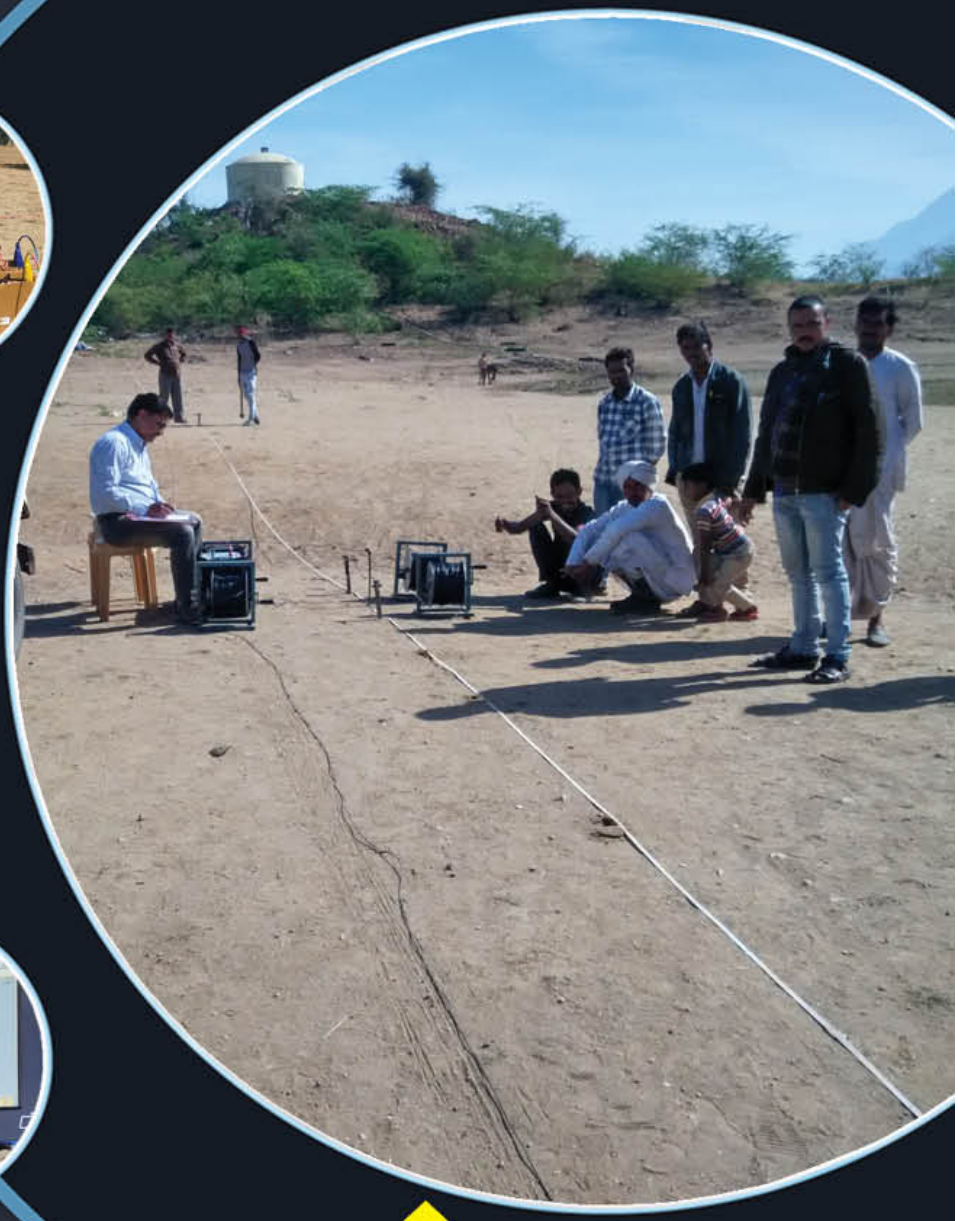
Govt. of India
Ministry of Jal Shakti
Dept. of WR, RD & GR
Central Ground Water Board



Cover Story
Atal Bhujal Yojana

भूजल संवाद

Bhujal Samvad, The Quarterly Magazine of Central Ground Water Board

April to Sept., 2021, Vol.13-14

Report
Transient Electromagnetic (TEM) Survey

Pathshala
Geophysical Survey

Shodh
Research publications by CGWB

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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. 13-14 (April to Sept., 2021)

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Cover Photo: Geophysical Survey in Central Ground Water Board.

MESSAGE

The first quarter of Year 2021 has shown a ray of hope for a better tomorrow as the Covid situation in the country was under much control. But unfortunately, the whole country was under the grip of Second wave of covid from April onwards which proved to be extremely devastating and fatal. The CGWB family has lost many members to Covid during this period and we are still trying to cope up with the situation. The activities of the Board continued amidst strict restrictions, maintaining all the norms and precautions.

I am pleased to introduce this new issue of Bhujal Samvad, which is a special issue on Geophysical Studies. The Report and Pathshala sections contain articles on Geophysical survey and studies carried out by CGWB in this field. A topic of great interest, 'Atal Bhujal Yojana', aiming at a Community led Ground Water Management in India, is a part of our Cover Story in this issue. Regular sections like 'In Focus' and 'Shodh' also includes topics of interest for everyone. Thoughts and Feedback of the avid readers are most welcome to make Bhujal Samvad a success. 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!

Dr. Nandakumaran P.
Chairman CGWB

IN FOCUS

Dr. Nandakumaran P. takes over as the new Chairman of Central Ground Water Board

Dr. Nandakumaran P. took over as the 28th Chairman of Central Ground Water Board, DoWR, RD & GR, Ministry of Jal Shakti, Government of India on 5th July, 2021 from the outgoing Chairman, Shri G C Pati.

Dr. Nandakumaran P. is an alumni of University of Kerala, Trivandrum, Kerala and completed his M.Sc. in Geology in 1982. He completed his Doctoral Degree in Ground Water Management from University of Madras in 2007.

Dr. Nandakumaran started his career in Central Ground Water Board in 1986 as a Junior Hydrogeologist and has worked in different parts of India in various capacities including Regional Director, Kerala and Director (Admn), CGWB Headquarters, Faridabad. In 2017, he was promoted as Member, CGWB and subsequently held key positions such as Member (HQ), Member (South) and Member (CGWA). From 2019 onwards, Dr. Nandakumaran is the Project Director, Atal Bhujal Yojana, a World Bank aided scheme of the Ministry of Jal Shakti, Government of India aimed at improving the long-term sustainability of ground water resources with emphasis on community participation.

Widely travelled, Dr. Nandakumaran has versatile experience of working in various facets of GW management including GW exploration in alluvium & Hard rock areas, assessment of GW resources, sustainable development and management of GW and Managed Aquifer Recharge. He has a number of National and International publications to his credit. He has also been part of various inter-ministerial committees and has played a key role in framing policies related to sustainable management of ground water in India.

CGWB family heartily welcomes Dr. Nandakumaran P. as the Chairman of the Board.

The second wave of Covid 19 hit the Country in April 2021 and has its peak during the month May with unprecedented spike in the number of cases. The second wave proves to be fatal with severe consequences all throughout. Central Ground Water Board family has lost many of its members to this dreaded virus. CGWB family members join hands in conveying heartfelt condolences to the bereaved families who have succumbed to this virus. Amidst this situation, the Board has tried to gear up its field activities from the month of June 2021.

National Inter-departmental Steering Committee (NISC)

9th Meeting of National Inter-departmental Steering Committee (NISC) was held under the Chairmanship of Sh. Pankaj Kumar, Secretary, Department of WR, RD & GR, MoJS at Shram Shakti Bhawan, New Delhi.

संसदीय राजभाषा समिति बैठक

संसदीय राजभाषा समिति ने बेंगलुरु में केंद्रीय भूमि जल बोर्ड के साथ निरीक्षण बैठक की। इस दौरान समिति ने मंत्रालय एवं विभाग के अधिकारियों की उपस्थिति में कार्यालय में हो रहें राजभाषा हिंदी के कार्यों का पुनर्विलोकन किया।

IN FOCUS

Achievement of CGWB Officer

A proud moment for CGWB !!

Dr.Sudhanshu Sekhar, Scientist, CGWB has been awarded Aqua Foundation's Excellence Award 2021 under the category of Professional Excellence. He is a professional Hydrogeologist for more than three decade and has significantrly contributed in planning and execution of National level projects including Aquifer Mapping and Management Programme (NAQUIM) of Central Ground Water Board, Ministry of Jal Shakti, Govt of India

Parliamentary Standing Committee on Water Resources

Meeting of the Parliamentary Standing Committee on Water Resources held on 26th August 2021 in Kolkata. Dr P Nandakumaran, Chairman, CGWB & Regional Director, CGWB, Kolkata attended the meeting.

PMKSY HKKP GW scheme of Govt of India

Wells constructed under PMKSY HKKP GW scheme of Govt of India proves to be a boon for small and marginal farmers and empowering them through ground water based assured irrigation in North Eastern India. 9,628 wells constructed, bringing 21,217 ha under assured irrigation in parts of Assam, Arunachal Pradesh, Tripura, Nagaland, Manipur and Mizoram.

REPORT

TRANSIENT ELECTROMANETIC (TEM) SURVEYS IN BIKANER DISTRICT, RAJASTHAN

Sh. K.P. Singh, CGWB

SET UP OF STUDY AREA

Bikaner District being a part of Thar Desert is predominantly covered by alluvial and aeolian sand. Its total geographical area is 27,244 sq.km, which extends between 71°54' and 74°12' east longitudes and 27°11' and 29°03' north latitudes. It shares its western boundary with Pakistan, northern with Ganganagar, north-eastern with Hanumangarh, eastern with Churu, south-eastern with Nagaur, southern with Jodhpur and south-west boundary with Jaisalmer Districts of Rajasthan State.The district experience arid type of climate with extreme summers and temperature reaching 48 °C in summers and 3 ° C in winters. The annual average rainfall of the district is 277.55 mm, 90% of which occurs during the south-west monsoon months of July to September.

Most of the aeolian sand is seen as sand dunes of variable heights. Otherwise, the geologic succession of the area is represented by rocks of Palaeozoic to Recent age. The Tertiary Group of rocks represented by Sandstones of variable grain size is exposed in Bikaner - Kolayat region. Marwar Super Group represented by Nagaur Sandstones and Bilara Limestone, occupies south-eastern part of the district. The ground water is found in confined to semi-confined conditions with discharge varying between 60 to 750 lps. The boreholes drilled in the district are in the depth range of 100 to 510 m bgl. The water level in the district varies from 4.35 mbgl to 122 mbgl in pre-monsoon and from 4.03 m bgl to 120 m bgl in post monsoon season. In ground water quality, the Electrical Conductivity (EC) varies from 470 to 8000 µS/cm at 25 °C, Nitrate (NO3) varies from traces to 118 mg/l and Fluoride (F) varies from traces to 1.70 mg/l.

A total of **270 TEM Soundings Surveys** were conducted in parts of Bikaner District in grid pattern, with maximum loop size of 100 m x 100 m array geometryof coincident loop set-up, with 2 m offset between Tx and Rx loops,for deeper depth of penetration. These surveys were conducted by deploying recently

procured TEM instrument - TerraTEM-24 instrument manufactured by Monex Geo Scope, Australia. The TEM surveys and Vertical Electrical Sounding (VES) with Schlumberger array were conducted near the recently drilled exploratory wells, to compare the TEM interpreted results with the sub-surface lithology inferred from electrical logs and VES surveys. Transient Electromagnetic Method (TEM) measurements involve sending an intermittent current into an un-grounded transmitter loop laid on the surface. During the times when the current is turned off abruptly, a receiver loop is used to measure electromagnetic field caused by the decay of currents.The decay rate of electromagnetic fields depends on the distribution of the resistivity in the sub-surface. Based on this principle, the measured voltage on receiver coil can provide information about geo-electrical structures at different depths.The results of TEM soundings presented in the form of voltagedecay curves and / or apparent resistivity sounding curves were plotted as a function of time on a log–log scale.

The quantitative interpretation of data is accomplished with the help of 1D model consisting of horizontal, infinitely extending homogenous layers each with different resistivity. Inverse modelling is done using IX1D software by choosing the smoothed modelling technique, based on Occam's inversion principle (Constable et al., 1987), to estimate the geo-electrical distribution of resistivities for each sounding along the profile.After each sounding, in profile, is inverted using the IX1D, the one dimensional smooth model for soundings are imported into one profile segment to generate a 2D geo-TEM interpreted layered resistivity model and is compared with lithological information obtained from electrical log and VES results. TEM has the advantagebeing much faster and easier to use in data collection in comparison with the conventional resistivity

sounding. It has a higher resolution for deep structure mapping and is very sensitive to the conductive anomalies which make it an ideal tool for study in saline/coastal areas.

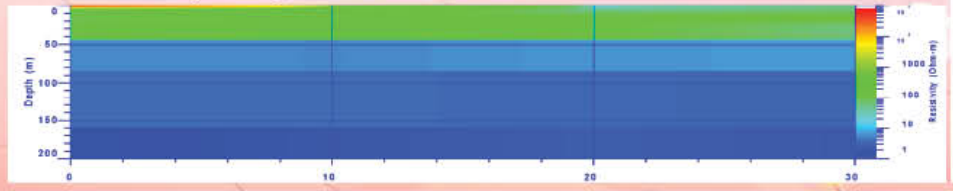
RESULTS & DISCUSSION

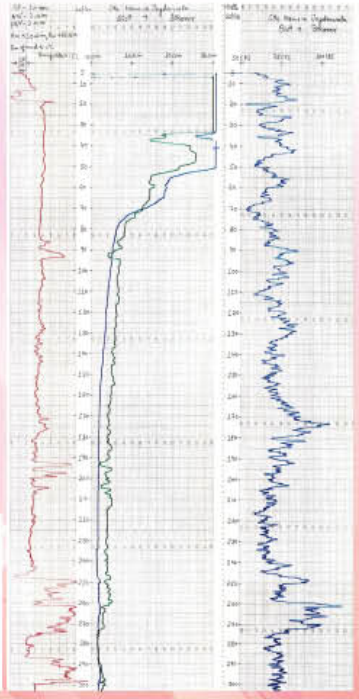
The TEM and VES surveys were conducted near the recently drilled exploratory wells, to compare TEM interpreted results with the sub-surface lithology inferred from electrical log and VES surveys. The comparison of results suggests that the TEM shows good agreement with lithology inferred from VES and electrical logs. Also, the marker boundary of high resistivity with low resistivity is clearly identified.

- The TEM method seems to be successful for an initial geo-electrical mapping.
- The TEM resistivity model for different locations reveals 5 to 9 geo-electrical layers.
- The upper first two layers are of relatively higher resistivity and are extended to about 70 m bgl. The high resistivity corresponds to the unsaturated dry formations as correlated from the electrical log and / or VES interpreted lithology.
- The interpretation of TEM resistivity model reveals that most of the sites yield TEM sounding curve that shows a monotonic decrease in apparent resistivity with time. Such curve behaviour undoubtedly proves the presence of a low-resistivity (saline) layer in the base of the section.
- Based on the produced TEM resistivity model, the vertical and lateral continuation of saline zones (TDS - >5000 ppm) can be observed to be matching with the electrical log.
- The high resistivity zones of 25 to 70 Ohm-m, found below the depth of 100 m bgl, can be attributed to slightly fresh water zones (TDS - 1000 to 8000 ppm).
- The aquifer saturated with brackish waters (transition or mixing zone or saline/freshwater interface) exhibit resistivity between 10 and 25 Ohm-m.
- The aquifers saturated with saline water have resistivity values in the range of 1 to 10 Ohm-m. This information is observed in nearly all of the TEM resistivity models, where the bottom layer is having resistivity value below 10 Ohm-m, which may be attributed to a very conductive formation - saline water zone.
- From the vertical and lateral continuation in TEM resistivity model of Bhiknera, Binjasar, Bhopalaram Ki Dhani, Gigasar, Govindnagar Rora, Guda, Nathusar, Rajasar Bhatiyan, Ranisar,Salasar, Roopnagar and Tharusar, it is observed that slightly fresh water zones exists, showing resistivity values in the range of 11 to 25 Ohm-m.
- The results of study demonstrate the efficiency of TEM data in mapping the fresh/saline water interface and the available supplementary data are also in good agreement with the obtained results.

RECOMMENDATIONS

- The TEM surveys shall be conducted and interpreted in collaborative mode with lithological information integrated from VES, hydrogeological and geophysical logging data sets, for easy understanding of TEM survey response.
- TEM surveys may be conducted with different loop configuration settings to calibrate and standardize the suitability of given type of loop in a particular formation / hydrogeological settings, while achieving the maximum depth of penetration.
- A minimum of 3 runs may be taken at a spot, so that noise can be averaged out.
- Time-lapse TEM measurements may be recommended in the saline / coastal areas to monitor the movement of the fresh/saline water interface over time and evaluate the management strategies implemented to prevent saltwater upconing.





ATAL BHUJAL YOJANA (ATAL JAL)

"Aiming at a Community led Ground water management in India"

Mrs. Neety Nagi,
Atal Bhujal Yojana

Atal Bhujal Yojana is a unique initiative of the Department of Water Resources, River Development & Ganga Rejuvenation, Ministry of Jal Shakti, partly funded by World Bank, towards community-led groundwater management with a focus on demand-side interventions

The major objective of the Scheme is to improve the management of groundwater resources in select water stressed areas in identified states viz. Gujarat, Haryana, Karnataka, Madhya Pradesh, Maharashtra, Rajasthan and Uttar Pradesh. The scheme is being taken up in select areas that include 81 districts, 222 blocks having 8774 water stressed Gram Panchayats (GPs) in seven states .

Atal Bhujal Yojana (ATAL JAL) is a Central Sector Scheme of the Government of India with an outlay of Rs 6000 crores, with a focus on community participation and demand-side interventions for sustainable groundwater 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 behavioural 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.

Atal Jal was conceptualized in the year 2015 (COP 21 Paris) and later launched by Hon'ble Prime Minister on 25 December 2019 on the auspicious birth date of Late PM Sh. Atal Bihari Vajpayee. The scheme came in to effect from 1st April, 2020 and is to be implemented for five years.

Objectives of the scheme

Improve ground water management through:

- Strengthening institutional structure for Ground Water (GW) governance in the States; improved infrastructure for GW monitoring & dissemination of data
- Promoting participation of communities & stakeholders; community -led GP wise Water Security Plans (WSPs);
- Encouraging efficient and planned use of public funds; implementation of interventions through convergence of schemes.
- Encouraging efficient use of water; increase in area under efficient water use practices.
- Facilitating increase in ground water availability & sustainability; increase in GW levels & its sustainability through various interventions envisaged.

Uniqueness of the Scheme

- Panchayat-led community participation for GW management.
- Mix of top-down and bottom- up approaches
- Behavioural change as key for sustainability
- Promotes demand side management
- Promotes convergence of other on-going Central / state Schemes.
- Program for Results (PforR) scheme in which disbursement of funds is dependent on achievement of results.
- Incorporates principles of Challenge Method; better-performing States to have access to more funds on achievement of results / outcomes.

Concerns Addressed

- Aims at improving GW management in priority areas
- Emphasis on long-term sustainability
- Stress on Demand side management
- Community participation considered vital in planning & execution.
- Major thrust on training & capacity building
- Lessons learnt from success stories on Participatory Ground Water Management (PGWM) incorporated in scheme design.

Program Components

The program has two components, (i) Institutional strengthening and capacity building (IS&CB) aimed at strengthening the ground water governance mechanism in the participating states and (ii) Incentive component, aimed at rewarding / incentivizing the states for various for various measures to ensure long term sustainability of ground water resources.

The disbursement of incentive money to the tune of Rs 4600 Crores is linked to performance by state implementing agencies against the five Disbursement linked Indicators (DLI) duly verified by Third party Government Verification Agency (TPGVA) . Weightage has been assigned to different DLIs.

DLI#	DLI Description	DLI Weightage (%)
1	GW Data disclosure/updating by the States	10
2	Preparation & updating of community-led GP level Water Security Plans (WSP)	15
3	Public financing of interventions in WSPs through convergence of ongoing / new schemes	20
4	Adoption of practices for efficient water use	40
5	Improvement in ground water levels / its rate of decline	15

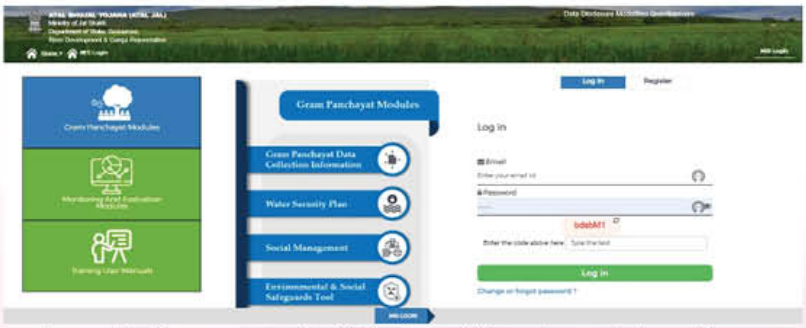
Expected Outcomes

- Improved ground water sustainability in the target areas.
- Enhanced source sustainability for interventions under Jal Jeevan Mission.
- Contribution to the goal of doubling of farmers' income.
- Inculcate behavioral changes to promote judicious water use.

Program Status and Initiatives

Other than the institutional strengthening which includes engagement of domain experts, recruitment, selection of agencies, Atal Jal has gone far in implementation of the ground level activities through the participating states:

- Designed a dedicated portal (ataljal.in) and a robust all-inclusive Management Information System to be used by all officials from the National, State, District, District Implementation Partner (DIP) and GP level. The MIS is not only used for preparing and uploading Water Security Plans, but to provide all relevant information through documents, guidelines, manuals, links etc. There is an interactive map view to get detailed information regarding the water level observation and water quality wells.



- Android platform-based Smartphone / Mobile Application has been developed to capture real time information on various aspects by the field workers. In case of internet connectivity issues, the data can be automatically uploaded later.
- A Grievance Redressal Mechanism system has been inbuilt in the Atal Jal portal for handling the specific grievances of the community or any concerned stakeholder. A dedicated Toll-Free number is operational, apart from the facility of directly lodging the grievance on the portal.
- Orientation programs in all participating States for the State and District level officials including District Implementation Partners have been conducted. . The Interactive Orientation Workshops were conducted physically observing.

- Developed toolkits, manuals, and guidelines for the States on numerous aspects of the program like Agriculture, Social, Gender, IEC, Capacity Building etc for ease of understanding, planning, and implementation of activities.

- Developed digital contents for the Master Trainer Training Programs. QR codes were incorporated to download the specific module on specific subject into the smartphone via online or offline content. Voice over presentations were created for ease of understanding and to conduct similar trainings further. Framework matrix and Airtable were developed to fetch all the relevant contents by the officials of States, districts, DIPs and GPs.
- Conducted online training programs for Master Trainers during June, July, 2021 in two batches for all participating State and district officials. The uniqueness of these program was the Cascading approach methodology, Participatory Digital Attestation smartphone app for attendance, downloading digital contents, tracking the downloaded contents by the participants via GPS location etc.

- Extended handholding support to all the States for the understanding and development of the WSPs, handling MIS and troubleshooting problems related to smartphone apps and personal guidance to individual officers / officials.
- WSPs targets were fixed as per the program implementation plan for all the States. The preparation of the same is being guided on continual basis over phone calls, virtual meetings and even physical meetings at the States to ease the process and get the desired results in time.

- Awareness programs and IEC activities are being conducted at the level of Gram panchayat as part of preparation of Water Security Plan (WSP).

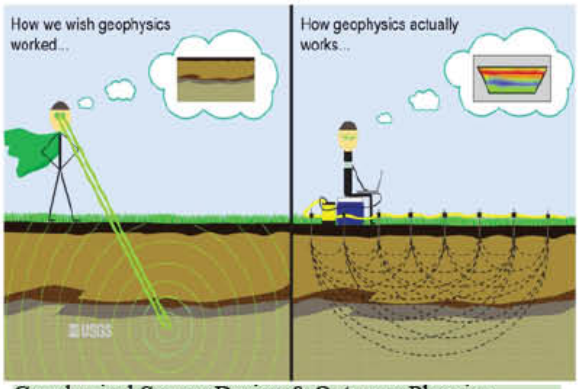
PATHSHALA

Sh. Anirudh Singh,
Central Ground Water board

Geophysical Survey

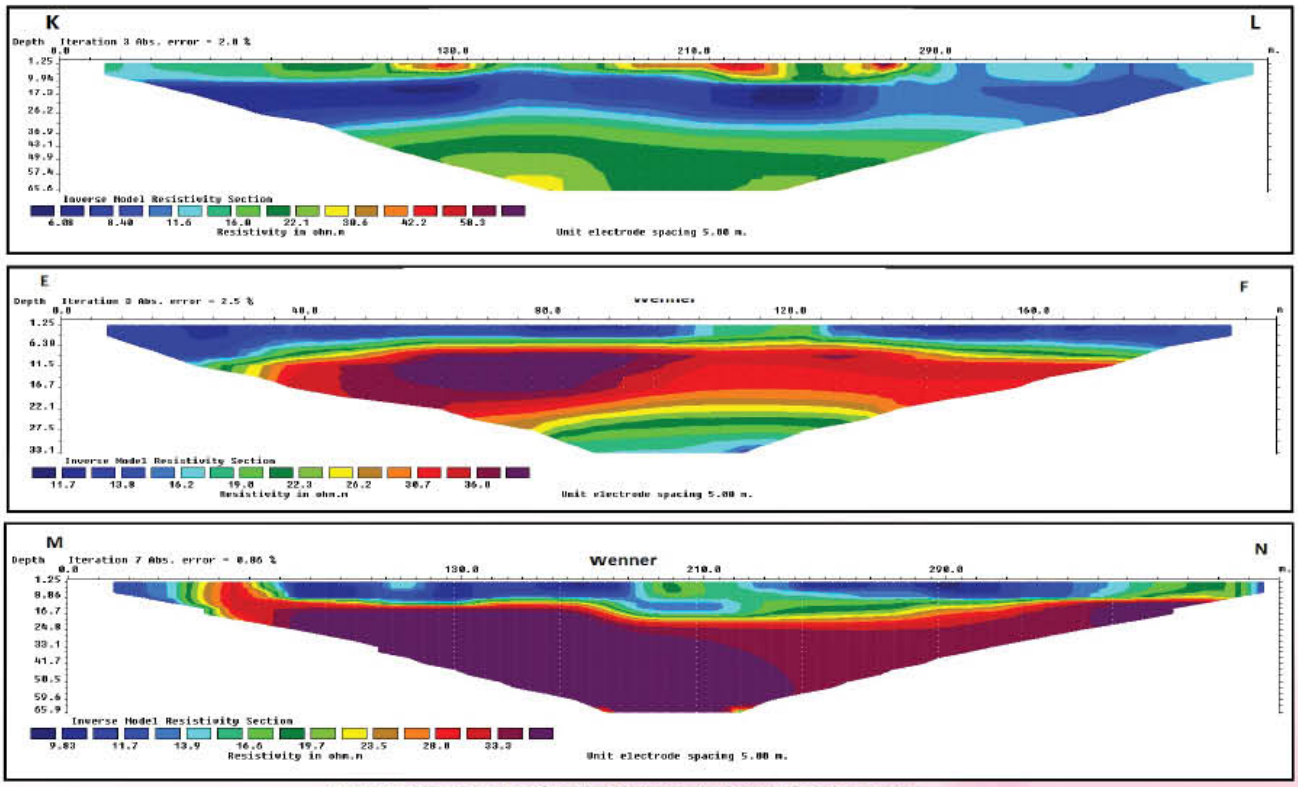
The science of geophysics applies the principles of physics to the study of the Earth. Geophysical investigations of the interior of the Earth involve taking measurements at or near the Earth's surface that are influenced by the internal distribution of physical properties. Analysis of these measurements can reveal how the physical properties of the Earth's interior vary vertically and laterally.

In CGWB Geophysical methods are widely applied for detection and delineation of groundwater potential formations. Electrical Resistivity method employed in various hard rock and alluvium formation of India in search of groundwater as showed in fig.



Geophysical Survey Design & Outcome Planning

CGWB Team Doing GP Survey at Field



Survey outcome showing the demarcated water bearing zone

Survey Basics

To investigate the subsurface resistivity distribution beneath an area of interest.

- In general, an electric current is injected into the ground, and the resulting voltage differences are measured at the surface of the Earth.
- The ground resistivity is related to various geological parameters such as the mineral and fluid content, porosity and degree of water saturation in the rock.
- Electrical resistivity is a measure of how a material resists a steady current.

Advantages

- Lithological / Hydrogeological / Structural information
- Relatively simple and fast method.

SHODH

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

01 Geochemical, metagenomic, and physiological characterization of the multifaceted interaction between microbiome of an arsenic contaminated groundwater and aquifer sediment

Journal of Hazardous Materials. 2021 Jun 15;412:125099

Mohapatra. B., Saha. A., Chowdhury. A.N. , Amlanjyoti Kar, Kazy. S.K., Pinaki Sar

Abstract: Geomicrobiological details of the interactions between groundwater microbiome (GWM) and arsenic (As)-rich aquifer sediment of Bengal basin was investigated through microcosm incubations. Role of key microorganisms and their specific interactions with As-bearing minerals was demarcated under organic carbon- amended and -unamended conditions. Acinetobacter (50.8 %), Brevundimonas (7.9 %), Sideroxydans (3.4 %), Alkanindiges (3.0 %) dominated the GWM. The microbiome catalysed considerable alterations in As-bearing mineral [Fe-(hydr) oxide and aluminosilicate] phases resulting in substantial changes in overall geochemistry and release of As (65 µg/L) and Fe (118 µg/L). Synergistic roles of autotrophic, NH4+-oxidizing Archaea (Thaumarchaeota) and chemoheterotrophic bacteria (Stenotrophomonas, Pseudomonas, Geobacter) of diverse metabolic abilities (NH4+-oxidizing, NO3-, As/Fe-reducing) were noted for observed changes. Organic carbon supported enhanced microbial growth and As mobilization (upto 403.2 µg As/L) from multiple mineral phases (hematite, magnetite, maghemite, biotite, etc.). In presence of high organic carbon, concerted actions of anaerobic, hydrocarbon-utilizing, As-, Fe-reducing Rhizobium, fermentative Escherichia, anaerobic Bacillales, metal-reducing and organic acid-utilizing Pseudomonas and Achromobacter were implicated in altering sediment mineralogy and biogeochemistry. Increase in abundance of arrA, arsC, bssA genes, and dissolution of Fe, Ca, Mg, Mn confirmed that dissimilatory-, cytosolic-As reduction, and mineral weathering fuelled by anaerobic (hydro)carbon metabolism are the predominant mechanisms of As release in aquifers of Bengal basin.

02 Groundwater solute chemistry, hydrogeochemical processes and fluoride contamination in phreatic aquifer of Odisha, India

Geoscience Frontiers Volume 12, Issue 3, May 2021, 101093

Sudarsan Sahu , Utpal Gogoi , N.C.Nayak

Abstract: The work investigates the major solute chemistry of groundwater and fluoride enrichment (F−) in the shallow phreatic aquifer of Odisha. The study also interprets the hydrogeochemical processes of solute acquisition and the genetic behavior of groundwater F− contamination. A total of 1105 groundwater samples collected from across the state from different hydro-geomorphic settings have been analyzed for the major solutes and F− content. Groundwater is alkaline in nature (range of pH: 6.6–8.7; ave.: 7.9) predominated by moderately hard to very hard types. Average cation and anion chemistry stand in the orders of Ca2+ > Na+ > Mg2+ > K+ and HCO3− > Cl− > SO42− > CO32− respectively. The average mineralization is low (319 mg/L). The primary water types are Ca-Mg-HCO3 and Ca-Mg-Cl-HCO3, followed by Na-Cl, Ca-Mg-Cl, and Na-Ca-Mg-HCO3-Cl. Silicate-halite dissolution and reverse ion exchange are the significant processes of solute acquisition.

Both the geogenic as well as the anthropogenic sources contribute to the groundwater fluoride contamination, etc. The ratio of Na+/Ca2+ > 1.0 comprises Na-HCO3 (Cl) water types with F− > 1.0

mg/L (range 1.0–3.5 mg/L) where the F− bears geogenic source. Positive relations exist between F− and pH, Na+, TDS, and HCO3−. It also reflects a perfect Na-TDS correlation (0.85). The ratio of Na+/Ca2+ < 1.0 segregates the sample population (F− range: 1.0–4.0 mg/L) with the F derived from anthropogenic sources. Such water types include Ca-Mg-HCO3 (Cl) varieties which are recently recharged meteoritic water types. The F− levels exhibit poor and negative correlations with the solutes in groundwater. The Na-TDS relation remains poor (0.12). In contrast, the TDS levels show strong correlations with Ca2+ (0.91), Mg2+ (0.80) and even Cl− (0.91). The majority of the monitoring points with the anthropogenic sources of groundwater F− are clustered in the Hirakud Canal Command area in the western parts of the state, indicating the role of irrigation return flow in the F− contamination.

03 Delineating the characteristics of saline water intrusion in the coastal aquifers of Tamil Nadu, India by analysing the Dar-Zarrouk parameters

Contributions to Geophysics and Geodesy, 51(2), 141-163

Singh,S.; Gautam, P.K.;Kumar, Prashant ;Biswas, Arkoprovo; Sarkar, T.

Abstract: Tuticorin, located in the southeastern part of Tamil Nadu, is a coastal aquifer on which Vertical Electrical Sounding (VES) was conducted, thereby analysing the interpreted subsurface resistivity layer parameters covering around 112 km2 area of the study region. VES is an essential tool for investigating hard rock terrains of coastal aquifers and perceive an idea about the groundwater quality. In this study, Dar-Zarrouk (D-Z) parameters like longitudinal conductance (Sc), transverse resistance (Tr) and anisotropy (λ) are analysed as these are well-established parameters in delineating the occurrence and distribution of both fresh and saline water aquifers. These parameters are also very persuasive in investigating complex subsurface parameters (resistivity and conductivity) within saline water intruded coastal region environment. After conducting a thorough survey, the resistivity results reflect that the sediments are enriched with saltwater, clay with moderate freshwater and freshwater-bearing formations. The analysis shows that the D-Z parameters offer a helpful and assured answer in demarcating the saline, moderate fresh, and freshwater aquifers. Therefore, the behaviour and patterns of the D-Z parameters in space established the existence of saline water and freshwater aquifer structures in the coastal aquifers over a vast area.

04 Groundwater quality assessment using water quality index in Ranchi Urban area, Jharkhand (India): in parts of Subarnrekha River Basin

International Journal of Environmental Analytical Chemistry

Goutam K. Roy, Suresh Kumar, Fakhre Alam, Anukaran Kujur, Saumya Anand, Sudhir K. Srivastava

Abstract: A comprehensive assessment of ground water resources is carried out in the Ranchi Urban Area to understand the hydrogeochemical processes along with assessment of drinking water quality by means of water quality index (WQI). The major chemical composition exhibits that, all major ions are present within the prescribed limits of BIS, 2012. WQI applying quality rating scale to assess the suitability of water for drinking purpose exhibits that 40%, 54.28% and 5.71% of groundwater samples fall within excellent, good and poor water quality, respectively. Elevated concentration of WQI in some locations may be owed to upheaved Sodium, Potassium and Chloride concentrations. In the study area, Ca2+-Na+-HCO3−, Ca2+-Na+-Cl− and Na+-Cl− were dominant hydrochemical facies. Results of the detailed analysis will contribute in appropriate chemical characterisation and proper management of the vital groundwater resources in the study area.

05 Identifying fluoride endemic areas and exposure pathways for assessment of non-carcinogenic human health risk associated with groundwater fluoride for Gujarat state, India

Environmental Science and Pollution Res Int. 2021 Sep;28(36):50188-50203. Epub 2021 May 5

Mohanavelu Senthilkumar, Biswarup Mohapatra , Devadasan Gnanasundar , Sourabh Gupta

Abstract: Analytical data of fluoride concentration in groundwater collected from various geological formations in Gujarat, India, have been studied to assess their spatial distribution characteristics and related potential chronic health risks. Decadal analysis of groundwater was attempted for precise quantification and a realistic ground representation of fluoride concentration in the entire state. This exercise involved collection of 6407 samples over a period of 10 years (2009-2018), from 641 representative locations, distributed evenly throughout the state (6407 = 641 locations × 10 years). The analytical results indicate that 19% of the sample locations have fluoride concentration higher than the permissible limit and 42% of the locations have fluoride concentration much below the desirable limit, thereby exposing children to a higher risk of associated dental morbidities. Monte Carlo simulation integrated with sensitivity and uncertainty analysis was applied for an accurate and realistic assessment of the non-carcinogenic health risk. Model results indicated that groundwater fluoride exposure through consumption is way higher than the exposure due

06 Palaeoenvironmental applications of chromium and aluminium: Concerns on partitioning and early diagenetic remobilization

Geological journal 56(5), pp. 2379-2397

Sellapa Gounder, E.,Sundaramurthy, S.,Ramasamy, N.,Palanivel, P.

Abstract: Sequential extraction of core samples collected from Pulicat Lake, east coast of India, showed that on average, 59% of labile Cr and 28% of labile Al remain adsorbed onto Fe–Mn oxides. Similarly, 61% of labile Al and 36% of labile Cr are associated with organic matter. Cross-correlation analysis revealed that in the Fe–Mn oxides phase, Cr primarily exists with Mn-oxides, while Al remains mainly adsorbed onto Fe-oxides. Factor analysis revealed four factors that could explain 82% of the variance in the data. Changes in water column ionic composition, salinity, dissolution of Fe–Mn oxides during microbial oxidation of organic matter, changes occurring to the organic matter and calcium carbonate during early diagenesis are the key factors influencing the Al and Cr concentrations in the labile fractions. The results of this study are useful to interpret palaeoenvironmental conditions.

SOCIAL MEDIA HIGHLIGHTS

Top Tweet earned 12.3K impressions

Wells constructed under 'PMKSY-HKKP-GW' scheme is empowering small and marginal farmers through ground water based irrigation in NE India. 9628 wells constructed bringing 21217 ha under assured irrigation in Assam,Arunachal Pradesh,Tripura,Nagaland,Manipur,Mizoram . **@MoJSDoWRRDGR**
pic.twitter.com/Ybpv2IBiTG

4 41 108

Top Tweet earned 10.2K impressions

Dugwell constructed for irrigation in Ahwa, Dang district, Gujarat under PMKSY-HKKP-GW scheme. In an area facing water shortage for irrigation, small and marginal farmers are getting benefitted from such interventions. **#irrigation #farmers #groundwater #dugwell @MoJSDoWRRDGR**
pic.twitter.com/GNxIYFLWXB

2 20 66

Top Tweet earned 4,158 impressions

High resolution aquifer mapping using State-of-the-art Heli-borne survey in Ganga-Yamuna Doab, U.P. undertaken as a part of a tripartite agreement involving CGWB, NMCG and CSIR-NGRI. **@MoJSDoWRRDGR @cleanganganmcg @CWCOfficial_GoI @csmrsdelhi @NWDA_MOWR**
pic.twitter.com/Ienu8qpvPD

4 20 73

Top media Tweet earned 8,373 impressions

Rooftop rainwater harvesting structure constructed in a school at Madampatti village, Coimbatore district, Tamil Nadu. A low cost yet effective intervention for artificial recharge. **#rainwaterharvesting #waterconservation #CatchTheRain #ArtificialRecharge @MoJSDoWRRDGR**
pic.twitter.com/3nBTLA64ul

3 31 77

Top media Tweet earned 2,930 impressions

Inauguration of Heliborne Survey for GW mapping & management in Arid Region by Hon'ble Minister of Jal Shakti Sh Gajendra Singh Shekhawat & Hon'ble Minister of State, MoES (Independent Charge) Dr Jitendra Singh on 5th October 2021 at Jodhpur **@MoJSDoWRRDGR @moesgoi @csirngri** pic.twitter.com/JrJsVV34bo

15 27

SOCIAL MEDIA HIGHLIGHTS

Top Tweet earned 3,161 impressions

Preliminary Yield Test(PYT) conducted at Dakhinhati EW,in the campus of Urban Water Supply Dept,Dakhinhati,Barpeta District,Assam.
Static Water Level is 3.5 m bgl. After 100 minutes drawdown is 5.6 m.99% recuperation took place after 40 mins from Compressor stopped @MoJSDoWRRDGR
pic.twitter.com/z10SHJa2l5

1 17 42

Central Ground Water Board
1 September

Ground Water Level Monitoring during August 2021 in Maharashtra and Rajasthan
Ministry of Jal Shakti, Department of Water Resources, RD & GR

6,910 People reached | 192 Engagements | Boost post

Radha Pyari, Sulekha Sharma and 43 others | 1 Comment 11 shares

Like | Comment | Share

Top media Tweet earned 10.4K impressions

High Yielding Exploratory Well at Mendipathar Soksan, North Garo district, Meghalaya.
Well drilled upto a depth of 171.80 m bgl.
4 fracture zones have been encountered and
Cumulative discharge is 7.99 lps.
@MoJSDoWRRDGR
pic.twitter.com/4FEnpoAXgU

1 14 53

Central Ground Water Board
26 April

High Yielding Exploratory well drilled down to a depth of 104.00 m bgl at Minigram village, Nurpur Block of Kangra district Himachal Pradesh. It has yielded a discharge of 21 lps . Formation in the area is Lower Shivaliks.
Ministry of Jal Shakti, Department of Water Resources, RD & GR

9,101 People reached | 285 Engagements | Boost post

Ashok Patre, Kundan Singh Rathode and 33 others | 1 Comment 8 shares

Central Ground Water Board
2 August

Monitoring sea-water ingress in vulnerable coastal aquifers of Tamil Nadu and Puducherry under National Hydrology Project. Purpose-built piezometers constructed. Digital water level recorders with water quality sensors will be installed for monitoring of salinity. Ministry of Jal Shakti, Department of Water Resources, RD & GR NHPC Limited

5,713 People reached | 119 Engagements | Boost post

Gyan Prakash Tiwari, Murrugesan Ghilli and 35 others | 6 shares

Central Ground Water Board
16 April

Inspection of Blast well at Lalganj, Rajgarh block Mirzapur district, Uttar Pradesh under PMKSY. Geology of the area is Vindhyan sandstone and Large diameter Dug/ blast wells are constructed to use stored water for Irrigation. Five farmers are beneficiaries of this well.
Ministry of Jal Shakti, Department of Water Resources, RD & GR

5,761 People reached | 222 Engagements | Boost post

Shubham Tripathi, Randhir Singh and 20 others | 1 Comment 7 shares

Like | Comment | Share

Top Tweet earned 3,161 impressions

Preliminary Yield Test(PYT) conducted at Dakhinhati EW,in the campus of Urban Water Supply Dept,Dakhinhati,Barpeta District,Assam.
Static Water Level is 3.5 m bgl. After 100 minutes drawdown is 5.6 m.99% recuperation took place after 40 mins from Compressor stopped @MoJSDoWRRDGR
pic.twitter.com/z10SHJa2l5

1 17 42

Central Ground Water Board
19 April

कमजोरीय राजभाषा समिति ने आज बेंगलुरु में केंद्रीय भूमि जल बोर्ड के साथ त्रिमासिक बैठक की।इस बैठक समिति ने मंत्रालय एवं विभाग के अधिकारियों की उपस्थिति में कार्यालय में हो रहें राजभाषा हिंदी के कार्यों का पुनर्विलोकन किया। Ministry of Jal Shakti, Department of Water Resources, RD & GR Gajendra Singh Shekhawat Rattan Lal Kataria WAPCOS Limited Central Water Commission Namami Gange National Water Development Agency Central Soil and Materials Research Station

4,785 People reached | 102 Engagements | Boost post

Shyam Khandelwal, Ashok Patre and 37 others | 7 shares

COLLECTABLES

1. *CGWB, Kolkata conducted Mass Awareness cum PIP on 'Sustainable GW Management' for South 24 Parganas District, West Bengal to commemorate 75th year of India's Independence*
2. *Hon'ble Minister Sh. Gajendra Singh Shekhawat review the progress of various activities of Central Ground Water Board.*
3. *Meeting of Parliamentary Standing Committee on Water Resources at Dharamshala*
4. *Parliamentary Standing Committee visit to Chandigarh during July 2021*
5. *The findings of NAQUIM study of Cuttack district has been presented and shared with the District Commisioner, Cuttack district*
6. संसदीय राजभाषा सगिति के निरीक्षण बैठक
7. गृह गंत्रालय की सांसदीय राजभाषा सगिति ने केंद्रीय भूगि जल बोर्ड, हैदराबाद के साथ निरीक्षण बैठक की। इस दौरान सगिति ने गंत्रालय एवं विभाग के वरिष्ठ अधिकारियों की उपस्थिति गें हो रहे राजभाषा हिन्दी के कार्यों का अवलोकन किया ।

COLLECTABLES

1. *Sh. M L Angurala, Scientist CGWB, Jammu sharing NAQUIM Report of Jammu Outer Plain Area with Sh. Anshul Garg, DC, District Jammu, UT of J&K.*
2. *Drilling by ODEX (42 m bgl)/DTH (49.25 m bgl) method at EW, Jhangar, Block Naushera, District Rajouri, UT of J&K. The location of the well is adjacent to POK.*
3. *Preliminary Yield Test (PYT) conducted at Exploratory well at Mendipathar Soksan, Resubelpara Block, North Garo Hills district, Meghalaya.*
4. *Wells constructed under 'PMKSY-HKKP-Ground Water' scheme is empowering small and marginal farmers through ground water based assured irrigation in North Eastern India.*
5. *Exploratory Borehole at Mantalai, Block Chaneni, District Udhampur, Jammu & Kashmir. Drilled down to 87 m by 8 inch dia DTH odex method. Further drilling to continue with 6 &1/2 inch dia DTH method.*
6. *Public Interaction Programme organised by CGWB, Western Region, Jaipur at Jagjivanpur, Bharatpur district, Rajasthan*
7. *Geophysical survey in Batalik Sector, near Tiger Hill in Kargil District, for providing sustainable water supply to the Armed Forces in the area.*

COLLECTABLES

1. *Site inspection and ground truth verification of outsourcing EW and OW sites in Darrang and Udalguri district of Assam.*
2. *Soil Infiltration test at Motaua Soraia, Behta, District Sitapur, Uttar Pradesh.*
3. *Pumping test in Kashipur, Udham Singh Nagar District, Uttarakhand. The well with a yield of nearly 2000 litres per minute taps aquifers in the Terai area.*
4. *Demonstration of Soil Infiltration Test at Central Ground Water Board, Western Region, Jaipur.*
5. *Inspection of Blast well at Lalganj, Rajgarh block Mirzapur district, Uttar Pradesh under PMKSY.*
6. *Transient Electromagnetic (TEM) Survey conducted by Geophysicists of CGWB, Lucknow at Hardoi District Uttar Pradesh.*
7. *High Yielding Exploratory well in Lower Shivaliks, drilled down to a depth of 104.00 m bgl at Kangra, Himachal Pradesh.*