India’s Groundwater Contamination Crisis

For Prelims: Central Ground Water Board, Pollutants in water, **World Health Organization**, **Atal Bhujal Yojana**

For Mains: Water resources management and groundwater contamination, Conservation

Source:TH

Why in News?

The **2024 Annual Groundwater Quality Report** by the **Central Ground Water Board’s (CGWB)** reveals widespread contamination of India’s groundwater. With over **600 million Indians depending on groundwater daily** this pollution has become a **serious public health crisis,** not just an environmental issue.

What are the Causes for India’s Groundwater Contamination Crisis?

- **Industrial Pollution:** Unregulated discharge of heavy metals **(lead, cadmium, chromium, mercury)** and toxic chemicals from industries pollutes groundwater.
    - Areas near industrial clusters like Kanpur (Uttar Pradesh) and Vapi (Gujarat) have dangerously high groundwater toxicity, creating “death zones.” Toxic effluents have caused kidney failures.
- **Overuse of Fertilizers:** Excessive use of nitrogen-rich fertilizers leads to **nitrate pollution**. Phosphate fertilizers contribute to uranium contamination in groundwater.
- **Improper Sanitation and Waste Management:** Leakage from septic tanks and sewage systems contaminates groundwater with **pathogens.** Faulty sewage treatment plants cause localized outbreaks of **waterborne diseases.**
- **Natural (Geogenic) Contamination: Fluoride, arsenic, and uranium** naturally occur in certain geological formations, especially in states like **Rajasthan, Bihar, Punjab, and West Bengal.**
    - Excessive pumping **lowers water tables** and concentrates pollutants, making **aquifers more vulnerable to geogenic toxins** and salinity intrusion.
- **Fragmented and Weak Regulatory Framework:** The **Water (Prevention and Control of Pollution) Act, 1974**, largely overlooks groundwater, and its enforcement on groundwater pollution is inadequate, allowing polluters to exploit loopholes.
    - The CGWB **lacks statutory authority**, and **State Pollution Control Boards (SPCBs)** are under-resourced and technically constrained.
    - Agencies like CGWB, CPCB, SPCBs, and the **Ministry of Jal Shakti** work in silos, duplicating efforts and lacking coordination for integrated action.
- **Poor Monitoring and Public Awareness:** Data collection is infrequent and not publicly accessible, delaying detection and response. Poor involvement of local communities and panchayats in monitoring and managing groundwater quality.

Key Bodies Involved in India's Groundwater Management

- **Central Ground Water Authority (CGWA):** Although water is a state subject, **groundwater regulation happens at both central and state levels.**
    - The CGWA, set up in 1997 under the Environment Protection Act, 1986, regulates and controls groundwater across India.
- **Central Ground Water Board (CGWB)**: Multi-disciplinary scientific body under the Ministry of Jal Shakti. It explores and monitors groundwater resources.
- **Central Water Commission (CWC):** India's premier technical body for water resources, operating under the Ministry of Jal Shakti. Headquartered in New Delhi.
    - It coordinates with state governments on flood control, irrigation, navigation, drinking water, and hydropower projects.
- **Central Pollution Control Board (CPCB)**:Implements the Water (Prevention and Control of Pollution) Act, 1974.
    - It restores and maintains water quality, advises the central government on pollution prevention and control, water quality improvement, and air quality improvement.

What are the Impacts of Contaminated Groundwater?

- **Health:**
    - **Fluoride contamination:** Above the **World Health Organization (WHO)** limit of 1.5 mg/L, causing skeletal **fluorosis**, joint pain, bone deformities, and stunted growth.
        - It affects around **66 million people,** especially in Rajasthan, Madhya Pradesh, and Uttar Pradesh.
    - **Arsenic poisoning:** In Bihar and Uttar Pradesh, levels have reached up to 200 µg/L, linked to thousands of cancer cases. Above the WHO limit of 10 µg/L, **Arsenic** poisoning causes skin lesions, respiratory issues, and cancers.
    - **Nitrate contamination:** Above the WHO safe limit of 45 mg/L, it causes **"blue baby syndrome" (methemoglobinemia)** in infants, with rising hospital admissions in Punjab, Haryana, and Karnataka.
    - **Uranium contamination:** Above the WHO threshold of 30 µg/L, causing chronic organ damage and kidney toxicity.
        - In Punjab's Malwa region, 66% of samples exceed safe levels.
    - **Heavy metals (lead, cadmium, chromium, mercury):** Elevated levels in industrial areas like Kanpur and Vapi cause developmental delays, anemia, neurological and immune damage.
    - **Pathogenic contamination:** Sewage leaks introduce bacteria and viruses, causing **cholera, dysentery, hepatitis A and E outbreaks.**
- **Agriculture:** Contaminated groundwater reduces crop yields by introducing harmful substances like heavy metals and toxins into the food chain.
    - In coastal regions, over-extraction of groundwater leads to salinity intrusion, significantly reducing agricultural productivity.
- **Ecosystem Stability:** Polluted groundwater harms local wildlife by **contaminating water sources, disrupting habitats,** and affecting biodiversity, leading to a decline in **species dependent on clean water.**

What Reforms are Needed to Address the Groundwater Contamination Crisis?

- **National Groundwater Pollution Control Framework (NGPCF):** Establish a NGPCF to define clear roles and give CGWB regulatory powers.
- **Modern monitoring systems** : Upgrade monitoring of ground water using real-time sensors, remote sensing, **National Aquifer Mapping and Management Programme,** and open data

platforms. Integrate with health surveillance systems like **Health Management Information System** for early detection.

- **Targeted Remediation**: Under the **Jal Jeevan Mission (JJM)**, expand and install **community water purification plants (CWPPs)** (arsenic and fluoride removal plants), and increase safe piped water coverage.
- **Strict industrial & Waste Regulation**: Mandate **Zero Liquid Discharge (ZLD), strictly regulate landfills**, and empower the **CGWB to enforce penalties for illegal discharges.**
- **Agrochemical Reforms:** Promote organic farming through schemes like **Paramparagat Krishi Vikas Yojana (PKVY).**
    - Regulate and reduce the overuse of chemical fertilizers and pesticides to prevent nitrate and heavy metal contamination.
- **Community-Centric Groundwater Governance:** Empower local bodies like panchayats, water user groups, and schools to actively participate in groundwater monitoring and management.
    - Programs like **Atal Bhujal Yojana (ATAL JAL)** promote community-led sustainable groundwater management through awareness, capacity building, and convergence of central and state efforts to ensure long-term water security.

Drishti Mains Question:

Discuss the major causes and health consequences of groundwater contamination in India.

UPSC Civil Services Examination, Previous Year Questions (PYQs)

Prelims:

Q. Which of the following can be found as pollutants in the drinking water in some parts of India? (2013)

1. Arsenic
2. Sorbitol
3. Fluoride
4. Formaldehyde
5. Uranium

Select the correct answer using the codes given below.

a) 1 and 3 only

b) 2, 4 and 5 only

c) 1, 3 and 5 only

d) 1, 2, 3, 4 and 5

Ans: C

Mains

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

Q. The ideal solution of depleting ground water resources in India is water harvesting system". How can it be made effective in urban areas? **(2018)**