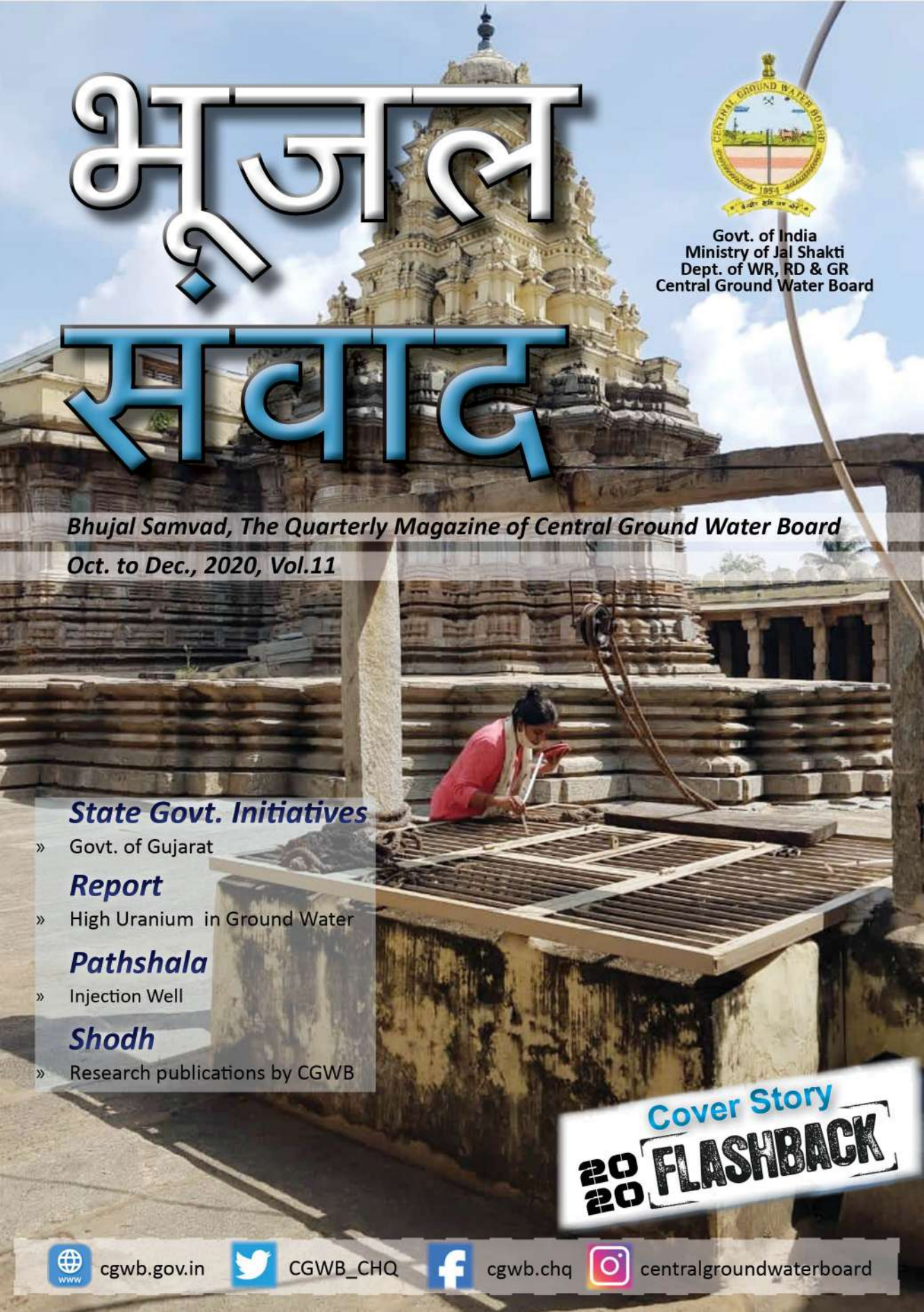
भूजल संवाद

Govt. of India
Ministry of Jal Shakti
Dept. of WR, RD & GR
Central Ground Water Board

Bhujal Samvad, The Quarterly Magazine of Central Ground Water Board
Oct. to Dec., 2020, Vol.11



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Report

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Pathshala

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Cover Story

2020 FLASHBACK

भूजल संवाद

The Quarterly Magazine of Central Ground Water Board
Dept. of Water Resources, River Development and Ganga Rejuvenation, Ministry of Jal Shakti, Govt. of India

Vol. 11 (Oct. to Dec., 2020)

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Flashback 2020

Cover Photo: Ground Water Monitoring well at Soumya Veshava temple premises, Nagamangala, Mandya District, Karnataka.

MESSAGE

The Year 2020 has proved to be a challenging year compelling the mankind to adapt to new realities. The CGWB family has very well adapted to the new Norms, and Pandemic & Lockdown have not dampened the spirit of the Board. The activities of the Board continued maintaining all the norms, with due precautions. The Cover Story of this issue of Bhujal Samvad gives a glimpse of activities in 2020 - Flashback-2020.

In this issue, a new section on 'Rajbhasa' has been introduced in which activities and achievements of Rajbhasa in CGWB have been included. State Government Initiative Section of this issue of Bhujal Samvad includes Success stories of Innovative approaches adopted for Ground Water Resources Management in Gujarat. A special report on occurrence of High Uranium in shallow ground water in India is also a part of this issue. In the 'Pathshala' section a small article on Injection Well is included. We are grateful to our avid readers for providing us with excellent feedback and thoughts towards improving the magazine.

Do share your ideas with us through our social media pages or send email to our editorial office (mediacell-cgwb@nic.in)

We are eager to hear from you !
Wishing everyone a promising 2021.

G.C.Pati
Chairman CGWB

IN FOCUS

Signing of MoA between Central Ground Water Board, Ministry of Jal Shakti and CSIR-NGRI, Hyderabad

MoA was signed on 21st December 2020 between Central Ground Water Board, Ministry of Jal Shakti and CSIR-NGRI, Hyderabad for use of advanced Heli-borne geophysical survey and other scientific studies for Aquifer Mapping in parts of Rajasthan, Gujarat and Haryana. The MoA was signed in the august presence of Hon'ble Minister of Science and Technology, Dr. Harsh Vardhan, Hon'ble Union Minister of Jal Shakti, Sh.Gajendra Singh Shekhawat and Hon'ble Minister of State for Jal Shakti, Sh. Rattan Lal Kataria.

The findings of the study will help in formulating plans for improving GW levels in the water stressed areas and charter the road map for sustainable management of ground water resources. ■

Inauguration of PMKSY – HKKP GW Scheme in Assam

Sh. Sarbananda Sonowal, Hon'ble Chief Minister of Assam has inaugurated the PMKSY (HKKP) access to Groundwater scheme on 30.12.2020 at Amingaon, Guwahati, Assam. Hon'ble Minister, Irrigation, Sh. Bhabesh Kalita has graced occasion as the distinguished guest. Sh. Sonowal highlighted about the importance of groundwater irrigation schemes under PMKSY (HKKP) and extended his sincere thanks to the Hon'ble Prime Minister of India and special thanks to Hon'ble Minister of Jal Shakti for providing the opportunity for the poor farmers of the State. ■

Special camp for NOC clearance

Special camps for clearance of NOC were organized by Central Ground Water Board, NWR, Chandigarh at Panipat, Haryana and Amritsar, Punjab.The entrepreneurs were explained about the new guidelines of CGWA in detail's G.C. Pati, Chairman CGWB, Sh. Sanjay Marwaha, Member, CGWB and Sh. Anoop Nagar, Regional Director, NWR, Chandigarh interacted with the participants and resolved the queries. ■

Chairman CGWB at the Economic Times ET Water Conclave

Sh. G. C. Pati, Chairman, Central Ground Water Board has addressed in the Inaugural session of CEO Panel on "Ensuring Water Footprint: Building Water Resource Utilization and Water Future Strategy" at The Economic Times ET Water Conclave. ■

REPORT

HIGH URANIUM IN SHALLOW GROUND WATER IN INDIA

INTRODUCTION

Rocks, soil, air surface and underground water, all contain varying amounts of uranium. Natural Uranium is radioactive and can cause chemical hazard as it is having a very long half-life.

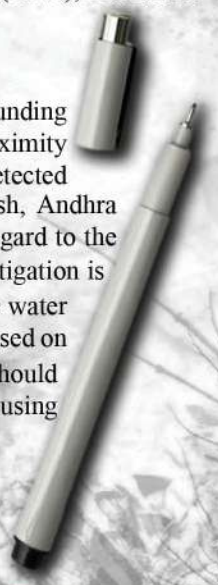
METHODOLOGY

Central Ground Water Board has taken pro-active steps for monitoring of uranium contamination in shallow groundwater through a network of 13622 observation wells located all across the country.For uranium analyses, samples were collected from these ground water monitoring wells in 100ml HDPE Bottles and were acidified to pH 2 with 1:1 HNO3 (Ultra trace elemental Grade / Suprapure) after filtering using a 0.45 µm membrane. Samples are filtered prior to acidification to prevent the leaching of material from any undissolved particulates. Trace metal samples are acidified to prevent precipitation out of solution and adsorption onto container walls. Some samples need to be diluted prior to analysis, either because of matrix problems or to get the instrument response within the linear dynamic range. These samples were analyzed(APHA; 2012) for Uranium and other trace metal concentrations using Inductively CoupledPlasmaMass Spectrometry (ICP-MS, DRC-II quadrupole) in Regional Chemical Laboratories of CGWB at Lucknow and Chandigarh.

RESULTS AND DISCUSSIONS

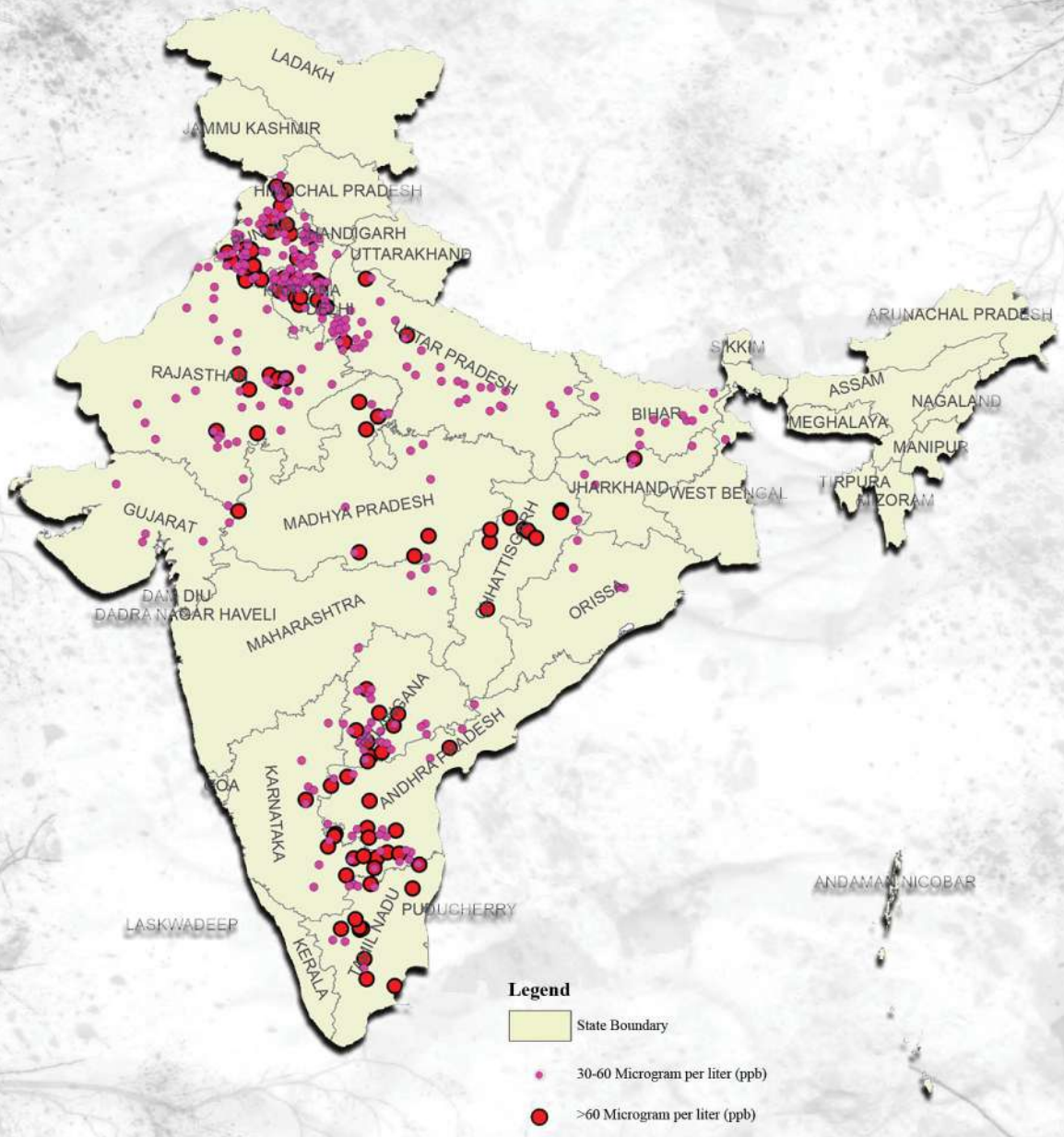
Uranium concentrations in ground water of shallow aquifers in the country, shows a wide variation from 0.0 to 2876 µg/L, indicating that uranium concentrations in groundwater greatly vary by several orders of magnitude. The Bureau of Indian Standards (BIS) has not yet mentioned any standard for Uranium in drinking water. The WHO have set drinking water standards for uranium in drinking water as 30 µg/L. A hydro-chemical evaluation of analysis of water samples reveal the following-

The most affected States in terms of percentage of samples found to have uranium concentration more than 30 µg/L (ppb) prescribed by World Health Organisation (WHO), are Punjab (24.2%), Haryana (19.6 %), Telangana (10.1 %), Delhi (11.7%), Rajasthan (7.2 %), Andhra Pradesh (4.9 %) and Uttar Pradesh (4.4%). Apart from above States, other states also have been found to have Uranium concentration above the thresh-old level of 30 µg/L in some localised pockets, such as Karnataka(1.9%), Madhya Pradesh (1.3%), Tamil Nadu (1.6%), Jharkhand(1.5 %), Chhattisgarh (1.3%), a (0.9%), Himachal Pradesh (0.8%), Maharashtra (0.3%), Odisha (0.4%), West Bengal (0.1%), and Bihar (1.7%). Atomic Energy Regulatory Board (AERB) has set a radiologically based limit for uranium as 60 µg/L (ppb) of water (radiological) in drinking water. Based on that the most affected states are Punjab (where 6.0%), Haryana (4.4 %), Telangana (2.6 %), Delhi (5.0 %), Rajasthan (1.2%), Andhra Pradesh (2.0 %), Chhattisgarh (1.1%), Tamilnadu (0.9%), Karnataka (0.7%), Madhya Pradesh (0.6%), Uttar Pradesh (0.4%) and Jharkhand (0.25%).



Uranium levels in groundwater may vary depending on geological formations surrounding the source water on the presence of factors affecting uranium mobilization & on the proximity of source water to uranium. High level of Uranium in groundwater has been detected predominantly in the states of Haryana, Punjab, Rajasthan, Telangana, Uttar Pradesh, Andhra Pradesh, Tamilnadu, Jharkhand and Chhattisgarh. The studies conducted so far with regard to the presence of Uranium in ground water are limited. A thorough and comprehensive investigation is required to be undertaken involving concerned agencies. A comprehensive aquifer wise water sampling should be taken up in the first phase to assess the intensity of contamination. Based on the results, contaminated areas should be precisely demarcated and micro-level studies should be initiated in those pockets. Utmost caution needs to be exercised in these areas for using ground water for drinking purposes.

LOCATION OF HIGH URANIUM IN SHALLOW AQUIFER IN INDIA



It has been found that **151** districts in **18** States are partly affected by high (>30 µg/L) concentration of Uranium in ground water.

REPORT

Districts partly affected with high Uranium in Groundwater

Sl. No.	State	Districts Partly affected with Uranium> 30 µg/L
1.	Andhra Pradesh	Ananthapur, Chittoor, Guntur, Cuddapah, East Godavari, Krishna, Kurnool, Prakasam
2.	Bihar	Saran, Bhabhua, Khagaria, Madhepura, Nawada, Sheikhpura, Purnea, Kisanganj, Begusarai
3.	Chhattisgarh	Bilaspur, Jashpur, Kanker, Korba
4.	Delhi	North West District, South West District, West District, North District
5.	Gujrat	Dohad, Ahmedabad, Vadodara, Patan
6.	Haryana	Ambala, Bhiwani, Faridabad, Fatehabad, Gurugram, Hissar, Jhajjar, Jind, Kaithal, Karnal, Kurukshetra, Mahendergarh, Palwal, Panipat, Rohtak , Sirsa, Sonipat, Yamuna Nagar
7.	Himachal Pradesh	Mandi
8.	Jharkhand	Godda, Koderma, Latehar, Palamau
9.	Karnataka	Bangalore Rural, Bangalore Urban, Bellary, Gulbarga, Kolar, Mandya, Raichur, Tumkur
10.	Madhya Pradesh	Balaghat, Betul, Chhatarpur, Datia, Gwalior, Jhabua, Panna, Raisen, Seoni, Shivpuri
11.	Maharashtra	Bhandara, Gondia, Nagpur
12.	Odisha	Angul, Dhenkanal, Sundargarh, Sambalpur
13.	Punjab	Bathinda, Moga, Faridkot, Fatehgarh Sahib, Fazilka, Ferozepur, Hoshiarpur, Jalandhar, Kapurthala, Ropar, Ludhiana, Muktsar, Pathankot, Patiala, Sangrur, SAS Nagar
14.	Rajasthan	Ajmer, Alwar, Banswara, Barmer, Bhilwara, Bikaner, Bundi, Chittaugarh, Churu, Dausa, Ganganagar, Jaipur, Jelore, Jodhpur, Karauli, Nagaur, Pratapgarh, Rajsamand, Sawai Madhopur, Tonk, Udaipur
15.	Tamil Nadu	Dindigul, Erode, Krishnagiri, Madurai, Mamakkal, Ramnathapuram, Salem, Thiruvannamalai, Tirupur, Tiruvallur
16.	Telangana	Adilabad, Hyderabad, Mahabubnagar, Medak, Nalgonda, RangaReddy
17.	Uttar Pradesh	Aligarh, Azamgarh, Bijnaur, Badaun, Bulandshaher, Deoria, Farrikhabad, Fatehpur, G.B.Nagar, Ghaziabad, Ghazipur, Hardoi, Hathras, J P Nagar, Kanpur Nagar, Mainpuri, Mathura, Pratapgarh, Raebarelli, Sultanpur, Unnao.
18.	West Bengal	Malda

Dr. Sudhir Kumar Srivastava

STATE GOVT INITIATIVES

Success story of innovative approaches adopted for Ground Water Resources Management in Gujarat to facilitate Water Security

Introduction

Over last few decades, there has been a paradigm shift in water management as the perception that fresh water is a free and abundant resource has changed to that of water being an economic good in scarce supply, threatened by pollution and warranting efficient use. The challenge of sustainable water use is particularly daunting for fast-developing states like Gujarat grappling with increasing population and industrial activity, drought prone regions and the need to enhance standards of living and economic growth.

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GWRDC Ltd., Gandhinagar, Gujarat
Formerly Chairman, CGWB & CGWA,
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According to the latest ground water assessment, the overall stage of ground water development in Gujarat is about 64%, which appears to be comfortable but the ground water development is not uniform throughout the state. Out of 248 assessment units, 25 units have been categorised as over-exploited, 5 as critical, 11 semi-critical, 194 safe and 13 saline. A large number of the OE/critical and semi- critical units are located in North Gujarat and Kachchh Regions of the state. In these areas intensive ground water development has resulted in secular decline in ground water levels in wells and tube wells, large seasonal drops in water levels in wells and under certain situations, deterioration in quality of ground water more particularly in the coastal areas.

Excessive ground water pumping has also resulted in problems like reduction in well discharge, increase in well construction cost, increase in electric consumption, increase in operation and maintenance cost of well and increase in the production cost of crop and reduction in yield per unit area, resulting economic loss to farmers and reason for economic disparity among farmers.Moreover, groundwater levels which provide water for one half of irrigated land in Gujarat are also falling.

For sustainable ground water management in the state two-pronged strategy addressing the demand as well as supply has been to adopted. We need to focus efforts of demand side management of water in irrigation which is the largest consumer of ground water, accounting for nearly 90% of the total ground water draft in the state .For supply augmentation there is a need to focus upon conservation of runoff and its recharge to ground water.

Efforts of the state

In order to conserve, augment and achieve judicious use of groundwater, following innovative measures have been taken up by Government of Gujarat.

Demand side management

Promotion of micro-irrigation techniques such as sprinkler and drip systems for improving water use efficiency and reduce ground water withdrawal.

- The micro-irrigation techniques are made mandatory from 27/03/2012 for new electric connection for withdrawal of Ground water for Agriculture purpose.
- Government of Gujarat is to providing100% subsidy for introduction of micro-irrigation in the command of all the 1293 GWRDC tube wells run by various beneficiary societies.
- Gujarat Green revolution Company (GGRC) is providing subsidy to the farmers (up to 75% - for General Farmer: Small and Marginal farmer (Land holders of less than 2 Hectares), up to 60% - for General Farmer (Land holders of more than 2 Hectares) and up to 85% for SC/ST farmer) for implementation of micro-irrigation.
- About 2,35,000 Ha area is covered under Drip/Sprinkler (by GGRC and GWRDC)

STATE GOVT INITIATIVES

Supply side augmentation

Gujarat has taken effective measures for conservation of water as well as rain water harvesting for arresting Ground Water Depletion. By promotion of rainwater harvesting and artificial recharge systems suitable for local Hydrogeological\conditions, the state launched a massive drive for water conservation and ground water recharge along with watershed conservation programme.Convergence of various schemes implemented under different Departments namely:Rural Development Dept (Water shed Development),Water Resources Dept (State fund and NABARD Assistance),Water Supply Dept (Source Development) and Forest Department (Within Forest Area) has been achieved. As a result of the initiatives taken by the state, construction of nearly 6 lakh water harvesting structures has been completed to harvest runoff and recharge ground water ,so as to progressively enhance water resources.Details of some of the major works are:

i. Construction of Sujalam Suflam Spreading canal, diverting surplus water to North Gujarat Region of the state in 332 Kms length
ii. Construction of 54 Tidal regulators (Bandharas) along the coastline of Saurashtra, preventing sea water intrusion in the river and checking river flow to the sea waters
iii. Construction of 1,69,325 Check dams across the state
iv. Construction of 1,25,541 boribandh
v. Construction of 2,61,988 khet talavadi (Farm Ponds)
vi. Deepening of 31,500 ponds
vii. Renovation of 15,030 traditional water bodies
viii. Other Water conservation water Harvesting Structures-35028

STATE GOVT INITIATIVES

Impact of innovative measures on ground water availability

As a result of various measures implemented by Government of Gujarat, the ground water recharge has significantly increased and there is a remarkable improvement in the status of ground water category of many talukas in the State during the last one and a half decade.

The utilizable Ground Water Recharge has increased by about7598 mcm/yr in 2017, which is about 50% increase as compared to 2002 and the overall stage of ground water development has improved from Semi-critical (75%) to safe (64%) for the state.

Table1. Summary of Ground water Resource Estimation-Gujarat (2002-2017)

Year	Utilizable Ground Water Recharge (mcm/Yr)	Ground Water Draft (mcm/Yr)	Development in %	Category
2002	15079.77	11313.98	75.03	Semi-critical
2011	17585.39	11855.08	67.41	Safe
2013	19787.47	13440.13	67.92	Safe
2017	22677.52	14490.26	63.90	Safe

An analysis of the number of talukas under different categories of stage of ground water development reveals an improvement during the period 2002-2017.

The "Over Exploited" talukas are reduced from 30 to 25,"Critical (Dark)" talukas are reduced from 12 to 5,"Semi Critical (Grey)" talukas are reduced from 63 to 11. "Safe" talukas are increased from 104 to 194 and "Saline" talukas are reduced from 14 to 13.

Table 2. Status of talukas under different categories of stage of ground water development in Gujarat (2002-2017)

Year	Over Exploited Talukas (G.W. Development Above 100%)	Critical Talukas (G.W. Development Between 90% and 100%)	Semi-Critical Talukas (G.W. Development Between70% and 90%)	Safe Talukas (G.W. Development Below 70%)	Saline Talukas (T.D.S .more than 2500 ppm)
2002	30	12	63	104	14
2011	24	5	13	171	10
2013	23	6	9	175	10
2017	25	5	11	194	13

Way Forward

Under **Atal Bhujal Yojana** a comprehensive plan with emphasis on use of scientific inputs from aquifer mapping in watershed development for supply as well as demand side interventions through scientific, holistic, demand driven and yet with public participation and involvement of NGOs has been taken up for implementation in a mission mode in Gujarat for the period 2020-2025. This plan has a mechanism of incentivizing convergence of on-going schemes and to encourage competition for achieving targets within the stipulated time-frame.The scheme envisages community participation in planning, implementation and monitoring as well as to build capacity of the communities through awareness creation, training & institutional strengthening for behaviour change to ensure informed decisions & manage groundwater resources efficiently and sustainably.

Cover Story

2020 FLASHBACK

The Unprecedented COVID 19 Pandemic

The Covid 19 Pandemic breakout is the worst thing to be happened to mankind in recent years. It gained momentum in India during the month of March 2020 and to deal with it total lockdown was declared in the last week of March. During the lockdown period, Government Organizations started functioning, in a restricted manner, maintaining proper safety measures. And Yes, Lockdowns have not dampened the spirit of the Board. Many activities continued during this phase with due precautions.

- Our training establishment, Rajiv Gandhi National Ground Water Training and Research Institute (RGNGWTRI) has brought in a new wave of change through its online training programmes and Virtual Meetings became the '**New Normal**'.

Shri G C Pati takes over as the Chairman of Central Ground Water Board

Shri G C Pati took over as the 26th Chairman of Central Ground Water Board, DoWR, RD & GR, Ministry of Jal Shakti, Government of India on 1st February, 2020. Shri Pati took over the charges from the outgoing Chairman, Shri K C Naik.

Outreach Programes

Public Interaction Programs (PIPs): A series of Public Interaction Programmes were organized by Central Ground Water Board throughout the Country, maintaining all the Covid 19 protocols. A total number of 362 PIPs have been conducted during the year 2020 and around 30,000 people participated in these programmes.

Awareness Programmes in Schools: Awareness Programme on Rain Water Harvesting and Artificial Recharge has been organized in Government Schools/ Institutions. 240 such programs were organized in 2020 in which nearly 36,000 students have participated.

Water Supply Investigations

The Board provides assistance to Defence establishments and other Government agencies to solve their immediate water supply problems by selecting suitable sites for construction of ground water abstraction structures. The Board has carried out a total of 91 investigations during January 2020 to December 2020.

Ground Water Regime Monitoring

Ground water levels in the country are monitored through a network of about 23,000 Ground Water Observation Wells four times a year. Premonsoon 2020 GW Monitoring was carried out amidst Covid 19 Pandemic.

Central Ground Water Authority

Central Ground Water Authority (CGWA) has been entrusted with the responsibility of regulating and controlling ground water development and management in the country.

Important activities of CGWA during 2020

- **Notification of New guidelines dated 24/09/2020**
  Guidelines primarily seek to regulate groundwater extraction for commercial usage. CGWA has notified its revised guidelines to regulate and control ground water extraction in the country on 24.09.2020. The guidelines have been prepared with an aim to streamline the existing procedure and make it more transparent.

- **Processing of Applications for Grant / Renewal of No Objection Certificate (NOC) for Ground Water Withdrawal**
  CGWA continued to evaluate applications from Industries/ Infrastructure Units / Mining Projects for grant of NOC for ground water withdrawal as per provisions of the guidelines. A total of 2496 new NOCs were issued during 2020-21 till 20th Jan 2021.
- **Monitoring of Compliance of Conditions Stipulated in the NOC**
  In order to ensure compliance of the conditions of NOCs by proponents, site inspections were carried out by authorized officers of CGWA. Subsequently, showcause notices were issued to units, which were not found to have fully complied with the NOC conditions. Orders for sealing of bore/tube wells and/or disconnection of electricity supply through the concerned DCs/ DMs were also issued in respect of units, which did not give satisfactory replies to the show-cause notices. Penalty has imposed under section 15 of EPA Act 1986 for non compliance of NOC conditions.
- **On Site Inspection by CGWB**
  On-site inspections are carried out by the Regional Offices of CGWB to check the compliance of NOCs granted by CGWA before recommending the renewal applications to CGWA, New Delhi. Necessary showcause notices are issued to the project proponents who have not complied with the conditions of the NOC issued by CGWA.

Inauguration of Rajiv Gandhi National Ground Water Training & Research Institute at Raipur

Hon'ble Union Minister of Jal Shakti, Govt of India, Sh. Gajendra Singh Shekhawat inaugurated the new building of Rajiv Gandhi National Ground Water Training & Research Institute (RGNGWTRI) at Raipur on 25th Feb., 2020.

The Institute located at Raipur, Chhattisgarh caters to the training requirements of CGWB, Central and State Govt. Organizations, Public Sector Undertakings (PSUs), Academic Institutions, NGOs etc. in the field of ground water. Since XII plan, keeping in view the requirements of NAQUIM, RGNGWTRI, under HRD and Capacity Building Scheme of DoWR, RD&GR, MoJS, has been implementing a three-tier training programme/ course.

During Covid-19 period, RGNGWTRI has adopted online mode of training.

Summary of the training programmes conducted during 2020 are given as below:

Training Programmes	Total No. of Trainings Conducted	Total No. of Participants	Female participants
Tier – I (National Level)	26	903	225
Tier – II (State Level)	23	1474	415
Tier – III (Block Level)	17	2428	995
Total	**66**	**4805**	**1635**

National Aquifer Mapping and Management Program (NAQUIM)

National Aquifer Mapping and Management (NAQUIM) Programme was initiated under Ground Water Management and Regulation (GWMR) scheme in the year 2012, with an objective of delineating and characterizing aquifers and developing management plans for enhancing the sustainability of ground water resources. Out of ~32 lakh km2 area of the entire country, an area of ~25 lakh km2 has been identified to be covered under Aquifer Mapping in phases.

A multidisciplinary approach is followed for delineation and characterisation. Drilling assisted ground water exploration provides direct information about aquifers. Geophysical investigations like Vertical Electrical Sounding (VES) provides indirect information about disposition of aquifers. Hydro chemical studies provide information regarding chemical quality of ground water. As a part of the NAQUIM, during 2020 following major scientific data generation activities were carried out:

» Exploratory Drilling
1950 Exploratory Drillings carried out to study subsurface disposition of aquifers.

» Geophysical
470 vertical electrical soundings (VES), 28 geophysical loggings and 54.4 km resistivity profiling.

» Ground Water Quality
Around 20000 ground water samples have been analysed for basic constituents and heavy metals.

» Aquifer Maps and Management Plans
Findings of hydrogeological survey, water level monitoring, exploration including pumping tests, geophysical investigations, water quality analysis are integrated for developing aquifer maps and management plans. During 2020 (Jan. 2020 to Dec. 2020), aquifer maps and management plans have been developed for an area of 2.88 lakh km2. Since inception of the NAQUIM program (2012), an area of ~14.78 lakhs km2 has been covered.

Atal Bhujal Yojana

Atal Bhujal Yojana (ATAL JAL) is a Central Sector Scheme of the Government of India with an outlay of Rs 6000 crore, with focus on community participation and demand side interventions for sustainable ground water management in identified water stressed areas. The scheme also envisages improved source sustainability for Jal Jeevan Mission, positive contribution to the Government's goal of 'doubling farmers' income' and inculcating behavioral changes in the community to facilitate optimal groundwater use.This scheme is expected to contribute significantly towards the water and food security of the participating States.The scheme was launched by the Hon'ble Prime Minister on 25.12.2019 and is being implemented from 1.04.2020 for a period of 5 years.

The scheme is being taken up in select areas that include 80 districts, 222 administrative blocks and 9000 water stressed Gram Panchayats of seven states, viz. Haryana, Gujarat, Karnataka, Madhya Pradesh, Maharashtra, Rajasthan and Uttar Pradesh.

The Scheme has two components viz.

i. **Institutional Strengthening & Capacity Building component (Rs. 1,400 crore):** for strengthening institutional arrangements by providing strong data base, scientific approach and community participation in the States to enable them sustainably manage their ground water resources.

ii. **Incentive Component (Rs.4,600 crore):** for incentivizing the States for convergence amongst various schemes of the Central and State Governments and achievement of pre-defined results as a measure of optimal water usage and consequent improvement in ground water scenario.

Work done under the scheme

- National Inter-departmental Steering Committee has been constituted & National Programme Management Unit (NPMU) established.
- Program Guidelines issued.
- Third Party Government Verification Agency (TPGVA) engaged.
- Preparation of web-based MIS to monitor progress of the scheme has advanced.
- MoA signed with all seven States.
- Release of funds to the tune of Rs. 34.00 crore under Institutional Strengthening and Capacity Building Component to all States.
- Establishment of institutional mechanism for implementation of scheme is in progress in the participating States. States are going ahead with preparatory activities for ground level implementation of the scheme.
- Verification of pre-agreed results for Disbursement Linked Indicator (Public disclosure of ground water data / information and Reports) being taken up by the Third-party Government Verification Agency (TPGVA). The report ofthe agency is expected shortly.

Honours and Recognition

"People work for money but go the extra mile for recognition, praise and rewards."--**Dale Carnegie**

» **केंद्रीय भूमि जल बोर्ड को राजभाषा के उत्कृष्ट कार्यान्वयन के लिए वैजयंती पुरस्कार से सम्मानित**

जल शक्ति मंत्रालय द्वारा केंद्रीय भूमि जल बोर्ड को राजभाषा के उत्कृष्ट कार्यान्वयन के लिए वैजयंती पुरस्कार से सम्मानित किया गया। नई दिल्ली में आयोजित एक समारोह में माननीय जल शक्ति राज्य मंत्री श्री रतन लाल कटारिया ने अपने कर कमलों से श्री जी. सी. पति, अध्यक्ष केंद्रीय भूमि जल बोर्ड को पुरस्कार प्रदान किया । श्री सुनील कुमार, सदस्य मुख्यालय तथा श्री राकेश गुप्ता, उपनिदेशक राज भाषा को प्रशस्ति पत्र प्रदान किये गए । इस अवसर पर सचिव, जल शक्ति मंत्रालय तथा मंत्रालय एवं इसके संगठनों सेअन्य वरिष्ठ अधिकारी भी उपस्थित थे ।

» Dr. D K Chadha, Ex Chairman, Central Ground Water Board elected as the vice-president of IAH- Asia.

» Shri Sushil Gupta, Ex Chairman, Central Ground Water Board appointed as the Member of Water Resources Regulation Authority of Punjab.

» Dr. AVSS Anand, Scientist, Central Ground Water Board has received the "Professional Excellence Award, 2020" from Aqua Foundation, New Delhi for his outstanding work in Ground Water related software development & GW Resource Assessment. It is indeed a proud moment for CGWB.

Research Publications by CGWB Officers

During the year 2020, CGWB officers published 28 research papers in scoups indexed publications of international repute. Research publication covered areas like hydrogeology, groundwater chemistry, Sustainable management, goinformatics, modeling, Natural Hazards, climate change etc.

Institutional Collaborations

Tripartite MoU signed between Central Ground Water (CGWB), National Mission for Clean Ganga (NMCG) and National Geophysical Research Institute (NGRI)

A Tripartite Memorandum of Understanding has been signed between CGWB, NMCG and NGRI on 14th February 2020 to study the disposition of aquifers, characteristics of the palaeochannels in the Ganga Yamuna Doab and possible interaction of the aquifers with Ganga and Yamuna Rivers. Aquifers in the Ganga Yamuna Doab play an important role in sustaining flows in these rivers. This study is expected to help in developing plans for effective augmentation of flow for rejuvenation of Ganga through managed aquifer recharge.

Tripartite MoU involving CGWB, GSI and DWS, Jharkhand for studies on Fluoride contamination

A tripartite Memorandum of Understanding (MOU) between Geological Survey of India (GSI), Ministry of Mines, Govt. of India; Central Ground Water Board (CGWB), Dept. of Water Resources, River Development and Ganga Rejuvenation, Ministry of Jal Shakti, Govt. of India and Drinking Water and Sanitation Department (DWSD), Govt. of Jharkhand was signed on 15.7.2020 on Assessment of fluoride contamination in surface and groundwater and its management in Jharkhand

MoA signed between Central Ground Water and CSIR-NGRI, Hyderabad

MoA signed between Central Ground Water Board, Ministry of Jal Shakti and CSIR-NGRI, Hyderabad for use of advanced heli-borne geophysical survey and other scientific studies for Aquifer Mapping in parts of Rajasthan, Gujarat and Haryana. The MoA was signed in the august presence of Hon'ble Minister of Science and Technology, Dr. Harsh Vardhan, Hon'ble Union Minister of Jal Shakti, Sh.Gajendra Singh Shekhawat and Hon'ble Minister of State for Jal Shakti, Sh. Rattan Lal Kataria.The findings of the study will help in formulating plans for improving GW levels in the water stressed areas and charter the road map for sustainable management of ground water resources.

Aquifer Rejuvenation Projects

Artificial Recharge in Aspirational Districts: Innovative schemes on Aquifer Rejuvenation has been undertaken CGWB in which innovative artificial recharge techniques for aquifer rejuvenation has been carried out in Aspirational districts of the States of Maharashtra, Telengana and Andhra Pradesh. The work has been executed in three blocks- one each in Andhra Pradesh, Telangana and Maharashtra state. The interventions have resulted in improvement of ground water situation in the area.

Artificial recharge structures have been constructed in parts of following three blocks of three Aspirational Districts of Maharashtra, Andhra Pradesh and Telangana state.

i. Osmanabad Block, Osmanabad District, Maharashtra
ii. Pulivendula, YSR Kadapa, Andhra Pradesh
iii. Bachannapet, erstwhile Warangal, Telangana

Bridge cum Bandhara in parts of Amrawati and Wardha districts, Maharashtra: Bridge cum Bandhara (BCB) have been constructed in parts of Andhra Pradesh, Telangana and Maharashtra state. The structure serves dual purpose of transportation as well as storage of water in the upstream side for drinking and irrigational needs besides other purposes such as ground water recharge. The five sites at which BCB have been constructed are

a. Sarwadi, Tehsil: Karanja, District: Wardha
b. Deoli, Tehsil: Deoli, District: Wardha
c. Jamni, Tehsil: Selu, District: Wardha
d. Tiwasa, Tehsil: Tiwasa, District: Amravati
e. AjraPhata, Tehsil: Samudrapur, District: Wardha

Sarwadi(Gates in closed position) position)

Jamni(Gates in open position)

AjraPhata (Rubber Dam – Inflated Position)

Deoli (Gates in open/closed position)

Trending posts

Top Tweet earned 5,779 impressions

CGWB Officers and Officials on field duty during Corona Crisis. Ground Water monitoring for the Premonsoon Period is carried out in Sagar District, Madhya Pradesh #Nation_battles_covid19 @MoJSDoWRRDGR
pic.twitter.com/oYA8KvvasU

4 9 52

Top Tweet earned 5,769 impressions

Catch the Rain where it falls #Alakh #Nayan #Mandir #Hospital, Udaipur, Rajasthan has set an example for conserving Rain Water in the hospital premises.
@MoJSDoWRRDGR
pic.twitter.com/GDmtgivtVO

3 35 94

Top Tweet earned 4,169 impressions

PMKSY -HKKP Ground Water Irrigation Scheme Tube Well (Phase I) with electrical energisation at Kulai Basudev Para, Ambassa Block, Dhalai District, Tripura. Six Marginal Farmers are going to get benefit from this well @MoJSDoWRRDGR
pic.twitter.com/PZuHHq8hpH

Top Tweet earned 5,359 impressions

Well maintained traditional Step well , locally known as "Thopu Bhaavi" located in the premises of Shivabaalayogi Ashrama in Devarayasamudra, Mulbagal Taluk, Kolar district, Karnataka . It caters to the drinking water needs for the local population.
@MoJSDoWRRDGR
pic.twitter.com/jHBBOG34U0

10 30

Top Tweet earned 2,055 impressions

Awareness Raising Program on Water Conservation and Artificial Recharge by CGWB at Govt Higher Secondary School, Lambari, district Reasi, Jammu & Kashmir on 03.03. 2020. #HarKaamDeshKeNaam @MoJSDoWRRDGR @gssjodhpur
pic.twitter.com/yy8NvxsP3V

Top Tweet earned 4,011 impressions

Hon'ble Minister of Jal Shakti, Sh. Gajendra Singh Shekhawat @gssjodhpur reviewed activities of CGWB including National Aquifer Mapping (NAQUIM) programme in his Shram Shakti Bhawan office today.
@MoJSDoWRRDGR
pic.twitter.com/pHvddG8dkn

राजभाषा

केंद्रीय भूमिजल बोर्ड में राजभाषा हिन्दी का कार्यान्वयन एवं प्रचार–प्रसार

भारतीय संविधान के अनुच्छेद 343 के प्रावधानों के अनुसार संघ की राजभाषा हिंदी और लिपि देवनागरी है। संघ का यह कर्तव्य है कि वह हिंदी भाषा का प्रसार बढ़ाए, उसका विकास करे, जिससे वह भारत की सामासिक संस्कृति के सभी तत्वों की अभिव्यक्ति का माध्यम बन सके। राजभाषा संबंधी सांविधानिक और कानूनी उपबंधों का अनुपालन सुनिश्चित करने और संघ के सरकारी काम–काज में हिंदी के प्रयोग को बढ़ावा देने के लिए गृह मंत्रालय के एक स्वतंत्र विभाग के रूप में जून, 1975 में राजभाषा विभाग की स्थापना की गई थी । राजभाषा विभाग संघ के सरकारी काम–काज में हिंदी का प्रगामी प्रयोग बढ़ाने के लिए प्रयासरत है ।

राजभाषा विभाग, गृह मंत्रालय द्वारा समय समय पर जारी दिशा निर्देशों के अनुपालन में केंद्रीय भूमिजल बोर्ड और इसके सभी अधीनस्थ क्षेत्रीय, प्रभागीय और राज्य एकक कार्यालयों में वर्ष 2019–20 के दौरान राजभाषा हिन्दी के कार्यान्वयन और प्रचारदृप्रसार के सक्रिय प्रयास जारी रखे गए। केंद्रीय भूमिजल बोर्ड राजभाषा हिंदी के प्रगामी प्रयोग व कार्यान्वययन के लिए प्रतिबद्ध है । राजभाषा विभाग द्वारा जारी वार्षिक कार्यक्रम के अनुसार निर्धारित लक्ष्यन को प्राप्त करने के लिए बोर्ड सतत प्रयत्नरशील है । राजभाषा विभाग, गृह मंत्रालय, जल शक्ति मंत्रालय और नगर राजभाषा कार्यान्वयन समिति से समय दृसमय पर प्राप्त अनुदेशों और दिशानिर्देशों के पूर्ण अनुपालन सुनिश्चित करने तथा संघ की राजभाषा नीति के प्रावधानों के कार्यान्वयन और वार्षिक कार्यक्रम में निर्धारित लक्ष्यों को प्राप्त करने के उद्देश्य से सभी अधीनस्थ कार्यालयों और मुख्यालय के सभी अनुभागों को इससे अवगत कराया गया।

सरकारी काम काज में हिंदी के प्रयोग को बढ़ाने के लिए नियमित रूप से विभिन्न परिपत्र, आदेश और अपील जारी किए जाते हैं। कार्यालय में हिन्दी में टिप्पण और आलेखन को बढ़ावा देने के उद्देश्य से राजभाषा विभाग द्वारा जारी वार्षिक कार्यक्रम की प्रति, द्विभाषी मानक मसौदे, प्रशासनिक शब्दावली आदि सभी अधिकारियों और कर्मचारियों को उपलब्ध कराये गए। सभी कम्प्यूटरों पर हिन्दी में काम करने की सुविधा प्रदान करने हेतु यूनिकोड सुविधा उपलब्ध कराई गयी ।

राजभाषा हिन्दी के प्रभावी प्रचार–प्रसार और कुशल कार्यान्वयन के लिए राजभाषा विभाग, गृह मंत्रालय द्वारा जारी समस्त प्रोत्साहन योजनाओं यथा मूल रूप से हिन्दी में टिप्पण दृ आलेखन, श्रुतलेखन, हिन्दी में टंकण आदि योजनाओं को कार्यालय में लागू किया गया है तथा अधिक से अधिक अधिकारी और कर्मचारी उत्साहपूर्वक इन योजनाओं में भाग ले रहे हैं।

केंद्रीय भूमिजल बोर्ड की वेबसाइट www.cgwb.gov.in को द्विभाषी रूप में तैयार किया गया है। राजभाषा से संबन्धित विभिन्न गतिविधियों और महत्वपूर्ण उपलब्धियों को इसमे विशेष स्थान दिया जाता है।

गृह मंत्रालय द्वरा जारी दिशा निर्देश के अनुसार सितंबर माह में दिनांक 14.9.2020 से 28.9.2020 के दौरान बोर्ड और इसके समस्त अधीनस्थ कार्यालयों मे वर्चुअल मोड में हिन्दी दिवस, हिन्दी सप्ताह, हिन्दी पखवाड़ा, हिन्दी माह का आयोजन किया गया। इस दौरान अधिकारियों और कर्मचारियों के लिए कई प्रतियोगिताओं जैसे हिन्दी निबंध प्रतियोगिता, टिप्पण–आलेखन, टंकण, वाद–विवाद, प्रश्न मंच आदि का आयोजन किया गया। सभी अधिकारियों और कर्मचारियों ने इन प्रतियोगिताओं में बढ़–चढ़कर भाग लिया।

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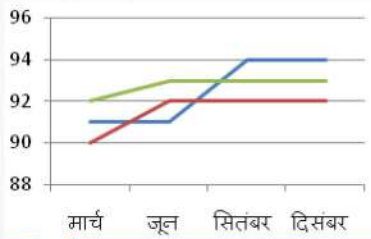
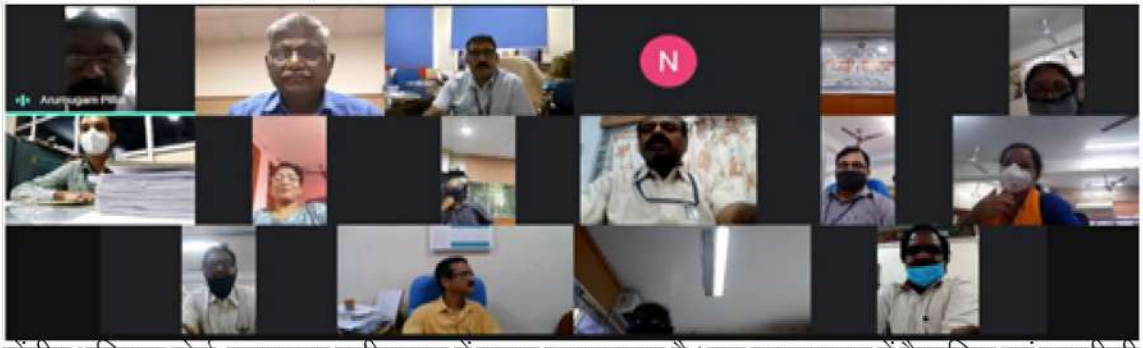


भारत सरकार की राजभाषा नीति के अनुसरण में राजभाषा अधिनियम, 1963 की धारा 3(3) के तहत सभी दस्तावेज हिंदी और अंग्रेजी दोनों में तैयार किए जाते हैं। राजभाषा नियम, 1976 के नियम 5 के तहत हिन्दी में प्राप्त सभी पत्रों के उत्तर अनिवार्य रूप से हिन्दी में ही दिये जा रहे हैं। वार्षिक कार्यक्रम में निर्धारित लक्ष्यों को ध्यान में रखते हुए कार्यालय में जांच बिन्दु स्थापित

किए गए हैं, ताकि इस दिशा में किए जा रहे कार्यों की मॉनिटरिंग की जा सके। पिछले वर्ष के दौरान 'क', 'ख' एवं 'ग' क्षेत्र में किए गए हिन्दी मूल पत्राचार के प्रतिशत का विवरण नीचे दिया गया है।

जल शक्ति मंत्रालय के संबंद्ध एवं अधीनस्थ कार्यालयों के मध्य राजभाषा हिन्दी के प्रति सकारात्मक वातावरण के सृजन के उद्देश्य से मंत्रालय द्वारा राजभाषा वैजयंती पुरस्कार योजना लागू की गई है। जल शक्ति मंत्रालय द्वारा राजभाषा के क्षेत्र में उत्कृष्ट कार्य करने के लिए केंद्रीय भूमि जल बोर्ड को वैजयंती पुरस्कार प्रदान किया गया। मंत्रालय द्वारा आयोजित एक भव्य समारोह में अध्यक्ष, केंद्रीय भूमिजल बोर्ड को शील्ड और प्रशस्ति पत्र से सम्मानित किया गया। राजभाषा विभाग, गृह मंत्रालय द्वारा समय–समय पर जारी दिशानिर्देशों के अनुपालन में केंद्रीय भूमिजल बोर्ड, मुख्यालय और इसके अधीनस्थ कार्यालयों में नियमित रूप से प्रत्येक तिमाही मे हिन्दी कार्यशालाओं का आयोजन किया जा रहा है। इस वर्ष ये कार्यशालाएं वर्चुअल मोड पर इंटरनेट के माध्यम से आयोजित की जा रही हैं। इन कार्यशालाओं में बोर्ड के अधीनस्थ क्षेत्रीय, प्रभागीय और राज्य एकक कार्यालयों को भी शामिल किया जा रहा है।



केंद्रीय भूमिजल बोर्ड, मुख्यालय फरीदाबाद में समृद्ध पुस्तकालय है। इस पुस्तकालय में वैज्ञानिक एवं तकनीकी मानक ग्रन्थों, जर्नल आदि के अतिरिक्त प्रशासनिक और अन्य विषयों पर प्रचुर पठनीय साहित्य उपलब्ध है। पुस्तकालय में हिन्दीा पुस्तवकों की खरीद वार्षिक कार्यक्रम में निर्धारित लक्ष्यों के अनुसार की जा रही है।

माननीय संसदीय राजभाषा समिति की दूसरी उपसमिति द्वारा दिनांक 08.12.2020 को केंद्रीय भूमि जल बोर्ड, मुख्यालय, फरीदाबाद का राजभाषायी निरीक्षण किया गया । समिति द्वारा बोर्ड में राजभाषा के प्रचार–प्रसार और इसके कार्यान्वयन की दिशा में किए जा रहे कार्यों पर संतोष प्रकट किया । केंद्रीय भूमि जल बोर्ड हिंदी के प्रगामी प्रयोग व कार्यान्वधयन के लिए प्रतिबद्ध है । राजभाषा विभाग द्वारा जारी वार्षिक कार्यक्रम के अनुसार निर्धारित लक्ष्य को प्राप्त। करने के लिए बोर्ड सतत प्रयत्नीशील है ।

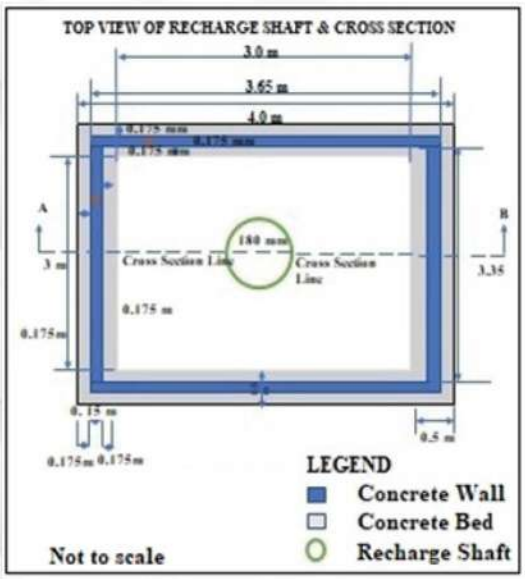
PATHSHALA

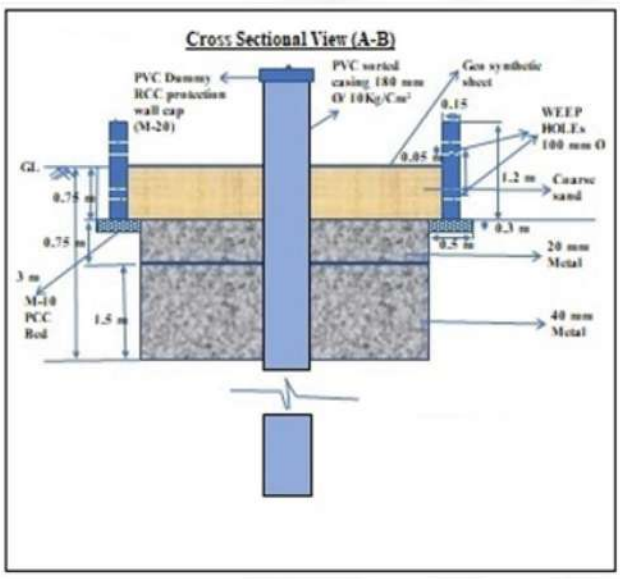
GW RECHARGE THROUGH INJECTION WELL (RECHARGE SHAFT)

Injection well is the most efficient and cost effective technique to recharge aquifer overlain by poorly permeable strata/layer (Clay) which hinders the infiltration of water to the aquifer. A bore well is drilled up to a fractured zone (30-40 m) with slotted casing in weathered part and end in permeable strata end just above/below water table. The filter media consisting of boulders/cobbles at bottom (~1.5 m) followed by gravel (0.75 m) and sand at top (0.75 m). Protection wall is constructed around it and the diameter of the shaft is normally 3 meters.The structure is mainly constructed in the upstream side of existing check dam/percolation tank/water body to facilitates the surface run off directly to the aquifer. These types of structures are most effective in over-exploited areas.

Dr. Pandith Madhnure,
Director,
Ground Water Department, (I& CAD, Dept),
Govt of Telangana

The top view and cross section of the structures and constructed in field area are given below.





SHODH

Research Publications by CGWB officers in reputed International Journals (as per Scopus database)

01 Can Groundwater Scenarios Be Predicted from Future Regional Climatic Input Variables?

Water Resources Management volume 34, pages4815–4830, Dec (2020)

Satiprasad Sahoo, Anirban Dhar, Anupam Debsarkar & Amlanjyoti Kar

Abstract: Conjunctive use of water is an integral part of water resources management. Future groundwater scenarios will dictate the water management policies. The present research focuses on future groundwater scenario generation based on regional scale CMIP5 data. The future scenarios for the years 2030, 2050 and 2080 were generated in terms of the groundwater potential zones (GWPZs) with seven futuristic parameters [land use and land cover, maximum temperature, minimum temperature, rainfall, groundwater recharge, groundwater table and evapotranspiration (ET)]. The Dyna-CLUE and MIROC5 were used for generation of the future change in climate and land use/land cover scenarios. The Soil and Water Assessment Tool (SWAT) was utilized for the recharge and ET estimation. Future groundwater heads were calculated by using the Modular Three-Dimensional Finite-Difference Groundwater Flow (MODFLOW). Bias corrected rainfall and temperature data of Representative Concentration Pathways (RCP 4.5) were utilized. Total twelve water quality parameters (pH, Cl-, Mg2+, F-, Na+, EC, TH, HCO3-, K+, Ca2+, SO42- and PO42-) were used for groundwater quality zone (GWQZ) mapping. These GWPZ and GWQZ were divided into three (poor potential, moderate potential, and good potential) and four zones (good quality, moderate quality, poor quality and above permissible limit) respectively. The lower part of the basin was identified as poor GWPZ (35.76% for 2030) and GWQZ due to an increase in urban areas. However, the middle and upstream portion covers good, moderate zones. Field-based soil moisture and groundwater level monitoring data were utilized for validation purposes. It was observed that groundwater level <5m bgl corresponds to good GWPZ. It was also observed that recharge and pH were the crucial parameters for good GWPZ (+11.83%) and GWQZ (-21.31%) according to sensitivity analysis.

02 Catastrophic flood of August 2018, Kerala, India: Study of partitioning role of lineaments in modulating flood level using remote sensing data

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Abstract: India's Kerala state, sandwiched between the Arabian Sea and the Western Ghats, witnessed a catastrophic flood during the southwest monsoon in mid-August 2018. Unusual precipitation (24% in excess of the normal) coupled with opening of flood gates of dams in the highland and high tide level in the coastal plains were the drivers of the flood. Synthetic Aperture Radar (SAR) data acquired from multiple satellites were used to demarcate area inundated by flood, which covered over 521 km2 in the coastal lowlands. Flood waters receded rather abruptly during the initial days between 18 August and August 21, 2018 where the flooded area dropped from 521 to 395 km2 and water levels dropped from 10 m to 5 m. But subsequent level fall was tremendously slow, taking 40 days to reach ~50% or 260 km2 on September 26, 2018. The chaotic distribution and discharge of flood water, together with structural controls of the coastal lowland, initiated the investigation to examine whether or not geologic lineaments of the basement terrain was involved in modulating the location and discharge of flood waters. The investigation resulted in identifying two scenarios around the lineaments: (1) pooling of flood water over extended periods and (2) rapid discharge of flood water, named as pooling and discharging lineaments, respectively. Flood water recession, for the 40 days, through discharging lineaments was 87.15% when compared to the low rate of recession through pooling lineaments (33.07%). Moreover, morphology-wise discharging lineaments are characterized by high relative relief whereas pooling lineaments were depressions. Results suggest, other than lineament's role in aiding water percolation, lineaments can also act as conduits for rapid discharge.

03 Assessment of heavy metal pollution in groundwater of an industrial area: a case study from Ramgarh, Jharkhand, India.

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Abstract: In the present study, pollution evaluation indices were carried out to assess the intensity of pollution in Marar industrial area of Ramgarh in Jharkhand. Fifteen groundwater samples were collected from the study area in May 2016. The physicochemical parameters (pH and EC,, HCO3-, Cl-, SO42-, NO3-, F-, Ca2+, Mg2+, Na+, K+) and heavy metals (Fe, Mn, As, Zn, Cu, Cr, Ni, Se, Al, Ba, Pb and Cd) were analysed. Measured concentration of heavy metals in the study area in decreasing order is as follows: Fe> Zn>Mn> Al> Ba > Ni> Cu >Pb> Cr > Se> As > Cd. Fe concentration was found beyond desirable limit in each sample. In the study area 73%, 60% and 21% water samples surpass desirable limit of Al, Mn and Ni respectively as per BIS,10,500 (2012). Concentration of As, Cu, Cr, Se, Pb, Ba and Cd was within the desirable limit in each sample. The analysed data was then applied for the calculation of Heavy Metal Pollution Index (HPI), Heavy Metal Evaluation Index (HEI) and Degree of Contamination (Cd). HPI values have not surpassed thecritical value of 100 in any of the sample despite of various industrial activities. Fe is the prominent contributor for all the three pollution indices followed by Ni, Cr, Pb, Cu and Mn. According to multiple of mean value approach 100%, 93% and 80% of the samples belong to low and medium classes of HEI, HPI, and Cd respectively. Cluster analysis results advocate that heavy metal concentration in groundwater resources are contributed by both lithogenic as well as anthropogenic inputs such as large number of ferro alloys, non-ferrous alloys, sponge iron, foundry, instrument manufacturing and welding industries in the study area

04 Patterns of groundwater chemistry: implications of groundwater flow and the relation with groundwater fluoride contamination in the phreatic aquifer of Odisha, India

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Abstract: The work analyzes the patterns of quality parameters and hydrochemical facies of 1105 nos (n = 685 in hard rock; n = 420 in alluvium) of groundwater samples drawn from the phreatic aquifer in Odisha, India. The study explores the possible relations of the groundwater chemistry including the fluoride (F^-) contaminations with the flow mechanisms. The hydrochemical facies types of Na-Mg-Ca-Cl-HCO3 characterize the groundwater discharge corridors lying close to the river valleys, and in parts of coastal alluvium, particularly in the Mahanadi deltaic region. In contrast, the facies types of Ca-Mg-HCO3-Cl dominate the groundwater recharge areas, located at relatively higher elevations. The recharge areas in the state are largely free from groundwater F^- contamination. The study delineates the ratio of Ca2+/Na+ and its distribution patterns to interpret the source of F^- (> 1.0 mg/L) in groundwater. The Ca2+/Na+ ratios of < 1.0 with Na-HCO3 (Cl) as the predominant hydrochemical facies types, indicates the geogenic source of groundwater F^-. Such groundwater samples are distributed close to the discharge corridors suggesting their longer resident time in the aquifer system and enrichment of F^- due to rock-water interaction along the flow paths. The Ca2+/Na+ ratios of > 1.0 are characterized by water types like Ca-Mg-HCO3 (Cl) of recent meteoritic origin. These are distributed in the groundwater recharge-midline areas where significant infiltration to groundwater occurs. The largest such cluster is observed in the Hirakud Canal Command area in the western parts of the state, indicating the role of anthropogenic sources of groundwater F^- contamination through irrigation return flows.

COLLECTABLES

1. *Long duration pumping test at Vaddagere, Gundlupet Taluk, Chamarajanagar district, Karnataka.*
2. *Public Interaction Programme (PIP) organized by CGWB, NER, Guwahati at Baruatilla village, Dullabcherra block, Karimganj district, Assam.*
3. *Verification of Outsourcing EW Site by CGWB Officers of NER, Guwahati and representative of WAPCOS.*
4. *CGWB Officer carried out Short Term Investigation for water supply to ITBP troops at Shipki La Pass. The forward base is located at LAC, having sub glacian climate.*
5. *Regional Chemical Laboratory, CGWB, Kolkata received accreditation as per New Standard of ISO/ IEC 17025:2017*.*
6. *Sh. Subodh Yadav, IAS, Joint Secretary, MoJS and Project Coordinator, NHP visited ground water monitoring sites at Hiranki, Jangola, Palla and Lodhi Garden, New Delhi.*
7. *Observation well drilled to a depth of 123.50 m bgl at Porla village,Gadchiroli district, Maharashtra.*

COLLECTABLES

1 2 *Post Monsoon GW Level Monitoring carried out throughout the Country during November 2020*

3 4 *Collection of Ground Water samples from Key Wells and Springs under NAQUIM studies*

5 6 *CGWB, ER, Kolkata organized series of Public Interaction Programmesat North 24 Parganas and South 24 Parganas Districts, West Bengal.*

7 *Public Interaction Program organised by CGWB, Shillong at Nogorpara, South West Garo Hills district, Meghalaya.*