storing capacity of around 254 BCM. In India the per capita storing capacity of water is around 209 cubic meter (cu m). Now in 1991, as per the Falkenmark Water Stress indicator, the per capita availability of water in India was around 2200 cu m and this was over the safe mark of 1700 cu m but it fell below this mark to 1486 cu m entering into the water stress state in 2021 and is fast approaching to cross into the water scarcity mark below 1000 cu m. In India the per capita availability of water (1486 cu m) and per capita storage capacity of water (209 cu m) are very low as compared to the respective values of other countries like United States (around 9800 cu m and 2000 cu m), China (around 2050 cu m and 1100 cu m) and Australia (around 21700 cu m and 4700 cu m). Here it can be mentioned that better availability of water can manage even lean rainfall and drought like conditions in a better way. In making large dams, India is ranked third after China and United States but per capita storage capacity of water is comparatively quite low. This means that dams have not completely sorted out our problem of storing water and in modern times we need to explore new techniques like making sub- surface dams or practicing certain traditional techniques like adopting rain water harvesting or adopting some new techniques of irrigation.

Practices of Water Management (Best Utilisation of Water Resources)

Rapidly increasing population has led to over use of water resources. Although water cycles in itself but freshwater resources are limited. Global warming is heating the climate and adversely affecting the environment. This heating together with pollution has deteriorated the quantity as well as the quality of water resources. Our agricultural system is mainly based on rainfall and is facilitated to some extent by water from dams. Now we need to adopt certain eco-friendly approaches to strengthen our domestic, irrigation and industrial water supply system and for this modern as well as traditional practices of water conservation and management need to be incorporated at micro level involving the local community.

Modern Practices of Water Management

Fresh water resources are not unlimited. To manage our population growth and to improve our standard of living we need to adopt certain best practices in water conservation that would promote efficient use of our water resources. This is all the more needed as we are in a water stressed situation and are fast approaching the condition of water scarcity. In India modern practices may include the following:

- **Harvesting of Rainwater**: It effectively recharge the groundwater by conserving the rainwater. Here the rainwater runoff is collected in a pit from rooftop or some catchment area and is allowed to percolate down into the soil to improve the groundwater level. This raises the water table by recharging the aquifers. The rainwater runoff can also be stored over the ground in some tank for further use.

- **Installation of Water Meters:** In the residential and commercial areas water meters have been installed to measure the water used to check wastage of water. Water bills with high usage are monitored and this can also help in detecting any water leakage.
- **Recycling of Grey Water:** Here the greywater which is waste water from kitchen, washing machine and bathing is recycled and used again in toilets, and even for watering plants in the garden. Adoption of this recycling process can reduce domestic water demand by more than 50%.
- **Use of Pressure Reducing Valves:** This controls the pressure in the hydraulic system that supplies water for domestic as well as commercial and industrial purposes. This provides pre-set level of water which efficiently reduces the consumption of water.
- **Use of Water Efficient Toilet Accessories:** The consumption of domestic water can be reduced by more than 50% by using water efficient toilet fittings like modified taps, showers and flushing systems.

Traditional Practices of Water Management

In India, traditional practices may include the following:

- **Talab:** These are reservoirs to store water for domestic purposes. Natural talabs are called pokhariyan or pondsas found at Tikamgarh in Bundelkhand while artificially made reservoirs are like lakes in Udaipur. Talai is a reservoir with area not more than five bighas. Bandhi is a lake with medium size while sagar or samand are lakes that are bigger in size.
- **Jhalara:** These are rectangular type of step wells. These have series of tiered steps on three or all four sides. These have a reservoir or a lake upstream and by subterranean seepage water collects in the step well. These can be located at Jodhpur in Rajasthan.
- **Bawari:** These are special type of step wells that were once part of water storage network in Rajasthan. Canals were built on the hilly outer terrain of cities in Rajasthan and the canals collected the little rainwater received by the region and filled these manmade tanks. This water percolated into the ground and recharged the aquifers thereby raising the water table. These have sequence of layered steps that make them narrow and deep wells that reduces evaporation and minimises the water loss.
- **Taanka:** In the Thar desert region of Rajasthan taanka is one of the traditional type of rain water harvesting technique that has been used for water conservation. In such arid regions where precipitation is less than 25cm these paved cylindrical underground pits are made which collects rainwater from courtyards as well as rooftops or from any prepared catchment area. This secured water can sustain for dry season and serves as a much needed water security.
- **Johads:** These are earthen check dams that collects rainwater and helps in recharging groundwater. Storage pit is excavated in such an area that has natural high elevation on three sides while the fourth wall is made with the excavated soil. It has a single outlet that opens into a nearby river. It is primarily a rainwater harvested storage wetland that works as a percolation pond and recharges groundwater.
- **Kund:** It is a catchment area that is shaped as a saucer and slopes towards a circular underground wellthat is centrally placed. It is a traditional rainwater harvesting system that provides water mainly for drinking. They are found in Rajasthan and Gujarat.
- **Baoli:** These are step wells that are beautifully designed with arches and carved motifs. They may also have rooms on their sides that were mainly used in villages for social gathering. On trade routes they were used as resting places. Sometimes they were specially used for agriculture and water was channelled into fields.
- **Zing:** These are small tanks found in Ladakh that collect water from melting glaciers. A network of several channels is made to bring water from the glaciers. In the morning water starts collecting as a trickle and by afternoon it forms a stream and the water that is collected by evening is used the next day in the field. Water official responsible for equitable distribution of this water is called Chirpun.
- **Kuhls:** These are surface water channels to carry glacial water from rivers and streams into the fields in the mountains of Himachal Pradesh. It is primarily a community controlled irrigation system in which water flows under gravity on the slopes of Kangra Valley.

- **Ooranis or Village Pond**: The small ponds in the village that collect rainwater from rains and from catchment areas are called ooranis. It is a traditional system of rainwater harvesting. Villagers use this water for drinking, washing and bathing. It is a 2000 year old traditional technique used by Tamil society. In drought areas people have restored these water harvesting structures. These help in recharge and conservation of groundwater.

Traditional Practices of Irrigation

- **System of Drip Irrigation using Bamboo Pipes**

This irrigation system uses network of bamboo pipes where water slopes down the bamboo channels under gravity over several hundred metres and drips at the plant site. It is prevalent in north-eastern part of India for more than 200 years where hills have steep slopes with rocky terrain and soil has little tendency to retain moisture. Water of spring or some stream is used in this way. The farmers of Jaintia, Khasi and Garo hills of Meghalaya state uses this technique to grow paddy,black pepper and betal leaves. Water may also be carried in this way for domestic use.

- **System of Zabo Farming**

This is a system of water harvesting practised in the north- eastern state of Nagaland. Here Zabo means impounding or collecting the run-off. In the hills the run-off slopes down passing through different terraces and somewhere in the middle terrace this water is collected in a pond like structure. This water is utilised in cattle yards and in paddy fields at the foothills. This water along with dung and urine of animals is carried through split type of bamboo channels and is nutritious for the crops.

Conclusion

Modern technology alone has limitations and are not sufficient in present times. Traditional Indian system of water management appear to be more appropriate and effective in achieving sustainability goals. Water problems should be managed at micro level involving local community. Almost 80% of water in India is used in agricultural activities. Traditional practices incorporating and infusing modern techniques can resolve India's water scarcity issues efficiently. Even Indian government has introduced certain inspiring projects like *Har Khet Ko Pani* under Pradhan Mantri Krishi Sinchayee Yojana (PMKSY), *Per Drop More Crop*(PDMC) Scheme and *Mission of Doubling Farm Income* to make farming more attractive and remunerative. *Jal Shakti Abhiyan* (JSA) was launched in 2019 and later *Catch the Rain* (CTR)initiative was taken up in 2021.To manage water scarcity scenario micro level initiatives with localised provisions include(i) creation of water harvesting structures (ii) promoting awareness programs for water conservation (iii) renovating and restoring the traditional water bodies (iv) crop pre-planning and budgeting (v) adoption of micro-irrigation practices and completing the pending irrigation projects. These measures can reduce uncertainties and can even mitigate extreme events due to climate change.

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