

BEFORE HON'BLE NATIONAL GREEN TRIBUNAL PRINCIPAL
BENCH

NEW DELHI

O.A. NO. 728 OF 2023

IN THE MATTER OF :

Suomoto Arsenic found in Ground Water in 25 States,
Flouride in 27 States: Govt.

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ND04. 20.12.2023

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Through



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STANDING COUNSEL (UOI)

CH. NO. 457, DELHI HIGH COURT,
NEW DELHI

D4. 18/12/2023

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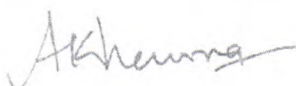
IN THE MATTER OF :

Suomoto Arsenic found in Ground Water in 25 States,
Flouride in 27 States: Govt.

REPORT ON BEHALF OF CENTRAL GROUND WATER
AUTHORITY

1. Background

A news article entitled "Arsenic found in ground water in 25 states, fluoride in 27 states: Govt" was published in national daily "The Hindu" on 04.12.2023. The detailed news mentions about detection of Arsenic (As) in ground water in parts of 230 districts in 25 states and fluoride (F) in parts of 469 districts in 27 states in the country as per the information provided by Union Minister of State for Jal Shakti Sh. Bishweswar Tudu in Rajya Sabha on 04.12.2023. In a written reply, the Minister said that the ground water contamination reported by Central Ground Water Board (CGWB) is mostly geogenic in nature and does not show significant change over the years. This Hon'ble Tribunal took Suomoto cognizance of the issue and issued notice to Central Ground Water Authority.



2. Monitoring and Studies on Ground Water Quality By CGWB

Water being State subject, study on ground water quality and making available safe water to public falls under States' mandate. Being the apex organization for ground water, Central Ground Water Board (CGWB) generates ground water quality data on a regional scale during various scientific studies and ground water quality monitoring throughout the country. The periodic monitoring of water quality is done by CGWB once in every year during the pre-monsoon season in which water samples are collected from about 17500 water quality monitoring stations of CGWB spread over the country and chemical analysis is carried out. The water quality monitoring stations comprise of various sources of ground water viz. dugwells, borewells, tubewells, piezometers and springs etc. CGWB has 16 chemical laboratories in different states of the country for water sample analysis, out of which 10 laboratories are NABL accredited. The total number of samples analysed in these chemical laboratories are in the range of 27500-32500 annually. The laboratories of CGWB analyse the ground water samples for 15 major chemical parameters which include (pH, EC, Ca, Mg, TH, Na, K, F, CO₃, HCO₃, SO₄, Cl, NO₃, SiO₂, PO₄) and heavy/trace elements (Fe, Mn, Cu, Zn, Cd, Cr, Pb, As & U) on need basis.

Apart from routine regional scale ground water quality monitoring CGWB has also taken up various studies on ground water quality and contamination of ground water as mentioned below:

1. 1.

- Under the National Aquifer Mapping Programme (NAQUIM) of CGWB, special attention is being given to the aspect of ground water quality including contamination by toxic substances such as Arsenic (As) and Fluoride (F) in ground water.
- CGWB along with National Institute of Hydrology (NIH) prepared a report on “ Mitigation and Remedy of Ground Water menace in India: A Vision Document” in 2010.
- The study on identification of Arsenic hotspots throughout the country has been started from 2015 by CGWB. Since then, periodic monitoring of As is being done in the identified hot spot states.
- An MoU was signed between CGWB & GSI on 05-01-2022 for five years. Study on Uranium, Lead, Arsenic, Fluoride and Mercury contamination of Ground Water the parts of Punjab, Haryana, Andhra Pradesh, Uttar Pradesh, Bihar, Chhattisgarh, Jharkhand and Assam will be taken up. The studies taken up regarding Arsenic and Fluoride contamination are as follows:
 - Study on Uranium, Lead, Arsenic, Fluoride and Mercury Contamination of Ground Water in the industrial area of North Guwahati, Kamrup, Assam.
 - Reassessment of Arsenic contamination in Patna & Bhojpur District, Bihar.
 - Tracing the source of Uranium in ground water resources of Biharsarif and Roh block in Nawada district of Bihar.
 - Geo-environmental appraisal of Fluoride contamination and assessment of toxic heavy metals in Bagbahara area, Mahasamund district, Chhattisgarh.

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- Assessment of fluoride contamination in surface and groundwater and its management in Jharkhand.
- Study on Uranium, Fluoride contamination of Ground Water in Mathura, Hathras and Aligarh Districts, Uttar Pradesh.

3. Arsenic (As) contamination of Ground Water in India

Arsenic is a naturally occurring trace element found in rocks, soils and the water in contact with them. Arsenic has been recognized as a toxic element and is considered a human health hazard. The maximum permissible limit of Arsenic for drinking purpose is 0.01 mg/L (or 10 ppb) as per BIS (Bureau of Indian Standards) Drinking Water Standards (IS 10500:2012). The BIS permissible limit of Arsenic was revised from 0.05 mg/L (50 ppb) to 0.01 mg/L (10 ppb) in the year 2015.

Arsenic Hotspots of India

The occurrence of Arsenic in ground water was first reported in 1980 in West Bengal in India. Occurrence of Arsenic in groundwater, in excess to the permissible limit of 10 ppb in the Ganges-Brahmaputra fluvial plains in India covering seven states namely, West-Bengal, Jharkhand, Bihar, Uttar Pradesh in flood plain of Ganga River; Assam and Manipur in flood plain of Brahmaputra and Imphal rivers and Rajnandgaon in Chhattisgarh. The most affected areas are on the eastern side of Bhagirathi River in the districts of Malda, Murshidabad, Nadia, North 24 Parganas and South 24 Parganas and western side of the districts of Howrah, Hugli and Bardhaman. The

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occurrence of Arsenic in the states of Bihar, West Bengal and Uttar Pradesh is in alluvial formations. The occurrence of Arsenic in ground water is mainly in the aquifers upto 100 m depth. The deeper aquifers are free from Arsenic contamination. In the state of Chhattisgarh, it is in the volcanic rocks exclusively confined to N-S trending Dongargarh-Kotri ancient rift zone. It has also been reported in Golaghat, Jorhat, Lakhimpur, Nagaon, Nalbari, Sibsagar, Sonitpur district of Assam.

Central Ground Water Board is in the process of continuously updating its database on the locations of Arsenic contamination based on its annual quality data. The number of district included in the list has increased since the permissible limit was revised from 50 ppb to 10ppb by BIS in 2015. The state-wise districts where cases of Arsenic > 0.01 mg/L have been recorded in ground water are given in **Table-1**.

Table-1: Districts having Arsenic >0.01 mg/L in Ground Water in Different States of India

Sl. No.	State	Parts of Districts having As > 10 ppb (0.01 mg/L)	No of Districts
1	Andhra Pradesh	Ananthapur, East Godavari, Guntur, Krishna, Kurnool, Nellore, Prakasam	7
2	Assam	Baksha, Barpeta, Bongaigaon, Cachar, Darrang, Dhemaji, Dibrugarh, Dhubri, Goalpara, Golaghat, Hailakandi, Jorhat,	21

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Sl. No.	State	Parts of Districts having As > 10 ppb (0.01 mg/L)	No of Districts
		Kamrup, Karimganj, Lakhimpur, Morigaon, Nagaon, Nalbari, Sivsagar, Sonitpur, Biswanth	
3	Bihar	Araria, Begusarai, Bhagalpur, Bhojpur, Buxar, Darbhanga, Katihar, Khagaria, Kishanganj, Lakhisarai, Munger, Patna, Purnea, Samastipur, Saran, Vaishali, E.Champaran, Gopalganj, Sheohar, Supaul, Madhepura, Muzaffarpur, Saharsa, Siwan, W. Champaran, Sitamarhi, Madhubani.	27
4	Chhattisgarh	Rajnandgon, Raipur, Raigarh, Koriya	4
5	Delhi	East Delhi, North East Delhi, South east Delhi, Central, Nazul Land	5
6	Gujarat	Amreli, Anand, Bharuch, Bhavnagar, Dahod, Gandhinagar, Kachchh, Mehesana, Patan, Rajkot, Surendranagar, Vadodara	12
7	Haryana	Ambala, Bhiwani, Faridabad, Fatehabad, Hissar, Jhajjar, Jind, Karnal, Panipat, Rohtak, Sirsa, Sonapat, Yamunanagar, Mahendergarh, Palwal, Panchkula, Rewari, Kaithal	18
8	Himachal Pradesh	Kangra	1
9	Jammu &	Jammu, Kathua, Rajouri	3

Sl. No.	State	Parts of Districts having As > 10 ppb (0.01 mg/L)	No of Districts
	Kashmir		
10	Jharkhand	Sahebganj, Lohardaga, Godda, Dhanbad	4
11	Karnataka	Raichur, Gadag, Yadgir	3
12	Kerala	Kollam	1
13	Madhya Pradesh	Betul, Burhanpur, Chhindwara, Dhar, Khandwa, Mandsaur, Morena, Neemuch, Umaria	9
14	Manipur	Bishnupur, Thoubal	2
15	Odisha	Bhadrak, Gajapati, Ganjam, Jagatsinghpur, Kendrapara	5
16	Punjab	Mansa, Amritsar, Bhatinda, Fazilka, Ferozpur, Gurdaspur, Hoshiarpur, Kapurthala, Ropar, Faridkot, Nawashahar, Sangrur, Taran Taran, SAS Nagar, Pathankot, Patiala, Chandigarh	17
17	Rajasthan	Ganganagar, Pali, Bikaner, Banswara, Bhilwara, Churu, Hanumangarh, Jodhpur, Sirohi, Tonk	10
18.	Tamil Nadu	Ariyalur, Perambalur, Dindigul, Cuddalore, Nagapattinam, Ramnathapuram, Tiruvallur, Tirunelveli, Thiruvarur, Trichchirappalli, Tuticorin, Sivaganga, Chennai, Dharmapuri	14
19	Telangana	Nalgonda	1
20	Tripura	North Tripura, Gomati and South Tripura	3

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Sl. No.	State	Parts of Districts having As > 10 ppb (0.01 mg/L)	No of Districts
21	Uttar Pradesh	Bahraich, Balia, Balrampur, Bareilly, Basti, Bijnor, Chandauli, Ghazipur, Gonda, Gorakhpur, LakhimpurKheri, Meerut, Mirzapur, Moradabad, Rai Bareilly, SantKabir Nagar, Shajahanpur, Siddarthnagar, SantRavidas Nagar, Unnao, Azamgarh, Rampur, Badaun, Deoria, Jhansi, Kausambi, Kushinagar, Pilibhit, Banda, Sitapur, Hardoi, Muzaffarnagar, Sultanpur, Faizabad, Pratapgarh, Maunath Bhanjan, Barabanki, Maharajgang, JP Nagar, Ayodhya, Bulandsahr, Firozabad, Farrukhabad, Hapur, Kannauj	45
22	Uttarakhand	Dehradun, Udham Singh Nagar, Haridwar, Almora, Uttarkashi	5
23	West Bengal	Purba Bardhaman, Dakshin Dinajpur, Hooghly, Howrah, Malda, Murshidabad, Nadia, N-24 Parganas, S- 24 Parganas, Coochbehar, Uttar Dinajpur	11
24	Daman & Diu	Diu	1
25	Puducherry	Pondicherry	1
	Total	25 States/UTs	230 Districts

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Thus there are 230 districts in 25 states/UTs across the country where instances of one or more Arsenic contamination have been detected.

4. Fluoride (F) contamination of Ground Water in India

Fluorine is the most electronegative and reactive of all elements that occur naturally within many types of rock. It exists in the form of fluorides in a number of minerals of which fluorspar, cryolite, fluorite and fluorapatite are the most common. The fluoride found in groundwater is naturally occurring from the breakdown of rocks and soils or weathering and deposition of atmospheric particles. Most of the fluorides are sparingly soluble and are present in ground water in small amounts.

It is well known that small amounts of fluoride (less than 1.0 mg/L) have proven to be beneficial in reducing tooth decay. Community water supplies commonly are treated with NaF or fluorosilicates to maintain fluoride levels ranging from 0.8 to 1.2 mg/L to reduce the incidence of *dental carries*. However, high concentrations such as 1.5 mg/L of F and above have resulted in staining of tooth enamel while at still higher levels of fluoride ranging between 5.0 and 10 mg/L, further pathological changes such as stiffness of the back and difficulty in performing natural movements may take place.

BIS has recommended an upper desirable limit of 1.0 mg/L of F⁻ as desirable concentration of fluoride in drinking water, which can be extended to 1.5 mg/L.

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of F in case no alternative source of water is available. Water with concentration of fluoride more than 1.5 mg/L, are not suitable for drinking purposes.

The fluoride content in groundwater from observation wells in a major part of the country is found to be less than 1.0 mg/L. The distribution of ground water samples with fluoride concentration more than 1.5 mg/L at several locations in the States of Andhra Pradesh, Gujarat, Karnataka, Madhya Pradesh, Rajasthan, Chhattisgarh, Haryana, Orissa, Punjab, Tamil Nadu, Kerala, Telangana, Haryana, Uttar Pradesh West Bengal, Bihar, Delhi, Jharkhand, Maharashtra, and Assam West Bengal where the fluoride in ground water exceeds 1.5 mg/L. The state-wise districts where instances of Arsenic > 0.01 mg/L in ground water have been recorded are given in **Table-2**.

Table-2 : Districts having localized occurrence of Fluoride (>1.5mg/L) in groundwater in India

Sl No.	State	Parts of Districts having Fluoride (>1.5 mg/L)	No of Districts
1	Andhra Pradesh	Alluri Sitharama Raju, Ananthapur, Annamayya, Bapatla, Chittoor, Guntur, Krishna, Kurnool, NTR District, Palnadu, Prakasam, Sirkakulam, SPS Nellore, Sri Balaji Dist, Sri Satyasai District, Visakhapatnam, Vizianagaram, West-Godavari, YSR, Kadapa.	19

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Sl No.	State	Parts of Districts having Fluoride (>1.5 mg/L)	No of Districts
2	Assam	Bangiagaon, Cachar, Dhubri, Dibrugarh, Goalpara, Hailakandi, Kamrup, KarbiAnglong, Lakhimpur, Naugaon, Golaghat, Karimganj, Sivasagar, Jorhat, Sonitpur, Morigaon, Darrang	17
3	Bihar	Aurangabad, Banka, Bhagalpur, Gaya, Jamui, Kaimur (Bhabua), Munger, Nawada, Rohtas, Jahanabd, Lakhisarai, Sheikhpura, Nalanda, Saharsa, Supaul, Samastipur, Sheikhpura, Nalanda, Muzaffarpur	19
4	Chhattisgarh	Bastar, Balod, Balrampur, Bemetra, Bijapur, Durg, Kanker, Kondagaon, Korba, Koriya, Raigarh, Surajpur, Surguja, Jashpur, Dhamtari, Mahasamund, Rajnandgaon, Bilaspur, Raipur, Mungeli, Janjgir-Champa, Raigarh, Gariyabandh	23
5	Delhi	East Delhi, New Delhi, North West Delhi, Central, South Delhi, South West Delhi, North Delhi, West Delhi	8
6	Gujarat	Ahmedabad, Amreli, Anand, Aravalli, Banaskantha, Bharuch, Bhavnagar, Chota Udaipur, Dahod, Gandhinagar, Jamnagar, Junagadh, Kachchh, Kheda, Mehesana, Panchmahals, Patan, Porbandar, Rajkot, Sabarkantha, Surendranagar, Vadodara, Navsari, Surat, Valsad, Botad, Morvi, Dev Bhumi Dwarka, Gir Somnath, Mahisagar	30
7	Haryana	Ambala, Bhiwani, Fatehabad, Faridabad, Gurgaon, Hissar,	21

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Sl No.	State	Parts of Districts having Fluoride (>1.5 mg/L)	No of Distri cts
		Jhajjar, Jind, Kaithal, Karnal, Kurukshetra, Mahendergarh, Panchkula, Palwal, Panipat, Rewari, Rohtak, Sirsa, Sonapat, Yamuna Nagar, Mewat	
8	Himachal Pradesh	Sirmour, Una	2
9	Jammu & Kashmir	Jammu, Kathua, Udhampur, Samba	4
10	Jharkhand	Bokaro, Chatra, Deoghar, Dhanbad, Garhwa, Giridih, Godda, Gumla, Jamtara, Koderma, Pakur, Palamu, Ramgarh, Ranchi, Sahebganj, Khunti, Latchar	17
11	Karnataka	Bagalkot, Bangalore-Rural, Bangalore-Urban, Belgaum, Bellary, Bidar, Bijapur, Chikaballapur, Chamarajanagar, Chikmagalur, Chitradurga, Davanagere, Dharwad, Dakshina Kannada, Gadag, Gulburga, Hassan, Haveri, Kolar, Koppal, Mandya, Mysore, Raichur, Ramnagara, Shimoga, Tumkur, Yadgir, Uttara Kannada, Udupi, Kodagu, Vijayanagara	31
12	Kerala	Palakkad, Alappuzha, Idukki, Ernakulam, Thiruvananthapuram, Malappuram	6
13	Madhya Pradesh	Alirajpur, Balaghat, Barwani, Betul, Bhind, Bhopal, Chhatarpur, Chhindwara, Datia, Dewas, Dhar, Dindori, Guna, Gwalior, Harda, Jabalpur, Jhabua, Khargon, Mandla, Mandsaur, Morena, Narsinhpur, Neemuch, Panna,	44

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Sl No.	State	Parts of Districts having Fluoride (>1.5 mg/L)	No of Districts
		Raisen, Rajgarh, Ratlam, Sagar, Satna, Sehore, Seoni, Shahdol, Shajapur, Sheopur, Sidhi, Shivpuri, Singrauli, Ujjain, Vidisha, Anuppur, Indore, Khandwa, Tikamgarh, Umaria	
14	Maharashtra	Ahmednagar, Amravati, Beed, Chandrapur, Bhandara, Dhule, Gadchiroli, Gondia, Jalna, Nagpur, Nanded, Parbhani, Ratnagiri, Sangli, Satara, Sindhudurg, Solapur, Wardha, Washim, Yavatmal, Hingoli, Nandurbar	22
15	Manipur	Thoubal	1
16	Meghalaya	East Jaintia, West Garo Hills, Ri Bhoi, North Garo Hills, Khowai	5
17	Nagaland	Dimapur, Phek, Kohima	3
18	Odisha	Angul, Balasore, Bhadrak, Bargarh, Bolangir, Boudh, Cuttack, Deogarh, Dhenkanal, Jajpur, Kandhamal, Keonjhar, Khurda, Mayurbhanj, Nayagarh, Nuapada, Ganjam, Jagatsinghpur, Kalahandi, Koraput, Puri, Rayagada, Sambalpur, Sonapur, Sundargarh, Gajapati	26
19	Punjab	Amritsar, Barnala, Bhatinda, Fazilka, Faridkot, Fatehgarh Sahib, Firozpur, Gurdaspur, Jalandhar, Ludhiana, Mansa, Moga, Muktsar, Pathankot, Patiala, Ropar, Sangrur, SAS Nagar (Mohali), Tarn-Taran	19
20	Rajasthan	Ajmer, Alwar, Banswara, Barmer, Bharatpur, Baran,	33

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Sl No.	State	Parts of Districts having Fluoride (>1.5 mg/L)	No of Districts
	n	Bhilwara, Bikaner, Bundi, Chittaurgarh, Churu, Dausa, Dhaulpur, Dungarpur, Ganganagar, Hanumangarh, Jaipur, Jaisalmer, Jalore, Jhalawar Jhunjhunu, Jodhpur, Karauli, Kota, Nagaur, Pali, Pratapgarh, Rajsamand, Sirohi, Sikar, Sawai Madhopur, Tonk, Udaipur	
21	Tamil Nadu	Coimbatore, Dharmapuri, Dindigul, Erode, Karur, Kancheepuram, Krishnagiri, Namakkal, Madurai, Pudukkottai, Ramanathanpuram, Salem, Sivagangai, Theni, Thiruvannamalai, Tiruchirappalli, Thirunelveli, Tirupur, Vellore, Cuddalore, Perambalur, Thanjavur, Thiruvarur, Tuticorin, Virudhunagar, Tiruvallur, Madurai, Chennai, Kanyakumari, Villipuram,	30
22	Telangana	Adilabad, Bhadrachalam, Hanamkonda, Hyderabad, Jagtial, Jangaon, Karimnagar, Khammam, Komarambhem, Mahabubabad, Mahabubnagar, Mancherla, Medak, Medchal, Mulugu, Nagarkurnool, Nalgonda, Narayanpet, Nirmal, Nizamabad, Peddapalle, Rajanna, Rangareddy, Sangareddy, Siddipet, Suryapet, Vikarabad, Warangal, Yadadri	29
23	Tripura	Unakoti, Khowai and North Tripura	3

Sl No.	State	Parts of Districts having Fluoride (>1.5 mg/L)	No of Districts
23	Tripura	Unakoti, Khowai and North Tripura	3
24	Uttar Pradesh	Agra, Aligarh, Allahabad , Auraiya, Azamgarh, Banda , Bulandshahar, Chitrakoot, Etah, Etawah, Farrukhabad, Fatehpur, Firozabad, G B Nagar, Ghazipur, Gonda, Ghaziabad, Hamirpur, Hathras, Jaunpur, Kannauj , Kanpur Nagar, Kasganj (Kashiram Nagar), Lalitpur, Mahoba, Mainpuri, Mathura, MaunathBhanjan, Pratapgarh, Rai Bareilly, Shajahanpur, Sonbhadra, Sultanpur, Varanasi and Unnao, Chandauli, Gonda, Hardoi, Sitapur, Jalaun, Amroha, Kanpur Dehat, Rampur	43
25	Uttarakhand	Uttarkashi	1
26	West Bengal	Bankura, Bardhaman, Birbhum, Dakshindinajpur, Malda, Purulia, Uttardinajpur, South 24 Praganas, Nadia Murshidabad, Paschim Medinipore, Paschim Bardaman	12
27	DNH, Daman & Diu	Dadra and Nagar Haveli	1
	Total	27 States/UTs	469 Districts

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Thus there are 469 districts in 27 states/UTs across the country where instances of one or more Fluoride contamination have been detected.

5. Mitigation of Ground Water Contamination by As and F

The studies on arsenic and fluoride contamination indicate that occurrence of these contamination in various parts of the country are mostly geogenic in nature, which means these constituents are already in the rock and soil matrix and they get in to the ground water through various chemical processes. There is no conclusive evidence regarding increase in concentration of these contaminants over time. However, when the contaminant is in the ground water, it has the tendency to spread along with the flow of ground water.

Various steps have been taken by the Central Government for facilitating ground water quality improvement/ remediation of contamination in the country, as given below:

1. Data on ground water quality available with CGWB are being shared with concerned State Governments for taking necessary remedial measures such as prohibition of contaminated sources of ground water for drinking purposes and finding alternate sources for drinking water supply.
2. CGWB constructs wells for Exploration of Ground Water. Successful contamination- free wells are handed over to the State Governments for gainful utilization.
3. Under the National Aquifer Mapping Programme (NAQUIM) of CGWB, special attention is being given to the aspect of ground water quality including contamination by toxic substances such as Arsenic in ground water. Further, under NAQUIM, CGWB constructs arsenic safe exploratory wells in arsenic affected parts of the States of West Bengal, Bihar and Uttar Pradesh. The arsenic safe deeper aquifer zones have been identified and wells have been

constructed tapping the arsenic safe deeper aquifers using innovative cement sealing technique. So far, 522 exploratory wells tapping arsenic safe aquifers have been constructed under NAQUIM programme including 40 in Bihar, 188 in West Bengal and 294 in Uttar Pradesh. In addition, the innovative cement sealing technique of CGWB has been shared with the state agencies to utilize to construct arsenic free wells.

4. Awareness generation programs/ workshop on various aspects of ground water including preventing ground water pollution and safe use of contaminated water are being conducted by CGWB periodically.
5. Department of Water Resources, River Development and Ganga Rejuvenation, Ministry of Jal Shakti has issued guidelines for control and regulation of groundwater extraction with pan-India applicability notified on 24 September 2020. The guidelines include clauses on 'Measures to be adopted to ensure prevention from pollution in the plant premises of polluting industries/projects'. It is pointed out that ground water in and around polluting industries like Tannery, Slaughter Houses, Dye, Chemical, Coal-washery, other hazardous units, etc. and is generally observed to be polluted. In order to prevent further deterioration of ground water quality in such places, it is essential to take necessary measures for well head protection, such as Tube well/ bore well to be constructed at the place which is hygienically maintained, RCC (Reinforced Concrete Cement) grouting around tubewell, no recharge measures within the plant premises etc.

Akhanna 18/12/23

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Member (North), Central Ground Water Board
For CENTRAL GROUND WATER AUTHORITY