WATER MANAGEMENT IN INDIA - ENVIRONMENT

NEWS: The Union Cabinet recently approved the Modernization of Command Area Development and Water Management (M-CADWM) as a sub-scheme of Pradhan Mantri Krishi Sinchayee Yojana (PMKSY) for the period 2025-2026 with an initial total outlay of Rs.1600 crore.

SCADA (Supervisory Control and Data Acquisition) is a computer-based system that gathers and analyzes **real-time data** to monitor and control equipment that deals with critical and **time-sensitive materials or events**.

WHAT'S IN THE NEWS?

About the Modernisation of Command Area Development and Water Management (M-CADWM) Scheme

Key Objectives and Features

- Modernization of Irrigation Systems:
 - **Goal**: Improve irrigation water supply infrastructure to ensure water reaches designated farming clusters from existing sources (e.g., canals).
 - Scope: Focus on modernizing the backend infrastructure for microirrigation and water supply up to 1 hectare per farm via underground pressurized piped irrigation systems. Technologies:
 - SCADA (Supervisory Control and Data Acquisition): For real-time monitoring and control.
 - Internet of Things (IoT): Used for efficient water accounting and management, improving Water Use Efficiency (WUE) at the farm level.
- Increased Agricultural Productivity: The modernization will increase agriculture production and productivity, leading to higher income for farmers.
- Irrigation Management Transfer (IMT):
 - Sustainability: The scheme includes the Irrigation Management Transfer (IMT) to Water User Societies (WUS), which will be responsible for the management of irrigation assets.
 - Support: WUS will be given handholding support for five years, helping them connect with economic entities such as Farmer Producer

Organisations (FPOs) or **Primary Agricultural Cooperative Societies** (PACS).

• Youth Engagement in Farming: Attract youth to adopt modern irrigation techniques and engage in farming, helping to modernize agricultural practices across the country.

Implementation Strategy

- Pilot Phase (2025-26): Challenge funding to states for projects across different agro-climatic zones.
 - Lessons will shape the National Plan for Command Area Development.
- Full-scale Launch (From April 2026): Aligned with 16th Finance Commission period.

Annual per-capita water availability of less than 1700 cubic meter is considered as water stressed condition whereas annual per-capita water availability below 1000 cubic meters is considered as a water scarcity condition.

India's Water Status

- Water Availability and Population Pressure: India has 4% of the world's freshwater but 18% of the world's population, making it one of the most water-stressed countries.
 - Per capita water availability has declined from 5,410 m³/year (1951) to 1,614 m³/year (2011) and is projected to fall to 1,235 m³/year by 2050.
- Precipitation Pattern: India receives an average of 4,000 km³ rainfall annually, but high temporal and spatial variability means that only ~1,123 km³ is utilizable.
 - 80-90% of rainfall occurs during the 4-month monsoon window, often in just 100 hours/year, leading to floods and underutilization.
- Groundwater Dependency and Crisis: 63% of irrigation water and 90% of rural drinking water comes from groundwater.
 - India withdraws 25% of the world's groundwater, more than the US and China combined.
 - **60% of districts** are in the **critical** category for groundwater—overexploited or poor quality.
- **Pollution and Quality Concerns: 70% of surface water** is polluted due to untreated sewage, industrial discharge, and agricultural runoff.

- India is ranked **120 out of 122 countries** on the **global water quality index**.
- Urban and Rural Water Challenges: Urban water losses due to leakage are massive; e.g., Mumbai loses 700 million liters/day.
 - More than 50% of the population lacks access to safe drinking water; 200,000 deaths/year occur due to waterborne diseases.
 - Over 75% of households lack clean drinking water, and 40% of Indians may have no access to drinking water by 2030.
- Economic Cost and Development Impact: NITI Aayog warns that water scarcity could lead to a 6% loss in GDP by 2050.
 - Water stress already affects **agricultural output**, **health**, **education**, and **livelihoods**, especially among women and rural poor.

Water Management in India

• Water management refers to the planning, development, distribution, regulation, and conservation of water resources — both surface and groundwater — for drinking, agriculture, industry, sanitation, and ecosystem sustenance.

Constitutional Provisions For Water in India

- State Subject (Entry 17, List II): Water is primarily a State subject covering water supply, irrigation, canals, drainage, water storage, and water power.
- Union List (Entry 56, List I): Parliament can regulate and develop inter-State rivers and river valleys if it serves the public interest.
- Article 262 Water Dispute Resolution: Enables Parliament to provide for adjudication of inter-State river disputes and bars Supreme Court's jurisdiction if a tribunal is set up.
- Right to Water under Article 21: The Right to Life has been interpreted by the Supreme Court to include the Right to Clean and Safe Drinking Water (e.g., Subhash Kumar v. State of Bihar, 1991).
- Directive Principles & Fundamental Duties:
 - Article 48A: State must protect environment, forests, and water bodies.
 - Article 51A(g): Duty of citizens to protect natural environment.
- Local Governance Empowerment: Articles 243G & 243W empower Panchayats and Municipalities to manage water supply, irrigation, and sanitation under the 11th and 12th Schedules.

Legislative Framework for Water Management in India

- Inter-State River Water Disputes Act, 1956: Enacted under Article 262, it provides for the adjudication of disputes relating to the use, distribution, and control of waters of inter-state rivers through tribunals (e.g., Cauvery, Krishna).
- River Boards Act, 1956: Empowers the Central Government to set up River Boards for inter-state river regulation and development, though never operationalized.
- Environment Protection Act, 1986: A comprehensive framework for water pollution control, under which the Water (Prevention and Control of Pollution) Act, 1974 also functions via the Central and State Pollution Control Boards.

Institutional Framework for Water Management in India

- Ministry of Jal Shakti (MoJS): The nodal central ministry (formed in 2019) responsible for policy formulation, coordination, and implementation of major schemes like PMKSY, Jal Jeevan Mission, and Namami Gange.
- Central Water Commission (CWC): A premier technical body under MoJS, responsible for surface water assessment, project planning, flood forecasting, and advisory support to states on irrigation and dam safety.
- Central Ground Water Board (CGWB): Monitors and regulates groundwater resources, prepares aquifer maps, and advises on sustainable groundwater usage and recharge.
- State Water Resources/Irrigation Departments: Implement and manage state-level water projects, local irrigation, and intra-state water governance, aligned with central schemes.
- Decentralized Institutions: Panchayati Raj Institutions (PRIs) and Urban Local Bodies (ULBs) manage local water supply and sanitation.
 - Water Users' Associations (WUAs) promote Participatory Irrigation Management (PIM) at the grassroots level under schemes like CADWM.

Major Government Initiatives for Water Management in India

- **Pradhan Mantri Krishi Sinchayee Yojana (PMKSY) (2015):** Umbrella scheme for **irrigation expansion**, **micro-irrigation**, and **water conservation**.
 - Key components: Accelerated Irrigation Benefit Programme (AIBP), CADWM, Per Drop More Crop (PDMC), and Watershed Development.
- Jal Jeevan Mission (JJM) (2019): Aims to provide Functional Household Tap Connections (FHTCs) to all rural households by 2024.

- Focus on source sustainability, community engagement, and IoT-based water quality monitoring.
- Atal Bhujal Yojana (2020): Targets critical groundwater blocks in 7 waterstressed states.
 - Promotes aquifer recharge, water budgeting, and Gram Panchayat-based planning.
 - World Bank-supported initiative.
- Namami Gange Programme (2014): Includes sewage treatment, industrial effluent management, biodiversity conservation, and riverfront development.
 - Implemented by National Mission for Clean Ganga (NMCG).
- Jal Shakti Abhiyan (2019): Focuses on rainwater harvesting, check dams, water reuse, and awareness campaigns.
 - Covers water-stressed districts across India during monsoon and pre-monsoon phases.
- National Water Mission (NWM): One of the 8 missions under the National Action Plan on Climate Change (NAPCC).
 - Key goals:
 - 20% increase in water-use efficiency
 - Promotion of basin-level integrated water management
 - **Comprehensive water data systems** and awareness campaigns (*"Catch the Rain" initiative under NWM*)
- National Aquifer Mapping & Management Programme (NAQUIM): Led by Central Ground Water Board (CGWB).
 - Uses **GIS and satellite data** to map and manage groundwater aquifers for **scientific extraction planning**.
- State & Community-Led Models
 - Rajasthan's Mukhya Mantri Jal Swavlamban Abhiyan
 - Hivre Bazar (Maharashtra) exemplary community-driven water conservation
 - Neeru-Chettu (Andhra Pradesh) integrates ecology and irrigation.

Challenges Related to Water Management in India

- Over-Extraction of Groundwater: India is the largest user of groundwater globally, with nearly 85% of rural drinking water and ~60% of irrigation dependent on it.
 - As per CGWB data, several states like Punjab, Haryana, Rajasthan, and Tamil Nadu are in the "over-exploited" category, with groundwater extraction exceeding recharge levels.
- High Dependence on Monsoons & Erratic Availability: India's water resources are unevenly distributed both spatially and temporally.
 - Over **75% of annual rainfall** is received during just **4 months (June– September)**, leading to **floods** during monsoon and **droughts** post-monsoon.
 - Around **51 million hectares** are drought-prone, while **40 million hectares** are flood-prone.
- Water Pollution and Depleting Quality: Around 70% of surface water in India is polluted, largely due to untreated sewage, agricultural runoff, and industrial effluents.
 - Of the **38,000 MLD of sewage** generated, only **11,500 MLD** is treated before being discharged into rivers.
 - Rivers like **Yamuna**, **Sabarmati**, **and Ganga** are among the most polluted in terms of **BOD and fecal coliform levels**.
- Inefficient Agricultural Water Use: Agriculture consumes ~80% of India's total water usage, but Water Use Efficiency (WUE) remains poor due to practices like flood irrigation.
 - Despite initiatives like **Per Drop More Crop**, adoption of **micro-irrigation** (drip/sprinkler) is still limited covering only ~11% of the total irrigated area.
- Institutional and Governance Challenges: Fragmented responsibilities between Centre, States, and local bodies lead to overlap, delays, and poor coordination.
 - Multiple agencies handle drinking water, irrigation, sanitation, and pollution control, often with **conflicting mandates**.
 - For example, **River Boards Act (1956)** has **never been effectively operationalized**, and water disputes often drag on for decades (e.g., **Cauvery**, **Krishna**).
- Urban Water Stress and Infrastructure Deficits: Cities like Delhi and Bengaluru face acute water shortages, despite having higher per capita allocations than some global cities.

- 30% of urban water is lost due to leakages, theft, and poor maintenance.
- Unplanned urbanization further strains existing water infrastructure, especially in slums and peri-urban areas.

Global Best Practices in Water Management

- Israel (Leading in Water Use Efficiency): Israel has emerged as a global leader in water recycling and micro-irrigation.
 - Over **85% of its wastewater is treated and reused**, primarily in agriculture.
 - The country has pioneered **drip irrigation systems**, drastically reducing water use per unit of crop output, making it a model for **"more crop per drop"**.
- Singapore (Integrated Urban Water Management): Singapore practices "Four National Taps" strategy: local catchments, imported water, NEWater (recycled wastewater), and desalination.
 - Through **PUB** (Public Utilities Board), Singapore has implemented smart metering, real-time leakage control, and stormwater harvesting, ensuring 24×7 potable water supply despite lacking natural resources.
- Australia (Community-Driven Water Governance): Australia, especially after the Millennium Drought, reformed its water governance through the Murray-Darling Basin Plan, emphasizing basin-level integrated water resource management (IWRM).
 - It includes **water markets**, **scientific flow assessments**, and **community participation**, showing how federal democracies can manage water equitably.
- Netherlands (Living with Water Approach): The Netherlands has adopted a long-term strategy of "Room for the River", allowing rivers to flood naturally into designated zones instead of building higher dykes.
 - This approach combines flood risk reduction, ecosystem preservation, and urban water sensitivity, reflecting a resilience-based urban water management model.
- South Africa (Legal Right to Water): South Africa's constitution recognizes access to water as a fundamental human right.
 - Its National Water Act (1998) mandates water to be treated as

a **public trust**, managed for the benefit of all.

Way Forward for Water Management in India

- Promote Water Use Efficiency (WUE) in Agriculture: Expand coverage of microirrigation systems (drip, sprinkler) under PMKSY-Per Drop More Crop.
 - Implement real-time irrigation scheduling using IoT, SCADA (as proposed under M-CADWM).
- Strengthen Groundwater Governance: Enforce state-level groundwater laws with support from Atal Bhujal Yojana.
 - Promote **community-led water budgeting** at panchayat levels.
 - Expand aquifer mapping and recharge zones under NAQUIM and Catch the Rain campaigns.
- Modernize Urban Water Infrastructure: Upgrade urban pipelines to reduce ~30% leakage losses in municipal supply.
 - Scale models like **Odisha's Drink-from-Tap mission** for **24**×7 **water supply**.
 - Promote **dual-pipe systems** for reusing treated water in landscaping and construction.
- Integrated River Basin Management: Operationalize the long-pending River Boards Act (1956) to establish multi-state basin authorities.
 - Encourage **cooperative federalism** in inter-state river sharing (e.g., Cauvery Water Management Authority as a model).
 - Adopt Integrated Water Resources Management (IWRM) as per National Water Policy (2012).
- Improve Water Quality Monitoring & Pollution Control: Strictly implement the Water (Prevention & Control of Pollution) Act, 1974 through CPCB/SPCBs.
 - Strengthen sewage treatment infrastructure, especially in Class-I and Class-I towns.
 - Expand **real-time water quality monitoring networks** on polluted rivers like Ganga and Yamuna.
- Enhance Community Participation and Public Awareness: Empower Water Users' Associations (WUAs) under CADWM for local irrigation governance.

- Use school programs, panchayat campaigns, and media to raise water literacy.
- Promote **traditional water harvesting practices** (e.g., tankas, baolis, johads) in culturally relevant regions.

Conclusion

The M-CADWM scheme is a vital step toward modernizing India's irrigation infrastructure, promoting efficient water use, and empowering communities for sustainable water management. In a water-stressed nation like India, such integrated efforts are crucial for ensuring agricultural resilience, food security, and inclusive rural development.

Source: <u>https://indianexpress.com/article/india/cabinet-oks-rs-1600-cr-scheme-to-modernise-irrigation-network-9935434/</u>