GOVERNMENT OF INDIA
MINISTRY OF SCIENCE AND TECHNOLOGY
DEPARTMENT OF SCIENTIFIC AND INDUSTRIAL RESEARCH
LOK SABHA
UNSTARRED QUESTION NO. 3174
(ANSWERED ON 11.03.2026)

SCIENTIFIC ASSESSMENT OF GROUNDWATER CONTAMINATION IN INDUSTRIAL AND RIVER BASINS OF UTTAR PRADESH

3174. SHRI PUSHPENDRA SAROJ:

Will the Minister of SCIENCE AND TECHNOLOGY be pleased to state:

(a) whether the Government, its scientific institutions and autonomous bodies, is conducting or funding research on groundwater contamination arising from industrial effluents and untreated discharge in major river basins and industrial clusters of Uttar Pradesh and if so, the findings thereof;
(b) the details of the districts identified with elevated levels of heavy metals, nitrates, fluorides or other toxic contaminants and whether district-wise hydro-geological risk mapping has been undertaken;
(c) the findings of long-term aquifer degradation, recharge obstruction and drinking water safety in affected regions; and
(d) the scientific remediation technologies, real-time monitoring systems or pilot projects proposed to restore contaminated aquifers and prevent further groundwater deterioration in the State?

ANSWER

MINISTER OF STATE (INDEPENDENT CHARGE) FOR THE MINISTRY OF SCIENCE AND TECHNOLOGY AND EARTH SCIENCES

(DR. JITENDRA SINGH)

(a)& (b) Yes. CSIR-Indian Institute of Toxicology Research, (CSIR-IITR) – a constituent laboratory of Council of Scientific and Industrial Research (CSIR) has conducted three sponsored studies for the Uttar Pradesh Ground Water Department across multiple districts of Uttar Pradesh for the analysis of ground water quality and mapping:

- **Ghaghara Basin (April 2022): Covered Kushinagar, Deoria, Ballia, Maharajganj, Mau, Gorakhpur.**
- **Central Ganga, Ramganga & Yamuna Basins (July 2021): Covered multiple districts including Fatehpur, Kanpur, Prayagraj, Bareilly, Moradabad, Agra, Aligarh, Ghaziabad, and others.**
- **Hindon Basin (September 2020): Covered Saharanpur, Shamli, Muzaffarnagar, Meerut, Bhagpat, Ghaziabad, Agra, Firozabad.**

Further, CSIR-National Environmental Engineering Research Institute (CSIR-NEERI), Nagpur has evaluated Effluent Treatment Plants (ETPs) in several cities of Uttar Pradesh, namely Meerut, Aligarh, Bulandshahr, Muzaffarnagar, Agra and Mathura, under a project sponsored by the Central Pollution Control Board. Borewell water samples from industrial areas near the Yamuna and Hindon rivers showed heavy metal concentrations within permissible limits (BIS 10500).

The Central Ground Water Board (CGWB), Department of Water Resources, River Development, and Ganga Rejuvenation, Ministry of Jal Shakti generates groundwater quality data at a regional scale across the country, including state of Uttar Pradesh, through its groundwater quality monitoring programme and scientific studies conducted as per the approved Standard Operating Procedure (SOP). As per the Annual Ground Water Quality Report – 2025 recently released by the CGBW, localized occurrence of arsenic, fluoride, iron, salinity, uranium, manganese, lead and nitrate in ground water in excess of the limits prescribed for drinking water use has been observed across Uttar Pradesh. The district-wise details of the same is at Annexure-I. The complete Annual Ground Water Quality Report – 2025 is available at https://cgwb.gov.in/cgwbpnm/public/uploads/documents/17628543752626804 75 file.pdf

(c) Central Ground Water Board carries out Annual Ground Water Resource Estimation (GWRE) to generate updated estimates of groundwater availability, extraction and stage of groundwater development, and to analyse trends in recharge and withdrawal.

The assessment of data collected for the State of Uttar Pradesh from 2017 to 2025 indicates that:

- **Total Annual Ground Water Recharge has increased from 69.92 Billion Cubic Meters (2017) to 73.39 Billion Cubic Meters (2025), i.e., an increase of 3.47 Billion Cubic Meters**
- **The Stage of Ground Water Extraction has marginally improved from 70.18% (2017) to 70.00% (2025), i.e., a reduction of 0.18 percentage points.**
- **GWRE categorisation indicates that the Safe assessment units (<= 70 %), have increased from 540 (65%) in 2017 to 563 (67.34%) in 2025, while the Over-exploited assessment units (>100 %). have declined from 91 (11%) in 2017 to 54 (6.46%) in 2025.**

CGWB has prepared a Master Plan for Artificial Recharge to Groundwater- 2020 which envisages construction of about 23,668 artificial recharge and rain-water harvesting structures and 20.57 sq. km area for roof-top rainwater harvesting in the state of Uttar Pradesh. Also, CGWB has completed the National Aquifer Mapping (NAQUIM) Project for the entire mappable area of about 2.40 lakh sq. km in Uttar Pradesh. The Aquifer maps and management plans have been shared with state agencies for implementation.

Further, the National Water Policy (2012) advocates rainwater harvesting, water conservation, and the scientific preservation of rivers and water bodies through community participation. It strictly prohibits encroachment or diversion of water bodies and drainage channels, and where such encroachments have occurred, it calls for their restoration wherever feasible. Additionally, the Uttar Pradesh Ground Water Management and Regulation Act-2019 is in force to regulate groundwater extraction in the state.

(d) Several steps have been taken by the Central Government for facilitating ground water quality improvement/ remediation of pollutants in the country including Uttar Pradesh alongwith a combination of preventive, treatment, and management strategies to ensure safe drinking water and mitigate groundwater contamination by various pollutants. The brief details of the aforesaid are at Annexure – II.

For real time monitoring and better groundwater management in Uttar Pradesh, the Ministry of Jal Shakti has initiated strengthening and automation of the groundwater monitoring network. Under this initiative, 172 Digital Water Level Recorders (DWLRs) have been installed on existing piezometers under the National Hydrology Project (NHP), providing high-frequency groundwater level data at 6-hour intervals. The expanded and automated monitoring network will ensure wider and denser coverage and near real-time data, thereby improving the accuracy of groundwater resource estimation and supporting special studies such as groundwater recharge which in turn will aid evidence-based planning and local-level groundwater management in the Uttar Pradesh State.

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Annexure-I

Ground Water Quality Status for State of Uttar Pradesh (as per Annual Ground Water Quality Yearbook-2025

Parameter	No. of samples analyzed	No. of Samples Exceeding Permissible Limits	% of Samples Exceeding Permissible Limits	No. of partially affected districts	Name of Partially affected districts
Electrical conductivity (EC)/Salinity (EC > 3000 µS/cm at 25°C)	1333	31	2.33	11	Agra, Aligarh, Amethi, Etawah, Firozabad, G.B. Nagar, Ghaziabad, Ghazipur, Hathras, Mainpuri, Mathura
Fluoride (F^-) (F > 1.5 mg/L)	1333	54	4.05	24	Agra, Aligarh, Auraiya, Azamgarh, Farrukhabad, Fatehpur, Firozabad, G.B. Nagar, Ghazipur, Jhansi, Kannauj, Kanpur Dehat, Kanpur Nagar, Kaushambi, Lucknow, Mahoba, Mainpuri, Mathura, Meerut, Pratapgarh, Prayagraj, Raebareli, Sonbhadra, Unnao
Nitrate (NO_3^{2-}) (Nitrate > 45mg/L)	1333	107	8.03	48	Agra, Aligarh, Amethi, Amroha, Auraiya, Baghpat, Balrampur, Banda, Bijnor, Budaun, Chitrakoot, Etah, Etawah, Fatehpur, Firozabad, G.B. Nagar, Ghaziabad, Ghazipur, Gorakhpur, Hamirpur, Hapur, Hathras, Jalaun, Jaunpur, Jhansi, Kanpur Dehat, Kanpur Nagar, Kasganj, Kaushambi, Lalitpur, Lucknow, Mahoba, Mainpuri, Mathura, Meerut, Mirzapur, Moradabad, Muzaffarnagar, Pilibhit, Prayagraj, Rampur, Sambhal, Sant Ravidas Nagar, Shamli, Siddharth Nagar, Sonbhadra, Unnao, Varanasi
Arsenic (As) (As > 10 ppb)	612	23	3.76	14	Bahraich , Balrampur , Ballia, Barabanki, Bareilly, Bijnor, Farrukhabad, Fatehpur, Lakhimpur Kheri, Moradabad, Pilibhit , Rampur, Sambhal, Shahjahanpur
Iron (Fe) (Fe > 1.0 mg/L)	601	144	23.96	46	Amethi, Amroha, Auraiya, Ayodhya, Bahraich, Balrampur, Ballia , Barabanki, Bareilly, Bijnor, Budaun, Chandauli , Chitrakoot, Etah , Farrukhabad, Fatehpur, Gonda, Hamirpur, Hardoi, Jalaun, Jhansi, Kannauj, Kanpur Nagar, Kushi Nagar, Lakhimpur Kheri, Lalitpur, Mahoba, Mahrajganj, Maunath Bhanjan, Meerut, Mirzapur, Moradabad, Muzaffarnagar, Pilibhit, Pratapgarh, Raebareli, Rampur, Saharanpur, Sant Kabir Nagar, Shahjahanpur, Shrawasti, Siddharth Nagar, Sitapur, Sonbhadra, Unnao, Varanasi

Parameter	No. of samples analyzed	No. of Samples Exceeding Permissible Limits	% of Samples Exceeding Permissible Limits	No. of partially affected districts	Name of Partially affected districts
Uranium (U > 30 ppb)	612	29	4.74	22	Agra, Aligarh, Banda, Bijnor, Budaun, Etah , G.B. Nagar, Ghaziabad, Ghazipur , Jalaun, Jhansi, Kannauj , Kanpur Dehat , Lalitpur, Mahoba, Meerut, Prayagraj, Raebareli, Shahjahanpur, Sonbhadra, Unnao, Varanasi
Lead (Pb > 0.01 mg/L)	581	2	0.34	2	Budaun, Chandauli
Manganese (Mn > 0.3 mg/L)	610	49	8.03	26	Amroha, Auraiya , Bareilly, Bijnor, Budaun, Chitrakoot, Etah , Fatehpur, Ghaziabad, Ghazipur , Gorakhpur , Hardoi, Jhansi, Kushi Nagar , Lakhimpur Kheri , Lalitpur, Mahoba, Mathura, Meerut, Mirzapur , Moradabad, Pilibhit , Pratapgarh, Sonbhadra, Unnao, Varanasi

Annexure - II

Steps taken by the Central Government for facilitating ground water quality improvement/ remediation of pollutants in the country including Uttar Pradesh

- Under the National Aquifer Mapping Programme (NAQUIM) of CGWB, special attention has been given to the aspect of ground water quality including contamination by toxic substances such as Arsenic in ground water. CGWB has successfully constructed Arsenic-free wells using cement-sealing technology under NAQUIM studies in the Gangetic flood plains of Uttar Pradesh. In total, 294 exploratory wells tapping arsenic-safe aquifers have been constructed under NAQUIM in Uttar Pradesh.
- Successful wells have been handed over to the State Governments for their purposeful utilization. Further, CGWB is providing technical assistance to the States by sharing the cement sealing technology for tapping contamination free aquifers in Gangetic flood plains.
- Central Ground Water Board (CGWB) conducts periodic groundwater quality monitoring to identify both contaminated and non-contaminated areas including UP. To enhance monitoring efficiency, a new Standard Operating Procedure (SoP) for Groundwater Quality Monitoring has been introduced, incorporating more frequent and denser sampling in vulnerable areas.
- Data on ground water quality that is available with CGWB are made available in public domain through reports as well as through the web site (http://www.cgwb.gov.in) for use by various stakeholders. The data is also shared with State Governments for taking necessary remedial measures.
- To further accelerate the dissemination of knowledge on ground water quality, CGWB has initiated the practice of issuing ground water quality year book, half-yearly ground water quality Bulletins so that immediate action can be initiated in the reported areas.
- Fortnightly results of chemical analysis data are shared with State Government as Ground Water Quality Alerts since 17 June 2024.
- Since improvement in ground water quality can also be achieved to some degree by taking up artificial recharge activities, Ministry of Jal Shakti and other central ministries are implementing several programmes towards this end, which are expected to improve the underground water table and also help in ameliorating the quality of ground water through dilution effect.

Preventive, treatment, and management strategies to ensure safe drinking water and mitigate groundwater contamination by various pollutants is as under:

- In **fluoride-affected** regions, water quality can be safeguarded through proper source selection, blending of high- and low-fluoride waters, installation of community based treatment plants and public awareness initiatives.
- For **nitrate contamination**, emphasis is placed on efficient fertilizer management, including regular soil testing, appropriate timing of fertilizer application and use of organic fertilizers. Additional measures include maintenance of septic systems and proper management of animal wastes to prevent nitrogen leaching into groundwater.
- **Arsenic mitigation** involves both short- and long-term measures. Short-term strategies include the installation of household and community treatment units, prohibition of contaminated wells, and conjunctive use of surface and groundwater. Long-term actions focus on developing alternate safe aquifers, rainwater harvesting and deep-well construction using sealing techniques.

- In the case of **uranium contamination**, multiple treatment technologies are available, including adsorption, coagulation, extraction, reverse osmosis and evaporation. Selection of the appropriate method depends on cost, efficiency and local conditions, with combined or need-based approaches recommended for best results.
- For **iron and manganese**, remedial options include aeration, filtration, use of iron or manganese removal plants and chemical oxidation. Reverse osmosis and specialized media filters are suitable for smaller-scale or household applications.
- To address **lead contamination**, the key measures include installation of filtration systems (activated carbon, RO, or ion exchange), strict regulation of industrial effluents, lead testing in public buildings, hydrogeochemical mapping and public advisories on safe water use practices. Overall, the integrated implementation of source protection, treatment technologies, regulatory enforcement, and community participation is crucial to ensuring safe and sustainable groundwater quality across affected regions.