



## Making Water Management Effective in India

*This editorial is based on “[A holistic approach to water conservation](#)” which was published in The Hindu Business Line on 05/12/2024. The article brings into picture the critical depletion and uneven distribution of India’s water resources, highlighting unsustainable practices that could lead to a severe water deficit by 2050. It underscores the need for urgent reforms in conservation, efficient usage, and transformative strategies like micro-irrigation and water recycling to ensure sustainable development.*

**For Prelims:** [India's water resources](#), [Article 21 of the Constitution](#), [Environment Protection Act, 1986](#), [Inter-State River Water Disputes Act, 1956](#), [National Water Policy](#), [Jal Jeevan Mission](#), [Pradhan Mantri Krishi Sinchai Yojana](#), [Groundwater level](#), [Cauvery water dispute](#), [Water Quality Index](#).

**For Mains:** Current Framework for Water Management in India, Major Issues Related to Water Management in India.

[India's water resources](#) are under critical pressure, with finite supplies and uneven distribution threatening future economic and ecological stability. Current water management strategies, heavily reliant on groundwater extraction and large dam construction, are proving unsustainable, with **54% of groundwater wells declining** and **78% of monsoon rainwater flowing unused into oceans**. The country faces a stark water deficit by 2050, where total water consumption is projected to exceed available supply, **necessitating urgent shifts towards comprehensive demand-side management** and water conservation.

### What is the Current Framework for Water Management in India?

#### ▪ Constitutional Provisions

- **State List:** Water is primarily a State subject (Entry 17, List II of the Seventh Schedule), allowing states to legislate on water supply, irrigation, canals, and drainage.
- **Union List:** The Centre has jurisdiction over inter-state rivers and river valleys (Entry 56, List I).
- [Article 21 of the Constitution](#) indirectly recognizes the **Right to Water** as a part of the Right to Life.

#### ▪ Legislative Framework

- [Environment Protection Act, 1986](#): Regulates water pollution and mandates environmental clearances for water-intensive projects.
- [Water \(Prevention and Control of Pollution\) Act, 1974](#): Establishes water quality standards and penalizes pollution.
  - Provides for the establishment of the **Central Pollution Control Board (CPCB) and State Pollution Control Boards (SPCBs)**.

- **Inter-State River Water Disputes Act, 1956:** Facilitates the resolution of disputes over sharing inter-state river waters through tribunals.
- **Institutional Mechanisms**
  - **Ministry of Jal Shakti:** Formed by merging the Ministries of Water Resources and Drinking Water & Sanitation. It oversees the planning and implementation of water resources programs.
  - **Central Water Commission (CWC):** Manages water resource development and flood forecasting.
  - **Central Ground Water Board (CGWB):** Monitors and regulates groundwater resources.
- **Key Policies and Programs**
  - **National Water Policy (2012):** Advocates for sustainable and integrated water resource management.
    - Emphasizes demand management, pricing of water, and community participation.
  - **Jal Shakti Abhiyan:** Focused on rainwater harvesting, water conservation, and rejuvenation of water bodies.
    - Targets districts facing acute water scarcity.
  - **Jal Jeevan Mission:** Aims to provide functional household tap connections to all rural households..
  - **Atal Bhujal Yojana:** Focused on groundwater management through community participation and demand-side interventions.
  - **Pradhan Mantri Krishi Sinchai Yojana (PMKSY):** Promotes efficient use of water in agriculture with the slogan “Per Drop More Crop.”

## What are the Major Issues Related to Water Management in India?

- **Over-Extraction of Groundwater:** India’s groundwater resources are being **over-exploited due to unregulated extraction**, primarily for irrigation and domestic needs.
  - This **over-reliance is exacerbated by free electricity for farmers** and insufficient surface water harvesting systems, leading to a severe decline in aquifers.
  - **Groundwater levels in 70% of monitored wells have shown significant depletion**, with Punjab declining at an **alarming rate of 0.49 meters annually**.
  - Given that groundwater supports **62% of irrigation and 85% of rural drinking water**, its depletion poses a catastrophic threat to water security.
- **Inefficient Use of Water in Agriculture:** With agriculture consuming nearly **80% of India’s water**, inefficient irrigation methods like **flood irrigation and the cultivation of water-intensive crops** such as sugarcane and paddy exacerbate the water crisis.
  - States like **Maharashtra** and **Punjab**, despite being **drought-prone**, continue to grow these crops without adequate diversification.
  - For instance, about **4% of farmed land in Maharashtra is under sugarcane**, but it consumes 71.5% of irrigated water, including wells.
- **Urban Water Mismanagement:** Rapid urbanization has outpaced water infrastructure, resulting in **supply-demand mismatches** and increasing reliance on tanker water.
  - Poor urban planning has reduced groundwater recharge, while untreated sewage further pollutes urban water bodies.
  - Bengaluru faces severe water scarcity amid its worst drought in **30-40 years**, with an IISc study attributing it to a **70% decline in the city’s water spread area**, leaving the city heavily dependent on Cauvery water.
- **Water Pollution:** India’s rivers and lakes are turning into **toxic reservoirs due to industrial effluents, untreated sewage, and agricultural runoff**. Weak enforcement of pollution control laws aggravates the problem.
  - Despite extensive cleaning efforts, the **Ganga river’s faecal coliform level** is found **3 to 12 times higher than the permissible level** at most inter-state boundaries.
  - The **CPCB identified 351 polluted river stretches**, with the Yamuna being one of the worst affected, receiving over 80% of Delhi’s untreated sewage.
- **Climate Change and Variability:** Climate change is intensifying **water-related disasters** such as floods and droughts, destabilizing water availability.
  - Erratic monsoon patterns and increased glacial melt in the Himalayas aggravate seasonal water scarcity.
  - India’s drought-prone area has increased by **57% since 1997**, while instances of heavy

- rainfall have risen by almost **85% since 2012**
- Studies by ISRO show that approximately **75% of the [Himalayan glaciers](#)** are retreating at an alarming rate.
- **Inter-State Water Disputes:** Conflicts over river water allocation disrupt cooperative water management and escalate regional tensions.
  - These disputes often arise due to a lack of transparent data-sharing and effective institutional mechanisms.
  - The **[Cauvery water dispute](#) between Karnataka and Tamil Nadu** escalated in 2023.
- **Inadequate Focus on Wastewater Recycling:** India's wastewater recycling efforts are inadequate, leading to the wastage of a valuable resource that could be reused for agriculture or industry.
  - **Israel**, for instance, reuses **90% of its wastewater** compared to less than **30% in India**.
  - While urban India generates **72,368 million litres (MLD)** of sewage every day, **only 28% is treated and reused**.
- **Ineffective Water Governance:** Fragmented institutional frameworks and overlapping jurisdictions hinder coordinated water management.
  - Policies often prioritize **short-term electoral gains, Minimum Support Price** incentives for water-intensive crops like rice and sugarcane, coupled with free or subsidized electricity, amplify water scarcity challenges.
  - India ranked **120th in the [Water Quality Index](#)** due to poor governance and inadequate implementation of water policies.
- **Overdependence on Monsoons:** India's reliance on monsoonal rains for agriculture and drinking water supply makes it **vulnerable to erratic rainfall patterns**, which are worsening due to climate change.
  - Poor rainwater harvesting infrastructure further compounds this dependency.
  - About **61% of India's farmers** rely on rain-fed agriculture and **55% of the gross cropped area is under rain-fed farming**
- **Privatization and Commercialization of Water:** The growing privatization of water resources has created inequitable access, with poorer communities often priced out.
  - In many remote areas, private water tankers dominate the supply, charging exorbitant rates.
  - For instance, the Tanker mafia earns **Rs 8,000-10,000 crore annually from water business** in Mumbai, disproportionately affecting people.
- **Loss of Wetlands and Their Water Retention Capacity:** India's wetlands, essential for groundwater recharge and flood mitigation, are shrinking due to urbanization, agriculture, and industrial activities.
  - Nearly two of every five wetlands in India have lost their natural existence in the last 30 years while 40% of water bodies have lost quality for survival of aquatic animals.
  - **For instance, Loktak Lake in Manipur, a Ramsar site, is in danger of decline.**
- **Impact of Sand Mining on Water Ecosystems:** Illegal sand mining from river beds **disrupts natural water flows, depletes aquifers, and destroys habitats**, worsening water scarcity and ecological imbalances.
  - **India extracts 500 million tons of sand annually.** Excessive sand mining has reduced the **water retention capacity like in Yamuna River**, causing a decline in flow during non-monsoon months

## What Measures can be Adopted for Enhanced Water Management?

- **Enforcing Groundwater Regulation:** India must strengthen regulations on groundwater extraction, **particularly in overexploited regions**, and promote the adoption of groundwater recharge systems.
  - Effective implementation can be driven through **community-led initiatives and mandatory water audits** for industries and agriculture.
- **Reviving Traditional Water Harvesting Systems:** Rehabilitating traditional water systems, such as **stepwells, tanks, and johads**, ensures sustainable water availability, particularly in arid and semi-arid regions.
  - **Rajasthan's Tarun Bharat Sangh NGO rejuvenated and revived 11 rivers in the state of Rajasthan**, improving groundwater recharge, which can serve as a model.
- **Promoting Drip and Micro-Irrigation:** Transitioning to **drip and sprinkler irrigation**

**systems** can enhance water use efficiency in agriculture by up to 70%, minimizing waste and conserving water.

- **Maharashtra's mandate for drip irrigation in sugarcane cultivation** can serve as a model.
- **Strengthening Urban Water Infrastructure:** Modernizing **urban water pipelines, leak detection systems, and smart metering** can significantly reduce non-revenue water (NRW) losses.
  - Mandating **rainwater harvesting** and wastewater recycling for urban projects can augment water resources.
  - For instance, cities like **Bengaluru**, where a major chunk of its water supply is lost to NRW, can benefit from **Singapore's smart water management model**.
- **Enhancing Water Governance:** India requires a **unified water governance framework** that integrates central and state policies to ensure accountability and minimize bureaucratic delays.
  - The **NITI Aayog's Composite Water Management Index (CWMI)** offers a roadmap for performance-based incentives.
  - Transforming cities into **Sponge Cities** is a key goal of the **AMRUT mission** and must be executed sincerely, not left as a **paper tiger**.
  - **National Water Policy (2012)** has not achieved its goals, because of governance and funding issues. Decentralized water management with adequate funding is key.
- **Incentivizing Crop Diversification:** Encouraging farmers to **shift from water-intensive crops like paddy and sugarcane to millets, pulses, and oilseeds** can reduce water demand in agriculture and improve productivity.
  - Financial incentives and robust market linkages are vital for this shift.
  - **Haryana's Mera Pani Meri Virasat scheme promotes alternative crops**, can serve as a model.
  - India's leadership in promoting millets during the **International Year of Millets (2023)** highlighted the potential of these water-efficient crops.
- **Advancing Wastewater Treatment and Reuse:** Investing in **wastewater treatment** infrastructure can convert urban sewage into usable water for agriculture, industry, and landscaping, building upon **Supreme Court's M.C. Mehta v. Union of India judgement**.
  - Chennai reuses **20% of its treated wastewater for industrial applications and can serve as a model**.
- **Addressing Climate Change Impacts:** Building climate-resilient infrastructure such as **floodplains, embankments, and storage reservoirs** can mitigate extreme weather impacts like floods and droughts.
  - Afforestation in catchment areas stabilizes water cycles. **Assam's Climate Resilient Brahmaputra Integrated Flood and Riverbank Erosion Risk Management Project**, can serve as a model.
- **Expanding Digital Water Management:** Digital technologies like **IoT sensors, satellite imagery, and AI** can optimize water monitoring, improve irrigation efficiency, and reduce leaks. Real-time decision-making through these tools enhances transparency and accountability.
  - **Mekorot, Israel's national water company, is installing AI-driven water quality monitoring**, setting a benchmark.
- **Protecting and Restoring Wetlands:** Wetlands act as natural water purifiers and storage systems but are rapidly declining due to urbanization and encroachments.
  - **Restoring degraded wetlands** can improve water quality and recharge aquifers, building upon Supreme Court judgment in **Mirza Abid Beg vs State Of U.P**, where SC observed that the **State has the constitutional duty to not only protect water bodies within the state but also to restore those water bodies**
  - **East Kolkata Wetlands**, on a daily basis, **naturally recycle 910 million litres of the city's** untreated sewage by providing a **basin for aerobic treatment of wastewater**
- **Incentivizing Private Sector Participation:** Private-sector investment in water infrastructure, such as **desalination plants, wastewater treatment, and smart water management**, can complement public efforts.
  - Clear regulations and public-private partnerships (PPP) are key to success.
  - **The Narmada desalination plant in Gujarat**, developed under a PPP model, can serve as a model.
- **Developing Inter-State Water Sharing Frameworks:** India must establish robust legal and institutional mechanisms to **manage inter-state water disputes and ensure equitable**



**distribution of shared resources.**

- Mediation, data transparency, and cooperative agreements are essential.
  - The **Cauvery Water Management Authority (CWMA)** has shown mixed results, but a transparent data-sharing mechanism could improve its effectiveness.
  - The **Indus Water Treaty model** can inspire similar frameworks for inter-state rivers like the Krishna and Godavari.
- **Introducing Differential Water Pricing:** Tiered water pricing for **agricultural, industrial, and domestic consumers** can discourage wasteful practices while subsidizing access for vulnerable populations.
- China's water pricing reforms show that the policy reform reduced annual residential water demand by **3-4% in the short run and 5% in the longer run.**

**Conclusion:**

India's water crisis demands an **urgent, multi-pronged approach that transcends traditional management strategies.** By integrating **innovative technologies, policy reforms, and community-driven solutions,** the country can address its critical water challenges. Embracing sustainable practices like micro-irrigation, wastewater recycling, and traditional water harvesting techniques will be pivotal in securing water resources.

**Drisht Mains Question:**

"Water mismanagement in India poses a significant threat to its socio-economic and environmental sustainability." Discuss the consequences, and measures needed to address this challenge.

**UPSC Civil Services Examination, Previous Year Question (PYQ)**

**Prelims:**

**Q.1. Which one of the following ancient towns is well known for its elaborate system of water harvesting and management by building a series of dams and channelizing water into connected reservoirs? (2021)**

- (a) Dholavira
- (b) Kalibangan
- (c) Rakhigarhi
- (d) Ropar

**Ans: A**

**Q.2. With reference to 'Water Credit', consider the following statements: (2021)**

1. It puts microfinance tools to work in the water and sanitation sector.
2. It is a global initiative launched under the aegis of the World Health Organization and the World Bank.
3. It aims to enable the poor people to meet their water needs without depending on subsidies.

**Which of the statements given above are correct?**

- (a) 1 and 2 only
- (b) 2 and 3 only

(c) 1 and 3 only

(d) 1, 2 and 3

**Ans: C**

**Mains:**

**Q.1** What are the salient features of the Jal Shakti Abhiyan launched by the Government of India for water conservation and water security? **(2020)**

**Q.2** Suggest measures to improve water storage and irrigation system to make its judicious use under the depleting scenario. (2020)

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