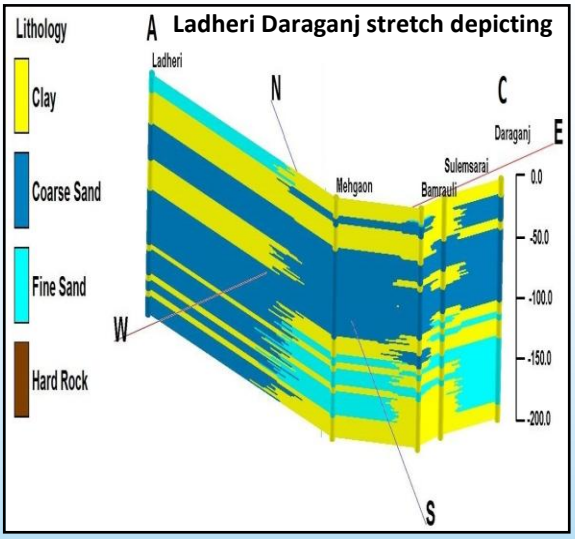
ANNUAL REPORT 2016-17



Ladheri Daraganj stretch depicting

CENTRAL GROUND WATER BOARD

Ministry Of Water Resources, River Development & Ganga Rejuvenation
Government of India

ANNUAL REPORT
2016 - 17

2018
FARIDABAD

CONTENTS

Executive Summary

Central Ground Water Board (CGWB), a subordinate office of the Ministry of Water Resources, River Development and Ganga Rejuvenation (MoWR, RD & GR), Government of India, is the National Apex Agency entrusted with the responsibility of providing scientific inputs for management, exploration, monitoring, assessment, augmentation and regulation of ground water resources of the country. The Board carries its activities through 18 Regional Offices, 17 Divisional offices and 11 State Unit Offices located in States/UTs.

National Aquifer Mapping and Management Programme (NAQUIM)

Ground Water Management and Regulation (GWMR) is the major Central Sector scheme of the CGWB, Ministry of Water Resources, River Development & Ganga Rejuvenation, Government of India which has the core component of National Aquifer Mapping and Mangement Programme (NAQUIM) initiated during the 12th Plan period (2012-17). As a part of the programme, an area of ~25 lakh km^2 has been identified as suitable for mapping out of the 32 lakh km^2 area of the country. To initiate the NAQUIM Programme, CGWB had taken up six pilot Projects in different Hydrogeological terrains spread across the country through application of advanced techniques including Heliborne electro-magnetic survey, application of isotopes and ground water flow modeling. The learning of the Pilot Aquifer Mapping was further utilized to take forward the NAQUIM programme nation-wide by the Board. As per of the programme, a reprioritized target of 5.26 lakh km^2 has been kept for 12th five year plan period and 4.03 lakh km^2 covered during the year 2016-17 and 6.31 lakh km^2 cummulative area covered during the 12th plan at the end of year 2016-17. Out of the total area covered so far, the major part lies in water stressed areas in the states of Haryana, Punjab, Rajasthan, Gujarat, Tamil Nadu, Telangana and Bundelkhand regions in Madhya Pradesh and Uttar Pradesh. By the end of March 2017, Aquifer Management plans have been prepared by the Board for an area of 6.31 lakh km^2 covering areas in part of 26 states & 3 UTs including priority areas in eight States and Bundelkhand area. Prior to the initiation of the Aquifer Mapping Programme, the ground water surveys and exploration work carried out by CGWB aimed to generate a regional picture of the ground water scenario in different parts of the country with a focus on ground water development prospects. However, NAQUIM programme has led to a paradigm shift in approach from ground water development to holistic management of the ground water resource.

Ground Water Exploration

Ground Water Exploration studies are being carried by the Board to understand the sub - surface hydrogeological set-up of various aquifers and to evaluate aquifer parameters of different aquifer systems. During the year 2016-17, the board has constructed 785 wells consistingof Exploratory Wells (EW)- 542, Observation Wells (OW) -196 and Piezometers (Pz)- 47. Outof 785 exploratory wells constructed, 647 wells were constructed in hard rock, 132 wells in alluvium and 6 wells in bouldary formation. 54 wells were constructed in the tribal and 91 wells in drought prone areas to make ground water available for drinking and irrigation purposes.

Monitoring of Ground Water Observation Wells

The Board is monitoring the ground water levels in the country four times a year (Jan/ May/ Aug/ Nov) through a network of around 23125 Ground Water Observation Wells. The ground water samples are collected once during the pre monsoon monitoring and analysed for the purpose of ascertaining the changes in chemical quality of ground water. Monitoring of Ground Water Observation Wells for May, August, November 2016 & January 2017 have been completed and reports describing fluctuation of water levels during each measurement compared to of the previous year, decadal average

and pre-monsoon period have been compiled to depict detailed information regarding short term and long term changes in the ground water regime of the country.

GeophysicalStudies

During the year 2016-17, 2917 Vertical Electrical Soundings (VES), 94.03 line kilometre 1-D resistivity profiling, 2.68 line kilometre 2-D resistivity profiling and 77 nos. of borehole logging have been conducted in various parts of the country to ascertain aquifer disposition, water bearing aquifer zones and fresh - saline interferences.

Water Quality Analysis

During the year 2016-17, 33808 water samples have been analyzed, out of which 22387 water samples have been analyzed for determination of basic constituents, 7436 water samples for Heavy and 3985 for other parameters to know quality of ground water in the various aquifers of the country.

Reports and Information Booklets

Results of investigations carried out by Central Ground Water Board are suitably documented in the form of reports and maps, which are categorized as Ground Water Year Books, State Reports (Hydrogelogical/ Exploration/ Geophysical/ Chemical), District Ground Water Brochures and Basic Data Reports. During the year 2016-17, 25 State Reports and 22 Ground Water Year Books were submitted & issued.

Water Supply Investigations

The Board also carries out short term water supply investigations for the Government departments and helps the ministry augmenting their water supply. The Board has carried 155 investigations during this year.

Dissemination and Sharing of Technical Know-how

Centra Ground Water Board has organized various workshops under IEC program. The officers of CGWB participated in various seminars/ symposia/ workshop/ conference toshare the expertise in the field of Ground Water and also for getting exposure to new ideas/ technological developments in the field Ground Water science with others.The officers of the Board also participated in various meetings/ committees etc. to render advice on ground water development in specific areas in various States/UTs.

Re-assessment of Dynamic Ground Water Resources

The total Annual Replenishable Ground Water Resources as on March 2013 of the Country have been reassessed as 447 Billion Cubic Metres (bcm) and the Net Annual Ground Water Availability has been estimated as 441 bcm. Annual Ground Water Draft as on March, 2013 for all uses is 253 bcm. The Stage of Ground Water Development has been worked out as 62%.

Technical Examination of Major / Medium Irrigation project proposals

During 2016-17, 08 major and minor irrigation project proposal received from Central Water Commission were examined by the Board regional officers.

Human Resources Development

It has been the earnest endeavour of the Board to keep its technical personnel abreast with the latest developments in all aspects related to ground water development & management. Besides the officers of the Board, trainees from State Departments and candidates from abroad are included in the training programme being organized by the Board. During the year 2016-17, 88 training programmes (38- Tier I, 16-Tier II and 34- Tier-III) were conducted by National Ground Water Training and Research

Instituteand a total of 6409 participants (798- Tier I, 507-Tier II and 5104- Tier-III) were trained including 1479 female participants.

IEC Activities

Central Ground Water Board organized 7th National Level Painting Competition on 8.02.2017 at August Kranti Lawn, India Gate ITO, New Delhi under IEC Scheme of the Ministry. The theme of the National Painting Competition was **"Conserve Water – Secure the Future".** A total of 87 students, who won the 1st ,2nd and 3rd prizes in the State Level Painting Competitions from various States / UT's participated in the National Level Painting Competition.

In the National Level Painting Competition a First prize of Rs. 50,000/-, four Second prizes of Rs. 25,000/- each, five Third prizes of Rs 10,000/- each and 77 Consolation prizes of Rs. 5000/- each was given. The first prize was bagged by Nikhila P, Kerala State and the winner of second prizes were Anubhab Sahoo, Ispita Raut, S Debnath and Twinkle P. The five third prize winners were S. Dinesh, Ritam Mondal, Namrata Devgun, Dipanshu Pandey and Pyanshu Roy.Under this event more than 13500 schools and over 13 lakh students in all over the country have participated with competitionat School Level. Out of these, 50 students selected by the Jury in each State, were invited to participate in the State Level Painting Competitions

2st National Essay Competition was organized under Jal Kranti Abhiyan 2016-17 in all the States and Union Territories of the country to create awareness among public. The Essay Competition was held for two categories i.e. Essay Competition for the age group of 15-25 Years (Category-1) and Technical Papers (Category-II). The themes were: Phase–I "Ground Water –Life line of the Nation"and Phase–II "When you Conserve Water , You Conserve life".

Bhujal Manthan

Bhujal Manthan-2 on 'Aquifer Mapping & Ground Water Management' was organized by the Board at Vigyan Bhavan, New Delhi on 29.11.2016 with following sub-themes:

- Aquifer Mapping – A National Perspective
- Advances in Science & Technology in Aquifer Mapping
- Groundwater Management: Community Involvement & Convergence
- Sustainable Management of Groundwater in Stressed Aquifer
- Aquifers in Arid Area & Paleo Channels

About 1200 experts and delegates including Officers from various Ministries, Govt. Organizations (Central as well as State Governments), Non-Government Organizations, Academicians, Scientists from Research Institutes working in the ground water domain and stakeholders like Students, Farmers & Industrialists from various areas in the country participated in the Bhujal Manthan.

Budget & Expenditure

During 2016-17, Expenditure of Rs.12481.78 lakhs under Plan and Rs.17651.61 lakhs under non - plan was incurred by the Board to carry out various activities.The Scheme wise expenditure is as below:

Sr. No.	Item of Work	Budget (Rs. In Lakhs)	Expenditure (Rs. In Lakhs)
1.	Plan	32838.00	12481.78
2.,	Non-Plan	17180.00	17651.61
3.	RGNGWTRI for Ground Water	800.00	512.26
4.	Building for Offices	700.00	550.00
5.	Deduct Recoveries	2500.00	1195.58

1. INTRODUCTION

1.1 Central Ground Water Board

Central Ground Water Board, the National apex organization dealing with Ground Water under the Ministry of Water Resources, River Development and Ganga Rejuvenation, Government of India is vested with the responsibilities to carry out ground water management studies, exploration,monitoring of development, management and regulation of country's vast ground water resources.

1.2 Mandate and Objectives

The mandate of Central Ground Water Board is to "Develop and disseminate technologies, monitor and implement national policies for the scientific and sustainable development and management of India's ground water resources including their exploration, assessment, conservation, augmentation, protection from pollution and distribution based on principles of economic and ecological efficiency and equity". Commensurate with the above mandate, the objectives laid down for the Central Ground Water Board are:-

- Aquifer mapping for delineation & disposition of Aquifer Systems to develop aquifer management plan
- Periodic long term monitoring of ground water regime for creation of time series database through existing and enhanced ground water observation wells.
- Capacity building in all aspects of ground water development and management through training, information dissemination, education and awareness
- To enhance ground water sustainability through artificial recharge and rainwater harvesting as a measure for checking the depleting trend of ground water.
- Regulation of ground water development and sustainable management of ground water resources in coordination with State Government Organizations.
- Promoting R&D programme in the field of ground water quality improvement.
- Technical assistance to defence and Govt. organizations for identification of ground water sources for their water supply.

1.3 Organizational Set-up

Central Ground Water Board is headed by the Chairman and has six full time Members namely, Member (North & West), Member (East/ RGI), Member (South), Member (HQ), Member (CGWA) and Member (Finance). The other Members of the Board are all ex-officio being the nominees of institutions in related fields of expertise. The ex-officio members are:

1. The Joint Secretary (A), Ministry of Water Resources, River Development and Ganga Rejuvenation.
2. The Joint Secretary & Financial Adviser, Ministry of Water Resources, River Development and Ganga Rejuvenation.
3. The Joint Secretary, Ministry of Environment & Forests, Paryavaran Bhawan, New Delhi.

4. The Chief Engineer, IMO (WP &P),CWC, Sewa Bhawan, New Delhi.
5. The General Manager, ONGC, Ministry of Petroleum & Natural Gas, Dehradun.

Central Ground Water Board has five main wings. Each wing is headed by a Member.

1. Survey, Assessment & Monitoring wing (SAM)

The Survey, Assessment & Monitoring wing looks after following work:

- National Aquifer Mapping & Management Programme (NAQUIM) .
- Preparation, implementation and progress monitoring of Annual Plan of Central Ground Water Board.
- Monitoring of Ground Water regime & development.
- Remote Sensing and GIS.
- Ground Water Modelling studies.
- Data information storage, retrieval, processing and dissemination (NDC & Web hosting).
- e- Governance and IT Plan.
- Preparation of EFC/SFC memo pertaining to activities of Ground Water Management and Regulation.
- Hydrology Project.
- Drawing and Map Section.
- Administrative & technical supervision of activities of the Regional Directorates and Divisional offices of MER/NCCR/SER/ER/NER.

2. Sustainable Management and Liaison wing (SM&L)

The Sustainable Management and Liaison wing looks after the following work:-

- Artificial recharge studies and water conservation.
- Project Appraisal and Perspective Planning for sustainability of ground water resources.
- Matters related to Parliamentary Committees, Parliament Questions and VIP references.
- Conjunctive use studies of surface and ground water.
- Liaison with Central and State Agencies including institutional financing agencies viz., NABARD, CAPART, NGOs and Panchayati Raj Institutions, and other banks etc. for ground water development and management.
- Preparation of EFC/ SFC memo pertaining to respective activities.
- IEC activities in Central Ground Water Board.
- Administrative & technical supervision of activities of the Regional Directorates and Divisional offices of NWHR/ NHR/ NWR/ UR/ NR/ SUO, Delhi.
- Acts as Member Secretary, Central Ground Water Authority. The activities include:

a. Regulation of Ground Water Development and Management.
b. Policy, planning and implementation of regulatory activities.

c. Notification of areas for ground water development and management and monitoring of regulatory directions.
d. Issuance of NOC for ground water withdrawal to industrial/ infrastructural/ mining projects.
e. Legal matters pertaining to CGWA.

3. The Exploratory Drilling and Material Management wing(ED&MM)

The exploratory drilling and material management wing looks after the following:-

- Activities Related to Exploratory Drilling and its Monitoring.
- Preparation of EFC/SFC for their activities.
- Activities Related to Material Management.
- Activities Related to Stores, procurement of machinery & equipments etc. (including scientific instruments)
- Preparation of Tenders & EOI etc. for Outsourcing of work for scientific and engineering activities.
- Administrative & technical supervision of activities of the Regional Directorates and Divisional offices of SR/ SWR/ SECR/ KR.

4. Water Quality & Technology Transfer wing (WQ&TT)

The Water quality and Technology Transfer Wing of the Board looks after the following:-

- All activities related to Water Quality & Technology Transfer.
- Assessment of ground water resources.
- Preparation of Hydrogeological atlases, maps etc.
- Plan and monitor Geophysical activities of the Board.
- Plan and monitor Hydrological and Hydrometeorological activities of the Board.
- Benchmarking and technological upgradation of CGWB.
- Special studies on various aspects.
- International & Bilateral cooperation, symposia, National/ International Trainings/ Awards/ Fellowships etc.
- Preparation and publication of Bhujal News
- Liaison with Water Quality Assessment Authority (WQAA)/Research Institutions/ Universities for R&D schemes.
- Preparation of EFC/ SFC memo pertaining to respective activities.
- Liaison with Water Quality Assessment Authority.
- All chemical labs & accreditation of Chemical labs.
- Ground Water Pollution Studies, Isotope studies/Chemical cell planning and monitoring.
- Climate change studies under National water mission.
- Technology transfer to National & International institutions and various Central / State organizations

- Administrative and technical supervision of activities related to water quality, Assessment of Water Resources.
- Administrative and technical supervision of activities of the Regional Directorates and Divisional offices of WR/ WCR/ CR/NCR.

5. Rajiv Gandhi National Ground Water Training and Research Institute

Rajiv Gandhi National Ground Water Training and Research Institute (RGI) located at Raipur, Chhattisgarh caters to the training requirements of Central Ground Water Board and also many Central and State Govt. Organizations, Academic Institutes, NGOs etc. During XII Plan, RGI under HRD and Capacity Building Scheme of Ministry of Water Resources, River Development and Ganga Rejuvenation is implementing a three tier training programme keeping in view the requirements of the National Project on Aquifer Management. These trainings will enable creation of a trained workforce for implementation of National Project on Aquifer Management and overall sustainable development of ground water resources.

The administrative & financial matters of the Board are being dealt with by the Director (Administration) and Member (Finance).

6. **Member (Finance)** looks after the following works:-

- Compilation and submission of the Budget Estimates, Revised Estimates, Performance Budget, Notes for Demands for Grants, Supplementary Grants, Annual Plan, Five year Plan proposals of the Board to the Ministry.
- Allocation of budget to all the offices of the Board and to monitor and control the expenditure as per the sanctioned budget. Compilation and submission of the expenditure returns to the Ministry and Controller of Accounts etc.
- Scrutiny of the cases relating to procurement of stores, equipment, machinery etc. from financial angle.
- To attend and settle the audit paras, audit notes, audit objection etc and to prepare a disposal sheet of outstanding paras whenever so required.
- Advise and apprise Chairman and Members of the Board in respect of financial matters of the Board from time to time.

Central Ground Water Board had undertaken various studies through 18 Regional Directorates, supported by 17 Engineering Divisions and 11 State Unit Offices. The Board had a fleet of 85 rigs for taking up drilling operations during 2016-17.

2. NATIONAL AQUIFER MAPPING AND MANAGEMENT PROGRAMME (NAQUIM)

2.1 INTRODUCTION

The programme has been taken up under Ground Water Management and Regulation Plan Scheme in XII Five Year plan.Considering ground water over-exploitation, contamination and other related issues, Central Ground Water Board under MoWR, RD & GR has embarked upon the new initiative of Aquifer Mapping and Management Programme with the following major objectives.

- Delineation and characterization of aquifers in three dimensions
- Identification and quantification of issues
- Development of Aquifer Management Plans to ensure sustainability of ground water resources.

Under the initiative, ground water management plans for aquifer systems are prepared suggesting various interventions to optimize ground water withdrawal and identifying aquifers for domestic and drinking water purposes in quality affected areas. The management options also include identification of feasible areas for artificial recharge to ground water and water conservation which may help in arresting declining water levels. Feasible interventions for demand side management including crop diversification, increasing water use efficiency etc., wherever relevant are also suggested in the management plans.

2.2 METHODOLOGY AND APPROACH

A multidisciplinary approach using advanced tools and techniques including remote sensing, GIS, geophysical techniques, ground water modelling etc. is being followed for preparation of aquifer maps and management plans. In order to study the application of advanced techniques, six pilot projects were taken up in 5 different States representing the hydrogeological complexity of the country. The areas were Maharashtra (part of Nagpur district), Rajasthan (parts of Dausa and Jaisalmer districts), Bihar (part of Patna district), Karnataka (part of Tumkur district) and Tamilnadu (part of Cuddalore district). The learning of the Pilot projects has been synthesized and adopted in nationwide Aquifer Mapping and Management programme.

The flow diagram for preparation of aquifer maps and management plans is as given below in fig. 2.1:

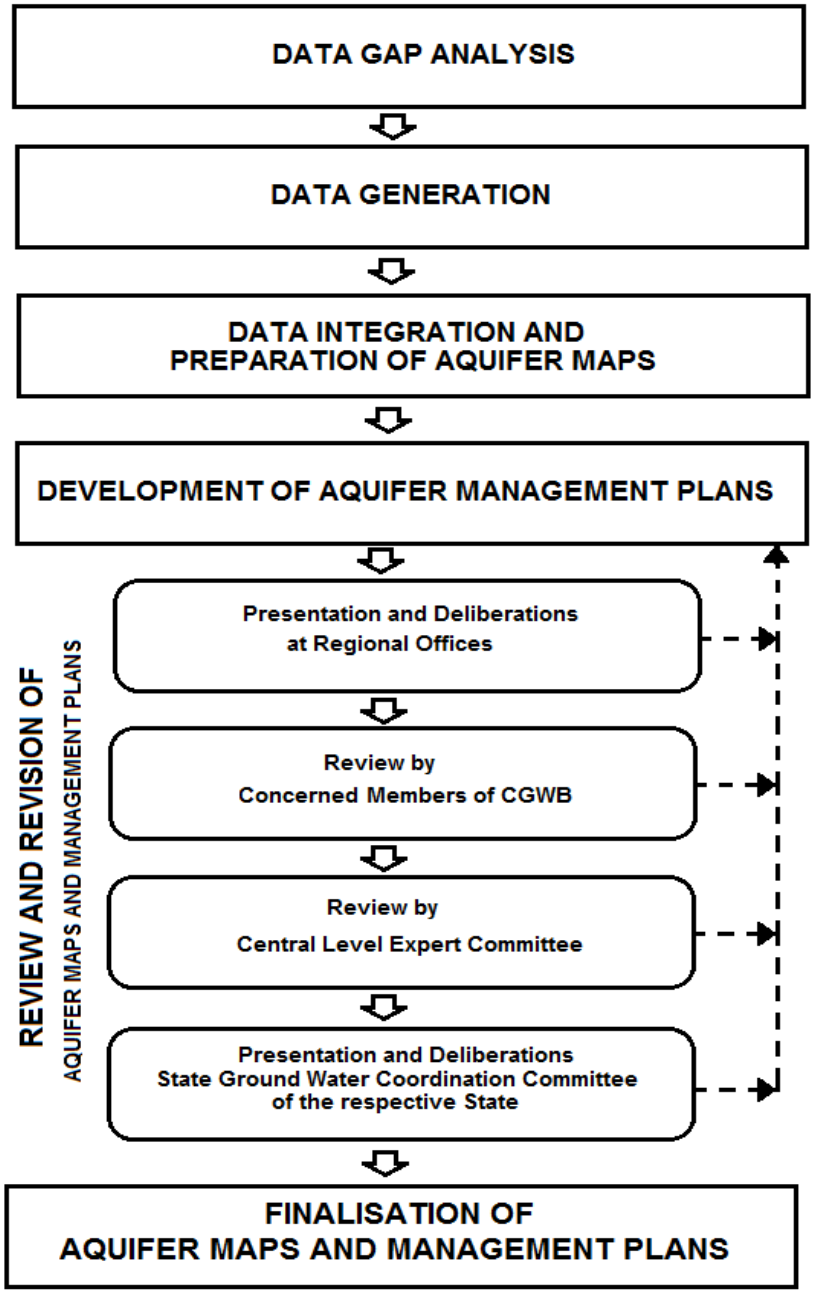


Figure 2.1 Summary of methodology and approach of the Aquifer Mapping and Management Programme.

A mutli-tier evaluation process has been put in place to ensure quality of outputs. The aquifer maps and management plans prepared by the team of officers are first reviewed by the Regional Director of the respective region of CGWB. The revised maps and management plans are then presented before the concerned members of CGWB at the central headquarters level. Subsequently the maps and management plans are presented before the National level expert committee (NLEC) constituted for this purpose. Domain specialists, who are part of the expert committee, include ground water specialists from JNU, Delhi; IIT, Roorkee; retired Chairman of CGWB; Agriculture Scientists etc. Agriculture

scientists of ICAR have also been associated in finalization of management plans for each State. In order to coordinate on various issues related to aquifer mapping, between the State and Union Government, State Ground Water Coordination Committee (SGWCC) has been formed in each state and UT, headed by the Principal Secretary of the concerned department in the respective State/U.T. The outputs are shared and deliberated in State Ground Water Coordination Committee with an objective to have mutual agreement on the proposed aquifer-wise ground water management plans which can be implemented by State Government.

2.3 MAJOR ACHIEVEMENTS

2.3.1 Aquifer Mapping and Managemen Plan Preparation

National Aquifer Mapping and Management Programme (NAQUIM) was initiated in 2012 and out of ~32 lakh km^2 of the entire country, an area of ~25 lakh km^2 has been identified to be covered under aquifer mapping in phases. During the XII plan (2012-17), major thrust was on an area of 5.26 lakh km^2 covering parts of eight priority States (Haryana, Punjab, Rajasthan, Gujarat, Andhra Pradesh, Telangana, Karnataka, Tamil Nadu) and Bundelkhand areas of Uttar Pradesh and Madhya Pradesh. These areas have been prioritised considering over-exploitation, ground water contamination and other issues. In addition to these priority areas, aquifer mapping was also taken up in other parts of the country. By the end of March 2017, aquifer maps were prepared and management plans were developed for an area of 6.31 lakh km^2 (Table 2.1) covering Bundelkhand region, parts of eight priority states and other States & 3 UTs of the country (Fig.2.2).

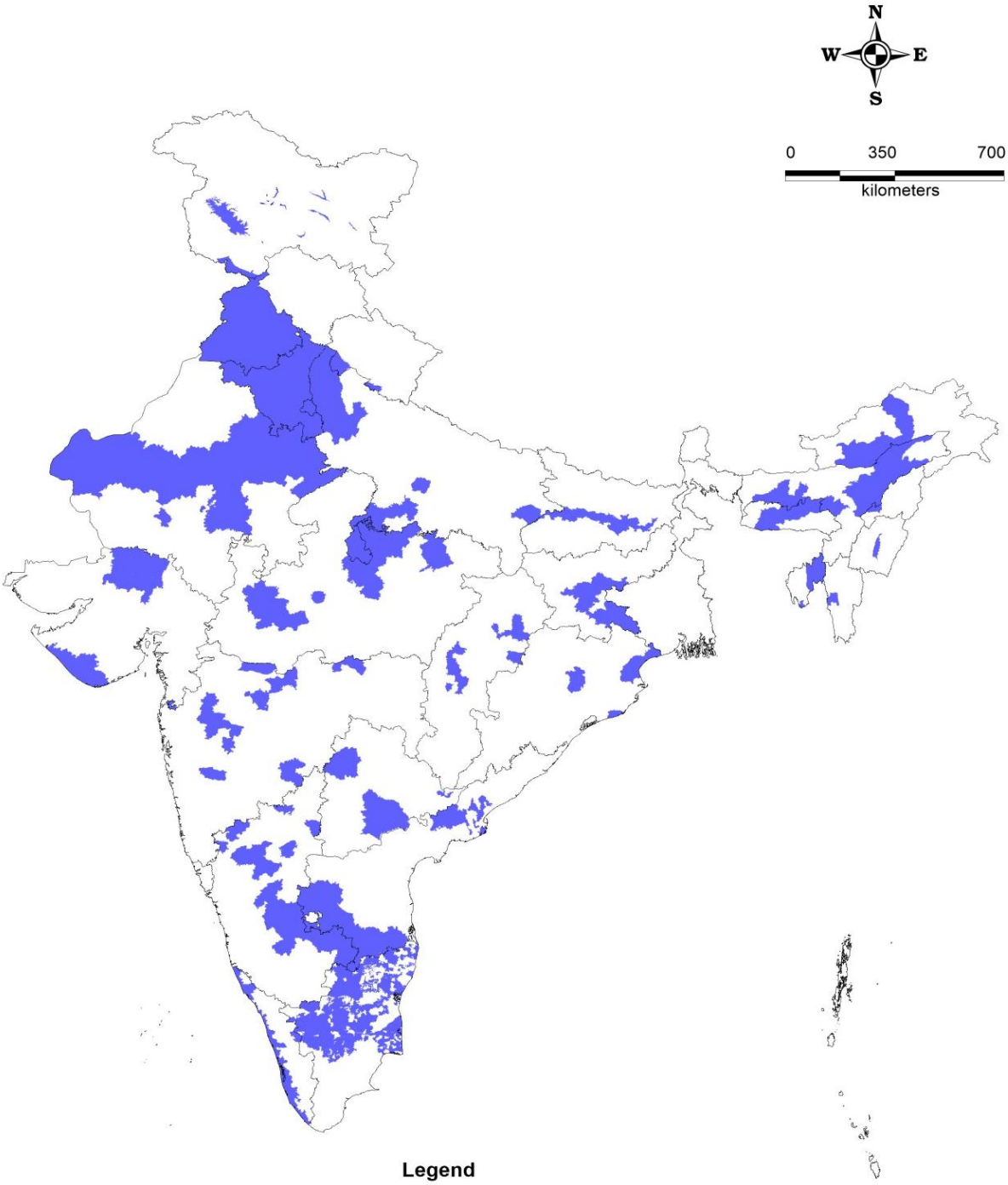


Figure 2.2: An indicative map of areas covered under NAQUIM programme till 31st March 2017.

Table 2.1: State wise progress under National Aquifer Mapping and Management Programme as on 31st March 2017

Sl. No.	State/UT	Area covered by 31st March 2017 (km^2)
1.	Andhra Pradesh	39141
2.	Arunachal Pradesh	1965
3.	Assam	6179
4.	Bihar	9607
5.	Chhattisgarh	10619
6.	Dadra & Nagar Haveli	490
7.	Delhi	1483
8.	Gujarat	31522
9.	Haryana	44179
10.	Jammu & Kashmir	8220
11.	Jharkhand	17693
12.	Karnataka	48311
13.	Kerala	5200
14.	Lakshadweep	32
15.	Madhya Pradesh	45430
16.	Maharashtra	31418
17.	Manipur	155
18.	Meghalaya	1627
19.	Nagaland	400
20.	Odisha	10193
21.	Puducherry	293
22.	Punjab	50368
23.	Rajasthan	143275
24.	Tamil Nadu	44573
25.	Telangana	22328
26.	Tripura	559
27.	Uttar Pradesh	45339
28.	Uttarakhand	2811
29.	West Bengal	8008
	TOTAL	**631418**

2.3.2 Meetings and workshops:

To facilitate effective implementation of the NAQUIM programme, a National Inter-departmental Steering Committee (NISC) has been constituted by the Govt of India. During 2016-17, two meetings (26/09/2016 and 23/03/2017) of the NISC were held under the Chairmanship of Secretary (WR). Representatives from several central ministries and state government departments participated in the meeting and deliberated on various issues related to NAQUIM. Regular meetings were held with the

state governments for implementation of Aquifer Management plans in the respective states during the meeting of State ground Water Coordination committee. To Review and finalize the Aquifer Maps and Management Plans a National Level Expert Committee was constituted. Groundwater experts from various institutions like IITs and central Universities, Agriculture scientists, retired Chairman of CGWB are part of the Expert Committee.

Ground water modeling is one of the important components of NAQUIM programme. To facilitate wider consultation leading to formulation of scientifically accurate and policy relevant management plans involving ground water modelling, CGWB had organised two workshops: i) at IISc, Bangalore on 22nd April 2016 (Fig.3) and (ii) IIT, Kharagpur on 1st September 2016 on the central theme of ground water modeling. While workshop at Bangalore focussed on modeling in hard rock areas, the workshop at Kharagpur was organised with special reference to the issues and challenges in soft rock areas. These workshops provided platforms for a multidisciplinary dialogue on various aspects of ground water modeling and allied topics. Various aspects like data requirements, data adequacy, alternative approaches, protocols, SOPs, skill requirements etc were deliberated upon.

Figure 2.3: Deliberations during the meeting of National Level Expert Committee (NLEC) for review of Aquifer Maps and Management Plan, New Delhi

2.3.3 Notable outcomes of the NAQUIM Programme.

1. Aquifer maps and management plans prepared as a part of this programme have been shared with the respective State Governments through state ground water coordination Committees, which are headed by the concerned Principal Secretaries of the respective States. The maps and

management plans are helping the agencies (State Govts) involved in water management in better decision making.

2. Aquifer mapping programme has provided detailed information on the aquifer dispositions and their characteristics, which are necessary inputs for groundwater management.
3. As a part of this programme, region specific groundwater management plans have been prepared which suggest appropriate demand and supply side management interventions to improve sustainability of ground water resources.
4. Notable actions initiated on the basis of outputs of aquifer mapping and management programme are indicated below:

i. In the State of **Andhra Pradesh**, taking up ground water recharge in the area covered under aquifer mapping is contemplated. The State Govt has completed artificial recharge studies on pilot basis.

   The Polavaram project, inter alia envisages enhanced groundwater recharge leading to improvements in groundwater levels. On request of the State Govt., as a part of NAQUIM studies total potential for ground water recharge in the sandstone area has been estimated at 234 MCM.

ii. In **Bihar**, aquifer mapping studies have provided newer insights into the depleting thermal springs of Rajgir area in Nalanda District, which is one of the most visited tourism sites in Bihar.

iii. For the State of **Delhi**, the Managed Aquifer Recharge plans are prepared in collaboration with NIH, Roorkee.

iv. In the State of **Karnataka**, conjunctive use of surface water and ground water programme is proposed to be included in the field programmeas per the recommendations of NAQUIM studies. The state govt has also informed that rainwater harvesting and ground water quality issues, as per the findings of aquifer mapping studies, are also proposed to be included in awareness programmes. They also propose to do detailed field surveys for artificial recharge sites and recommend them to minor irrigation department.

v. In the State **Kerala**, based on the findings of aquifer mapping, two Panchyats (Vadakarapathi and Eruthenpathi) of Chittur block have prepared water security plans.

   Based on the reports of aquifer mapping studies, Govt of Kerala has initiated artificial recharge and water conservation programmes. For this purpose, the State govt has also sought assistance of CGWB in identifying sites.

vi. In **Madhya Pradesh**, based on the findings of exploration under the aquifer mapping programme in Tikamgar district, 22 sites for construction of water wells were recommended in villages in which there were problems of locating potential sites for drinking water wells.The PHED, Govt of Madhya Pradesh has prepared a proposal for artificial recharge in parts of Dewas district. Department of Panchayat and Rural development, Govt of Madhya Pradesh is

utilising the NAQUIM report for construction of recharge shafts and percolation tanks in Kolans watershed of Phanda block of Bhopal district.

vii. A proposal has been formulated for Recharge of Ground Water in Tapi Basin covering parts of **Madhya Pradesh and Maharashtra**. The scheme will benefit inaugmenting groundwater recharge In these areas.

viii. **Maharashtra** State Govt, by utilising the outcomes of the National aquifer mapping and management programme has undertaken schemes for source water sustainability under National Rural Drinking Water Programme (NRDWP) in 10 districts viz. Nasik, Jalgaon, Ahmednagar, Pune, Aurangabad, Jalna, Latur, Amravati, Buldana and Nagpur.

ix. In **Meghalaya,** based on the management plan suggested by CGWB, the State govt has proposed a pilot project on ground water based irrigation system in Marangar area of Ribhoi district.

x. Ground Water Department of **Rajasthan** has accepted and forwarded the recommendations of aquifer mapping studies to PHED for consideration.

xi. In **Tamilnadu**, based on the findings of aquifer mapping, the state government has initiated regulatory measures to control ground water extraction in the coastal areas of Cuddalore district. In addition to this, the State Government has proposed piezometers along coasts to monitor sea water intrusion.

xii. In the state of **Uttar Pradesh**, based on the outcome of Aquifer mapping, 72 arsenic safe wells have been constructed in the second aquifer (Avoiding Arsenic infested first aquifer) in Bairia block of Ballia district and Karanda block of Ghazipur district. The main wells have been handed over to the State Govt facilitating supply of arsenic safe drinking water in these two blocks. The maps and management plans have been shared at district level in meetings chaired by District Magistrates/Chief Development Officers of the respective districts in 17 districts. Based on the recommendations of aquifer mapping and management programme, the district Magistrate of Meerut has directed the concerned official to implement modern sugarcane irrigation practice in select areas.For sustainability in ground water recharge in stressed blocks and stressed urban areas, a new scheme named ‘State ground water conservation mission’ has been initiated by the Govt of UP.

xiii. Govt of **West Bengal** has informed that the recommendations of the aquifer mapping studies in West Bengal especially those in the Arsenic affected areas are being considered by PHED for execution.

3. GROUND WATER EXPLORATION

Ground Water Exploration aided by drilling is one of the major activities of the Board. It is aimed at delineation of aquifers in different hydrogeological setups and determination of their hydraulic parameters. The exploratory drilling operations have enabled demarcation of aquifers both in lateral and vertical extensions and evaluation of various aquifer parameters, designing of suitable structures and assessment of their yield potential in various hydrogeological settings. These studies have helped in identifying areas worthy for future ground water development. Ground Water Exploration contributes to a large extent in guiding the States to implement ground water development schemes.

It is being carried out by the Board through a fleet of 85 drilling rigs (31 Direct Rotary, 46 Down the Hole and 8 Percussion Combination types). During the year 2016-17, Central Ground Water Board under their Ground Water Exploration programme, constructed 785 wells (EW- 542, OW- 196, Pz- 47. Priority was accorded to Over-Exploited/ Critical/ Semi-Critical/ Drought Prone and areas affected with ground water pollution etc. Out of 785 exploratorywells, 647 wells were constructed in hard rock, 132 wells in alluvium and 6 wells in bouldary formations (Table 3.4). 54 wells were constructed in Tribal areas and 91 wells were constructed in drought prone areas (Table3.5). The statement showing State and Division & Region wise distribution of boreholes drilled/completed during 2016-17 is presented in Table 3.1 &3.2(a) & (b) & Fig 3.1 & Fig.3.2.

The Board has drilled cumulative 35236 bore holes (Including 3090 bore holes through outsourcing) as on 31.03.2017 to identify ground water worthy areas for ground water development in the country. The statement showing State-wise distribution of boreholes drilled/ completed till March, 2017 in the country is presented in Table 3.3.

Table: 3.1 State Wise Wells Constructed by CGWB during the Year 2016-17

Sl. No.	STATE/U.T.	EW	OW	Pz	TOTAL
1.	Andhra Pradesh	0	0	0	0
2.	Arunachal Pradesh	1	1	0	2
3.	Assam	10	6	0	16
4.	Bihar	0	0	0	0
5.	Chhattishgarh	25	7	0	32
6.	Goa	0	0	0	0
7.	Gujarat	28	8	0	36
8.	Haryana	6	4	1	11
9.	Himachal Pradesh	11	8	0	19
10.	Jammu & Kashmir	13	6	1	20
11.	Jharkhand	25	9	2	36
12.	Karnataka	39	17	0	56
13.	Kerala	16	5	0	21
14.	Madhya Pradesh	50	10	0	60
15.	Maharashtra	70	9	2	81
16.	Manipur	2	1	0	3
17.	Meghalaya	0	0	0	0
18.	Mizoram	0	0	0	0

19.	Nagaland	0	0	0	0
20.	Orissa	45	22	8	75
21.	Punjab	3	8	4	15
22.	Rajasthan	43	19	0	62
23.	Sikkim	0	0	0	0
24.	Tamil Naidu	59	15	0	74
25.	Tripura	1	1	2	4
26.	Telangana	34	8	23	65
27.	Uttarakhand	0	0	1	1
28.	Uttar Pradesh	35	19	3	57
29.	West Bengal	26	13	0	39
	Total	**542**	**196**	**47**	**785**

EW: Exploratary well; OW: Observation well; Pz: Piezometer

Table3.2 (a) Division wise wells constructed by CGWB during 2016-17

DIVISION		TARGET (2016-17)				ACHIEVEMENT (2016-17) (01.04.16 TO 31.03.2017)				% ACHIEVEMENT
		EW	OW	PZ	T	EW	OW	PZ	T	
1.	Ahmedabad	24	19	0	43	28	8	0	36	83.72
2.	Ambala	13	9	0	22	9	12	5	26	118.18
3.	Varanasi	19	16	0	35	27	10	3	40	114.29
4.	Chennai	34	36	0	70	68	20	0	88	125.71
5.	Ranchi	29	20	0	49	25	9	2	36	73.47
6.	Nagpur	31	26	0	57	70	9	2	81	142.11
7.	Guwahati	18	12	0	30	14	9	2	25	83.33
8.	Jammu	18	12	0	30	13	6	1	20	66.67%
9.	Hyderabad	23	20	20	63	34	8	23	65	103.17
10.	Bhubneshwar	39	21	10	70	45	22	8	75	107.14
11.	Jodhpur	18	18	10	46	43	19	0	62	134.78
12.	Bhopal	33	27	0	60	50	10	0	60	100.00
13.	Raipur	26	22	0	48	25	7	0	32	66.67
14.	Bangalore	32	28	0	60	46	17	0	63	105.00
15.	Kolkata	18	12	0	30	26	13	0	39	130.00
16.	Bareilly	10	7	0	17	8	9	1	18	105.88
17.	Dharamshala	10	10	0	20	11	8	0	19	95.00
	TOTAL	**395**	**315**	**40**	**750**	**542**	**196**	**47**	**785**	**104.67**

Table3.2 (b) Region wise wells constructed by CGWB during 2016-2017

REGION, States	TARGET 2016-17				ACHIEVEMENT 2016-17				% ACHIEVEMENT
	EW	OW	PZ	T	EW	OW	PZ	T	
NWHR. Jammu	18	12	0	**30**	13	6	1	**20**	66.67
NWR. Chandigarh	13	9	0	**22**	9	12	5	26	118.18
WR. Jaipur	18	18	10	**46**	43	19	0	62	134.78
WCR. Ahmedabad	24	19	0	**43**	28	8	0	36	83.72
NCR. Bhopal	33	27	0	**60**	50	10	0	60	100.00
NCCR. Raipur	26	22	0	**48**	25	7	0	32	66.67
CR. Nagpur	31	26	0	**57**	70	9	2	81	142.11
NR. Lucknow	28	22	0	**50**	35	19	3	57	114.00
MER. Patna	29	20	0	**49**	25	9	2	36	73.47
ER. Kolkata	18	12	0	**30**	26	13	0	39	130.00
NER. Guwahati	18	12	0	**30**	14	9	2	25	83.33
SER. Bhubaneshwar	39	21	10	**70**	45	22	8	75	107.14
SR. Hyderabad	23	20	20	**63**	34	8	23	65	103.17
SWR. Bangalore	25	22	0	**47**	39	17	0	56	119.15
SECR. Chennai	27	30	0	**57**	59	15	0	74	129.82
KR. Trivandrum	14	12	0	**26**	16	5	0	21	80.77
UR. Dehradun	1	1	0	**2**	0	0	1	1	50.00
NHR. Dharamsala	10	10	0	**20**	11	8	0	19	95.00
TOTAL	**395**	**315**	**40**	**750**	**542**	**196**	**47**	**785**	**104.67**

Table 3.3: Status of Bore Holes Drilled by CGWB as on 31.03.2017

S. No.	STATE/ UT	EW	OW	PZ	Total	EW	OW	PZ	SH	DW	Total	TOTAL (I + II)
		(I) Through Outsourcing (Contractual)				(II) Through Departmental Rigs						
A	**STATES**											
1	Andhra Pradesh	90			90	719	368	263	9	4	1363	1453
2	Arunachal Pradesh				0	38	6	0	1	1	46	46
3	Assam				0	415	190	59	16	42	722	722
4	Bihar				0	298	185	74	10	514	1081	1081
5	Chhattisgarh	300		105	405	720	233	161	0	28	1142	1547
6	Goa				0	58	18	14	0	31	121	121
7	Gujarat	165			165	1064	485	498	27	255	2329	2494
8	Haryana	21	2	80	103	404	271	225	23	170	1093	1196
9	Himachal Pradesh				0	229	29	5	1		264	264
10	Jammu & Kashmir	21			21	425	89	37	8	114	673	694
11	Jharkhand	82	8		90	397	195	44	4	71	711	801
12	Karnataka	134			134	1427	662	354	7	5	2455	2589
13	Kerala	10			10	534	193	231	16	13	987	997
14	Madhya Pradesh	364	8	80	452	1223	696	176	8	149	2252	2704
15	Maharashtra	92	2	88	182	1498	509	166	2	166	2341	2523
16	Manipur				0	29	14	1	0	2	46	46
17	Meghalaya				0	100	30	2	2	8	142	142
18	Mizoram				0	3	3	0	0		6	6
19	Nagaland				0	15	6	1	0	3	25	25
20	Orissa	439		67	506	1546	377	148	21	191	2283	2789
21	Punjab	19	3		22	208	211	95	20	14	548	570
22	Rajasthan	240			240	1302	490	565	93	591	3041	3281
23	Sikkim				0	31	9	0	0		40	40
24	Tamil Nadu	110		179	289	1148	411	278	13	93	1943	2232
25	Tripura				0	62	29	1	5	22	119	119
26	Telangana				0	711	500	532	5	27	1775	1775
27	Uttarakhand	20	4		24	71	6	3	1	129	210	234
28	Uttar Pradesh	245	12		257	980	649	199	40	501	2369	2626
29	West Bengal			100	100	518	250	177	12	82	1039	1139
TOTAL (A)		**2352**	**39**	**699**	**3090**	**16173**	**7114**	**4309**	**344**	**3226**	**31166**	**34256**
B	**Union Territory**											
1	Andaman & Nicobar				0	46	13		1		60	60

2	Chandigarh				0	7	17	14	2	15	55	55
3	Dadra & NagarHaveli				0	14	1				15	15
4	Delhi				0	149	64	160	13	380	766	766
5	Daman & Diu				0			7			7	7
6	Pondicherry				0	30	20	8	5	14	77	77
TOTAL (B)		**0**	**0**	**0**	**0**	**246**	**115**	**189**	**21**	**409**	**980**	**980**
GRAND TOTAL (A+B)		**2352**	**39**	**699**	**3090**	**16419**	**7229**	**4498**	**365**	**3635**	**32146**	**35236**

Table 3.4: Division/ State/ Formation wise achievement during 2016-17 (as on 31.03.2017)

DIVISION	STATE/ UT	HARD ROCK				ALLUVIUM					BOULDARY				TOTAL				
		EW	OW	PZ	T	EW	OW	PZ	SH	T	EW	OW	PZ	T	EW	OW	PZ	SH	T
I. Ahmedabad	Gujarat	17	2		**19**	11	6			**17**				**0**	28	8	0	0	**36**
II. Ambala	Haryana				**0**	5	7	5		**17**				**0**	5	7	5	0	**17**
	Punjab				**0**	4	3			**7**		2		**2**	4	5	0	0	**9**
	Delhi				**0**					**0**				**0**	0	0	0	0	**0**
III. Varanasi	Uttar Pradesh	17	6	3	**26**	10	4			**14**				**0**	27	10	3	0	**40**
IV. Chennai	Tamil Nadu	57	13		**70**	1	3			**4**				**0**	59	15	0	0	**74**
	Kerala	9	5		**14**					**0**				**0**	9	5	0	0	**14**
V. Ranchi	Bihar				**0**	1				**1**				**0**	1	0	0	0	**1**
	Jharkhand	24	9	2	**35**					**0**				**0**	24	9	2	0	**35**
VI. Nagpur	Maharashtra	70	9	2	**81**					**0**				**0**	70	9	2	0	**81**
VII. Guwahati	Assam			1	**1**	2	1			**3**	1	1		**2**	3	2	1	0	**6**
	Meghalaya	10	6		**16**					**0**				**0**	10	6	0	0	**16**
	Tripura				**0**	1	1		1	**3**				**0**	1	1	0	1	**3**
VIII. Jammu	Jammu & Kashmir	12	6	1	**19**					**0**	1			**1**	13	6	1	0	**20**
IX. Hyderabad	Andhra Pradesh	21	6	23	**50**					**0**				**0**	21	6	23	0	**50**
	Telangana	13	2		**15**					**0**					13	2	0	0	**15**
X. Bhubaneswar	Orissa	42	19	8	**69**	3	3			**6**				**0**	45	22	8	0	**75**
XI. Jodhpur	Rajasthan	19	10		**29**	24	9			**33**				**0**	43	19	0	0	**62**
XII. Bhopal	Madhya Pradesh	50	10		**60**					**0**				**0**	50	10	0	0	**60**
XIII. Raipur	Chattisgarh	25	7		**32**					**0**				**0**	25	7	0	0	**32**
XIV. Bangalore	Karnataka	39	17		**56**					**0**				**0**	39	17	0	0	**56**
	Kerala	7			**7**					**0**				**0**	7	0	0	0	**7**
XV. Kolkatta	West Bengal	8	4		**12**	18	9			**27**				**0**	26	13	0	0	**39**
XVI. Bareilly	Uttarkhand				**0**					**0**	1			**1**	1	0	0	0	**1**
	Uttar Pradesh	7	9	1	**17**					**0**				**0**	7	9	1	0	**17**
XVII. Dharamshala	Himachal Pradesh	11	8		**19**					**0**				**0**	11	8	0	0	**19**
TOTAL		**458**	**148**	**41**	**647**	**80**	**46**	**5**	**1**	**132**	**3**	**3**	**0**	**6**	**542**	**196**	**46**	1	**785**

Table 3.5: Division/ State/ Head wise achievement during 2016-17 (as on 31.03.2017)

DIVISION	STATE/ UT	NORMAL				TRIBAL					DROUGHT				TOTAL				
		EW	OW	PZ	T	EW	OW	PZ	SH	T	EW	OW	PZ	T	EW	OW	PZ	SH	T
I.Ahmedabad	Gujarat	28	8		**36**					**0**				**0**	28	8	0	0	**36**
II.Ambala	Haryana	5	7	5	**17**					**0**				**0**	5	7	5	0	**17**
	Punjab	4	5		**9**					**0**				**0**	4	5	0	0	**9**
	Delhi				**0**					**0**				**0**	0	0	0	0	**0**
III.Varanasi	Uttar Pradesh	10	4		**14**					**0**	17	6	3	**26**	27	10	3	0	**40**
IV.Chennai	Tamil Nadu	58	16		**74**					**0**				**0**	59	15	0	0	**74**
	Kerala	9	5		**14**					**0**				**0**	9	5	0	0	**14**
V.Ranchi	Bihar	1			**1**					**0**				**0**	1	0	0	0	**1**
	Jharkhand	24	9	2	**35**					**0**				**0**	24	9	2	0	**35**
VI.Nagpur	Maharashtra	70	9	2	**81**					**0**				**0**	70	9	2	0	**81**
VII.Guwahati	Assam	3	2	1	**6**					**0**				**0**	3	2	1	0	**6**
	Meghalaya				**0**	10	6			**16**				**0**	10	6	0	0	**16**
	Tripura				**0**	1	1		1	**3**				**0**	1	1	0	1	**3**
VIII.Jammu	Jammu & Kashmir	13	6	1	**20**					**0**				**0**	13	6	1	0	**20**
IX.Hyderabad	Andhra Pradesh	21	6	23	**50**					**0**					21	6	23	0	**50**
	Telangana	13	2		**15**					**0**				**0**	13	2	0	0	**15**
X.Bhubaneswar	Orissa	18	13	8	**39**	10	3			**13**	17	6		**23**	45	22	8	0	**75**
XI.Jodhpur	Rajasthan	19	10		**29**					**0**	24	9		**33**	43	19	0	0	**62**
XII.Bhopal	Madhya Pradesh	50	10		**60**					**0**				**0**	50	10	0	0	**60**
XIII.Raipur	Chattisgarh	1			**1**	18	4			**22**	6	3		**9**	25	7	0	0	**32**
XIV.Bangalore	Karnataka	39	17		**56**					**0**				**0**	39	17	0	0	**56**
	Kerala	7			**7**					**0**				**0**	7	0	0	0	**7**
XV.Kolkatta	West Bengal	26	13		**39**					**0**				**0**	26	13	0	0	**39**
XVI.Bareilly	Uttarkhand	1			**1**					**0**				**0**	1	0	0	0	**1**
	Uttar Pradesh	7	9	1	**17**					**0**				**0**	7	9	1	0	**17**
XVII.Dharamshala	Himachal Pradesh	11	8		**19**					**0**				**0**	11	8	0	0	**19**
TOTAL		**438**	**159**	**43**	**640**	**39**	**14**	**0**	**1**	**54**	**64**	**24**	**3**	**91**	**542**	**196**	**46**	**1**	**785**

Table 3.6: Statewise Status of Boreholes Drilled by CGWB during 2016-17

Sr. No.	STATE/U.T	EW	OW	PZ	SH	TOTAL
1	Andhra Pradesh	0	0	0		**0**
2	Arunachal Pradesh	1	1	0		**2**
3	Assam	10	6	0		**16**
4	Bihar	0	0	0		**0**
5	Chhattishgarh	25	7	0		**32**
6	Goa	0	0	0		**0**
7	Gujarat	28	8	0		**36**
8	Haryana	6	4	1		**11**
9	Himachal Pradesh	11	8	0		**19**
10	Jammu & Kashmir	13	6	1		**20**
11	Jharkhand	25	9	2		**36**
12	Karnataka	39	17	0		**56**
13	Kerala	16	5	0		**21**
14	Madhya Pradesh	50	10	0		**60**
15	Maharashtra	70	9	2		**81**
16	Manipur	2	1	0		**3**
17	Meghalaya	0	0	0		**0**
18	Mizoram	0	0	0		**0**
19	Nagaland	0	0	0		**0**
20	Orissa	45	22	8		**75**
21	Punjab	3	8	4		**15**
22	Rajasthan	43	19	0		**62**
23	Sikkim	0	0	0		**0**
24	Tamil Naidu	59	15	0		**74**
25	Tripura	1	1	1	1	**4**
26	Telangana	34	8	23		**65**
27	Uttarakhand	0	0	1		**1**
28	Uttar Pradesh	35	19	3		**57**
29	West Bengal	26	13	0		**39**
	TOTAL	**542**	**196**	**46**	**1**	**785**

3.3. HIGH YIELDING WELLS

During 2016-17 the Board under its scientific exploratory drilling programme has constructed high yielding wells in various aquifers in different parts of the Country based on hydrogeological studies coupled with remote sensing and geophysical techniques. High yielding wells with discharge ranging from 180 to 2460 litres per minute (lpm) have been constructed in the States of Telangana, Chhattisgarh, Kerala, Karnataka, Rajasthan, Madhya Pradesh, Maharashtra, Gujarat, Andhra Pradesh, Odisha, Uttara Pradesh, Himachala Pradesh, Jammu Kashmir, West Bengal and Tamilnadu. The study helped in identifying groundwater sources in other parts of States having similar hydrogeological conditions and in guiding the States to adopt follow up action in this regard for ground water development to cater to drinkingwater supply and other demands. High Yielding Wells explored during 2016-17 are presented in Table 3.8.

Table 3.7: High Yielding Wells Explored During 2016-17

S. No.	State	District	Location	Discharge in Litre per minutes(lpm)
1	Kerala	Palakkad	Kanjirapuzha EW	540
2	Kerala	Palakkad	Kanjirapuzha OW	720
3	Kerala	Palakkad	Nellipuzha	360
4	Kerala	Palakkad	Bhimanad	360
5	Kerala	Palakkad	Cherpulassery	960
6	Kerala	Palakkad	Kinavallur	270
7	Kerala	Palakkad	Kadampazhipuram EW	960
8	Kerala	Palakkad	Kadampazhipuram OW	1200
9	TamilNadu	Thiruvarur	Central University	1800
10	TamilNadu	Trichy	Uppliyapuram	456
11	TamilNadu	Trichy	Eragudi	750
12	TamilNadu	Vellore	Kaniyambadi	630
13	TamilNadu	Vellore	Banavaram	500
14	TamilNadu	Vellore	Velam	540
15	Karnataka	Tumkur/ Madhugiri	Kodalapura EW	847.8
16	Karnataka	Bellary/Hadgali	Nevli EW	353.4
17	Karnataka	Bellary/ Hadgali	Nevli OW	429.6
18	Karnataka	Bellary/ Hadgali	Kavli EW	330
19	Karnataka	Bellary Bellary /Hadgali	Kavli OW	414
20	Karnataka	Tumkur /sira	Chikkanahalli EW	1480
21	Karnataka	Tumkur/C.N.Halli	Kenkere EW	330
22	Karnataka	Bellary/ Hadgali	Nagati Basapura(EW)	180
23	Karnataka	Bellary/ Hadgali	Nagati Basapura(OW)	552
24	Karnataka	Tumkur /Korategere	Mavathur OW	607.2

25	Karnataka	Tumkur /Sira	Chikkanahalli OW	720
26	Karnataka	Tumkur /Sira	Sidlakona EW	720
27	Karnataka	Tumkur/C.N.Halli	Kenkere OW	201
28	Karnataka	Tumkur/C.N.Halli	Siddanakatte EW	412.8
29	Karnataka	Tumkur/C.N.Halli	Siddanakatte EW	540
30	Karnataka	Tumkur /Sira	G.Rangenahalli	198
31	Karnataka	Tumkur /Koratege	Doddapalanahalli (EW)	240
32	Karnataka	Tumkur /Koratege	Doddapalanahalli (OW)	986.40
33	Karnataka	Tumkur /Sira	Badamranahalli EW	306
34	Karnataka	Tumkur/Tumkur		360
35	Karnataka	Tumkur/Gubbi	Marishettyhalli (EW)	504.6
36	Karnataka	Tumkur/Gubbi	Marishettyhalli (OW)	371.4
37	Karnataka	Tumkur/CN Halli	Beldhara EW	390
38	Karnataka	Tumkur/CN Halli	Beldhara OW	360
39	Andhra Pradesh	Ananthapur	Cholasamundram	654
40	Andhra Pradesh	Ananthapur	Cholasamundram	529
41	Andhra Pradesh	Ananthapur	Narsingarayana Roppam	646
42	Andhra Pradesh	Ananthapur	Narsingarayana Roppam	1034
43	Andhra Pradesh	Ananthapur	Narsingarayana Roppam	356
44	Telangana	Karimnagar	PotlaPally-I	323
45	Telangana	Karimnagar	Potlapally-I	189
46	Telangana	Karimnagar	Devakkapally	288
47	Maharastra	Buldhana	Golegaon (Kh	266
48	Maharastra	Solapur	Malkhambi	190
49	Maharastra	Solapur	Akluj	190
50	Maharastra	Solapur	Tamshidwadi	465
51	Maharastra	Satara	Aundh	190
52	Maharastra	Latur	Kabal Sangvi	190
53	Maharastra	Latur	Chincholi Sayakhan	266
54	Maharastra	Latur	Pohregaon	356
55	Maharastra	Akola	Mirzapur	465
56	Maharastra	Akola	Jamb	1076
57	Maharastra	Akola	Pandhurna	356
58	Madhya Pradesh	Chhatarpur	Bhimkund	2460
59	Madhya Pradesh	Shajapur	Niphaniya	376
60	Madhya Pradesh	Agar	Tanodiya	216
61	Madhya Pradesh	Agar	Kanod	372
62	Madhya Pradesh	Agar	Suigaon	186
63	Gujarat	Kachcha	Palasva EW I	540
64	Gujarat	Kachcha	Palasva EW II	1098
65	Gujarat	Banaskhantha	Vanasan EW	840
66	Gujarat	Banaskhantha	Vanasan OW	600
67	Gujarat	Botad	Alau EW II	720

68	Gujarat	Botad	Vajalka EW	720
69	Gujarat	Botad	Vajalka EW	660
70	Chhattisgarh	Balod	Dhanapuri EW	180
71	Chhattisgarh	Balod	Tarri EW	210
72	Chhattisgarh	Balod	Kochwahi EW	296
73	Chhattisgarh	Balod	Kochwahi OW	296
74	Chhattisgarh	Dhamtari	Bhatagaon	180
75	Chhattisgarh	Dhamtari	Dahi OW	240
76	Chhattisgarh	Dhamtari	Gadadih	300
77	Chhattisgarh	Dhamtari	Dahi EW	330
78	Chhattisgarh	Dhamtari	Bhatagaon EW	600
79	Chhattisgarh	Durg	Shivkokri	960
80	Chhattisgarh	Balod	Dhanapuri EW	180
81	Odisha	Ganjam	Pallunga II	204
82	Odisha	Ganjam	Baruda	210
83	Odisha	Ganjam	Baruda(ow)	210
84	Odisha	Ganjam	Lalmetta	210
85	Odisha	Ganjam	Lalmetta(ow)	240
86	Odisha	Ganjam	Bhadakhalajari	240
87	Odisha	Puri	Kulashekharpatana OW	252
88	Odisha	Cuttack	Bentua, Chakradharpur	270
89	Odisha	Puri	Kulashekharpatana EW	270
90	Odisha	Puri	Suhagpur	300
91	Odisha	Cuttack	Radhadamodarpur(EW)	330
92	Odisha	Cuttack	Bentua, Chakradharpur(OW)	336
93	Odisha	Puri	Talabania EW	345
94	Odisha	Puri	Talabania OW	345
95	Odisha	Keonjhar	Raghunathpur	480
96	Odisha	Keonjhar	Raghunathpur(ow)	480
97	Odisha	Puri	Loknath Temple	480
98	Odisha	Puri	Loknath Temple(ow)	480
99	Odisha	Puri	Pirjipur	480
100	Odisha	Khurda	Pitagadia	540
101	Odisha	Cuttack	Radhadamodarpur(OW)	546
102	Odisha	Keonjhar	Pandua	552
103	Odisha	Khurda	Pitagadia	592
104	Odisha	Cuttack	Dahisara	600
105	Odisha	Keonjhar	Pandua	600
106	Odisha	cuttack	Dhurkudia	660
107	Odisha	Cuttack	Dhurkudia(ow)	666
108	Odisha	Khurda	Firkinali(ow)	690
109	Odisha	Cuttack	Ghantikhal	720
110	Odisha	Khurda	Firkinali	720

111	Odisha	Khurda	Mahimanagar	720
112	Odisha	Khurda	Mahimanagar(OW)	720
113	Odisha	Cuttack	Dahisara	750
114	Odisha	Khurda	Bhola	900
115	Odisha	Khurda	Bhola(ow)	900
116	Odisha	Cuttack	Ghantikhal(ow)	923
117	Uttara Pradesh	Sonbhadra	Bichchhi	1130
118	Uttara Pradesh	Sonbhadra	Khan Pather	1130
119	Uttara Pradesh	Mirzapur	Sondhi Parsona	892
120	Uttara Pradesh	Mirzapur	Mahullar EW	540
121	Uttara Pradesh	Mirzapur	Mahullar OW	690
122	Uttara Pradesh	Sonbhadra	Devatan EW	624
123	Uttara Pradesh	Sonbhadra	Devatan OW	771
124	Uttara Pradesh	Mirzapur	Piuri	600
125	Himachal Pradesh	Sirmaur	Dhangwala	871
126	J & K	Kathua	Pucca Chumar	1080
127	J & K	Kathua	Dewal	960
128	J & K	Udampur	15th BN ITBP	432
129	J & K	Jammu	52 Brigade Pallanwalla	600
130	J & K	Jammu	Lower Rangoora	918
131	Rajasthan	Ajmer	Moremagri	300
132	Rajasthan	Alwar	Sachond	650
133	Rajasthan	Alwar	Sachond	450
134	Rajasthan	Jaipur	Chotta Guda	700
135	Rajasthan	Jaipur	Chotta Guda	700
136	Rajasthan	Jodhpur	Netera	2400
137	Rajasthan	Jodhpur	Netera	1100
138	Rajasthan	Jodhpur	Netera	1100
139	Meghalaya	Ri Bhoi	Thadrang	198
140	West Bengal	Nadia	Sutia	1920
141	West Bengal	Nadia	Moktarpur	1260
142	West Bengal	Purulia	Ambagan	240
143	West Bengal	Purulia	Belguma	240
144	West Bengal	Purulia	Tulin	480
145	West Bengal	South 24 Parganas	Sarberia	1560

Fig 3.1 High Yielding wellconstructed by CGWB , ER, Kolkata in Alluvium formation at Sutia, Nadia district, West Bengal

Fig 3.2 High Yielding well Kadambazhipuram Palakkad district, Kerala discharge 20lps

Fig 3.3 . Pumping test at Cherpulassery Exploratory well (discharge 16.00 Lps), Kerala

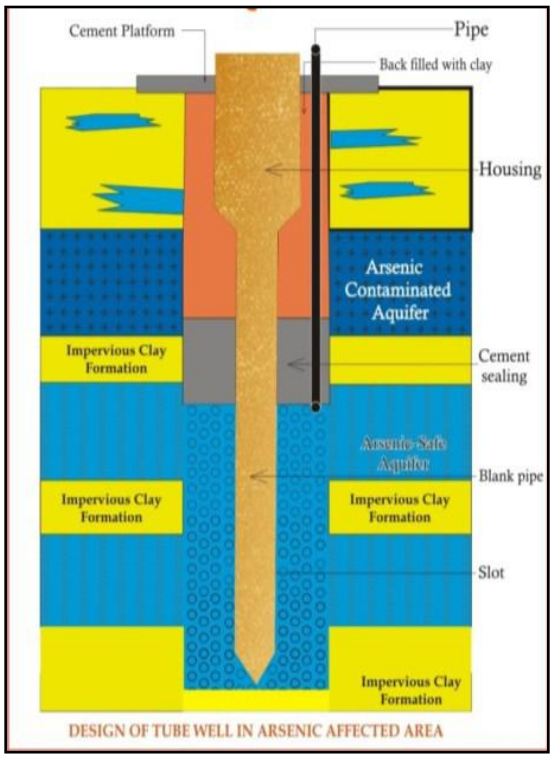


Fig 3.4. Schematic Design of a Tube Well with Cement Seal for Arsenic affected area

Fig 3.5-Exploratory Well drilled at Nawagaon, Block-Bagbahera, District- Mahasamund (CG), Discharge with 18 lps

4. GEOPHYSICAL STUDIES

Geophysical investigations are mainly used for exploration of groundwater and in delineating the underground structures which control the occurrence, distribution and movement ground water. Geophysical techniques for ground water investigations are applied on regular basisin CGWB. The Board utilizes both the surface and the subsurface (well logging) geophysical techniques in the search of groundwater and proper construction of water wells. The findings of the geophysical studies supplement the hydrogeological and geomorphologic investigations of a place. These techniques are integral part of the ground water surveys and exploration programmes.

Borehole logging is used to obtain information pertaining to lithology, fractures, permeability, porosity and, water qualityso as to delineate subsurface disposition of aquifers. Borehole logging determines the character and thickness of the different geologic units in drilled boreholes. As Saline / brackish water bearing aquifers are present in different parts of India and fresh water bearing aquifers are often intervened by the saline water aquifers,such information is essential for proper placement of casing and screens in water-supply wells, for characterizing problems related to ground-water salinity. The proper positioning of casing and screen pipes in a well can be rapidly evaluated with geophysical logging.

Various other techniques like Self Potential, Induced Polarization, Mise-a-la-masse of electrical method*,* refraction seismic, electromagnetic – the Horizontal Loop, Very Low Frequency (VLF) & Transient Electromagnetic *and* magnetic, Imaging Resistivity 2-D survey and Heliborne Survey are being gradually incorporated through several Indian andforeign aided collaborative groundwater projects.

Central Ground Water Board has carried out surface geophysical surveys specially the traditional Electrical Resistivity Surveys in soft and hard rock formations to delineate the ground water bearing zones/structures, pin-pointing sites for construction of boreholes and providing inputs for formulating proposals for constructing artificial recharge structures. Geophysical surveyshave also been conducted for delineating the bedrock topography and sandy horizon of non – perennial channel. Apart far these, resistivity survey (VES) werecarried for short-term water supply investigations on request of other Government organizations and Public Sector Undertakings.

Aquifer Mapping Programme

Under the Aquifer mapping programme, Central Ground Water Board has targetfor delineating the aquifers upto 300 m depth in areas underlain by soft rock and upto 200 m in areas underlain by hard rock formations, in which geophysical survey and techniques playa vital role.

During the year 2016-17, geophysical investigations have been carried out under Aquifer Mapping program through 2917 VES, 94.03 line Km profiling, 2.68 line Kms 2-D profiling and 77 borehole

logging (Table 4.1). An important highlight of the programme during 2016-17 was the conduction of Electrical resitivity survey in mission mode through563 VES in Gujrat and 630 VES in Tamilnadu.

Table 4.1 Geophysical Surveys & Bore Hole Logging during 2016-2017

	Regions	VES	1-D profiling Line KM	2-D profiling Line KM	GP-Logging
1.	NWHR, Jammu	38	0	0	2
2.	NWR, Chandigarh	115	0	0	6
3.	WR, Jaipur	53	0	0	0
4.	WCR, Ahmedabad	48	9	0	6
5.	NCR, Bhopal	109	0.28	0	0
6.	NCCR, Raipur	51	0.8	0	0
7.	CR, Nagpur	20	0	0	0
8.	NR, Lucknow	154	0	2.68	14
9.	MER, Patna	140	67.31	0	1
10.	ER, Kolkata	150	0	0	13
11.	NER, Guwahati	72	0	0	0
12.	SER, Bhubneshwar	65	0	0	7
13.	SR, Hyderabad	239	0	0	25
14.	SWR, Bangalore	308	0	0	0
15.	SECR, Chennai	70	0	0	3
16.	KR, Trivendrum	92	16.64	0	0
17.	UR, Dehradun	0	0	0	0
18.	NHR, Dharamshala	0	0	0	0
19.	SUO, Delhi	0	0	0	0
20.	WCR, Gujarat miss. mode	563	0	0	0
21.	SECR, Tamil Nadu miss. mode	630	0	0	0
	TOTAL	**2917**	**94.03**	**2.68**	**77**

Fig 4.1 Geophysical investigation at Lakshadweep islands

5. WATER QUALITY STUDIES

Central Ground Water Board has 16 Regional Chemical Laboratories to carry out chemical analysis of major and minor inorganic constituents in water samples. Action has been initiated for getting accreditation of laboratories from National Accreditation Board for Testing and Calibration Laboratories (NABL) and ISO 9001:2008 certificate. The Chemical laboratories are well equipped to carry out Basic analysis & Trace metal and Toxic elements determinations using sophisticated instruments like Atomic Absorption Spectrophotometer (AAS), Digital PC based UV- VIS Spectrophotometer, Ion meter, Flame Photometer, pH meter, Conductivity meter, and Nephelometer. The laboratories are also provided with Electronic Monopan and Top loading Balances, Deionizer, Double Distillation Plant, Hot Air Oven, Water Bath, Magnetic Stirrer and Hot Plates. Four Regional Laboratories at Kolkata, Hyderabad, Lucknow and Raipur are also equipped with Gas Chromatograph (GC) to undertake the analysis of organic pollutants (Pesticides) at µg/l level. The Chemical Laboratory at Hyderabad is additionally equipped with Inductive Coupled Plasma Spectrometer (ICPS) for sequential analysis of multiple toxic elements with high accuracy. Total Organic Carbon (TOC) analyzer is installed in the Regional Chemical Laboratory at Kolkata. The chemical analysis data generated by these laboratories is utilized for monitoring and evaluating the groundwater quality in compliance with National Standards (BIS 2012) for its designated use, to study the impact of anthropogenic activities on ground water quality, to demarcate critical areas where there is water quality deterioration and to assess the point and non-point sources of ground water pollution so as to take necessary action for management of ground water resources.

During 2016-17, a total number of 33808 water samples have been analyzed, out of which 22387 water samples have been analyzed for determination of basic parameters, 7436 water samples for heavy and 3985 for other parameters. The details of water samples analyzed by different Chemical Laboratories during 2016- 17 are presented in table 5.1.Thesamples of UR & SUO Delhi have been analysed by NWR Lab and samples of NHR analysed at NWHR Lab.

Region Wise Water Sample Analysis During 2016-17

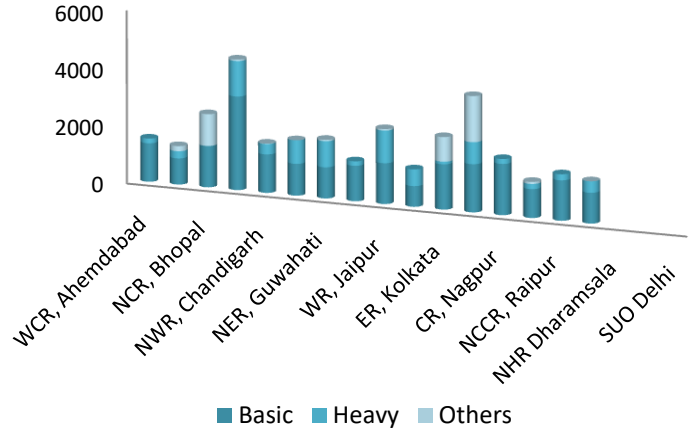


Table 5. Water samples analysed by different regions during 2016-17

Region	Number of Samples			
	Basic Analysis	**Heavy**	**Others**	**Total Sample Analyzed**
WCR, Ahemdabad	1340	164	0	1504
SWR, Banglore	910	250	177	1337
NCR, Bhopal	1440	0	1107	2547
SER, Bhubaneshwar	3259	1236	53	4548
NWR, Chandigarh	1339	365	11	1715
SECR, Chennai	1108	822	0	1930
NER, Guwahati	1084	910	49	2043
SR, Hyderabad	1234	155	0	1389
WR, Jaipur	1421	1137	52	2610
NWHR, Jammu	722	582	0	1304
ER, Kolkata	1578	90	858	2526
NR,Lucknow	1679	766	1606	4051
CR, Nagpur	1786	170	0	1956
MER, Patna	1006	179	72	1257
NCCR, Raipur	1409	210	0	1619
KR, Trivendrum	1072	400	0	1472
Total	**22387**	**7436**	**3985**	**33808**

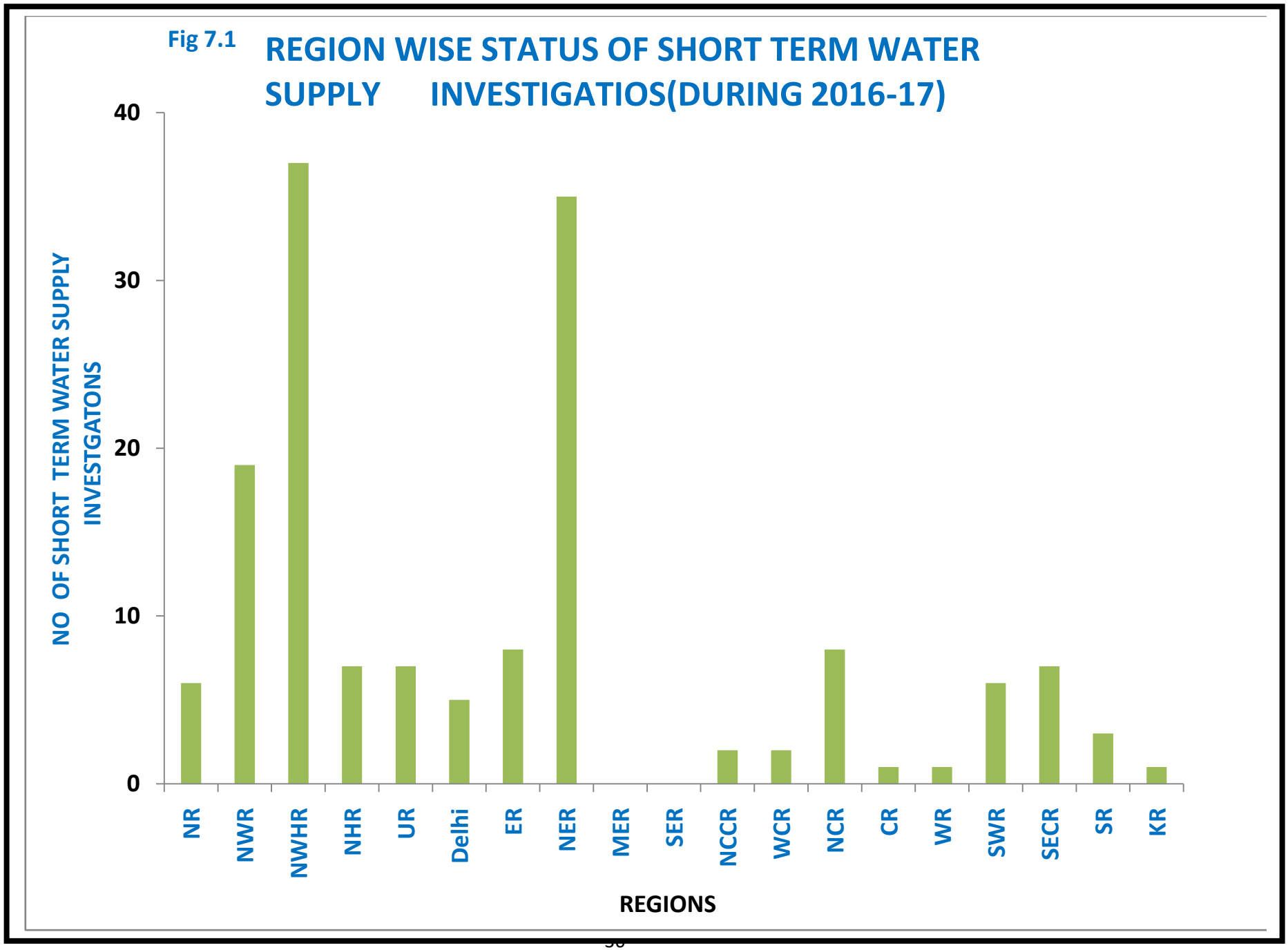
6. WATER SUPPLY INVESTIGATIONS

Central Ground Water Board provides assistance to defence and government agencies/ establishments to solve their immediate water supply problems by selecting feasible suitable sites for construction of ground water abstraction structures. During 2016-17, 155 Water Supply Investigations were carried out and Region / state wise status are given in table 6.1 and fig. 6.1.

Table 6.1: Region/ State wise Water Supply Investigations taken up during 2016-2017

Sl. No.	Regions	States	Water Supply Investigations (Nos.)
1	North Western Himalayan Region	Jammu & Kashmir	37
2	North Western Region	Punjab	19
		Haryana	
		Chandigarh	
3	West Central Region	Gujarat	2
4	Western Region	Rajasthan	1
5	North Central Region	Madhya Pradesh	8
6	North Central Chhattisgarh Region	Chhattisgarh	2
7	Central Region	Maharashtra	1
8	Northern Region	Uttar Pradesh	6
9	Eastern Region	West Bengal	8
10	North Eastern Region	Assam	35
		Arunachal Pradesh	
		Tripura	
		Meghalaya	
		Nagaland	
11	Mid Eastern Region	Bihar Jharkhand	0
12	South Eastern Region	Orissa	0
13	Southern Region	Andhra Pradesh Telangana	3
14	South Western Region	Karnataka	6
15	South Eastern Coastal Region	Chennai	7
16	Kerala Region	Kerala	1
17	UR, Dehradun	Uttaranchal	7
18	NHR, Dharamshala	Himachal Pradesh	7
19	SUO, Delhi	NCT, Delhi	5
Total			**155**

Fig 7.1


REGION WISE STATUS OF SHORT TERM WATER SUPPLY INVESTIGATIOS(DURING 2016-17)
NO OF SHORT TERM WATER SUPPLY INVESTGATONS
40
30
20
10
0
NR
NWR
NWHR
NHR
UR
Delhi
ER
NER
MER
SER
NCCR
WCR
NCR
CR
WR
SWR
SECR
SR
KR
REGIONS

7. GROUND WATER REGIME MONITORING

Monitoring of ground water regime is an effort to obtain information on ground water level and chemical quality through representative sampling. The important attributes of ground water regime monitoring are ground water level, ground water quality and temperature. The primary objectives of establishing the ground water monitoring network stations is to record the response of ground regime to the natural and anthropogenic stresses of recharge and discharge parameters with reference to geology, climate, physiography, land use pattern and hydrologic characteristics. The natural conditions affecting the regime involve climatic parameters like rainfall, evapotranspiration etc., whereas anthropogenic influences include pumpage from the aquifer, recharge due to irrigation systems and other practices like waste disposal etc.

Ground water levels are measured by the Board four times a year during January, March/ April/ May, August and November. The regime monitoring was started on regular basis since 1969 by Central Ground Water Board. At present, a network of **23125** observation wells are located all over the country is being monitored. Ground water samples are also collected from these observation wells once in a year during the month of March/ April/ May to obtain background information of ground water quality changes on regional scale. The database thus generated forms the basis for planning the ground water development and management programme. This data is used for assessment of ground water resources and changes in the regime consequent to various development and management activities.

Table 7.1: State-wise distribution of Ground Water Observation Wells

Sl No	Name of the State/ UTs	GW Monitoring Stations (March 2017)		
		Dugwell (DW)	Piezometer (PZ)	Total
1	Andhra Pradesh	742	113	855
2	Arunachal Pradesh	30	0	30
3	Assam	422	39	461
4	Bihar	715	33	748
5	Chhattisgarh	1054	268	1322
6	Delhi	24	103	127
7	Goa	102	49	151
8	Gujarat	844	404	1248
9	Haryana	527	661	1188
10	Himachal Pradesh	128	0	128
11	Jammu & Kashmir	266	11	277
12	Jharkhand	453	22	475
13	Karnataka	1490	383	1873
14	Kerala	1402	266	1668

15	Madhya Pradesh	1204	325	1529
16	Maharashtra	1641	192	1833
17	Manipur	0	0	0
18	Meghalaya	68	12	80
19	Nagaland	22	12	34
20	Odisha	1606	89	1695
21	Punjab	170	794	964
22	Rajasthan	724	446	1170
23	Tamil Nadu	847	531	1378
24	Telangana	344	445	789
25	Tripura	69	8	77
26	Uttar Pradesh	804	247	1051
27	Uttarakhand	41	126	167
28	West Bengal	813	805	1618
	Union Territory			
1	Andaman & Nicobar	110	2	112
2	Chandigarh	1	24	25
3	Dadra & Nagar Haveli	16	0	16
4	Daman & Diu	14	5	19
5	Pondicherry	10	7	17
TOTAL		**16703**	**6422**	**23125**

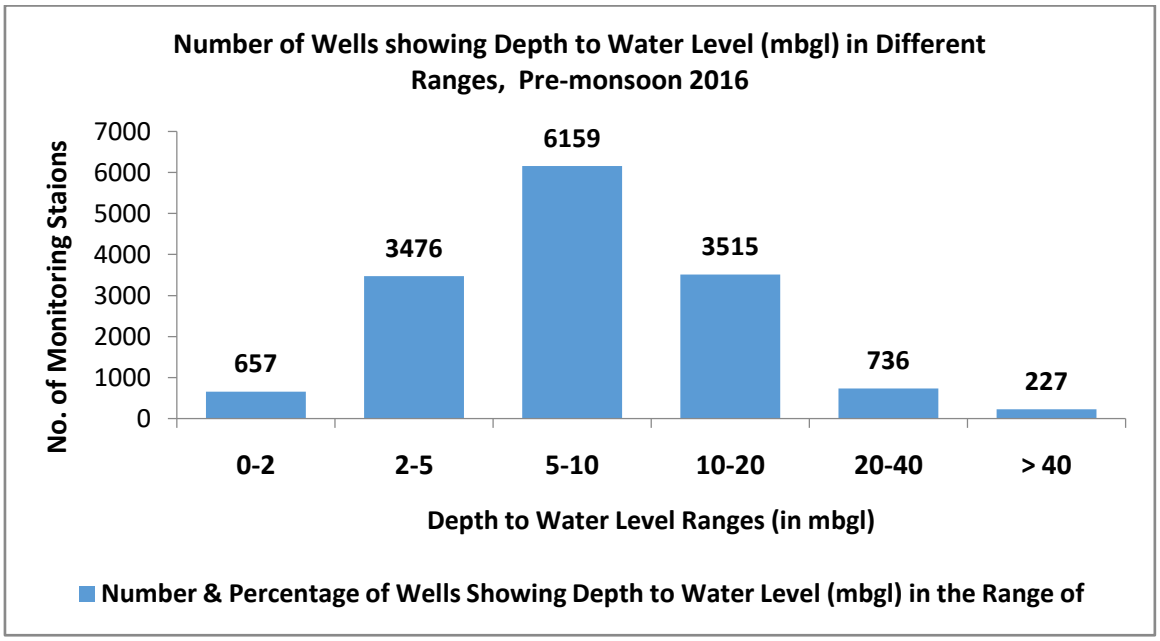
Ground Water Level Scenario

Depth to Water Level – Pre Monsoon 2016

The ground water level data for Premonsoon 2016 indicated that out of the total 14770 wells analysed, 657 (4 %) wells were showing water level less than 2 m bgl (metres below ground level), 3476 (24%) wells were showing water level in the depth range of 2-5 m bgl, 6159 (42 %) wells were showing water level in the depth range of 5-10 m bgl, 3515 (24%) wells were showing water level in the depth range of 10-20 m bgl, 736 (5%) wells were showing water level in the depth range of 20-40 m bgl and the remaining 227 (1%) wells were showing water level more than 40 m bgl.

The depth to water level map of Premonsoon 2016 for the country indicated that the general depth to water level of the country ranged from 2 to 20 m bgl. To be more specific, in major parts of the country, water level was observed to be in the range of 5 to 10 m. Very shallow water level of less than 2 m bgl were also observed locally, in isolated pockets, in few states, such as Assam, Andhra Pradesh, Himachal Pradesh and Gujarat. In major parts of north-western and western states, depth to water level were generally deeper and ranged from about 10- 40 m bgl. In parts Delhi and

Rajasthan, water level of more than 40 m bgl were also recorded. The Peninsular part of country recorded a water level in the range of 10 to 20 m bgl. The maximum depth to water level of 153.00 m bgl was observed in Ahmednagar district, Maharashtra whereas the minimum was less than 1 m bgl, seen in various states.

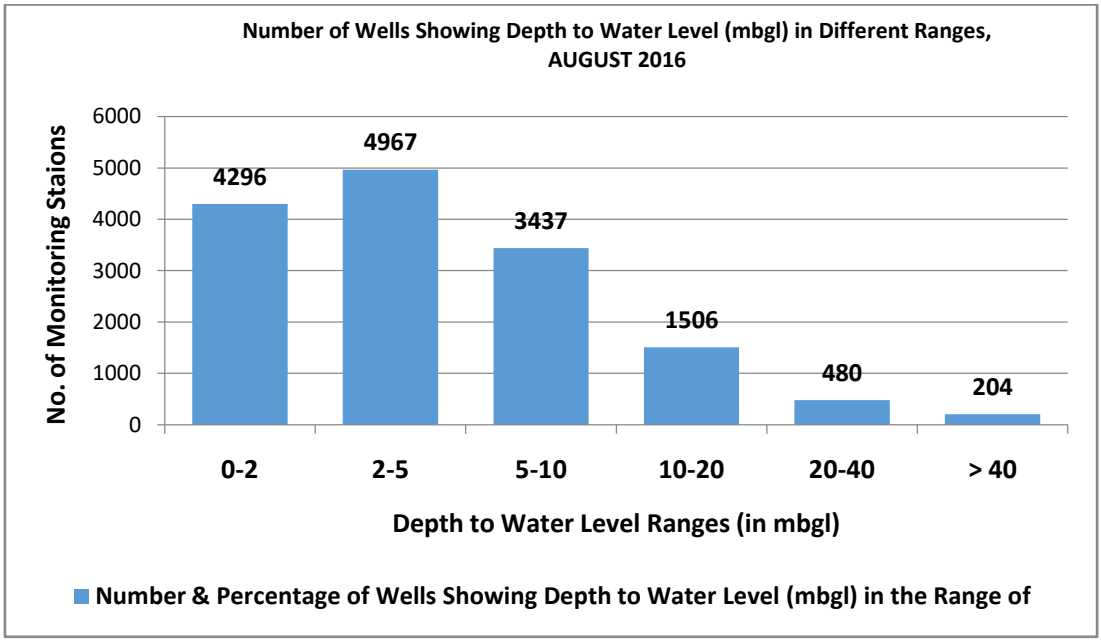


Depth to Water Level – August 2016

The ground water level data for August 2016 indicated that out of the total 14890 wells analysed, 4296 (29 %) wells were showing water level less than 2 m bgl (metres below ground level), 4967(33%) wells were showing water level in the depth range of 2-5 m bgl, 3437 (23 %) wells are showing water level in the depth range of 5-10 m bgl, 1506 (10%) wells were showing water level in the depth range of 10-20 m bgl, 480 (3%) wells were showing water level in the depth range of 20-40 m bgl and the remaining 204 (1 %) wells were showing water level more than 40 m bgl, **(Annexure-II).** The maximum depth to water level of 120.46 m bgl was observed in Rajasthan whereas the minimum wasless than 1 m bgl.

The depth to water level map of August 2016 for the country indicated that in general depth to water level ranged from 0 to 5 m bgl as observed at about more than 60% of the monitoring stations. Sub-Himalayan area, Uttar Pradesh, Bihar, Odisha, Chhattisgarh and Madhya Pradesh generally the depth to water level varied from 2-5 meter below ground level. Shallow water level of less than 2 m bgl was observed in the states of Assam, Chhattisgarh, Maharashtra, Orissa, Madhya Pradesh, Rajasthan, West Bengal and Uttar Pradesh, mostly in isolated pockets. In the states of Andhra Pradesh, Maharashtra, Karnataka, Telangana, Tamil Nadu, Kerala, north western part of Uttar Pradesh and West Bengal water level generally varied from 5 to 10 m bgl with small patches showing depth to water level between 2 to 5 m bgl.

In major parts of north-western states depth to water level generally ranged from 10-40 m bgl. In the western parts of the country deeper water level was recorded in the depth range of 20-40 m bgl and more than 40 m bgl. In some parts of Delhi and Rajasthan water level of more than 40 m bgl was recorded. Along the eastern & western coast water level was generally less than 10 m. Central part of West Bengal state recorded water level in the range of 10-20 m bgl. The peninsular part of country generally recorded a water level in the range of 5 to 20 m bgl depth range.

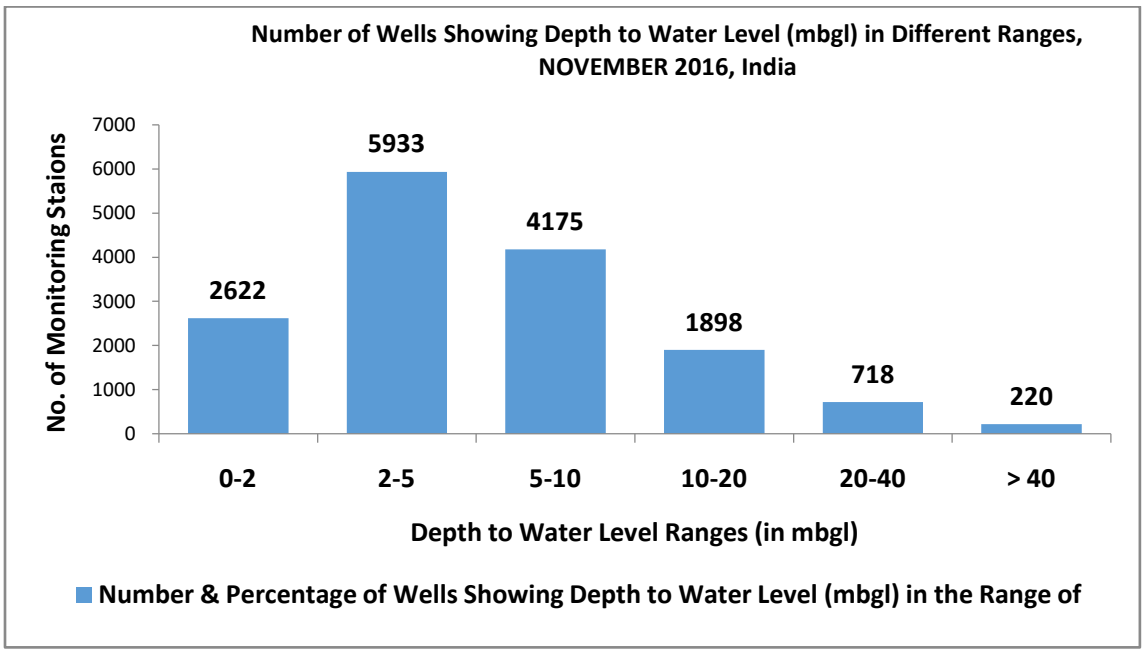


Depth to Water Level – Post Monsoon 2016

The ground water level data for November 2016 indicated that out of the total 15566 wells analysed, 2622(17 %) wells were showing water level less than 2 m bgl (metres below ground level), 5933(38%) wells were showing water level in the depth range of 2-5 m bgl, 4175 (27 %) wells were showing water level in the depth range of 5-10 m bgl, 1898 (12%) wells were showing water level in the depth range of 10-20 m bgl, 718 (5%) wells were showing water level in the depth range of 20-40 m bgl and the remaining 220 (1 %) wells were showing water level more than 40 m bgl. The maximum depth to water level of 122.00 m bgl was observed in Bikaner district of Rajasthan whereas the minimum was less than 1 m bgl.

Perusal of depth to water level data of November 2016 indicated that in general depth to water level ranged from 2 to 10 m bgl as observed at about 65% of the monitoring stations during these period. In the states of Uttar Pradesh, Bihar, Odisha, Chhatishgarh, Assam, Jharkhand, West Bengal and Maharashtra, generally the depth to water level varied from 2-5 meter below ground level. Shallow water level of less than 2 m bgl was observed in the states of Assam, Odisha, Andhra Pradesh, Maharashtra, Rajasthan and Uttar Pradesh and isolated pockets in Chhatishgarh, Jharkhand and Madhya Pradesh. In major parts of north-western states depth to water level generally ranged from 10-40 m bgl. In the western parts of the country deeper water level was recorded in the depth range

of 20-40 m bgl and more than 40 m bgl. In some parts of Haryana, and Delhi and almost major parts of Rajasthan, water level of more than 40 m bgl was recorded. Along the eastern & western coast water level was generally upto 10 mbgl. Central part of West Bengal recorded water level in the range of 5-20 m bgl. In Central India water level generally varied between 2 m bgl to 10 m bgl, except in isolated pockets where water level more than 10 m bgl has been observed.

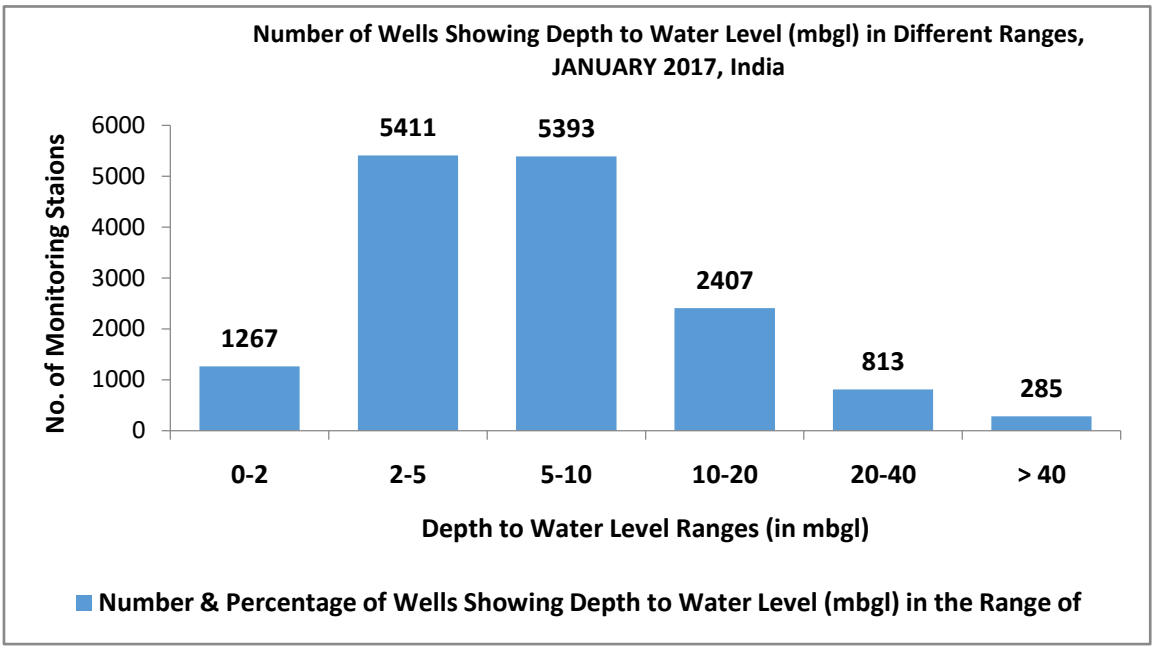


Depth to Water Level – January 2017

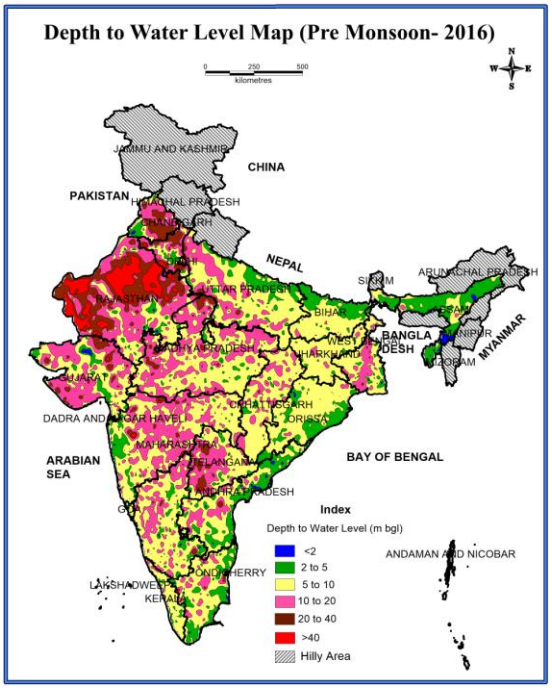
The ground water level data for January 2017 indicated that out of the total 15576 wells analysed, 1267 (8 %) wells were showing water level less than 2 m bgl (metres below ground level), 5411 (35%) wells were showing water level in the depth range of 2-5 m bgl, 5393 (35 %) wells were showing water level in the depth range of 5-10 m bgl, 2407 (15%) wells were showing water level in the depth range of 10-20 m bgl, 813 (5%) wells were showing water level in the depth range of 20-40 m bgl and the remaining 285 (2 %) wells were showing water level more than 40 m bgl. The maximum depth to water level of 122.10 m bgl wasobserved in Bikaner district of Rajasthan whereas the minimum was less than 1 m bgl.

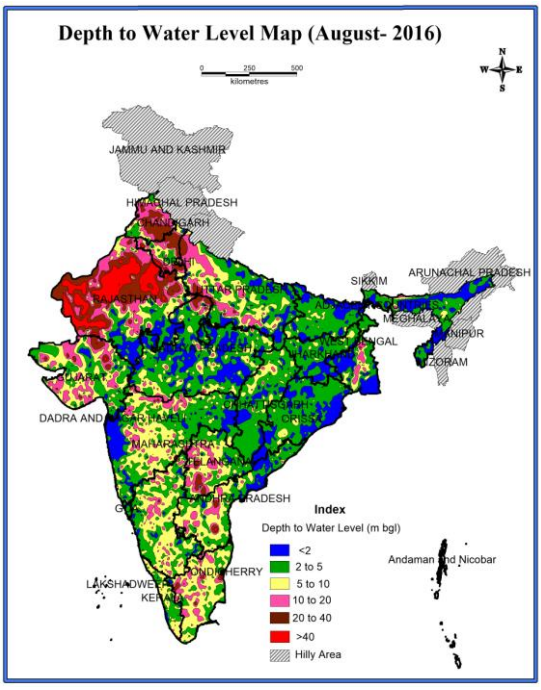
The depth to water level map of January 2017 for the country indicated that in general depth to water level ranged from 2 to 10 m bgl as observed at about more than 70% of the monitoring stations. Sub-Himalayan area, north of river Ganges, northern and eastern parts of Uttar Pradesh, almost whole of Bihar, Jharkhand, Odisha, Assam, coastal parts of Maharashtra, generally the depth to water level varied from 2-5 meter below ground level. Shallow water level of less than 2 m bgl was observed in the states of Assam, Andhra Pradesh, Maharashtra, Rajasthan and Uttar Pradesh in isolated pockets. In West Bengal water level generally varied from 2 to 10 m bgl and central parts of the state showed water level of 10 m and above.In major parts of north-western states depth to water level generally ranged from 10-40 m bgl. Water level of more than 40 m bgl was also prevalent in the

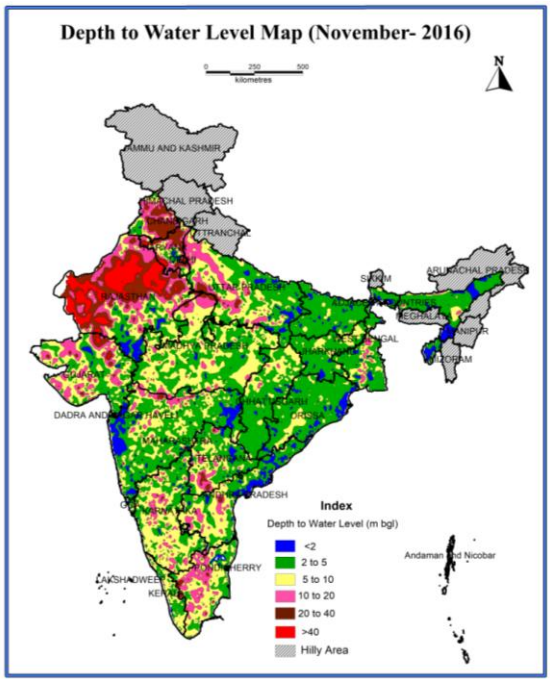
north western part of the country. In the western parts of the country deeper water level was recorded in the depth range of 20-40 m bgl and more than 40 m bgl. In some parts of Haryana, and Delhi and almost major parts of Rajasthan, water level of more than 40 m bgl was recorded. Along the eastern coast water level was generally upto 5 m bgl whereas in the western coast water level of 10 m bgl was prevalent. In Central India water level generally varied between 5 m bgl to 20 m bgl, except in isolated pockets where water level of less than 5 m bgl has been observed. The peninsular part of country generally recorded a water level in the range of 2 to 20 m bgl depth range.

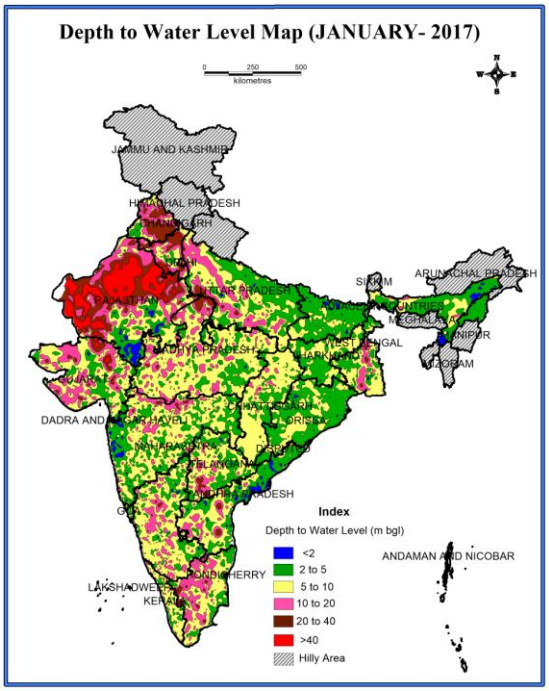


Depth to Water Level Maps at a Glance






Depth to Water Level Map (November- 2016)
kilometres
N
Index
Depth to Water Level (m bgl)
<2
2 to 5
5 to 10
10 to 20
20 to 40
>40
Hilly Area


Depth to Water Level Map (JANUARY- 2017)
kilometres
JAMMU AND KASHMIR
HIMACHAL PRADESH
SIKKIM
ARUNACHAL PRADESH
MEGHALAYA
MANIPUR
MIZORAM
Index
Depth to Water Level (m bgl)
<2
2 to 5
5 to 10
10 to 20
20 to 40
>40
Hilly Area
ANDAMAN AND NICOBAR

8. RE-ASSESSMENT OF DYNAMIC GROUND WATER RESOURCES

The National Water Policy, 2012 lays emphasis on periodic assessment of ground water resources on scientific basis. Accordingly, State Ground Water Departments and Central Ground Water Board carry out the Ground water resources assessment at periodical intervals jointly under the guidance of the respective State Level Committee on Ground Water Assessment at State Levels and under the overall supervision of the Central Level Expert Group.

The assessment of Ground Water Resources for the entire country was last carried out during 2013, following the Ground Water Estimation Methodology- 1997. Since then, significant changes have been observed in the ground water scenario in different parts of the country and the database has been strengthened. The methodology for estimation has been improved to accommodate changed scenario in the name of Ground Water Estimation Methodology- 2015.

As per the Dynamic Ground Water Resources of country (as on 31st March 2013), the total annual replenishable ground water resources of the have been estimated as 447 billion cubic meter (BCM). Keeping 36 BCM for natural discharge, the net annual ground water availability for entire country is 411 BCM. The annual ground water draft is 253 BCM out of which 228 BCM is for irrigation use and 25 BCM is for domestic and industrial use. The stage of ground water development in the country is 62%. Out of the total 6584 numbers of assessment units (Block/ Taluks/ Mandals/ Watershed/ Firka), 1034 units have been categorized as ‘Over-exploited, 253 as ‘Critical’, 681 as ‘Semi- critical’, 4520 as ‘Safe’ and 96 as ‘Saline’. State-wise Ground Water Resources of India (as on 31st March 2013) are given in Annexure I and the district-wise figures are given in Annexure II.

Annexure I

STATE-WISE GROUND WATER RESOURCES AVAILABILITY, UTILIZATION AND STAGE OF DEVELOPMENT- INDIA

(as on 31st March 2013) ***(in bcm)***

Sl. No.	States / Union Territories	Annual Replenishable Ground Water Resource					Natural Discharge during non-monsoon season	Net Annual Ground Water Availability	Annual Ground Water Draft			Projected demand for Domestic and Industrial uses upto 2025	Ground Water Availability for future irrigation use	Stage of Ground Water Development (%)
		Monsoon Season		Non-monsoon Season		Total			Irrigation	Domestic and industrial uses	Total			
		Recharge from rainfall	Recharge from other sources	Recharge from rainfall	Recharge from other sources									
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
	States													
1	**Andhra Pradesh**	8.97	4.25	3.21	3.97	20.39	1.91	18.48	7.29	0.81	8.10	1.64	10.21	44
2	**Arunachal Pradesh**	3.340	0.0003	1.092	0.001	4.433	0.443	3.990	0.002	0.007	0.01	0.020	3.967	0.23
3	**Assam**	20.56	1.82	9.22	0.49	32.11	3.21	28.90	4.06	0.68	4.74	0.84	24.00	16
4	**Bihar**	20.66	3.48	3.36	3.81	31.31	2.82	28.49	10.36	2.37	12.73	0.60	17.52	45
5	**Chhattisgarh**	10.11	0.76	0.87	1.06	12.80	0.90	11.90	3.76	0.64	4.40	0.76	7.38	37
6	**Delhi**	0.09	0.02	0.014	0.22	0.34	0.03	0.31	0.14	0.25	0.39	0.25	0.02	127
7	**Goa**	0.15	0.011	0.01	0.08	0.24	0.10	0.15	0.02	0.03	0.05	0.04	0.09	37
8	**Gujarat**	13.93	3.22	0.00	3.71	20.85	1.07	19.79	12.30	1.14	13.44	1.46	6.77	68
9	**Haryana**	3.62	3.10	1.03	3.60	11.36	1.06	10.30	13.32	0.60	13.92	0.56	-3.58	135
10	**Himachal Pradesh**	0.40	0.02	0.11	0.03	0.56	0.03	0.53	0.16	0.11	0.27	0.07	0.30	51
11	**Jammu & Kashmir**	1.22	2.69	0.79	0.55	5.25	0.43	4.82	0.20	0.98	1.18	1.07	3.55	24
12	**Jharkhand**	5.61	0.06	0.73	0.16	6.56	0.57	5.99	0.63	0.72	1.35	0.17	5.19	23
13	**Karnataka**	6.74	4.18	2.67	3.40	17.00	2.16	14.83	8.76	0.99	9.76	1.49	5.55	66
14	**Kerala**	4.51	0.04	0.59	1.13	6.27	0.60	5.66	1.18	1.45	2.63	1.55	2.93	47
15	**Madhya Pradesh**	28.59	1.27	0.82	5.30	35.98	1.82	34.16	17.95	1.41	19.36	2.35	13.86	57
16	**Maharashtra**	21.96	1.64	1.83	7.76	33.19	1.71	31.48	15.93	1.14	17.07	2.21	13.72	54

17	**Manipur**	0.244	0.010	0.201	0.019	0.474	0.047	0.426	0.004	0.001	0.004	0.049	0.374	1.01
18	**Meghalaya**	3.05	0.00	0.15	0.107	3.31	0.33	2.98	0.0080	0.0040	0.0120	0.207	2.76	0.4
19	**Mizoram**	0.02899	Negligible	0.01042	Negligible	0.03942	0.00394	0.03548	0	0.00104	0.00104	0.00238	0.0331	2.9
20	**Nagaland**	1.30	0	0.64	0	1.94	0.194	1.75	0.00	0.03	0.03	0.01	1.74	2.0
21	**Odisha**	11.29	2.53	1.33	2.63	17.78	1.09	16.69	4.14	0.87	5.02	1.35	11.20	30
22	**Punjab**	5.75	13.21	1.32	5.64	25.91	2.52	23.39	34.05	0.77	34.81	0.97	-11.63	149
23	**Rajasthan**	9.06	0.69	0.27	2.49	12.51	1.26	11.26	13.79	1.92	15.71	2.32	0.90	140
24	**Sikkim**	-	-	-	-	-	-	-	-	-	-	-	-	-
25	**Tamil Nadu**	7.12	9.87	1.52	2.15	20.65	2.07	18.59	12.98	1.38	14.36	1.53	4.08	77
26	**Telangana**	8.13	2.12	1.65	2.84	14.74	1.35	13.39	7.00	0.76	7.77	1.55	4.83	58
27	**Tripura**	1.141	0.000	0.738	0.593	2.471	0.202	2.269	0.093	0.072	0.165	0.200	1.976	7.3
28	**Uttar Pradesh**	41.97	11.52	4.60	18.25	76.34	4.75	71.58	48.35	4.41	52.76	6.44	19.01	74
29	**Uttarakhand**	1.10	0.22	0.24	0.43	2.00	0.03	1.97	0.84	0.15	0.99	0.30	0.82	50
30	**West Bengal**	18.71	5.26	1.51	3.85	29.33	2.77	26.56	10.84	1.00	11.84	1.53	14.19	45
	Total States	259.33	72.00	40.53	74.28	446.14	35.49	410.65	228.16	24.71	252.87	31.54	161.76	62
	Union Territories													
1	**Andaman & Nicobar**	0.38	0.04	0.0002	0.00005	0.420	0.0420	0.378	0.0001	0.0035	0.0037	0.016	0.361	1
2	**Chandigarh**	0.015	0.0004	0.005	0.001	0.022	0.0022	0.0194	0	0	0	0	0	0
3	**Dadara & Nagar Haveli**	0.054	0.002	0.010	0.004	0.070	0.007	0.063	0.008	0.013	0.020	0.014	0.042	32
4	**Daman & Diu**	0.012	0.001	0.000	0.001	0.015	0.001	0.014	0.008	0.002	0.010	0.003	0.003	70
5	**Lakshdweep**	0	0	0	0	0.01055	0.00704	0.00350	0.00000	0.00237	0.00237	0	0	68
6	**Puducherry**	0.095	0.060	0.009	0.028	0.193	0.019	0.174	0.124	0.029	0.153	0.047	0.053	88
	Total UTs	**0.56**	**0.10**	**0.024**	**0.035**	**0.73**	**0.08**	**0.65**	**0.139**	**0.050**	**0.189**	**0.08**	**0.46**	**29**
	Grand Total	**259.89**	**72.10**	**40.55**	**74.32**	**446.87**	**35.56**	**411.30**	**228.30**	**24.76**	**253.06**	**31.62**	**162.22**	**62**

Annexure -II

Categorization of Blocks/ Mandals/ Talukas in India (2013)

Sl.No.	States / Union Territories	Total No. of Assessed Units	Safe		Semi-critical		Critical		Over-exploited		Saline	
			Nos.	%	Nos.	%	Nos.	%	Nos.	%	Nos.	%
	States											
1	**Andhra Pradesh**	670	497	74	54	8	17	3	61	9	41	6
2	**Arunachal Pradesh**	11	11	100	0	0	0	0	0	0	0	0
3	**Assam**	27	27	100	0	0	0	0	0	0	0	0
4	**Bihar**	534	520	97	14	3	0	0	0	0	0	0
5	**Chattisgarh**	146	125	86	18	12	2	1	1	1	0	0
6	**Delhi**	27	5	19	7	26	0	0	15	56	0	0
7	**Goa**	12	12	100	0	0	0	0	0	0	0	0
8	**Gujarat**	223	175	78	9	4	6	3	23	10	10	4
9	**Haryana**	119	30	25	11	9	14	12	64	54	0	0
10	**Himachal Pradesh**	8	6	75	0	0	1	13	1	13	0	0
11	**Jammu & Kashmir**	22	22	100	0	0	0	0	0	0	0	0
12	**Jharkhand**	260	244	94	10	4	2	1	4	2	0	0
13	**Karnataka**	176	98	56	21	12	14	8	43	24	0	0
14	**Kerala**	152	131	86	18	12	2	1	1	1	0	0
15	**Madhya Pradesh**	313	228	73	58	19	2	1	25	8	0	0
16	**Maharashtra**	353	324	92	19	5	1	0	9	3	0	0
17	**Manipur**	9	9	100	0	0	0	0	0	0	0	0
18	**Meghalaya**	11	11	100	0	0	0	0	0	0	0	0
19	**Mizoram**	22	22	100	0	0	0	0	0	0	0	0
20	**Nagaland**	11	11	100	0	0	0	0	0	0	0	0
21	**Odisha**	314	308	98	0	0	0	0	0	0	6	2
22	**Punjab**	138	26	19	3	2	4	3	105	76	0	0
23	**Rajasthan**	248	44	18	28	11	9	4	164	66	3	1
24	**Sikkim**	-	-	-	-	-	-	-	-	-	-	-
25	**Tamil Nadu**	1139	429	38	212	19	105	9	358	31	35	3
26	**Telangana**	443	311	70	74	17	12	3	46	10	0	0
27	**Tripura**	39	39	100	0	0	0	0	0	0	0	0
28	**Uttar Pradesh**	820	603	74	45	5	59	7	113	14	0	0
29	**Uttarakhand**	18	16	89	1	6	1	6	0	0	0	0
30	**West Bengal**	268	191	71	76	28	1	0	0	0	0	0

Categorization of Blocks/ Mandals/ Talukas in India (2013)

Sl.No.	States / Union Territories	Total No. of Assessed Units	Safe		Semi-critical		Critical		Over-exploited		Saline	
			Nos.	%	Nos.	%	Nos.	%	Nos.	%	Nos.	%
	Total States	**6533**	**4475**	**68**	**678**	**10**	**252**	**4**	**1033**	**16**	**95**	**1**
	Union Territories											
1	**Andaman & Nicobar**	34	34	100	0	0	0	0	0	0	0	0
2	**Chandigarh**	1	1	100	0	0	0	0	0	0	0	0
3	**Dadra & Nagar Haveli**	1	1	100	0	0	0	0	0	0	0	0
4	**Daman & Diu**	2	1	50	0	0	1	50	0	0	0	0
5	**Lakshdweep**	9	6	67	3	33	0	0	0	0	0	0
6	**Puducherry**	4	2	50	0	0	0	0	1	25	1	25
	Total UTs	**51**	**45**	**88**	**3**	**6**	**1**	**2**	**1**	**2**	**1**	**2**
	Grand Total	**6584**	**4520**	**69**	**681**	**10**	**253**	**4**	**1034**	**16**	**96**	**1**

9. NATIONAL HYDROLOGY PROJECT

The Project Implementation Plan of the Board in Hydrology Project is to take up following activities under NHP in time span of 8 years.

- **Real time monitoringof water quality in coastal aquifers in Tamil Nadu & UT of Puducherry:** Construction of 60 piezometers & installation of DWLR with telemetry.
- **Establishment of Center of Excellencefor groundwater modeling:**It will support the modeling studies of PDS, Joint study of CGWB & CWC in River Basin Modeling and also assist State Groundwater agencies & Regional Offices of CGWB to take up modeling studies.
- **e- GEMS:** Consultancy for Design, development and Implementation of additional modules, including procurement of additional licenses and hosting; data integration and training for Pan India expansion.
- **PDS:** Apurpose driven study proposed to be taken up in sub-basin above Ramganga confluence of Ganga Basin, for stream aquifer relationship, delineation of aquifer contamination through solute transport model & pilot study for aquifer remediation.
- **River Basin Studies:** A joint collaborative study with CWC for River Basin Studies.
- **Institutions Capacity Enhancement:**
  - **International Trainings: Domain specific training-** Inhouse trainings (3 trainings per year) for 1 week duration for a batch of 15-20 trainees at RGI, Raipur.
  - **Workshops** / Awareness Programmes- 6 programmes per year.
  - **Training** in collaboration with USGS, as per the MoU to be signed with USGS by the Ministry
- **Technical Guidance & Support to States in the implementation of NHP**:

In 2016-17, a budget of Rs 69.5 Lakh has been allocated for CGWB in these projects. Till December 2016, bids for real time water quality monitoring in the Tamil Nadu & UT of Puducherry were under preparation and action had been initiated for conducting 3 Nos of Domain specific training and 6 Awareness raising campaigns.

By end of march 2017, 3 Nos of Domain specific training at RGI, Raipur and 6 Awareness raising Campaigns in NE States (2 Nos), Jharkhand (1 No), Rajasthan (1 No), Uttarakhand (1 No) & West Bengal (1 No) were completed.

10. CENTRAL GROUND WATER AUTHORITY (CGWA)

In pursuance of the order passed by the Hon'ble Supreme Court of India, Central Ground Water Board has been constituted as Central Ground Water Authority (CGWA) under sub-section(3) of Section 3 of the Environment (Protection) Act, 1986 vide notification no. S.O. 38 (E), dated 14.1.1997 for the purpose of regulation and control of ground water management and development in the country.

The Central Ground Water Authority was re-constituted vide S. O. 1121(E) dated 13th May, 2010. As per the Notification issued the Authority consists of Chairman & 14 members with Member (SML), CGWB as Member Secretary.

The Authority performs the following functions:-

- Exercise of powers under section 5 of the Environment (Protection) Act, 1986 for issuing directions and taking such measures in respect of all the matters referred to in sub-section (2) of section 3 of the said Act.
- To resort to penal provisions contained in sections 15 to 21 of the said Act.
- To regulate and control, management and development of ground water in the country and to issue necessary regulatory directions for the purpose.
- Exercise of powers under section 4 of the Environment (Protection) Act, 1986 of the appointment of the officers.

Guidelines / Criteria on Ground Water Abstraction by Food Parks / Agro Based Industries in Areas Notified for Ground Water Regulation (*w.e.f.* 31st August, 2016)

CGWA has framed new Guidelines/ Criteria for evaluation of proposals/ requests for ground water abstraction by Food parks/ Agro Based Industries in Notified areas. These guidelines are effective from 31.08.2016 and are available on website www.cgwa-noc.gov.in.

11. TECHNICAL EXAMINATION OF IRRIGATION SCHEMES / PROPOSALS

Scrutiny of Major/ Medium Irrigation Projects:

As per the directives of the Planning Commission, the CGWB is scrutinizing the Major and Medium Irrigation project reports/ proposals sent by the State Government / Central Water Commission/ Command Area Development & Water Management Wing of Ministry of Water Resources from the point of view of their impact on groundwater regime. Specific recommendations are being made on the projects and submitted to the concerned for compliance. 8 projects were examined during 2016-17 as on 31.03. 2017 and are listed below:

Sl. No.	Name of the Irrigation Project
1	Sher-Shakkar-Machharewa Complex Project, Madhya Pradesh
2	Dwarakeshwar-Gandeshwari Reservoir Project(New Major), West Bengal
3	Kanhar Barrage Project, Jharkhand
4	Singatalur Lift Irrigation Scheme- Karnataka
5	Restoration and Lining work of Western Main Canal and Ara Main canal & its system-Bihar
6	Pancheshwar Multipurpose Project, Uttarakhand
7	Chintalapudi Lift Irrigation scheme, Andhra Pradesh
8	Bhitaura Pump Canal, Uttar Pradesh

The observations on two Irrigation Projects are under scrutiny at Regional offices of Board as on 31.03.2017.

12. NATIONAL GROUND WATER TRAINING AND RESEARCH INSTITUTE (NGI)

National Ground Water Training and Research Institute (RGI) located at Raipur, Chhattisgarh caters to the training requirements of Central Ground Water Board and also many Central and State Govt. Organizations, Academic Institutes, NGOs etc. in the field of ground water. During XII Plan, RGI under HRD and Capacity Building Scheme of Ministry of Water Resources, River Development and Ganga Rejuvenation is implementing a three tier training programme keeping in view the requirements of the National Project on Aquifer Management. These trainings will enable creation of a trained workforce for implementation of National Project on Aquifer Management and overall sustainable development of ground water resources.

Human Resources Development

It has been the earnest endeavor of Central Ground Water Board to keep its technical personnel abreast with the latest developments in all aspects related to ground water development & management. Besides the officers of the board, traineesfrom State Departments and candidates from abroad are included in the training programme being organized by the Board. National Level training programmes were conducted at NGI, Raipur, the State and Block Level training programmes were organized by the respective Region Offices of CGWB. During the year 2016-17, 88 training programmes (38- Tier I, 16-Tier II and 34- TierIII) were conducted by NGI and a total of 6409 participants (798- Tier I, 507-Tier II and 5104- Tier-III) were trained including 1479 female participants. The actual expenditure incurredunder NGI for FY 2016-17 is Rs 5.12 Cr.

Summary details of Training Programmes

Training Programme	Total No. of Trainings Conducted	Total No. of Participants	Female Participants
TIER – I (National Level)	38	798	166
TIER – II (State Level)	16	507	145
TIER – III (Block Level)	34	5104	1168
Total	**88**	**6409**	**1479**

As a part of this three-tiered training programme, during the entire XII plan period (2012-17) 169 Tier I (National Level) training courses wereconducted in which professionals from Central/State Government departments, Academic Institutions etc. were trained. Under Tier II (State Level) training programme, 163 courses were conducted in which ground Water professionals, NGOs, VOs, PRIs etcwere trained. Similarly, 312 Tier III (Block Level) training programme wereconducted in which NGOs, PRIs, Progressive Farmers and other stakeholders at grassroots level were trained. The actual expenditure occurred under NGI for the entire XII plan period (2012-17) is Rs27.65 Cr.

Few photographs during the Tier-I Trainings conducted by NGI during 2016-17 are given below:

Geophysical Survey during Training on "Ground Water Technology & Management" for Hydrogeologists/ Engineers, Government of Nepal.

Field Demonstration during Training on "Ground Water Development & Management" for Hydrogeologists/ Scientists of State Ground Water Department, Govt of Telengana.

Valedictory functionof the Training on "Ground Water Technology & Management" for Hydrogeologists/Engineers, Government of Nepal.

Field Demonstration at Ralegaon Siddhi, Maharashtra during Training on "River Basin Management" at NWA organised by NGI, Raipur for Scientists of CGWB.

International Training Programmes*:*

International Training at Japan International Co-operation Agency (JICA), Tsukuba, Japan

Dr. P.K. Jain, Superintending Hydrogeologist and Sh. Rahul R. Shende, Assistant Hydrogeologist successfully participated in International training at JICA, Tsukuba, Japan on "Water Resource Management in Rural Area and Integrated Water Resource Management on Irrigation and Drainage (A)" during 27th November to 17th December 2016. During the training the issues/problems/challenges of the type area of Maharashtra were presented and discussed and the action plan for providing suitable solutions was also presented.

13. GROUND WATER MODELLING STUDIES

Central Ground Water Board took upground water modelling studies in Tamil Nadu State during 2016-17 in Amaravathi Aquifer System.

Groundwater recharge and draft have been computed through different methods and resources of the aquifer system estimated through groundwater balance method. A three-dimensional mathematical model of regional groundwater flow was used to provide a mechanistic description of groundwater flow in the Amravathi aquifer system. The model was simulated using the finite-difference approximation of three-dimensional partial differential equation of regional groundwater flow and was calibrated for steady and transient conditions to forecast the dynamic groundwater flow under different recharge and stress conditions. Based on the above studies management strategies have been evolved for augmentation of groundwater through artificial recharge and water conservation and plans for sustainable management of the resourcewere formulated.

14. SPECIAL STUDIES

Central Ground Water Board has carried out special studies in the following States during the year 2016-17:

14.1 Hydrogeological study of Hot Spring in and around Rajgir, Nalanda district, Bihar

Hydrogeological study has been taken up to understand the reasons for diminishing discharge of hot springs in and around Rajgir Area, Nalanda district, Bihar as per request received from Principal Secretary, Dept. of Water Resources, Govt. of Bihar vide their letter no Mon-03-Karya-P-4/2011-392 dated 08/3/16 and Mon-03-Karya-P-4/2011-515 dated 04/04/16. The area can be located in SOI toposheet72G/8, 72H/5, 72 G/12, 72H/1. Apart from visit by Sh. S. N. Dwivedi, Sc-C accompanying Principal Secretary, Dept. of Water Resources and Principal Secretary, PHED, an immediate field visit was made to the area on 05/04/2016 by Sh. A. K. Agrawal, Regional Director, CGWB, MER accompanied by Dr. Indranil Roy, Sc. C, Sh. S. N. Dwivedi, Sc. C and Dr. F. Alam, STA (Hg) for formulation and strategy development regarding the study. The team visited the problem areas, took a small traverse along Saraswatinala and across the quartzite ridge. The team also visited the three hot spring complexes in the area namely Brahma Kund Complex, TapovanKundComplex and Agni Kund Complex along with limited discharge and temperature measurement. The team also visited the site of recently built series of boreholes in PanduPokhar area to assess the impact of pumping in the vicinity. Throughout the study, effort has been made towards understanding the processes involved in spring generation in and around Rajgir Area, so that proper recommendations could be made. However, in view of short time-frame for the study, every aspect of understanding the process could not be explored. Still, the study provided some basic results to formulate at least an initial management policy for sustainable future. Here, the importance of long duration study may be highlighted for understanding of such natural phenomenon. Study by Guha (1961-65) forms backbone of this study by providing the background data with which findings of this study could be compared and changes in temporal scale could be understood. Hence it may be concluded by saying that arranging and deploying a system toward periodic scientific data collection and monitoring, will form a base towards future management needs.

14.2 Special studies on detection of high level of arsenic in groundwater of Kamrup-urban, Assam

Arsenic contamination in groundwater has become one of the emerging environmental issues. Presence of arsenic in groundwater of Assam has come to light recently. Another interesting fact of Assam is the sharing of same hydrogeological condition with its neighboring state West Bengal and neighboring country Bangladesh where symptomatic groundwater arsenic contamination has been reported. The present study attempts to determine the extent and severity of arsenic and other trace elements contamination in groundwater of Assam, India. An arsenic contamination study of Kamrup-urban area was conducted during 2016-17 in which twenty samples were collected from key wells of

Kamrup-Urban. The result was compared with the results obtained from extensive arsenic study conducted during 2015-16 in which four hundred thirty two (432) samples were collected from the entire North Eastern Region out of which three hundred nineteen (319) groundwater samples were collected from twenty two (22) districts of Assam and analyzed for arsenic contamination. Various physicochemical parameters viz., pH, turbidity, total dissolved solids, electrical conductivity, alkalinity, hardness, nitrate, chloride, sulphate, fluoride, sodium, potassium and total iron content were also analyzed alongwith arsenic and results were compared for the two studies in respect of Kamrup-Urban area. Study based on 2015-16, reveals that groundwater samples from nineteen districts out of twenty districts of Assam were significantly contaminated with iron and three districts out of twenty districts, contamination of groundwater by fluoride was evaluated. Study on presence of arsenic in groundwater of Kamrup-urban during 2016-17 showed out of twenty (20) samples collected, fifteen (15) samples were found be contaminated with arsenic greater than the permissible limit (10 ppb) of Bureau of Indian standard (BIS) IS 10500:2012, amendment No.1 June 2015 and its relationship with other general water characteristics and other trace elements were established.

The source of ground water arsenic contamination in the area is yet to be established. Arsenic contamination of groundwater poses a serious risk to public health in Assam. From the study it is found out that out of twenty (20) samples collected from different locations of Kamrup-urban area fifteen (15) samples were found be contaminated with arsenic greater than the permissible limit of Bureau of Indian standard (BIS) IS 10500:2012, amendment No.1 June 2015 i.e. 10 ppb with highest concentration at tube well located at Pan Bazaar-circuit house (24 ppb). The inhabitants have not developed any visible symptoms of arsenicosis, but long term use may cause serious threat to them in near future. Another interesting fact is the occurrence of iron in this area much higher than the permissible limit for the last many years leading to the use of conservative filtration techniques by inhabitants for iron removal, that iron removal technique may contribute to the automatic removal of arsenic also, hence no symptoms of arsenic poisoning were evident. Regular monitoring of the study area is of utmost importance. Furthermore, it would be most appropriate to adapt the existing iron-removal technologies to remove or reduce arsenic as well, as this would have better acceptability among the public.

14.3. Arsenic in Ground Waters of Indo-Nepal Border Districts of Uttar Pradesh

The study was undertaken during 2015-16 and the report was issued in 2016-17. Arsenic (As) is a ubiquitous element, which occurs naturally in the earth's crust. Its source is geological in nature, as well as human activities such as mining, burning of fossil fuels, and pesticide application. In India, the alluvial sediments deposited by rivers draining from the Himalayas have been implicated as the major source of arsenic in groundwater lying in the flat plain of Terai. Both inorganic and organic forms of arsenic have been identified in water by many researches around the world. Since ancient times, Arsenic has long been known as toxic, and its effects on health even at small doses can be quite harmful. Inorganic arsenics are proven as carcinogens in humans. The crises in India and Bangladesh provides frightening

testament to the far-reaching, chronic effects of arsenic poisoning. Arsenic contamination of natural waters has become an issue of growing concern, particularly in Southeast Asia, to the extent that the World Health Organization (WHO) declared groundwater contamination on the Bengal delta the largest mass poisoning of a population in history The toxicity of arsenic to human health ranges from skin lesions to cancer of the brain, liver, kidney, and stomach. Arsenic can also be passed from a pregnant woman to her unborn child.

Due to severe health impacts of Arsenic on human body and the earlier reports of arsenic contamination in ground water of adjoining districts of tarai belt in Uttar Pradesh, the study of arsenic in ground water of Indo-Nepal border districts of Lakhimpur, Shahjahanpur, Pilibhit, Bahraich, Shrawasti, Balrampur, Siddhartnagar & Mahrajganj was undertaken and it was observed that in total 116 nos samples collected 30% were found within limits of 10 ppb, 60% ranging between 11 to 50 ppb and 10 % > 50 ppb in the area under study. The higher values > 50 ppb have been observed in Lakhimpur & Bahraich districts of the area.

14.4. Ground Water Quality of Baldeo Block of Mathura District, UP

On the basis of chemical analysis results of 42 number of ground water samples from 14 sampling locations of Baldeo block , Mathura district, U.P, the quality of ground water in terms of TDS_{Cal} value (Calculated value of TDS from EC value) was mainly found to be suitable for drinking purpose as its value was found to be less than the permissible limit of 2000mg/l in 64% samples as per IS 10500: 2012 and in remaining 36% samples its calculated value was found to be more than 2000 mg/l. The quality of ground water for Total Hardness (TH) as $CaCO_3$ was mainly found to be suitable for drinking purposes as its value was found to be less than 600 mg/l in 86% samples as per IS 10500: 2012. The Fluoride concentration was found to be more than permissible limit of 1.5 mg/l (as per IS 10500: 2012) in 50% samples. High values of TDS_{Cal} (more than 2000 mg/l) **(**based on EC values) in 36% samples and high values of Fluoride (more than 1.5 mg/l) in 50% samples (as per drinking water specification, BIS, 2012). In 46% samples (4 samples), Fluoride concentration was found to be less than 1.5 mg/l and TDS_{Cal} value was also found to be less than 2000 mg/l. In 60% samples, Fluoride concentration was found to be less than 1.5 mg/l but TDS_{Cal} value were found more than 2000mg/l. Nitrate concentration was found to be more than permissible limit of 45 mg/l at 02 locations i.e at Swami Sivanand Ashram and at Prathamik Vidyalaya of Avernee village. Trace metals were found within permissible limits of BIS 2012 except Iron which was found more than 0.3 mg/l in 71% samples of the study area. Arsenic was not reported in the samples of the study area.

14.5. Water Quality in and around Chauri-Chaura Gorakhpur District, UP

There is no piped water supply for drinking/ domestic purposes in the surrounding villages and local population are using hand pump and India Mark II hand pump from shallow aquifer to meet drinking and domestic requirements. There is need to provide piped water supply to these villages.The industries in the nearby area should have proper and working ETP to avoid the contamination of aquifers. The BOD & COD Values of the few ground water samples indicate that Dekaniya Badi has higher BOD & COD values more than the limits as compared to Devipur village. Deeper aquifer is more contaminated as compared to shallow aquifer as the BOD & COD values are more in IM II Hand pumps than private hand pumps.

14.6. Ground Water Pollution Study at Jajmau, Kanpur, UP

Central Ground Water Board has taken up a ground water pollution study in Jajmau area of Kanpur District for assessment of ground water quality of shallow and deeper aquifers of the area due to impact of nearby industries.

In shallow aquifer (hand pumps) the high value of TDS (at Peundi, Shekhpur, Motipur and Opp Raja leather tannery), Chloride (at Kripa Shankar Motipur), Hardness (at Peaundi, Shekhpur, Motipur, Jajmau Crossing), Sodium and Magnesium (at Peaundi, Shekhpur, Motipur, Jajmau Crossing) has been found which can be attributed to the pollution from tanneries effluent. Since the tanneries use salt for processing of leather, the ground water of the area nearby industries may be due to leaching of waste water impregnated with high salt content. High values of Nitrate (at Peundi, Motipur, Garibnawaj crossing and Shekhpur) may be attributed to sewage contamination as a result of leaching of waste water from untreated sewage dumps in the near vicinity to ground water body. Total Chromium in Surface water has been found higher on the downstream side of river Ganga which indicates that there is disposal of untreated effluent in river Ganga from Jajmau area. The parameters analyzed indicate that there is no contamination in deeper aquifer.

14.7. Vulnerability Assessment of Salt Water Intrusion for Coastal Aquifers of Puri District, Odisha by using RS and GIS methods

Saltwater intrusion is a growing concern for the coastal aquifers of Puri district. As the population of the district is increasing with more stress on Agricultural use, ground water withdrawal is likely to increase in near future. The unscientific exploitation of groundwater has already created a water stress condition with some salinity problems in the area. This alarming situation calls for a cost and time-effective technique for proper evaluation of groundwater resources and management planning. One solution to saltwater intrusion is to diversify the source of drinking water. Due to the abundant supply of fresh surface water and saltwater intrusion becoming a growing concern it may be time to look to other alternative source of supply from the rivers and fresh water lakes like the Samang lake. Another source of water is brackish or seawater which can be treated with a reverseosmosis process to produce extremely high-quality drinking

water but the treatment plants are highly cost effective hence not feasible. One innovative solution to the saltwater intrusion problem is the use of saltwater intrusion barrier wells. These wells are used to inject water into a freshwater aquifer to prevent the intrusion of saltwater. Drilling of saltwater intrusion barrier wells are done to various depths depending on the depth of the aquifer being protected. They work by injecting freshwater into the aquifer, creating a ridge of freshwater, which acts as a hydraulic barrier against saltwater intrusion. The method is artificial recharge and raises the piezometric head of the aquifer, which prevents saltwater from moving inland (EPA, 1999).The creation of a saltwater vulnerability map, through application of the GALDIT method, allows us to identify areas that are highly vulnerable to saltwater intrusion. The six factors incorporated into assessing saltwater intrusion vulnerability (groundwater occurrence, aquifer hydraulic conductivity, depth to groundwater level, distance from shore, impact of existing seawater intrusion, and aquifer thickness) allow us numerically rank and map areas of low to very high vulnerability. By using this mapping model and the saltwater prevention techniques can be of great help in real world applications which include future siting of groundwater pumping wells, well areas that may need to be abandoned in the future, and strategic locations where saltwater intrusion barrier wells could be installed to prevent saltwater intrusion. As demonstrated successfully in this study, the integrated remote sensing and GIS can provide appropriate platform for convergent analysis of large volume of multi-disciplinary data for decision making in groundwater management studies.

The maps generated by the application of Remote sensing and GIS is the preliminary map to generalise the whole area on vulnerability to Sea water intrusion and ground water prospecting. It is difficult and inadequate only on the basis of Remote Sensing and GIS to map the exact extent of Sea water intrusion and to locate the boundary of transitionzone. For that, a detailed modelling study is required

14.8. Report on Pollution of Groundwater by Industrial Clusters notified By Central Pollution Control Board in Karnataka

As per directives of Special Secretary vide letter no. 08/CGWB/M (TT& WQ)/VIP-Ref/2012-637 dated 27.01.2016., MoWR, RD & GR, New Delhi, the pollution clusters studies identified by CPCB were reassessed during the AAP of 2016-17. Accordingly, ground water sampling was carried out at the following five notified industrial clusters of Karnataka:-

- Mangalore in Dakshina Kannada district
- Bhadravathi in Shimoga district
- Raichur district
- Bidar district
- Peenya in Bangalore Urban district

The ground water samples were subjected to repeat analysis for pH, Specific Conductance, $C0^{3--}$, $HC0^{3-}$, Cl^{-}, $N0^{3--}$, $S0^{4--}$, F^{-}, Ca^{2+}, Mg^{2+}, Total hardness, Na+ and K+ along with heavy metals like Cu, Mn and Ni. The procedures of the analysis were based on standard procedures recommended by APHA (American Public Health Association) 22nd Edition and analytical grade reagents were used for all analysis. The

results of the chemical analysis were assessed as per BIS drinking water standards, 10500: 2012. Samples were collected from ground water abstraction structures like dug well , bore well and hand pump which were in use and non stagnant in nature. These locations were demarcated from the listed industries which were identified by CPCB as causing pollution. To identify the impact on human, eco-geological features & other sensitive receptors, an impact zone of two kilometers in all directions from the boundary of the notified industrial clusters of CPCB of the districts were identified and ten samples (five normal and five acidified) were collected within the industrial cluster. Remaining ten samples (five normal and five acidified) were collected from five different locations outside the impact zone of two km.

On perusal of the chemical analysis results from the five industrial clusters, it is found that the ground water quality deterioration is not severe in Baikampady (Mangalore) and Bhadravathi (Shimoga) industrial clusters. All major cations and anions, heavy metals are found within the permissible limits in Mangalore and out of ten samples, three samples were found slightly acidic in nature. In Raichur, the analysis results for Basic cations, anions and heavy metals are within the permissible limit. During 2016, nitrate value ranges from 8-57 mg/l and Yedlapura recorded the highest value of 57 mg/l whereas in 2011 the highest nitrate value was recorded as 156 mg/l. At one location named Shaktinagar (Nagappa katte) fluoride value (2.1 mg/l) is above the permissible limit of 1.5 mg/l.

Bidar recorded the most marked change in quality of ground water. Parameters such as EC, Sulphate, Calcium, Nitrate, Chloride, Magnesium, Total Hardness and Heavy metals (Cu, Ni and Mn) are beyond permissible limits at Satwik Drugs Ltd, Vivimidland Industrial Unit 1 and Nirmodh Kendra. Nitrate concentration in the ground water sample of Bidar ranges from 8 to 102 mg/l during the present year which was 5 to 23 mg/l during 2011. At two places namely Satwik Drugs Ltd and Nirmodh Kendra shows nitrate concentration of 46 mg/l & 102 mg/l respectively which is above the permissible limit of 45 mg/l as prescribed by BIS, 10500:2012. One location (Stereo Drugs limited) is having fluoride value of 1.6 mg/l. Manganese above permissible limit is reported from Satwik Drugs Ltd (1.053 mg/l), Vivimidland Industrial Unit -1(2.87 mg/l) and Nirmodh Kendra (0.95 mg/l) indicating ground water contamination due to industrial activity. Local people should be refrained from consuming such water as it is not fit for drinking.

In Peenya, five locations namely Kalika Nagara (19th Cross, Peenya 2nd stage), Balaji Nagara (Dhanlaxmi Concrete Block Industry, Peenya 2nd stage), Karnataka Handloom Development Corporation office (Peenya 2nd stage) , Ankit Traders (C-89, 3rd Cross, Peenya 3rd stage) and STQC ETDC office (Peenya 1st stage) are having nitrate value above the permissible limit of 45 mg/l .Nitrate value ranged from 24 to 79 mg/l during the previous study and in the year 2016, it ranged from 10 to 96 mg/l thereby suggesting ground water contamination due to industrial, sewage or municipal waste. The ground water sample at Central Institute of Coir Technology (Peenya, 1st stage) is having a fluoride value of 1.6 mg/l which is above the permissible limit.

Further, it is observed that there is not much difference in the quality of ground water in areas within and outside the five industrial clusters and wherever reported it is a point source contamination and cannot be generalized for the whole area. Deterioration of ground water quality due to blooming industrial

and various anthropogenic activities can be tracked by continuous monitoring of ground water quality using modern technologies or tools. Artificial recharge structures and rain water harvesting may be taken up in such quality affected areas. In order to meet the potability of groundwater, it is recommended that continuous and effective treatment combined with constant monitoring and surveillance is essential for maintaining the standards of drinking water. Strict regulations may be enforced and the license of industries causing pollution may be invoked with imposition of hefty fines. The role of Central and state Pollution Control Boards are very important in this regard.

15. COLLABORATIVE STUDIES

15.1 Collaborative R & D study between RGNGWTRI & NCCR (Year: 2015-2017) on "Sustainability of aquifer system underlying Bemetara Block, Bemetara, Chhattisgarh- a mathematical modelling based approach."

The study area is situated in Bemetera district between latitudes 21°30' to 22°00' N and longitudes 81°15' to 81°50' E. It spreads over an area of around 856 km^2 covering most part of Bemetera block and parts of Saja and Berla block. Hanp and Dotu river which are perennial in nature forms its northern and southern boundary respectively while the Seonath river forms its eastern boundary.

The study area is part of the Central Chhattisgarh Plain and is represented by structural plain on Proterozoic rocks mainly by Maniyari formation which is the youngest formation of the Chhattisgarh basin. It is characterised by a plateau with land elevation varies between 250 to 300 meter above mean sea level.

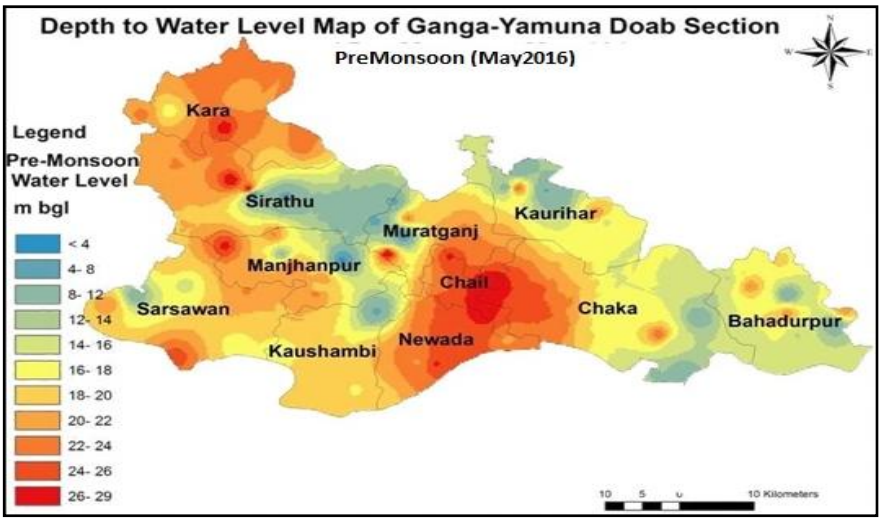
Monthly monitoring of both dug wells (shallow) and exploratory bore wells drilled by CGWB in the study area is being carried out. The depth to water level in dug wells in pre-monsoon (May) varies from 1.0 to 14.9 mbgl. The average water level varies from 5 to 12 mbgl. In pre-monsoon (June) water level in bore wells varies from 6.41 to 27.63 mbgl. In pre-monsoon (November) water level in bore wells varies from 6.41 to 27.63 mbgl. In post-monsoon (November) water level in bore wells varies from 4.33 to 21.65 mbgl. The deepest water level is recorded at Tipni.

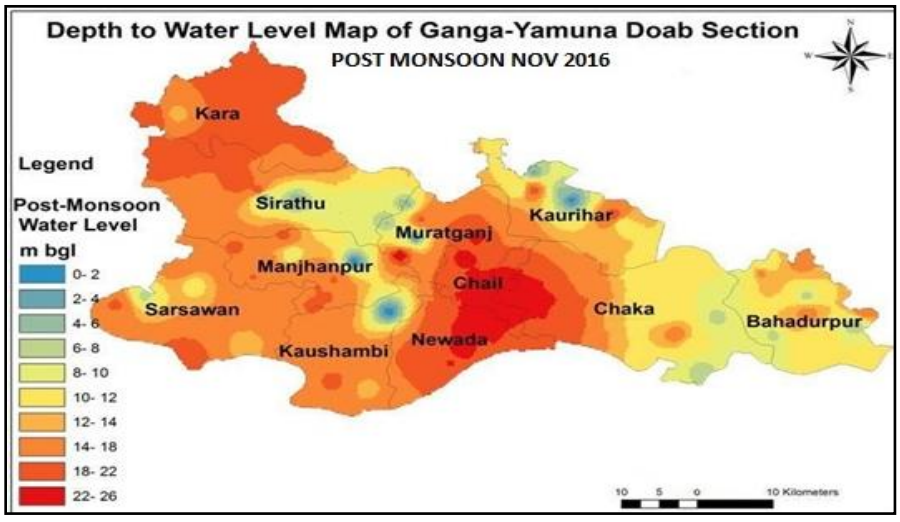
The depth of exploration of ground water through drilling was carried out down to a depth of 202 mbgl by NCCR. The study area is mostly covered by Maniyari shale. The discharge of the bore wells varies from 2 to 18 litres per second (lps). High discharge is encountered in Maniyari shale because of presence of gypsiferous shale. Because the gypsum is leached it forms solution cavities and forms prolific aquifers. Most of the fracture/solution cavities are located between 20-90 mbgl and maximum upto 130 mbgl.

Because of the presence of gypsiferous layer which form solution cavities the yield of aquifers is as high as 18 lps. These form the most prolific aquifers. Data from electric office Bemetera reveals that in total Bemetera district there are around 38,000 energized bore wells. Intense agriculture is practiced in the area with the help ground water from bore wells. There is indiscriminate extraction of water from deep bore wells which leads to declining of water level as well as water resources. Because in some areas the water level has gone below 25 metre there is shortage of water in summer season. Due to leaching of gypsum from the gypsiferous layer which forms the solution cavities the electrical conductivity of ground water reaches as high as 2250 µS/cm. Because of the high EC the water is not potable for drinking purpose and RO plant is installed by PHE&D Dept. and supplied to the public.

15.2 Palaeochannel Studies in Ganga–Yamuna Doab Area, Covering Parts of Allahabad and Kaushambi Districts, Uttar Pradesh in Collaboration with NGRI, Hyderabad

As per AAP 2016-17 Palaechannel Studies were assigned in Bahadurpur and Chka blocks of Allahabad and all blocks of Kaushambi district, covering an area of 2464 Sq Km. The study is being undertaken in collaboration with National Geophysical Research Institute, Hyderabad, with the institute assigned to carry out Heliborne Survey in 1200 Sq Km area, which is likely to be increased. Vertical Electrical Soundings (VES) at 88 locations have been carried out by CGWB, NR. Exploratory drilling has also been taken up to study the subsurface variation in the characteristics of the sediments, assess their ground water potential, aquifer parameters and quality of formation water. 4 Exploratory Wells and 2 Observation Wells have been constructed dyring the year. Monitoring of water levels at 60 locations in Allahabad and Kaushambi districts has been carried out. Ground water samples were collected from time to time and submitted to different departments for analysis of isotopic, physiochemical, heavy metals, phenolic, antibiotic and detergent etc.





Fairly, large area shows moderate to deep water level. Depth to Water level in phreatic zone ranges from 3.00mbgl at Manjhanpur to 28.85mbgl at Chail during pre-monsoon period in district Kaushambi whereas it ranges from 1.1mbgl at Manjhanpur to 25.8mbgl at Lalapur- Chail during post monsoon period in district Kaushambi. Water levels greater than 9mbgl occur in most of the non-command areas of the district. Water level along the course of Yamuna river shows deep water level conditions whereas along the course of Ganga river it is shallow to deep. It reflects that Yamuna is a gaining river. Maps showing depth to water level (DWL) data collected from Ground Water Monitoring Wells in May' 2016 and Nov' 2016 are presented in following figures.

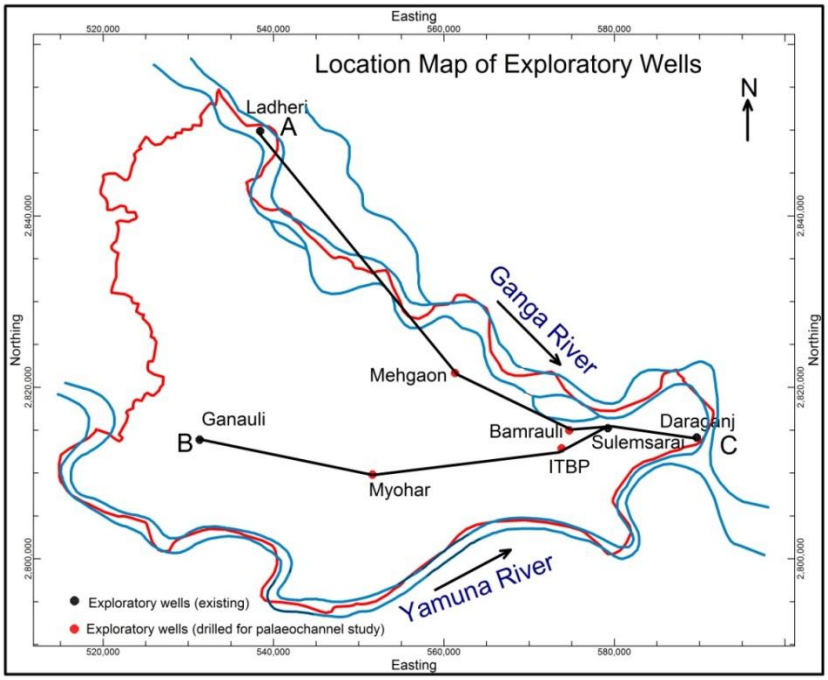
Existing CGWB Exploratory drilling data of the district reveals that there are three tier aquifer system in Trans Ganga area while fractures are encountered in Trans Yamuna area. Yield of tubewells in alluvial area varies from 1000-3000 lpm with 7.0m drawdown. Potential Zones are encountered in Central as well as North Eastern part of the district. The Transmissivity of the aquifers range from 2100-3330m^2/day with storativities ranging from $1.79x10^{-4}$ to $4.13x10^{-4}$, which represents highly potential aquifers. Such high values of aquifer parameters indicate presence of unconsolidated coarse sediments representing the younger alluvial deposit. Findings of exploratory drilling confirm the presence of coarse grained unconsolidated sediments with high groundwater potential aquifer system. Summarized hydrogeological results of exploratory drilling are given in following table.

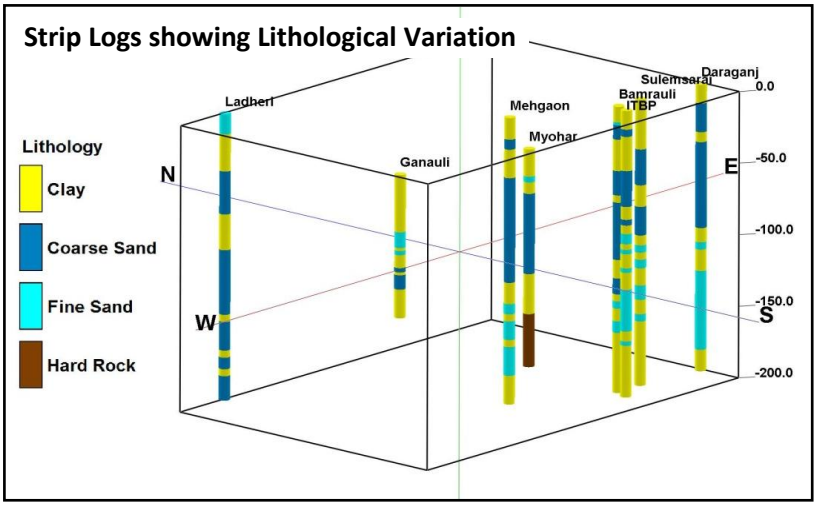
Summarized Hydrogeological Results of Exploratory Wells (EW) drilled as part of Ongoing Study on Palaeochannels in parts of Allahbad and Kaushambi Districts, UP

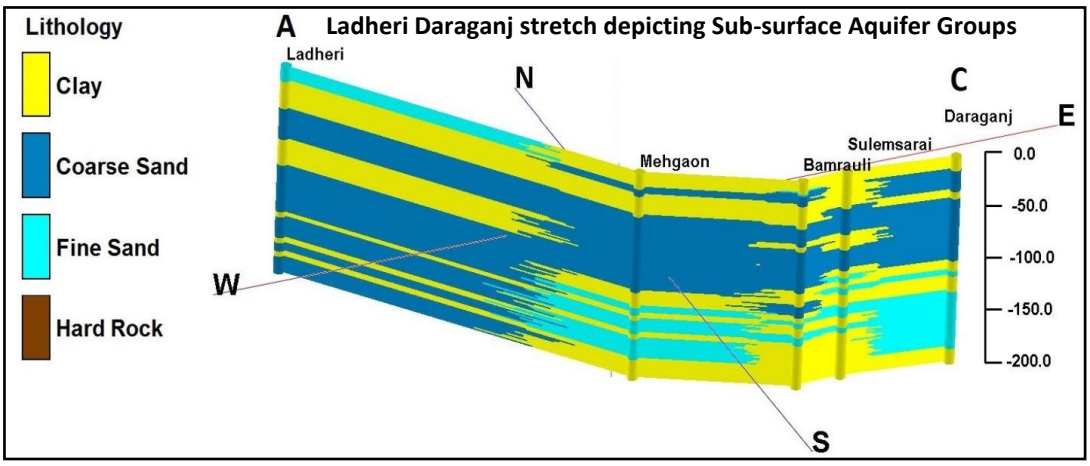
Sl. No.	Location	Block	District	Long	Lat	Depth Drilled (m)	Zone Tapped	OW	Tests Conducted
1	CATC Bamrauli	Kaurihar	Allahabad	81.743	25.450	200	70-76,82-94,100-106	Yes	PYT, borehole logging
2	ITBP–I Allahabad	Kaurihar	Allahabad	81.734	25.431	200	48-60,73-79,95-101,125-137,145-153	NO	borehole logging
3	ITBP-II Allahabad	Kaurihar	Allahabad	81.742	25.451	200	126-150	Yes	PYT, borehole logging
4	Myohar Laxmanpur*	Kausham bhi	Kaushambhi	81.513	25.404	153	51-57,63-75	NO	-

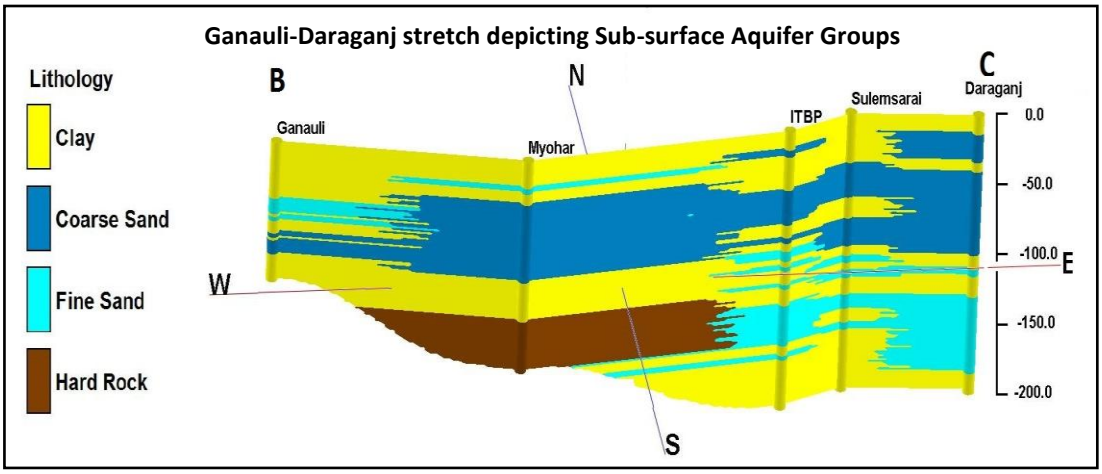
***completed during 2017-18**

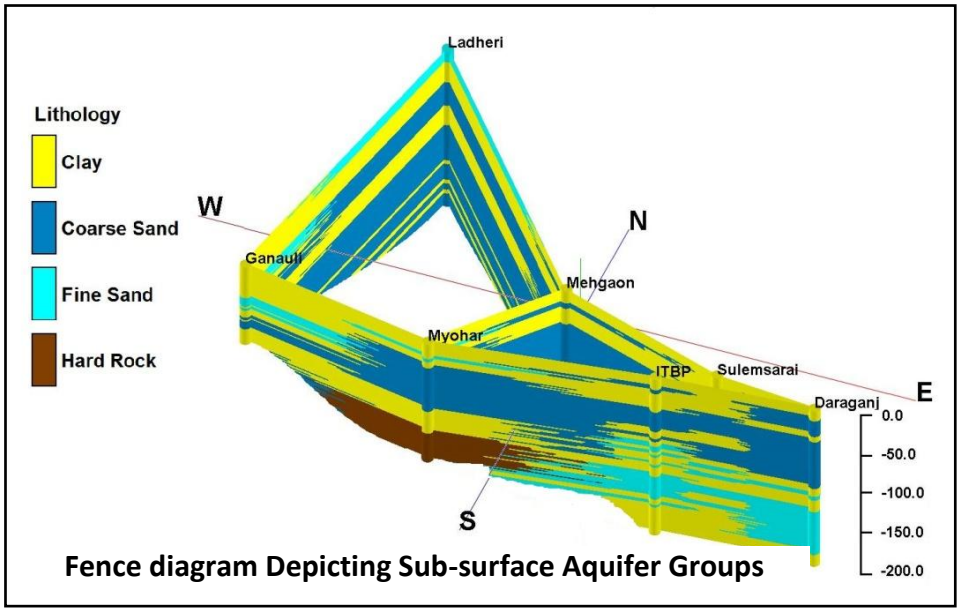
Following figures show location of EWs and depict sub-surface lithological variations/ aquifer disposition based on the exploratory drilling data.






Lithology
Clay
Coarse Sand
Fine Sand
Hard Rock
A
Ladheri Daraganj stretch depicting Sub-surface Aquifer Groups
Ladheri
N
C
Daraganj
E
Sulemsarai
Mehgaon
Bamrauli
W
S
0.0
-50.0
-100.0
-150.0
-200.0


Ganauli-Daraganj stretch depicting Sub-surface Aquifer Groups
Lithology
Clay
Coarse Sand
Fine Sand
Hard Rock
B
N
C
Daraganj
Sulemsarai
ITBP
Ganauli
Myohar
W
E
S
0.0
-50.0
-100.0
-150.0
-200.0


Lithology
Clay
Coarse Sand
Fine Sand
Hard Rock
Ladheri
W
N
Ganauli
Mehgaon
Myohar
ITBP
Sulemsarai
Daraganj
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S
0.0
-50.0
-100.0
-150.0
-200.0
Fence diagram Depicting Sub-surface Aquifer Groups

15.3 Purpose Driven Study (PDS) for River-Aquifer Relationship in the Sub - basin above confluence of Ramganga and Ganga in Upper Ganga Basin (under NHP)

Exercise for taking up Purpose Driven Study (PDS) on river-groundwater interaction in sub basin above the confluence of Ramganga with Ganga in Upper Ganga Basin was initiated in collaboration with National Institute of Hydrology (NIH). PDS proposal is in initial stage. Broad objectives of the proposed study are given below.

- Aquifer- River Interconnection in the top phreatic aquifer
- Aquifer interconnection in the multi aquifer system
- Causes and Extent of Contamination in River & Groundwater system
- Solute Transport Model for predictive simulation and for contaminant containment (need based)
- Feasibility of Aquifer Remediation on pilot basis(need based)

In order to ascertain vertical and lateral extension aquifers, it is proposed to drill slim holes, and to construct shallow tube wells (down to 100-150m bgl) and deep tube wells (maximum depth of 300m bgl) at select places to determine aquifer parameters. Water samples are proposed to be collected from both river and groundwater at strategic locations, and analyzed for the chemical and isotope characterization and to correlate the water chemistry between surface water and groundwater system. The aquifer characterization would form an input for groundwater model to study groundwater dynamics and Solute Transport Modeling would be used to study the extent of contamination, if any. On the basis of the studies, river - groundwater interaction would be inferred and calibrated in the model. A pilot area would be identified on the basis of the study for aquifer remediation and a pilot study would be taken up as part of PDS.

16. RESEARCH & DEVELOPMENT STUDIES

The following Research and Development studies were taken by Regional offices of the Board during the year.

Interim report on perchlorate contamination in groundwater in and around Aluva, Kerala

Perchlorate is produced in bulk in the ammonium perchlorate experimental plant (APEP) at Kalamassery industrial area in Ernakulam district of Kerala and the area surrounding this Plant is reported to have been affected with perchlorate contamination. Studies in coastal areas of central Kerala have found that a considerable section of the population suffers from thyroid disorders as well as a high incidence of thyroid cancer compared to other states.The studies by Nadaraja et.al in Kerala identified perchlorate contamination in surface and groundwater at four places viz; Aluva in Ernakulam district, Thumba in Trivandrum district and other two locations in Kannur and Palakkad districts. The ammonium perchlorate experimental plant (APEP) where this chemical is produced in bulk is the major sources of the contaminant in Aluva and Thumba. Whereas the contaminant source in Kannur and Palakkad districts is mainly from possible sources like usage of ClO_4^- in fireworks, explosives etc.The studies indicate a high perchlorate contamination in groundwater compared to surface water. The BIS has not established a maximum contaminant level or enforceable regulatory limit for perchlorate in drinkingwater. The World Health Organisation has established a provisional maximum tolerable daily intake (PMTDI) of 0.01 mg/kg body weight for perchlorate.

The main purpose of the present study is to identify the mobility of perchlorate ion in groundwater to develop a solute transport model in the aquifer system and the chemical reactions it undergoes within the system (if any) and its socio environmental implications.

The study area falls around, the APEP at Aluva in Ernakulam district (SOI topo sheet No.58B/8). The area has been identified for a detailed study on perchlorate contamination and its mobility in groundwater. As part of the study, a reconnaissance survey was carried out in the above area, where perchlorate contamination is reported/suspected.The main objectives of the reconnaissance survey were to understand the general hydrogeological set up, physiography, slope-hydrology relationships, local ground water level scenario and also to interact with local population, on the health problems associated with perchlorate in ground water if any.

Geologically, the study area has two distinct geological formations; crystalline rocks of Precambrian age, and the Recent alluvium deposits along the river course. The most wide spread geological formations of the study area are the Precambrian crystalline rocks comprising charnockites. The charnockite is foliated showing strike in NNE – SSW to N – S direction with gentle dip towards west. Subrecent, laterites occurs as a capping, above the charnockites, with a lithomarge clay deposit in between. Quaternary formation is found at the entire stretch along the river course of Periyar and Muttar.

The groundwater generally occurs under phreatic condition in weathered (laterite) and fractured Charnockites, and unconsolidated river sediments along the course of Periyar and Muttar in the study area. The ground water occurs under semi-confined to confined conditions in the deep seated fractured aquifer of the crystallines rocks. The weathered laterite capping the Charnockites forms the primary phreatic aquifer in the study area. The depth of dug wells varies from 3.5-18.00 mbgl in the study area tapping the phreatic aquifer (Laterite) zone. The Static water level in the wells tapping lateritic phreatic aquifers in the study area ranges from ranges from 3-15 mbgl. The laterites are highly porous and permeable. It is extensively developed by dug wells in the study area for domestic and to a limited extent for irrigation. The thin beds of alluvial formation forms aquifers in isolated pockets and the thickness of alluvium in such areas ranges up to a maximum of 10 m and is tapped by dug wells (having depth between 3-10 mbgl) and occasional filter points The depth to water level in dug wells tapping alluvium ranges between 2 and 9 mbgl. The Ground water quality except for perchlorate in the study area is fairly good as observed during preliminary survey. In addition to the main area around Aluva, certain samples were also taken from Thumba ERLS premises, Trivandrum and Puttingal a village in Kollam district. A total of 92 samples for the analysis of perchlorate concentration; 51 samples to understand the hydro geochemical characteristics (major ions) of the aquifers were collected (Table 16.1).

Table16.1. Enumeration of samples collected as part of R&D study on Perchlorate concentration

S. no.	Location/District	No. of Samples for Perchlorate analysis	No. of Samples for major ion analysis
1	Aluva/Ernakulam	61	37
2	Puttingal/Kollam	16	8
3	Thumba/Thiruvananthapuram	15	6

The study is continuing in next year also.

17. CHEMICAL QUALITY STUDIES IN URBAN CLUSTERS

Central Ground Water Board has carried out following Chemical Quality study in Urban Clusters studies in following states during 2016-17.

17.1 Maharashtra:

The cluster study of 8 MIDC areas (Chandrapur, Chembur, Dombivali, Navi Mumbai, (Tarapur) Thane, Aurangabad, Pune and Nasik) was carried out.

17.2 West Bengal:

Studies have been undertaken in four Industrial cluster areas of West Bengal and reports have been submitted. Major findings in the different cluster areas are as follows:

A. Asansol– Durgapur Industrial Area:

Ground water of Asansol shows maximum value of pH 8.3, EC- 1120 µs/cm at 25^0 C, total hardness 415 ppm, calcium 102 ppm, magnesium- 26ppm, Na- 168ppm, K- 13 ppm, Bicarbonate 385 ppm, Chloride- 149 ppm, Sulphate- 74ppm, F- 0.71ppm, Phosphate- 1.59ppm and Silica- 65ppm. Water is slightly alkaline .Electrical conductivity is more than permissible limit. Other parameters are within permissible limit. Among the heavy metals maximum value of Iron- 1.5ppm, Arsenic- 0.0026 ppm, Cadmium- 0.0015ppm, Chromium- 0.0008ppm, Lead- 0.0034 ppm, Manganese- 0.42ppm. Among the values of heavy metals Iron and manganese values are more than permissible limit.

B. Durgapur Industrial Area:

Ground water of Durgapur shows maximum value of pH 8.2 EC- 1620µs/cm at 250^0 C, Total hardness 420 ppm, calcium 106 ppm, magnesium- 38ppm, Na-161 ppm, K-108 ppm, Bicarbonate-390 ppm, Chloride- 391ppm, Sulphate- below detectable limit, F- 0.67 ppm, Phosphate- 2.57 ppm, Silica-52 ppm. Water is slightly alkaline. Electrical conductivity is more than permissible limit. Others values are within permissible limit. Among the heavy metals maximum value of Iron- 0.75ppm, Arsenic- 0.0012ppm, Cadmium- 0.0025 ppm, Chromium- 0.0002 ppm, lead- 0.01 ppm, Manganese- 6.06 ppm, Zinc- 0.26 ppm. Among the values of heavy metals Iron and manganese values are more than permissible limit. Manganese values are not only high, alarming (permissible value- 0.3 ppm).

C. Haldia industrioal belt:

Ground water of Haldia shows maximum value of pH 8.3 EC- 2630µs/cm at 25^0 C, Total hardness 280 ppm, calcium 88 ppm, magnesium- 34 ppm, Na- 500 ppm, K- 2.3 ppm, Bicarbonate-403 ppm, Chloride- 693 ppm, Sulphate- below detectable limit, F- 0.67 ppm, Phosphate- 0.65 ppm, Silica-48 ppm. Water is slightly alkaline. Electrical conductivity is more than permissible limit. Others values are within permissible limit. Among the heavy metals maximum value of Iron- 4.6 ppm, Arsenic- 0.0004 ppm, Cadmium- 0.0004 ppm, Chromium- 0.0006 ppm, lead- 0.0022 ppm, Manganese- 0.27 ppm, Zinc- 0.74 ppm. Among the values of heavy metals Iron is high.

D. Howrah industrial belt:

Haora - Analysis report of Ground water of Haorar shows maximum value of pH 8.2 EC= 2950µs/cm at 25^0 C, Total hardness 425 ppm, calcium 90 ppm, magnesium- 96 ppm, Na- 598 ppm, K-11.6 ppm,

Bicarbonate- 488 ppm, Chloride- 818 ppm, Sulphate- 48 ppm, F- 0.70 ppm, Phosphate- 0.53 ppm, Silica- 52 ppm. Water is slightly alkaline. Electrical conductivity is more than permissible limit. Others values are within permissible limit. Among the heavy metals maximum value of Iron- 5.10 ppm, Arsenic- 0.0092 ppm, Chromium- 0.0018 ppm, lead- 0.0047 ppm, Manganese- 0.85 ppm, Zinc-1.49 ppm, lead- 0.0047, cadmium- 0.0002 ppm. Among the values of heavy metals Iron and manganese values are more than permissible limit 17.3 in Kerala:

Chemical quality in Kochi cluster II was carried out and the results derived from the study is stated below:

- Hydrochemical studies were carried out in an area of about 200 sq.km in the urban clusters of Ernakulam – Kochi in Ernakulam district, which includes one of the major industrial belts of Kerala. The area includes Kochi Corporation, Elur Municipality, part of Kalamassery Municipality and some islands in the downstream side of Periyar river. Some of the biggest industries like Fertilizers and Chemicals Travancore (FACT), Travancore Cochin Chemicals, Indian Rare Earths Limited, Hindustan Insecticides Limited etc. fall in the study area. The area lies between north latitude $9^{o}54'30"$ $10^{o}07'00"$ and east longitude $76^{o}14'00"$; $16^{o}21'00"$.
- The coastal plains in the study area are covered by sediments of Recent and Sub-Recent age. The thickness of alluvium is 5 to 9 m. The recent alluvium in the coastal area is underlain by Tertiary sediments and in the north eastern part of the study area is covered by laterites.
- Ground Water exploration in the sedimentary area indicates that Recent Alluvium is underlain by laterite of 5 to 8 metres thickness and is followed downwards by Vaikom formations consists of sequences of coarse clay, carbonaceous clay and sand. Ground water occurs under phreatic condition in the Recent Alluvium and under semi-confined to confined condition in the Tertiary unconsolidated sediments
- Ground water in the study area is developed through dug wells mainly from phreatic aquifers. The depth of dug wells ranges from 1.10 to 9.40 m.bgl, 2/3rd of the dug wells had the depth of less than 3.0 m.bgl. Since the quality of water is generally poor, the wells are generally using for other purposes than drinking. Ground water from Tertiary formations are developed in minor scale.
- The ground water in phreatic aquifers in general, is slightly alkaline in nature, with median pH of 7.23. Highly acidic ground water with pH of less than 5 occurs at a few locations such as Mulavukad, Thevara and Udyogamandal etc. which have high concentration of industries or very near to marshy places .
- The electrical conductivity of ground water in the area ranges from 96 to 2400 µS/cm at 25^{o} C with a median value of 300µS/cm at 25^{o}C. Saline ground water occurs in some of the islands or in wells very near to the lake.
- The ground water in the phreatic aquifer in major part of the area is hard to very hard. The groundwater in major part of the area is suitable for drinking, though majority of the area depends on piped water supply for drinking purpose (surface water source).
- Ground water in the area is mostly Ca-Mg-HCO_3 type, indicating recharging type of ground water, followed by Ca-Mg-Cl_2 type, indicative of the influence of sea/water bodies surrounding the area.
- Based on the available hydrochemical data (major ions), there is no indication of significant ground water pollution in the area, except for acidification of ground water in local patches near major industrial clusters. The analytical data of heavy and trace elements from the water sample collected in 2012 reveals that there is no significant ground water pollution in the area. Many of the heavy and trace elements are within the permissible limit. But in the case of iron,it is found in very much excess in some localities which are very near to marshy areas. Iron concentration is found above the permissible limit in almost all parts of the state. Hence, the increased iron content may not be due to industrial pollution alone. Majority of industrial pollution may be washed out in the rain being very near to rivers and lake. Moreover some of the pollutants are being absorbed in the clayey formations in the surrounding areas of industrial areas.

- The electrical conductivity in the dug well samples are comparatively less in the present study compared to the study in 2011-12, is mainly because of the dilution due to prolonged rainfall in the year-2015.In some of the dug wells there is considerable changes due to the local reasons like rainwater recharge, more pumping/non pumping etc compared to the previous study.

17.4 Chattisgarh:

Pollution studies:

During AAP 2016-17 three industrial cluster (Bhilai Korba and Raipur) studies have been taken up. All the three industrial areas were investigated and ground water samples for basic analysis and heavy metal analysis were collected. The collected water samples were analyzed for the basic parameters and heavy metals. The results obtained are as follows:

The chemical analysis result of the ground water samples collected around the industrial cluster Bhilai shows that the water quality is potable for domestic and suitable for agricultural purposes in most of the locations. In two locations water is alkaline in nature. In three locations fluoride contamination is observed in ground water. The iron and manganese are observed more than the permissible limit at few locations. Chromium and lead also observed in few places. The industrial effluents are discharged in Somni nala and all the heavy metals are present in water samples of Somni nala. The chemical analysis results of ground water samples collected around Bhilai area is given below in Table no 17.1.

Table 17.1 Ground water chemical analysis result of industrial cluster Bhilai

Parameters	Average	Minimum	Maximum	BIS Acceptable limit	BIS Permissible limit
pH	7.71	7.27	8.78	6.5	8.5
EC (µS/cm)	639	141	1300	750	3000
TH (mg/l)	214	50	445	300	600
Ca (mg/l)	60	14	150	75	200
Mg(mg/l)	15	4	30	30	100
Na (mg/l)	34	7	178	NR	NR
K (mg/l)	5	0	41	NR	NR
CO3 (mg/l)	1	0	9	NR	NR
HCO3 (mg/l)	236	43	433	500	1000
Cl (mg/l)	64	14	160	250	1000
SO4 (mg/l)	31	3	81	200	400
F (mg/l)	0.45	0	1.8	1	1.5
Fe (mg/l)	0.17	bdl	0.826	0.3	NR
Mn (mg/l)	0.07	bdl	0.358	0.1	0.3
Cu (mg/l)	bdl	bdl	0.01	0.05	1.5
Cr (mg/l)	0.02	bdl	0.106	0.05	NR
Zn (mg/l)	0.6	bdl	2.94	5	15
Pb (mg/l)	0.01	bdl	0.053	0.01	NR

The ground water chemical analysis result of Korba industrial cluster reveals that the ground water is polluted by fluoride, nitrate, phosphate in certain locations. Iron and manganese in ground water have their concentration well above the standard norms for the drinking water. Copper, zinc and chromium are also present in water of study area but mostly below the permissible limit. The chemical analysis result is given below in Table no 17.2.

Table-17.2. Ground and surface water quality in Korba industrial area

Number of samples	Dug well (n=22)	Hand pump (n=34)	Surface water (n=06)	BIS Permissible limit
	Min-Max (Mean)	***Min-Max (Mean)***	***Min-Max (Mean)***	Range
pH	6.6-8.2 (7.6)	6.1-8.5 (7.7)	7.1-8.1 (7.7)	6.5-8.5
EC (µS/cm)	125-1800 (585.3)	65-1543 (415.1)	76-292 (171.7)	-
HCO_3^- (mg/l)	6-500 (107.8)	12-580 (125.4)	18-122 (59.0)	200-600
Cl^- (mg/l)	7-199 (58.5)	7-131 (35.6)	7-11 (9.0)	250-1000
F^- (mg/l)	0.2-2.3 (0.5)	0.2-1.8 (0.5)	0.0-2.8 (1.2)	1.0-1.5
SO_4^{2-} (mg/l)	0-310 (68.1)	0-131 (29.7)	0-54 (16.5)	200-400
NO_3^- (mg/l)	2-210 (60.7)	0-160 (29.0)	0-7 (2.0)	45
Na^+ (mg/l)	7.1-180 (52.2)	0.3-103.3 (27.1)	0.5-13 (5.5)	-
K^+ (mg/l)	1.3-57.8 (15.5)	0.5-23 (6.7)	3.2-5.5 (4.6)	-
Ca^{2+} (mg/l)	10-136 (36.9)	4-152 (36.0)	6.0-40 (18.7)	75-200
Mg^{2+} (mg/l)	1-72 (15.3)	1-26 (10.1)	2-10 (5.8)	30-100
TH (mg/l)	35-530 (155.7)	20-455 (132.1)	25-125 (70.8)	200-600
Pb (mg/l)	bdl- 0.026 (0.01)	bdl-0.022 (0.01)	bdl-0.015 (0.01)	0.01
Fe (mg/l)	0.02-0.44 (0.13)	0.04-14.0 (3.12)	0.5-1.3 (0.84)	0.3
Mn (mg/l)	bdl- 0.66 (0.22)	bdl-0.58 (0.12)	bdl-0.25 (0.09)	0.1-0.3
Cu (mg/l)	bdl- 0.32 (0.02)	bdl-0.08 (0.02)	bdl-bdl	0.05-1.5
Zn (mg/l)	bdl- 1.30 (0.65)	bdl-2.90 (0.98)	bdl-1.8 (0.30)	5-15
Cr (mg/l)	bdl- 0.05 (0.03)	bdl-0.08 (0.04)	bdl-0.04 (0.02)	0.05

The industrial effluent discharges by the industries containing high fluoride and phosphate that may contaminate the nearby ground water sources. Industries should fulfil the criteria decided for industrial effluent disposal. Nitrate pollution are existing up to shallow aquifer, it is due to poor sanitation condition

prevailing around the well. The iron and manganese are observed beyond the permissible limit due to geological formation. Chromium also observed in few places is due to local pollution. The thermal power plant and other industries discharging their effluent in the surfaces water drainage and nearby shallow ground water in most of the area has deteriorated and turned surface water pale to yellow colour. Over all ground water and surface water of the study area is suitable for the drinking, agriculture and industrial purpose whereas in few locations water of study area having corrosive tendency.

The industrial cluster study of Raipur reveals that the ground water is neutral to slightly alkaline in nature. Its classification based on major ions, total alkalinity and total hardness show that ground water is suitable for drinking and domestic purposes. In respect to heavy metals most of the ground water is potable and heavy metals are within the acceptable limit except at few places where high iron, lead and manganese are observed. The chemical analysis result of the ground water samples collected around the Raipur industrial cluster is given below in Table-17.3.

Table-17.3 Chemical analysis result of the ground water samples collected around the Raipur industrial cluster

Year (No. of Samples)	2016-17 (n=20)		BIS 10500 :2012 Acceptable limit	BIS 10500 :2012 Permissible limit
Parameters	Min-Max	Mean		
pH	6.9-7.7	7.4	6.5	8.5
EC (µS/cm)	185-1890	976.6	-	-
HCO_3^- (mg/l)	79-366	249.2	200	600
Cl^- (mg/l)	14.2-337.3	136.0	250	1000
F^- (mg/l)	0.0-1.1	0.2	1.0	1.5
SO_4^{2-} (mg/l)	0.5-145.4	57.9	200	400
NO_3^- (mg/l)	-	-	-	45
Na^+ (mg/l)	6-207	55.0	-	-
K^+ (mg/l)	0.5-12	2.5	-	-
Ca^{2+} (mg/l)	24-176	86.7	75	200
Mg^{2+} (mg/l)	2.4-52.8	19.9	30	100
TH (mg/l)	70-520	299.5	200	600
Fe (mg/l)	bdl-1.35	0.17	-	0.3
Mn (mg/l)	bdl -0.42	0.08	0.1	0.3
Cu (mg/l)	bdl -0.02	0.01	0.05	1.5
Zn (mg/l)	bdl -1.17	0.25	5	15
Pb (mg/l)	bdl -0.07	0.01	-	0.05

17.5 Madhya Pradesh:

(a) Ground Water Quality Assessment around Dewas Industrial Area, District Dewas, Madhya Pradesh

The pH of ground water of Dewas Industrial area is neutral to slightly alkaline in nature.The electrical conductivity ranged in 310 to 4620 µS/cm at 25°C and value shows that the 32% of ground water is of poor quality with saline in nature. The fluoride concentration in and around the industrial area are found within the permissible limit as prescribed by BIS standard 1.50 mg/l. The nitrate concentration in ground

water ranged in between 3 to 300 mg/l and in 63.6% of ground water samples recorded nitrate concentration beyond the permissible limit as prescribed by BIS standard 45 mg/l. Total hardness concentration in ground water ranged in between 130 to 2020 mg/l. According to World Health Organization classification, 95.5% water samples belonging to very hard category in the study area.Suitability of water for irrigation purposes in industrialarea shows RSC values and Sodium Absorption Ratio (SAR), the ground water are suitable for agricultural purposes with proper soil management.

(b) Ground Water Quality Assessment around Ratlam Industrial Area, District Ratlam, Madhya Pradesh

The pH value of water belonging to Industrial Areas of Ratlam and its bordering villages ranged in between 6.65 to 7.56.The electrical conductivity ranging from 1086 to 7985 µS/cm at 25°C indicating the quality of ground water has been gravely contaminated and belongs to extremely poor quality. The fluoride concentration in and around the industrial area are found within the permissible limit as prescribed by BIS standard 1.50 mg/l. The study shows that 31.57% samples had high NO_3 conc. greater than BIS desirable limit (45 mg/l). The Total hardness concentration ranged in 200 to 2960 mg/l as $CaCO_3$, the study shows that the water belonging to area can be classified as hard to very hard for drinking purpose and household use.

(c) Ground Water Quality Around Pithampur Industrial Area, Madhya Pradesh

The pH of ground water have been observed in between 6.89 to 7.29 ranged shows that the ground water is within the permissible limit of 6.5 to 8.5 as prescribed by BIS. The electrical conductivity ranged in between 386 -4100 µS/cm at 25°C. The EC values less than the 750 µS/cm 25°C were recorded in four locations (11.4%) whereas 27 locations (77.1%) has been recorded in between 750 to 3000 µS/cm 25°C. four locations (11.4%) recorded EC more than 3000 µS/cm 25°C.The fluoride concentration in and around the industrial area are found within the permissible limit as prescribed by BIS standard 1.50 mg/l. The nitrate concentration in ground water ranged in between 3 to 134 mg/l and in 33% of ground water samples recorded nitrate concentration beyond the permissible limit as prescribed by BIS standard 45 mg/l. Total hardness has been observed in between 130 to 1800 mg/l. As per World Health Organization classification the degree of hardness, the 94.3% water samples are belonging to very hard category for drinking as well as domestic purposes. Suitability of water for irrigation purposes in industrial area shows RSC values and Sodium Absorption Ratio (SAR), the ground water are suitable for agricultural purposes with proper soil management.

(d) Ground water quality around Malanpur Industrial Area, Madhya Pradesh

In the Malanpur industrial area the pH of ground water is slightly neutral to alkaline in nature.The electrical conductivity of ground water is ranged in between 590 to 3550 µS/cm at 25°C shows the quality of ground water good to poor quality with saline in nature. The fluoride concentration have been observed in between 0.18 to 1.74 mg/l and three locations are found fluoride concentration more than permissible limit set by BIS (1.50 mg/l). In the industrial area nitrate concentration in ground water ranged in between 4 to 86 mg/l and 12.5% water samples recorded more than 45 mg/l as BIS recommendation. Total hardness of ground water in the study area ranged in between 225 to 845 mg/l with 18.7 % water samples found more than permissible limit set by BIS i.e. 600 mg/l. World Health Organization has classified the degree of hardness in water for domestic uses. In the study area all waters samples have hard category. Suitability of water for irrigation purposes in industrial area shows RSC values and Sodium Absorption Ratio (SAR), the ground water are suitable for agricultural purposes with proper soil management.

(e) Ground water quality around Indore urban Area, Madhya Pradesh

The pH in the ground water of the Indore urban ranged in between 6.90 to 7.57 and observed within the permissible range of 6.5 to 8.5 as prescribed by the BIS. The fluoride concentration reveals that the ground of urban area is within the permissible limit recommended by BIS i.e. 1.50 mg/l. In the industrial area nitrate concentration in ground water ranged in between 0.3 to 105 mg/l and 26% water samples recorded more than 45 mg/l as BIS recommendation. Suitability of water for irrigation purposes in industrial area shows RSC values and Sodium Absorption Ratio (SAR), the ground water are suitable for agricultural purposes.

17.6 Himachal Pradesh:

To assess the impact of industrial pollution on ground water quality, 24 numbers of water samples were collected from the study area of Baddi&Parwaanoo Industrial area of district Solan and Kala Amb industrial area of Sirmaur district in 2016.

Table 17.4: General ranges of water quality parameters of the study area

Sr.No	Water Quality Parameters	Minimum	Maximum
1.	pH	7.18	8.77
2.	E.C Sp. Cond. µmhos/cm at 25°C	90	1190
3.	CO_3 (mg/l)	54	
4.	HCO_3 (mg/l)	18	519
5.	CL (mg/l)	11	191
6.	NO3(mg/l)	0.13	116.5
7.	F (mg/l)	1.4	
8.	Ca (mg/l)	4	66
9.	Mg (mg/l)	2.4	45
10.	Na (mg/l)	9	310
11.	K (mg/l)	0.6	5.4
12.	TH (mg/l)	20	275

17.7 Uttar Pradesh:

The Study of **12 Industrial Clusters** was undertaken in Uttar Pradesh- Ghaziabad Noida, Kanpur, Agra, Varanasi, Moradabad, Aligarh, Firozabad, Mathura, Meerut Bulandshahar & Singrauli Industrial area.

The Basic Parameters analysed were pH, EC, Total Hardness (TH), Bicarbonates (HCO_3), Chloride (Cl), Fluoride (F), Nitrate (NO_3), Sulfate (SO_4), Calcium (Ca), Magnesium (Mg), Sodium (Na), Potassium (K), Silica (SiO_2) and Phosphate (PO_4).

Heavy Metal analysis was done for Copper (Cu), Zinc (Zn), Managanese (Mn) and Iron (Fe). Samples from Kanpur Industrial Area were also analysed for Chromium (Cr). In addition, samples were analysed for Arsenic (As) content.

Permissible Limits for the constituents have been considered as per BIS 2012 Drinking Water Standards and are given in following table.

District - wise results/ findings for key Basic Parameters (pH, EC, Nitrate and Fluoride), Heavy Metals and Arsenic are summarized below. Information regarding only those chemicals/ instances are provided where concentrations higher than permissible limits have been found.

Summary of Chemical Analysis results of Basic parameters in respect of samples collected from 12 Industrial Clusters in Uttar Pradesh

S. No.	District/ Industrial Cluster	No. of Sam-ples	EC			Fluoride			Nitrate		
			Range (µ-Siemens /cm at 25°C)	No. of samples above 3000 µ-Siemens/cm at 25°C	Range above 3000 µ-Siemens/cm at 25°C	Range (mg/l)	No. of samples above 1.5 mg/l	Range above 1.5 mg/l	Range (mg/l)	No. of samples above 45 mg/l	Range above 45 mg/l
1	Agra	10	2130 - 8400	8	3830-8400	0.49-1.60	1	1.60	31-270	9	52-270
2	Firozabad	10	790 - 2050	nil	nil	0.74-2.80	4	1.70-2.80	6.9-170	2	105-170
3	Singrauli	26	236-1614	nil	nil	0.07-3.6	2	1.60-3.60	0-82	5	67-82
4	Moradabad	19	450-1732	nil	nil	0-0.39	nil	nil	0-118	2	51-118

S. No.	District/ Industrial Cluster	No. of Sam-ples	EC			Fluoride			Nitrate		
			Range (µ-Siemens /cm at 25°C)	No. of samples above 3000 µ-Siemens/cm at 25°C	Range above 3000 µ-Siemens/cm at 25°C	Range (mg/l)	No. of samples above 1.5 mg/l	Range above 1.5 mg/l	Range (mg/l)	No. of samples above 45 mg/l	Range above 45 mg/l
5	Aligarh	10	730 - 2340	nil	nil	0.27-1.08	nil	nil	0-170	1	170
6	Mathura	13	1000-23700	8	3340-23700	0.39-6.00	7	1.6-6.00	0-625	1	625
7	Ghaziabad	9	579 - 2607	nil	nil	0-1.0	nil	nil	1.4-329	5	126-329
8	Noida	12	581 - 13562	4	3280-13562	0.65-8.05	9	3.40-8.05	0.03-47	1	47
9	Meerut	17	574-1704	nil	nil	0.22-1.23	nil	nil	0-390	3	64-390
10	Varanasi	58	506 - 2990	nil	nil	0.21-4.50	22	3.45-4.50	0-393	10	49-393
11	Bulandshahar	20	366 - 2566	nil	nil	0.22-3.5	4	1.6-3.5	0.03-118	4	55-118
12	Kanpur	10	1121 -	1	3017	0-3.8	1	3.8	1.2-	4	48-

			3017						139		139

High EC is found in 8 out of 10 samples from **Agra**. The area is known to be infested with inland salinity problem. High EC in Agra, therefore, appears to be geogenic.

Summary of Chemical Analysis results of Heavy Metals in respect of samples collected from 12 Industrial Clusters in Uttar Pradesh

S. No.	District	No. of Samples	Fe			Mn		
			Range (mg/l)	No. of sam-ples above 0.3 mg/l	Range above 0.3 mg/l	Range (mg/l)	No. of sam-ples above 0.3 mg/l	Range above 0.3 mg/l
1	Agra	10	0.14- 2.2	9	0.390-2.2	0- 0.12	nil	nil
2	Firozabad	10	0.14 -3.0	6	0.38-3.0	0 - 0.05	nil	nil
3	Singrauli	26	0.076-4.010	21	0.381-4.010	0-0.05	nil	nil
4	Moradabad	19	0 -2.070	6	0.400-2.070	0.016-0.711	1	0.711
5	Aligarh	10	0.15-2.9	5	0.34-2.9	0.01-0.11	nil	nil
6	Mathura	13	0.15-1.23	6	0.38-1.23	0-.05	nil	nil
7	Ghaziabad	9	0.081 - 4.128	7	0.337-4.128	0- 0.304	1	0.304
8	Noida	11	2.0 - 4.75	11	2.0 - 4.75	0.06 - 0.75	2	0.420-0.75
9	Meerut	17	0.375- 6.125	17	0.375- 6.125	0.002 - 0.260	nil	nil
10	Varanasi	58	0.1105- 2.0680	25	.3038-2.0680	0.0153- 0.2651	nil	nil
11	Bulandshahar	20	0.054-1.13	13	0.305-1.13	0.004-1.434	2	0.451-1.434
12	Kanpur	10	0.106-1.040	5	0.423-1.040	0-0.144	nil	nil

Copper (maximum permissible limit in potable water is 1.5 mg/l) and **zinc** (maximum permissible limit in potable water is 15 mg/l, BIS 10500:2012) were found **within maximum permissible limits** in all the samples. Barring **3** samples from **Moradabad** and **2** samples from **Meerut**, **arsenic** was not detectable in any of the samples. In these five samples arsenic was below 0.05mg/l. However, values above 0.01mg/l were found in 2 samples from Moradabad district (Nr Rly Crossing, Sambhal Rd – 0.017mg/l and Lakhani, Nr Tarun Bhawan, Mini Bypass to Sambhal, Mini Bypass, Transport Nagar to Delhi - 0.031mg/l) and 1 sample from Meerut district (Mohqampur Industrial Area – 0.011mg/l).

17.8 Punjab

Review of Ground Water Pollution In The Industrial Clusters Of Jalandhar City District Jallandhar, Punjab State

Water samples were collected from same locations points where one or parameter was found to be above BIS permissible limit during the study carried out in 2014. Broadly, there is not much change in water quality with time. But the water quality at Surra nasi has deteriorated with time as salinity in terms of EC has increased from 756 µs/cm to 1071 µs/cm leading to corresponding increase in all major anions and cations, specifically nitrate and sodium which have increased from 29 mg/l to 96 mg/land 34 mg/l to 116 mg/l, respectively, from 2014 in 2016.

During 2014 ground water was mainly of Ca+Mg-HCO_3 type with isolated samples of Ca- HCO_3 and Na - HCO_3 type. In the present study (2016), the water type is also mainly Ca+Mg-HCO_3 type but Ca-Na-HCO3-Cl and Na-Ca-Mg-HCO3 type is also observed indicating base exchange reaction. There is not much change in water quality with reference to to irrigational use.
The percent samples with Iron and Manganese has increased during the two years while there is no change in % samples with cadmium concentration above BIS permissible limit of 0.003 mg/l. Lead was detected in all samples in both the years but maximum concentration detected has increased with time 0.118 mg/l to 0.1822 mg/l at same location (Surra nassi).

Groundwater of the study area is moderately mineralized. In general, there is not much change in physio-chemical parameters from 2014 to 2016 with exception of hand pump at Surra Nassi where increase in salinity, nitrate and sodium concentration is observed. Among the heavy metals analyzed, the concentration of Copper, Zinc and Arsenic are within the permissible levels of drinking water standards recommended by Bureau of Indian Standards 2012. Iron and Manganese above respective BIS permissible limit have increased with time while Lead is found to be more than the permissible limits in all samples. Industrialization and rise in agricultural and urban development has contaminated the ground water with respect to nitrate and Lead.
Ground water is suitable for drinking purposes with respect to salinity, chloride and fluoride but is unsuitable due to Lead contamination. However, these waters can be used for drinking purposes only after proper treatment. The ground water is suitable for irrigation on well-drained soils.
Every industry (small or large) should be directed to install ETP in its premises to overcome the water contamination. Drainage system should be developed so that impoundage of wastewater could be stopped, as it may affect the ground water quality right in its vicinity. Deeper aquifers which are comparatively less mineralized and contaminated with fluoride and heavy metal such as lead and iron concentrations should be developed for drinking water. PPCB should regularly check and monitor the chemical quality of the effluents produced by industries before these are discharged out of the industrial premises. Strict action is required against the industrial unit, if found violating norms/guidelines. Unpolluted roof top rainwater harvesting in large and medium industries should be made mandatory to augment groundwater recharge. This will not only increase the availability of groundwater but will also dilute the pollutants.

17.9 Haryana:

Ground Water Pollution Studies in Faridabad, Faridabad District, Haryana:

The study was taken up to assess groundwater quality in Industrial clusters of Faridabad industrial clusters, Haryana, wherein samples have been collected from potential contaminated pockets to outline the management actions that may be necessary to ensure different levels of modifications so that groundwater quality is maintained.
On the basis of hydrochemical data it is inferred that deeper aquifer is highly saline in comparison to shallow aquifer and highly saline waters are located in north eastern and southern parts of the study area. There is increase in chloride concentration with increase in salinity. Nitrate is more than 45mg/l in 33% of the samples and north eastern part has nitrate above 100 mg/l. The fluoride concentration varies upto 2.07 mg/l at Village Dabua (TW) and higher values of Fluoride are found in central part of study area. In general, calcium is less than the permissible limit of 200 mg/l (BIS, 2012) in the area, while magnesium content in ground water is higher than the permissible limit of 100 mg/l (BIS, 2012) in 22% samples. Sodium ranges from 115mg/l at Chandawali village (HP) to 1106 mg/l at Gopal Garden, Mathura road(TW). 28% samples are having concentration above 10mg/l indicating ground water contamination with respect to potassium. 27% samples have total hardness beyond the prescribed permissible limit of 600 mg/l (B.I.S, 2012).

It is observed that Copper, Manganese and Zinc are found in low concentration The cadmium concentration is found to be above the prescribed desirable limit BIS, 2012 (<0.003 mg/l) in ground water samples ranging up to 0.031 mg/l at Tube well No 3,Sect-37, indicating wide spread contamination by industrial activities in the entire study area. Lead is found to be more than the permissible limit of 0.01 in 89% samples.

In general quality of water in Faridabad has deteriorated in last few years. Remarkable change in water quality has been observed due to tapping of deeper aquifer. Hydrochemical, studies have indicated higher concentration of total dissolved solids (electrical conductivity) chloride, sulphate as compared to the drinking water standards. It is found that ground water at several places is not suitable for drinking uses because of either EC/Cl/F/NO_3 or all of them. Continuous use of such waters may lead salinity as well as sodium hazards when used for irrigation under normal practices. However, these waters can be used for irrigation along with an appropriate quantity of gypsum. Presence of Cadmium and Lead at all places and high iron at few places make the water unsuitable for drinking purpose. Zinc, copper and iron, though within permissible limit of BIS, are also on higher as reported in the previous reports. Thus, ground water should only be used after suitable treatment.

Ground Water Quality & Temporal Variation In The Industrial Clusters Of Panipat City, Haryana:

A review assessment study of ground water of Industrial clusters of Panipat city has been carried out in February 2016 wherein samples have been collected from already identified contaminated pockets in a study carried out during May 2014. In Panipat City, dense industrialization set up for various industrial units such as dyeing, textile processing and foundries etc. coupled with rapid and haphazard urbanization has resulted in groundwater pollution.

The study indicates that aquifers are polluted by fluoride and heavy metals such as Iron, Manganese and Cadmium at some locations. These locations are either confined to in the proximity of thermal Power Plant, Oil Refinery and Rojhla in the industrial clusters of HUDA. The ground water pollution is not confined to one particular part of the city but is scattered in nature due to industrial set up in various clusters at various locations. Due to the presence of fluoride and heavy metal like iron and manganese in ground water aquifers, it can be used for drinking puposes only after proper treatment.

However, these waters can be used for irrigation for salt tolerant crops on soils with adequate permeability along with suitable soil amendments due to high RSC values**.** Continuous use of such waters may lead to high salinity and high sodic hazards or may lead to medium to high salinity and low to medium sodicity when used for normal irrigation practices.

There is improvement in water quality in general, from 2014 to 2016, with respect to salinity, chloride sulphate, Calcium, magnesium, sodium, potassium and hardness with time but there are a few exceptions. There is not much change in water quality with respect to nitrate. Fluoride concentration has increased with time at all locations. Cause of fluoride in the area is found to be associated with its proximity to Ash Disposal Plant. Not much change in water quality is observed with respect to Cadmium, Copper and Zinc while there is slight improvement in water quality with respect to Lead and Iron from 2014 to 2016.

17.10 Tamil Nadu

Water samples were collected from Industrial cluster areas falling in the districts of Tiruvallur, Salem, Erode, Tiruppur and Cuddalore during May 2016 and the report on the results of the chemical analysis have been prepared and shared with line departments of state government.

17.11 Odissa

Chemical analysis of Water samples collected from selected dug, bore/tube wells and drainage channels such as Tikira,Nandira,IB,Veden in three pollution cluster indentified by CPCB such as Angul-Talcher,Paradip,Jharsuguda-Ib valley in state of Odisha revealed that there was a wide variation of hydrochemical parameters in waterbody. The concentration of Fluoride, heavymetal (Pb) above Permissible limit noticed at Tikra &,Nandira may be due to mixing of fly ash circulation water from nearby thermal power plant & other anthropogenic activities. It is observed that the content F (3.86mg/L), Pb(0.153mg/L),Mn (0.25 mg/L)As (20.206 µg/L) increased in fly ash circulation water of NTPC at Takua with variation of time. The concentration of heavy metals particularly Pb(71.42%)& F(57.14%) above permissible limit noticed in surface water of angul Talcher industrial area.

Presence of Arsenic(85.71%) &Mn(100%) also observed in surface water & all are within the permissible limit except only one sample of Mn at Talcher pond (1.114mg/L) above the permissible limit.The soluble salt content observed more in phreatic aquifer(dug well) at Paradip may be due to effect of sea water. The fluoride content in phreatic aquifer observed within the permissible limit in three pollution cluster except one at Angul-Talcher. The concentration of heavymetals Such as Fe(66.66%)&Mn(44.44%) above permissible limit noticed in phreatic aquifer(dug well) at Paradip whereas Pb concentration (71.42%) above permissible limit noticed in Angul-Talcher may be due to leaching from anthropogenic activities(Thermal power plant,Stock yard,Urbanisation). Presence of Arsenic also noticed in phreatic aquifer of Angul-Talcher(42.85%)&Paradip Port (55.5%) but within the much below permissible limit (50 µg/L) may be due to leaching from adjoining areas. Maximum value observed at Mundapada(16.28 µg/L) of Paradip.In few(2no.s) Bore well water (Confined/Semi-confined aquifer) at Jharsuguda-Ib valley observed to be slightly acidic (6.33&6.36)& lowest value observed at Markuta.The content of soluble salts observed to be higher in Paradip may be due to sub surface intrusion of sea water with variation of time.

The concentration of Fe in bore well water above permissible limit noticed at Paradip (100%) & Jharsuguda-Ib valley (50%) may be due to percolation of iron mineral as ferrous carbonate. All lean slurry disposal system to be converted to (High concentration slurry disposal (HCSD) or mine void filling. All the thermal power plants shall adopt zero discharge. Creation of reservoir for storage of mine drainage water and run off which can be used for industrial purpose.Conducting a comprehensive waste water audit for the Thermal power plant including run off management. The Urban waste should be treated before discharging these in to water bodies, otherwise the content of F, heavy metals increase in due course of time. Construction sewage treatment plant and drainage network for the nearby town ship. All the STP will be provided with standby DG sets to prevent discharge of sewage during power failure

The rapid industrialisation (fly ash generation), Urbanisation, Port activities may increase the content of fluoride, heavymetals such as Pb, Mn, Fe, As with variation of time in drainage channels & ground water (Phreatic aquifer) in industrial cluster of Angul - Talcher, Paradip, Jharsuguda - Ib valley in state of Odisha. So, due precautions need to be taken by the industry.

17.12 Andhra Pradesh

Vijayawada, Andhra Pradesh:

Ground Water samples are collected and analyzed from Vijayawada Industrial cluster notified by CPCB and analyzed for basic and heavy metal parameters. Out of 10 samples analyzed for trace elements, 2 samples (sample no. 9 & 10) show Manganese (Mn) in more than permissible limits and 7 samples (sample no. 1, 2, 3, 7, 8, 9, 10) show iron (Fe) in more than permissible limits. However, the presence of trace metals may not necessarily be an indication of industrial pollution, as the occurrence of high concentration of Mn & Fe are surmised to be of geogenic origin (Rao et.al).

Visakhapatnam, Andhra Pradesh: Ground Water samples are collected and analyzed from Visakhapatnam Industrial clusters notified by CPCB. A total of 10 water samples were analyzed for basic and heavy metal parameters. Out of 10 ground water samples analyzed for trace elements, Mindi (sample no. 4) show cadmium (Cd), Manganese (Mn) and Nickel (Ni) concentrations more than permissible limits. The presence of EC, Mg, Sulphates along with high concentrations of Cadmium (Cd), manganese (Mn) & Nickel (Ni) indicate the pollution of ground water from the industrial effluents. The Presence of high Nitrate in the ground water beyond permissible limit indicates the anthropogenic influences of Ground water contamination.

17.13 Telangana State

Ground Water samples were collected from six industrial clusters of Greater Hyderabad and analysed.

1. Patancheru Industrial Area, Jinnaram Mandal, Medak District
2. Bolarum Industrial Area, Jinnaram Mandal, Medak District
3. Jeedimetla Industrial Area, Qutubullapur Mandal, Ranga Reddy district
4. Kukapalli/Prashanthnagar Industrial Area, Qutubullapur Mandal, Ranga Reddy district,
5. Uppal Industrial Area, Uppal Mandal, Ranga Reddy district
6. Katedan Industrial Area, Rajendranagar Mandal, Ranga Reddy district.

The industrial areas are no longer confined in isolated industrial clusters because of the rapid urbanization, resulted in human settlements in and around the Industrial Clusters. In Patancheru IDA, 8 locations show high Electrical Conductivity, 4 locations show high chloride, 3 locations show high Sulphate and 7 locations show high Nitrate. The presence of high Chlorides, Sulphates along with high concentrations of Manganese (Mn) & Nickel (Ni) indicate the pollution of ground water from the industrial effluents. In Bolarum IDA, 11 locations show high Electrical Conductivity, 7 no. of locations show high chloride, 6 locations high Sulphate and 5 locations show high Nitrate. In Jeedimetla IDA, 3 locations show high Electrical Conductivity, 2 locations show high chloride, 4 locations high Sulphate and 6 No. of locations show high Nitrate. In Katedan Industrial area, 5 locations show high Electrical Conductivity, 3 locations show high Sulphate and 5 locations show high Nitrate. In Kukatpalli/Prashanthnagar Industrial areas, 2 locations show high Electrical Conductivity, 1 location show high Sulphate and 1 No. of location show high Nitrate. In Uppal Industrial area, 6 locations show high Nitrate concentration than the prescribed limits of BIS (IS-10500-2012). The analytical results show the ground water contamination by Industrial and domestic effluents.

17.14 Uttarakhand:

Groundwater Pollution Studies In Industrial Cluster of Bhagwanpur, Bahadrabad&Roorkee Blocks, District Haridwar, Uttarakhand

The Integrated Industrial Estate at SIDCUL, Roshnabad, Bahardrabad and Industries located in Bhagwanpur and Roorkee are located in the Tarai region of Indo-Gangetic alluvium where industrial development is going on at a faster pace. The industrial development is being organized by the State Industrial Development Corporation Limited (SIDCUL). It is quite possible that the industries will generate waste material, which may be toxic. The water source may be surface or subsurface would be polluted if untreated industrial wastes come in contact with the water.

The collected groundwater samples were analyzed for Electrical conductivity, pH, total hardness (TH) as CaCO3, calcium (Ca^{2+}), sodium (Na^{+}), potassium (K^{+}), bicarbonate (HCO_3), chloride (Cl^{-}), sulfate (SO_4), nitrate (NO_3), and fluoride (F^{-}) and major heavy metals analyses following the standard water quality methods . The evaluation of chemical characteristics of groundwater and suitability of groundwater quality was for drinking purposes.

The chemical analyses of the water samples collected from the National Hydrograph Stations show that by and large all the physico-chemical parameters analyzed are within permissible limits.The results of the physico-chemical parameters and heavy metal analyses of the water samples collected during the study shows that locally groundwater is having slightly higher values than the permissible in terms of the fluoride and nitrate. The illustration from piper diagram depict that Mg-HCO3 type of water predominated in the industrial cluster of the Haridwar District .Among the Heavy metals Manganese and Iron are more than the acceptable limits. The High concentration of Flouride will lead to the Dental Fluorosis and the High concentration of Nitrate will lead to the disease named Methemoglobinemia, or blue baby syndrome, which robs the blood cells of their ability to carry oxygen. The Higher content of Iron will not affect health of the individual but it will affect the property by corroding pipelines which will affect the water supply system and promotes iron bacteria. High concentration of Mn is toxic and cause manganism, disease of central nervous system involving psychiatric and neurological disorders. Due to this there may be irritability, difficulty in walking, abnormal gait, speech disturbance etc. (Mena et al, 1967).

Groundwater Pollution Studies in Integrated Industrial Estate (Iie), Sidcul, Pantnagar, District Udham Singh Nagar, Uttarakhand

The Integrated Industrial Estate Pantnagar is located in the Tarai region of Indo-Gangetic alluvium where industrial development is going on at a faster pace. The industrial development is being organized by the State Industrial Development Corporation Limited (SIDCUL). There are about 450 industries in Pantnagar. It is quite possible that the industries will generate waste material, which may be toxic. The water source may be surface or subsurface would be polluted if untreated industrial wastes come in contact with the water.

The chemical analyses of the water samples collected from the National Hydrograph Stations show that by and large all the analyzed parameters are within permissible limits except Fluoride, iron and magnesium, which is local.

To ascertain the actual status of groundwater pollution due to industrial effluents near the IIE, SIDCUL, Pantnagar area twenty Six (26) normal and acidified water samples have been collected during the present investigation from Borewells and ETPs inside the premises of the Industries and from the Hand pumps near by the industies. The results of the physico-chemical parameters and heavy metal analyses of the water samples collected during the study shows that locally groundwater is having slightly higher values than the permissible in terms of the fluoride and nitrate. Among the Heavy metals Manganese and Iron are slightly more than the acceptable limits. The High concentration of Flouride will lead to the Dental Fluorosis and the High concentration of Nitrate will lead to the disease named Methemoglobinemia, or blue baby syndrome, which robs the blood cells of their ability to carry oxygen. The Higher content of Iron will not affect health of the individual but it will affect the property by corroding pipelines which will affect the water supply system and promotes iron bacteria. High concentration of Mn is toxic and cause manganism, disease of central nervous system involving psychiatric and neurological disorders. Due to this there may be irritability, difficulty in walking, abnormal gait, speech disturbance etc. (Mena et al, 1967).

17.5 Gujarat

During the year 2016-17, chemical study in the following urban cluster was taken up at . Ankleswar,. Vapi. Rajkot,. Surat,. Ahmedabad,. Junagadh and . Vatva .

The findings of the urban cluster study are as given below:

Ahmedabad and Vatva Industrial Cluster

Further studies are recommended to ascertain pollution level in different aquifers in Ahmedabad Industrial Cluster in association/collaboration with suitable research institute.

As the authorities started supplying surface water in residential areas, adjacent to industrial clusters during the period 2013-16 (Narmada Water) the ground water abstraction structures which were used regularly during April 2013 are not used presently or partially used. The value of Cadmium (Cd) and Nitrate (NO3) beyond permissible limit in Vatva Industrial area is a serious threat to human health. Water supply agencies should make efforts to supply potable drinking water.

Ankleswar Industrial Cluster

In Ankleshwer industrial Estate there are about 1200 industries established so far. . About half of them are chemical units. Hazardous production process and products includes paints, fertilizers, dyes, pulp and paper, pharmaceutical and pesticides. Whenever common effluent treatment plant (ETP) becomes out of order or quantity of effluent generated by the industries are received beyond the capacity of treatment plant to treat the effluent, then untreated hazardous effluent is directly discharged into drain/ nala of Amlakhadi which carries effluent to Gulf of Khambat. This has caused lot of hardship to downstream villagers of Koyali, Tariya, Sajod, Mothiya, etc. They face the problem of drinking and irrigation water, due to pollution of Narmada, which forms main source of drinking as well as irrigation.

Vertical leakage/ leaching of effluent at a few places has taken place into the aquifer causing contamination of some heavy element like lead, copper, cadmium and chromium etc in the ground water but within the permissible limit. The concentration of heavy metals like Fe, Cu, Cd, Mn, & Zn is observed in surface water and drains carrying effluents passing through the area. The concentration of these metals is also reflected in the ground water samples. It is therefore, recommended that no industry should be allowed to discharge the industrial waste material and effluent into the drains or surface water body which would cause serious of problem of pollution into ground water. The industrial liquid and solid waste should not be allowed to be discharged near any water body and it should be mandatory to all the industries that they should not dump their waste material in open place which would cause contamination to ground water regime through percolation.

Vapi Industrial Cluster:

Earlier pollution reported in the area was due to then industrial effluents discharged from the industrial complexes through the open unlined storm drain adjoining the roads. During monsoon, this had resulted in formation of effluent puddles in low-lying areas in the industrial complex. Subsequently this effluent became local ground water pollution sources through vertical leakage from the surface to the underlying aquifers. Shallow ground water became coloured and at places with organic smell.

Before commencement of CETP, all industrial effluent used to flow through Bil Khadi. The natural stream of the area, Bil Khadi, had lost its natural identity and became open drain for industrial effluent of the area for a decade. Its streambeds became red colour and all along its course down to industrial complex became patch of colour and odour pollution throughout the year. Even after the commencement of CETP, many times untreated industrial effluents are discharged into the Bil Khadi.

The CEPT was commissioned in January 1997 and since then the effluents are treated at CEPT and being discharged into Daman Ganga River after treatment. Based on the above it is concluded that although the CETP has contributed a lot in controlling further contamination of ground water, a lot more needs to be done. . Both the Daman Ganga and Kolak rivers are of effluent nature, it is unlikely that the effluents flowing through these rivers contribute for further ground water contamination. Out of 24 samples, 8 samples have been found to have Iron concentration more than the highest desirable limit i.e. 0.3 mg/l. Out of 24 samples, 7 samples have been found to have Cadmium concentration more than the

highest desirable limit i.e. 0.003 mg/l. Out of 24 samples, 3 samples have been found to have Manganese concentration more than the maximum permissible limit i.e. 0.3 mg/l.

Rajkot Industrial Cluster:

From the study it has been observed that majority of water samples collected from study area falls under BIS desirable or permissible category and hence are suitable for drinking water purposes. . In the study area Nitrate content in more than 60% samples were found below permissible limit (45 mg/L). Location which has high nitrate content more than 100 mg/L are Maliyasan (320) and Madahpar (135mg/L).The higher concentration of Nitrate may be attributed due the poor sanitation conditions and use of fertilizers in the adjoining agricultural areas. The concentration of all trace metals were found within BIS permissible limits which indicates that there is no perceptible contamination of ground water due to industrial effluents. A detailed long term monitoring of general chemical quality and trace elements is needed to establish the source of the pollutants in this vulnerable area. There is an urgent need for management of industrial waste and strict regulation on disposal into ground to avoid the groundwater pollution due to heavy metals.

Junagadh Industrial Cluster:

There is an urgent need for management of industrial waste and strict regulation on disposal into ground to avoid the groundwater pollution due to heavy metals. Creating awareness among the people regarding water conservation, water quality, pollution through wastes, drainage water maintenance, judicious use of water and adoption of efficient irrigation techniques like drip/sprinkler irrigation. Awareness of people on groundwater aquifer system based on quality and quantity, affect of heavy pumping on the aquifer is required for management of groundwater at local level. Taking up artificial recharge on large scale through appropriate techniques on a regional scale with active community participation will develop the groundwater scenario.

18. GROUND WATER STUDIES IN DROUGHT PRONE AREAS

18.1 Maharastra

NAQUIM studies in Ausa, Chakur, Nilanga, Renapur and Latur talukas, Latur district. Construction of Exploratory Wells for drought mitigation in Latur district from other NAQUIM areas

Due to three consecutive deficient rainfall years (2012-15), the major parts of Maharashtra was reeling under drought in three consequtive years. The Hon'ble Minister of Water Resources, RD&GR, Sushri Uma Bharati, had convened a meeting at Nagpur on 18-04-2016 to discuss about the prevailing severe drought conditions and acute water scarcity in Latur district and other parts of Maharashtra.

After through discussions with CWC, CGWB, NWDA and State Government officers from Vidarbha Irrigation Development Corporation, State Irrigation Circle etc. the Hon'ble Minister directed CGWB, Nagpur to drill about 20 to 25 borewells by diverting the departmental rig to Latur district to combat the drought situation before the onset of monsoon.

Construction and Handing Over of Exploratory Wells for drought mitigation in Latur district

In order to accomplish the above task, three number DTH rigs of 200 m/300 m capacity have been diverted from other NAQUIM areas to Latur district for construction of 25 exploratory wells in drought affected Latur, Ausa, Renapur, Chakur and Nilanga talukas. The target of 25 wells had been completed and all the wells have been handed over to the district administration for restoring water supply. These wells can cumulatively provide water supply to about 23000 persons @ 40 lpcd if wells are pumped for 10 hrs/day intermittently. This would go a long way in helping the district administration to provide a sustainable source of water supply to these villages. The assistance provided by CGWB in short period of 1 month during extreme exigency has been appreciated by District Collector.

Report on "On the Spot Studies of Water Situation of Latur District of Maharashtra" by CGWB, CR, Nagpur

On the spot studies of groundwater situation of Latur district with objectives i) to analyse the probelm and causes leading to such situation, ii) to identify water resources management challenges, iii) to identify gaps in water information and plans for artificial recharge, iv) to identify long term solutions and v) protection management and restoration of water bodies has been carried out and report submitted.

18.2 Tamil Nadu

The Aquifer mapping was carried out during 2016-17 covering total area of 33,371 sqkm area which includes 3 aquifer systems namely, Amaravathi, Bhavani and Chennai. Out of 3 basins, Amaravathi and Bhavani aquifer systems are having drought prone areas and they have been covered under the aquifer mapping. The district wise details are given below.

Sl. No	District	Area (Sq. Km.)
1	Coimbatore	1530
2	Dindigul	1846
3	Namakkal	572
4	Karur	976
5	Salem	1057
Total		**5981**

19. STUDIES IN TRIBAL AREA

Tamil Nadu

The Aquifer mapping was carried out during 2016-17 covering total area of 33,371 sqkm area which includes 3 aquifer systems namely, Amaravathi, Bhavani and Chennai. Out of 3 basins, Amaravathi and Bhavani aquifer systems are having tribal areas and they have been covered under the aquifer mapping.

The district wise details are given below;

Sl. No	District	Area (Sq. Km.)
1	Coimbatore	2310
2	Namakkal	2272
3	Nilgiris	1972
4	Salem	1962
	Total	8516

20. IEC ACTIVITIES

7th NATIONAL LEVEL PAINTING COMPETITION, 2016

The 7th National Level Painting Competition for school children, aimed at creation of public awareness on the importance of water conservation and prevention of its contamination was organized by Central Ground Water Board, on 8.02.2017 at August Kranti Lawn, India Gate, New Delhi. The event was organized under Information Education and Communication (IEC) Scheme of the Ministry of Water Resources, River Development and Ganga Rejuvenation, Government of India. The theme of the National Painting Competition was **"Conserve Water – Secure the Future".** A total of 87 students, who won the 1st , 2nd and 3rd prizes in the State Level Painting Competitions from various States / UT's participated in the National Level Painting Competition. More than 13 lakh students from 13,500 schools across the country participated in the School Level Competitions.

During his welcome address Chairman mentioned that to motivate and educate young minds on water resources, Union Minister of Water Resources, River Development & Ganga Rejuvenation has started nationwide campaign which is being organized since 2010 every year amongst the school children through painting competition and this is the sixth painting competition of this kind. The competition was held in three stages – the School Level Competition, followed by the State Level competition and finally terminating today at the National Level Painting Competition.

Sushri Uma Bharti, Hon'ble Minister of Water Resources, River Development and Ganga Rejuvenation was the Chief Guest on the occasion.

The theme for the State Level Painting Competition was **"Save Water –Save Earth ".** The State Level Painting Competitions were also combined with plantation of tree saplings to create awareness among children on the importance of conservation of ecosystems which having a close linkage with water.

In the National Level Painting Competition a First prize of Rs. 50,000/-, four Second prizes of Rs. 25,000/- each, five Third prizes of Rs 10,000/- each and 77 Consolation prizes of Rs. 5000/- each was given.

In the National Level Painting Competition 2017, the first prize was bagged by Kumari Nikhila P of Kerala State. The list of winners is furnished below:

Prize	Name	Class & School	State/UT
First	Nikhila P	8th, St. Teresa AIHSS, Kannur	Kerala
Second	Anubhab Sahoo	8th, Ahlcon Public School, Mayur Vihar, Delhi	NCT, Delhi
Second	Ispita Raut	8th, Times Scholars Gurukul, Kendrapara	Odisha
Second	S Debnath	6th, Holy Cross School, Agartala	Tripura
Second	Twinkle P	8th, Chinmaya Vidyalaya, Kannur	Kerala
Third	S. Dinesh	8th, Dr. Vimla Convent Hr Sec School, Chennai	Tamil Nadu
Third	Ritam Mondal	7th, Hariyana Vidya Mandir, Kolkata	West Bengal

Third	Namrata Devgun	8th, Bal Bharti Public School	Uttar Pradesh
Third	Dipanshu Pandey	8th, Rockford Convent High School, Gurugram	Haryana
Third	Pyanshu Roy	8th, Birina Art School, Guwahati	Assam

Dignitaries on the Dias during National Painting Competition at New Delhi

Address by Hon'ble Minister, WR, RD & GR

All the participants of 7th NLPC with Hon'ble Minister, WR, RD & GR

Bhujal Manthan

Bhujal Manthan-2 on Aquifer Mapping & Ground Water Management was held at Vigyan Bhavan, New Delhi on 29.11.2016. Following five sub-themes were identified:

1. Aquifer Mapping – A National Perspective
2. Advances in Science & Technology in Aquifer Mapping
3. Groundwater Management: Community Involvement & Convergence
4. Sustainable Management of Groundwater in Stressed Aquifer
5. Aquifers in Arid Area & Paleo Channels

Participants:

The Programme received overwhelming response and about 1200 experts and delegates including Officers from various Ministries, Govt. Organizations (Central as well as State Governments), Non-Government Organizations, Academicians, Scientists from Research Institutes working in the ground water domain and stakeholders like Students, Farmers & Industrialists from across the country. Hon'ble Guests and participants in the Buhujal Manthan included were following:

- Sushri Uma Bharati, Hon'ble Minister for Water Resources, River Development and Ganga Rejuvenation graced as the Chief Guest of the occasion.
- Shri Narendra Singh Tomar, Hon'ble Minister for Rural Development, Panchayati Raj Drinking Water Supply & Sanitation was guest of honour.
- Sh. Shashi Shekhar, IAS, Secretary, Ministry of Water Resources, RD &GR, Govt. of India
- Sh. Parameswaran Iyer, IAS, Secretary, Ministry of Drinking Water & Sanitation, Govt. of India
- Dr. Amarjit Singh, IAS, OSD, Ministry of Water Resources, RD&GR, Govt. of India
- Water Experts and other delegates.
- Representatives of Ministry of Water Resources, River Development and Ganga Rejuvenation including Additional Secretary, MoWR,RD & GR, Joint Secretary, MoWR, RD & GR and others.
- Various organizations of MoWR, RD & GR including Central Water Commission.
- Other water related Ministries of Central and State Governments.

- Former Chairman, Members and other senior level officer of Central Ground Water Board.
- Officers of Central Ground Water including Regional Directors of Central Ground Water Board.
- Local students
- Local farmers & industrialists.
- NGOs
- Other stakeholders including common citizen
- CGWB received received 65 technical papers for inclusion/presentation during the technical sessions of Bhujal Manthan

Recommendations of Bhujal Manthan-2:

- The outputs of NAQUIM should be made in local language for benefit of the stakeholders down the line.
- Management plans arising out of NAQUIM should be practical and adoptable so that they can be effectively implemented and state government can set their priorities accordingly.
- Efforts should be made to delineate areas having surplus groundwater and assess that resource during NAQUIM programme.
- Build in-house capacity for analysis and interpretation of Isotope and its widespread use in aquifer mapping. Isotope data generated through IWIM programme may be interpreted to understand the isotope finger printing.
- Ground Water modeling should be an integral part of NAQUIM, particularly in critical areas. It may significantly improve the water budget based management Plan. Use of advanced remote sensing and geophysical technique may be promoted in groundwater investigation as they can facilitate better demarcation and characterization of aquifers and understand stresses.
- The water available in open cast mines particularly in coal mines should be considered during the Aquifer Mapping. It should be seen whether they can be utilized for gainful in that areas and recharging the aquifers.
- Awareness and capacity building on scientific principal in ground water management needs to be improved in all levels. Help of NGOs/VOs and other stakeholders be taken under existing scheme.
- Tier-II and Tier-III programme of CGWB should have active involvement of NGOs/VOs and other stakeholders to broaden the capacity building.
- Springs are the lifeline for water in hilly region. Climate change has brought out the challenges of sustainable management of springs. A programme on mapping of springs and their rejuvenation should be taken up.
- Steps to be taken to ensure convergence of programmes related to groundwater under different ministries.
- Afford should be taken to use the expertise of ground water professionals and NGOs for speedy implementation of NAQUIM.
- Different data generated by CGWB may be made available suitably to students and researchers.

Second Essay Competition 2016-17

Central Ground Water Board, Ministry of Water Resources, River Development and Ganga Rejuvenation conducted 2nd National Essay Competition during the year 2016-17 on Water related issues under two Phases- **Phase I** and **Phase II**

In Phase I, the Essay Competition was held among the youth in the age group upto 18 years across the country. The Essay Competition aimed to make the youth aware of the need for conservation and prevention of pollution of this precious natural resource. The theme of the Essay Competition was "**Ground Water- Life line of the Nation"**. A total of 7990 persons participated in this Phase I of essay competition which was held at 31 places.

The theme for Phase II was "**When you conserve water, you conserve life."**

10 participants from each states/UTs were selected for Phase II of the second essay competition. Out of ten participants who appeared for Phase -II Competition, best 3 winners were selected from each State/UT and were be then sent to 10 Zonal Offices.

The prize money for each of the 10 zones is detailed below

First prize	10 Nos.	Rs. 50000 each
Second prize	10 Nos.	Rs. 25000 each
Third prize	10 Nos.	Rs. 15000 each
Consolation prize	30 Nos.	Rs. 5000 each

Jal Kranti Abhiyan

20 no Trainings and Five Workshops were held at Regional Offices of CGWB during 2016-17

Jal Grams selected (under Jal Kranti Abhiyan as on (31.3.2017)

Sl. No.	State/ UT	No. of Districts	Targets for identification of Jal Grams	Jal Grams Identified	Jal Grams yet to be identified	Water security Plans received
1	A & N Islands	3	6	6	0	0
2	Assam	32	54	27	27	27
3	Chhattisgarh	27	54	54	0	2
4	Goa	2	4	6	0	5
5	Kerala	14	28	28	0	2
6	Lakshadweep	1	2	2	0	0
7	Maharashtra	36	72	59	13	0
8	Manipur	9	18	9	9	9
9	Nagaland	11	22	22	0	22
10	Puducherry	4	6	4	2	0
11	Punjab	22	44	32	12	4
12	Rajasthan	33	66	66	0	4
13	Tamil Nadu	32	64	62	2	1
14	Tripura	8	16	8	8	8
15	West Bengal	20	40	0	40	0
	Total	**254**	**496**	**385**	**113**	**84**

Status of proposals received from states for consideration under PMKSY / Jalkranti Abhiyan

S. No.	State	No. of Jalgrams	Cost (in Cr.)	Implementing agency	Status
1	Nagaland	22	4.063	Irrigation & Flood Control dept., Nagaland	Submitted to Ministry on 16.12.16
2	Arunachal Pradesh	Under PMKSY	35.6685	WRD, Arunachal Pradesh	Submitted to Ministry on 28.12.16 & 16.3.17 for consideration under PMKSY
3	Mizoram	16	3.825	PHED, Mizoram	Submitted to Ministry on 10.2.17
4	Goa	3	6.9174	WRD, Goa	Submitted to Ministry on 2.2.17
5	Tripura	8	44.1065	PWD (WR), govt. of Tripura	Observations sent to Regional Director, NER for compliance, which is awaited
6	Kerala	2	21.535	Irrigation dept., Ground Water Dept., & Local Self Govt. Of Kerala state	Vide letter dated 31.1.2017 directly submitted to ministry by state govt.
	Total	**51**	**116.1154**		

22. SEMINAR / WORKSHOP

- One day Workshop on “Aquifer Mapping & Ground Water Modelling” was organized on 22nd April, 2016 at National Science Seminar Complex, Indian Institute of Science, Bangalore. The workshop was attended by about eighty delegates including experts in the subject from various Central and State Government Departments, professionals, researchers, stakeholders, water managers engaged in ground water resource development, management and policy planners. Distinguished invitees included Prof V.K.Gaur, Distinguished Professor & Fellow of the Indian National Science Academy, Prof P.P.Mujumdar, Chairman, Inter-disciplinary Centre for Water Resources, I.I.Sc., Bangalore, Prof L.Elango, Anna University, Chennai, Dr. M. Thangarajan, Former Head Ground Water Modelling, NGRI, Hyderabad, Prof. Shekhar Muddu, Sri S. Das, M.C. Reddy and Dr. B. Jayakumar retired Regional Directors, CGWB. Dr. Dipankar Saha, Member, CGWB, welcomed the delegates. Sri K.B. Biswas, Chairman, Central Ground Water Board presided over the Valedictory Session.
- Scientists of CGWB, SR, Hyderabad attended a one day Workshop on Ground Water Modelling organized by Central Ground Water Board at IISC, Bangalore on 22.04.2016.
- Scientists of CGWB, WR, Jaipur attended one day training cum workshop on "ISRO's Geo-Portal for development planning and e-governance" organised by Regional Remote Sensing Service Centre,Jodhpur & ISRO, Govt. of India held at Birla Auditorium, Jaipur on 12.04.2016.
- Chairman CGWB, Members, Regional Directors and Scientists of Central Ground Water Board attended India Water Week (IWW 2016) during 4th- 8th April 2016 organized by Ministry of Water Resources, RD & GR at Vigyan Bhavan, New Delhi.
- Scientists of CGWB, NWR, Chandigarh attended a National Workshop organized by National Institute of Hydrology, Roorkee on “Isotopes in Aquifer Mapping ’’during 11-13 April, 2016 at CGWB, New Delhi.
- Dr. P.K Naik, Suptdg. Hg, alongwith Sh. G.P Singh, Sc ‘D’ , CGWB, NWR, Chandigarh attended National Ground Water Improvement Programme meeting on 7th April 2016 with the team of World Bank in the office of Director of Agriculture, Haryana.The Meeting was conducted to discuss the matter to support Sustainable Ground Water Resource Management and to create an environment for reforms in Ground Water Sector.
- Shri Ashok Kumar, Sr. Hydrogeologist of CGWB, WCR, Ahmedabad attended workshop on “Use of Isotopes in Groundwater studies” organized by NIH, Roorkee at CGWB, New Delhi during 11-13 April 2016.
- Officers of CGWB, Central Region, Nagpur have attended a one Day Workshop on “Aquifer Mapping and Ground Water Modelling” on 22-04-2016 at Indian Institute of Science (IISC), Bangalore.

- One day Workshop and Global Market Conference on “Emerging issues, Opportunities and Challenges in Water well drilling for Drilling Engineers, Service provider and Rig Manufactures” was organized by CGWB on 24.05.2016 at New Delhi. The objectives of the workshop is i) to deliberate upon and to assess emerging issues, opportunities and challenges in water well drilling and related data generation; ii) to provide a platform to Government organizations, private service providers, drilling contractors, drilling rig manufacturers and all related stakeholders in water well drilling to share their experiences and difficulties in the field; iii) Assessing the potential of the market in terms of equipment and capabilities for water well drilling and related data generation in NAQUIM. The workshop was attended by about 150 delegates including experts from various Central and State Government Departments, professionals, service providers, drilling contractors and rig manufacturers. Distinguished invitees included Shri Shashi Shekhar , Secretary, MOWR, RD & GR, Shri Harbans Singh, DG GSI, Dr R.D. Singh,Director, NIH, Shri Subodh Kumar, ONGC, Dr D.K. Chadha & Dr. S.C. Dhiman, Ex Chairman, CGWB, Shri S.S.Chauhan, Dr. R. C. Jain, Shri. Bhajan Sing, Shri Ashis Chakraborthy, Ex-Member, CGWB, and Senior officers of CGWB have also attended the workshop.
- Shri. A. Subburaj, Scientist-D & H.O.O delivered the inaugural address during the inaugural function of the National Level Workshop on “Multiphase approaches on Assessment and Sustainable management of Stressed Coastal Aquifers” organised by Department of Earth Sciences, Pondicherry University 18.05.2016 at Puducherry.
- Shri K.B. Biswas, Chairman, CGWB attended the Seminar on “Sustainable Ground Water Management through effective governance” organized by NRIEMT at Science City Auditorium, Kolkata as the Chief Guest in the 2 days long Seminar from 21.05.2016 to 22.05.2016. The seminar was attended by Shri K.R. Biswas, Regional Director and other senior officers of ER, Kolkata. Technical papers were presented by Dr. S.K. Samanta, Suptd. Hydrogeologist on “Delineation of Managed Aquifer Recharge zones in parts of West Bengal using GIS”, Shri Tapan Talukdar, Scientist ‘D’ on “Village Level Ground Water Development and Management Plan-an approach from Domkol block, Murshidabad district, West Bengal”, and Dr. S. Brahma, Scientist ‘D’ on ”Development Plan of Aquifers of Fluoride infested Purulia district, West Bengal”.
- Sh. S. Bhattacharya, Suptg. Hydrogeologist & OIC and Sh. Rajesh Chandra, Sr. Hydrogeologist, CGWB, New Delhi attended conference on Water Security in India at PHD Chamber of Commerce on 10.05.2016.
- A Workshop on “Palaeochannels - Evolution and Ground Water Prospects” was organized by CGWB at CSMRS Auditorium, New Delhi. The programme was inaugurated by Honorable Minister of State, Water Resources, River Development & Ganga Rejuvenation, Prof. Sanwar Lal Jat, in the presence of Sh. U. P. Singh, Additional Secretary, Ministry of Water Resources, River Development and Ganga Rejuvenation, Sh. B. Rajendra, Joint Secretary, MoWR, RD & GR, Shri. K. B. Biswas, Chairman, CGWB and other dignitaries.

- Padma Bhushan Prof. K.S. Valdiya, in his key note speech discussed in detail about the origin and history of the palaeochannels with special emphasis on the once mighty River Sarswati flowing along the north westerns and western part of India. Prof. Anindya Sarkar, Head, Dept. of Geology & geosciences, IIT Khargpur dealt with the archaeological findings depicting one of the oldest civilization along the flood plains of the rivers in the north western India which is recently published in the Journal Nature. Padma Shri Dr Bisht explained in detail about the correlation between archeological sites and the palaeo-channel courses of river Sarswati. Prof. Rajiv Sinha, Head Geosciences Deptt. IIT Kanpur spoke about the sedimentological characters of the palaeochannels. Dr. D.Saha, Member CGWB, spoke about the work being carried out by the department in the palaeochannel areas of river Sarswati. During the panel discussion, Prof. S.K.Tandon emphasised the need for further studies to accurately delineate the palaeochannels and ascertain their characters particularly along the once mighty River Sarswati. Sh. Prashant Bhardwaj, briefed about the various activities being undertaken in the state of Haryana in this regard. The programme was attended by the luminaries from the field of geosciences, water resources engineering, archaeology, environment etc.
- The Regional Director of CGWB, West Central Region, Ahmedabad attended the conference on "Regional Challenges and Opportunities for building Drought and Climate, Resilience for farmers, cities and villages" organized by South Asia Groundwater Forum during 1st to 3rd June 2016 at Jaipur, Rajasthan.
- A workshop was organized to promote Hindi in the office at conference hall CGWB, WR, Jaipur on 23.06.2016.Shri Atul Kumar Agnihotri, Hindi translator, Rajbhasha Vibhag,GSI,Jaipur delivered lecture on various aspects of Hindi language.
- Central Ground Water Board, Ministry of WR, RD and GR, Govt. of India has organized a workshop on 1st September 2016 at IIT, Kharagpur under the NAQUIM. The theme of the Workshop was "Ground Water Modelling for Aquifer Management in Soft Rock Areas". This workshop mainly dealt with the challenges and issues arising during Groundwater modelling in Soft rock areas of Indo-Gangetic Plains. The workshop was inaugurated by Dr. S K Bhattacharyya, Acting Director, IIT, Kharagpur along with Shri K B Biswas, Chairman, CGWB; Dr. D Saha, Member, CGWB; Dr. Anindya Sarkar, Professor and Head, Department of Geology and Geophysics, IIT, Kharagpur; and Dr. J. Bhattacharya, Professor and Head, School of Environmental Studies, IIT, Kharagpur. The workshop consisted of 2 Technical sessions each comprising of 4 presentations on various aspect ofmodelling in soft rock areas. Total 80 invitees had participated in the workshop.
- One Workshop on Hindi at Region Office, Jaipur on 01.09.2016. Shri Rajesh Meena, Hindi teacher, AG office, Jaipur was the key speaker on the workshop. Hindi week was organised by CGWB, WR, Jaipur during 14.09.2016 to 21.09.2016. Various competitions,programme to

promote hindi language were conducted. The programme was concluded by prize distribution to the winners.

- Central Ground Water Board, Ministry of WR, RD and GR, Govt. of India has organized a workshop on 15.10.2016 at CSMRS, New Delhi. During workshop Shusri Uma Bharati the Honble Minister of WR, RD & GR released the Report entitled “Palaeochannel of North India: Review & Assessment”, compiled by expert Committee constituted by the Ministry. Total about 200 invitees had participated in the workshop from CGWB and other Department.
- Central Ground Water Board, Ministry of WR, RD and GR, Govt. of India has organized Bhujal Manthan-2 a national Dialogue on National Aquifer Mapping and GroundWater Management at Vigyan Bhavan, New Delhi on 29.11.2016. Sh. K.B. Biswas, Chairman, CGWB, Ministry of Water Resources, RD & GR. During Program Shusri Uma Bharati the Honble Minister of WR, RD & GR, released the app “Mera Bhujal” and Bhujal Manthan- 2 volume. Total four technical Session have been presented on different theme. Total about 1000 invitees had participated in the Bhujal Manthan-2 from CGWB and other Department.
- In pursuance to directives of Ministry of Water Resources, River Development & Ganga Rejuvenation, New Delhi, a Workshop/Meeting was organized at CGWB, SR, Hyderabad on 23.12.2016 on the use of “Digital measures for financial transactions” for the officers and staff of CGWB, SR, Hyderabad and CGWB, Div.IX, Hyderabad.
- CGWB, SWR Bangalore has organised a Workshop on “Digital Payment/Banking”at Bhujal Bhavan on 26.12.2016 to sensitize the Officers/Staff of SWR and Division XIV on the subject. Sri Gajaraj Chief Manager and Sri Mohit Khanna Asstt.Manager, Corporation Bank, HSR Lay out, Bangalore delivered talk on various types of digital payment.
- A workshop on “Use of digital means for financial transactions” has been organized on 23.12.2016 and 29.12.2016 at Patna, Bihar and at CGWB, Bhopal on 29.12.2016.
- A workshop on "Digital Payment" was conducted at CGWB, WR Jaipur on 23.12.2016.
- A workshop under Jalkranti Abhiyan was organized at Central Island Agriculture Research Institute, Garacharama, Port Blair on 14.11.2016.

Workshop on “Ground Water Resource Estimation 2015 Methodology”

One day workshop on “Ground Water Resource Estimation Methodology, 2015” (GEC-2015) was organised by Central Ground Water Board, Central Region, Nagpur on 24th January 2017 at Central Water and Power Research Station(CWPRS), Khadakwasla, Pune. The prime objective for organizing the workshop was collective interaction amongst various researchers, stakeholders, water managers and policy planners to discuss the changes proposed by the Committee in the draft report on GEC-2015 Methodology and to incorporate the important modifications, if any, that did not appear in the draft report. S/Shri Sunil Patil, IAS, Director, GSDA, Pune, Dr. S. K. Shrivastava, Chief Engineer, NWA, Pune, K.C.

Naik, Memebr (RGI), G.C. Pati, Member (WQ&TT), CGWB, Shri D. Subba Rao, Regional Director, CGWB, CR, Nagpur and Dr. P.K. Jain, Superintending Hydrogeologist graced the dais during the inaugural function. In all 107 participants from various departments attended the workshop. The major recommendation of the workshop was to develop software for computation of resources.

- Workshop on “Ground Water Issues in West Bengal” was organized under National Hydrology Project on 22.2.2017 at Aikatan, Salt Lake, West Bengal.
- Workshop under Jal Kranti Abhiyan was conducted on 23/2/2017 at Samnvay Bhawan Bhopal on "Remedial Measures for Ground Water issues & Management in Madhya Pradesh. In this workshop proceeding ofworkshop was released and 510 participants from various Organsation /Students participated.
- Organized workshop on “Rajya Bhasa Hindi” on 28.02.2017 at CGWB MER-Patna in which officers from different departments of State have participated and exchange their views regarding Rajya Bhasa Hindi.

Workshop on Arsenic Problem in ground water & its remediation in Ganga Basin on 7.03.2017.

- Central Ground Water Board, Ministry of Water Resources, RD & GR organised one day workshop on “***Arsenic Problem in ground water & its remediation in Ganga Basin”*** on 7th, March, 2017 at Scopes Complex, New Delhi. During the inaugural session the workshop volume was released by Hon’ble Union minister and the distinguished guests. In her speech **Shushri Uma Bharti**, Hon’ble Union Minister of Water Resources, River Development and Ganga Rejuvenation emphasized on the arsenic hazard in the largest and densely populated area of Ganga basin and showed her concern over the growing health issues. She also showed her determination to overcome the situation by suitable all out efforts of her ministry. Nearly 300 participates attended the workshop including eminent scientists from all over India, students from various departments of several University of New Delhi, faculties, water experts policy makers and staff members from various. 23 selected papers are included in the workshop volume. A total 08 papers were presented during the workshop apart from ~~a~~ panel discussion among the eminent subject experts.
- The workshop on “Artificial Recharge and Rain Water Harvesting” was organized on 23rd March 2017 at Chitnavis Centre, Nagpur to address the State specific ground water related issues and to evolve strategies and management options for sustainable ground water development. 75 participants from various departments such as GSDA, Agriculture Dept., Zilla Parishad, NEERI, Industry representatives, Educational Institutes, Engineering Colleges, etc., attended the workshop.
- Workshop on “Analytical Work & Technical Assistance to Support Strategic Basin Planning for Ganga River Basin in India” was held on 02nd March, 2017 at Kolkata.

- Workshop on Jalkranti Abhiyan on the topic “Groundwater Resource Management Issues in view of Climatic Change in West Bengal, Sikkim & Andaman & Nicobar Islands” was held on 21.03.2017 at Barasat, North 24 Pargana district. About 283 participants from State Govt. Departments, colleges, universities, NGOS etc took part in the workshop.
- CGWB arranged a stall to display physical models of artificial recharge and geophysical studies to educate visitors at 6th Bhopal Vigyan Mela from 03.03.2017 to 06.03.2017.
- One day workshop on “Sustainable Management of Ground water Resources under Jal Kranti Abhiyan” was organized at Indira Gandhi Institute for Panchayti Raj and Gramin Vikas Sansthan, Jaipur on 16th March, 2017. 200 participants were present in the workshop.
- One day Awareness Raising Program under National Hydrology Project organized on 22nd March, 2017 at Sinchai Bhawan, Water Resources Department, J.L.N. Marg, Jaipur. 70 participants were present.
- One day Mass awareness programme under Tribal Sub plan was organized on 27th March, 2017 at Aja Mata Temple, village Oriya, Block Abu Road, District Sirohi , Rajasthan. 169 participants are presents.
- A Mass Awareness Programme on ‘Water Conservation’ in Tribal area organized at Samudaik Bhawan, Janpad Panchayat, Gariyabandh, Raipur on 23.03.2017.
- An Awareness Raising Programme under National Hydrology Project was held on **8-03-2017 at** Shri **Krishna Institute of Public Administration (SKIPA)**, Ranchi, Jharkhand. Eighty Six participants (80 male and 6 female) from various organizations participated in the programme.
- Awareness Raising Programme on National Hydrology Project(NHP) was organized on 3rd March, 2017 at Hotel Great Value, Dehradun.

22. TECHNICAL DOCUMENTATION AND PUBLICATION

Results of investigation carried out by the Central Ground Water Board were suitably documented through reports and maps. All the field offices have been provided with report processing sections which are responsible for the scrutiny and issuance of reports of various assignments carried out by its officers.

22.1 Reports

Details of various types of technical reports issued by respective regional offices of the Board are as follows:

State/UT Ground Water Reports

State Reports containing complete details of ground water surveys, exploration and other ground water related information are compiled and prepared to update the status of ground water development in the State. Based upon reports, ground water development perspectives are worked out and future strategies are planned. During 2016-17, total 25 state reports (Himachal Pradesh, Dadra Nagar Haveli, West Bengal, A&N, Kerala , Nagaland, Jammu , Chandigarh, Karnataka and Goa, Daman and Diu ,Rajasthan, Uttara Pradesh,Uttarakhand, Delhi, Bihar, Chhattisgarh , Telangana, Gujarat ,NER state, Tamilanadu, Bihar , Jharkhand, Kerala and Tamilnadu) have been completed/submitted.

District Brochures

Central Ground Water Board compiles and issues district brochures of each district from time to time containing all the results of ground water surveys, exploration and other related studies. Further, ground water development perspectives are also worked out for the benefit of Stateand other user's agencies. The reports have been found very useful for planning their strategies for future ground water development programme . During 2016-17,17 updated district brochures were updated and submitted/issued.

Ground Water Year Book

The Central Ground Water Board compiles ground water year books to elucidate the changes in ground water levels and water quality.The accurate monitoring of the ground water levels and its quality both in space and time are the main requisite for assessment, scientific development and planning of this vital resource. During 2016-17, 22 reports were prepared. Region wise status of preparation of ground water year book are presented in Table 22.1.

Table 22.1 Status of Ground Water Year Books completed during 2016-17

Sl. No	Region	Ground Water Year Book prepared	
		Nos.	State
1	North West Himalayan Region	1	Jammu & Kashmir
2	North Western Region	3	Punjab,Haryana& Chandigarh
3	Western Region	1	Rajasthan
4	West Central Region	1	Gujarat
5.	North Central Region	1	MadhyaPradesh
6.	North central Chhattisgarh Region	1	Chhattisgarh
7.	Central Region	1	Maharashtra
8.	Northern Region	1	UttarPradesh
9.	Mid Eastern Region	1	Bihar,Jharkhand
10.	Eastern Region	1	WestBengal
11	North Eastern Region	1	NorthEasternStates
12	South Eastern Region	1	Orissa
13	Southern Region	2	AndhraPradesh, Telengana
14	South Western Region	2	Karnataka,Goa
15	South Eastern Coastal Region	1	Tamilnadu, Puducherry
16	Kerala Region	1	Kerala
17.	Uttaranchal Region	1	Uttarakhand
18.	SUO,Delhi	1	NCT, Delhi
	Total	**22**	

23. CONSTRUCTION / ACQUISITION OF OFFICE BUILDINGS

Infrastructure Development Scheme (IDS) viz. Land & Building (CGWB) has been approved with an outlay of Rs.101.26 Crore for 12th plan for the following 10 Offices of CGWB:

- Construction of Regional and Divisional office at Guwahati.
- Construction of Store and Workshop buildings at Bangalore.
- Construction of Store & Workshop for Division XII at Bhopal.
- Construction of Regional and Divisional office at Ahmedabad.
- Construction of Building for Divisional, Workshop & Store Division II at Ambala.
- Construction of Boundary Wall, Building for office, Workshop & Store for Region & Division at Jammu.
- Construction of Boundary Wall and Building for RGI at New Raipur.
- Construction of Building for Divisional Workshop & Store at Chennai.
- Construction of Boundary wall and Building for Divisional, Workshop & Store at Jodhpur.
- Construction of Staff Quarter at Bhubaneswar.

Out of the 10 projects, three projects at Guwahati, Bangalore and Bhopal were completed in 12th Five Year Plan. The work of seven new projects will be floated in continuation of the scheme beyond 12th plan.

The objective is to provide better working environment in the offices, creation of assets and savings on payment of monthly rent. To achieve this objective, construction of offices, workshop & stores at various locations and construction of RGI at Raipur and staff quarters at Bhubaneswar is being carried out.

During the financial year 2016-17, an amount of Rs.5.50 Crore was allocated under BE 2016-17. Under the Scheme Rs.1.78 Crore has been released to CPWD for the construction of Guwahati building and Rs.3.72 Crore has been released to NPCC for construction of RGI, Raipur building and total expenditure was Rs. 4,88,68,000/- during 2016-17.

24. DISSEMINATION AND SHARING OF TECHNICAL KNOWLEDGE

24.1 Publication of Paper in National/ International Journal

- Mapping lithology and assessing recharge characters in granitic hard rock aquifer - Inference from 2-D resistivity induced polarization by tracer and moisture measurements by Dr. P.N. Rao and Dr. Pandit Madhnure, CGWB, SR, Hyderabad along with NGRI Scientists published in Geological Society of India, Vol.88-July, 2016.
- Conjunctive Use of Surface and Ground Water Resources- Selected Case Studies from A.P and Telangana in peninsular India by Sh. A.D. Rao, Regional Director and Dr. P.N. Rao, Suptdg. Hg published in Special Publication of Geological Society of India, No.5; 2016, pp 137-144, DOI: 10, 17491/C9S1/2016/95960.
- Geochemical processes controlling Fluoride bearing Ground Water in the Granitic aquifer of the semi arid region by Dr. P.N. Rao, Suptdg. Hg, Dr. Pandith Madhnure, Scientist-D and K. Maruthi Prasad, Scientist-B (Coauthors) published in Geological Society of India, Vol.88, Sept. 2016 pp 350-356.
- Impact of urbanization on Ground Water Quality in Vijayawada Urban Agglomeration, the new capital region of Andhra Pradesh, India- A baseline study by Dr. P.N. Rao, Suptdg. Hg, et.al. published in Geological Society of India, Vol.87, May 2016 pp 539-552.
- Evaluation of Fluoride enrichment process in groundwater of Chimakurthy granitic pluton complex in Prakasam District India published by A.G. S. Reddy, D. V. Reddy, ***M. Sudheer Kumar*** and P. K. Naik in African Journal of Environmental Science and Technology Vol. 10(10), pp. 350-379, October 2016.
- Hydrogeochemical processes of fluoride enrichment in Chimakurthy pluton, Prakasam District, Andhra Pradesh, India published by A. G. S. Reddy, D. V. Reddy and ***M. Sudheer Kumar in*** Environ. Earth Sci. (2016) 75:663 DOI 10.1007/s12665-016-5478-8.
- Quantification and Assessment of Health Risk due to Ingestion of Uranium in Groundwater of Jammu District, J&K, India published by Ajay Kumar, Manpreet Kaur, Rohit Mehra, ***Kanwar P. Singh***, Bikramjit S. Bajwa in Springer Journal of Radioanalytical & Nuclear Chemistry, Nov. – 2016, Vol. 310, Issue 2, pp 793 - 804. ISSN : 0236-5731.
- Geospatial Approach for Mapping of Ground Water Quality of Outer Plains of Samba District, J&K, India published by ***Priya Kanwar*** & Pragya Khanna in International Journal of Science and Research (IJSR) Volume 5 Issue 12, December 2016.
- Petrofacies and Tectono Provenance of the Sandstones of Jara Dome, Kachchh, Gujarat published by ***Shaista Khan***, M.Adnan Quasim A. H. M. Ahmad & M. Masroor Alam in Journal of Indian Association of Sedimentologists Volume 34, Nos. 1 & 2 (2017) pp.17-28
- Hierarchical Cluster Analysis as an indicative of the Hydrogeochemical Evolution of Ground water in a Shallow Aquifer System published by ***Aneeshkumar Narikkatan, Uma Kapoor*** and A G S Reddy in Environmental and Ecological Statistics.
- Sustainable Water management in Lakshadweep Islands an integrated approach Published by Dr Vinay chandran in Geological Society of India.
- Yield characterisitics of fractured aquifers and their relation to lineaments in Precambrian, crystalline rocks of Bharathapuzha river basin, Kerala published by P Nandakumaran, K.Balakrishnan and V.Kunhambu in Journal of the Geological Society of India, Vol 88, No.6, Pg 743.
- Advanced geophysical investigation including Heliborne TEM in high-resolution aquifer mapping with special emphasis to crystalline hard rocks published by N Veera Babu andet al. Sp. Pub. of The Geological Society of India, Vol.5, Pg. No.87-96.
- Paper titled “Conjunctive use of Surface and Ground Water Resources- Selected Case Studies from Andhra Pradesh and Telangana in Peninsular India” by A. D Rao Regional Director and P. N Rao

Suptdg. Hydgeologist published in Special Publication of Jour. Geol. Soc. India No.5; 2016 pp 137-144 DOI:10,17491/C9S1/2016/95960.

- Paper titled “Geochemical Processes controlling Fluoride bearing Ground Water in the granitic aquifer of a semi arid region” published in Jour. Geol. Soc. India Vol.188,Sept.2016 pp 350-356 by P. N Rao, Pandit Madhnure and K. Maruthi Prasad.
- A report on “Hydrogeological study taken up to understand the reasons for diminishing discharges in hot springs in Rajgir Area, Nalanda district, Bihar was submitted to the Principal Secretary, Dept. of Water Resources, Govt. of Bihar.
- A paper titled “Fluoride hydrogeochemistry and its occurrence in drinking water in Morappur region of Dharmapuri District, South India” by M. Panneer, M. Senthil Kumar, published in the International Journal of Environmental Science and Technology, 2017 pp 1-14 DOI: 10.1007/s13762-017-1277-3.
- Study on Water Quality Trends in Ground Water of Digboi, Assam” published by Keisham Radhapyari, Naresh Kumar Jatav and Suparna Datta in Bhujal News, Volume 28, No.1-4, Jan-Dec 2013, pp 38 – 46.
- Water Crisis in Africa Myth or Reality by Dr. P. K. Naik, Suptdg. HG published in international Journal of Water Resources Development, 2016.
- Rain Water Harvesting and Water Conservation at local level by Dr. S.K Jain, Regional Director and Sh. M.L Angurala, Sc ‘’D’’ Poster Presentation on Rain Water Harvesting and Water Conservation at Local level during 4-8 April,2016 IWW at Vigyan Bhawan, New Delhi.
- Impact Assessment of a Land Fill Site in Eastern Kolkata, India by Tarun Mishra, AHG in National, ISWA World Congress 2016.
- Hydro geological Scenario of Ludhiana Smart City, Punjab State by Sh. Dinesh Tewari Sc D, Sh. Roopesh G. Krishnan Sc B, Dr. S. K. Jain, Regional Director **Published** in Abstract volume of Indian National Committee of IAH on “Role of Ground Water in Smart Cites and villages”. The National Workshop was organized on 17th December, 2016 at Manav Rachana international University, Faridabad.
- Ground Water Quality and occurrence of Arsenic and Iron in Punjab” by Dr. S.K.Jain, RD, Balinder P. Singh, Sc ‘D’ and Rishi Raj, ACH **Published** in workshop on ‘Arsenic problem in ground water and its remediation in Ganga Basin’ on 07.03.2017.
- Ground Water Management Plan for the NCR, Haryana by Dr. S.K.Jain, Regional Director and Scope of Ground Water Development in Yamuna Flood Plains to augment water supply in depleted aquifer areas of National Capital Region, Haryana by M.L.Angurala, Scientist ‘D’ in Water Conservation and Pollution’ organized on 19.12.2015 jointly by INC-IAH.
- Fluoride Hydrogeochemistry and its occurrence in drinking water in Morappur Region of Dharmapuri District, South India” by M**. Panneer & Dr.M.Senthilkumar,, et al. Published in** International Journal of Environmental Science and Technology, 2017 pp 1-14 DOI: 10.1007/s13762-017-1277-3.
- Aquifer Management plan for sustainable development in over exploited Ganagavalli block of Salem district Tamil Nadu by Dr.K.Rajarajan and A.Subburaj published in IJAR.
- Spatial modeling for demarcating recharge zones using Remote sensing and Geographical Information System (GIS) in Gangavalli block, Salem district, Tamil Nadu by Dr.K.Rajarajan and A.Subburaj published in IJAR.
- Recent Hydrogeological Research in India by Dr. Dipankar Saha, Shashank Shekar, Shakir Ali, S.S.Vittala and N.J.Raju published in Proceedings of Indian National Science Academy, 82 No. 3 , July Spl Issue pp 787-803.

- Groundwater management and Sustainability and Equity by G.Sudarshan and K. R. Sooryanarayana published Special Publication of Geological Society of India, No.5, 2016, pp-18.
- Estimation of Hydraulic Characteristics from electrical resistivity data in coastal aquifers of southern India by Dr. Somvir Singh, V. S. Singh published in Journal of Geological Society of India in July, 2016.
- Groundwater Quality in and around Tuticorin town, Southeast Coast of India by Dr Somvir Singh et al. Published in Journal of Indian Geophysical Union in January, 2017.
- Shri Mathew T Thomas, Hon'ble Minister of Water Resources, Government of Kerala has released the report on "Mapping of Hard Rock Aquifer System and Aquifer Management Plan in Chittoor and Malampuzha blocks of Palakkad District, Kerala" in a function organized at his chamber of Secretariate/Assembly Hall on 7th November 2016.

24.2 Awards

- Dr. Subhash Singh, Scientist-D has been awarded Aqua Foundation's Excellence Award, 2016 under the category of Professional Excellence (Individual) on 24.11.2016 at New Delhi.
- Dr. S.Sahu, Scintist-C, CGWB, SER, Bhubaneswar was awarded Savitri Chadha INC-IAH Young Scientist Award by Indian National Committee of IAH.
- **National Geosciences Award 2016**: Dr. Pradeep .K. Naik, Suptd.Hydrogeologist, NGWTRI, Raipur selected for the National Geoscience Award 2016 in the field of ground water exploration including project development, hydrogeological studies and management of ground water resources.
- **Jalseva Award of Indian Water Works Association (IWWA):** Dr. P.K. Jain, Superintending Hydrogeologist, CGWB, CR, Nagpur received the "***Jalseva Award"*** in the 49th Annual Convention 2017 at VNIT, Nagpur on 19-01-2017 at the hands of Shri Vishwas Jamdar, Director VNIT and Dr. Rajesh Gupta, National President, IWWA for his commendable work towards promoting the sustainability of water supply systems during the last three years.

24.3 Paper Presented /Publsihed in Seminar/symposium/Workshop/Conferences

- The Aquifer mapping and management plan of a water stressed hard rock aquifer system: A case study from Kerala Published by Shri K Balakrishananand et.al in Bhujal Manthan 2 on 29.11.2016 at Vigyan Bhawan, New Delhi
- The following papers were Published in Sustainable Development of Ground Water" under Jal kranthi Abhiyan on 16.3.2017 at Coimbatore.
- Intergrated Water and Land Management of Kuttanad Wet land system of Kerala" published by Shri V Kunhambu and et al.
- Impact of Rainfall vagaries on Ground Water level Scenario of Ground Water Level of Kerala" by Smt Rani V R and Shri Sreehari Sarangan.
- Ground Water Status and Management options in the state of Kerala by Smt Mini Chandran, and et.al.
- Hydrochemical Evaluation and Characteristics of Ground Water Resources in a small tropical coral island of Kalpeni, U.T of Lakshadweep by Dr V S Joji.
- Hydrogeology, Spatial pattern of Resistivity, Salinity and Water management in a small tropical coral atoll island in the Arabian Sea"published by Shri. K. Balakrishnan, Sci-D (SHG) and etal in Disaster Risk Vulnerability Conference held at Dept. of Geology, Kariavattom on 29th to 31st March 2017.
- Sustainable Water management in Lakshadweep Islands an integrated approach published by Dr Vinay chandran in Geological Society of India.

- Yield characterisitics of fractured aquifers and their relation to lineaments in Precambrian, crystalline rocks of Bharathapuzha river basin, Kerala published by P Nandakumaran, K.Balakrishnan and V.Kunhambu in Journal of the Geological Society of India, Vol 88, No.6, Pg 743.
- Advanced geophysical investigation including Heliborne TEM in high-resolution aquifer mapping with special emphasis to crystalline hard rocks published by N Veera Babu andet al. In Sp. Pub. of The Geological Society of India, Vol.5, Pg. No.87-96.
- Characterisation of Ground water quality and its suitability for drinking in Pamba River Basin, Kerala presented by T.S. Anitha Shyam at IISc Bangalore in International Conference & Exhibition on SWWEM-2016" on 18.08.2016.
- Aquifer mapping and Management plan in Amaravathi Aquifer System- an overview presented by Dr. K.Rajarajan in National Level Workshop cum Training Programme on Multiphase Approaches on Sustainable Groundwater Development and Management in the Hard Rock Aquifer on March 9 - 10, 2017 at Salem.
- An overview of Geophysical techniques for aquifer management plan Presented by Dr. V. Arulprakasam in National Level Workshop cum Training Programme on Multiphase Approaches on Sustainable Groundwater Development and Management in the Hard Rock Aquifer on March 9 - 10, 2017 at Salem Tamilnadu.
- Delineation of subsurface formation in hard rock area using Vertical Electrical Sounding – case study in Gangavalli Block, Salem district, Tamil Nadu presented by Dr. V. Arulprakasam, Dr. V.S.T. Gopinath and T. S. N. Murthy in Workshop on "Sustainable Development of Groundwater" organized by CGWB, SECR, Chennai at Coimbatore on 16 March 2017 at Coimbatore.
- Sri A.D. Rao, Regional Director and senior officer, SR, Hyderabad had given presentation on Aquifer Mapping and Management plan for Nalgonda distric Telangana State and for Sandstone areas of Andhra Pradesh State on 20.10.2016 at New Delhi before the Expert Committee.
- The following papers were presented by officers of CGWB,SR, Hyderabad in the INGWC-2016 held from 6th to 10th October at JNTU, Hyderabad.
- Influence of Percolation Tank on Ground Water- A case study in Tadipatri Shales of YSR Kadapa District, Andhra Pradesh
- Ground Water issues and options for Sustainable Management, Nalgonda District, Telangana State.
- Hydrochemical characterization of ground water in hard rock terrain in parts of Nalgonda District, Telangana State.
- Ground Water Management in sub-urban and peri-urban parts of Greater Hyderabad
- Appraisal of ground water quality in Tandur Town, RangaReddy District, Telanagana State.
- The following papers were presented by officers of RGNWTRI Raipur in the conference of International Society for Fluoride Research during November 9-11, 2016 at NIN, Hyderabad.
- Climatological Control over Disposal of Fluoride Ground Water in Consolidated Aquifers a study in Attappady tribal area Palghat District, Kerala State.
- Assessment of Fluoride Contamination and Mitigation in the Consolidated Aquifers, Birbhun District West Bengal State. .
- Evaluation of Fluoride Enrichment Process in Ground Water Chimkurthy Granitic pluton Complex, Prakasham District Andhra Pradesh State.
- The following papers were presented by officers of CGWB, SECR, Chennai in National Seminar on "Eco Friendly Surface Mining Technology Challenges & Way Forward" during November 12-13, 2016 at Neyveli, Tamilnadu.
- Ground Water Modeling and Aquifer Management Plan for Cuddalore coastal aquifer system.
- Delineation of recharge zones for construction of artificial recharge structures in Neyveli Hydrogeological Basin using remote sensing and GIS analysis.

- Indian National Committee of IAH and Manav Rachna International University has jointly organized a **National workshop on "Role of Ground Water in Smart Cities & Villages" on** 17th December 2016 at Manav Rachna International University, Faridabad. .The function was inaugurated by **his Excellency Prof.Kaptan Singh Solanki, Hon'ble Governor, Haryana**. Sh K B Biswas, Chairman, CGWB, was the guest of honor. Dr Prashant Bhalla, President, MREI, Dr D K Chadha, President, INC- IAH, Dr Dipankar Saha, Member (SAM) CGWB , & other dignitaries were present in this occasion. The Inaugural Session was followed by three technical sessions Chaired by eminent personalities from the field. The following papers was submitted by Officers of CGWB, apart from other scientist-
- Groundwater regime and Role of Water conservation structures and artificial structures in urban areas by Dr Dipankar Saha, HQ, Faridabad
- Groundwater related problems in Smart Cites of NCR- Arunangshu Mukherjee , S Shekhar, K C Naik HQ, Faridabad
- Role of Groundwater in meeting the water demand of Bhubaneswar smart city, Odisha. G C Pati, HQ, Faridabad
- Ground water as a solution to water scarcity problems in Solapur, Maharashtra- Pradeep K. Naik, Alok K. Dube and Sunil Kumar, RGI, Raipur
- Surging dynamism of population to Land use Land cover change in metro cities of India- Shilpi Gupta S.Marwaha, HQ, Faridabad
- Ground Water Resource Management Options In Urban Environs-- A Case Study From Bengaluru Metropolis- M. A. Farooqi and K. R. Sooryanarayana, SWR, Bangalore.
- Smart Hydro-Geophysical Concept for Smart Water in Building Smart City at Bhopal, Madhya Pradesh.- Subhash C Singh
- Hydrogeophysical inference on disposition of potential aquifers in and around Haldia Smart City of West Bengal, India -Anadi Gayen &Sujit Sarkar
- Impact of urbanization on water quality in Lucknow city, UP.**-** S.K. Srivastava, S.G. Bhartariya & B.C. Joshi
- Assessment of Geogenic Pollution in Ground Water - In Guwahati Urban Agglomerate **-** Anil Kumar, A K Madhukar
- Studies On Post Tsunami Salinity Rise In Water Scarce Chowra Island, Nicobar District, A & N Island**-** Amlanjyoti Kar, Anirban Dhar ,Satiprasad Sahoo, Ankita Bhattacharya and Prahlad Ram, ER, Kolkata
- The following papers were published in the International conference titled "Emerging Technologies in Agricultural and Food Engineering held at IIT Kharagpur during 27-30th December 2016.
- Accelerated ground water irrigation vis-à-vis arsenic pollution in West Bengal: Need for eco-friendly Management.
- Ground Water Development in Eastern and North Eastern India for sustenance of Food Security.
- Paper published on Yield characteristics of fractured aquifers and their relation to lineaments in Precambrian, crystalline rocks of Bharathapuzha river basin, Kerala by P Nandakumaran, K.Balakrishnan and V.Kunhambu in the Journal of the Geological Society of India, Vol 88, No.6, Pg 743.
- The following papers were presented in NCWES-2017, JNTU, Hyderabad on 18.03.2017.
- "Post Tsunami Salinity Rise in a Small Inhabited Island in Nicobar, A&N Islands: Need for Large Scale Rainwater Harvesting and Artificial Recharge" Amlanjyoti Kar, Anirban Dhar, Satiprasad Sahoo, Ankita Bhattacharya and Prahlad Ram.
- "Sector Specific Ground Water Management: A Case Study from Pasch Medinipur District, West Bengal", Sanjib Chakraborty.

- The following papers were presented in Jalkranti Workshop on “Groundwater Resource Management Issues in view of Climatic Change in West Bengal, Sikkim & Andaman & Nicobar Islands at Barasat, N 24 Pargana, WB, on 21.03.2017.
- Chemical quality of ground water parts of South 24 Parganas district- a review for irrigational use by Manashi Bhattacharyya.
- An Attempt To Delineate Arsenic Free Aquifer Through Geophysical Investigations In Barasat I Block Of North 24 Parganas District, West Bengal Dr. S.K.Adhikari and Tapan Talukdar.
- Micro Level Study Of Aquifer Disposition In Baruipur Block, South 24 Parganas And Change In Water Level Over Past Few Years by Madhumanti Roy and Prachi Gupta.
- Aquifer Mapping Study In Pandua Block, Hugly District, West Bengal by Prachi Gupta and S. Brahma.
- Aquifer Disposition-A Guiding Tool For Supply Of Arsenic Free Water- Case Study From Deganga Block, North 24 Parganas District, West Bengal by Prachi Gupta, Madhumanti Roy and Tapan Talukdar
- Rainwater Harvesting Practices In A&N Islands by Amlanjyoti Kar,D.Balaji, Sivarama Subramanium,S.Adhikari,Ankita Bhattacharya and T.K.Dhali.
- Hydrological Importance Of High Altitude Springs On Landside Generation And Its Role On Sustainable Drinking Water Supply In Sikkim Himalayas by Amlanjyoti Kar, S.K.Dhakal and S.M.Hossain.
- Rejuvenation Of Springs In Sikkimwith Reference To Climatic Change by Amlanjyoti Kar and Sital Chandra Pradhan.
- The following papers were published in workshop volume on ‘Sustainable Development of Ground Water” under Jal kranthi Abhiyan organised by CGWB, SECR on 16.3.2017 at Coimbatore.
- “Intergrated Water and Land Management of Kuttanad Wet land system of Kerala” by Shri V Kunhambu and et al.
- “Impact of Rainfall vagaries on Ground Water level Scenario of Ground Water Level of Kerala” by Smt Rani V R and Shri Sreehari Sarangan.
- “Ground Water Status and Management options in the state of Kerala” by Smt Mini Chandran, and et.al.
- “Hydrochemical Evaluation and Characteristics of Ground Water Resources in a small tropical coral island of Kalpeni, U.T of Lakshadweep” by Dr V S Joji.
- Water Security Plan model for Jal Gram – A case study in Sengunam Village, Polur Block, Thiruvannamalai district, Tamil Nadu, India *K. Azhahia Nambi and A. Subburaj*.
- Multiple approaches on sustainable groundwater management plan preparation- A case study in Amaravathi Aquifer Systems *Dr.K.Rajarajan, A.Subburaj and Dr.D.Gnanasundar.*
- Natural and Ancient Hydro-geo-engineering marvels of Tamil Nadu State *Dr. B. Umapathi*.
- Delineation of subsurface formation in hard rock area using Vertical Electrical Sounding – case study in Gangavalli Block, Salem district, Tamil Nadu*Dr. V. Arulprakasam, A. Subburaj, T. S. N. Murthy and V. S. T. Gopinath.*
- A technical Paper was presented by Dr K.R.Sooryanarayana,Sc-D SWR, CGWB, Banglore on the topic” An action plan for aquifer sustainability through water conservation and artificial recharge in Madhugiri taluk, Tumkur district” during the National Seminar on “Water Conservation and Waste water Management for Sustainable Development” at World Water Day organized at Dayanand Sagar College, Bangalore on 22.3.2017.
- “Role of Ground water in the Proposed Agartala Smart City, Tripura” published by T. Chakraborty, Snior Hydrogeologist,V Kezo, Junior Hydrogeologist in Proceeding of a National Workshop on role of Ground Water in Smart City and Villages at MRI University, Faridabad, Haryana on 17.12.2016.

- 'Aquifer Mapping and Management Plan in The North Eastern Region' by T. Chakraborty, Sr HG, B. Ray, Sr HG in Bhujal Manthan – II at Delhi.
- Effects of Solid Wastes and Industrial Effluents on Groundwater Quality of Byrnihat Industrial Belt, Meghalaya" by Dr. Suparna Datta, Assistant Chemist B. Ray, Sr HG Sri Vengatajalapathi. G, STA-HG Dr. K Radhapyari, Scientist 'B' (Chemist) in Bhujal Manthan – II at Delhi.
- Ground water conditions in Meghalaya' by T Chakraborty, Sr HG in 1st Departmental Workshop organized by DMR, Govt. of Meghalaya on 30.11.2016.
- Sustainable Management of Groundwater in Meghalaya' published by T Chakraborty, Sr HG in Water Conference 2016 organzed by Lady Keane College, Shillong on 28.7.2016 to 29.7.2016.
- Evaluation and mitigation of high levels of arsenic in groundwater of Assam, India" published by K.Radhapyari, Suparna Datta, Snigdha Dutta, Utpal Gogoi in Workshop "Arsenic problem in ground water and its remediation in Ganga basin", CGWB, 2017 on 7th March 2017, New Delhi.
- "Study of presence of fluoride and Iron contamination in ground water of Karbi-Anglong published by N. K Jatav Published in Workshop on "Water Conservation, Water security and water quality, climate change on 22th March-2016.
- A Industrial cluster study on ground water quality of Digboi, Tinsukia district Asssam published by N.K.Jatav in Bhujal News
- Traditional Irrigation system in India specially in Himachal Pradesh" published by Sh. N.P.S. Nagi, Regional Director & Dr. SK MahammadSartajBasha, STA (Hg) in volume of "Bhujal Manthan-2" A National Dialogue on Aquifer Mapping and Ground Water Management by CGWB.
- The following papers were presented in Workshop on 'Arsenic Problem in Ground Water & its Remediation in Ganga Basin' organised by CGWB on 07.03.2017 at New Delhi
- Arsenic in ground water of Indo-Nepal border district of Uttar Pradesh by Ram Prakash, Kiran Singh *et al*.
- Occurrence and Seasonal variation of Arsenic in ground water around Ganga river (Makanpur-Nanamau ghat), Unnao-Kanpur, District- Uttar Pradesh by Ram Prakash *et al*.
- Arsenic Contamination in Ground Water and itrs Remediation in Parts of Ghazipur District, Middle Ganga Plains, UP by Prashant Rai *et al.*
- The following papers were presented in Bhujal Manthan-2: A national Dialogue on Aquifer Mapping and Ground Water Management, New Delhi on 29.11.2016
- Aquifer Mapping & Management Plan, Sambhal District, UP by Y.B. Kaushik, Vikas Ranjan, R.K. Rajput, S. Mehrotra, P.K. Tripathi & S.K. Singh
- Aquifer Management Options in Water-scarce Jhansi and Lalitpur Districts, Bundelkhand Region, Uttar Pradesh by Y.B. Kaushik, P.K. Tripathi, Jagdamba Prasad, T.K. Pant, S.K. Singh, Vikas Ranjan, Rajesh Chandra & Anmol Sharma.
- Ground Water Storage Estimation through GIS Based Modeling – A Case Study in Parts of Kanpur and Unnao Districts of Uttar Pradesh by Anmol Sharma
- Aquifer Mapping and Ground Water Management in Muzaffar Nagar District by S. Mehrotra *et al.*
- Semi Quantitative Analysis of Apparent Resistivity Data for the Delineation of Fractured Aquifers in Limestone Areas of Chattisgarh State, India by ***K. P. Singh*** Scientist -B & Ajay Kumar Sinha published in Ist Indian Ground Water Conference – 2016 at JNTU, Hyderabad 05 – 07 October 2016.
- Rain Water Harvesting and Water Conservation at Local Level by Dr. S. K Jain, Regional Director and Sh. M. L Angurala, Sc D in India Water Week (IWW 2016) 4-8 April, 2016 Vigyan Bhavan, New Delhi.
- Gravity of deterioration of Ground Water in near & distant future for the State of Punjab and Haryana by Sh. S. K. Saigal Sc "D" in Seminar on "Challenges & Strategies for Management of Water in Rural

areas" organized by National Bank for Agriculture & Rural development (NABARD) at Mount View Hotel, Chandigarh on 13.07.2016.

- Rain Water Harvesting & Ground Water Recharge by Sh. Dinesh Tewari, Scientist D presented in ICT based Training Programme on "Environment and Sustainable Development at NITTTR Chandigarh on 20-10.2016.
- Water conservation and Artificial Recharge to Ground Water by Roopesh G Krishnan, Sc- B presented in One day Training Programme under Jal Kranti Abhiyan at Jacob Hall, Dept. of SWE, PAU, Ludhiana Punjab on 21.10.2016.
- Application and Uses of Hydro-geomorphologic Maps for Ground Water prospection by Dr. S. K. Jain, Regional Director presented in Two days Training Workshop at ICSSR Complex, Near Sports complex, Punjab University, Chandigarh on 11-12th November, 2016.
- Aquifer mapping and management plan (NAQUIM) by Dr. S. K. Jain, Regional Director along with the Officers and Officials of NWR, Chandigarh presented in Bhujal Manthan- 2 on Aquifer Mapping and Ground Water Management New Delhi on 29.11.2016.
- Application and uses of Hydro Geo-morphological Maps (HGM) for NAQUIM by Sh. S. K. Saigal, Scientist D presented in Workshop by India Water Foundation (Special Consultative Status with UN-ECOSOC) National Key Resource Centre, Ministry of Drinking Water & Sanitation, Government of India uses of Hydro Geo-morphological Maps at Haryana Institute of Rural Development, Nilokheri, Karnal Haryana. On 23.12.2016.
- Aquifer map and management plan of Haryana and its scope for inclusion in MNREGA scheme by Dr. S. K. Jain, Regional Director along with Sh. Tarun Mishra, Sc 'B' and Ms Iti Gupta, Sc 'B' presented in Orientation Workshop on "Mission Water Conservation" Natural Resource Management framework of PMKSY and formulation of labour budget under MGNREGA at Haryana Niwas, Chandigarh on 09.01.2017.
- Geochemical Appraisal of Fluoride contamination in Artificially Recharged Groundwater in Gangavalli Block, Salem District, Tamil by Dr.K.Rajarajan and A. Subburaj published in National Seminar Proceeding.
- Spatial distribution of Fluoride contamination and Mitigation in groundwater in Gangavalli Block, Salem District, Tamil Nadu using Remote Sensing and Geographical Information System (GIS) by Dr.K.Rajarajan and A.Subburaj published in National Seminar Proceeding.
- Delineation of Recharge Zones For Construction of Artificial Recharge Structures In Neyveli Hydrogeological Basin Using Remote Sensing and GIS Analysis by Dr.K.Rajarajan A.Subburaj and Dr. D.Gnanasundar published in Proceeding of National seminar on Eco-friendly surface mining technology, challenges and way forward.
- Multiple approaches on Groundwater Management plan preparation –A case study in Amaravathi Aquifer System by Dr.K.Rajarajan A.Subburaj and Dr. D. Gnanasundar published in Proceedings National Workshop on Sustainable Development of groundwater by CGWB, SECR.
- Aquifer mapping and Management plan in Amaravathi Aquifer System- an overview by Dr. K.Rajarajan published in National Level Workshop cum Training Programme on Multiphase Approaches on Sustainable Groundwater Development and Management in the Hard Rock Aquifer at, Salem on March 9 - 10, 2017.
- An overview of Geophysical techniques for aquifer management plan by Dr. V. Arulprakasam published in National Level Workshop cum Training Programme on Multiphase Approaches on Sustainable Groundwater Development and Management in the Hard Rock Aquifer at, Salem on March 9 - 10, 2017.
- Delineation of subsurface formation in hard rock area using Vertical Electrical Sounding – case study in Gangavalli Block, Salem district, Tamil Nadu by Dr. V. Arulprakasam, Dr. V.S.T. Gopinath and T. S.

N. Murthy published in Workshop on “Sustainable Development of Groundwater” organized by CGWB, SECR, Chennai at Coimbatore on 16 March 2017.

- Natural and Ancient Hydro-geo-engineering marvels of Tamil Nadu State” by Dr. B. Umapthi, published in Workshop on “Sustainable Development of Groundwater” organized by CGWB, SECR, Chennai at Coimbatore on 16 March 2017.
- Multiple approaches on Groundwater Management plan preparation –A case study in Amaravathi Aquifer System by Dr.K.Rajarajan published in Workshop on “Sustainable Development of Groundwater” organized by CGWB, SECR, Chennai at Coimbatore on 16 March 2017.
- Aquifer Mapping & Application of Groundwater Modelling for Sustainable Groundwater Management of Upper Ponnaiyar Aquifer System, Southern India by Dr. D. Gnanasundar, Dr. M. Senthilkumar and N.Ramesh kumar published in National seminar on “Eco Friendly Surface Mining Technology Challenges & Way Forward” organised by Neyveli Lignite Corporation India Limited at Neyveli, Tamil Nadu during 12.11.2016 to 13.11.2016.
- Delineation of recharge zones for construction of artificial recharge structures in Neyveli Hydrogeological Basin using remote sensing and GIS analysis” by Dr.K.Rajarajan, A.Subburaj and Dr. D. Gnanasundar published in National seminar on “Eco Friendly Surface Mining Technology Challenges & Way Forward” organised by Neyveli Lignite Corporation India Limited at Neyveli, Tamil Nadu during 12.11.2016 to 13.11.2016.
- Aquifer configuration and its Sustainable Groundwater Management plan for Amaravathi Basin in Tamil Nadu State by A.Subburaj, S.Piramanayagam and. R.Arumugam published in Bhujal Manthan at Vighyan Bhawan, New Delhi on 29.11.2016.
- Hydrogeological Scenario of Coimbatore City, Tamil Nadu State by Dr. B. Umapathi and A. Subburaj published in National workshop on “Role of groundwater in Smart Cities” organized by Indian National Committee of IAH on 17.12.2016.
- Water Security Plan model for Jal Gram – A case study in Sengunam Village, Polur Block, Thiruvannamalai district, Tamil Nadu, India by K. Azhahia Nambi and A. Subburaj published in Workshop on Sustainable Groundwater Development under Jal Kranthi Abhiyan organized by CGWB, SECR, Chennai.
- Multiple approaches on sustainable groundwater management plan preparation- A case study in Amaravathi Aquifer Systems by Dr. K. Rajarajan, A.Subburaj and Dr.D.Gnanasundar published in Workshop on Sustainable Groundwater Development under Jal Kranthi Abhiyan organized by CGWB, SECR, Chennai at Coimbatore on 16.03.2017.
- Coastal Hydrogeology of Tamil Nadu by A. Subburaj presented in National Level Workshop on “Multiphase approaches on Assessment and Sustainable management of Stressed Coastal Aquifers” organised by Department of Earth Sciences, Pondicherry University at Puducherry on 18.05.2016.
- Aquifer Mapping & Application of Groundwater Modelling for Sustainable Groundwater Management of Upper Ponnaiyar Aquifer System, Southern India by Dr. M. Senthil Kumar, et al published in 4th India Water Week 2016 organized by Central Ground Water Board at New Delhi during 4-8 April, 2016.
- Strategies for Sustainable Management of Ground Water Resources through Aquifer mapping in Over Exploited Valipur Mandal, Nizamabad district, Telangana State by Dr. Pandith Madhnure ,Sc-D presented in National Conference on “Climate Change and Sustainable Development: Issues, hallenges & Opportunities at Hyderabad (IPE).
- Conceptualization and Characterization of Hard rock Aquifers in parts of Nalgonda district, Telangana State by Sh. G.Praven Kumar Sc-C presented in National Conference Strategic Trends and Future perspectives in the Development of Natural Resources of Telangana State at kakatiya University, Warangal on March 2017.

- Aquifer Mapping for Suitable management of Groundwater Resources – A case study from parts of Nalgonda district, Telangana State by Dr. Pandith Madhnure, Sc-D published in Proceedings of Bhujal Manthan-2,at New Delhi on 29thNovember 2016.
- The following Papers presented in the First Indian National Ground Water Conference organized by JNTU, Hyderabad during October 5-7, 2016.
  - Influence of Percolation Tank on Ground water – A case study in Tadipatri Shales of YSR Kadapa district, A.P by Sh. J. Siddhardha Kumar, Sc-D
  - Ground Water Issues and Options for Sustainable management, Nalgonda district, T.S by Dr. Pandith Madhnure, Sc-D.
  - Hydrochemical characterization of groundwater in hard rock terrain in parts of Nalgonda district, T.S by Sh. G. Praveen Kumar,Sc-C.
  - Ground water management in sub-urban and peri-urban parts of Greater Hyderabad by Sh. G. Ravi Kumar, Sc- C & Dr. P.N. Rao, Sc-D.
  - Appraisal of groundwater quality in Tandur town , Ranga Reddy district, T.S by Sh. Dibakar ohanta, AHG.
- An Appraisal of Hydrogeological, Hydrochemical Parameters and options for Sustainable Management in Adilabad District, Telangana by Dr. Pandith Madhnure, Scientist-D presented National Seminar on “Water, Science & Environment” at JNTU Hyderabad on 6th June, 2016.
- Water Quality Index and Hydrogeological Interpretation to assess Ground Water Quality using GIS in B. Ramaram and B. Pochampalli Watersheds, Nalgonda district, Telangana by Sh. G.Praven Kumar Sc-C presented in 11th Deccan Geographical Society (IICGS) MCR HR Centre, Hyderabad Sept-27 to 29,2016.
- The following papers were presented in International Conference on Sustainable Water, Waste Water and Energy Management (SWWEM-2016) organized by Civil Engineering Department, UVCE, Bangalore University, at IISC, Bangalore on 17.8.2016 & 18.8.2016.
  - Influence of Evapotranspiration and Rainfall Patterns On Ground water Recharge In The Agro-Climatic Zones of Karnataka, India by S.S.Hegde Sc-D.
  - Evaluation of Suitability Of Ground Water For Drinking And Its Sustainable Management - A Case Study From Chikballapur District, Karnataka, India by Sangita.P.Bhattacharjee AHG
  - Best Practices for Sustainable Groundwater Development by Dr K.R. Sooryanarayana Suptd. Hg.
  - Rain water harvesting and Artificial Recharge- A Case Study by Dr K.R. Sooryanarayana Suptd. Hg
- National Aquifer mapping in Kolar district, Karnataka by S. S. Hedge Sc-D presented in India Water Week, 2016 during 4.4.2016 to 8.4.2016 New Delhi.
- Statutory and Regulatory requirements related to water industry by K.M.Viswanath, Regional Director Dr K.R. Sooryanarayana Suptd. Hg presented in Industry Awareness programme on Water Standards at BIS, Bangalore on 29.8.2016.
- Characterization of Aquifers in Chikkaballapur district, Karnataka by Dr A.Asokan Sc –D presented in Bhujal Manthan, 2016 at New Delhi.
- Hydro-Geological scenario of Davangere city, Karnataka India by Dr M.A.Farooqi Sc-D and Aquifer Mapping for Groundwater Management at Village Level in Hard Rock Areas of Southern Peninsular India - A case study by Dr S.S.Vittala AHG presented in National Workshop on “Role of groundwater in smart cities and villages” at Faridabad, INC-IAH on 17.12.2016.
- An action plan for aquifer sustainability through water conservation and artificial recharge in Madhugiri taluk, Tumkur district by Dr. K.R. Sooryanarayana Suptd.Hg presented in National Seminar on “Water Conservation and Waste water Management for Sustainable Development” at Dayanand Sagar College, Bangalore on 22.3.2017.

24.5 Delivered lectures/presentations

- Dr. S.K Jain, Regional Director and Sh. M.L Angurala, Sc 'D' , CGWB, NWR, Chandigarh delivered a Poster Presentation on 'Rain Water Harvesting and Water Conservation at Local Level' during India Water Week at New Delhi.
- Scientists of CGWB, SR, Hyderabad presented the progress of Aquifer Mapping and Management Plan (6000 sq.km.) in Nalgonda district of Telengana state at Central Headquarter, Faridabad on 18.04.2016.
- Scientists of CGWB, ER, Kolkata presented the report on Aquifer Mapping and Management plan for 5031 sq km area covering 26 blocks in parts of Nadia, Hooghly, Barddhaman and N 24 Pargana district in West Bengal at CHQ Faridabad on 18.04.2016-19.04.2016.
- Scientists of CGWB, NWR, Chandigarh delivered a Presentation on Aquifer Mapping & Management plan for the target areas of Phase II on 19th April, 2016 at CGWB, CHQ Faridabad.
- Officers of CGWB, SWR, Bangalore Visited CHQ on 18th and 19th April, 2016 and made presentations of Aquifer management plan of Chikaballapur district**.**
- Officers of CGWB, CR, Nagpur presented Aquifer Maps and Management Plans for an area of 12,165 sq.kms against the target of 11,176 sq.kms at CHQ, CGWB, Faridabad on 19-4-2016 before the Members, CGWB. The presentation was appreciated by the Members.
- Shri. A. D Rao, Regional Director, SR, Hyderabad presented the progress on "Aquifer mapping and Management Plan for 11,311 Sq.Km. Nalgonda district, Telangana" on 19.05.2016 at Faridabad.
- Dr. S.K Jain, Regional Director made a presentation on Implementation Plan for NAQUIM Phase I for Haryana State before the Secretary MOWR, RD & GR, Chairman CGWB & other Senior Officers of CGWB on 16.05.2016 at CHQ, Faridabad.
- Dr. S. K Jain, Regional Director, Sh. Rakesh Rana, Sc 'D', Sh. Roopesh G. Krishnan, Sc 'B' presented Implementation plan for NAQUIM Phase I & II of Haryana State before Secretary Irrigation on 23.05.2016.
- The Regional Director, WCR, Ahmadabad made presentation in front of the expert committee on "Aquifer mapping and Management Plan" at CHQ, Faridabad on 25/05/2016
- The Regional Director, SER, Bhubaneswar presented the NAQUIM – Bhadrak District at CHQ on 19th May, 2016.
- Regional Director, NCCR, Raipur presented the "Ground Water Management Plan of Katghora & Kartala blocks of Korba district and Dharamjaigarh, Gharghoda & Tamnar blocks of Raigarh district, Chhattisgarh" at CHQ, Faridabad on 25-05-2016.
- S/Shri D. Subba Rao, Regional Director and J.R. Verma, Sc-D presented Aquifer Maps and Management Plans at CHQ, CGWB, Faridabad on 25-05-2016 before the Chairman, Members, CGWB and Expert Panel.
- Sh. Rajesh Chandra, Sr. Hydrogeologist, CGWB, New Delhi delivered lecture on Rain Water Harvesting at Varunalaya, Delhi Jal Board Office, New Delhi on 14.05.2016.
- Dr. Pandith Madhnure, Scientist D ,CGWB, SR, Hyderabad presented paper titled "An Appraisal of Hydrogeological, Hydrochemical Parameters and options for Sustainable Management in Adilabad district, Telengana in National Seminar on Water Science and Environment" organized by JNTU on 6th June, 2016 at Hyderabad.
- A paper on "Traditional Irrigation system in India specially in Himachal Pradesh" written by Sh. N.P.S. Nagi, Regional Director & Dr. SK Mahammad Sartaj Basha, Scientist published in Annual Technical Volume 2015-16 by Institution of Engineers (India). An appreciation letter to Sh. N.P.S. Nagi, Regional Director & Dr. SK Mahammad Sartaj Basha, Scientist was presented by publisher.

- A lecture session was organized at Delhi Public School, Bopal, Ahmedabad in connection with the Action Plan of the Ministry of Water Resources, RD & GR under the theme “Education and Health: Universal access and Quality” where in lectures were delivered on Ground water Hydrogeology and quality of ground water. About 450 students attended the lecture session.
- Shri Sourabh Gupta, Scientist-D and OIC, CGWB Pune delivered lecture on “Ground Water Management and Artificial Ground Water Recharge” at National Water Academy, Pune on 21st July 2016. The one day training program was attended by about 60 participants of youth organizations like Nehru Yuva Kendra, Indian Red Cross Society, Eco-Club, Scout Guides, NSS etc.
- Shri T.Talukdar, Scientist D, CGWB, ER, Kolkata delivered lectures as Guest faculty in the training course on “Mathematical Modelling of Ground Water System” at RGNGWTRI on 14.07.16 & 15.07.2016.
- Shri I. K. Sharma, Superintending Hydrogeologist ,CGWB WR, Jaipur attended the "Water Awareness Programme" organised by Nehru Yuva Kendra Sansthan , Jaipur on 12.07.2016 and delivered a lecture on steps to be taken for Water Conservation /Artificial Recharge to ground water.
- Senior officers of CGWB, attended Presentation on the report of Re-structuring of CWC and CGWB at CSMRS, New Delhi on 24.08.2016.
- Four Industrial Pollution Cluster Reports pertaining to Asansol Industrial Area, Durgapur Industrial Area, Haldia Industrial Area, Howrah Industrial Area, West Bengal have been published.
- Shri Sourabh Gupta, Scientist-D and OIC, Pune delivered lecture on “Conjunctive Use of Surface Water and Ground Water at National Water Academy, Pune on 24-08-2016.
- Dr. P.N. Rao, Suptdg. Hydrogeologist, SR, Hyderabad delivered a guest lecture on “Ground Water perspective and Management” on 22.08.2016 in Department of civil Engineering, Nalla Narasimha Reddy Engineering College, Hyderabad.
- Scientist of SWR, Bengaluru presented four papers in the International Conference on Sustainable Water, Waste Water and Energy Management(SWWEM-2016) organized by Civil Engineering Department, UVCE, Bangalore University on 17.8.2016 & 18.8.2016 at IISC, Bangalore.
- Regional Director shri C.Paul Prabhakar, delivered a presentation on “Status of ground water resources, ground water recharge and quality issues in Chhattisgarh during the meeting of SWG5 for surface and ground water governance and policy under Chhattisgarh state planning held on 12th august 2016 in Matralaya Raipur.
- Regional Director , Kerala Region attended the International Conference & Exhibition on “Best practices in Sustainable Water: Waste Water & Energy Management –SWWEM-2016”, from 17/08/2016 to 19/08/2016, at IISc Bangalore-560012, Karnataka and presented a paper on ‘Characterisation of Ground water quality and its suitability for drinking in Pamba River Basin, Kerala.
- Sh. Sunil Kumar, Regional Director and Senior Scientist delivered lectures in training programme on “Recent Advancement in Groundwater Development and Management” organized by NIT, Raipur during 08-12, 2016.
- Senior officer from CGWB, CR, Nagpur delivered lecture on “Rain Water Harvesting & Water Management” during the Capability Building Program on Sustainable Development for Senior Executives of Indian Oil Corporation Limited at Mumbai on 23-9-2016.
- Presentations on Aquifer Mapping and Management Plan for the target areas of Ahmednagar, Katol area of Nagpur and UT of D&NH were made by the Regional Director & Senior officer CR, Nagpur at CGWB, Faridabad on 8th September 2016.
- Faculty members of RGNGWTRI, Raipur have delivered lectures in Tier-lll training programme on "Local Ground Water Related lssues and Participatory Ground Water Management" organized by CGWB, NCCR, Raipur during September 08-09, 2016.

- Regional Director, SR, Hyderabad, delivered lecture on “Ground Water and it significance in Water Management” in Seminar on “Processes and Products of Dynamic Earth” on 17.09.2016 at Eluru, West Godavari district, Andhra Pradesh.
- Sh. Parvinder Singh, Regional Director and Senior officer, NCR Bhopal presented Aquifer Maps and Management Plan for Tikamgarh and Chhatarpur district at CHQ, Faridabad on 07.09.2016.
- Senior office from CGWB , NWR, Chandigarh attended a workshop on Water Quality and Environmental Issues by World Bank’s Water Quality Mission under Punjab Rural Water Supply and Sanitation Sector improvement project held under the Chairmanship of Director Water Quality Punjab, Department of Water Supply and Sanitation at Mahatma Gandhi State Institute of Public Administration Punjab, Industrial area on 26th, September, 2016 .
- Senior officer from CGWB, WCR, Ahamedabad made presentation on “Protocols for obtaining permission for Ground Water withdrawal for industries/infrastructures and NOCAP i.e. online application system of CGWA during the workshop held on 8.09.2016 at Bhuj. Sh. Ashok Kumar,SHG & B.Mohapatra ,Sc-C were present as panel members during the panel discussion session held after the technical sessions.
- Shri P.K.Parchure,Regional Director and Senior officer CGWB,WR,Jaipur attended Inaugural function of the National Conference on " Environment Challenges, Human Health and Society" organised by University Maharaja College & International Society for Life Sciences at Humanities Hall, University of Rajasthan, Jaipur on 8.9.2016.
- Senior officer CGWB, WR, Jaipur attended workshop on "Air Quality Monitoring, Impact and Action plan" organised by Rajasthan State Pollution Control Board in association with Indian Institute of Tropical Meteorology (IITM) GOI and UNICEF on 09.09.2016 at Jaipur. Demonstrations were done for some of the studies conducted in significant climate sensitive, vulnerability and low adaptive capacity in Jaipur urban areas.
- Hindi Pakhwara was organised during 1st to 14th September 2016 at Conference Hall, CGWB, MER-Patna.
- Senior officer from CGWB, SWR, Bangalore attended the 19th International River Symposium from 12th to 14th September 2016 at Hotel Taj Palace, New Delhi.
- Senior officer from CGWB, HQ and Regional offices attended the training on “River basin, planning using HEC software under NHP held at IIT, Roorke from 5th to 10th September, 2016.
- Officer from CGWB, SWR, Bangalore attended the training course on “GEMS (Water Quality Module) held during 19th to 23rd September, 2016 at CHQ, Faridabad.
- Under NAQUIM, presentation was made by senior officer from, CGWB, SWR, Bangalore on Aquifer management plan of 17,818 sq.km covering parts of Bangalore Rural, Tumkur, Chitradurga and Hassan districts of Karnataka on 6th of September 2016 at CHQ.
- Senior Scientist from NCR, Bhopal presented aquifer mapping and Management plan of Dewas district targeted area of June 2016 during the meeting of expert Committee on 21 oct'2016 at CGWB, Faridabad.
- Senior officers from CGWB, SWR, Bengaluru delivered delivered lectures during the training programme on “Conservation and Management of Groundwater” for Senior Geologist/Geologists of Directorate of Ground Water, Government of Karnataka at Administrative Training Institute, Mysuru on 18th ,22 and 26th , October ,2016.
- Under NAQUIM, presentation was made by senior officers from SWR, Bengaluru on Aquifer management plan of 17,818 sq.km covering parts of Bangalore Rural, Tumkur, Chitradurga and Hassan districts of Karnataka on 18.10.2016 at CHQ, Faridabad.

- Senior officer from CGWB, SWR, Banglore delivered a lecture on “Aquifer Mapping and Management in Pilot Project areas in parts of Tiptur and CN Halli taluks of Tumkur district” on 18.11.2016 at Civil Engineering Department of SJB Institute of Technology, Bangalore.
- Shri S.S.Hegde, Scientist-D , CGWB, SWR, Bangalore delivered Late Sri K.R.Karanth Endowment lecture “Deep Ground water exploration in Over exploited Kolar district- An Over view” on 26.12.2016 at GSI Bangalore.
- Shri Vidyanand, Scientist-D, CGWB, NHR, Dharamshala presented lecture on “Ground Water scenario of Himachal Pradesh” at Mandi on dated 20.12.2016 during a workshop under Jal Kranti Abhiyan 2016-17 organized by CWC, Shimla.
- Shri S.K.Saigal, Scientist-D,CGWB, NWR, Chandigarh delivered a lecturer on Application and uses of Hydro Geo-morphological Maps (HGM) for NAQUIM on 23rd December, 2016 in Training Programme 2016-17 organized by India Water Foundation National Key Resource Centre, Ministry of Drinking Water & Sanitation, Government of India, at Haryana Institute of Rural Development, Nilokheri, Karnal Haryana.
- Dr. P.N. Rao, Head of Office participated in NCWES, 2017 and delivered key note address on “**Ground Water Issues & Management options in India**” organised by Centre for Water Resources, Jawaharlal Nehru Technical University, Hyderabad on 20th March, 2017.
- Dr. P.N. Rao, Head of Office made presentation of “Aquifer Mapping & Management Plan of Chittoor District, Andhra Pradesh” before Expert Committee at New Delhi on 15th March, 2017.
- Dr. P.K. Jain, Head of Office, CGWB, CR, Nagpur delivered a popular talk on “Rain Water Harvesting and Artificial Recharge by Public Participation” at Irrigation Department Auditorium, Wainganga Nagar, Nagpur on 21st March 2017. The talk was delivered as a part of जल – जागृति सप्ताह observed during 16-22 March 2016 by Water Resource Dept., GoM in association with IWRS, CGWB and other Organisations.
- Dr. S. K. Jain, Regional Director CGWB, NWR, Chandigarh made a ppt on NAQUIM work of Punjab State in a programme on ‘Science Day’ organised by Department of Applied Sciences, Punjab Engineering College, Chandigarh on 04.03.2017

24.6 Participation in Workshop/Seminars/Conference/Exibition/ Training Workshop.

- Dr. D. Gnanasundar, Scientist-D(Sr.HG), CGWB, SECR, Chennai attended the one day workshop on “Ground Water Estimation Methodology, 2015 (GEC 2015)” organised at CWPRS, Pune on 24th January 2017 to discuss the modifications proposed in the draft report and to incorporate changes.
- S/Shri. T.Balakrishnan, Scientist-D(Sr.HG) and A. Balachandran, Scientist-D(Sr.HG) CGWB, SECR, Chennai participated in the One day workshop on National water Mission organised by SG&SWRDC, PWD, Chennai on
- Shri. A. Subburaj, H.O.O, SECR, Chennai attended 19th International River Symposium from 12th to 14th September, 2016 at New Delhi managed by International River Foundation, Australia.
- Dr. K. Rajarajan, AHG and Dr. N. Ramesh Kumar AHG CGWB, SECR, Chennai had participated in the National Workshop on “Water and Waste Water – Sustainable Management” conducted by CSIR-NEERI, Chennai during March 27-28, 2017.
- Dr. S. Subramanian, Scientist-D (Sr.HG) CGWB, SECR, Chennai attended India water Week 2016 from 4th April to 8th April 2016 at Pragadhi Maidan, New Delhi.
- Sh. S. K. Saigal Sc “D”, CGWB, NWR, Chandigarh attended a Seminar on “Challenges & Strategies for Management of Water in Rural areas” organized by National Bank for Agriculture & Rural development (NABARD) and delivered a lecture on Gravity of deterioration of Ground Water in near & distant future for the State of Punjab and Haryana on 13th July at Mount View Hotel, Chandigarh

- Shri T.Talukdar, Sc D, CGWB, ER and Dr. P.K. Das, Sc D CGWB, ER, Kolkata attended the State level Workshop organized by Ganga River Basin Planning Project on “Strategic Basin Planning for Ganga River Basin in India” at Conference hall, Jal sampad Bhavan, Irrigation & Waterways, Govt. of West Bengal on 25.07.2016 & 26.07.2016.
- Shri T.Talukdar, Sc D, CGWB, ER, attended Workshop on “Basin wise workshop on Ganga River Basin Planning Project” organized by Ganga River Basin Planning Project on 18th July, 2016 at Hotel Rennaissance (Marriott), Gomti Nagar, Lucknow, Uttar Pradesh.
- Sri T. Chakraborty, OIC, SUO, CGWB Shillong attended Water conference 2016 organised by Lady Keane College, Shillong. Presented a paper on “Sustainable management of Ground Water in Meghalaya”.
- The Regional Director along with Shri B K Gupta, Scientist-D, CGWB, WCR, Ahmedabad attended a workshop on “MAKING CITIES WATER SECURE” on 8th July 2016 at CEPT, Navrangpura, Ahmedabad.
- Shri P.K.Parchure, Regional Director and senior officers of CGWB, WR, Jaipur attended the seminar "Water Conclave 2016" on the theme "Water Conservation & Recharge" at SMS function center, Jaipur on 07.07.2016.The seminar was organised by PHED, Ground Water Department, GOR and CII. Shri P.K.Parchure, Regional Director, CGWB, WR, Jaipur made a presentation on the topic "Developing Water Efficient Infrastructure and Rain Water Harvesting (RWH) during Plenary Session.
- Sh. D.N.Mandal, Scientist-D and Dr.S.Sahoo, Scientist- C, CGWB, SER, Bhubaneswar attended ITRA Workshop Feedback workshop at KIIT from 27th to 29th July, 2016.
- Dr. P. N. Rao Suptdg. Hydrogeologist & Dr. Pandith Madhnure, Scientist-D, SR, Hyderabad participated in multi stakeholders dialogue on understanding the linkage between climate change policy and water security in peri urban context organized by “SaciWATERs” on 17.08.2016 at Hyderabad.
- Sri K.T.Suresha Sc-D and Sri G.Krishnamurthy Sc-D,SWR, Baglaluru attended one day workshop on Aerogeophysical Surveys over OGP areas at RSAS, Geological Survey of India, Bangalore on 5.8.2016.
- Sri K.M.Viswanath, Regional Director, SWR, Bangaluru , Inaugurated the Industry Awareness programme on Water Standards organized by Bureau of Indian Standards, Bangalore Branch Office on 29.8.2016 as Chief Guest. Dr K.R. Sooryanarayana Suptd.Hg presented technical paper on”Statutory and Regulatory requirements related to water industry” during the programme.
- The South Australian Delegates visited Jaipur for setting of the Centre of Excellence on Water Resource Management , during this month. In this regard Dr. Arijit Dey, Suptd. Hg., CGWB,WR, Jaipur attended the workshop on "Water Quality Management, Mapping out roles and responsibilities for Centre of Excellence and finalizing twelve month action plan" at SMS Convection Center, Jaipur on 12.08.2016.
- Shri. A. Subburaj, H.O.O, Chennai inaugurated two days National workshop ‘on Recent Trends on Geoexploration’ on 18.08.2016 as Chief Guest and delivered a key note organised by the Department of Earth Sciences, Annamalai University, Chidambaram, Tamil Nadu.
- The Regional Director and other officers WCR, Ahmedabad attended the Inaugural ceremony of the Workshop (**हिन्दी कार्यशाला)** organized by the **राजभाषा कार्यान्वयन समिति** of CGWB, WCR, Ahmedabad on 10/08/2016. The officials attended the workshop wherein the importance of using the Rajbhasha Hindi in day to day official correspondence was deliberated in the one day workshop.
- Senior Scientist from NWR, Chandigarh attended “State Level Workshop on Collaborative Modelling” during 28-29th july, 2016 organized at Red Bishop, Haryana Tourism, Panchkula.

- A two days workshop on Strategic Basin Planning for Ganga River basin in India by Kees (C.A.) Bons and Team in consultation with State Water Resources Department, Govt of Chhattisgarh, was attended by Senior officer from CGWB, NCCR, Raipur at Mahanadi Bhawan, Mantralya, Naya Raipur.
- Senior Scientist from NCR, Bhopal attended workshop on "Management of Hydroscientific Events" organized by National Institute of Hydrology on 20 Oct. 2016 at at Walmi Parishar, Bhopal.
- Shri Parvinder Singh, Regional Director, NCR, Bhopal attended one day workshop on "Reassement of Water Resources of India' organized by CWC on 21st Oct. 2016 in the conference Hall of CWC, R.K.Puram, New Delhi. The workshop was organized woth objective of establishing the importance and requirement of water resources assessment, methodology available, technology, Challenges and constraints.
- Senior officers from WCR, Ahmedabad attended a round table discussion on Sabarmati River: Ecology and Environmental issues and concerns organized by CMS, Vatavavaran in connection with Sabarmati River International Festival along with VIKSAT, held at Chimanbhai Patel Institute of Business Administration, Ahmedabad on 20.10.2016.
- Senior officers from WCR, Ahmedabad attended a one day workshop jointly organized by Gujarat State Watershed Management Agency (GSWMA) and ACT,_Kutch on “Participatory Ground Water Management Protocols” held at Bhaskaracharya Institute of Space Application and Geoinformatics (BISAG), Gandhinagar on 21.10.2016.
- Workshop on “Bangalore water future-An exploratory workshop using transformative scenario planning” organized by Indian Institute of Human Settlement, Bangalore was attended by Senior officers from CGWB, SWR, Bangalore on 18.10.2016.
- Senior officer from CGWB, SER, Bubaneshwar attended the workshop on 21st Oct, 2016 on Integrated Coastal Zone Management organised by State Coastal Management Projects.
- Senior officer from CGWB, NCCR, Raipur attended Two days Workshop organized Jointly by PHED and IRSC Nagpur at New Circuit House Raipur on 11 Nov to 12 Nov 2016 on “Existing Database Of PHED-CG & Assessment of Ground Water Potential Based on Geo-Spatial Scientific Database of Chhattisgarh State-Technological Applications,& Innovations-Way Forward”.
- Senior officer from CGWB, SWR, Banglore delivered lecture on “Procedures for various Groundwater Recharge- Case studies”during the training programme on “Conservation and Management of Groundwater” for Senior Geologist/Geologists of Directorate of Ground Water, Government of Karnataka at Administrative Training Institute, Mysuru on 09.11.2016.
- Senior officer from CGWB, SWR, Banglore attended the one day Workshop on “Karnataka State water policy with regard to Climate Change” on 16.11.2016 organized by Advanced Center for Integrated Water Resource Management at Bangalore.
- Regional Director, NER Guwahati attended 3 days workshop on “Faculty Development Programme” organized by GIMT, Guwahati and a lecture has been delivered by him on “Hydrogeology of Assam with special reference to Guwahati. As part of dissemination and awareness amongst the institutions, following materials are contributed for the library of the said department –
  - Reference material of RGI Tier II training programme on sustainable ground water development.
  - Aquifer system of Assam.
  - Dynamic ground water resources of Assam (as on 2011).
- Senior officer from CGWB, WCR Ahmadabad participated in one day workshop on “mission water conservation an NRM framework under MGNREGA with in the overall framework of PMKSY “on 80.12.2016 at department of Rural Development, Govt. of Gujarat , Ahmadabad.
- Senior officer from CGWB, CHQ, Faridabad, WR, Jaipur and ER, Kolkatta, NWR, Chandigarh attended the Seminar on "Improving Ground Water Management with Communities" organised by WLE, IWMI and FES on 02.12.2016 at NASC complex,New Delhi.

- CGWB, SWR Bangalore participated in workshop organised by Rural Development and Panchayat Raj department, Govt.of Karnataka on 28.12.2016 to chalk out strategy for arranging State level Natural Resource Abhiyaan.
- Sri K.M.Viswanath, Regional Director and Senior Officer from CGWB, SWR, Bangalore attended meeting on 21.12.2016 at Bangalore regarding use of Innovative Source tapping Magmatic Aquifer. The meeting was convened by RWS & SD, Govt. of Karnataka and the innovative technique was presented by M/s Water Quest.
- Dr. S. K. Jain, Regional Director and senior officers from CGWB, NWR, Chandigarh attended Orientation Workshop on "Mission Water Conservation" Natural Resource Management framework of PMKSY and formulation of labour budget under MGNREGA for FY 2017-18 held on 09.01.2017 at Chandigarh. Dr. Jain delivered ppt presentation on 'Aquifer map and management plan of Haryana and its scope for inclusion in MNREGA scheme'.
- Sh. M.L.Angurala, Sc-D, CGWB, NWR, Chandigarh attended "Awareness Workshop on National Hydrology Project" organized by Haryana Irrigation and Water Resources Department on 20.01.2017 at Haryana Irrigation Research & Management Institute (HIRMI), Kurukshetra, Haryana.
- Senior Officer from CGWB, SWR, Bengalurur attended workshop on "Water Accounting and Crop Budgeting" organized in connection with NGWMIP by Advanced Centre for Integrated Water Management at Bangalore on 23.1.2016.
- Sh. A.K.Agrawal, Regional Director, and senior officers from CGWB, MER, Patna attended the one day National Symposium 2017 on Environmental Degradation and its impact on Children and Women health on 16th January 2017 at Mahavir Cancer Sansthan & Research Centre, Phulwarisharif, Patna Bihar. Invited lecture delivered on "Arsenic contamination of Groundwater in Bihar" at National Symposium Environment Health Organised by Mahavir Cacer Research Insitute Patna by Shri. S.N Dwivedi , Sc-C from CHQ, CGWB, Faridabad on 16.02.2017.
- Regional Director, and senior officer from CGWB, WCR, Ahmadabad attended Seminar on Water Challenges on 12th January 2017 at Vibrant Gujarat event at Gandhinagar.
- Regional Director, and Senior officer from CGWB, WCR, Ahmadabad attended a two day training workshop on "Application and Uses of Hydro- Geo-morphological Maps (HGM) for Groundwater Prospection" organized by India Water Foundation on 6th and 7th January 2017 at Gandhinagar.
- Regional Director, and Senior officer from CGWB, WCR, Ahmadabad attended a Training and "Capacity building program for Tribal dominated areas" on 7th January 2017 at Chota Udaipur organized by Global Hydrogeological Solution in association with CGWB.
- Senior officers from CGWB, SR Hyderabad had participated in the Seminar "Geospatial Technology in Water Resources Management' organized by Geospatial World forum on 25.01.2017.
- Dr. P.K. Jain, Superintending Hydrogeologist, CGWB, CR, Nagpur chaired the session on "Water Quality and Surveillance" during the 49th Annual Convention of IWWA on Smart Water Management organized by IWWA at VNIT, Nagpur on 21-01-2017.
- Sh. O.P. Poonia, Sc-D (SHG) and I/c SUO, Jodhpur along with Sh. Ramakishan, SC-D (SHG), SUO Jodhpur atteding workshop on "Innovative Planning and Manging Scarce Water Resources", organised by Indira Gandhi Panchyati Raj and Gramin Vikas Sansthan at Jodhpur duirng 26-28 February 2017.

25. PROPAGATION AND PROGRESSIVE USE OF HINDI LANGUAGE DURING 2016-17

- Central Ground Water Board is committed towards the progress and implementation of Hindi and determined for its progressive use as per the Annual Programme issued by Official Language Department.
- During the period the provision relating to Section 3(3) of the Official Language Act, 1963 has been complied with.
- Under Rule 5 of the Official Language rule 1976 all the letters received in Hindi were invariably replied in Hindi.
- Hindi Quartely Progress report has been sent regularly to the Ministry of Water Resources, RD & GR, Town Official Language Implementation Committee, Faridabad and Official Language Department (Regional Implementation Office)
- Quarterly meeting of the Departmental O.L. implementation Committee are organised regularly and necessary action is taken as per the decisions taken in the meeting.
- Check points has been set up for the compliance of O.L. Act 1963 & O.L. Rule 1976.
- Incentive for original Noting & drafting in Hindi is being implemented. Ten officials were awarded cash prize under this scheme.
- Ten sections of the Office have been specified to work cent-percent in Hindi.
- Hindi Pakhwara was celebrated in CHQ, Faridabad during 14.9.2016 to 28.9.2016. Various competitions relating to official language were organized during the Pakhwara and prizes were awarded to the participants.
- Hindi Workshop was organized in CGWB.
- The second sub-committee of Parliamentary Committee on Official Language conducted inspection of the Central Ground Water Board, Regional offices, Chandigarh and Bengaluru. The Committee expressed its satisfaction on the implementation of official Language and propagation of Hindi in these offices.
- Hindi books are being purchased as per prescribed target in the Annual Programme.
- Inspections of 12 subordinate offices were made by senior officers of CHQ.
- Advertisements of all India level are being published as per rules in bilingual/trilingual form.

26 IMPORTANT MEETINGS

The following important meetings were held during the year 2016-17

26.1 Visit of Hon'ble Union Ministers of Water Resources, River Development and Ganga Rejuvenation:

- Hon'ble Minister of Water Resources, River Development & Ganga Rejuvenation Sushri Uma Bharti visited Haridwar, Kedarnath and Gaurikund in Uttarakhand on 29th October, 2016. Senior Officers from CGWB, UR, Dehradun have attended the visit of Hon'ble Minister.
- Hon'ble Minister of Water Resources, River Development & Ganga Rejuvenation Sushri Uma Bharti visited Devprayag and Srinagar on 21-22, November 2016. Senior Officers from CGWB, UR, Dehradun have attended the visit of Hon'ble Minister.
- Hon'ble Minister of Water Resources, River Development & Ganga Rejuvenation Sushri Uma Bharti visited Dehradun on 19.12.2016.Senior Officers from CGWB, UR, Dehradun have attended the visit of Hon'ble Minister.
- Hon'ble Minister of State for Water Resources, River Development & Ganga Rejuvenation **Dr. Sanjeev Kumar Balyan** visited Dehradun on 20.12.2016. Senior Officers from CGWB, UR, Dehradun have attended the visit of Hon'ble Minister.
- Hon'ble Minister Sushri Uma Bharti, Union Minister for Water Resources, River Development and Ganga Rejuvenation, laid the foundation stone of National Ground Water Training & Research Institute on 20th January 2017 at Tuta, Naya Raipur. Sh. K.B. Biswas, Chairman CGWB, Sh.K.C.Naik Member, CGWB & senior officers of CGWB were present on that occassion.
- Sushri Uma Bharti, Hon'ble Union Minister for Water Resources, River Development and Ganga Rejuvenation visited Nagpur on 20th and 21st January, 2017 enroute to Chindwara from Raipur. Shri D. Subba Rao, Regional Director, held discussions with the Hon'ble Minister on the review of progress.
- The inspection of SWR, Bangalore regarding the implementation of official language by the second sub-committee of Parliament on official language Hindi parliamentary was done on 13.1.2017. The inspection was headed by Dr Prasanna Kumar Patsani, Honorable Member of Parliament (Lok Sabha), Dr Sunil Baliram Gaikwad , Honorable Member of Parliament (Lok Sabha) and Sri Vivek Gupta, Honorable Member of Parliament (Rajya Sabha). Sri K.M.M. Alimalim Goti, Economic Advisor and Official Language (Incharge),Sri G.C. Pati, Member (TT & WQ), K.M. Viswanath, Regional Director, CGWB, SWR, Bangalore ,Sri M.C. Bhardwaj, Deputy Director (Official Language) were also present.
- Hon'ble Minister of State, Ministry of Water Resources, River Development & Ganga Rejuvenation Dr. Sanjiv Baliyan visited Krishi Vigyan Kendra, Baghra, Muzaffar Nagar ,UttaraPradesh for the inaugural session of one day Tier-III training. Hon'ble MLA from Charthwal Assembly Constituency, Sri Vijay Kumar Kashyap and the Chairman, CGWB, Sri K. B. Biswas graced the occasion. Around 400 participants attended the training.
- Honorable Minister Sh. G.M Siddeshware, Minister of States, Heavy industries & Public Enterprises, Govt. of India & Sh. K.B. Biswas, Chairman, CGWB visited Moga District to create the awareness among People on "Water Conservation, Ground Water Development & local water related issues, their management & alternatives" under Jal Kranti Abhiyan on 14.06.2016. In above connection a Tier III Training Programme was organized at Jal Gram Korewala kalan, Moga.

- The Regional Director, NCCR, attended a meeting on 'Works being undertaken in Drought Affected area in Chhattisgarh' with Hon'ble Chief Minister of Chhattisgarh, Dr. Raman Singh held at Mantralaya, Naya Raipur on 03.06.2016. During the discussion, the Regional Director, NCCR brought to the notice of Chief Minister and concerned Secretaries about the launching of Mobile app ' Jal Sanchayan' by CGWB, MOWR,RD&GR.

26.2 Visit of Additional Secretary, Joint Secretary (MoWR, RD & GR)

- Dr. Amarjit Singh, OSD, Ministry of Water resources, River Development and Ganga Rejuvenation, Govt. of India and Dr. Dipankar Saha, Member SAM, Central Ground Water Board, New Delhi visited Raipur for PMKSY meeting held at Mahanadi Bhawan, Mantralya, Naya Raipur under Chairmanship of Hon'ble Chief Minister of Chhattisgarh Dr. Raman Singh on 08.09.2016.

- Sh. Sushil Kumar Singla, PS to MoS along with Senior officers, CGWB, NWR, Chandigarh visited Budha Nala, Ludhiana, on 27th September, 2016 for assessment of the pollution in the Ludhiana City and to visit the site at Jainpur Village where Rejuvenation of Buddha Nallah using in-situ Bioremediation techniques by Central Pollution Control Board under NRCP Project of MoEF.

- Sh. Akhil Kumar, Joint Secretary (Admn. & Ground Water), Ministry of Water Resources, River development & Ganga Rejuvenation visited ~~to~~ the infrastructure projects Omaxe city & Omaxe North Avenue, at Bahadurgarh, district Jhajjar regarding compliances of the conditions cited in NOC issued by CGWA on 29.12.2016. Senior officer from CGWB, NWR, Chandigarh , CGWA, New Delhi,Sh.Sushil Gupta, Ex Chairman, CGWB,Sh.Aashis Chakrawarthi, EX Member, CGWB have accompanied the inspection team.
- Dr Amarjeet Singh, Secretary, Ministry Of Water Resources, RD & GR visited Ahmedabad /Gandhinagar during 31st December 2016 to 1st January 2017.
- Shri Akhil Kumar, Joint Secretary (GW & Admn.), MoWR, RD & GR, Govt. of India, visited Jaipur during the period from 25.1.2017 to 27.01.2017 regarding site inspection of Industries for ensuring the compliance condition of CGWA NOC.
- Dr. Amarjit Singh, Secretary, Water Resources, River Development and Ganga Rejuvenation, GoI, New Delhi visited Hivre Bazar village, Ahmednagar district on 12th February 2017 to observe the works done under integrated watershed management by public participation. During his visit, Shri Popatrao Pawar, Sarpanch, Hiwre Bazar welcomed the Secretary and briefed him about the overall development works undertaken and completed in the village with the help of villagers. During the visit, the various recharge structures, dugwells, rain-gauge station, school were visited. The Secretary lauded the efforts taken by Shri Popatrao Pawar and villagers in developing the village to Adarsh gaon (Model village) not only in water management but in all the sectors through public participation. During the visit, Dr. S.K. Shrivastava, Chief Engineer, CWC/NWA, Pune Shri P. Nandkumaran, Regional Director, CGWB, Faridabad, Shri Chaskar, Director, NWA, Pune, Shri D. Subba Rao, Regional Director, and Senior officers from CGWB, CR, Nagpur were present.

26.3 Visit of the Chairman, CGWB

- Sri K.B. Biswas, Chairman, CGWB inspected and reviewed the work of Regional Office and Divisional Office at Bangalore on 23.4.2016 and 24.4.2016. He had discussions with Officers of SWR, Bangalore and Division XIV on achievement of AAP 2015-16. He also addressed the Officers/Officials of SWR, Division XIV and State Unit Office, Belgaum and stressed upon the achievement of goals envisaged by Ministry of WR, RD & GR in ground water sector and advised to bring productive output so as to reach end user in water sector.

- A meeting was convened during the visit of Shri K.B.Biswas, Chairman, CGWB ER, Kolkata on 20.05.2016 to review the progress of various activities undertaken by CGWB, ER, Kolkata. Regional Director and Officers of CGWB, ER and CGWB, Division XV, Kolkata attended the meeting. Aquifer mapping and aquifer management plan for Phase II was presented by Dr. S.K. Samanta, Suptd. Hydrogeologist & Shri D. Biswas, Scientist D.
- Sh. K.B. Biswas, Chairman CGWB visited North Central Region, Bhopal on 9th July, 2016 and chaired the 100th meeting of Office Council held at conference hall of CGWB, NCR-Bhopal. The Chairman also reviewed the progress of NAQUIM and related works at CGWB office.
- Shi. K.B. Biswas, Chairman CGWB visited Kachchh district during 8-10th September 2016 in connection with workshop on “Blue Revolution: Water scarce to water surplus” organized by ACT, Bhuj and Federation of Kutch Industries Association (FOKIA) and field visit in Kachchh district. The Chairman graced the inaugural session of the workshop as the Chief Guest. The Regional Director and Senior officers from CGWB, WCR, also attended the workshop.
- Shi. K.B. Biswas, Chairman, CGWB along with the Regional Director and Senior officers from CGWB, WCR visited the coastal area of Kachchh to inspect the works being carried out for control of salinity in the area. He also visited Vivekanand Research and Training Institute, Mandvi, Kachchh.

- Shri K B Biswas, Chairman CGWB graced the valedictory function of two week Executive Development Program (September 19 to 30) on “Mineral resources evaluation and geostatistics” for executives of Mineral Exploration Corporation Limited (MECL) at ISM, Dhanbad on 30.09.2016 as Chief Guest.
- Shri K.B.Biswas, Chairman, CGWB visited Western Region, Jaipur on 25.10.16 and monitored the progress of the region.
- Sh. K. B. Biswas, Chairman CGWB visited Chandigarh and hold a meeting on 27.12.2016 to review the progress of various activities of AAP 2016-17.
- Shri K.B. Biswas, Chairman, CGWB, Faridabad visited Pune unit Office on 16-02-2017, Hiwre Bazar village on 17-02-2017 and also attended workshop at Dhule on 18-02-2017. During his visit to Hivre Bazar village, Ahmednagar district, Shri Popatrao Pawar, Sarpanch, Hiwre Bazar welcomed the Chairman and briefed him about the overall development works undertaken and completed in the village with the help of villagers.
- Shri K. B. Biswas, Chairman, CGWB visited Kolkata on 02.03.2017 in connection to attend workshop on Strategic Basin Planning for Ganga River Basin in India. He also chaired a meeting of the Nodal Officers of CGWB across the country on Ganga River Basin Planning and Management.
- Shri K B Biswas, Chairman, CGWB, and Shri G C Pati, Member (TT & WQ) visited Ahmedabad and Bhadreshwar, District: Kachchh regarding Swachchh Bharat Abhiyan on 21.03.2017.

- Shri K.B.Biswas, Chairman, CGWB, Faridabad visited Village Bhadson, Block Indri, District Karnal, Haryana for participating in programme Swachh Bharat Abhiyan was organised by CGWB, NWR, Chandigarh, MoWR, RD & GR on 28.03.2017.

26.4 Visit of the Member, CGWB

- Dr. Diapnakar Saha, Member (SAM), CGWB, Faridabad along with Sh. Anurag Khanna, Head of Office and Sh. D. Bagchi, AHG, UR, Dehradun attended meeting at Indian Institute of Remote Sensing (IIRS), Dehradun on 13th August, 2016 and held discussions with Dr. Champthi Ray, Head, Geosciences Division, IIRS regarding Gaurikund Thermal Spring, Rudrapayag District, Uttarakhand.

- Dr. Dipankar Saha, Member (SAM) visited Bhopal regarding Tapi Mega Project. Sh. Parvinder Singh, Regional Director, and Senior Officer from CGWB, CR, Nagpur attended meeting with Dr. Narottam Mishra, Hon'ble Minister, WRD, Govt. of Madhya Pradesh on 13.09.2016 regarding Tapi Mega Recharge Project. Presentation on Tapi Mega Project was delivered by Dr. Dipankar Saha, Member (SAM), CGWB.

- Dr. Dipankar Saha, Member (SAM) visited Bhopal between 9 to 12 Oct'2016 regarding Aquifer Mapping in Ujjain district. He visited Ujjain & Dewas to see the hydro-geological condition in the districts. During his visit to Bhopal he also discussed with officers of CGWB about the progress & issues related to aquifer mapping.
- Dr Dipankar Saha, Member (SAM), CGWB Faridabad, Regional Director and Senior officer from CGWB, WCR, Ahmadabad ~~had~~ attended the 5th Meeting of Committee for "Exploration of alternate sources of water in arid area of the country including paleochannels" held on November 17, 2016 at Gandhinagar under the chairmanship of Sh. B.N.Navlawala, Chief advisor of Honorable Minister Of Water Resources, RD & GR.
- Dr. DipankarSaha, Member(SAM), CGWB, Faridabad and Senior officers from CGWB SWR, Banglore visited Indian Institute of Science, Bangalore on 22.11.2016 to participate in the meeting on Ground Water Resource Estimation.
- Shri G.C Pati ,Member (TT& WQ), CGWB, CHQ, Faridabad and Senior Officers from CGWB, UR, Dehradun have visited Gangnani Hot spring for rejuvenation studies, District Uttarkashi, Uttarakhand during 18-19th November, 2016.
- Dr. D. Saha, Member(SAM) had visited to PRL, Ahmadabad to discus interpretation of ground water isotopic data generated under IWIN Project on 29.12.2016.
- Dr D. Saha, Member, SAM, CGWB visited Ahmedabad /Gandhinagar from 31st December 2016 to 2nd January 2017.
- Dr. M. Aziz Ahmed, Member (Finance) and Mission Director, National Water Mission, MoWR, RD &GR, visited Vijayawada from 11.01.2017 to 14.01.2017. He convened meeting on 13.01.2017 with Departmental Head of Ground Water Department at Vijayawada and a draft Proposal on Improved Sustainability of Accountability through Monitoring of Ground Water Draft was prepared and submitted.
- Shri K. C. Naik, Member (RGI), Central Ground Water Board, Faridabad visited Village Samlehri, Block Saha, District Ambala, Haryana State for participating in programme Swachh Bharat campaign was organised by CGWB, NWR, MoWR, RD & GR on 20.03.2017.
- Dr. D. Saha, Member (SAM), CGWB, Faridabad has visited Village Sandharshi, Block Ghanaur, District Patiala, Punjab State for participating in programme Swachh Bharat Campaign was

organised by Central Ground Water Board, Ministry of Water Resources, River Development and Ganga Rejuvenation on 21.03.2017.

- Shri G. C Patti, Member (WQ &TT) CGWB, visited village Raipur Ariyan, Block Phillaur, district Jalandhar, Punjab State for participating in programme Swachh Bharat campaign was organised by CGWB, NWR, MoWR, RD & GR, on 27.03.2017.
- Dr. Dipankar Saha, Member (SAM), CGWB, Faridabad has visited Purulia district in order to verify the prevailing hydrogeological and socio economic condition in water scarce, with objective of irrigation development through Pradhan Mantri Krishi Sinchayee Yojana on 10.03.2017.
- Shri K.C.Naik, Member (RGI) and Dr. DipankarSaha, Member (SAM), CGWB, visited the CGWB, MER-Patna office from 24thto 26th March 2017for attending the Ganga Swachta Pakhwara at Gandhi Ghat, Patna on 24th March 2017, organised by National Mission for clean Ganga, Ministry of Water Resources, RD & GR, Government of India and also for pond cleaning / handing over ceremony under Swachta Pakhwada at Mander, Kharagpur, Munger district on 25.03.2017, organized by CGWB MER Patna in collaboration with ITC Limited, Munger (Bihar).
- Dr Sampath Kumar, Member Secretary, Central Ground Water Authority, New Delhi on 16th March, 2017 inaugurated Swachhta Pakhwada under Swachh Bharat Mission at village Dosod, Neemrana, District Alwar, Rajasthan.
- Dr Sampath Kumar, Member Secretary, Central Ground Water Authority, New Delhi visited CGWB, NR, Lucknow to grace the inaugural function of Swachhata Pakhwara organized by M/s. Balrampur Chini Mills Ltd., Balrampur.
- Sri G.C. Pati, Member (TT&WQ) attended a Meeting at NRSC Hyderabad on **"Rejuvenation of Springs in India**" and had discussions with Group Head. Dr. P.N. Rao, Suptdg. Hydrogeologist accompanied the Member and also participated in the Meeting. The Member (TT&WQ) visited the Southern Region Office and interacted with Sr. Officers of the Region.
- Dr. E. Sampath Kumar, Member (SML) and Member Secretary, CGWA, New Delhi visited Nagpur and Chandrapur district for attending the activities related to Swachhta Pakhwara carried out by Industries.

26.5 On the Spot Study visit of the Parliamentary Standing Committee on Water Resources to Bengaluru, Mysuru from 1st to 4th June, 2016 :

Parliamentary Standing Committee on Water Resources comprising of Sri Hukum Singh, Hon'ble MP & Chairman, 13 Hon'ble Members of Parliament, Joint Secretary of MOWR, RD & GR and Senior Officers from Lok Sabha Secretariat & Ministry, visited Karnataka covering Bengaluru and Mysuru from 1.6.2016 to 4.6.2016 to study water situations and related issues such as implementation of various irrigation projects under AIBP, ground water scenario and status of ground water pollution including the steps to address the issue, and activities of WAPCOS and Tungabhadra Board.

Being the Nodal Department, CGWB, SWR organized the complete arrangement for the visit and meetings. Sri K. M.Viswanath Regional Director and Dr K.R.Sooryanarayana Suptd.HG supervised the complete arrangement. Other departments viz., CWC, NWDA and State Government departments were also involved. Brief highlights of the visit are given below.

1.6.2016: The Committee held discussions with representatives of CWC and State Government of Karnataka regarding implementation of various irrigation projects under AIBP and encroachment of water bodies. This was followed by meeting held with CGWB. Sri K.B.Biswas, Chairman, CGWB, Dr P.Nandakumaran Regional Director, (CHQ), presented Ground water

scenario and status of contamination/pollution of ground water in Karnataka and management strategies taken up by CGWB to address the pollution issues.

2.6.2016: At Mysore, the Committee had discussions with representatives of WAPCOS. They also visited Krishna Raja Sagar Dam to study the status of dam and held discussions with Kaveri Neeravari Nigama Limited (KNNL).

3.6.2016: The committee visited Jnanabharathi Campus, Bangalore University to study the impact of Rain water Harvesting and Artificial Recharge Project implemented by CGWB. They also visited Ulsoor lake to study the condition of lake and held discussion with Heads of State Departments such as BBMP, KSPCB, BWSSB and Fisheries.

During afternoon session, discussions were held with Officials of Tungabhadra Board.

On 4.6.2016 the team departed to Hyderabad. Chairman and Other Members of the committee appreciated the arrangements and hospitality extended to them during their visit at Bengaluru and Mysuru.

26.6 Visit of Director(Admn), CGWB

Col. Rajesh Kumar Gaur, Director (Admn), CGWB visited and inspected SWR, Bangalore and Division XIV on 12.4.2016**.**

26.7 Visit of Second Sub -committee of Parliamentary committee on Official Language

Inspection visit to Division XIV, Bangalore by Second Sub-committee of Parliamentary committee on Official Language implementation was held on 11.4.2016 at Bangalore. Sri K.M. Viswanath, Regional Director was associated in the inspection along with Col. Rajesh Kumar Gaur, Director (Admn), CGWB and Sri Shiv Shankar, EE of Division XIV. Dr B.K.Singh, Director (Rajbhasha) and R.Gupta, Assistant Director (Rajbhasha) from CGWB, Faridabad coordinated in the inspection. A stall was put up at the venue showcasing the material highlighting the implementation of official language by the region.

26.8 Visit of Dr. R C Jain, Expert and Consultant, NWM

- Dr. R C Jain, Expert and Consultant, National WWater Mission(NWM) visited Regional Chemical Lab, WCR, Ahmedabad during 12-16 April 2016 for inspection of Ground water Quality status of RCL, Ahmedabad.
- The Chemical Laboratory of Central Region, Nagpur was inspected by Dr. R.C. Jain, Consultant, NWA, MoWR on 27th & 28th April 2016 for the purpose of *Restructuring of chemical laboratory of CGWB as per the committee constituted by MoWR, RD&GR*.

26.9 NABL Team visit for Accreditation of Regional Chemical Laboratory

NABL accreditation team comprising 2 members Dr. J.G. Mhalas, Mumbai and Smt. Meenal Satghare, Thane visited the Regional Chemical Laboratory, CGWB, CR, Nagpur on 6th and 7th August 2016. During their visit, they inspected various instruments, documentation and assessed the technical and quality aspects of the laboratory for award of NABL accreditation.

26.10 Review meeting in respect of schemes under Pradhan Mantri Krishi Sinchai Yojana (PMKSY)

A Review Meeting in respect of Schemes under Pradhan Mantri Krishi Sinchai Yojana (PMKSY) including AIBP, under implementation in the State of Maharashtra was held on 03.05.2016 at Mumbai. Shri Nitin Gadkari, Hon'ble Union Minister of Road Transport and Highways and Sushri

Uma Bharti, Hon'ble Union Minister of Water Resources, River Development and Ganga Rejuvenation,Shri Devendra Fadnavis, Hon'ble Chief Minister of Maharashtra and Shri Girish Mahajan, Hon'ble Minister for Water Resources, Government of Maharashtra were also present in the meeting.During the meeting, the Water Resources Dept. Govt of Maharashtra made a presentation on status of irrigation projects pending for completion and proposed projects to be covered on priority in drought affected areas of Maharashtra under PMKSY. During the meeting, discussion was also held on progress of DPR of Tapi Mega Recharge Scheme. It was informed by TIDC and CGWB that the DPR involves both pre and postmonsoon studies, further this scheme is a first of its kind in the Country, hence utmost precaution and precision needs to be followed in preparing the DPR. During the meeting, Special Secretary, MoWR, RD & GR also discussed the CGWB map depicting the change in mean decadal water level with January 2016 water levels. He stressed that MGNREGA schemes related to water conservation should be prioritized in the areas where water level decline of more than two meters has been observed. Dr. Dipankar Saha, Member (SAM), Dr. P.K. Jain, Suptdg. HG and Sh. Rahul R. Shende, AHG. From CGWB attended the meeting.

26.11 Report on "On the Spot Studies of Water Situation In Drought Affected Areas of Maharashtra" by CGWB, CR, Nagpur

In compliance to the letter from Ministry of Water Resources, RD & GR (Ground Water Desk), New Delhi, the technical team comprising officers of CGWB & CWC have taken up "On the spot studies of water situation in Drought affected areas of Maharashtra" as per the Terms of Reference. The report of the "On the spot studies of water situation Drought Affected Areas of Maharashtra" has been submitted to CHQ on 16-05-2016. The report highlights the areas affected by drought and the long term and short term measures recommended to deal with the drought situation.

26.12 Construction of Exploratory Wells for drought mitigation in Latur district from other NAQUIM areas

Three number DTH rigs of 200 m/300 m capacity were diverted from other NAQUIM areas to Latur district for construction of 24 exploratory wells in drought affected Latur, Ausa, Renapur, Chakur and Nilanga talukas.

26.13 Review Meeting of Regional Directors

- A Review meeting for Regional Directors and Executive Engineers was held during3-4th May, 2016 at Central Ground Water Board, Faridabad under the Chairmanship of Shri K.B.Biswas, Chairman CGWB to review the progress of work during 2015-16, materials related to implementation of Aquifer Mapping, Procurement Plan during 2016-17, finalisation of AAP 2016-17 and discuss the other agenda items like Water Quality, RGI, CGWA , administrative and financial etc. The meeting were attended by the Members, Director (Admn.), Regional Director(HQ), Regional Directors, Superintending Engineers, Executive Engineers from Divisions and other Senior officers of CGWB.
- A meeting of Regional Directors and Executive Engineers of the Board was held on , **08th December ,2016** at HQ, Faridabad ,under the Chairmanship of K.C. Naik, Member (RGI), CGWB. The meeting was attended by Dr D. Saha, Member (SAM), Dr. E. Sampath Kumar, Member(SML), Shr. G.C. Pati, Member (WQ & TT), Shri. Col. R. K. Gaur Director (Admin), all Regional Directors, superintending Engineers, Executives Engineers and senior officers of the Board. The agenda points discussed in the meeting were Progress of activity till

November, 2016, Action plan for completion of NAQUIM by 2021 in mission mode, Issues related to CGWA, Issues related to implementation of NHP, Proposal of DWLR with telemetry &Data Entry of NAQUIM into GEMS.

26.14 On the Spot Studies of Water Situation of Latur District of Maharashtra" by Technical Team Comprising of CGWB, CR, Nagpur

In compliance to the letter dated 6.4.2016 of the Ministry of Water Resorces, RD & GR (Ground water desk), New Delhi, a team of two scientists constituted from CGWB, CR, Nagpur to take up "On the spot studies of water situation of Latur district" along with the other team members with an objective i) to analyse the probelm and causes leading to such situation, ii) to identify water resources management challenges, iii) to identify gaps in water information and plans for artificial recharge, iv) to identify long term solutions and v) protection management and restoration of water bodies .

In order to achieve the objectives, the team carried out the On the spot studies of water situation in Latur district from 8-4-2016 to 12-4-2016 and suggested short term and long term solutions for tackling the drought and water scarcity for Latur town and rural areas of Latur district. The report of the "On the spot studies of water situation of Latur district" has been submitted to CHQ on 16-4-2016.

26.15 Meeting with the Hon'ble Revenue Minsiter of GoM at Divisional Commissioner Office at Aurangabad

The Chief Enginer, CWC, Nagpur vide letter No. DM/NAG/8/9/Miscellaneous/ 2016/257-58 dated 22-04-2016, requested the Regional Director, CGWB, CR to attend a meeting being convened by the Divisional Commissioner, Aurangabad on 23-04-2016 with regard to *'take stock of the extent of problem of Drought and acute shortage of water in Marathwada Region and solution to tackle the probelm'* at the office of Divisional Commissioner, Aurangabad.

Accordingly a senior officer of CGWB, Central Region, Nagpur attended the meeting 23-04-2016 which was convened in the office of Divisional Commissioner, Aurangabad. The meeting was chaired by Shri. Eknathrao Khadse, Hon'ble Revenue Minsiter of Government of Maharashtra. Shri. Girish Mahajan, the Hon'ble Water Resources, GoM was also present alongwith Dr. Umakant Dangat, IAS, the Divisional Commissioner, Aurangabad. Apart from CGWB, the meeting was also attended by the Chief Engineer, CWC, Nagpur and their respresntatives, Deputy Director, GSDA, Aurangabad Division, District Collectors and CEO's of Marathwada Region and also Chief Engineers of Irrigation Department and Maharashtra Jeevan Paradhikaran, Director, Soil Conservation and District Superintending Agriculture Officer etc. All the concerned officers of state government departments made detailed presentations on existing water scenario of Marathwada Region and after hearing all the issues, the Hon'ble Revenue Minsiter of Government of Maharashtra Shri. Eknathrao Khadse deliberated on the issues and directed Water Resources Department, GoM for technical clearance of pending projects in consulation with CWC, Nagpur.

26.16 Meeting With the Divisional Commissioner at Amravati, Maharastra

As per the letter received from the Chief Engineer, CWC, Nagpur vide letter No. DM/NAG/8/9/Miscellaneous/ 2016/250-51 dated 15-04-2016, the Regional Director, CGWB, CR was requested to attend a meeting to be convened by the Divisional Commissioner, Amravati on 20-04-2016 with regard to *'take stock of the extent of problem of Drought and acute shortage of*

water in Amravati Division of Vidarbha Region and solution to tackle the probelm' at office of Divisional Commissioner, Amravati.

Mr. S D Waghmare, AHG, CGWB, Nagpur attended the meeting 20-04-2016 which was convened in the office of Divisional Commissioner, Amravati. The meeting was chaired by Shri. Dnyaneshwar Rajurkar, Divisional Commissioner, Amravati. Apart from CGWB, the meeting was also attended by the Chief Engineer, Central Water Commission, Nagpur and their representatives, District Collectors and CEO's of Amravati Division, Deputy Director, GSDA, Amravati Division, Chief Engineers of Irrigation Department and Maharashtra Jeevan Paradhikaran, District Superintending Agriculture Officers and also Chief officers of Nagar Panchayats etc.

At the outset Shri Dnyaneshwar Rajurkar, Divisional Commissioner, Amravati welcomed all the participants and appraised about the water scarcity issues and acute shortage of water in Amravati Division of Vidarbha Region and the requested the authorities of state and Central government to give solutions for drought like situation in Amravati Division of Vidarbha Region. After hearing all the presentations and suggestions made by the concerend authorities, the Divisional Commissioner, Amravati opined as such there is no drought like situation in Amravati Division of Vidarbha region but he stressed that there is alarming situation and long term measures may be taken to tackle the drought, if it occurs.

26.17 Meeting with the Hon'ble Union Minsiter of Water Resources, RD&GR at Nagpur

The Chief Enginer, CWC, Nagpur vide letter No. CE/Monitoring Cell/NAG/Tech-1(B)/2014/155 dated 17-04-2016, requested the Regional Director, CGWB, CR to attend a meeting being convened by Sushri Uma Bharati, the Hon'ble Minsiter of Water Resources, RD&GR on 18-04-2016. at Nagpur to discuss about the various issues of Irrigation Development and drought situation in Maharashtra.

Dr. P.K. Jain, Head of Office alongwith Mr. D. Venkateswaran, Sc-D, CGWB, Nagpur attended the meeting 18-04-2016 at Ravi Bhavan, Nagpur. The meeting was also attended by CWC, NWDA and State Government offices like Divisional Commissioner, Irrigation Department, Vidarbha Irrigation Development Corporation etc. After discussions on all issues, the Hon'ble Minister directed CGWB & CWC to implement the following measures in Latur district on war footing and complete it before the onset of monsoon.

a) To drill about 10 to 20 borewells by deploying the departmental drilling rigs to combat drought situation till the onset of monsoon. Dr. Jain informed that an immediate action will be taken in this regard by drilling 10 to 20 borewells upto 200 meters depth by deploying departmental DTH rig at suitable sites.

b) The CWC, Nagpur was advised to assess the surface water potential and also desilting of reservoir on Manjra River so as to increase the stoarage capacity of the reservoirs for the forth coming monsoon. The Hon'ble Minister also advised the authorities to take necessary steps for more run off in the resevoir and also ground water recharge and desired that Latur experiment should come out as a Model.

   Besides this, the Divisional Commissioner, Nagpur Region informed the Hon'ble Minister that as such there is no drought like situation in Nagpur Division as there is sufficient stock in reservoirs and only 6 tankers are being operated for water supply in the region.

26.18 State Ground Water Co-ordination Committee (SGWCC) Meeting

- A meeting of the State Ground Water Co-ordination Committee (SGWCC) was held on June 22, 2016 at Mahanadi Bhawan, Mantralaya, Naya Raipur on “Implementation of Aquifer Mapping in Chhattisgarh state”. The meeting was chaired by Shri G. S. Mishra, Secretary, Water Resources, Govt. of Chhattisgarh. The meeting was attended by representatives from CGWB, State Water Resources Department, Public Health Engineering Department, Chhattisgarh State Watershed Management Agency (CGSWMA) and Department of Agriculture. The Aquifer Management Plan for Bemetara and Saja Blocks of Bemetara District” for an area of 1604 sq km and “Aquifer Management Plan for Korba and Raigarh Districts” for an area of 3380 sq km. were presented before the committee. The committee was of the opinion to consider Artificial Recharge as the most viable ground water management interventions in the ground water stressed blocks. The Secretary. Water Resources also brought up the issue regarding NOC being issued by CGWA. The matter was discussed at length and necessary objections of the state are being referred to CGWA.
- The second meeting of State Ground Water Coordination Committee on NAQUIM was held on 10.06.2016 at Chennai. During the meeting, presentations on Aquifer Mapping and Management Plan for Upper Ponnaiyar and Upper Cauvery basins were made.
- Dr. S. K. Jain Regional Director and Scientists of CGWB, NWR, Chandigarh attended the meeting of State Ground Water Coordination Committee (SGWCC) regarding National Project on Aquifer Mapping and Management Plan being implemented in Haryana and made a ppt Presentation on NAQUIM Phase III on 11th July, 2016 in the office of ACS Agriculture, Civil Secretariat, Sec 17 Chandigarh.
- Dr. S. K. Jain Regional Director and Scientists of CGWB, NWR, Chandigarh attended a meeting of State Ground Water Coordination Committee (SGWCC) held under the Chairmanship of Sh. K. S. Pannu IAS Secretary Irrigation regarding National Project on Aquifer Mapping & Management Plan (NAQUIM) being implemented in Punjab State and made a Presentation on Aquifer Management Plan of Punjab State on 19th July, 2016 at Mini Secretariat Punjab, Chandigarh.
- Shri P.K.Parchure, Regional Director, and Dr. Arijit Dey , Superintending Hydrogeologist , CGWB, WR, Jaipur, attended the State Ground Water Coordination Committee (SGWCC) meeting at Ground Water Department conference hall, Jaipur on 28.07.2016. The meeting was conducted under the chairmanship of Secretary, PHED & GWD ,Govt. of Rajasthan to discuss about progress and issues related to NAQUIM.
- The Second Meeting of the State Ground Water Co-ordination Committee (SGWCC) was held under the Chairmanship of Shri Gaurav Singh Rajawat, IAS, District Collector, D&NH and Secretary, Panchayat Raj & Rural Development on 11th August 2016 at Collectorate Office, Silvassa. During the meeting, Dr. P.K. Jain, Head of Office,CR, Nagpur made a presentation on “NAQUIM – Aquifer Maps and Management Plan for UT of Dadra & Nagar Haveli. The aquifer maps and management plan of UT of D&NH was approved by SGWCC.
- Sh. Parvinder Singh, Regional Director and Senior officer of CGWB, NCR, Bhopal attended meeting of the State Groundwater Coordination Committee (SGWCC) held at State Ground Water Data Centre, Bhopal on 21.09.2016 at 12.10 PM. The meeting was chaired by Sh. Pankaj Agarwal, Principal Secretary Water Resources Department, Govt. of Madhya Pradesh.

26.19 Meeting on Jalgram Yojana.

- Regional Director, CGWB, Kerala Region attended the Village Level Evaluation Committee meeting (VLEC) at Veliyanad grama panchayat in Alappuzha district chaired by M P Sajeev, President Veliyanad on 23.06.2016 in connection with Jalgram Yojana.
- Regional Director, CGWB, Kerala Region attended the Village Level Evaluation Committee meeting (VLEC) at Karode grama panchayat in Thiruvananthapuram district chaired by Smt Latha Shibu, President Karode on 8.06.2016 and 14.06.2016 in connection with Jalgram Yojana to finalise the schemes to be taken up under Jalgram. Three projects have been approved by the VLEC.
- Sh Parvinder Singh, Regional Director attended State Level meeting on 29.06.2016 regarding review the progress of Jalkranti. The meeting was chaired by Secretary, WRD, Govt of MP.
- Regional Director, NER & Dr. S.S.Singh, Scientist , CGWB, NER, Guwahati attended meeting on formulation of rules for Assam State Ground Water Authority and identification of second set of jalgrams in Assam in the chamber of secretary, Dept of Irrigation on 2nd June and 13th June 2016
- Dr. E. Sampat Kumar, Member(SML), Sh. Dalel Singh, Supdtg. Hydrologist, Sh S.K.Juneja , Scientist D and Dr.L.N.Mathur, Scientist D of CGWB, New Delhi attended meeting of Nodal officers regarding progress and to decide future road map for various activities of Jal Kranti Abhiyan under the Chairmanship of Chairman, CWC on 15.7.2016.
- Regional Director, CGWB, Kerala Region, Trivendrum attended a meeting of Nodal officers involved in implementation of Jal Kranti Abhiyan under the chairmanship of Chairman CWC to review the progress of Jal Kranti Abhiyan on 15th July 2016 at CWC ,R K Puram, New Delhi
- Regional Director , CGWB, Kerala Region, Trivendrum visited the two Jalgrams of Kannur district (Valapattanam and Narath) on 7th July 2016 to review the progress of Jal Kranti Abhiyan and also attended the VLIC meeting of Narath gram panchayath on 22/7/2016.
- Regional Director , CGWB, Kerala Region, Trivendrum visited the two Jalgrams of Kasargod district (Muliyar and Karadka) on 8th July 2016 to review the progress of Jal Kranti Abhiyan.
- Shri D. Venkateswaran, Scientist-D attended the meeting of nodal officers of Jal Kranti Abhiyaan (JKA) held on 15th July 2016 in CWC Auditorium, Library Building, Central Water Commission, New Delhi under the Chairmanship of Chairman (CWC). During the meeting, the progress was reviewed and the road map for successful implementation of JKA was discussed. During the meeting, Shri D. Venkateswaran, Scientist-D highlighted the bottlenecks faced by CGWB, CR, Nagpur in implementation of JKA in Maharashtra.
- Dr. S. K. Jain Regional Director, CGWB, NWR, Chandigarh attended a meeting on Jal Kranti held under the Chairmanship of Chairman CWC on 15th July, 2016 to review the progress achieved so far and to decide Road Map for Implementation of Jal Kranti Abhiyan at CWC Auditorium, Central Water Commission, R. K. Puram, New Delhi.
- Shri Amlanjyoti Kar, Suptd. Hydrogeologist and Shri D.Ghoshdastidar, Sc D attended the review meeting of Jal Kranti Abhiyan at CWC Library hall at R.K.Puram, New Delhi on 15.07.2016 and briefed the bottlenecks and programmes of Jal Kranti Abhiyan in West Bengal and Andaman. It was requested to take up the matter of Jal Kranti Abhiyan at the Chief Minister/ Chief Secretary level. Directions from the Chief Minister and the Chief Secretary are necessary for implementation of Jal Kranti Abhiyan in West Bengal. For A & N Islands, 2-3 months time was sought for preparation of water security plan.
- Dr P.K.Das, Sc D, Shri S.Chakraborty, Sc B, Ms Prachi Gupta, Sc B, Dr A.K.Sinha, Asstt. Geophysicist, CGWB, ER, Kolkata attended inauguration of Namami Ganga Programme at

Garulia, Halisahar (N 24 parganas district), Budge Budge (S 24 parganas district) and Nabadwip (Nadia district) on 07.07.2016.

- Sh. Parvinder Singh, Regional Director and Sh. D. K. Rai, Scientist `D' CGWB, NCR, Bhopal attended meeting at Water Resource Department, Bhopal on 26.07.2016 regarding progress of Jal Kranti Abhiyaan.
- Shri P.K.Parchure, Regional Director, CGWB WR, Jaipur attended the meeting under" Jal Kranti Abhiyan" at CWC, New Delhi on 15.07.2016.
- Sri K.M. Viswanath, Regional Director , CGWB, SWR, Bangalore attended the Jal Kranti Abhiyaan meeting on 15.7.2016 at CWC Auditorium, RK Puram, New Delhi.
- Dr K. R. Sooryanarayana, Supdt HG and Dr J. Davithuraj, Sc-B, CGWB, SWR, Bangalore held discussion with C.E, WRD, Goa and other officers of the department for Jal Kranti Abhiyaan on 27.7.2016 and 28.7.2016. During the meeting discussions on implementation of Jal Kranti Abhiyaan in Goa state, issues related to village water security plan, identification of model command area and identification of Jaal Mitras, water related issues of the villages were discussed.
- Shri. A. Subburaj, H.O.O, CGWB, SECR, Chennai participated in the Nodal Officers meeting on Implementation of Jal Kranti Abhiyan held at Central Water Commission, New Delhi on 15.07.2016 to review the progress and to decide the road map for successful implementation of Jal Kranti Abhiyan.
- A meeting was held with the Dr. Purshottam Bhapkar, IAS, Secretary of Water Conservation Department (WCD), Mumbai on 9-8-2016 to appraise about the various activities of Jal Kranti Abhiyan. During the meeting, Dr. Jain, H.O.O.,CR, Nagpur, highlighted the various activities taken up under Jal Kranti Abhiyan during 2015-16 in Maharashtra. He also handed over a district-wise list of Jal grams already selected with the coordination of Water Conservation Department and also requested the Secretary about the selection of 9 remaining Jal Grams. Dr. Purshottam Bhapkar, IAS, Secretary, WCD, Mumbai after reviewing the various activities assured that the needful action would be taken.
- Regional Director, Kerala Region attended District level meeting of Jal Kranthi Abhiyan in Ernakulam District on 22.8.2016. for the discussion on water Security Plan.
- Regional Director, Keral Region attended meetings with District Collectors of Kannur & Kasargod districts and appraised the activities of Jal kranthi Abhiyan on 19.8.2016. He discussed the formality of seeking consent for selected Jal Gram from concerned Member of Parliament and participated VLIC at Mangalam Jal Gram in Malappuram district.
- Senior Scientist from Eastern Region,Kolkata attended a meeting at CGWA, R.K.Puram, New Delhi on 11.08.2016 and briefed the progress of Jalgram in West Bengal and Andaman.
- Senior Scientist from NER, Guwahati attended one day programme on the "Preparation of Water Security Plan under JKA " held on 10.08.2016 at CGWA office R. K. Puram, New Delhi.
- Senior Scientist from NWR, Chandigarh attended meeting for the “Preparation of Water Security Plans of Two Selected Jal Grams in each district for the State of Punjab” on 10th Aug. 2016 at CGWB, R. K. Puram, New Delhi.

26.20 Meetings on Ground Water Resource Estimation committee

- Meeting of “State Level Ground Water Resource Estimation committee “was held under Chairmanship of Secretary, WRIDD, Govt. of West Bengal on 15.06.2016 for approval of Dynamic Ground Water Resource Assessment of West Bengal, 2013. The principle and the outcome of the assessment were presented in the meeting and the report is under

consideration for approval from State Govt.

- A meeting under the Chairmanship of Secretary (Water Resources), Govt. of Andhra Pradesh was conducted on 16th June, 2016 for approval of draft estimates of Ground Water Resoures of the State as on 2012-2013. The draft estimates were approved by the committee.
- Sh. P. Kalita, Suptg. Hydrogeologist and Sh. M.Konwar, Scientist –DCGWB, NER, Guwahati attended SLTC meeting on 8th June 2016 for approval of Ground Water Resources Estimation 2013 of Nagaland at Kohima, Nagaland and the same has been approved by the committee.
- State Level Coordination Committee meeting for finalization of Dynamic Ground Water Resources as on31st, March 2013 was held on 28.06.2016 at CGWB, MER Patna under the Chairmanship of Principal Secretary Minor Water Resource Department, Govt. of Bihar.
- 7th Meeting of State Level Committee on "Ground Water Resource Estimation of Himachal Pradesh as on March 2013" held on 23.06.2016 under the Chairmanship of Secretary (I&PH) to Govt. of Himachal Pradesh at Shimla. The report on Dynamic Ground Water Resource Estimation as on March, 2013 has been approved by the committee.
- Dynamic Ground water resource estimated as on March 2013 for Karnataka has been approved in the State Level Committee meeting held on 17.6.2016 at VIkas Soudha, Bengaluru under the Chairmanship of Secretary to Govt, Minor Irrigation, Government of Karnataka. Sri K.M.Viswanath, Regional Director, Dr K.R.Sooryanarayana and Sri J.Sivaramakrishnan Scientist attended the meeting.
- Sh. Anurag Khanna, Sc-D & HOO, Sh. Ravikalyan Bussa, Sc-C and Sh. D. Bagchi, AHG had a meeting with Secretary, Irrigation and Minor Irrigation, Government of Uttarakhand for finalization of Dynamic Ground Water Resources of Uttarakhand state (as on March, 2013)".
- Sh. Anurag Khanna, Head of Office & Sh. Ravikalyan Bussa, Scientist-C and Sh. D. Bagchi, AHG CGWB, UR, Dehradun attended meeting with Secretary, Irrigation and Minor Irrigation and Chairman of State Level Technical Coordination Committee (SLTCC) for finalization of Assessment of Dynamic Ground Water Resources, 2013 on 1st July, 2016.
- Sri T. Chakraborty , OIC, SUO,CGWB Shillong Attended Tenth meeting of district level committee on Ground Water resources, East Khasi Hills district, Meghalaya.
- State Level Technical Coordination Committee (SLTCC) Meeting was held for finalization of Assessment of Dynamic Ground Water Resources, 2013 of Uttarakhand on 14th July, 2016 at Conference Hall of Irrigation Department, Yamuna Colony, Dehradun and the SLTCC has approved the DGWR, 2013.
- Shri.A. Subburaj, H.O.O, Dr. D. Gnanasundar, Scientist-D(Sr.HG) and Shri. S.Piramanayagam, Scientist-D of CGWB, South East Coastal Region, Chennai participated in the meeting of State Level Committee held on 19.07.2016 at the Chamber of Secretary to Government (Agri.) for the approval of Reassessment of Dynamic Groundwater Resources of UT of Puducherry as on March 2013.
- The Second Meeting of the State Level Committee (SLC) for Ground Water Resource Estimation in D& N Haveli as on March 2013 was held under the Chairmanship of Shri Gaurav Singh Rajawat, IAS, District Collector, D&NH and Secretary, Panchayat Raj & Rural Development on 11th August 2016 at Silvassa. During the meeting, Shri Rahul R. Shende, CR, Nagpur made a presentation on "Ground Water Resource Assessment of UT of D&NH - 2013". Dr. P.K. Jain, Head of Office, CGWB, Nagpur and Member Secretary, SLC said that many industries exist in UT however, data on industrial draft is not available. Thus exact consumption of water, its source, is precisely required for future assessments.The Ground

Water Resource Assessment of UT of D&NH was approved by SLC for inclusion in the National Report to be issued by Govt. of India.

- The Regional Director, WCR, Ahmedabad along with Senior Scientist attended the meeting of the UT level committee on Dynamic Ground water Resource Assessment of UT of Daman & Diu held on 18/08/2016 at, UT of Daman. The meeting was chaired by Shri Sanjay Kumar, Chief Engineer, PWD, Daman. Presentation was made on the "Dynamic Ground Water Resources of UT of Daman & Diu as on March 2013".

26.21 Meeting on NGMIP at Ministry of WR, RD & GR, New Delhi:

Dr. Amarjit Singh, Secretary, MoWR, RD & GR, GoI, New Delhi chaired the meeting called to discuss the preparedness of the States for undertaking Ministry and World Bank assisted NGMIS on 04th February 2017 at MoWR, RD & GR, New Delhi. During the meeting, the presentations from Haryana, UP, MP, Maharashtra States were made before the Secretary and Joint Secretary, MoWR, RD & GR, GoI, Chairman, CGWB and World Bank Officials.

26.22 Meeting on Model Bill, Springs and PMKSY at Ministry of WR, RD & GR, New Delhi:

The meeting on Ground Water Model (Sustainable Management) Bill – 2016 was chaired by Dr. Amarjit Singh, Secretary, MoWR, RD & GR, on 07th February 2017 at CSMRS, Hauz Khas, New Delhi. The meeting was called to discuss the model bill with the State Govt.'s representative and obtain their views on the Model Bill -2016. The meeting on springs and PMKSY was chaired by Joint Secretary, MoWR, RD & GR, GoI, New Delhi. During the PMKSY – Har Khet ko Pani – GW meeting, presentation on concept, criterion considered for 94 most deprived irrigation districts of the 12 States of the Country for providing access to ground water irrigation in mission mode through Central – State Partnership on 60-40 ratio was made by Dr. Dipankar Saha, Member (SAM), CGWB.

26.23 5th National Inter Departmental Steering Committee (NISC) Meeting:

5th Meeting of the "National Inter Departmental Steering Committee (NISC)" constituted to monitor NAQUIM was held on 23rd March, 2017 under the Chairmanship of Dr. Amarjit Singh, Secretary (MoWR, RD &GR). The meeting was held in the Committee Room of MoWR,RD&GR. The meeting was attended by around 50 participants including members of the NISC; senior officers of MoWR, RD & GR; senior officers of CGWB and invited domain experts. Achievements made in Aquifer mapping and Management Programme and other related topics were discussed in the meeting.

26.24. World Water Day 22nd March 2017:

Central Ground Water Board, Ministry of Water Resources, RD & GR has celebrated **World Water Day**: **2017** on 22nd March, 2017 at Bhujal Bhawan, Faridabad. UN-Water coordinates the World Water Day campaign and proposes a theme for each year. The theme for 2017's campaign has been "waste water". CGWB has organized a mass awareness programme on this occasion involving all its employees of Faridabad office (~100). The function was chaired by the Member (TT&WQ), CGWB Sh G C Pati. Sh K C Langel, Director, MoWRRD & GR was present as guest of honor. The forum was addressed by Col R K Gaur, Director (Admin), Sh K C Langel and by Dr A Mukherjee, Scientist D, CGWB, Faridabad, who elaborated on the disposal of waste water and human health aspect. In his concluding remarks Sh G C Pati. Member has appealed for conservation of fresh water and for water use efficiency so that minimum quantity of waste water can be produced and as far as possible this can be recycled and re-used.World Water Day was also celebrated in Regional office of CGWB, SR, Hyderabad CR, Nagpur, NER, Guwahati, KR, Trivendrum, MER, Patna.

26.25 Swachh Bharath Pakwada from 16.03.2017 to 31.03.2017

Under Swachh Bharat Abhiyan, Swachh Bharath Pakwada was celebrated from 16.03.2017 to 31.03.2017 in CGWB, CHQ, Faridabad and Regional offices of CGWB.

26.26 Other Important Meetings

- First meeting of Panchayat/ Village Level Committee on Jal Kranthi Abhiyan pertaining to Mangalapuram Jalgram held on 21/4/2016 at Mangalapuram Panchayat Office, Tholikode, Trivandrum to discuss on the modalities of implementing Jal Kranthi abhiyan.
- First meeting of Panchayat/ Village Level Committee on Jal Kranthi Abhiyan pertaining to T.V.Puram Jalgram Panchayat, Kottayam district held on 23/4/2016 at Panchayat Office, TV Puram, Kottayam district to discuss on the modalities of implementing Jal Kranthi abhiyan. Regional Director attended the meeting.
- Shri Parvinder Singh, Regional Director and Scientists of CGWB, NCR, Bhopal held discussion with Principal Secretary, PHED on drought affected area and water scarcity problem in Madhya Pradesh on 26.04.2016.
- Shri B. P. Singh, Scientist 'D' of CGWB, NCR, Bhopal attended second meeting of Water Source Finalization Committee of Madhya Pradesh Urban Development Company (MPUDC) on 28.04.2016 at Urban Development and Environment Department, Bhopal.
- Sh. Sanjay Pandey, Scientist of CGWB, NWR, Chandigarh attended a meeting of Haryana Sarasvati Heritage Development Board (HSHDB) regarding Drilling of Borewells on Saraswati River Palaeo-Channels held on 27th April, 2016 in the office of Haryana Sarasvati Heritage Development Board, Akademi Bhawan , Panchkula.
- Dr. P. K Naik, Suptdg. Hg, along with Sh. Sanjay Pandey, AHG of CGWB, NWR, Chandigarh attended 5th meeting of Apex Committee of State Water Sanitation Mission Haryana (SWSMH) held under the Chairmanship of Sh. Depinder Singh Dhesi, IAS, Chief Secretary, Govt. of Haryana on 4th April, 2016 at Civil Secretariat Chandigarh .
- Shri Suresh Pareek , Scientist-D of CGWB, WR, Jaipur attended meeting "Strategic Basin Planning for Ganga River basin in India under the chairmanship of Principal Secretary, PHED & GWD ,on 21.04.2016 at state Secretariate , Jaipur.

- Dr.Rakesh Kushwaha, Scientist-D (Sr HG) of CGWB, WR, Jaipur attended the meeting of District Level Advisory Committee for Ground Water Regulation in notified blocks of Jaipur District on 29.04.2016.
- The Regional Director along with Scientist D of CGWB, WCR, Ahmedabad attended the meeting of the Steering Committee on 5th MI Census held in the Chamber of the Secretary (Water Resources),N, WR, WS & K Department, Govt. of Gujarat, Gandhinagar on 28.04.2016.
- The Regional Director, CGWB, WCR, Ahmedabad had meeting with the Managing Director, Gujarat Water Resources and Development Corporation Ltd., GoG, Gandhinagar regarding meeting of the State Level Committee on Ground water Resource Assessment and NAQUIM activities in Gujarat on 12/04/2016 at N, WR, WS & K department.
- saw (RG & DR ,RW) yraterceS fo pihsnamriahC rednu gniteeM weiveR lanoigeR nretsaE .2016 yaM ht28 ot ht27 gnirud rawsenbuhB ta etatS fo seussi lanoigeR eht evloser ot dleh .gniteem eht dednetta RN dna ,RES ,RE ,REM fo sroceriD lanoigeR
- Dr. E. Sampath Kumar, Member (SML) CGWB along with Dr. S.K Jain, RD, NWR, Chandigarh had a meeting with Sh. K.S Pannu, Secretary Irrigation, Govt of Punjab at Mini Secretariat Punjab, Chandigarh to discuss the issues related to Jal Kranti Abhiyan on 19.05.2016.
- Dr. E. Sampath Kumar, Member (SML) along with Sh. Dinesh Tewari, Sc 'D' had a Visit to Select Jal Gram Jandiali, Jal Gram Talwandi Kalan in Ludhiana dist. Punjab state on 20.5.2016 for ascertaining the status of the Water Resources in the village and activities taken under the Jal Kranti Abhiyan and make a discussion with Village Sarpanch and Farmers.
- Dr. E. Sampath Kumar, Member (SML) along with Sh. Dinesh Tewari, Sc 'D' CGWB had a Visit to the Department of Soil and Water Engineering, Punjab Agricultural University, Ludhiana on 20.05.2016 to meet Dr. Rajan Aggarwal, Head and Senior Research Engineering for the discussion on Management Plan of NAQUIM.
- Dr. E. Sampath Kumar, Member (SML) along with Sh. Dinesh Tewari, Sc 'D' a Visit to Punjab Remote Sensing Center (PRSC), Ludhiana, Punjab State on 20.05.2016 to meet Dr. Brijendra Pateriya, Director PRSC & Sh. P.K Litoria Scientist 'SE' for discussion on Management Plan of NAQUIM.
- Dr. E. Sampath Kumar, Member (SML) along with Sh. Dinesh Tewari, Sc 'D' had a Visit to Select Jal Gram Nandpur kesho in Patiala dist. Punjab State on 21.5.2016 for ascertaining the status of the Water Resources in the village and activities taken under the Jal Kranti Abhiyan and make a discussion with Village Sarpanch and Farmers.
- The Regional Director, WCR, Ahmadabad, attended meeting with the Secretary (WR,RD & GR) on 30th May'2016 at Shram Shakti Bhawan, New Delhi with the concerned Principal Secretaries of the states to review the State proposals under National Ground Water Management Improvement Programme(NGWMIP).
- State Ground Water Coordination Committee meeting for approval of Ground Water Resource Estimation for the year 2013 and finalization of Aquifer Management Plan for Nalagonda district, Telangana State being convened on 30.05.2016 in the Chamber of Special Chief Secretary, I & CAD, Government of Telangana.
- Sh Parvinder Singh, Regional Director and Sh P K Jain, Scientist `D' of CGWB, NCR, Bhopal held meeting with Sh M G Chaube, Water Resources Department, Govt. of MP on 11-05-2016 and requested for nomination of nodal officer from WRD for technical team for on the

"spot study of water situation in drought affected/water scare regions/ areas" of MP State. WRD has nominated nodal officer on 16-05-2016.

- Sh Parvinder Singh, Regional Director and Dr L K Mathur, Scientist `D' met with Sh S K Jain, EE, PHED, Sehore district on 13-05-2016 and discussed water scarce area of district. After discussion visited Adidabad & Lilakhedi villages to selected sites for construction of ground water abstraction structures for providing drinking water.
- Sh Parvinder Singh, Regional Director and Dr L K Mathur, Scientist `D' of CGWB, NCR, Bhopal along with Director, CWC & Suptd Engineer, WRD inspected severely drought affected village Bansia, Block Rehli, distt Sagar to assess the affect of drought.
- Dr. P.K Naik Suptdg. Hg. along with Sh. Rakesh Rana Sc 'D' CGWB, NWR, Chandigarh attended a meeting of State Level Sanctioning Committee under PMKSY for screening of the proposals/projects of various departments recommended by Inter Departmental Working Group (IDWG) Committee under the Chairmanship of Chief Secretary, Govt. of Punjab on 05.05.2016 at Civil Secretariat Chandigarh.
- Dr. S.K Jain, Regional Director, Sh. Sanjay Pandey, AHG of CGWB, NWR, Chandigarh attended a meeting with Sh. Amit Jha IAS, Principal Secretary Forest & Wild Life Department regarding Management Plan and related issues in Haryana State on 13.05.2016.
- Sh. Dinesh Tewari Sc 'D' and Sh. Sanjay Pandey AHG of CGWB, NWR, Chandigarh attended a meeting on 16.05.2016 Chaired by Principal Secretary, Department of Forest, Govt. of Haryana to discuss Presentation on Aquifer in Haryana Aravalis.
- Dr. P. K Naik Suptdg. Hg. of CGWB, NWR, Chandigarh attended a meeting of State Steering Committee on Climate Change under the Chairmanship of Chief Secretary Punjab was held on 23.05.2016 at Punjab Civil Secretariat- 1, Chandigarh.
- The Regional Director, WCR, Ahmadabad , along with other officers of CGWB attended the meeting of the State Level Committee on GW Resources assessment held on 05.05.2016 at Sachivalay, Gandhinagar.
- The Regional director, WCR, Ahmadabad, along with Shri Ashok Kumar, Sr. Hydrogeologist and Shri B.Mohapatra, Scientist-C attended meeting with the Director (Monitoring), CWC, Gandhinagar and officers from CDO, Gandhinagar in connection with on spot study of water situation in the drought affected areas of Gujarat held at NTBO, Gandhinagar on 05.05.2016.
- The Regional Director, WCR, Ahmadabad, Shri B. Mohapatra, Scientist-C attended meeting held at CWC, NTBO, Gandhinagar with the Director-Monitoring in connection with Drought situation in Gujarat and on spot study to assess the water situation in the drought affected areas in Gujarat held on 9/5/2016.
- The Regional Director, WCR, Ahmadabad, along with Sh. Ashok Kumar, Sr. Hydrogeologist attended the meeting with the MD, GWRDC Ltd., Govt. of Gujarat, Gandhinagar in connection with the National Ground Water Management Improvement Programme (World Bank Project) held on 20.05.2016 at Gandhinagar to deliberate upon the uses, pros and cons of Solar Panel based devices and their use in abstraction of ground water from wells.
- Shri Ashok Kumar, Sr. Hydrogeologist, CGWB, WCR, Ahmadabad, attended meeting convened by the Principal Secretary, Rural Development Dept.,Govt. of Gujarat held at Gandhinagar on 24.05.2016 for discussion on various water conservation structures constructed by GSWMA in watershed areas.
- Regional Director & Dr. S.S.Singh, Asst. Hydrogeologist , CGWB, Guwahati attended video conferencing meeting with Dr. B.Rajender, Jt. Secy (PP) regarding progress of Jal Kranti Abhiyan at Guwahati on 13th May 2016.

- Sh. P.Kalita, Suptg . Hydrogeologist CGWB, Guwahati attended the 2nd TAC meeting for inclusion of new RRR proposals in Bodoland Territorial Council, Assam on 24th May .
- Sri K.M.Viswanath, Regional Director, CGWB, SWR, Bangalore attended 10th Karnataka Ground Water Authority meeting on 25.5.2016 at Bangalore.
- Sh Anurag Khanna, HOO, Sh D. Jamloki, Sc- D & Sh Ravikalyan Bussa, Sc- C, CGWB, Uttaranchal Region, Dehradun attended meeting with the officers of the President Estate, Dehradun regarding the Groundwater Availability in the President State.
- Sh. S. Bhattacharya, Suptg. Hydrogeologist and officers of SUO, Delhi attended meeting of State Ground Water Co-ordination Committee for re-estimation of Ground Water Resource as on March, 2013 held under the Chairmanship of Secretary, Urban Development Department, Govt. of NCT Delhi on 11.05.16 at Delhi Secretariat.
- Sh. S. Bhattacharya, Suptg. Hydrogeologist & OIC, CGWB, New Delhi attended 49th meeting of UYRB at CWC conference room, Sewa Bhawan on 22.04.16.
- Dr.Rakesh Kushwaha, Scientist-D (Sr.HG), CGWB, WR, Jaipur attended the meeting of District Level Advisory Committee for Ground Water Regulation in notified blocks of Sikar District on 02.05.2016.
- Shri.O.P.Poonia, Scientist-D (Sr HG),SUO, Jodhpur attended the meeting of District Level Advisory Committee for Ground Water Regulation in notified blocks of Jodhpur District on 26.05.2016.
- Shri P.K.Parchure,Regional Director, CGWB, WR, Jaipur attended "Consultation workshop on draft environmental and social safeguards assessment (ESSA) report for the National Ground Water Management Improvement Programme (NGWMIP) on 30.05.2016 at New Delhi.
- Dr.Rakesh Kushwaha, Scientist-D (Sr HG), CGWB, WR, Jaipur attended the meeting of District Level Advisory Committee for Ground Water Regulation in notified blocks of Jaipur District on 31.05.2016.
- Dr. P.K Naik Suptdg. HG., CGWB, NWR, Chandigarh attended a Consultation Workshop with Participatory States on draft Environmental & Social Safeguards Assessment (ESSA) report for NGWMIP held under the Chairmanship of Secretary WR, RD & GR on 30.05.16 at Ministry of Water Resources, RD & GR, Shram Shakti Bhawan, New Delhi.
- Sh. S.K Saigal Sc 'D' CGWB, NWR, Chandigarh attended the 11th Meeting of State Level Nodal Agency (SLNA) for PMKSY/IWMP Haryana, held under the Chairmanship of Smt. Navraj Sandhu, IAS Additional Chief Secretary to Govt. of Haryana, Rural development department cum Chairperson State level Nodal Agency on 09.06.2016 at Civil Secretariat, Chandigarh.
- Sh. G.P Singh Sc 'D' CGWB, NWR, Chandigarh attended a meeting of Punjab Water Resources Management & Development Corporation limited held under the Chairmanship of Chairman, Punjab Water Resources Management & Development on 13.06.2016 at sec- 26, Chandigarh.
- Dr. S. K Jain, RD, CGWB, NWR, Chandigarh held a meeting with Dr. Albert Tuinhof & Dr. Koos Groen, Consultant World Bank and Dr. Veenakshi department of Water supply and Sanitation, reg. installation of Monitoring wells at various depths to ascertain the variation of Ground Water quality with respect to depth & time on 20.06.2016 in Regional Directors Chamber, NWR Chandigarh.
- Shri Sourabh Gupta, Scientist-D & Unit Incharge, CGWB, SUO, Pune attended the 25th Meeting of State Level Schemes Sanctioning Committee (SLSSCJ) on National Rural

Drinking Water Programme (NRDWP) on 29th June, 2016 held at Committee Hall of Water Supply and Sanitation Department, Govt. of Maharashtra.

- Sh. S. Bhattacharya, Suptg. Hydrogeologist & OIC and Sh. Rajesh Chandra, Sr. Hydrogeologist attended meeting of Forum to suggest ways and means to improve ground water situation in NCT Delhi and around NCR region at Conference hall, CGWB, Jamnagar House, New Delhi on 15.06.2016.
- Sh. S. Bhattacharya, Suptg. Hydrogeologist & OIC and Sh. Rajesh Chandra, Sr. Hydrogeologist attended meeting of Committee to examine the cases of Mega Food Parks and Agro units for CGWA NOC at CGWB, Conference hall, Jamnagar House, New Delhi on 20.06.2016.
- Er.K.R.Biswas, Regional Director, Dr.S.K.Samanta, Suptd. Hydrogeologist and other officers and officials from CGWB, ER, Kolkata accompanied Parliamentary Standing Committee on Water Resources on account of study visit of the committee at Bagdogra and Gangtok from 05.06.16-06.06.16.
- A meeting of Chief Secretary, A&N administration and Shri Amlanjyoti Kar, Suptdg Hg of CGWB, ER, Kolkata regarding perennial water scarcity in Chora island, Nocobar district as also to solve water scarcity in various Islands in A& N islands. Accordingly as desired by Chief Secretary, Shri Kar visited Chora island to prepare a Short term and long term plan for solving the water crisis in the island. The report preparation is under progress and will be submitted shortly.
- Parliamentary Standing Committee on Water Resources, RD&GR visited Hyderabad on 4th June, 2016. Member(SML), Regional Director, Southern Region, Dr. P. N. Rao, Supdtg. Hydrogeologist, Southern Region, Executive Engineer, Div. IX participated in the meeting taken by Committee.
- As the member of the Central team constituted by MoWR, RD& GR, for Inspection of Pampa river for its protection and Rejuvenation, Regional Director joined the team and visited various places of Pathanamthitta and Alappuzha districts including Pamba, Triveni, Cherukol Puzha, Aranmula, Ranni and Chengannur on 6.06.2016 & 07.06.2016. Held discussions with Hon'ble Chief Minister, Minister of Water Resources and Secretary of Water Resources, Govt. of Kerala along with the Central team to finalise an action plan for Pamba river protection.
- A meeting held on 23.06.2016 under the Chairmanship of Secretary (I&PH) to Govt. of Himachal Pradesh at Shimla and discussed about the progress of Aquifer mapping work carried out till date in Himachal Pradesh.
- The Regional Director along with Shri Ashok Kumar, Sr. Hydrogeologist, CGWB, West Central Region, Ahmedabad attended meeting in respect of National Ground Water Management Improvement Programme held at State Data Centre, Gandhinagar on 10th June, 2016.
- State Level Coordination Committee meeting for Aquifer Mapping was held on 28.06.2016 at CGWB, MER Patna under the Chairmanship of Principal Secretary Minor Water Resource Department, Govt. of Bihar.
- Sri K.M.Viswanath, Regional Director, Dr K.R.Sooryanarayana, TS to RD held discussions with Technical Director, Advanced Centre for Integrated Water Resource Management regarding National Ground Water Management and Improvement programme (NGWMIP) on 30.6.2016.
- Sri K.T.Suresha, Sc-D and Sri Benjamin Vedanayagam, Sc-D were associated with Officers of CWC and State Water Resource Department during the visit of Central Team for on the

spot study of Water scenario in drought affected areas of Kolar and Chickaballapur districts on 9th and 10th of June 2016.

- Dr. E. Sampath Kumar, Member (SML) CGWB along with Sh. S.K.Juneja, Sc-D and Sh. Dalel Singh, Suptd.Hydrogeogist had a meeting with Joint Secretary, (MGNREGA) MoRD, at Nirman Bhawan, New Delhi on 7th June, 2016 and discussed about Over Exploited and Critical areas for water conservations schemes.
- Sh. Dalel Singh, Suptdeg.Hyd, CGWB, New Delhi attended a Presentation on "Sustainable Development in Himalayan Region" by ICIMOD, Kathmandu, Nepal under the Chairmanship of Dr.V.K.Saraswat, Member,NITI Aayog at NITI Aayog, New Delhi on 15th June 2016.
- 6th meeting of Project Review Committee (PRC) for the project on hydrogeological data generation in Jhansi and Lalithpur of Bundelkhand at Jamnagar House, New Delhi was held on 16th June, 2016 to discuss about the physical & financial progress. The meeting was Chaired by Dr. D. Saha, Member(SAM) CGWB.
- 2nd meeting of Project Review Committee (PRC) for the project on construction of 72 wells for supply of Arsenic free water in Balia & Gazipur dist(UP) at Jamnagar House, New Delhi was held on 16th June, 2016 and discussed about the physical & financial progress. The meeting was Chaired by Dr. D. Saha, Member(SAM) CGWB.
- Dr. E. Sampath Kumar, Member (SML) attended CGWA presentation for grant of NOC for Ground water withdrawal at Jamnagar House, New Delhi on 17th June, 2016 under the Chairmanship of Chairman of CGWB and CGWA.
- Dr. E. Sampath Kumar, Member (SML) attended Meeting of Committee to examine the cases of Mega Food Parks & Agro units for CGWA NOC at Jamnagar House, New Delhi on 20th June, 2016 under the Chairmanship of Dr. D K Chadha, Ex Chairman of CGWB.
- Er. K.R.Biswas, Regional Director, Shri Amlanjyoti Kar, Suptd. Hydrogeologist and Shri T.Talukdar, Scientist D of CGWB, ER, Kolkata attended meeting of State Level Scheme Sanctioning Committee (SLSSC) at the conference room of PHED department, Kolkata under the Chairmanship of Chief Engineer (WQ & Planning), PHED , Govt. of West Bengal on 08.07.2016 for source clearing of water supply schemes.
- Er.K.R.Biswas, Regional Director, Shri Amlanjyoti Kar, Suptd. Hydrogeologist and Shri T.Talukdar, Scientist D of CGWB, ER, Kolkata attended meeting to discuss the arsenic contamination in Gaighata block, North 24 Parganas district, West Bengal in compliance with the order of the Hon'ble National Green Tribunal Eastern zone, Kolkata at the conference room of PHED department, Kolkata under the Chairmanship of Chief Engineer (WQ & Planning), PHED , Govt. of West Bengal on 28.07.2016.
- The commissioning of the KLR rig at Block Medical health Centre, Kanksa, Barddhaman district was done on 2.07.2016 before a team comprising S/Shri J.C. Borgohain, SE, CGWB, CHQ, Faridabad & Chairman of the commissioning committee, D.G. Dastidar , Scientist D & OIC, Exploration, M. Oraon, Executive Engineer (CC) Division XV, Kolkata and A. K. Chakraborty, AEE, Division XV, Kolkata.
- Sh. Parvinder Singh, Regional Director and Sh. A. K. Jain, Scientist `D' of CGWB, NCR, Bhopal attended State Level Schemes Sanctioning Committee (SLSSC) meeting of PHED on 12.07.2016.
- Sh. A. K. Jain, Scientist `D' , CGWB, NCR, Bhopal attended 3rd meeting of Water Source Finalization Committee of Madhya Pradesh Urban Development Company (MPUDC) held on 15.07.2016 at Bhopal regarding Water supply sources identified for different towns covered under Madhya Pradesh Urban Services Improvement Program.

- Dr Vinayachandran, Scientist D (Sr.HG), CGWB, Kerala Region, Trivendrum attended the brainstorming session on 'Technology vision for Kerala- water' organized by KSCSTE in which water was a subject on 7th July 2016 at the Council Head Quarters at Sasthra Bhavan, Pattom, Trivandrum and also attended meeting organized by TIFAC along with KSCSTE to discuss and debate on the issues of the Technology vision 2035 on 15th July 2016 at Trivandrum.
- Regional Director, CGWB, Kerala Region as a member of Central Committee on "Inspection of Pamba River for its Protection and Rejuvenation" constituted by the Ministry of Water Resources, RD & GR attended a meeting on 5th July 2016 at Coimbatore, Tamil Nadu, for finalizing the Study Report.
- Dr. S. K. Jain Regional Director along with Scientists of CGWB, NWR, Chandigarh hold a presentation on 25th July, 2016 before the Director of Research & The Scientists of PAU Ludhiana in the Committee room of Director of Research of PAU Ludhiana constituted for preparation of District Irrigation Plan (DIP) as advised by Additional Chief Secretary to Govt. of Punjab.
- Dr. S. K. Jain Regional Director hold a meeting with Additional Chief Secretary to Govt. of Punjab, Department of Agriculture in his Chamber on 22th July, 2016. The Meeting was attended by Dr. Balwinder Singh Sidhu Commissioner Agriculture, Sh. Rajesh Vashisht Joint Director Agriculture, Dr. S. S. Kukal Additional Director of Research PAU Ludhiana and Scientists of NWR. During meeting presentation on Aquifer Maps & Management Plan of Gurdaspur, Amritsar & Faridkot were discussed in details for sharing of outcome of NAQUIM & obtaining comments/feedback from the State Agency. In the Meeting it was advised by the Additional Chief Secretary to share Aquifer Map & Management Plan before committee of PAU Ludhiana constituted for preparation of District Irrigation Plan (DIP).
- Dr. S. K. Jain Regional Director and Scientists of CGWB, NWR, Chandigarh attended a meeting of the Committee to review the available information on Paleochannel held on 7th July, 2016 at CGWB, New Delhi.
- Ms. Amandeep Kaur, Sc-B, Ms. Monalisha Singh, Sc-B, Sh. D. Bagchi, AHG from CGWB, UR, Dehradun actively participated and coordinated in the successful organization and launch of the National Mission for Clean Ganga(NMCG) at Haridwar, Srinagar, Devprayag and Rudraprayag on 7th July, 2016.
- Sh. Anurag Khanna, Head of Office and Sh. D. Jamloki, Scientist-D of CGWB, UR, Dehradun actively participated in National Mission for Clean Ganga launching Programme at Haridwar, where Hon'ble Minister of Water Resources, River Development &Gnaga Rejuvenation Sushri. Uma Bharati, launched NMCG on 7th July, 2016.
- The Regional Director, CGWB, WCR, Ahmedabad attended the meeting of the State Technical Advisory Committee in the chamber of Chief Engineer (Panchayat) & Additional Secretary for deliberate discussion on the project proposal for 200 M.I. Scheme estimate amounting to Rs.12908.14 Lakhs of irrigation scheme under Drought Prone area, Tribal area and Normal area which is to be submitted to the Govt. of India (CWC) with respect to modified guidelines of RRR schemes issued by Govt. of India.
- A Meeting /discussion on "interpretation methodology of isotope data being generated in the palaeochannel study in Punjab, Haryana, Rajasthan, Gujarat and Uttar Pradesh" held on 29th July 2016 at BARC, Mumbai. Initial comments were given by Dr. A Dash, Head of Isotope and production Division, BARC. Dr. D. Saha, Member (SAM) emphasis the importance of isotope investigation in palaeochannels. Dr. U.K Sinha, Scientist, BARC made a presentation on the Introduction of Isotope studies, followed by presentation of

Hydrogeologist and Chemist from CGWB and Scientist from BARC with reference to the palaeochannel investigation in Punjab, Haryana, Rajasthan, Gujarat and Uttar Pradesh on hydrogeological, chemical and isotopic studies.

- Dr. Arijit Dey, Superintending Hydrogeologist, CGWB,WR, Jaipur attended the meeting of Water and Sanitation Support Organization(WSSO) to "review performance of consultants" under the chairmanship of Secretary, PHED & GWD Government of Rajasthan on 04.07.2016 at his chamber in State Secretariat, Jaipur.
- Sh. S.K.Juneja, Scientist-D of CGWB, New Delhi attended a meeting of High level expert committee to examine the issues of Kandi area under the chairmanship of at Conference Hall of MoDWS Paryawaran Bhawan, CGO, New Delhi on 18.7.2016.
- 20ht meeting of Jharkhand state Geological programming Board was attended by Shri A.K.agrawal, Regional Director, CGWB,MER,Patna and Shri T.B.N. Singh, Scientist-D, CGWB, SUO, Ranchiat project building, Dhurwa, Ranchi on 17/07/2016 no noitatneserP . antaP-REM ,BWGC fo 16-2015 ni stnemevihca dna 17-2016 ni seitivitca desoporpwas nevig by Regional Director, CGWB, MER, Patna.
- Sh. S. Bhattacharya, Suptg. Hydrogeologist & OIC and Sh. Sanjay Kr. Naik, Asstt. Hydrogeologist attended meeting of status of revival of 33 Water Bodies in Dwarka in compliance of NGT order dated 22.06.2016 at Delhi Secretariat under the chairmanship of Pr. Secretary, (UD) on 21.07.16.
- Sh. N. Jyothi Kumar, Sr. Hydrogeologist attended meeting of District Ground Water Advisory Committee of New Delhi district on 26.07.16. The meeting was chaired by Dy. Commissioner, New Delhi district.
- Sh. N. Jyothi Kumar, Sr. Hydrogeologist and S. Sanjay Kr. Naik, Asstt. Hydrogeologist attended meeting in compliance of various directions of NGT OA No. 94 of 2013 on 11.07.16 at Delhi Secretariat under the Chairmanship of Addl. Secretary, Deptt. of Environment.
- Sh. N. Jyothi Kumar, Sr. Hydrogeologist and Sh. Sanjay Kr. Naik, Asstt. Hydrogeologist attended meeting in compliance of various directions of NGT OA No. 94 of 2013 on 23.07.16 at Delhi Jal Board under the Chairmanship of Member (Water), DJB.
- Sh. Rajesh Chandra, Sr. Hydrogeologist attended meeting of District Ground Water Advisory Committee of South district on 18.07.16. The meeting was chaired by Dy. Commissioner, South district.
- Sh. Rajesh Chandra, Sr. Hydrogeologist attended meeting of District Ground Water Advisory Committee of South East district on 28.07.16. The meeting was chaired by Dy. Commissioner, South East district.
- Er.K.R.Biswas, Regional Director and Senior Scientist, ER, Kolkata attended Special Core Committee Meeting on 18.08.2016 at Kolkata. Prof. K J Nath, Chairman, Core Committee on Water Quality & Arsenic Task Force, related to preparation of “Action Plan for monitoring and adaption of preventive measures to address the issues of Arsenic contamination of soil and in the food chain”. In the context of the concern expressed by the Ministry of Agriculture and Farmers Welfare, Govt. of India, on the above issues and as advised by the Director, WSSO, the Special meeting of the Core Committee on WQS&S, under Joint Plan of Action, Phase-IV, was convened by Chairman, Core Committee on Water Quality & Arsenic Task Force.
- Senior Scientist from NWR, Chandigarh has attended meeting of Programme Management & Monitoring Group regarding Implementation of Remediation plan for Ground Water Quality of Taonsa, Tehsil Balachour, district Nawanshahr, Punjab on 28th July, 2016 held under the Chairmanship of Chairman PPCB.

- Dr. S. K. Jain, Regional Director NWR, Chandigarh along with Senior Scientist attended meeting on “Interpretation methodology of Isotope data generated in the Paleochannel study in Punjab” on 29th July, 2016 held at BARC, Mumbai.
- Dr. S. K. Jain, Regional Director, NWR, Chandigarh attended 39th Meeting of Central Ground Water Authority held on 4th August 2016 at CGWB, Jamnagar House, New Delhi.
- Dr. S. K. jain, Regional Director and Senior Scientist NWR, Chandigarh hold a meeting regarding discussion on reduction in the excessive Ground Water withdrawal in Agricultural sector at Hisar Agriculture University (HAU), on 20th August, 2016.
- Senior Scientist from NWR, Chandigarh attended meeting of District Advisory Committee on 23rd August 2016 held under the Chairmanship of Deputy Commissioner, Sangrur.
- Sri K.M.Viswanath, Regional Director and Senior Scientist SWR, Banglor had meeting on 25.8.2016 with Chief Engineer, MI (South), Department of Minor Irrigation regarding project on Filling of MI tanks using treated at water.
- Sh. Parvinder Singh, Regional Director, and Senior Scientist NCR Bhopal attended meeting of the State Technical Advisory Committee (STAC) for the approval of Revised Demonstrative Projects on Artificial Recharge to Groundwater under the Central Sector Scheme of CGWB on Groundwater Management & Regulation on 03.08.2016, chaired by Agriculture Production Commissioner, Govt. of MP at Vallabh Bhavan, Bhopal.
- Senior Scientist NCR Bhopal attended Financial & technical Sanction Committee meeting of Water Resources Department on 12.08.2016 at Vallabh Bhawan, Bhopal. In the meeting matter related to finance & Technical of approval of RAA, and Minor Projects etc were discussed.
- Sh. Parvinder Singh, Regional Director & Senior Scientist NCR Bhopal held meeting with Prof. P. K. Verma, DG-MAPCOST on 26.08.2016 regarding shifting of River Kshipra.
- Senior Scientist from NCR Bhopal attended meeting on 29.08.2016 regarding Ground Water Conservation & preparation of DPR for artificial recharge at Enginerring In Chief office, Bhopal.
- Senior Scientist from CGWB attended the "Nation Ground Water Management Improvement Plan" Meeting under the Chairmanship of Principal secretary PHED and GWD at his chamber, State Secretariat, Jaipur on 19.08.2016. In the meeting Project Execution Unit, State Level Empowerered Group and District Level Implementation Unit has been formed.
- Sh. AnuragKhanna, Head of Office & Senior Scientist UR, Dehradun held meeting with Dr. AnkurKansal, Regional Officer, Uttarakhand State Environment Protection & Pollution Control Board, Roorkee, Haridwar District, Uttarakhand on 29th August, 2016 regarding the Illegal Extraction of Groundwater by the M/s. Havels Pvt. Ltd., IIE, SIDCUL, Haridwar.
- Senior Scientist from CGWA, Delhi attended presentation of DPR of Western Main canal and Ara Main canal and its systems (CWC), and Meeting regarding Indian Water Week 2017 at CWC, R.K.Puram, New Delhi on 12.08.2016.
- Senior Scientist from SECR, Chennai participated in the 90th meeting of Tamil Nadu State Coastal Zone Management Authority on 03.08.2016 in the Chambers of Principal Secretary to Government, Environment & Forest Department, Secretariat, Chennai.
- Regional Director , Kerala Region attended 53rd meeting of the State Geological Programming Board (SGPB) at Govt. Guest House, Trivandrum on 5.08.2016 and presented the Activities of the AAP 2016-17 and Achievements of AAP 2015-16 of the Region.

- 7th project Review Committee meeting of lalitpur & Jhansi district and 3rd Project Review Committee meeting of Balia & Gazipur district were held on 23.08.2016 at Faridabad under the Chairmanship of Dr. D Saha Member(SAM) to review the progress.
- Senior officer of CGWB, CR, Nagpur had technical discussions on the '*Mega Recharge Scheme of Ground Water in Tapi Basin'* before the Hon'ble Minister of Water Resources Department, Govt. of Madhya Pradesh at Bhopal on 13-9-2016.
- 4th NISC Meeting on NAQUIM Chaired by the OSD, MoWR, RD & GR on 26.09.2016 at New Delhi which was attended by senior officer of the Board and Senior officer from MoWR, RD & GR, state Government.
- Shri K.R.Biswas, Regional Director and Senior officer of CGWB, ER Kolkata attended 12th meeting of CGPB Committee-XI (Geoinformatics & Data Management) organized by GSI at Kolkata on 22.09.2016. The issue of delivery of Geological sheets (1: 50,000 scale) as per MoU has been raised in the meeting. Sh. Mandal, Sr. ADG (GSI) told that they have received the letter of CHQ and it is in process for issuance the said toposheets.
- A detailed presentation was held at the Conference Hall of Secretariat, Port Blair before the Chief Secretary, A&N Administration on "Action plans required in various sectors of Water Resources Management in A&N Islands' on 13.09.2016. During the presentation, Secretaries of A&N Administration & HODs of various stake holder departments were present. Amongst the action plans, the water security plans under Jal Kranti Abhiyan in Jalgrams were also prioritized. Chief Secretary, A&N Administration has directed to create a task force at Secretariat to solve the water related issues in the Island expeditiously.
- ER. K.R. Biswas, Regional Director and Senior officer of CGWB, ER Kolkata attended a meeting on the topic of "Save Drinking Water Supply in Arsenic Infested areas of West Bengal" on 20.09.2016 at University of Veterinary and Animal Husbandry, Belgachia, Kolkata. The meeting was also attended by Professors of BCKV (Bidhan Chandra Krishi Biswavidyalaya), Uttar Banga Krishi Biswavidyalaya, and scientists from CIFRI ICAR Barrackpore.
- Senior officer of CGWB, ER Kolkata attended meeting of State Level Scheme Sanctioning Committee (SLSSC) at Kolkata under the Chairmanship of Chief Engineer (W.Q.M & Planning), PHED, Govt. of West Bengal on 28.09.2016 for technical clearance of DPR of different Public Water Supply Schemes.
- Sh. Parvinder Singh, Regional Director and Senior officer of CGWB, NCR, Bhopal attended State Level Technical & Finance Committee meeting chaired by Principal Secretary, WRD on 14.09.2016.
- Senior officer of CGWB, NCR, Bhopal attended State level Workshop on 22.09.2016 and 23.09.2016 regarding Strategic Basin Planning for Ganga River Basin in India. The meeting was held at held at PICU, WRD, Bhopal.
- Senior officer of CGWB SUO, Shillong **a**ttended CGPB meeting organised by GSI, Shillong.
- Dr. S. K. Jain, Regional Director, Senior Officer from CGWB, NWR, Chandigarh attended a programme of International Water Management Institute IWMI on informing changes in Indus Basin Knowledge Sharing & Cross Basin Learning to support stronger Trans boundary Management on 17th September, 2016 at International River Symposium, Chandigarh.
- Senior Officer from CGWB, NWR, Chandigarh delivered a lecturer and ppt presentation on Rain Water Harvesting & Ground Water Recharge on 20th September, 2016 at ICT based Training Programme on "Environment and Sustainable Development" at NITTTR Chandigarh Organized by the Department of Electrical Engineering for the faculty of Polytechnics and Engineering Colleges.

- Senior Officer from CGWB, NWR, Chandigarh attended a meeting of PSTC on 27th September, 2016 held under the Chairmanship of Secretary Irrigation, Punjab at Sec 26 Chandigarh.
- Senior officers from CGWB, attended the meeting of District Level Advisory Committee for Ground Water Regulation for notified blocks of Jaipur District on 8.9.2016 and for Non-notified blocks of Jodhpur District on 21.09.2016.
- Senior officer from CGWB, WR, Jaipur attended the meeting of District Level Advisory Committee for Ground Water Regulation for notified blocks of Jaipur District on 08.09.2016 and for Non-notified blocks of Jodhpur District on 21.09.2016.
- Senior officer from CGWB, WCR, Ahmadabad attended one week training programme on "River Basin Planning and Management ,Best Practices & Development and Data Acquisition and Analysis" for CGWB officers organized by RGI ,Raipur and NWA Pune held during 19-23th September
- Senior officer from CGWB, NHR, Dharamshala attended meeting of State Ground Water authority at JalBhawan, Shimla on dated 15.09.2016 and 30.09.2016.
- Shri. A. Subburaj, H.O.O & Senior officers from CGWB, SECR, Chennai participated in the First meeting of the Expert Committee constituted for evolving a Policy Frame Work for U.T of Puducherry in consonance with Draft National Water Framework Bill, 2016 & Model Bill of 2016 at UT of Puducherry on 30.09.2016
- Hindi week celebrations were held at SECR, Chennai from 22.09.16 to 29.09.16. The program was inaugurated by Smt. Vani Sathya Narayana. M, Hindi Officer, SECR< CSIR, Taramani, Chennai. During the Hindi week period, various competitions like copy writing, oral reply, Dictation, translation, essay writing and elocution were conducted in SECR and prizes distributed to the participants. Workshop on Hindi was conducted on the concluding day of 29.09.2016.
- Senior officer from CGWB, SWR, Bangalore visited NRSA, Hyderabad on 22nd and 23rd September,2016 in connection with firming up the pilot project and sharing of Hydrogeological and remote sensing data of Madhugiri taluk, Tumkur as per MOU signed with NRSA.
- Under Official language implementation programme, Hindi Week was celebrated from 8th to 16th September 2016 at SWR, Bangalore.
- Senior officer from CGWB, SUO, Delhi attended CGWA presentation for grant of NOC for ground water withdrawal at Conference hall, CGWB, Jamnagar House, New Delhi on 16th & 17th September'16.
- Senior officer from CGWB, SUO, Delhi attended meeting of District Ground Water Advisory Committee of New Delhi district on 20.09.16 & 29.09.16. The meeting was chaired by Dy. Commissioner, New Delhi district.
- NABL pre-assessment of Regional Chemical laboratory done on 19.09.2016 by Dr. R.S.saini.
- Sri A.D Rao, Regional Director participated in SLSSC meeting convened by Rural Water Supply & Sanitation Dept. Govt. of Telangana on 24.10.2016 for approval of drinking water schemes for implementation in the state of Telangana State.
- Senior Scientist from NCR, Bhopal attended Financial & technical Sanction Committee Meeting of WRD for finance & Technical sanction of 21 minor irrigation projects on 13 Oct '2016 Vallabh Bhawan , Bhopal.
- Senior Scientist from NCR, Bhopal attended 14th Regional Coordination Meeting of Central India Hydrology Regional Centre, NIH, Bhopal on 20 Oct '2016 at State Data Centre, WRD,

Bhopal. In the meeting progress of projects/studies conducted during the year 2015-16 and being carried by NIH were discussed.

- Dr. S.K.Jain, Regional Director attended 3rd Meeting of the Expert Committee to review the available information on Paleo channel and to finalize Paleochannel Map on 4th October, 2016 at CGWB, Jam Nagar House, New Delhi.
- Senior Scientist from CGWB, NWR attended 1st Meeting of the Executive Committee of State Level Nodal Agency held under the Chairmanship of Smt. Navraj Sandhu, IAS Additional Chief Secretary to Govt. of Haryana, Rural Development Department-Cum- Chairperson, Executive Committee State Level Nodal Agency on 24th October, 2016 at Haryana Civil Secretariat, Chandigarh.
- Sri K.M. Viswanath, Regional Director SWR, Bengaluru chaired the 23rd State Technical Agency (STA) Meeting held on 06.10.2016 organized by RWS & SD, Govt. of Karnataka, Bangalore for technical clearance of village water supply schemes and Senior officer from SWR, attended 24th STA meeting on 27.10.2016.
- Senior officer from SWR, Bengaluru attended 10th Karnataka Ground Water Authority meeting on 06.10.2016 at Ground water Directorate, Govt. of Karnataka, Bangalore.
- Senior Scientist from CGWB, KR, Thiruvananthapuram attended the meeting of Working Group on Drinking Water and Sewerage on 7th October 2016 constituted by the State Planning Board, Thiruvananthapuram as a part of framing the 13th five year plan.
- Regional Director, KR, Thiruvananthapuram presented the key note address at the National seminar on 'Water Safety of Kerala in a climate change perspective' organized by Dept of geology, GEMS arts and science college, Ramapuram, Malappuram on 18/ 10/2016.
- Senior Scientists from CGWB, KR, Thiruvananthapuram attended the Alapuzha District Level Evaluation Committee meeting on 18.10.2016 organized by State Ground Water Department for giving clearance to three drinking water industries and the committee has approved two schemes.
- Senior Scientist from CGWB, KR, Thiruvananthapuram attended the Kozhikode District level committee of Jalkranti Abhiyan on 20.10.2016 for scrutinizing the draft water Security Plan for the Jalgrams in Kozhikode district.
- Regional Director KR, Thiruvananthapuram attended the review meeting of WRD-PMKSY/Jalkranthi Abhiyan chaired by The Secretary, Water Resources, Govt of Kerala in the chamber of Secretary on 25.10.2016.
- Regional Director KR, Thiruvananthapuram was the chief guest and faculty to the training course on 'Interaction between shallow and deep Aquifers' organized by CWRDM, Kozhikode on 26.10.2016.
- Senior officers from WR, Jaipur attended the meeting of District Level Advisory Committee for Ground Water Regulation for notified blocks of Jhunjhunu District on 25.10.2016.
- Under Jal Kranti Abhijan a one day awareness training programme on "Water Security Plan of Jal Kranti Abhijan" is organised on 24th October 2016 at IFCD, Kohima, Nagaland.
- Senior officer from SUO, Shillong attended district level ground water committee meeting of East Khasi Hills District, Meghalaya at Shillong.
- Senior officer from CGWB, SER, Bhubaneswar attended the DLEC meeting at Keonjhar on 21st Oct, 2016.
- Meeting of State Level Working Group on Dynamic Groundwater Resources Estimation of Tamil Nadu State as on 2013 was held on 27.10.2016 at PWD(WRD), Taramani, Chennai.

- Senior Scientist from CGWB, SECR, Chennai participated in the 91st meeting of Tamil Nadu State Coastal Zone Management Authority on 24.10.2016 in the Chambers of Principal Secretary to Government, Environment & Forest Department, Secretariat, Chennai
- Senior Officers from CGWB, UR, Dehradun has attended meeting with the Regional Officer, Uttarakhand Environment Protection & Pollution Contorl Board, Roorkee, Haridwar District, Uttarakhand for finalization of M/s. Havels Industries Ltd, Haridwar inspection report on 24th October, 2016 at Roorkee.
- Senior Officers from CGWB, New Delhi attended meeting of Town Official Language Implementation Committee Delhi (Centre) on 17.10.16.
- Senior Officers from CGWB, New Delhi attended meeting of Crop Weather Watch Group at Krishi Bhawan on 7th, 21st and 28th October 2016.
- Senior Officers from CGWB, New Delhi attended CGWA presentation for grant of NOC for ground water withdrawal at Conference hall, CGWB, Jamnagar House, New Delhi on 21st & 22nd October'16.
- Senior Officers from CGWB, New Delhi attended meeting of District Ground Water Advisory Committee of New Delhi district on 17.10.16. The meeting was chaired by Dy. Commissioner, New Delhi district.
- Senior Officers from CGWB, New Delhi attended meeting of District Ground Water Advisory Committee of South East district on 21.10.16. The meeting was chaired by Dy. Commissioner, South East district.
- Shri D. Subba Rao, Regional Director, and Senior officer from CGWB,CR attended the Secretary Level Inter-State Water Sharing meeting at Water Resources Dept., Bhopal on 26th October 2016. The meeting was chaired by Shri. Chahal, Principal Secretary, WRD, Govt. of Maharashtra and Shri Pankaj Agrawal, Principal Secretary, WRD, Govt. of Madhya Pradesh and attended by Sh. V.M. Kulkarni, Jt. Secretary, WRD, Govt. of Maharashtra and Officers from TIDC and VIDC. During the meeting, one of the items was requirement of surface water for Tapi Mega Recharge Scheme. It was agreed that both the States will provide surface water from their respective share for utilization in Tapi Mega Recharge Scheme.
- Senior officer from CGWB, ER, Kolkata attended a meeting on Revival of Spring in Himalayan Region under the Chairmanship of Secretary (WR) on 10.11.2016 at Shram Shakti Bhavan, New Delhi. The meeting was graced by various experts from different renowned institutions and organizations throughout the country in the relevant field along with experts from CGWB.
- Senior officer from CGWB, CR, Nagpur had a meeting with Joint Secretary, Water Conservation Department at Mantalaya, Mumbai on 18-11-2016 regarding Jal Kranti Abhiyan. He discussed about the preparation of Water Security Plans along with PPR for the identified Jal Grams and insisted upon issuance of G.R. for formation of various committees viz VLC, DLC & SLC for necessary approval of PPR of Water Security Plans.
- Second meeting of the State Level Committee on Jal Kranthi Abhiyan 2016-17 conducted on 15th November 2016 in the chamber of Secretary, Water Resources Department, Govt. of Kerala. Smt. Tinku Biswal, Secretary of Water Resources, Govt. of Kerala chaired the meeting. All State Level Committee members attended the meeting.
- Shri Parvinder Singh, Regional Director had attended the State Level Nodal Agency (SLNA) Rajiv Gandhi Watershed Mission-Standing committee meeting regarding "Integrated Watershed Development (PMSKY-Watershed Development)" on 04.11.2016 held at Bhopal.

- Senior officers from CGWB, New Delhi attended meeting of District Ground Water Advisory Committee of North West, East and Central districts of Delhi on 02.11.16, 09.11.2016 and 30.11.2016 respectively.
- Senior officers from CGWB, New Delhi attended meeting of the Committee to chalk out the modalities of participation of MoWR in IISF-2016 on 25.11.16 in the chamber of Member (RM), CWC, Sewa Bhawan, R.K. Puram, New Delhi.

- Senior officers from CGWB, New Delhi attended meeting of Work Advisory Committee (WAC) on 29.11.16 in the chamber of Member (Water), Delhi Jal Board.

- Senior officers from CGWB, New Delhi attended meeting to discuss the water problem in Vasant Kunj Enclave on 04.11.16 in the Chairmanship of Member (Water Supply), Delhi Jal Board.

- Senior officers from CGWB, New Delhi has carried out inspection of SDMC Park near Chhattarpur Temple in the direction of NGT in association with DJB and NDMC on 22.11.16.
- Senior officer from CGWB, UR Dehradun had attended the meeting for formulation of Action Plan for rejuvenation of Himalayan Springs at MoWR, RD & GR, New Delhi on 9th November, 2016.

- Senior officer from CGWB WR, Jaipur attended the meeting of District Level Advisory Committee for Ground Water Regulation for notified blocks of Jaipur District on 15.11.2016.
- Shri P.K.Parchure, Regional Director, and Senior officer from CGWB, WR, Jaipur attended the Meeting of the Streering committee for implementation of Rajasthan Centre of Excellence in Water Resource Management on 16.11.2016 under the Chairmanship of Principal Secretary, PHED & GWD at Jaipur.
- Shri P.K.Parchure, Regional Director and Senior officer from CGWB, WR, Jaipur attended a Meeting on 17.11.2016 conveyed by Hon'ble Minister of PHED & GWD Govt. of Rajasthan to discuss the regulatory aspects of Ground Water Development & Management in the State of Rajasthan.
- Shri P.K.Parchure, Regional Director and Senior officer from CGWB, WR, Jaipur appeared in Parangat (पारंगत) Examination under Hindi teaching scheme organised by Department of Offcial Language Ministry of Home Affair, Govt. of India on 20.11.2016 at Jaipur.
- Sri K.M. Viswanath, Regional Director chaired the 25th State Technical Agency (STA) Meeting held on 18.11.2016convened by RWS & SD, Govt. of Karnataka, Bangalore for technical clearance of village water supply schemes. Dr. K.R. Sooryanarayana, Supdt. HG also attended the meeting.
- State Level Committee for re-estimation of groundwater resources assessment for Tamil Nadu State was convened on 17.11.2016 by the Principle Secretary , public Works Department, Gov. of Tamil Nadu. The Report of Dynamic Groundwater Resources of TamilNadu as on March-2013 was approved by the committee.
- Senior officer from CGWB, SECR, Chennai attended 15th Meeting of the Pondicherry Ground Water Authority held on 30.11.2016 at Pondichery.
- Shri N.P.S. Nagi Regional Director, NHR, Dharmasala attended meeting with Secretary, Ministry of Water Resources, RD & GR on revival of Himalayan Spring on 10.11.2016.
- Senior officer from CGWB, SR, Hyderabad attended the Convergence meeting of Panchayat Raj & Rural Development, Gov. of Andhra Pradesh at Velagapudi, Andhrapradesh.

- The Chemical Laboratory of CGWB, CR, Nagpur has been granted accreditation by NABL on 7th November 2016 in accordance with ISO/IEC 17025:2005.
- As directed by MoWR, RD &GR sapling plantation activities of varieties of plants was done by participating students and their family members, Jury members and the staffs and officers of CGWB, WCR, Ahmedabad in the premises of Sardar Vallabhbhai Patel Memorial, Ahmedabad.
- Senior Officer from CGWB, SER, Bhubaneswar attended District Level Evaluation Committee Meeting for drawal of Ground Water held on 20.12.2016 under the Chairmanship of Collector and District Magistrate, Cuttack.
- Senior Officer from CGWB, SER, Bhubaneswar attended the meeting for site inspection of the Industries/ Projects to whom NOC being accorded in Uttar Pradesh on 23.12.2016 at N. Delhi.
- Senior Officer from CGWB, SER, Bhubneshar attended workshop on State Water Policy foundation meeting on 16.12.2016 at Bhubaneswar.
- Senior officer from CGWB, NHR, Dharamshala attended meeting of State Ground Water Authority on 29.12.2016 at Shimla.
- 7th State level painting competition successfully completed on 18-12-2016 and 20.12.16 at Ranchi, Jharkhand and Patna, Bihar respectively.
- State Level Committee meeting in connection with Jal-KrantiAbhiyan attended by Senior officer CGWB SUO Ranchi on 23-12-2016 at Ranchi.
- Regional Director and Senior officer from CGWB, WCR attended meeting at CGWB,WCR,Ahmedabad with Dr. U.k.Sinha ,Head ,Isotope Hydrology Section, BARC on 06.12.2016 regarding the project “Isotope Fingerprinting of Aquifer System for Sustainable Management Of Deep Ground Water Resources in Patan district of Gujarat,India.”
- The Regional Director and Senior officer from CGWB, WCR, Ahamadabad attended meeting with Advisor, GWRDC Ltd at Data centre and BISAG, Gandhinagar on 27.12.2016 regarding identification of sites for Artificial Recharge using GIS in respect of NGWMIP.
- Shri Parvinder Singh, Regional Director attended meeting with Engineer-in-chief PHED at Jal Bhawan, Banganga, ENC office on 02.12.2016 regarding Drinking water scheme for sustainable water supply.
- Senior officer from CGWB, NCR, Bhopal attended video conference meeting on 08.12.2016 regarding “Mission Water Conservation-Natural resource Framework under the MGNREGS within overall framework of PMKSY and the formulation of Labour Budget under Mahatma Gandhi NREGA for FY 2017-18” at the Department of Panchayat and Rural Development, Madhya Pradesh.
- Regional Director, KR, Tiruvanthapuram conducted Fourth meeting of the State Level Coordination Committee on NAQUIM on 22nd December 2016 in the chamber of Secretary, Water Resources Department, Govt. of Kerala. The Report on Mapping and Management Plan of Coastal Aquifer systems in Kerala presented in the meeting.
- Regional Director, KR, Tiruvanthapuram attended the consultative meeting on State Action Plan on Climate Change (SAPCC) on 17th December 2016 at, Thiruvananthapuram and participated in the deliberations.
- Regional Director, KR, Tiruvanthapuram attended the LSGD meeting on India Highrange Mountain Landscape Project on 20.12.2016 at Trivandrum convened by the Principal Secretary, LSGD, Govt of Kerala and participated in the deliberations.
- 7th State Level Painting Competition, 2016-17 was organized at Kolkata, West Bengal, on 11.12.2016 ,A& N Islands on 20.12.2016 and Gangtok, Sikkim on 23.12.2016.

- Senior Officer from CGWB, WR, Jaipur attended the meeting of District Level Advisory Committee for Ground Water Regulation for non-notified blocks of Jodhpur District on 06.12.2016.
- Regional Council Meeting (RCM) was held on 23.12.2016 at CGWB, WR Jaipur.
- Shri P. K. Parchure, Regional Director, Senior officers from CGWB, WR, Jaipur were present in the meeting.
- Senior officer from CGWB, SECR, Chennai participated in the 92nd Meeting of Tamil Nadu State Coastal Zone Management Authority conducted at the Chambers of the Principal Secretary to Government, Environment & Forests Department, , Chennai on 21.12.2016.
- Senior officer from CGWB, SECR, Chennai participated in the State Level Scheme Sanctioning Committee for clearing the NRDWP proposal for the year 2016-17 convened by the Managing Director, Tamil Nadu Water Supply and Drainage Board, at Chennai on 23.12.2016
- Senior officer from CGWB, SECR, Chennai participated in the State Level Scientific Source Finding Committee on Water Quality – Quantity and Conservation of Water convened by the Managing Director, Tamil Nadu Water Supply and Drainage Board, at Chennai on 23.12.2016
- Senior officer from CGWB, SECR, Chennai participated in the 58th State Geological Programming Board meeting convened by Commissioner for Geology and Mining, Chennai at Chennai on 27.12.2016.
- Shri Sanjay Marwaha, Regional Director, Faridabad, Dr. P.K. Jain, Superintending Hydrogeologist, CGWB, CR, Nagpur, Shri Sourabh Gupta, Scientist-D, SUO, CGWB, Pune and Shri Siva kumar, Hydrologist, CGWB, SECR, Chennai attended the meeting on 12.01.17. During the meeting, the possibility of association with IITM regarding Aquifer Mapping and Climate Change was discussed considering that the expertise of IITM. It will be very useful for providing valuable inputs to ground water management plans being prepared as an outcome of aquifer mapping activities for overall benefit of stakeholders.
- Shri D. Subba Rao, Regional Director, Dr. P.K. Jain, Superintending Hydrogeologist, and Shri B.P. Mathad, EE, CGWB, Nagpur attended the meeting with Shri Sunil Patil, IAS, Director, and other officers of GSDA, Pune on 25.01.17. During the meeting, the various issues pertaining to the NGMIP were discussed
- Dr. S. K. Jain, Regional Director and senior officers from CGWB, NWR, Chandigarh held a meeting with Sh. K.S.Takshi, Chief Engineer, Irrigation Department Punjab & his team Sh. Atul Sood, Sr. Geophysiciest, WRED and Sh. N.K.jain, XEN on 11.01.2017 at Water Resources Bhawan, regarding progress of jal Kranti Abhiyan and discussion on water security plan of selected Jal Gram.
- Senior officers from CGWB attended meeting on NGMIS held at World Bank Office, New Delhi on 13.1.2016 and attended discussions on the scheme heldat MOWR, RD & GR, Shram Shakti Bhawan,New Delhi on 14.1.2017.
- Senior officers from CGWB, attended a meeting on 14.01.2017 held under the Chairmanship of Secretary (WR), MoWR,RD&GR at Shram Shakti Bhawan, New Delhi for discussion on readiness of States to implement the scheme of NGWMIP in the seven States of the country.
- Dr. S. K. Jain, Regional Director held a meeting with Sh. Rajesh Vashisth, Joint Director Agriculture Punjab, Dr. S.S.Kukal, Additional Director Research, PAU Ludhiana on 18.01.2017 at Bhujal Bhawan to discuss and sharing of Aquifer Maps of Punjab.

- Senior officers from CGWB, NWR, Chandigarh held a meeting with Shri Sanjay Rahar, Suptdg. Engineer, Sh. Rajeev Rathi, XEN of Irigation department Haryana and Sh.Pankaj Mehla, GW Development Specialist, GWC Haryana on 25.01.2017 at Irrigation Deptt Haryana to review the work of implementation of National Ground Water Management Improvement Program (NGWMIP).
- Sri K.M.Viswanath, Regional Director and H.P.Jayaprakash Sc-C attended meeting on follow up of review meeting chaired by Principal Secretary ((WR), Govt. of Karnataka on NGWMIP at Bangalore on 24.1.2017.
- Senior officers from CGWB, SWR, Bangalore attended State Geological Programming Board meeting on 16.1.2017 held at Khanija Bhavan, Bangalore.
- Regional Director, and Senior officer from CGWB, WCR had a meeting with Additional Secretary Government Of Gujarat and MD GWRDC regarding NGWIMP on 12th January 2017 & 16th January 2017 at Gandhinagar.
- Shri G R C Reddy, Sc-D attended the SLSSC meeting chaired by Principal Secretary, RWS & S, Govt. Of Andhra Pradesh at Vijayawada on 23.01.2017.
- A meeting was held between Chairman CGWB and Secretary, WRIDD, Govt. of WB in the chamber of Secretary, WRIDD at Khadya Bhawan, MirzaGhalib Street, Kolkata on 07/02/2017 to discuss over various issues.
- Model Ground Water (SustainableManagement) bill 2016 presented before the Secretary, Water Resources, Govt.of Kerala and other heads of water related Depts on 20.2.2017 and before Honorable Administrator, U.T of Lakshadweep on 22.2.2017.
- Regional Director Shri C. Paul Prabhakar and Shri A.K. Patre, Sc-D, CGWB, NCCR has attended meeting with Chief Secretary, Govt of Chhattisgarh held on 13.02.2017 at Mantralaya Naya Raipur on “Mission Water Conservation-Natural Resource Management Framework under the MGNREGS within the overall framework of PMKSY and the formulation of the Labour Budget under Mahatma Gandhi NREGA for FY 2017-18”
- Dr. S. K. Jain, Regional Director made ppt on 04.02.2017 before the Secretary, MoWR, RD & GR and team of World Bank on the status of NGMIS Haryana in association with Shri Rajeev Bansal, Chief Engineer, Irrigation Department Haryana.
- Dr. S. K. Jain, Regional Director and other officer of NWR, Chandigarh attended meeting on 13.02.2017 held under the Chairmanship of Shri S. Narayanan, IFS, Member Secretary, Haryana State Pollution Control Board to discuss issues regarding compliance of directions of hon’ble NGT-industries/project drawing ground water and paying cess to SPCB without valid NOC from CGWA.
- 3rd State Ground water Coordination committee Meeting to oversee implementation of NAQUIM in the state of Telangana was held on 06.02.2017 under the Chairperson of Dr. S.K. Joshi, IAS, Special Chief Secretary, I & CAD, Government of Telengana at Hyderabad.
- The third State Ground Water Coordination Committee was conducted at Chennai on 24.02.2017. During the meeting presentations on “Aquifer mapping and Aquifer management Plan for Amaravathi Basin Aquifer System and Bhavan basin Aquifer System” were made and detailed deliberations were made by the members of the committee.
- Dr. Arijit Dey, Suptdg. Hydrogeologist, CGWB, WR, Jaipur attended meeting on "Policy of Water for India" held under the chairmanship of the Joint Secretary, MoWR, RD & GR, New Delhi on 9 February 2017.
- Shri P.K.Parchure, Regional Director, and Senior officer of CGWB, WR, Jaipur attended the First meeting of the Committee for formulation of Draft Bill regarding Regulation of

groundwater held at Ground Water Department (GWD), Govt. of Rajasthan, Jaipur on 21 February 2017.

- Sh. A.K.Agrawal, Regional Director along with Dr. Indranil Roy, Sc-C attended a meeting in the Chamber of the Chief Secretary, Govt. of Bihar, Patna on 27.02.2017 to discuss implementation plan and recommendations of Central Ground Water Board related to revival discharge of hot water spring Rajgir, Nalanda. District Bihar.
- 2nd SGWCC Meeting on NAQUIM was conducted on 02.03.2017 at Velagapudi, Amaravathi, Andhra Pradesh under the Chairmanship of Sri Sasi Bhushan Kumar, I.A.S, Secretary, Water Resources, Government of Andhra Pradesh.
- 4th SGWCC meeting: The 4th Meeting of the State Ground Water Co-ordination Committee (SGWCC) for NAQUIM was held under the Chairmanship of Shri Rajesh Kumar, Principal Secretary, Water Supply and Sanitation Department (WSSD), Govt. of Maharashtra Mumbai on 15th March 2017.
- Shri Amlanjyoti Kar, Head of Office, CGWB, ER attended State Level Seminar on the occasion of Launching "Water Campaign" By National Bank for Agriculture and Rural Development on 22nd March at West Bengal Regional office of NABARD in Kolkata.
- Senior officers from CGWB, NCR, Bhopal attended meeting chaired by Chairman, CGWB at Regional office, ER- Kolkata on 03.03.2017 regarding "Analytical Work and Technical Assistance to support Strategic Basin Planning for Ganga River Basin in India"
- Senior officers from CGWB, NCR, Bhopal attended meeting with Sh. Alok Lehri, Sc-E, National Botanical Research Institute, Lucknow and Sh. P. K. Shrivastava, Sc-C, MPPCB, for final assessment of NABL during 04.03.2017 and 05.03.2017 at CGWB, NCR, Bhopal.
- Shri Parvinder Singh, Regional Director, Dr. L. K. Mathur, Sc-D and Sh. S. K. Verma, Sc-D, attended meeting with ENC, WRD regarding Model Bill at State Regional Data Center on 15.03.2017.
- Regional Director, CGWB, NER, Guwahati attended meeting with CE, Irrigation Department, Govt. of Assam. Views from the State Govt. received for implementation of tube well scheme (under PMSKY) and accordingly forwarded to Ministry.
- Regional Director, CGWB, NER, Guwahati attended meeting with Secretary, PHED, Govt. of Mizoram on G.W. Model Bill and spring rejuvenation. A presentation was made before the Secretary.
- Dr. S. K. Jain, Regional Director, Sh. Tarun Mishra, Sc B attended a meeting regarding 'Pricing of Ground Water used by Packaged Water/Beverages/Bottling Industry on 03.03.2017 under the Chairmanship of Principal Secretary to Irrigation & Water Resources Department, Chandigarh at New Secretariat, Sector 17, Chandigarh.
- A meeting on 'Integrated Water Conservation efforts of different Ministries' with Chief secretary, Govt of Chhattisgarh held at Vidhan Sabha Bhawan Raipur attended by Regional Director and senior officers from CGWB NCCR, Raipur on 30 .03.2017
- Sh. S.K.Samanta, Suptdg Hydrogeologist, MER, CGWB attended the RCC meeting for Flood Management Studies, NIH, Patna on 24.03.2017 and shared views in discussion regarding River Bank Filtration (RBF) Schemes proposed by NIH & remediation of As contamination.
- Sh. AnuragKhanna, Head of Office,CGWB, Dehradun has attended meeting with the Chief Secretary Government of Uttarakhand, Secretariat, Dehradun regarding the "Rejuvenation of Nainital Lake, Nainital District" and submission of report on "Rejuvenation of Gaurikund Hot Spring, Gaurikund, Rudraprayag District, Uttarakhand" on 31st March, 2017.

27. VIGILANCE ACTIVITIES

During the year 2016-17, 21complaints cases were brought forward w.e.f. 1.4.2016 and 12 new complaint cases were received during the year 2016-17. Out of these (21+12) 33 complaints, 14 were closed and 4 complaints cases were taken up as disciplinary proceedings. Therefore, 15 complaint cases were carried forward to next year.

DISCIPLINARY PROCEEDINGS

12 cases of disciplinary proceeding were brought forward w.e.f.1.04.2016 and 4 new cases of disciplinary proceeding were received during the year. Out of these (12+4) 16 cases were disposed off. Thus total 11 cases of disciplinary proceeding were carried forward to next year.

28. RTI INFORMATION

The opening balance of RTI applications as on 01.04.2016 were 236 and 245 RTI applications were received during the year 2016-17. Out of 245, 84 numbers of cases were transferred to other public authorities. 156 applications have been disposed off. An amount of Rs.3832 was received towards application fee. Details are given below in table 28.1

Table 28.1: RTI Information for year 2016-2017

Opening balance as on 01.04.2016	Received during the year (including cases transferred from other public authorities)	No. of cases transferred to other public authorities	Decisions where Requests/ Appeals Rejected	Decisions where Requests/ Appeals Accepted	Amount of Charges collected (in Rs.)
236	245	84	5	7	3832

29. PERSONAL MANAGEMENT

The sanctioned strength, filled up, vacancy position and category-wise personnel deployed in the Board are presented in table 29.1.

Table 29.1 Personnel Deployment in Central Ground Water Board during 2016-2017 (Up to 31st March, 2017)

GROUP "A"							
Section	**Sanctioned**	**Filled**	**Vacant**	**OBC**	**Handicapped**	**SC**	**ST**
Scientific	403	302	101	31	01	49	14
Ministrial	8	6	2	0	0	0	0
Engineering	56	40	16	10	0	07	06
Total	**467**	**348**	**119**	**41**	**1**	**56**	**20**
GROUP "B"(Gazetted)							
Section	**Sanctioned**	**Filled**	**Vacant**	**OBC**	**Handicapped**	**SC**	**ST**
Scientific	219	121	98	20	01	21	08
Ministrial	36	27	9	0	0	4	4
Engineering	110	25	85	04	0	08	03
Total	**365**	**173**	**192**	**24**	**1**	**33**	**15**
GROUP "B"(Non-Gazetted)							
Section	**Sanctioned**	**Filled**	**Vacant**	**OBC**	**Handicapped**	**SC**	**ST**
Scientific	179	108	71	20	01	19	09
Ministrial	198	165	33	08	06	31	14
Engineering	265	210	55	15	1	63	35
Total	**642**	**483**	**159**	**43**	**8**	**113**	**58**
GROUP "C"							
Section	**Sanctioned**	**Filled**	**Vacant**	**OBC**	**Handicapped**	**SC**	**ST**
Scientific	83	35	48	04	0	10	04
Ministrial	1025	727	298	159	11	163	70
Engineering	1462	1111	351	189	4	237	90
Total	**2570**	**1873**	**697**	**352**	15	**410**	**164**
GRAND TOTAL							
Groups	**Sanctioned**	**Filled**	**Vacant**	**OBC**	**Handicapped**	**SC**	**ST**
Group "A"	467	348	119	41	1	56	20
Group "B"(Gazetted)	365	173	192	24	1	33	15
Group "B"(Non-Gazetted)	642	483	159	43	8	113	58
Group "C"	2570	1873	697	352	15	410	164
TOTAL	**4044**	**2877**	**1167**	**460**	**25**	**612**	**257**

30. BUDGET AND EXPENDITURE

Statement showing actual expenditure incurred by the Board during 2016-17 has been shown in Table 30a.

		PLAN (Rs. in Lakhs)				NON-PLAN (Rs.in Lakhs	
Unit Code	**Unit Name**	**Budget**	**Expenditure**	**Unit Code**	**Unit Name**	**Budget**	**Expenditure**
16.02.01	Salary	3000.00	2451.27	01.01.01	Salary	16963.00	17484.01
16.02.02	Wages	120.00	122.51	01.01.02	Wages	0.50	0.19
16.02.03	O.T.A.	9.00	4.19	01.01.03	O.T.A.	3.00	1.16
16.02.06	M/Treatment	175.00	188.23	01.01.06	M/Treatment	99.70	98.09
16.02.11	D.T.E.	1300.00	1146.37	01.01.11	D.T.E.	80.00	64.61
16.02.12	F.T.E.	20.00	1.47	01.01.12	F.T.E.	0.20	0.10
16.02.13	Office Expenses	1300.00	1325.59	16.02.13	Office Expenses	5.00	2.95
16.02.14	R.R.T.	230.00	181.64	01.01.14	R.R.T.	1.00	0.00
16.02.16	Publications	220.00	60.71	01.01.16	Publications	1.00	0.47
16.02.26	Advert & Public.	0.00	0.00	01.01.26	Advert & Public.	0.20	0.00
16.02.20	O.A.E.	185.00	15.56	01.01.20	O.A.E.	0.10	0.03
16.02.24	P.O.L.	1400.00	1428.55	01.01.24	P.O.L.	1.00	0.00
16.02.27	Minor Works	275.00	179.54	01.01.27	Minor Works	0.00	0.00
16.02.28	P.S.	438.00	74.13	16.02.28	P.S.	0.20	0.00
16.02.30	Oth. Cont. Ser.	0.00	0.00	01.01.30	Oth. Cont. Ser.	0.00	0.00
16.02.33	Subsidies	2.00	0.35	01.01.33	Subsidies	0.00	0.00
16.02.43	S/Stock	1650.00	1009.53	01.01.43	S/Stock	0.00	0.00
16.02.50	Other Charges	9.00	0.00	01.01.50	Other Charges	0.10	0.00
16.02.64	W.O.L	5.00	0.00	01.01.64	W.O.L	0.00	0.00
2702	**Total (Revnue)**	**10338.00**	**8189.64**	**2702**	**Total (Revnue)**	**17155.00**	**17651.61**
4702	Capital Expend.			4702	Capital Expend.		
16.02.51	Motor Vehicle	800.00	425.96	05.01.51	Motor Vehicle	25.00	0.00
16.02.52	M &E	5000.00	2042.17	05.01.52	M &E	0.00	0.00
16.02.53	M/Works	16700.00	1824.01	05.01.53	M/Works	0.00	0.00
4702	Total Capital Exp.	22500.00	4292.14	4702	Total Capital Exp.	25.00	0.00
Total: Revnue+Capital		**32838.00**	**12481.78**	**Total: Revnue+Capital**		**17180.00**	**17651.61**

Table 30b: Rajiv Gandhi National Training and Research Institute

Unit Code	**Unit Name**	**Budget**	**Expenditure**
18.01.01	Salary	290.00	276.29
18.01.02	Wages	13.00	0.00
18.01.06	M/Treatment	5.00	2.19
18.01.11	D.T.E.	40.00	20.31
18.01.12	F.T.E.	75.00	0.00
18.01.13	O.E.	100.00	40.98
18.01.14	R.R.T.	60.00	45.04
18.01.16	Publication	2.00	0.00
18.01.24	P.O.L.	5.00	2.53
18.01.28	P.S.	170.00	118.84
	Total Revnue RGI	**760.00**	**506.18**
4702	Capital RGI		
07.01.51	M.V.	10.00	0.00
07.01.52	M & E	30.00	6.08
07.01.53	Major Works	0.00	0.00
	Total Capital RGI	**40.00**	**6.08**
	Total	**800.00**	**512.26**

Table 30c:- Major Head: 2701-.80.004.08 Hydrology Project-Phase-III (PLAN)

Unit Code	**Unit Name**	**Budget**	**Expenditure**
08.01.11	D.T.E.	17.50	0.46
08.01.12	F.T.E.	30.00	0.00
08.01.13	O.E.	20.00	0.00
08.01.20	O.A.E.	15.00	2.20
08.01.51	Minor Works	2.50	0.00
08.01.28	P.S.	50.00	0.20
08.01.30	Oth Cont Services	15.00	0.00
2701	**Total (Ext. Sup)**	**150.00**	**2.86**
2701	**Dom. Supp.**		
08.02.11	D.T.E	17.50	0.49
08.02.12	F.T.E.	30.00	0.00
08.02.13	O.E.	20.00	0.00
08.02.20	O.A.E.	15.00	12.02
08.02.51	Minor Works	2.50	0.00

08.02.28	P.S.	50.00	1.25
08.02.30	Oth Cont Services	15.00	0.00
2701	**Total (Dom. Sup)**	**150.00**	**13.76**
Total 01 Ext.Supp. & 02 Dom.Supp.		**300.00**	**16.62**

4701 Capital (NHP) Ext. Support

Unit Code	Unit Name	Budget	Expenditure
08.01.51	M.V.	30.00	0.00
08.01.52	M & E	50.00	0.00
08.01.53	M/Works	25.00	0.00
4701	**Total (Ext. Sup)**	**105.00**	**0.00**
	(NHP) Dom. Supt		
08.02.51	M.V.	30.00	0.00
08.02.52	M & E	50.00	0.00
08.02.53	M/Works	25.00	0.00
4701.00	**Total (Dom. Sup)**	**105.00**	**0.00**
4701.00	**Total Capital (Ext. + Dom. Sup)**	**210.00**	**0.00**
2701+4701	**Total NHP (Ext. + Dom. Sup)**	**510.00**	**16.62**

Table 30d: Sub Head: 03- Infrastructure Development

		BUILDING FOR OFFICE	
Unit Code	**Unit Name**	**Budget**	**Expenditure**
03.00.51	Motor Vehicle	0.00	0.00
03.00.52	M. & E.	150.00	0.00
03.00.53	Major Works	550.00	550.00
	Total	**700.00**	**550.00**

Table 30e: Sub Head- 17 Issue to Work & Other Credits

		Deduct Recoveries	
Unit Code	**Unit Name**	**Budget**	**Expenditure**
17.01.70	Issue to Work	2500.00	1195.58
17.02.70	Other Sus. Char.	0.00	0.00
	Total Recoveries	**2500.00**	**1195.58**

Annexure- 1

LOCATION AND JURISDICTION OF REGIONAL AND OTHER OFFICES OF CENTRAL GROUND WATER BOARD

REGIONS	HEADQUARTERS	JURISDICTION
i) NORTHWESTERNHIMALAYAN REGION		
Regional Office	Jammu	Jammu and Kashmir
Division Office	Div.VIII, Jammu	
ii) NORTHHIMALAYAN REGION		
Regional Office	Dharamshala	Himachal Pradesh
Division Office	Div.XVII,Dharamshala	
iii) NORTHWESTERN REGION		
Regional Office	Chandigarh	Punjab,Haryana & UT of
Division Office	Div.II,Ambala	Chandigarh
iv) WESTERN REGION		
Regional Office	Jaipur	Rajasthan
State Unit Office	Jodhpur	Western Rajasthan
Division Office	Div.XI, Jodhpur	Rajasthan
v) WESTCENTRAL REGION		
Regional Office	Ahmedabad	Gujarat,UT of Daman & Diu
Division Office	Div.I,Ahmedabad	
vi) NORTHCENTRAL REGION		
Regional Office	Bhopal	Madhya Pradesh
Division Office	Div.XII,Bhopal	
vii) NORTHCENTRAL CHHATTISGARH		
Regional Office	Raipur	Chhattisgarh
Division Office	Div.XIII,Raipur	
viii) CENTRAL REGION		
Regional Office	Nagpur	Maharashtra, UTof D & N. Haveli
		West Maharashtra
State Unit Office	Pune	Maharashtra, UTof D & N. Haveli
Division Office	Div.VI,Nagpur	
ix) NOTHERN REGION		
Regional Office	Lucknow	Uttar Pradesh
State Unit Office	AllahabadDiv.III,	
Division Office	Varanasi	
x) UTTARAKHAND REGION		
Regional Office	Dehradun	Uttarakhand
Division Office	Div.XVI, Bareilly	
xi) MID EASTERN REGION		
Regional Office	Patna	Bihar, Jharkhand
State Unit Office	Ranchi	Jharkhand
Division Office	Div.V,Ranchi	Bihar, Jharkhand

REGIONS	HEADQUARTERS	JURISDICTION
xii) EASTERN REGION Regional Office Division Office	 Kolkata Div.XV,Kolkata	 West Bengal,Sikkim, UTof A & Nicobar Islands
xiii) NORTH EASTERN REGION Regional Office State Unit Office Division Office	 Guwahati Naharlugan Shillong Agartala Div.VII,Guwahati	 Assam, Arunachal Pradesh, Meghalaya, Manipur, Mizoram,Nagaland,Tripura ArunachalPradesh Meghalaya Tripura Assam,ArunachalPradesh,Meghalaya, Manipur,Mizoram,Nagaland,Tripura
xiv) SOUTH EASTERN REGION Regional Office Division Office	 Bhubaneshwar Div.X,Bhubaneshwar	 Orissa
xv) SOUTHERN REGION Regional Office State Unit Office Division Office	 Hyderabad Vishakhapatanam Div. IX,Hyderabad	 Andhra Pradesh &Telangana N-Coastal Andhra Pradesh Andhra Pradesh & Telangana
xvi) SOUTH WESTERN REGION Regional Office State Unit Office Division Office	 Bangalore Belgaum Div.XIV,Bangalore	 Karnataka & Goa NW.Karnataka & Goa Karnataka & Goa
xvii) SOUTH EASTERN COASTAL REGION Regional Office Division Office	 Chennai Div.IV, Chennai	 Tamil Nadu,UT of Pondicherry
xviii) KERALA REGION Regional Office Division Office	 Trivendrum Div.IV,Chennai	 Kerala & UT of Lakshadweep Kerala & UT of Lakshadweep
State Unit Office	NCT, Delhi	NCT, Delhi

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Shri K C Naik, Chairman, CGWB
Shri G C Pati Member (HQ), CGWB

Contributors

Dr. Rakesh Singh, Scientist- 'B', CGWB, Faridabad
Shri T.Madhav, Scientist- 'B', CGWB, Faridabad
Shri M. K. Garg, Scientist- 'D', CGWB, Faridabad
Ms. Rumi Mukherjee, Scientist- 'C', CGWB, Faridabad

CENTRAL GROUND WATER BOARD

Ministry Of Water Resources, River Development & Ganga Rejuvenation
Government of India
Bhujal Bhawan, NH- IV,
Faridabad (Haryana).