

# Water Resource Management in India: A Review

Dr. Pardeep Malik

Associate Professor, Department of Geography, Pt. N. R. S. Government College, Rohtak

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## ABSTRACT

Our lives are immensely dependent on water. Water is an important natural resource for maintaining the environment and life. For sustainable development to be attained, the availability of water must be managed effectively and sustainably. India, one of the most populous and diverse nations in the world, has a difficult time managing its water resources sustainably. An overview of India's geographical and hydrological variety, highlighting the variances in water supply across different regions, is given at the start of the assessment. It explores the historical evolution of the nation's water management techniques, from ordinary community-based methods to centralized programs launched after freedom.

**Keywords:** Water demand, Natural resources, Water resources, Water Management Techniques, Water supply

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## Water Management

The concept of "water management" denotes to the careful preparation, use, conservation, and regulation of India's water resources. It involves putting plans, regulations, and practices into effect to tackle issues with water, such as a shortage of water, too much groundwater use, surface water body pollution, equitable water distribution, & water conservation within many sectors, such as agriculture and domestic supply.

India's temperature, groundwater, geography, flora, and fauna are wildly varied, and the country has a land area of 3.28 million square kilometers. Massive rains and flooding are a threat to the entire India. The excessive use of groundwater is a major factor in many areas of the nation's ongoing decline. Just 4 percent of the world's water resources exist in India, while containing around 18% of the global population. Due to its severe water shortage, water management is now a top national issue. The largest user of groundwater in the world is India, consuming within 230 cubic km of groundwater on a yearly or more than 25% of the total amount used worldwide. Over 60% of the irrigated area in India is supported primarily by groundwater resources, and about 90% of the water taken from groundwater is utilized for agriculture. Water is a major factor behind agriculture in a farming country like India and it directly affects its production and sustainability.

The impact of climate change is making the issue worse by causing unpredictable and heavy rainfall. This results in the loss of valuable freshwater to the ocean, together with a shortage of overflow storage capacity. Additionally, there is a severe shortage of infrastructure within communities for the safe disposal of sewage, which contributes to additional contamination of water sources. Water pollution is a significant issue that raises issues with hygiene and health. Controlling the water in every place is crucial in the extreme temperature. Water management involves more than just moving water. Increasing water consumption & managing the demand for water under pressure is a couple of options to water management.

## Ground Water Management:

An essential part of India's overall water resource management policy is groundwater management. Groundwater supplies 85% of the country's rural drinking water demands, 30% of the nation's agriculture needs, and an important amount of the industrial water needs, therefore managing it properly is crucial for long-term sustainability and tackling the problems associated with water scarcity. When compared to the decadal level of water average (2010-19), the groundwater level in 33% of the wells that the Central Ground Water Board (CGWB) monitors decreased by 0 to 2 meters in Nov 2020.

With a fourth of the worldwide departure, India is the biggest groundwater consumer. About 48% of the water consumed in Indian areas is derived from groundwater. In India, there are approximately 4400 statutory cities and villages, and there are already 400 million people living there.

### **Drought Management**

A key component of India's attempts to reduce the effects of recurrent droughts and maintain the adaptability of populations and ecosystems to protracted water shortages is drought management. In India, substantial agricultural losses, water stress, food shortages, economic difficulties, and negative effects on the environment and public health can result from droughts. To reduce these effects and aid those that are impacted, effective drought management methods are crucial.

In India, irregular rainfall—more days with higher rainfall, longer dry intervals between heavy rainfall events, and delayed monsoons—is what causes drought in addition to insufficient rainfall. This pattern is becoming more common as a result of climate change.

Approximately 55 million people in the world are affected by the drought each year & they provide the greatest threat to livestock and crops in almost every region of the planet. 40% of the world's population suffers from shortages of water, and by 2030, 700 million people could be at risk of being evacuated due to drought.

### **Flood Management**

India's diverse climate, geography, and monsoonal seasons make its citizens vulnerable to frequent and hazardous floods, rendering flood management a crucial component of disaster prevention and response. Floods can result in fatalities, destruction of property and infrastructure, disruption of daily life, and negative environmental effects. In order to reduce the effects of floods and increase the ability to recover of communities and ecosystems, effective flood control measures are crucial.

The Ganga-Brahmaputra-Barak flood basins are now prone to flooding every year. The tragedy dwarfs the threat of floods in several other states in terms of scale. At their worst, the floods impacted 1240 villages and 81.59 lakh people in North Bihar and around 4600 villages and 57.50 lakh people in Assam. Rescue efforts were launched in response, and relief camps and distribution hubs were established. However, they fall short of the disaster's size. The situation requires an intense effort toward flood governance through building resilience.

The conversation needs to move away from building enhancements and toward the daily lives and means of survival for communities living in places that frequently experience flooding. It is necessary to adopt a wide range of flood risk control measures at once using a combination of structural & other forms of action. This calls for developing highways, canals, sluice barriers on banks, and bank rehabilitation in addition to investments in earnings, wellness, and education. By doing so, the flood management concept would be expanded to encompass risk of flooding preparation, protection, and post-flood recovery methods in addition to flood defense strategies.

Out of a total area of 3290 lakh hectares, 40 million hectares are vulnerable to flooding. This makes up 12% of the nation's total land area. Floods are now also happening in places that weren't previously believed to be at risk of flooding. Flood evaluations and alerts are still used as unusual measures. With more than 157 flood monitoring sites spanning almost all flood-prone states, CWC has developed a flood forecast for 62 primary rivers.

### **Watershed Management**

With the objective to provide required products and services without negatively damaging soil and water resources, watershed management is a method of controlling and structuring land use and utilization of other resources in a watershed.

This idea recognizes the connections between uplands and downstream regions as well as the interactions between soil, water, and land use. To safeguard and enhance the quality of the water and other natural resources within a watershed, it entails putting land use and water management practices into practice.

In Integrated Water Resources Management (IWRM), the watershed is a management area where land use and management have no effect on surface waters or groundwater. The initiative is being carried out in every state in the nation, and it is being funded 90:10 by the federal and state governments.

### **Water Conservation**

In India, water conservation is crucial because of the nation's expanding population, rising water demand, and unpredictable rainfall patterns. Groundwater loss, water pollution, and other issues with India's water supply make conservation efforts crucial for long-term water management. More than 50% to 80% of the total waste water discharge in every city comes from the residential sector. Only commercial and industrial structures are left.

It is estimated that we presently need 1,100 billion cubic meters of water annually. The government has been working to enhance the state of water bodies and implement improved treatment methods in an effort to get to that high standard. Some of the campaigns and schemes started by the Government of India are:

1. Jal Shakti Abhiyan- This campaign was started in 2019, to improve availability of water and conservation.
2. AMRUT 2.0 Scheme- This scheme was started by the Government of India in 2021 that includes every statutory town in the nation in order to guarantee water supply for everyone and make cities "water secure."

The "Environment (Protection) Act, 1986" established the Central Ground Water Authority (CGWA) with the purpose of regulating and managing ground water development.

### **Recycle and Reuse of Water**

Reusing treated wastewater for use including irrigation, toilets, and recharging groundwater sources involves water recycling, also known as water reuse. Gray water is a sort of reusable wastewater that is produced by sinks, bathtubs, and washing machines in homes and businesses. Municipalities are developing novel ways to use treated wastewater for cleaning streets, watering golf courses, and landscaping as a result of the rising drought conditions. Instead of just being sewage, treated wastewater is increasingly being used as a resource.

Reusing water involves gathering it from various sources, treating it, and using it again for advantageous activities such irrigation and farming, potable water production, groundwater replenishment, manufacturing, and conservation.

### **Rainwater Harvesting**

Rainfall can be gathered for use in the future using an easy method called rainwater harvesting. The rainwater that is collected can be utilized for recharging, stored, or used in other ways. RWH can significantly reduce the effects of declining groundwater levels and varying temperatures. In India, where water scarcity is a common problem due to the country's fast expanding population, variable climate, and unequal rainfall distribution, rainwater collection is an essential water conservation practice.

Tamil Nadu was the first Indian state to mandate rainwater collection for facilities in order to slow the depletion of groundwater, and the state is seeing many advantages as a result. Five years later, Chennai's groundwater levels increased by roughly 50%, which enhanced the water's quality? Efforts to raise general awareness both in urban and rural areas played a role in the success of this initiative. 97% of the water on Earth is found in seas, 2% is frozen in the polar caps, and only 1% is fresh water. India makes for 4% of that 1%, but making up 18% of the worldwide population. Madakas, aharpynes, surangas, taankas, and other traditional and ancient rainwater collecting methods are still used in India nowadays.

India receives approximately 1,120 mm of rainfall on a yearly average. The amount of rain that falls in Maharashtra on average ranges from 400 to 6000 mm. The average yearly RWH potential per acres would be around 4.4 million litres using the state typical rainfall of 1,300 mm.

### **Water Desalination**

Desalination is the process of purifying saline of minerals and salts to create fresh, drinkable water. Desalination is a crucial strategy in areas with severe water shortages, and it has drawn interest in India because of the country's rising water demands and constrained freshwater supplies. Although desalination technology use across India has improved, it is still very limited when compared to other water sources.

## **CONCLUSION**

In my opinion water resource management in India is a difficult task with multiple aspects. Due to the nation's expanding population, brisk urbanization, and erratic climate, there is an increasing need for freshwater resources, which are already scarce.

Therefore, it is essential to use effective and environmentally friendly water management techniques to guarantee water security and environmental protection. Weather structures, rainfall, and the natural cycle of water are all significantly impacted by climate change, which also has an impact on soil moisture and groundwater recharge.

Instead of using river basins as the hydrological unit, the majority of water planning and development in the nation has been done according to regulatory boundaries. Since most river basins are shared by multiple states, this has caused in

water conflicts as each state's water consumption has increased significantly to accommodate growing household, industrial, and agricultural needs.

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