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

July to Sept., 2020, Vol.10

Cover Story

Guidelines to regulate & Control Ground Water extraction in India

State Govt. Initiatives

» Govt. of Telangana

Report

» Selenium in Ground Water

Pathshala

» Sub Surface Dyke

Shodh

» Research publications by CGWB

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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. 10 (July to Sept., 2020)

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CONTENTS

Cover Photo: Granite gneiss pebbles encountered during construction of borehole in Boipariguda, Koraput, Odisha indicating presence of potential fracture zone.

MESSAGE

Bhujal Samvad is constantly evolving. In this issue a new section on state initiatives has been introduced in which an article on water management strategies adopted by Government of Telangana has been included. One of the major achievements in Ground Water sector is the recently notified Guidelines to regulate and control ground water extraction in India. Salient features of the Guidelines are outlined in the cover-story. A special report on occurrence of Selenium in ground water in Hoshiarpur and Nawanshahr Districts of Punjab is part of this issue. The report is based on past studies carried out by CGWB. In the 'Pathshala' section a small article on sub-surface dykes is included. Research publications of CGWB officers in reputed International journals are listed with abstracts on the section titled 'Shodh'.

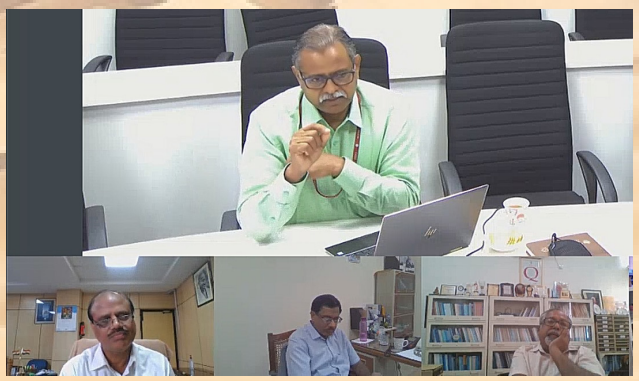
We are thankful to our readers for providing us with excellent suggestions towards improving the magazine. Ideas may be shared with us through our social media pages or through email to our editorial office (mediacell-cgwb@gov.in).

We are eager to hear from you!

G.C.Pati
Chairman CGWB

IN FOCUS

Unravelling Submarine Groundwater Discharge (SGD) zones along the Indian subcontinent and its islands (Mission-SGD)



A study has been taken up by National Centre for Earth Science Studies (NCESS), Ministry of Earth Sciences, Thiruvananthapuram for delineation of SGD zones, estimation of SGD flux and related aspects. The project is primarily based on information on aquifers and water levels generated by CGWB. Chairman, CGWB is the Chairman of the Monitoring Committee of the project. First annual review meeting of the project was held under the Chairmanship of Shri G C Pati, Chairman, CGWB during 17-18 August 2020. ■

Guidelines to Regulate and Control Ground Water Extraction in India

Guidelines to regulate and control ground water extraction in India were notified vide the Gazette Notification dated 24th September 2020. The complete guidelines are available at http://www.mowr.gov.in/gazette-notifications. ■

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

झारखण्ड सरकार

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. ■

15th Board Meeting of CGWB

15th Board Meeting of CGWB was held under the Chairmanship of Sh. G.C.Pati, Chairman, CGWB on 29.09.2020. ■

PMKSY- HKKP GW Irrigation Scheme : Foundation Stone Laying in Manipur

Foundation Stone Laying for construction of 550 numbers Ground water Irrigation schemes under Centrally Sponsored Scheme of PMKSY-HKKP-GW was performed by Sh. N.Biren Singh, Hon'ble Chief Minister of Manipur through Video conferencing on 28th August, 2020 at City Convention Centre, Imphal. Total cost of the project is 61.68 crores. The project envisages creation of 2057 Ha of additional irrigation command from ground water through construction of 550 wells out of which 135 will be fitted with Solar and 415 with electrical pumps. 550 small and marginal farmers in the state will be befitted through this project. ■

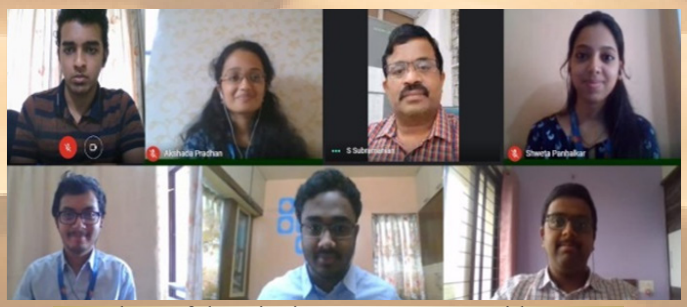
Sh. N. Biren Singh, Hon'ble Chief Minister, Manipur addressing through Video conferencing.

Grand Finale of Smart India Hackathon (SIH-2020)

Smart India Hackathon is an initiative to provide students a platform to solve some of pressing problems we face in our daily lives, and thus inculcate a culture of product innovation and a mindset of problem solving. Fourth edition of the Smart India Hackathon (SIH) 2020, organized by the Ministry of Education, Govt. of India, All India Council for Technical Education and associated agencies is the world's largest 36-hour non-stop digital product building competition focusing on software development. Two problem statements related to ground water identified by CGWB were given to the participants to build software solutions:

i) Assessment of land holding pattern, source of irrigation, cropping pattern and depth of the wells in different parts of the country (DM 83) and ii) Data analytics to provide complete solution for groundwater management for the country (DM 84). After several rounds of assessment, total nine teams, four for DM83 and five for DM84 were shortlisted to participate in the grand finale.

Sh. Sanjay Marwaha, Member (HQ), CGWB, addressing the teams as the chief guest.



Members of the winning team Zero++, with mentor Dr. S. Subramanian

Two scientists of CGWB, Dr. S Subramanian and Dr. M Senthil Kumar participated as mentors and Jury members. Team Zero++ (Team leader: Hrishikesh Mahajan) of Dr. Vishwanath Karad, MIT, World Peace University and Team Belisama (Team leader: Abhyansh Agrahari) of Chandigarh University emerged winners for the problem statements DM 83 and DM 84 respectively. ■

Visit of Hon'ble Member of Parliament, Lok Sabha

Sh. Kripanath Mallah, Hon'ble MP, Lok Sabha from Karimganj and Sh. Bijoy Malakar Hon'ble MLA, Ratabari Constituency visited Exploration site of Central Ground Water Board at Mookamchara village, Dullabcherra, Karimganj district, Assam, on 8th August 2020. ■

हिन्दी पखवाड़ा

भारत सरकार, गृह मंत्रालय, राजभाषा विभाग नई दिल्ली द्वारा जारी दिशानिर्देशों का अनुपालन एवं वर्तमान वैश्विक कोविड –19 महामारी की परिस्थिति को ध्यान में रखते हुए केंद्रीय भूमि जल बोर्ड, मुख्यालय एवं समस्त क्षेत्रीय, प्रभागीय और राज्य एकक कार्यालयों में सितंबर माह के दौरान हिन्दी दिवस / सप्ताह पखवाड़ा का आयोजन किया गया। इस दौरान विभिन्न राज्य सरकारों द्वारा जारी मानक प्रचालन प्रक्रिया (SOP) की पूर्ण अनुपालना करते हुए राजभाषा हिन्दी संबन्धित प्रतियोगिताएं आयोजित की गई । हिन्दी दिवस के शुभ अवसर पर 14 सितंबर को बोर्ड के माननीय अध्यक्ष श्री जी. सी. पति द्वारा संदेश जारी किया गया। इसी क्रम में हिन्दी स्लोगन, हिन्दी निबंध, हिन्दी काव्य पाठ, हिन्दी प्रश्न मंच प्रतियोगिताएं आयोजित की गई। प्रतियोगिताओं एवं उदघाटन और समापन सत्र मे मुख्यालय से अधिकारी वर्चुअल रूप से उपस्थित थे। इन आयोजनों का उद्देश्य कार्यालय में राजभाषा हिन्दी के प्रति सकारात्मक वातावरण का सृजन करना और हिन्दी के प्रयोग को प्रोत्साहित करना है। ■

REPORT

Selenium in Groundwater in Hoshiarpur and Nawanshahr Districts, Punjab

INTRODUCTION

Selenium is of special interest in different environmental fields due to its narrow range between beneficial and toxic effects. Se is an essential trace element with multiple positive functions but both low and excessive dietary intake could cause various health risks or disorders in humans and livestock. High Se concentrations in water can be of concern if transferred to the soil-plant system via irrigation leading to toxic Se concentrations in food as reported in several cases worldwide.

In our Country, pockets of seleniferous areas have been identified in the North Western Parts, especially in the states of Punjab and Haryana. Selenium (Se) is a micronutrient which is often called a "Double-edged sword" due to its ambivalent nature with regard to human and animal health. Selenium is not an essential element for plant growth, but its concentration in fodder crops is important to animal health and also necessary for metabolism in humans. Excessive consumption resulting in toxicity in humans has been reported from parts of Punjab. The common symptoms in human beings are giddiness, lassitude, nervousness, mental depression, hair and nail loss and deformity, garlic odor in breath etc. Animals are affected more than humans as green fodder contains more Selenium as compared to grains. High Se concentrations in water can be of concern if transferred to the soil-plant system via irrigation leading to toxic Se concentrations in food as reported in several cases worldwide.

Selenium in Groundwater

Studies carried out by various organization in the past twenty years, reveal high selenium concentration in tube well, hand pump and soil samples. A survey undertaken in the eighties, lead to identification of selenium toxic areas in Nawanshahar and Hoshiarpur districts in Punjab. Ground water is only source of irrigation in the seleniferous area. The triangle shaped selenium contaminated area amounts to approximately 1000 ha in these districts. The toxic symptoms of Selenium were visible in plants, animals and humans. Groundwater pumped from relatively shallow tubewells (24-36 m depth) contained 2-3 times more Selenium than that pumped from deep tubewells.

CGWB also carried out studies during nineties, in the Selenium affected areas of Punjab and study revealed that Selenium was present above permissible levels (0.01mg/l) in soil and shallow groundwater at a few locations. In general, the selenium level ranged from 0.002 to 0.015 mg/l. But extremely high concentration of Selenium was reported in well water of Barwa village in Nawanshahr district (0.114 mg/l). In continuation to the above, CGWB again undertook an investigation to identify the source of Selenium. For this, micro groundwater sampling from shallow depth and soil samples from varying depths was carried out from the affected area. Water sample analysis and soil profiling revealed that groundwater contains much less concentration of Selenium as compared to soil. Further the maximum concentration of Selenium was encountered up to a depth of 30 cm (Root zone), below that Selenium was not detected in soil, studies of CGWB revealed.

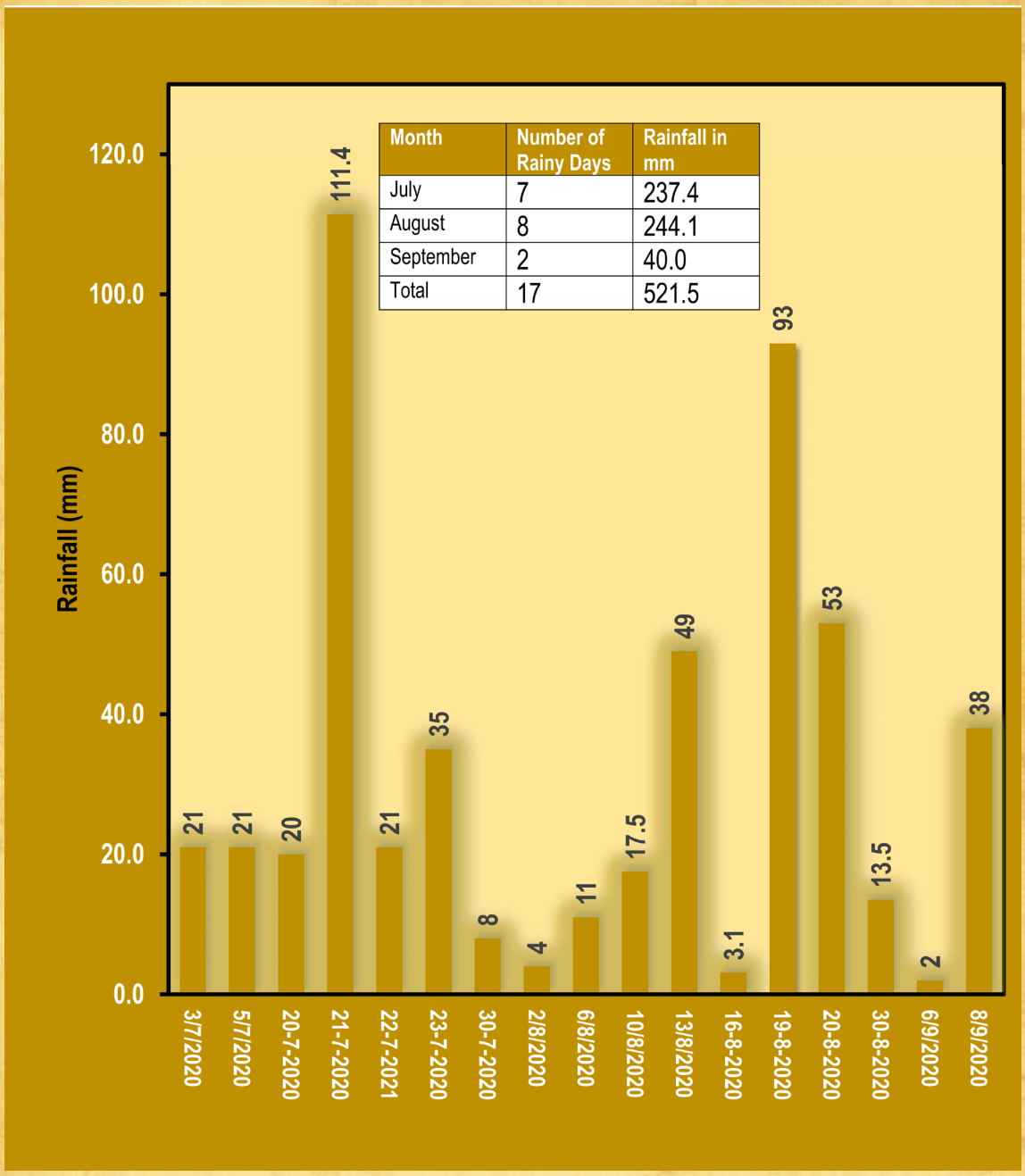
Relatively higher concentration of Se, U, Mo, Cu, Co, V and Au have been identified by Atomic Mineral Directorate for Exploration & Research (AMD) spread over entire Siwalik belt.

Presence of high Selenium in ground water of Hoshiarpur and Nawanshahr district is the result of geogenic contamination since there is no other known source of these ions. The Se-toxic sites are located at dead ends of seasonal rivulets originating from upper Shiwalik ranges. It is most likely that Se rich sediments lying in Shiwalik ranges have been transported down along with flood water over a period of time and repeatedly being deposited in low lying areas. Agriculture, especially the form of land use, strongly influences all processes and is thus, a major factor in the local Se cycling.

by ***Balinder P. Singh, Scientist, CGWB.***

Rainfall Measurement in Bhujal Bhawan

Month	Number of Rainy Days	Rainfall in mm
July	7	237.4
August	8	244.1
September	2	40.0
Total	17	521.5



Daily rainfall at Bhujal Bhawan, Faridabad is recorded using Non recording type Rain Gauge. During the period of July 2020 to September 2020, 521.5 mm of rainfall has been recorded at Bhujal Bhawan. Rainfall Records for the period July to September are summarized above.

Sh. P Sudhakar, Scientist CGWB, Faridabad

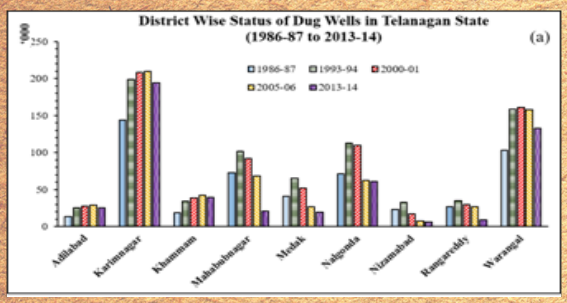
STATE GOVT INITIATIVES

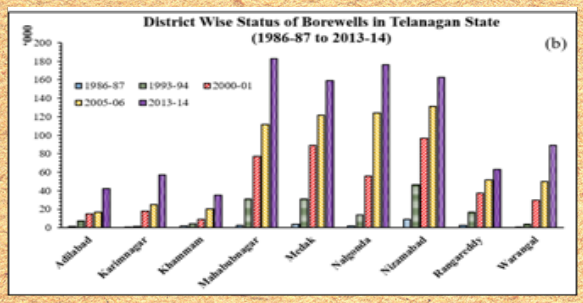
Ground Water Management Initiatives by Government of Telangana

Dr. Pandith Madhnure
Director,
Groundwater Department,
Government of Telangana,
Hyderabad

Introduction

In Telangana state, Groundwater based irrigation is in existence for a long time and it was an assured source of irrigation during monsoon failure years also. Development of drilling technologies in hard rock areas in early 1980's, brought more area under groundwater irrigation, overtaking tank and canal irrigations. Most of well irrigation in the State is in the hands of individual farmers who have invested their capital in digging of dug wells, dug-cum-bore wells or construction of bore/tube wells, fitting of pump sets and laying pipelines to their fields.The only concession given to them is free power since 2004 by former Govt. twice a day.The current Govt. is providing free quality power to agriculture pump sets for entire 24 hours. Presently there are ~24.2 lakh power connections to pump sets in the State, extracting ~8084 million cubic meter (mcm) of groundwater for irrigation; drinking and industrial use.





The Management Strategies

The major technological solution adopted by the State Government is re-engineering of Pranahita Chevella Sujala Shravanthi Projects (PCSSP) into Dr. B.R. Ambedkar Pranahita Project & Kaleshwaram Lift Irrigation Project (KLIP). Dr. B.R. Ambedkar Pranahita Project is constructed across river Pranahita at Tummidi Hetti (Asifabad district) for diversion of 20 thousand million cubic feet (TMC) of water to irrigate ~2 lakh acres in Asifabad and Mancherial districts. The KLIP, one of the biggest lift irrigation projects in the World is constructed on the river Godavari at Medigadda at 90 meter above mean sea level (m amsl) and to lift ~180 TMC water in stages to > 600 m amsl height in to the mainland canals to irrigate additional 18.25 lakh acres area in 13 districts. The releasing of water into mainland canals during 2019 "Yasangi" (rabi) season has shown positive impact on water levels as shallow water level area (< 10 m bgl) which, occupied 27 % of total command area during post-monsoon season (November) of last decade (2009-18) increased to 51 % during the same season of 2019. The other major schemes taken up are the Sita Rama Project, the Palamuru-Rangareddy Lift Irrigation Scheme, the Bhakta Ramdasu Project and the Dindi lift Irrigation Project.

The other measures include Mission Kakatiya, to fill up the gap ayacut of ~10 lakh acres, by restoration of existing ~46530 MI tanks in phased manner.By end of March 2018 , ~27700 tanks are taken up which, has created a perceptible impact on agriculture and their livelihood, benefitting small and marginal farmers (NABCONS). To ensure safe and sustainable piped drinking water supply from surface water sources Mission Bhagiratha Project is taken up with a cost of ~42853 crores to provide @ 100/135 and 150 litres/capita/day (lpcd) of water in rural, urban and municipal areas & for industrial supply by bringing ~86 TMC of surface water. To rejuvenate the degraded forest cover from 24 % to 33 % and for soil and moisture conservation on watershed approach, Haritha Haram Project was started in July 2015 and ~81.6 crores seedlings are planted. To bring on fast track of Accelerated Irrigation Benefit Program (AIBP) under Long Term Irrigation Funds (LTIF), Govt. under PMKSY

STATE GOVT INITIATIVES

sanctioned an amount of Rs.3413 crores and released Rs.297 crores to complete existing projects at early date.

As recharge measures, the Govt. has constructed >19000 various artificial recharge structures (ARS) in the state and recently sanctioned construction of an additional of 1200 new check dams (CD) on the 4th and above order streams with NABARD funding. To recharge the de-saturated aquifers in over-exploited villages, the Ground Water Department has taken up construction of recharge shafts in existing water bodies (202 nos) and already completed 138 structures including the Chief Minister adopted 2 villages in Medchal-Malkajgiri districts.

The demand side measures like Andhra Pradesh Farmer Managed Groundwater System (APFAMGS) with FAO funding and Andhra Pradesh and Telangana State Community Based Tank Management Programme (AP & TS CBTMP with World Bank funding was adopted in erstwhile Andhra Pradesh state (including erst while Nalgonda and Medak districts from present Telangana state) (World Bank, 2019). Review of results from APFAMGS implemented areas shows improved awareness and behavioural changes, which helped the communities to adapt to droughts. World Bank funded restructuring and modernization of canals of NSLC area, User centred Aquifer level groundwater management pilot study in Nalgonda district and conjunctive use of surface and groundwater in NSLC from Khammam district under water sector improvement project (WSIP) were taken up. The aquifer level groundwater management plan from Nalgonda district was taken up to develop institutional model and community-based water management plan for which the SGWD, Govt. of Telangana received Rs 1 lakh cash prize (3rd position) from 1st National Water Mission, MOWR, Govt. of India during 2019. The other measures include water conservation measures under MGNREG, on and off method of releasing of canal water in NSLC command area and by adopting water saving technological solutions. The State has brought ~7.42 lakh ha area under micro irrigation from ~95000 ha benefitting ~7.46 lakh farmers during 2016 under Micro Irrigation Project (MIP). The other water saving measures includes changing cropping pattern to low water consuming crops like oil seeds, palm oil cultivation, ground nut, pulses etc., enhancing support price for dry crops, implementation of Jalam-Jeevam a rainwater harvesting programme in GHMC area etc. To bring awareness among the farmers/students and users for conserving water, awareness is created under Jal Shakti Abhiyan and under National Hydrology Project (NHP) in 139 over-exploited and critical mandals. The department is creating information, education and communication (IEC) activities in over-exploited villages as part of regular activities in all districts from the year 2018-19 and so far, 35 such programmes are conducted benefitting ~3500 participants by the end of March 2020. As regulatory measures, the state is implementing TSWALTA-Act where powers are given to notify the over-exploited villages for control and regulation of groundwater development, registration of rigs etc.



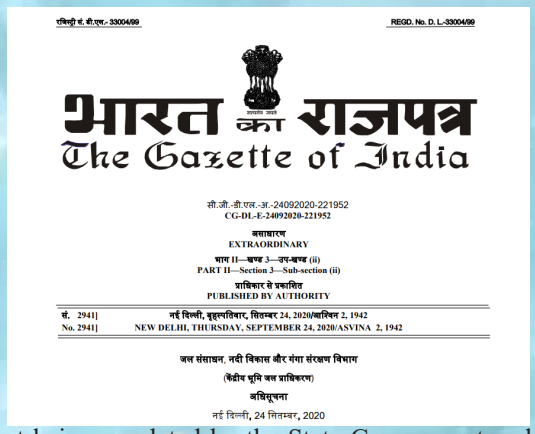
Hon'ble Minister for Irrigation, Govt. of Telangana, Sh.T.Harishrao Guru and Hon'ble Chairman, WRDC, Telangana, Sh.Prakash Guru and Director, Ground Water Dept., Telangana State, Dr. Pandith Madhnure inspecting the new sites in Siddipet and Nagarkurnoot district (implemented after succesful implementation of Chandur Model).

Guidelines to regulate and control ground water extraction in India

Background

Central Ground Water Board as Authority was constituted on 14thJanuary, 1997 to exercise powers under sub section (3) of section 3 of the Environment(Protection) act, 1986 (29 of 1986) for the purposes of regulation and control of Ground Water Management and Development and to exercise certain powers and perform certain functions as per the said Act.

The Authority has been regulating ground water development and management by way of issuing 'No Objection Certificates' for ground water extraction to industries or infrastructure projects or Mining Projects etc., and framed guidelines in this connection from time to time applicable in twenty two States and two Union territories, where ground water development is not being regulated by the State Government and Union territory administration concerned.To have sustainable management of water resources in the country,Groundwater abstraction guidelines have been prepared to regulate groundwater extraction and conserve the scarce groundwater resources in the country, having pan India applicability.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भारत का राजपत्र
The Gazette of India

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असाधारण
EXTRAORDINARY
भाग II—खण्ड 3—उप-खण्ड (ii)
PART II—Section 3—Sub-section (ii)
प्राधिकार से प्रकाशित
PUBLISHED BY AUTHORITY

सं. 2941] नई दिल्ली, बृहस्पतिवार, सितम्बर 24, 2020/आश्विन 2, 1942
No. 2941] NEW DELHI, THURSDAY, SEPTEMBER 24, 2020/ASVINA 2, 1942

जल संसाधन, नदी विकास और गंगा संरक्षण विभाग
(केंद्रीय भूमि जल प्राधिकरण)
अधिसूचना
नई दिल्ली, 24 सितम्बर, 2020

Ground water abstraction in States/ UTs (which are not regulating ground water abstraction) shall continue to be regulated by Central Ground Water Authority. Further, wherever States/ UTs have come out with their own groundwater abstraction guidelines, which are inconsistent with the CGWA guidelines, the provisions of CGWA guidelines will prevail. In case the guidelines followed by such States/ UTs contain some more stringent provisions than CGWA guidelines, such provisions may also be given effect to by the States/ UTs Authorities in addition to those contained in the CGWA guidelines.

Guidelines to regulate and control ground water extraction in India were notified vide the Gazette Notification dated 24th Sept 2020.

The complete guidelines are available at ***http://www.mowr.gov.in/gazette-notifications***. Salient provisions in the guidelines are outlined here. This compilation is only indicative, project proponents are requested to refer the complete guidelines.

Salient Features of the Guidelines

- Individual domestic consumers, Rural drinking water supply schemes, Armed Forces Establishments, Central Armed Police Forces establishments, Agricultural activities, Micro and Small Enterprises drawing ground water less than 10 cum/day are **exempted** from seeking No Objection Certificate (NOC).
- All **drilling rigs** are to be registered.
- NOC for Withdrawal for Domestic use for **Residential apartments/ Group Housing Societies** shall be granted only in such cases where the local Government water supply agency is unable to supply requisite amount of water in the area.
- **Agriculture sector** shall be exempted from obtaining No Objection Certificate for ground water extraction. A participatory approach for sustainable ground water management would be more productive.
- In Over-exploited assessment units, No Objection Certificate shall not be granted for ground water abstraction to any new industry except those falling in the category of

Micro, Small and Medium Enterprises (MSME). However, NOC for drinking/ domestic use for work force, green belt use by these new industries shall be permitted subject to the conditions laid down in the guidelines.

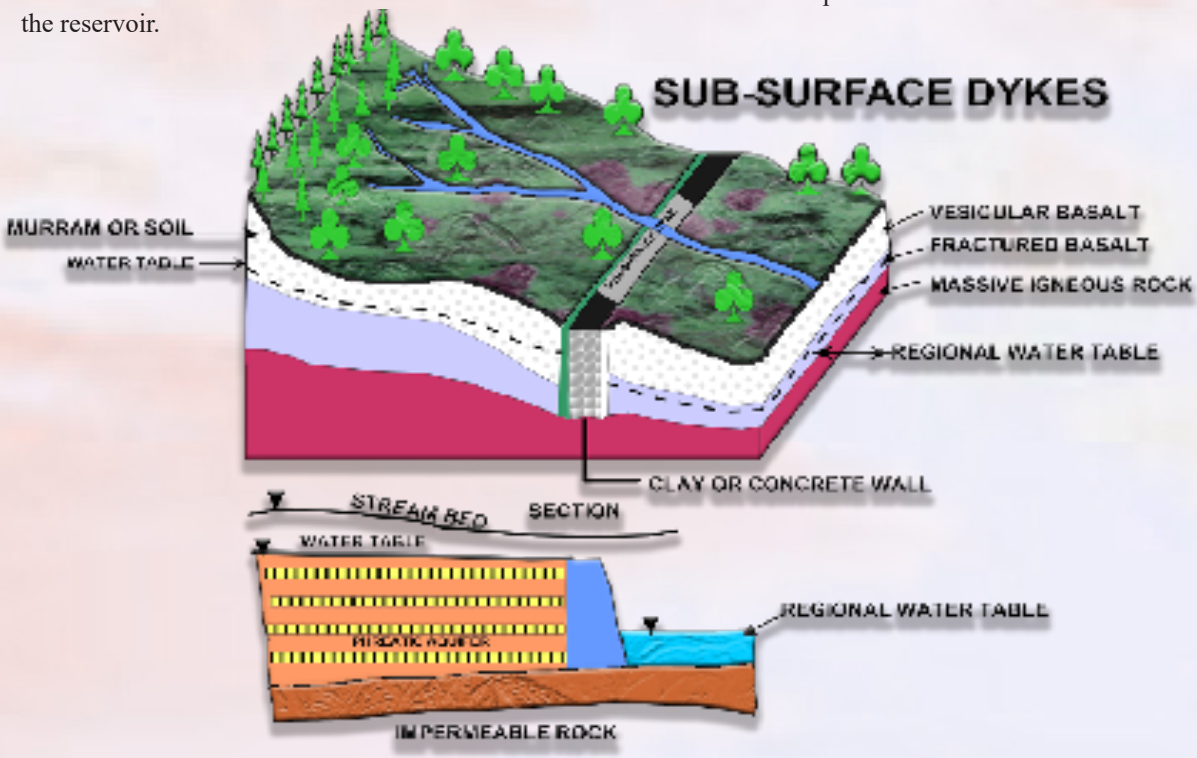
- All existing as well as new **mining projects** will be required to obtain NOC subject to conditions specified in the guidelines.
- Since **infrastructure projects** are location specific, grant of NOC to such projects located in over-exploited assessment units shall not be banned. Conditions like installation of STPs have been specified.
- NOC shall not be granted for extraction of groundwater for **Water Parks, Theme Parks and Amusement Parks** in over-exploited assessment units.
- All industries/mining/ infrastructure projects drawing ground water in safe, semi-critical and critical assessment units will have to pay **ground water abstraction charges** based on quantum of ground water extraction and category of assessment unit as per details given in this guideline.
- All existing mining/ infrastructure projects and existing industries including MSME drawing ground water in over-exploited assessment units will have to pay **ground water restoration charges** based on quantum of ground water extraction.
- The revenue generated from the proposed water abstraction/ restoration charges shall be kept in a separate fund for implementation of **site specific suitable demand/ supply side interventions**.
- All **private tankers** abstracting ground water and use it for supply as bulk water suppliers will now mandatorily seek NOC for ground water abstraction.
- Abstraction of **saline ground** water would be encouraged. Such industries shall be exempted from paying ground water abstraction charges.
- Projects falling within 500 m. from the periphery of demarcated **wetland areas** shall mandatorily submit a detailed proposal indicating that any ground water abstraction by the project proponent does not affect the protected wetland areas.
- Installation of **piezometers**, installation of **digital water flow meters** having telemetry system in the abstraction structure(s) shall be mandatory for all users seeking NOC.
- Wherever feasible, requirement of water for greenbelt (horticulture) shall be met from **recycled / treated waste water**.
- NOCs shall be **renewed periodically**, subject to the compliance of the conditions mentioned therein.
- Extraction of ground water for commercial use by industries, infrastructure units and mining projects without a valid NOC shall be considered illegal and such entities shall be liable to pay **Environmental Compensation** for the quantum of ground water so extracted.

For further details, please visit http://cgwa-noc.gov.in

PATHSHALA

Sub Surface Dyke

Sub Surface dyke is a subsurface barrier across streams which retards the base flow and store water upstream below ground surface. The water level in upstream part rises, saturating the otherwise dry part of the aquifer.A subsurface dyke is suitable as a groundwater conservation structure at sites characterized by a broad valley with a narrow mouth which reduces the cost of the structure and makes it possible to have a comparatively large storage volume. It is suitable at locations where hard rock is encountered within a depth of 8 – 10 m below ground level. Clay can be used as dyke material and in its absence, brick wall can also be cost effective. A Sub-surface dyke has no recurring expenditure of maintenance and also does not result in wastage of agricultural land. A trench of 1-2 m wide is dug across the breadth of stream down to impermeable bed. The trench may be filled with clay or brick/concrete wall upto 0.5mbelow the ground level. Since the water is stored within the aquifer, submergence of land can be avoided and land above the reservoir can be utilized even after the construction of the dam with no evaporation loss and no siltation in the reservoir.



CGWB had constructed Subsurface Dyke at Ananganadi, Kerala way back in 1979. During late 80s, detailed investigation project was carried out for Sub surface dyke under SIDA assisted Coastal Kerala GW Project. Also, Sub-surface dykes constructed on an experimental basis by CGWB in hard rock areas of Tamil Nadu (in four locations namely Kunavelampatty, Madam, EllapudaYampatty and NallanpilLai Petral in pilot basis) have prove to be effective in conserving ground water. These structures have been constructed across small watersheds in the Precambrian Crystalline rocks, comprising gneisses and granites. They essentially comprise brick masonry structures constructed on massive crystalline rocks, which are exposed in trenches cut across the valleys. The annular space between the structure and the walls of the trench has been filled by impermeable clay. The heights of the brick walls have been kept 1.0 to 1.5 m. below the streambed to allow free flow of surface water. They are found to be cost-effective alternatives for providing sustainable drinking/irrigation water supplies to small communities in areas where construction of other artificial recharge structures cannot be attempted due to adverse geomorphologic conditions or constraints of space. These structures are found to bring up the water levels in the upstream side by arresting the sub-surface flow of ground water, without any adverse impacts on river/stream ecology. In addition to storing water in the weathered residuum, sub-surface dykes are also effective in recharging the deeper aquifers through interconnected fractures.

SHODH

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

01 Assessing groundwater quality and health risks of fluoride pollution in the ShaslerVagu (SV) watershed of Nalgonda, India

Human and Ecological Risk Assessment. Volume 26, Issue 6, 2 July 2020, Pages 1569-1588

Adimalla N., Marsetty S.K., Xu P.

Abstract: The principal objectives of this study were to evaluate groundwater quality and human health risks of fluoride contamination in ShaslerVagu (SV) watershed of Nalgonda district, India. For this purpose, 107 groundwater samples were collected and analyzed various physcio-chemical parameters including fluoride, and Gibbs diagrams, Hill–Piper trilinear diagram, and groundwater quality index (GWQI) were applied to understand the groundwater chemistry and its suitability for drinking purpose. In addition to this, non-carcinogenic health risks of high fluoride intake were also evaluated using the US Environmental Protection Agency model for adults and children in the study region. Groundwater chemistry is mainly controlled by HCO3−-Ca2+-Mg2+ and Na+-HCO3− type, and rock weathering. Assessment of GWQI indicates that 76% of groundwater sources in the study region have poor quality for drinking uses. Results reveal that fluoride concentration ranged from 1.4 to 5.9 mg/L in the groundwater samples, which was significantly higher than the recommended limit of 1.5 mg/L for drinking uses. Results of hazard quotient (HQ) estimates are in the ranges of 0.90–3.78 and 1.21–5.11 in adults and children populations of the study region, respectively. About 98% of adults and 100% of children population of SV watershed are at very high risks of chronic toxicity by excess fluoride intake.

02 Impact of land use change dynamics on sustainability of groundwater resources using earth observation data

Environment, Development and Sustainability, Volume 22, Issue 6, 1 August 2020, Pages 5185-5198

Verma, P.,Singh, P.,Srivastava, S.K.

Abstract: The aim of the present work was to determine the effects of long-term changes in land use/land cover (LULC) on surface and groundwater resources of quaternary aquifers in the Lucknow area of the Ganga plain, based on the analysis of multi-temporal satellite and field survey data. Changes in LULC for the period of 2008 and 2016 were mapped using Landsat-7 and Landsat-8 satellite data by applying hybrid image classification techniques. Hydro-geomorphic feature mapping for 2008 and 2016 was also carried out to monitor changes in important surface and subsurface hydro-geomorphic features of the area such as paleochannels, cut-off meanders, oxbow lakes, meander scars, flood plains and younger alluvial plain, and observation found that a decreasing trend in most features. Groundwater level data of selected wells for 2008 and 2016 were used to analyze the trend in groundwater level depletion and its relation with land use change and hydro-geomorphic features. In general, the observations from the present study clearly indicate that large-scale changes in groundwater reservoirs has been taken place due to changes in LULC, hydro-geomorphic features and extensive groundwater exploration practices over the past decade. The results show 4.09% increase in built-up land, 5.49% increase in open area, 8.80% decrease in vegetation cover, 2.31% decrease in agricultural land and 0.35% decrease in surface water bodies. The results observed through monitoring of LULC change, along with water level dynamics of the area, provide scientific data base for the protection, governance and decision-making for water resources management.

03 Improved rainfall threshold for landslides in data sparse and diverse geomorphic milieu: a cluster analysis based approach

Natural Hazards, Volume 103, Issue 1, 1 August 2020, Pages 639-657

Sajin kumar, K.S., Rinu, S., Oommen, T., Vishnu, C.L., Praveen, K.R., Rani, V.R., Muraleedharan, C.

Abstract: Rainfall-triggered landslides are the most common type of mass movement seen along the tropical belt due to the prevalence of monsoons. These landslides can be forecasted by understanding the spatial and temporal rainfall distribution patterns, and subsequent generation of rainfall threshold (RT). However, deriving a regional RT in a geologically, geographically and physiographically diverse milieu is a formidable task. The data on spatial and intra-seasonal variability of monsoons can be widely dispersed in such diversified terrains. Clustering analysis provides a promising approach to handle such widely dispersed data. This study intends to develop a methodology using 2-stage clustering process to create RT in such terrains by using daily rainfall versus antecedent rainfall and rainfall versus antecedent rainfall versus soil depth. Sixteen rainfall-induced landslides, located in different terrains in the Western Ghats of India, were subjected to this analysis. Majority of the landslides were modeled, and different RTs were derived for different conditions. The landslides belong to four different classes, viz., landslides occurring at steep slopes; those occurring at knickpoints of highland and midland; in the plateau region and others characterized by a thin veneer of soil. Out of 16 landslides subjected to RT, this method was able to model 13 landslides with a success rate of 81.25%, which is a fair figure.

04 Effectiveness of groundwater heavy metal pollution indices studies by deep-learning

Journal of Contaminant Hydrology, Volume 235, Article number 103718 (published online)

Singha, S.,Pasupuleti, S.,Singha, S.S.,Kumar, S.

Abstract: Globally, groundwater heavy metal (HM) pollution is a serious concern, threatening drinking water safety as well as human and animal health. Therefore, evaluation of groundwater HM pollution is essential to prevent accompanying hazardous ecological impacts. In this aspect, the effectiveness of various groundwater HM pollution evaluation approaches should be examined for their level of trustworthiness. In this study, 226 groundwater samples from Arang of Chhattisgarh state, India, were collected and analyzed. Measured concentration for various HMs were further used to calculate six groundwater pollution indices, such as the HM pollution index (HPI), HM evaluation index (HEI), contamination index (CI), entropy-weight based HM contamination index (EHCI), Heavy metal index (HMI), and principal component analysis–based metal index (PMI). Groundwater in the study area was mainly contaminated by elevated Cd, Fe, and Pb concentrations due to natural and anthropogenic pollution. Moreover, this study explored the performance of deep learning (DL)-based predictive models via comparative study. Two hidden layers with 26 and 19 neurons in the first and second hidden layers, respectively, were optimised along with rectified linear unit activation function. A mini-batch gradient descent was also applied to ensure smooth convergence of the training dataset into the model. Results demonstrated that the DL-PMI scored lowest errors, 0.022 for mean square error (MSE), 0.140 for mean absolute error (MAE), and 0.148 for root mean square error (RMSE), in the model validation than the other DL-based groundwater HM

pollution model. Prediction performances of all pollution indices were also verified using artificial neural network (ANN)-based models, which also highlighted the lowest validation error for ANN-PMI (MSE = 3.93, MAE = 1.38, and RMSE = 1.98). Furthermore, the prediction accuracies of PMI using both ANN and DL models scored the highest R2 value of 0.95 and 0.99, respectively. Therefore it is suggested that groundwater HM pollution using PMI as the best indexing approach in the present study area. Moreover, compared to benchmark, ANN, the DL performed better; hence, it could be concluded that the proposed DL model may be suitable approach in the field of computational chemistry by handling overfitting problems.

05 A prolific aquifer system is in peril in arid Kachchh region of India

Groundwater for Sustainable Development, Volume 11, Article number 100394(published online)

Saha, D.,Gor, N.

Abstract: The Bhuj Sandstone, a lithostratigraphic unit of Late Mesozoic - Early Cretaceous age, forms a prolific aquifer system in the Kachchh region of Gujarat State, known for acute water shortage and groundwater dependence. The region forms a part of the great arid zone of western India, marked with low rainfall (annual average 376 mm), which is erratic in space and time. The present research, for the first time, has dealt on the groundwater regime and aquifer configuration of the Bhuj Sandstone, also referred as Bhuj Aquifer. A detailed inventory of water levels in post monsoon 2018 and its comparison with 2014 reveals an average fall of 20.62 m during the period. The area is experiencing intensive groundwater mining. Between 2014 and 2018, the net volume of groundwater mined annually is 955 mcm. Considering 104 mcm as annual recharge in 2018, the total groundwater extraction comes out as 1059 mcm, which is more than 10 times of the annual recharge. To tackle such a dismal scenario a host of interventions are urgently needed, which are mentioned in the paper.

06 Evaluation of heavy metals contamination with calculating the pollution index for Ganga River system

Taiwan Water Conservancy, Volume 68, Issue 3, 1 September 2020, Pages 52-65

Matta, G.,Nayak, A.,Kumar, A.,Kumar, P.,Kumar, A.,Tiwari, A.K.,Naik, P.K.

Abstract: The aim of the study was to evaluate the water contamination in terms of heavy metals by applying heavy metal pollution index (HPI). Surface water samples were collected from 20 sampling locations throughout the Ganga River during winter pre-monsoon, monsoon and post-monsoon seasons. The concentrations of Al, Cd, Mg, Co, Cu, Fe, Mn, Pb, Ni and Zn were determined using atomic absorption spectroscopy. The results demonstrated that the heavy metals concentrations showed significant seasonality and most variables exhibited higher levels in the summer season. The HPI value for winter, summer, monsoon and post-monsoon season were found 73.23, 79.18, 66.40 and 67.01 respectively. The HPI of the river surface water computed for the sampling sites indicate great variations ranging from 41.74 to 97.77. This study explains the important of applying the pollution index along with chemometric analysis, that gather information on water quality in integrated approach could better facilitate the water resource management.

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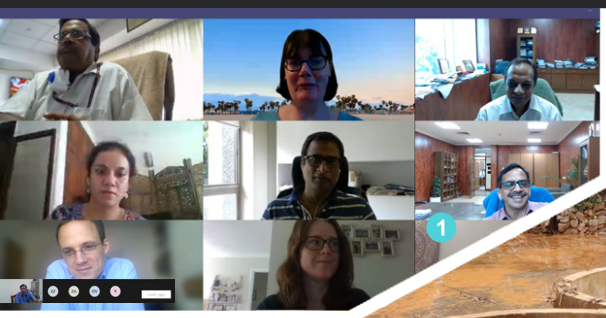

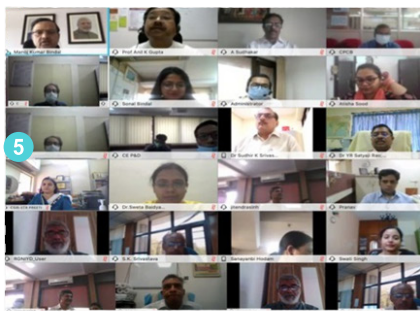

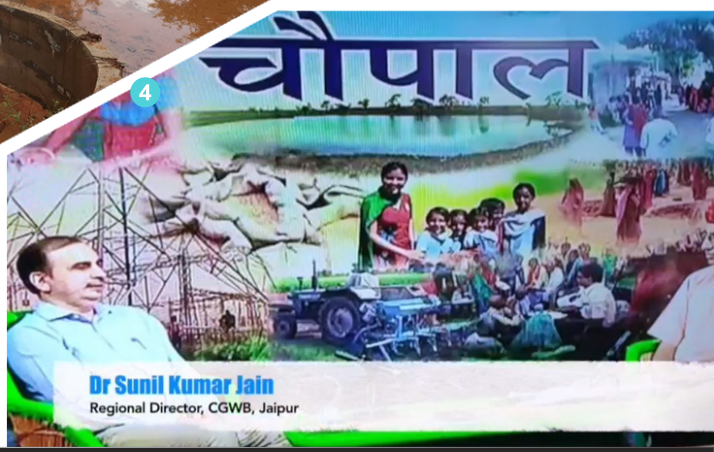

1. *Sh. Sanjay Marwaha, Member (HQ), CGWB attended 5th Indo-UK steering Group Meeting on 18.09.2020.*
2. *CGWB Officers and Team of Implementing Agency visited PMKSY - HKKP ground water sites in Nagaon District, Assam.*
3. *High yielding Well drilled under Ground Water Exploration at Kollegal Taluk, Chamarajnagar district, Karnataka .*
4. *Dr. S.K. Jain, Regional Director, CGWB in Chopal Programme aired on DD Rajasthan.*
5. *Dr. S.K. Srivastava, Sc. D, CGWB deliberated in Workshop organised by National Institute of Disaster Management, CPCB -Project.*
6. *Check Dam constructed at Motunuthalapalli, Pulivendula, YSR Kadapa, AP under Aquifer Rejuvenation Project in Aspirational Districts.*
7. *Sh. V.Kunhambu, Regional Director, Bangalore inspected water conservation structures (Multi Arch Check Dams) constructed in the water Stressed Block in Karnataka.*

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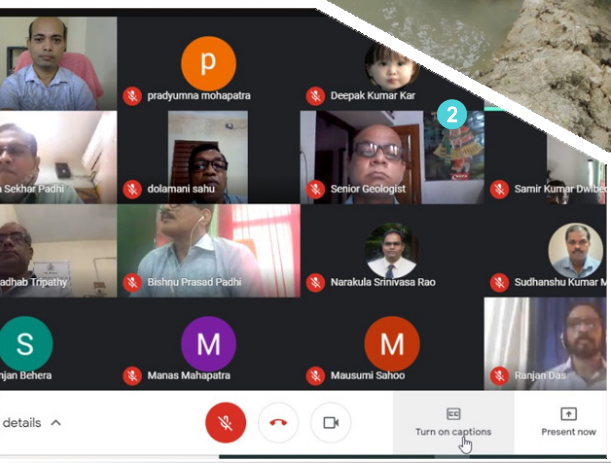

1. *Ground Water Exploration at Badheri, Samba District, Jammu & Kashmir. Well drilled upto a depth of 107 m.*
2. *Tier-II training on Local Ground Water Management Issues organized by CGWB, SER, Bhubaneswar.*
3. *Installation of Solar Panel in Nagaon district, Assam under PMKSY - HKKP - GW Scheme.*
4. *Preliminary Yield Test (PYT) conducted at Vaddagere OW site, Gundlupet Taluk, Chamarajanagar district, Karnataka with the volumetric discharge of 7.10 lps. Gundlupet is one of the most highly drought prone Taluk in the state.*
5. *Preliminary Yield Test (PYT) conducted at Sarachi, South 24 Paraganas in the Sunderban Delta.*