भूजल संवाद

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

The Quarterly Magazine of Central Ground Water Board (CGWB)
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Central Ground Water Board
Dept. of Water Resources,
River Development and
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Cover Photo: Nadi-Utsav Celebrating Rivers of India.

MESSAGE

It gives me immense pleasure to introduce this new volume of Bhujal Samvad, a special issue on 'Nadi Utsav - Celebrating Rivers of India' as a part of ongoing 'Azadi ka Amrut Mahotsav', a pan India celebration. I am pleased to state that Heliborne Survey for Ground Water mapping and management in Arid Region was inaugurated by Honourable Ministers Sh Gajendra Singh Shekhawat ji & Dr. Jitendra Singh ji at Jodhpur. Also, in this quarter one major MOA is signed between CGWB and WAPCOS for aquifer rejuvenation intervention in parts of Rajasthan which are covered under 'In Focus' Section of this issue of Bhujal Samvad. The Story of Artesian Aquifer in Udham Singh Nagar District, Uttarakhand is a part of this issue in Report Section. The Pathshala section contains Fluorescence spectroscopy Technique for Uranium determination. CGWB also takes pride to share the success story of water conservation and artificial recharge of Tamaswada Pattern, Wardha, Maharashtra. Regular sections like Shodh also includes topics of interest for everyone.

We welcome thoughts, feedbacks and ideas of our readers to make Bhujal Samvad a success 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

Heliborne Survey for Ground Water Mapping & Management in Arid Region

Inauguration of Heliborne Survey for Ground Water Mapping & Management in Arid Region by Hon'ble Minister of Jal Shakti **Sh Gajendra Singh Shekhawat** & **Dr Jitendra Singh**, Hon'ble Minister of State, MoES (Independent Charge), Minister of State (Independent Charge) Ministry of Earth Sciences, Minister of State (Independent Charge) of Science & Technology, Minister of State in the Prime Minister's Office, Minister of State in the Ministry of Personnel, Public Grievance **on 5th October 2021 at Jodhpur, Rajasthan**.

Visit of Hon'ble Union Minister of State to CGWB Offices

- **Sh. Prahlad Singh Patel**, Hon'ble Union Minister of State for Food Processing Industries and Jal Sakthi, Govt of India has visited Central Ground Water Board, Chennai and conducted review meeting alongwith WAPCOS Ltd and NWDA, Chennai.
- **Sh. Bishweswar Tudu**, Hon'ble Minister of State, Ministry of Jal Shakti and Tribal Affairs visited Central Ground Water Board, Faridabad and interacted with the officers of the Board

In Focus

BRICS Water Forum

Dr. Nandakumaran P, Chairman, CGWB co-chaired the session on "Technological Innovation in Water Management" at BRICS Water Forum on 16th Nov 2021 at Sushma Swaraj Bhavan, New Delhi.

Dr. M . Senthil Kumar, Scientist, CGWB presented Country Paper on Technological Innovation in Water Management.

Nadi Utsav

CGWB organized various activities like cleanliness drives, pledge, awareness programmes etc. to celebrate **"Nadi Utsav"** at 14 locations along the river banks in different parts of the country during 17th- 23rd December 2021.

In Focus

संसदीय राजभाषा समिति

संसदीय राजभाषा समिति ने गुवाहाटी में केंद्रीय भूमि जल बोर्ड कार्यालय का निरीक्षण किया। समिति ने कार्यालय के हिंदी के कार्यों की समीक्षा की एवं अपेक्षा अनुसार निर्देश दिए।

इस अवसर पर मंत्रालय एवं विभाग के शीर्ष अधिकारी उपस्थित थे।

माननीय संसदीय राजभाषा समिति की २ री उपसमिति द्वारा प्रो. रीता बी जोशी जी, सांसद, प्रयागराज की अध्यक्षता मे श्री मनोज तिवारी जी,सांसद, उत्तरी-पूर्वी दिल्ली, श्री बाळूभाऊ धानोरकर जी,सांसद,चंद्रपुर एवं श्रीमती. रंजनबेन भट्ट जी, सांसद, वडोदरा ने केंद्रीय भूमिजल बोर्ड ,प्रभाग ६ ,नागपुर, महाराष्ट्र के साथ निरीक्षण बैठक की। इस दौरान समिति ने मंत्रालय एवं विभाग के वरिष्ठ अधिकारियों की उपस्थिती मे हो रहे राजभाषा हिंदी के कार्यो का अवलोकन किया।

संसदीय राजभाषा समिति ने आज कोलकाता में केंद्रीय भूमि जल बोर्ड प्रभाग १५ कार्यालय का निरीक्षण किया। समिति ने कार्यालय के हिंदी के कार्यों की समीक्षा की एवं अपेक्षा अनुसार निर्देश दिए। इस अवसर पर मंत्रालय एवं विभाग के शीर्ष अधिकारी उपस्थित थे।

MoA between CGWB and WAPCOS

Signing of MoA between Central Ground Water Board and WAPCOS for Aquifer Rejuvenation Interventions in parts of Rajasthan.

Awards and Recognition

Dr. P.K. Jain, RD, CGWB, Nagpur received prestigious "Linga Raja Das Memorial Trophy" for outstanding contribution in the field of "Community Participation in Water Supply/ Sanitation Sector" 2019-20 in 53rd Annual Convention of Indian Water Works Association, 2021.

Success Story

Water Security by Tamaswada Pattern (TP) Nalla Treatment

Dr. P.K.Jain, Kartik Dongre, Rahul Shende

Introduction: Purti Sinchan Samruddhi and Kalyankari Sanstha (NGO), Wardha, Maharashtra evolved an innovative Tamaswada Pattern (TP) nalla treatment technique which restores and enhances the capacity of existing structures thereby ensuring water security and fulfilling the key objectives of various recharge schemes of government.

Location: A tribal village Tamaswada is situated close to water divide (Ridge), in Selu Taluka of Wardha district, Maharashtra. It is located at a distance of about 80 km south-west of Nagpur city. The village is having an area of 856 ha, cultivable area of 429 ha with annual rainfall of 1050 mm (Selu). During pre-project time, ground water irrigation was limited and job opportunities were almost nil.

Issues/Problems: The major issues/problems of the village were deficit rainfall recorded in 13 years during last 20 years resulting declining rainfall trend @ 4.34 mm/year, depletion of ground water levels, limited aquifer thickness of Basaltic aquifer, water scarcity in lean period, absence of irrigation facilities, low socio-economic development due to non-availability of water which resulted in migration from the village in search of job.

Methodology Adopted: Entire pilot project was undertaken in "Public Participatory" mode and convergence with other schemes of Govt. Detailed hydrogeological survey of the village and its surroundings was carried out for identification of all the recharge structures constructed in watershed/village. Watershed/ Village water security plans, DPR with locations, detailed designs and cost estimates were prepared. The Tamaswada Pattern (TP) nalla treatment technique works with people's participation since the scheme/structures after its restoration are to be maintained and managed by beneficiaries.

Work Implementation: Based on detailed survey, estimation, preparation of DPR and management of appropriate fund, the implementation of project was done

Success Story

by repairing of existing 15 existing water conservation structures and removal of silt.Widening of nalla upto 3.5 line Km of nalla and deepening of nalla for maximum up to 3 meters on reverse gradient without disturbing the ecology of nalla and nalla course was also carried out. Construction of additional 10 more low cost new structures (5 Gabion and 5 storage bandhara) on upstream side to reduce the silt load, hydraulic pressure on structure and also improve the storage

and recharge capacity considering the gradient and physiographical conditions. Plantation on both banks of nalla to avoid the soil erosion and siltation. Awareness and capacity building of end users/Stake holders for maintenance and judicious use of available water resources by adopting appropriate water efficiency measures and change in cropping pattern.

Results, Benefits and Impact Assessment: Many tangible and intangible benefits were accrued from the project, which includes creation of 1,05,000 m³ of storage on 3.5 km of nala. Considering 3 repetitive fillings and 75% efficiency as per CGWB pilot studies, a total of 2,36,250 m³ of water artificially recharged to aquifer. Many fold increase in area under different crops. Area under kharif increased from 190 ha to 305 ha, rabi from 0 to 15 ha, sugarcane from 4 ha to 16 ha, ground nut and vegetables from 0 to 16 ha and horticulture activities are also seen in 6 ha. Additional land of 24 ha also reclaimed under cultivation, which was earlier getting flooded during monsoon due to siltation in nala. Water level decline was arrested and rising water level trend @ 0.07 m/year during pre monsoon and 0.34 m/year during post monsoon seasons is observed due to additional recharge potential. Farmers have adopted modern irrigation practices (Micro-irrigation). Agriculture allied activities has also increased. It resulted in overall socio-economic development of the village with increase in house-hold income from Rs. 4,906.00 per month to Rs. 17,217.00 per month which is almost 250% as compared to pre-project scenario, reduction in migration due to increase in job opportunities and increase in land valuation.

Report

STORY OF ARTESIAN AQUIFER, UDHAM SINGH NAGAR DISTRICT, UTTARAKHAND

Ravikalyan Bussa, Prashant Rai, Kishan Patel

Introduction: A confined Aquifer is an aquifer below the land surface where impermeable materials are below and above the aquifer, causing it to be under pressure so that when the aquifer is penetrated by a well, the water will rise above the top of the aquifer, when the water flows above the ground surface, it is called flowing wells.

When a confined aquifer is exposed at the surface its gets recharged through rainfall. In simple terms at the valley portion the aquifer is under confining pressure, such that if a bore hole is constructed tapping the confined aquifer water flows out automatically. The confined aquifer may be replenished/ recharged by rainfall/ stream water infiltrating the rocks at the considerable distance away from the confined aquifer. Groundwater in these aquifers can sometimes be thousands of years old. All Flowing wells are Artesian, but not all Artesian Wells are flowing wells.

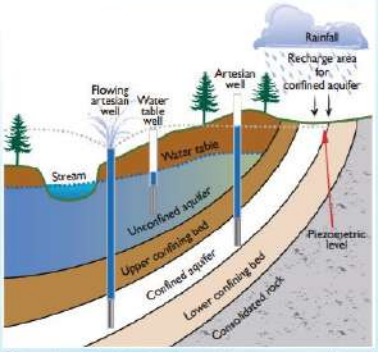
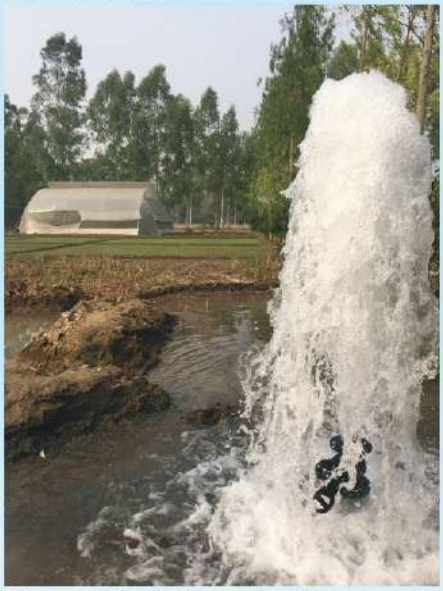


Fig. 1. Geological and topographical controls affecting artesian and flowing artesian wells

Occurrence: Flowing artesian wells are common in India, which have been reported from many parts of the country like Jammu & Kashmir, Uttarakhand, Uttar Pradesh, Bihar, Odisha, West Bengal, Rajasthan, Chhattisgarh, Kerala, Telangana, Tamil Nadu, Tripura etc. out of these, most prominent and continuous zone of flowing artesian wells are observed in the Terai belt, which is located at the foot hills of the Himalayas. Flowing wells in this terrain are encountered in Uttarakhand, Jammu & Kashmir, Himachal Pradesh, Punjab etc.



Hydrogeological conditions: In Uttarakhand, artesian wells are prominent in District Udham Singh Nagar due to its geographical condition. Geologically, it falls in the Terai formation (lower Piedmont Plain), consisting of clays, sandy clays, fine to medium sand and occasional gravels, and it is located south of the Bhabar Formation (Upper Piedmont Plain), foot hills of the Himalayas. A spring line separates the Bhabar and Terai Formations. Bhabar Formation consists of unconsolidated sediments like sand, gravel, boulder and clays. Hydrogeologically, the water levels are very shallower in Terai areas, whereas deeper

in Bhabar areas. The groundwater occurs both unconfined and confined conditions in Terai and unconfined conditions in Bhabar. The tubewells tapping deeper confined aquifers with auto-flow conditions yield 25.0 to 55.0 lps of freshwater for a drawdown of 2.0 to 8.0 m. In case of tube wells tapping confined aquifers with non-flowing conditions, the yield varies between 10 and 40 lps for a drawdown of 4.0 to 9.0 m.flowing artesian wells are observed in the Terai belt, which is located at the foot hills of the Himalayas.

Causes of reduction in pressure heads and discharge: During the NAQUIM studies it has been demarcated the auto flow zones in the district. Three decades ago, the area of autoflow zone was huge, even artesian conditions existed in southern part of the Udham Singh Nagar district (Rampur and Bareilly districts, presently part of Uttar Pradesh), sadly, it has been shrunk quite large extent from south to north. The present situation of autoflow zones shown in Fig. 4. This is mainly due to increasing groundwater withdrawal, which has caused to cease auto flow conditions in the shallow aquifers and as well as diminishing discharge too. The discharge of the wells reduced along with the artesian pressure heads (from 8.69 m agl to 0.01 m agl) with the progress of time and space. Some of the shallow private tube wells have almost got exhausted/lost their artesian/free flowing conditions due to faulty construction and well design of tubewells in the depth ranging from 50.0 to 90.0 m bgl. Interlocking of confined and unconfined aquifer and choking of wells, decrease in recharge area of Bhabar, demographic change, rapid industrialization and urbanization, intensive agriculture practices/ irrigational activities, massive deforestation and continuous over exploitation etc. have led to diminish of discharge and loss of pressure head of artesian/free flowing. It is also noticed that some of the artesian wells have gained free flowing conditions after monsoon due to ample of recharge and looses the same in very short period of time. This phenomenon is also observed during the recent lockdown period due to non-functioning of industries, which has reduced stress on groundwater, this resulted improvement of piezometric head leading to free-flowing conditions in Gadarpur and Rudrapur blocks, which is so amazing!

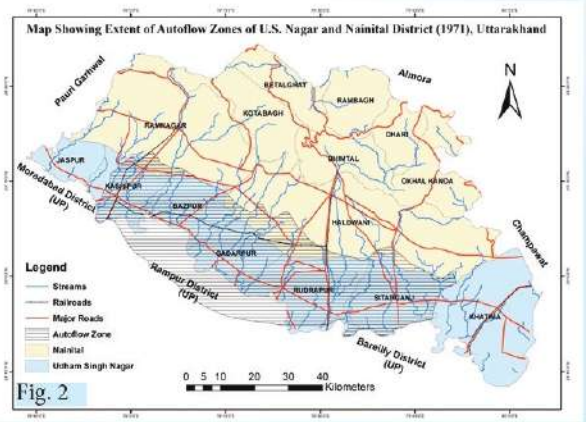


Fig. 2

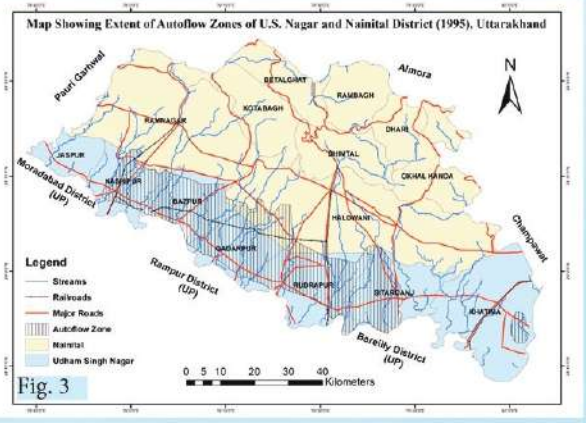


Fig. 3

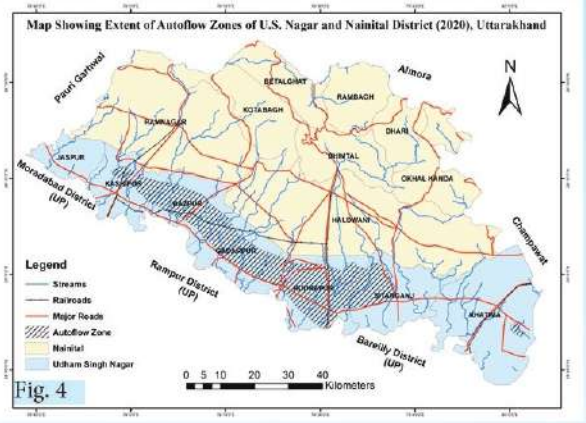


Fig. 4

Hydrogeologically, Bhabar area is the recharge for the Terai aquifers (Fig. 5). Any recharge activities in the Bhabar will help in recharging the Terai aquifers. First/second order streams are very useful for effective recharge in the area. The causes of reduction in discharge of artesian aquifer and its head probably due to reduction in recharge area of Bhabar formation and thus recharge of confined aquifer. Ever growing demand of groundwater led to continuous over exploitation of confined aquifers by industries/ infrastructure project and increase of domestic and irrigation needs in the Bhabar/Terai zones due to exponential growth of urbanization. Also, there is no proper mechanism to measure the actual withdrawals of groundwater. Further, continuous free flow of artesian water as there is no proper leak proof device to arrest the flow. Massive deforestation and more developmental/ constructional activities in the Bhabar zone during the past three decades, earlier which was covered by dense forest, now causing more surface run off resulting declining in recharge.

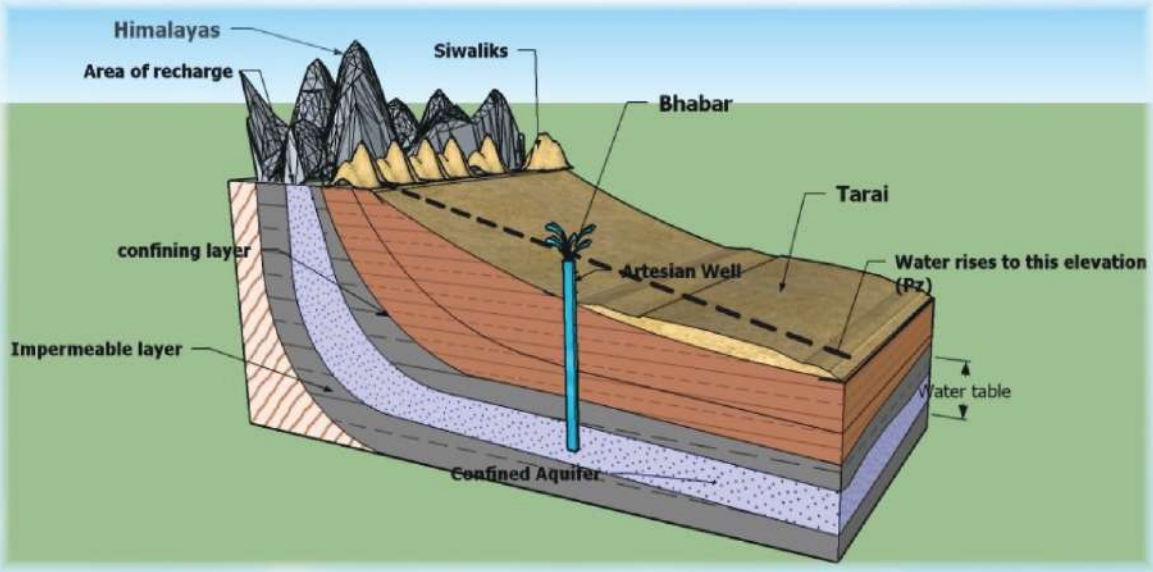


Fig. 5 Schematic view of Bhabar and Terai areas

Strategic measures: Adoption of artificial recharge measures to groundwater in the Bhabar area is the need of hour, which will help in augmenting the sustainability of pressure heads for long term. Implementation of suitable site-specific artificial recharge structures like check dams, gully plugs, gabion structures are proven to be very successful. Artesian wells should be provided a mechanism to control and regulate the flow so that the unnecessary wastage can be controlled/avoided, thus pressure heads can be preserved/maintained. Deforestation is to be avoided and massive afforestation to be adopted in Bhabar as well as in Tarai areas, which has greater impact on climatological order. Change of cropping pattern also to be adopted, which helps to augment the groundwater to avoid stress on confined aquifer. Balancing between groundwater extraction and recharge will certainly improve the groundwater conditions in the area, which has already been observed during the lock down period, when the extraction of groundwater is nearly zero.

Fluorescence spectroscopy Technique for Uranium determination

Dr. Suresh Kumar

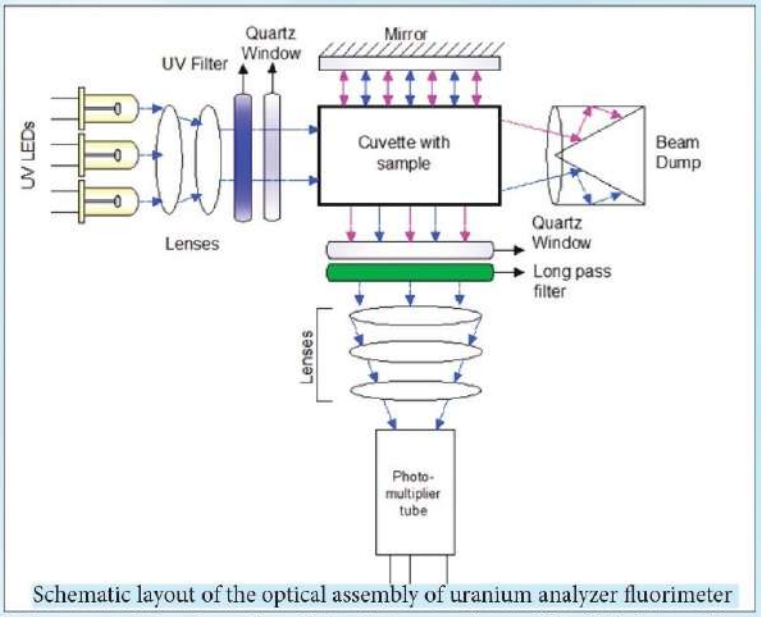
The occurrence of uranium in contaminated groundwater is a major concern in India. In recent studies, presence of high uranium content in groundwater in 16 states of India has been reported. Groundwater is most reliable source of drinking water in India as piped water supply has not been ensured everywhere. Hence a large-scale investigation by analyzing a huge number of samples for uranium analysis in groundwater is required. For which a fast, simple and an accurate uranium determination is required. Various chemical analytical techniques for uranium are: gravimetry, titrimetric, pellet fluorimetry, ICP-MS, ICP-OES and fluorescence spectroscopy.

Here, we will have an introduction about fluorescence spectroscopy technique for uranium determination.

Uranium determination using Fluorescence spectroscopy

To determine trace quantities of uranium, measurement of fluorescence is one of the most common and sensitive method. Fluorescence of uranium salt is excited under ultraviolet radiation and gets measured quantitatively by a suitable photodetector. In natural aqueous samples, uranium may be present in two valency states, i.e., +4 and +6 respectively. Both these valency states are reduced to single valency state by complexing with phosphate. For this 'Fluren' is added to test sample. 5 grams of sodium pyrophosphate powder is taken in a 100 mL flask and is filled upto mark with double distilled water. Then ortho- phosphoric acid is added to solution drop by drop until pH 7 is reached. This desired buffer solution is called 'Fluren'. When uranium joins with oxygen it forms uranyl ion (UO_2^{++}). The main function of this buffer solution is formation of single fluorescent uranyl ion (UO_2^{++}). Under ultraviolet excitation provided by nitrogen laser (337 nm), aqueous solution carrying fluorescence from uranyl ion (UO_2^{++}), emits green fluorescence which can be measured quantitively by employing a photodetector.

Under excitation fluorescence from organic matter in solution may superimpose on the uranium fluorescence. Hence, a discrimination by time and wavelength is required. On excitation, fluorescence from natural organic component exhibits wavelength of 400 nm. Radiation from this wavelength can be nullified by employing optical green filters. After excitation, using laser pulse, fluorescence from natural organic molecules and uranyl ions are measured. It has been found that lifetime of fluorescence from organic contents is about few tens of nanosecond only and decays very rapidly. On the other hand, fluorescence obtained from uranyl ion lasts for relatively longer time with a life time of few tens of microsecond. An electronic delaying gate is designed in such a manner that it accepts signal only after fluorescence from organic contents have been decayed and accumulates fluorescence obtained from uranium. In this way, complete isolation of uranium contribution is achieved.



Schematic layout of the optical assembly of uranium analyzer fluorimeter

Experimental Technique

The fluorescence obtained from uranium can have positive or negative interferences from the presence of other chemical elements in the solution. This effect of quenching from other elements can be nullified by adopting standard addition method. In this case, initially fluorescence obtained from aqueous sample is recorded. This is followed by addition of a small volume of uranium standard (10 to 50 µL) to the sample solution under analysis. Now, response is measured. Here, response after addition of uranium standard is due to the difference between fluorescence of sample only and fluorescence of sample after addition of standard solution. This exercise is repeated by adding another uranium standard. Uranium concentration in the aqueous sample is calculated by using following equation:

$$\frac{F_{smp}}{F_{smp+add} - F_{smp}} \times \frac{V_{std.add}}{V_{smp}} \times \frac{1}{D_{smp}} \times C_{std.}$$

where, Fsmp= fluorescence of the sample
Fsmp+ add = fluorescence of the sample +standard added
Vstd.add= volume of the standard addition
Vsmp = volume of the sample
D smp= dilution ratio of the sample
C std= concentration of the standard

Advantages

- Very sensitive (ppb level U)
- Low power consumption
- Only reagent is a fluorescence enhancing buffer

Limitation

- Chloride above 300 ppm acts as a quencher in presence of phosphate buffer
- With this method, it is not possible to measure water containing turbidity

Nadi Utsav: Celebrating Rivers of India

Sh. S. N. Dwivedi,
Dr. Rakesh Singh

As part of the ongoing "Azadi Ka Amrit Mahotsav", River festival (Nadi Utsav) was organized under the joint auspices of the Department of Water Resources, River Development & Ganga Rejuvenation under the Ministry of Jal Shakti in collaboration with Ministry of Culture, Govt. of India and National Mission for Clean Ganga (NMCG) from 17th to 23rd Dec, 2021. With an aim to encourage stakeholders engagement and public participation towards augmentation, management and sustenance of the natural resources, several events were organised under the four chosen themes of Cleanliness, Patriotism, Nature & Ecology and Devotion & Spirituality. The Nadi Utsav- 2021 was formally launched with the flag-in ceremony of Ganga Mashal Yatra on 16th December 2021 by the Hon'ble Jal Shakti Minister, Sh. Gajendra Singh Shekhawat.

Central Ground Water Board participated in Nadi Utsav with immense enthusiasm and spirit and organized programmes in 14 States of the country. A variety of events were organized by CGWB as part of the Nadi Utsav celebrations which included awareness programmes, cleanliness drive, pledge ceremony, shram daan, afforestation, Jal Yatra, Nature biodiversity walk, quiz, extempore, painting competition, poster competition, elocution and story-telling on local freedom fighters. These events were attended by 1751 people including 749 female participants. Three special booklets were prepared and released by CGWB on the occasion namely (i) a booklet on Kundi/ Khooni Bhandara at Burhanpur (a network of well like structures interconnected through underground tunnel) prepared by CGWB, North Central Region, Bhopal, (ii) booklet on water supply security following Tamaswada pattern (TP) Nala treatment by CGWB, Central Region, Nagpur and (iii) Compendium on Rain Water Harvesting structures in the temples along the rivers of Tamil Nadu by CGWB, South Eastern Costal Region, Chennai. State wise summary of the events organized by CGWB as part of the Nadi Utsav celebrations are enumerated as under.

Cover Story

Maharashtra (Wardha), Dham (Tributary of Wardha River) Wardha

- Awareness
- Cleanliness Drive
- Preparation of Document on water supply security following Tamaswada pattern (TP) Nala treatment.

Odisha (Khurdha) Kuakhai River

- Awareness programme on importance of rivers in sustenance of life

नदी उत्सव पर हुई प्रतियोगिताएं

विश्ववार्ता संवाददाता

लखनऊ। केन्द्रीय भूमि जल बोर्ड, जल शक्ति मंत्रालय व पृथ्वी इन्वेंशन्स के संयुक्त तत्वावधान में हुसैनाबाद पार्क में 'नदी उत्सव' पर एक जन-संवाद कार्यक्रम का आयोजन किया गया। कार्यक्रम में गवर्नमेंट गर्ल्स पॉलिटेक्निक कालेज, यूनिटी कालेज, एसएआर मेमोरियल पब्लिक स्कूल, श्रीरामस्वरूप कालेज से लगभग 60 छात्र व छात्राओं ने हिस्सा लिया।

कार्यक्रम की शुरुआत स्वागतम, योग द्वारा की गई। नदी पर गीत-गायन प्रस्तुत किया गया। इसमें डॉ. एसके श्रीवास्तव, वैज्ञानिक-डी द्वारा गोमती नदी के जल का स्वापनिक जांच करके दिखाया गया। इसके बाद एक जल से संबंधी प्रश्नोत्तरी एवं चित्रकला प्रतियोगिता का भी आयोजन किया गया। जिसमें विजेता प्रतिभागियों को पुरस्कार प्रदान किया गया। नदी के आस-पास सुखे कचरे की सफाई की गई एवं पौधरोपण कार्यक्रम किया गया। कार्यक्रम के अंत में नदी को स्वच्छता हेतु शपथ ग्रहण किया गया एवं सभी प्रतिभागियों को प्रमाण-पत्र

प्रदान किया गया। यह कार्यक्रम क्षेत्रीय निदेशक, केन्द्रीय भूमि जल बोर्ड, उत्तरी क्षेत्र, लखनऊ पीके त्रिपाठी के मार्गदर्शन में आयोजित किया गया। कार्यक्रम का संचालन डॉ. शशि कांत सिंह, वैज्ञानिक-बी ने किया। इस कार्यक्रम में केन्द्रीय भूमि जल बोर्ड के वैज्ञानिक करम सिंह, कुलदीप भारतीय, अभिजीत सिंह, सुश्री अंकिता सिंह, डॉ. शाहनवा खान व पृथ्वी इन्वेंशन्स से अनुराधा गुप्ता, रश्मि चतुर्वेदी उपस्थित थे। कार्यक्रम में धन्यवाद ज्ञापन सुश्री राय चौधरी ने किया।

Madhya Pradesh (Burhanpur), Tapi River

- Awareness programme on Kundi/ Khooni Bhandara at Burhanpur (a network of well like structures interconnected through underground tunnel)
- Cleanliness Drive
- Preparation of Booklet on Kundi/Khooni Bhandara of Burhanpur

Karnataka (Bangalore) Vishrabhavathi (Tributary of Arkavathi River)

- Shram Daan
- Afforestation

Uttar Pradesh (Lucknow) Gomti River

- Open Quiz
- Extempore
- Tree Plantation
- Nature Biodiversity walk

Chhattisgarh (Janjgir), Mahanadi River

- 1. Cleanliness Drive
- 2. Afforestation
- 3. Awareness Program

Haryana (Yamuna Nagar), Yamuna River

- Shram Daan
- Painting competition
- Afforestation
- Jal Yatra
- Pledge

Tamil Nadu (Thiruchirapalli), Cauvery River

- Shram Daan and Pledge Activity
- Preparation of Compendium on Rain Water Harvesting structures in the temples along the rivers of Tamil Nadu

West Bengal (North 24 Parganas), Hoogly River

- 1. Quiz programme on Rivers of India
- 2. Debate
- 3. Elocution
- 4. Story Telling on Local freedom fighters
- 5. Pledge

Research Publications by CGWB officers in reputed International Journals

Morphometric Analysis of Koyna-Warna Region Seismicity

Journal of the Geological Society of India volume 97, pages1583–1589 (2021)

Arora, K., Srinu, Y.

Abstract: After sixty years of studies of the reservoir triggered earthquakes in the Koyna-Warna region, several questions remain unanswered. In particular, the role of reservoir water on the seismicity, the area of influence and possible pathways through which surface water may catalyze an earthquake at depth, continues to be an enigma. On the basis of the high resolution DEM derived from airborne LiDAR data, several aspects of surface features have been unraveled. The characteristics of surface morphology over the region have been revealed. Lineament systems have been delineated, the association of which with subsurface trends and seismicity patterns, establish them as fault systems. We also attempt to look at geomorphic parameters over the region and investigate their correlation with seismicity. We find that earthquake clusters are associated with regions of tectonic control, the signatures of which differ in the Koyna and Warna regions.

Harvesting of water by tunnelling: A case study from lateritic terrains of Western Ghats, India

Journal of Earth System Science volume 130, Article number: 202 (2021)

Joji, V.S., Gayen, A., Saha, D.

Abstract: Harvesting of water by tunnelling in the Western Ghats lateritic terrains of India known as surangam (tunnel well) is practiced since ages. It is common even today in the northern parts of Kerala state in India. Surangams are featured by horizontal tunnel wells, dug manually within the laterite, where the tunnel wall collects the seepage water, flows out under gravity and get accumulated in open tanks or dug wells for further use. The tunnels are laid horizontally or slightly inclined, placed just over the lithomarge clay so that maximum seepage can be accumulated through the porous laterites (generally of 3.95–30.20 m thick). A study is done on surangams from the Kasaragod district of Kerala, where it is still popularly used. They represent different designs; single tunnel, criss-cross tunnels and diversion tunnels, depending upon the terrain conditions, the permeability of the laterites and thickness of the saturated zones within laterites, demand of water and location of delivery points, etc. Surangam system may start from a dug well, end in a dug well and there can be an open shaft or dug well in between. Total 32 surangams are inventoried in Bedadka Panchayath, of which 24 are investigated in detail. The discharge varies from 0.078 to 13.29 m3/day during pre-monsoon while it remains between 172.80 and 691.20 m3/day during monsoon period in 2019. In 2019 summer, 12 inventoried surangams remained dry. The hydrochemical facies of water from the surangams generally varies from Ca–HCO3 type to Ca–Mg–Cl type indicating rock–water interaction. Because of lack of proper maintenance caving of walls occur during the rainy season. Lack of maintenance renders the priceless traditional groundwater abstraction structures disappearing fast. Surangams with good discharge are to be protected with proper concrete reinforcing of the outlet of the tunnel and proper storage options and arrangement of delivery systems up to the user point. Besides, water harvesting measures in the catchment of surangams are required for round the year sustainability of yield. A plan has been proposed for the revival of the surangams along with design specifications.

Application of Cl/Br ratio to demarcate the fresh-saline water interface in coastal aquifers of northern Tamilnadu, Southern India

Groundwater for Sustainable Development,15,art.no.100658

Senthilkumar, M., Gnanasundar, D.

Abstract: Geochemical parameters, chloride and bromide were used as tracers to demarcate the extent of saline water intrusion in the northern part of Tamilnadu coastal aquifer which served as a hub for major pumping well fields for supply of drinking water to Chennai city. 158 groundwater samples were collected during pre & post monsoon period to analyse the hydrochemical variations across this temporal stretch and two major water types were interpreted from the analytical data. During pre-monsoon period, Na–Cl is dominant followed by Na–HCO3 type and during post monsoon, the groundwater in the central and eastern part shift towards Na–HCO3 type from Na–Cl type. Bromide is absent in the freshwater samples, while the mixed water samples have varying bromide concentrations. In the study area, Br concentration in groundwater ranged from 0 to 22.1 mg/l while the seawater sample had Br concentration of 63 mg/l. The Cl/

Br ratios of groundwater of the study area ranged from 0.01 to 188 while that of the seawater figured at 288. The groundwater of the eastern and north-eastern portion of the study area has Cl/Br ratio between 75 and 188 and this value has a similar signature to that of seawater. The continental part of the study area has Cl/Br ratio less than 50 which corresponds to that of the intermittent zone between the seawater and rainwater. Spatial distribution of Cl/Br ratio and their variation across distance from the coast indicate the remnants of seawater in the aquifer material upto 19–20 km inland and the ratio tends to decrease beyond 20 km distance. The study explores the applicability of the Cl/Br ratios for defining the extent and movement of he freshwater-saline water interface in a coastal region, which can be used by the water managers, administrators and planners for effective management and protection of available groundwater resources.

Isotope and hydrochemical systematics of groundwater from a multi-tiered aquifer in the central parts of Indo-Gangetic Plains, India – Implications for groundwater sustainability and security

Science of the Total Environment, 789, art. no. 147860

Keesari, T., Sinha, U.K., Saha, D., Dwivedi, S.N., Shukla, R.R., Mohokar, H., Roy, A.

Abstract: The Indo-Gangetic multi-aquifer system provides water supplies to the most populous regions of the Indian subcontinent, however precise knowledge on the sources and dynamics of groundwater is still missing. Environmental isotopes (2H, 18O, 13C, 3H and 14C) and hydrochemical modeling tools were used in this study in the multi-tiered aquifers underlying the Middle Gangetic Plains (MGP) to investigate the source of recharge, aquifer dynamics and inter-connectivity among aquifers. Within a depth span of 300 m, three aquifers, with contrasting recharge sources and dynamics, were delineated in this Sone-Ganga-Punpun interfluve region, with limited cross-aquifer hydraulic interconnections. The chemistry evolves from Ca-HCO3 to Na-Ca-HCO3 in the shallow semiconfined Aquifer-I with a mean transit time of 20–23 years. The dominant recharge to Aquifer-I is from the river inflows and rainwater percolation through paleochannels. The semi-confined to confined Aquifer-II holds fresh quality groundwater with mixed water facies (Mg/Ca-Na-HCO3). The modeled age of Aquifer-II groundwater is found to be 205–520 years, which is supported by presence of negligible tritium and minor variations in stable isotopes. Outcrop regions of Aquifer-II sediments in the marginal alluvial areas and deep-seated paleochannels in the southwestern part are the potential zones for Aquifer-II recharge. A deep confined Aquifer-III with fresh quality of groundwater is identified below 220 m. This aquifer is characterized by old age (~3.5 to 4.7 ka BP) and enriched δ18O (−5.7‰). These results along with the existing paleoclimate records of this region infer that Aquifer-III is recharged during an arid climate. The marginal alluvial plains are the probable recharge zones for Aquifer-III. This study helped in conceptualizing the groundwater flow paths in multi-tiered aquifers of MGP. The knowledge and understanding would extend crucial inputs for the sustainable development of deep aquifers not only in the MGP but also in other regions of Indo-Gangetic Plains.

A study on the hydrogeochemical mechanisms controlling groundwater fluoride enrichment in Jaipur: a semi-arid terrain in India

International Journal of Environmental Analytical Chemistry

Saini, A., Kanwar, P., Kumar, S., Tembhurne, S., Roy, I.

Abstract: The main objective of this research paper was to find out the major governing factors controlling fluoride enrichment in groundwater resources in the Jaipur region of India. Chemical analysis of collected water samples revealed that 36% of the collected groundwater samples exhibit fluoride concentration of more than 1.5 mg/L as per BIS, 10,500 and WHO, 2017. An attempt has been made to discuss occurrence of fluoride alongside its spatial distribution in the study area with respect to geology and groundwater flow direction. Chloroalkaline indices, Gibb's plot, Piper diagram and various inter-ionic bivariant plots have been applied to recognize hydrochemical processes and dissolution trends resulting in high concentration of fluoride in groundwater. There exist five water types in the study area: Ca-HCO3, Na-HCO3, Na-Cl, Ca-Mg-Cl and Ca-Na-HCO3. Due to ion association of excess Cl− emanating from wastewater, Na-HCO3 type water finally gets changed as Na-Cl type in aquifer. In the study area, 82% of water samples enriched in F− concentration (>1 ppm) pertain to Na-Cl type. Geochemical modelling confirms that reduced Ca2+ ion activity due to oversaturation of calcite with respect to fluorite might have triggered the favourable condition for dissolution of fluoride bearing minerals leading to fluoride enrichment in groundwater. To further assess the extent of natural and anthropogenic processes, the data was subjected to multivariate statistical analysis by performing correlation analysis, principal component analysis and hierarchical cluster analysis.

Social Media Highlights

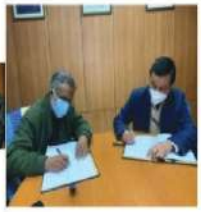
Top Tweet earned 6,313 impressions

Field Demonstration of blast well constructed under PMKSY - HKKP GW Scheme at Rajgarh, Mirzapur district, Uttar Pradesh to the trainees of Induction Level Training course. @MoJSDoWRRDGR
pic.twitter.com/INH2bym28f


1 11 50

Central Ground Water Board
5 January

A new chapter in collaboration between CGWB and GSI. MoU for study on groundwater contamination signed by Chairman, CGWB and Director General, GSI.
Ministry of Jal Shakti, Department of Water Resources, RD & GR

Top Tweet earned 6,119 impressions

CGWB, Bhubaneswar conducted Public Interaction Program under the banner @ 75 years of India's Independence at Jawahar Navodaya Vidyalaya, Nabarangpur.
@MoJSDoWRRDGR
pic.twitter.com/nMns525msy



Central Ground Water Board
31 December 2021

Scientist of CGWB, Chandigarh preparing Litholog of a well drilled (Pz) at site Govt Middle school Buhawa, Babaon, District Kurukshetra, Haryana. Pz drilled upto a depth of 205 m. Lithology encountered is mainly Sand and Clay. Ministry of Jal Shakti, Department of Water Resources, RD & GR




Central Ground Water Board
29 December 2021

Geophysicists of CGWB, Kolkata conducting Transient Electromagnetic (TEM) survey at water scarce Jhalda & Bagmundi Block of Purulia District, West Bengal
Ministry of Jal Shakti, Department of Water Resources, RD & GR

Central Ground Water Board
24 December 2021

CGWB, SR, Hyderabad has organized Nadi Utsav under the banner of Azadi ka Amrit Mahotsav to commemorate 75 Years of India's Independence on the theme "Save Musi River from Pollution" on the banks of Musi River, Nagole, Hyderabad
Ministry of Jal Shakti, Department of Water Resources, RD & GR

Top Tweet earned 6,582 impressions

Media Coverage of ongoing Heliborne Survey in Pokhran, Rajasthan
@MoJSDoWRRDGR
pic.twitter.com/TpQIy08u1p

The survey aims to conduct high-resolution aquifer mapping

1 17 55

Central Ground Water Board
24 December 2021

As a part of the ongoing 75 years of Independence celebrations, CGWB, Kerala Region, has organized a River Cleaning Campaign along Nayyar Riverbank at Kallikkadu Grama Panchayath.
Ministry of Jal Shakti, Department of Water Resources, RD & GR






Social Media Highlights

Central Ground Water Board
15 December 2021

Sh Aniruch Singh, Geophysicist, CGWB, Lucknow received Young Scientist Award in Interdisciplinary Studies from International Academy of Physical Sciences, Allahabad, India
Ministry of Jal Shakti, Department of Water Resources, RD & GR

Top Tweet earned 5,618 impressions

Ground water recharge through abandoned Dugwell at Nakipura block Loharu district Bhiwani Haryana.
@MoJSDoWRRDGR
pic.twitter.com/k4jFHIraY7

4 17 77

Central Ground Water Board
23 November 2021

संयुक्त राज्य-भाषा समिति के अंतर्गत कोलाबरान में केंद्रीय भूमि जल बोर्ड प्रभाग 15 कार्यालय का निरीक्षण किया।
समिति ने कार्यालय के हिंदी के कार्यों की समीक्षा की एवं अपेक्षा अनुसार निर्देश दिए। इस अवसर पर मंत्रालय एवं विभाग के वरिष्ठ अधिकारी उपस्थित थे।
#Second Sub Committee
Ministry of Jal Shakti, Department of Water Resources, RD & GR

Central Ground Water Board
9 December 2021

Sh. Aniruch Singh, Geophysicist, CGWB, Lucknow carrying out Geophysical survey in parts of Agra district, Uttar Pradesh.
Ministry of Jal Shakti, Department of Water Resources, RD & GR

Central Ground Water Board
26 November 2021

केन्द्रीय भूमि जल बोर्ड, पश्चिमी क्षेत्र, जयपुर, रसायन शाला में डा. जयंत गर्ग, रसायनज्ञ द्वारा डॉक्टर सकरीली सहायक के पद पर नयी नियुक्त भिवानी मुख्यालय को रसायन शाला में जल नमूनों के विश्लेषण में प्रयुक्त उपकरणों के संचालन के तरीकों का एवं विश्लेषणात्मक विधियों का प्रशिक्षण प्रदान किया गया।
Ministry of Jal Shakti, Department of Water Resources, RD & GR

Central Ground Water Board
15 November 2021

Ms. Rachna Bhatti & Sh. Devinder Kumar, Scientists CGWB, Dharamshala shared NAQUIM Report to Smt. Sonakshi Tomar I.A.S, ADC, Sirmour, Himachal Pradesh
Ministry of Jal Shakti, Department of Water Resources, RD & GR

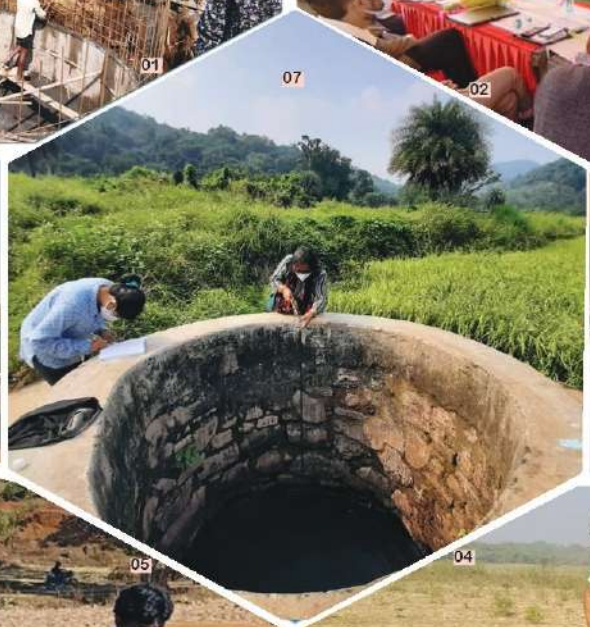
Central Ground Water Board is with Senthil Kumar
17 November 2021

Dr. Nandakumaran P, Chairman, CGWB co chaired the session on "Technological Innovation in Water Management" at BRICS Water Forum on 16th Nov 2021 at Sushma Swaraj Bhavan, New Delhi. Dr. M . Senthil Kumar, Scientist , CGWB presented Country Paper on Technological Innovation in Water Management.
Ministry of Jal Shakti, Department of Water Resources, RD & GR Namami Gange Central Water Commission Central Soil and Materials Research Station CSIR - NGRI Official Account WAPCOS Limited

Central Ground Water Board
11 November 2021

Central Ground Water Board welcomes Sh. Bishweswar Tudu, Honourable Minister of State, Ministry of Jal Shakti and Tribal Affairs to CHQ, Bhujal Bhawan, Faridabad.
Ministry of Jal Shakti, Department of Water Resources, RD & GR

Collectable



01 CGWB and State Govt officers visited Sites under PMKSY-HKKP -GW at Dang district, Gujarat

02 CGWB, Delhi conducted a Training Program in Yamuna flood plain of Palla area, North Delhi.

03 Regional Chemical Laboratory, CGWB, Eastern Region, Kolkata participated in proficiency testing program in compliance of NABL ISO/IEC 17025:2017

04 Officer of CGWB, Lucknow carrying out Geophysical survey in parts of Agra district, UP.

05 Geophysical Survey at Ultapani, Mainpat block, Surguja district, Chhattisgarh

06 Exploratory well drilled at Police line, Sheopur, District Sheopur, Madhya Pradesh.

07 Ground Water Level Monitoring during Post monsoon (November) period.

Collectable

01 Sh Subodh Yadav, IAS, JS, Ministry of Jal Shakti, DOWR, RD & GR chaired a Review meeting of PMKSY-HKKP-GW scheme in Kolkata.

02 Presentation of NAQUIM report and Ground Water Resource Estimation of Karnal District, Haryana with DC Karnal.

03 Sh. Pankaj Kumar, IAS, Secretary, Dept of WR, RD & GR, MoJS reviewed the progress of various activities of CGWB

04 Inauguration of Sixteen Weeks Induction Level Training Course, 2021-22 in Physical mode by Dr Utpal Gogoi, Member (RGI), CGWB

05 CGWB, Jammu organised a workshop on CGWA guidelines at Leh, inaugurated by Sh Ajeet Sahu, IAS Commissioner Secretary, Govt. of Ladakh.

06 Meeting at the chamber of Hon'ble Chief Minister of UT, Puducherry, Sh. N Rangasamy, to discuss the viability of construction of tubewells for water supply.

07 CGWB NCCR, Raipur conducted a Public Interaction Program in Balod district, Chhattisgarh.