

2. NGT Directs States to Tackle Arsenic and Fluoride Contamination in Groundwater – Environment

1. Why in News?

1. National Green Tribunal (NGT) has directed all State governments to take urgent measures to mitigate arsenic and fluoride contamination in groundwater
2. Centre has been asked to monitor implementation across the country
3. Directions issued during Suo motu hearing based on media reports highlighting severity of contamination

2. Public Health Implications

1. Long-term exposure to contaminated groundwater results in chronic and often irreversible health conditions
2. Disproportionately affects rural populations relying on untreated water sources
3. Creates a silent but severe public health burden across affected regions

3. NGT's 2026 Enforcement Framework

Granular Data Reporting

1. States directed to furnish detailed contamination data at district, block, and village/ward levels
2. Ensures policy responses become targeted and evidence-based rather than generic
3. Enables precise mapping of affected areas for intervention

Strengthened Regulatory Oversight

1. Central Ground Water Authority (CGWA) tasked with closely monitoring mitigation efforts
2. Ensures remedial measures are effectively implemented on ground
3. Periodic reviews mandated for ongoing assessment

Time-Bound Mitigation Measures

1. States required to adopt appropriate filtration and purification technologies within defined timeframe
2. Signals shift towards strict compliance and outcome-oriented governance
3. Emphasizes accountability in implementation

Legal Accountability Framework

1. NGT invoked key environmental principles: Polluter Pays Principle and Sustainable Development
2. Framework based on NGT Act, 2010
3. Ensures institutional inaction or negligence attracts legal accountability

5. Arsenic vs Fluoride Contamination: Comparative Profile

Dimension	Arsenic (As)	Fluoride (F)
Nature and Use	Naturally occurring toxic metalloid used in pesticides, alloys, electronics, and wood preservatives; becomes hazardous when present in drinking water	Reactive element used in toothpaste, aluminium production, fertilizers, and controlled water fluoridation; harmful in excess concentration
Geogenic Source (Natural Origin)	Released from alluvial sediments of Ganga-Brahmaputra basin through geochemical processes such as reductive dissolution	Leaches from fluoride-bearing minerals like fluorite due to rock weathering in hard rock regions
Anthropogenic Source (Human-Induced)	Enhanced by industrial discharge, mining activities, and legacy use of arsenic-based pesticides	Increased due to excessive use of phosphate fertilizers, industrial effluents, and groundwater over-extraction

Hydrogeological Conditions	Mobilized under anaerobic and stagnant aquifer conditions, which facilitate arsenic release into groundwater	More soluble in alkaline conditions with low calcium levels; often found in deeper aquifers
Health Impact	Causes arenicolids, leading to skin lesions, pigmentation disorders, and increased risk of cancers (skin, lung, bladder)	Causes fluorosis, including dental discoloration and skeletal deformities resulting in disability
Spatial Distribution	Predominantly affects eastern and north-eastern India, including Bihar, West Bengal, Uttar Pradesh, Jharkhand, and Assam	Widely prevalent in western, central, and southern India, including Rajasthan, Gujarat, Karnataka, Andhra Pradesh, and Telangana

6. Challenges that Need to be Tackled

Economic Burden

1. Chronic illness leads to high out-of-pocket healthcare expenditure
2. Reduced earning capacity especially among vulnerable rural households
3. Loss of productive working days
4. Intergenerational impact on family finances

Social Consequences

1. Physical manifestations like skin lesions and dental discoloration result in stigma
2. Social exclusion from community activities
3. Reduced social mobility and marriage prospects
4. Psychological impact on affected individuals

Governance Issues

1. Unregulated groundwater extraction through private borewells continues unchecked
2. Subsidized electricity for irrigation encourages excessive pumping
3. Aggravates contamination by depleting aquifers
4. Institutional fragmentation weakens coordination across agencies
5. Multiple departments involved with overlapping mandates

Implementation Bottlenecks

1. High cost and maintenance challenges of purification systems
2. Low community acceptance of treated water
3. Preference for traditional sources despite contamination
4. Weak last-mile delivery and monitoring capacity
5. Lack of trained personnel at grassroots level

7. National Green Tribunal (NGT)

Establishment and Legal Basis

1. Established under National Green Tribunal Act, 2010
2. Specialized judicial body for environmental adjudication
3. Operational since 2010

Powers and Authority

1. Exercises powers equivalent to a civil court
2. Authority to award compensation and order restitution
3. Can enforce environmental liability
4. Binding decisions on parties

Jurisdiction

1. Covers key environmental legislations
2. Water (Prevention and Control of Pollution) Act, 1974

3. Environment (Protection) Act, 1986
4. Forest (Conservation) Act, 1980
5. Air (Prevention and Control of Pollution) Act, 1981

Functional Role

1. Ensures time-bound environmental justice
2. Strengthens regulatory accountability
3. Enforces principles like sustainable development and polluter pays
4. Suo motu powers to take cognizance of environmental issues

8. Central Ground Water Authority (CGWA)

Statutory Status

1. Constituted under Environment (Protection) Act, 1986
2. Statutory body with regulatory powers
3. Established to regulate and control groundwater development

Administrative Control

1. Functions under Ministry of Jal Shakti
2. Primary regulatory authority for groundwater governance
3. Coordinates with state authorities

Regulatory Functions

1. Issues guidelines for groundwater extraction
2. Grants permissions for groundwater withdrawal
3. Takes measures to prevent over-exploitation
4. Monitors compliance with regulations

Area Classification

1. Identifies and classifies regions based on extraction levels
2. Categories: over-exploited, critical, semi-critical, and safe
3. Imposes regulatory restrictions on withdrawal in vulnerable areas
4. Regular assessment and reclassification

Sustainable Management Role

1. Promotes rainwater harvesting practices
2. Encourages artificial recharge mechanisms
3. Supports water conservation initiatives
4. Enhances long-term water security

Role in Current Context

1. Ensures compliance with NGT directions
2. Monitors implementation of mitigation measures
3. Translates policy decisions into on-ground action
4. Provides technical guidance to states

9. Jal Jeevan Mission (JJM)

Launch and Objective

1. Launched in 2019 under Ministry of Jal Shakti
2. Aims to provide Functional Household Tap Connections (FHTCs) to every rural household
3. Ensures safe and adequate drinking water supply
4. Target-driven implementation

Focus on Water Quality

1. Strong emphasis on water quality monitoring
2. Special attention to arsenic and fluoride-affected areas
3. Regular testing protocols
4. Source sustainability measures

Community Participation

1. Promotes community-led approach
2. Involves Village Water and Sanitation Committees (VWSCs) in planning
3. Local ownership of water supply systems
4. Gram Panchayat-led implementation

Infrastructure Development

1. Supports creation of piped water supply systems
2. Establishes water treatment plants
3. Source sustainability measures like recharge structures
4. Functional tap connections at household level

Current Relevance

1. Critical intervention for reducing dependence on unsafe groundwater
2. Provides alternative safe water sources in contaminated regions
3. Addresses last-mile connectivity challenges
4. Integrates water quality and quantity objectives

10. Groundwater Governance Framework in India

Fragmented Institutional Structure

1. Multiple agencies at Central and State levels involved
2. Coordination challenges and mandate overlaps
3. Different ministries handle related aspects
4. Need for integrated approach

Regulatory Mechanism

1. CGWA regulates groundwater extraction at central level
2. States implement local water laws and policies
3. Licensing and permission systems vary
4. Enforcement challenges persist

Legal Framework

1. Groundwater largely treated as private resource linked to land ownership
2. Limits effective regulation and control
3. State subject under Constitution
4. Central intervention through environmental laws

Policy Initiatives

1. Atal Bhujal Yojana (Atal Jal): Community-led groundwater management
2. National Aquifer Mapping Programme (NAQUIM): Scientific assessment of aquifers
3. Jal Jeevan Mission: Safe drinking water access
4. Jal Shakti Abhiyan: Water conservation campaigns

Sustainability Measures

1. Rainwater harvesting mandates
2. Aquifer recharge programs
3. Demand-side management strategies
4. Water-use efficiency promotion
5. Watershed development initiatives

Key Challenges

1. Over-extraction beyond recharge capacity
2. Weak enforcement of regulations
3. Data gaps in monitoring and assessment
4. Lack of community participation
5. Electricity subsidies encouraging overuse
6. Climate change impacts on recharge

11. Way Forward

Strengthening Data-Driven Governance

1. Develop real-time, GIS-based groundwater quality monitoring system
2. Integrate data from States and central agencies
3. Enable early detection of contamination
4. Facilitate targeted intervention based on evidence

Technological Interventions

1. Promote low-cost, decentralized water purification technologies
2. Establish community filtration plants in affected villages
3. Support household-level purification solutions
4. Focus on rural hotspots with high contamination

Regulating Groundwater Extraction

1. Enforce stricter regulation of borewells and tube wells
2. Rationalize electricity subsidies for agriculture
3. Incentivize water-efficient irrigation practices like micro-irrigation
4. Implement volumetric pricing where feasible

Source Substitution and Safe Supply

1. Expand access to treated surface water under Jal Jeevan Mission
2. Reduce dependence on contaminated groundwater sources
3. Develop alternative safe water sources
4. Ensure reliability of piped water supply

Community Participation and Behavioural Change

1. Strengthen awareness campaigns on health risks
2. Empower local governance institutions
3. Improve acceptance of safe drinking water practices
4. Involve communities in monitoring and maintenance

Inter-Agency Coordination

1. Ensure better coordination between CGWA and state water departments
2. Establish clear accountability mechanisms
3. Regular review meetings and progress tracking
4. Unified monitoring and reporting framework

12. Conclusion

NGT intervention highlights that groundwater contamination is a critical public health and governance challenge. Requires integrated action through monitoring, regulation, technology adoption, and community participation. Ensuring safe water access essential for public health. Long-term water security depends on sustainable groundwater management practices

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