

Water Resource Management in India

1. Introduction: The Paradox of Abundance and Scarcity

India faces a unique hydrological paradox. While the country receives substantial annual rainfall (nearly 4,000 Billion Cubic Meters or BCM), geographical unevenness, seasonal concentration (the monsoon), and inadequate storage infrastructure mean only about 1,100 BCM is considered utilizable.

The Core Imbalance:

India supports approximately **18% of the global population** but possesses only about **4% of the world's freshwater resources**. The management of these resources is critical to the country's agricultural security, economic growth, and public health.

2. Water Availability & Distribution

A. Surface Water

India's surface water is primarily distributed across major river basins. The Ganga, Brahmaputra, and Indus basins hold the vast majority of the country's surface water, but this distribution is heavily skewed. For instance, the Brahmaputra basin holds massive water wealth but supports a relatively small population, whereas the Peninsular river basins face frequent deficits.

B. Groundwater

India is the **largest user of groundwater globally**, accounting for nearly 25% of global extraction.

- **Extraction Rates:** According to the Dynamic Groundwater Resources Assessment (2025), India's annual groundwater extraction stands at 247.22 BCM, which is over 60% of the assessed natural recharge.
- **Regional Stress:** States like Punjab, Haryana, Rajasthan, and parts of Tamil Nadu are extracting groundwater much faster than it can be naturally replenished. In Rajasthan alone, over 70% of groundwater assessment units are classified as "overexploited".

C. Per Capita Availability Decline

Water stress is defined when per capita availability falls below 1,700 cubic meters/year, and water scarcity begins below 1,000 cubic meters/year.

Year	Per Capita Water Availability	Status
1951	> 5,000 cubic meters	Comfortable
2021	1,486 cubic meters	Water Stressed
2031 (Projected)	1,367 cubic meters	Nearing Scarcity

Data Source: Central Water Commission (CWC) Reassessment of Water Availability.

3. Key Challenges in Water Management

- 1. Agricultural Over-reliance:** Agriculture consumes nearly 80% of India's freshwater resources. The cultivation of water-intensive crops (like paddy and sugarcane) in water-scarce regions (like Punjab and Maharashtra) severely depletes aquifers.
- 2. Institutional Fragmentation:** Water governance is divided across multiple agencies handling irrigation, drinking water, groundwater, and urban supply, leading to policy overlaps and weak accountability.
- 3. Climate Change:** Changing precipitation patterns result in greater rainfall variability. We are seeing a rising concentration of high-intensity precipitation events, meaning water falls too quickly to be absorbed, leading to urban floods followed by summer droughts.
- 4. Pollution:** Both surface rivers and groundwater face severe contamination from untreated sewage, industrial discharge, and agricultural runoff (leading to arsenic and fluoride contamination in several states).

4. Institutional Framework

Water governance in India operates through a federal structure, with "Water" primarily being a State subject, while the Central Government provides technical and financial frameworks.

Institution	Key Responsibilities
Ministry of Jal Shakti	The nodal central ministry created by merging various water-related ministries to ensure integrated water management.
Central Water Commission (CWC)	Focuses on surface water management, flood forecasting, river basin planning, and dam safety.
Central Ground Water Board (CGWB)	Assesses groundwater resources, monitors aquifer levels, and provides scientific inputs for sustainable extraction.
NITI Aayog	Introduced the Composite Water Management Index (CWMI) to promote competitive and cooperative federalism among states in water governance.

5. Major Policies and Conservation Strategies

To shift from a supply-side approach (building more dams) to a demand-side approach (using water more efficiently), India has launched several flagship initiatives:

- a) **Jal Jeevan Mission (JJM):** Aims to provide functional household tap connections (FHTCs) to all rural households, shifting the burden of water collection away from women and improving rural sanitation.
- b) **Pradhan Mantri Krishi Sinchayee Yojana (PMKSY):** Focuses on improving water-use efficiency on farms ("More crop per drop"). It promotes micro-irrigation, drip, and sprinkler systems.
- c) **Jal Shakti Abhiyan - "Catch the Rain":** A nationwide campaign focusing on water conservation, rainwater harvesting, intensive afforestation, and the geo-tagging of local water bodies.
- d) **AMRUT 2.0:** Targeted at urban areas to ensure universal coverage of water supply and make statutory cities "water secure" through circular economy principles like recycling treated wastewater.

The Way Forward: A Circular Water Economy

India must transition from a linear "use and discard" model to a circular water economy. This requires large-scale wastewater recycling for industrial and agricultural reuse, crop diversification toward less water-intensive crops, and the revival of traditional water bodies (like tanks and step-wells) to improve natural recharge.