INC of IAH
Indian National Chapter
International Association of Hydrogeologists

Newsletter

VOLUME 12 ISSUE 01 April, 2025

this issue

Edited, designed and composed by

Dr Ashok Kumar
Treasurer, INC-IAH

INC of IAH

Reg. Off.: O/o Central Ground Water Board, Bhujal Bhawan, NH-IV, Faridabad – 121001

E: groundwater2008@gmail.com

E: bschaudhary@kuk.ac.in

www.inciah.org

President's Message

Prof. A. K. Sinha

President (INC of IAH),
Vice-President (Asia), IAH Council
Founder Vice-Chancellor,
Chhatrapati Shivaji University, Navi Mumbai
Member, Governing Council, IUAC, GOI, New Delhi and
Founder Groundwater Community Forum
E: groundwater2008@gmail.com

Dear members, Colleagues & Friends

Welcome to our quarterly newsletter! We are now in second quarter of the current year.

We had good activities during First quarter. We had technically highly successful National seminar with International participation on "Earth Science perspective on Groundwater Sustainability – Recent Advances" organised jointly with Rajasthan State Groundwater Department, Amity University Rajasthan Jaipur and Indian National Chapter of International Association of Hydrogeologists at Amity University Rajasthan Jaipur on 1st and 2nd March 20205 where in about 250 delegates from India and abroad participated. More than 80 research papers with multiple authors were presented and deliberated upon. Not only Few very senior eminent Hydrogeologists were felicitated for the first time as Veteran Hydrogeologists of the Country but also the Annual regular awards were given to the selected awardees. Detailed report would be circulated soon.

We also had Annual general body meeting (AGM) on 29th march wherein INC IAH 's Audit report was presented and approved. AGM also agreed in principle to hold ISMAR!3 during 2027-2028 accepting the request of IAH Commission of Managed Aquifer Recharge.

Suggestions were also made to bid for IAH Annual Worldwide Groundwater Conference in India.

We have some challenges which slows down the enthusiasm of the Governing body. Governing body many times get demotivated owing to poor participation of the members in the events organised by Governing body for the benefit and strengthening of INC IAH in general and its members in particular. I on behalf of the governing body and on my own behalf wish to make humble request to our member that we should make our association with INC IAH as an additional professional identity. We must take pride in being member of the most vibrant global groundwater organisation with more than 5000 members from 132 countries with 40 chapters' countries. India is also a chapter country and we in the beginning of 2025 have acquired the status of having second highest number of members of after Australia. However quite good number of erstwhile members have not renewed their membership which made us lose the prestigious status in this month. We are looking to surpass even Australia if you all support. I once again appeal to those who have so far not renewed the membership to renew it and help in increasing the membership of IAH from India.

The INC IAH is visualising to focus on following key domain:

1. Expanding professional and scientific handholding of youngsters

2. Assisting the User in Developing and Managing Managed Aquifer Recharge /Artificial recharge

3. Initiating and Strengthening collaboration with policymakers

4. Enhancing public awareness programs

I request you all to share your expertise at least locally with Industrialists and farmers to enhance the visibility of yours as well as of INC of IAH; Mentor young professionals entering the field; Contribute to our quarterly e-journal and e-Newsletter and Participate in upcoming webinar. seminar. meeting and workshop.

Looking Ahead our society stands at the forefront of groundwater conservation. The challenges ahead require our collective wisdom and dedication. Let's continue working together to ensure sustainable groundwater management for future generation.

Wish you all very best.

(A. K. Sinha)

Secretary's Message

Prof. (Dr) B.S. Chaudhary

Secretary, INC of IAH

Chairman, Department of Geophysics, Kurukshetra University, Kurukshetra -136 119 (Haryana) India,
E: bschaudhary@kuk.ac.in / secretaryinciah@gmail.com

Revered members of INC-IAH,

Greetings of the Day!

I am happy to see that the first issue of the E-Newsletter of INC-IAH for year 2025 is in front of you to apprise you about various activities being taken up by INC-IAH and also to enrich your understanding about groundwater science as it includes articles from academia and professionals dwelling upon issues ranging from local site-specific plans to global changes. You will also see comprehensive report on recently concluded two days national seminar at Amity University, Jaipur which has international participation ranging from USA, Australia to Italy and was well attended by young professionals in groundwater science as well.

I on behalf of INC IAH and on my own behalf share this joy and bliss that Dr Ashok Kumar, Treasurer INC-IAH is taking all pains in timely release of the Newsletter so that we all are well informed. As we all understand, prudent use and judicious management of the water resources of the earth is the only way for ensuring the sustainability of these resources and is of vital importance for the survival of mankind. United Nations' Sustainable Development Goals focuses on making the planet more livable through achieving the targets by 2030. As we all know this year, March 21, 2025 has been celebrated as the "Glaciers' Preservation" day and the year 2025 is being celebrated as the year of "Glaciers' Preservation" embarking on a decade of focus on Cryospheric sciences. There is a need for according great importance to Glaciers' preservation for availability of freshwater and for sustainable water management as the accelerated melting of glaciers due to climate change will result in to Reduced Water Supply, Disrupted Water Cycles, Increased Water Scarcity and Threats to the Ecosystems. Rapid melting alters water temperatures and flow patterns, putting aquatic species and their habitats at risk. Some species may not adapt quickly enough to survive. It is therefore the need of the hour to adopt water sensitive behavior in all walks of life. We all understand that the themes of World Water Day have guided global campaigns, educational initiatives, and policy discussions, fostering a deeper understanding of water-related challenges and it also coincides with the release of the United Nations World Water Development Report, which provides valuable insights into global water trends and challenges.

I am of the considered opinion that, we the members of INC IAH, can play a pivotal role for the better conservation, management and optimal utilization of groundwater resources at Pan-India level. This can be done by the active participation of each and every member in their respective spheres through active participation and connect with the society. There is need to adopt the practical ways to use water wisely in our day-to-day activities through Conservation at Home, Responsible Outdoor Water Use, changing Personal Habits, Mindful Showers and

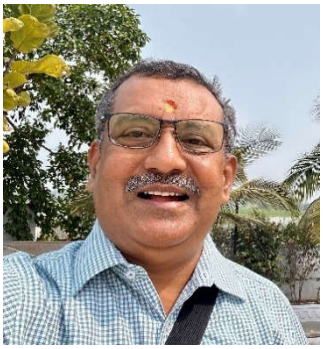
Community Efforts. Various schemes of Central and State governments like Atal Bhujal Yojana, Mera Pani Meri Virasat Scheme, Rainwater Harvesting and Awareness Campaigns needs to be percolated deep down in the practical actions and in the psyche of the people so that we can ensure water sustainability in India.

Through this message, I call upon each and every member of INC-IAH to be a positive catalyst in the dynamic efforts of our President Prof. (Dr.) A K Sinha to take this chapter at continued newer heights and make it imprinted as the most dynamic chapter at global level. I would like to put on record the active participation of the Members Executive Committee of INC-IAH for their active involvement in INC-IAH affairs and expect the same in future activities as well. I am sure that the fruitful and far-reaching results can't be achieved without your active and continued participation. I request you all to participate in maximum numbers in all the activities being conducted by INC-IAH and also organize campaigns for making INC-IAH visible from local to global level. I am sure you all will come forward in this noble cause.

With profound regards,

(B.S. Chaudhary)

Editor's Desk



Ashok Kumar *M.Sc. Tech (IIT-ISM), PhD (PU)*

Treasure, INC of IAH

Principal Consultant – GW Modelling
(CGWA Accredited IA & Modelling Expert)
Honorary Secretary, VSED, New Delhi
Former Advisor - Hydrogeologist (Cairn India)

ashok.kumar@wateraquifer.com
https://wateraquifers.com

Dear Readers,

It is indeed a great honour to be the newsletter editor for this edition of INC-IAH, and it is an immense pleasure to publish this first edition for 2025.

In this edition, we will recount the various activities in which INC-IAH since the last quarter of 2024 until the end of April 2024. It provides an overview of major activities, Declaration of INC of IAH Award – 2022, felicitation of veteran hydrogeologists, popular talks of international experts, successful national seminar at Amity University, Jaipur, World Water Day 2025.

I am an admin for the INC of the IAH website. I have tried my level best to make the website (inciah.org) more informative as well as up-to-date. Most of the information is available on the website. In recent times, there has also been a surge in visitor counts to the website.

The application form for becoming or renewing membership in IAH with applicable fee structures has also been included in this edition. My sincere request to old members is to renew their membership using various available payment options. Existing members may also help in enrolling new members.

This volume contains articles co-authored by Dr. Debasish Bagchi, Dr. Hrushikesh Behera, and Dr. Anadi Gayen from the Central Ground Water Board, Eastern Region, Kolkata; Dr. Fenil R. Gandhi and Dr. Jayantilal N. Patel from the Department of Civil Engineering at the Sardar Vallabhbhai National Institute of Technology, Surat; and Mr. Amit Sharma, a research scholar in the Department of Geology at the University of Jammu, J&K.

Last but not least, I would like to thank INC-IAH President Prof. A. K. Sinha, Vice President Dr. Anadi Gayen, Secretary Dr. Bhagwan Singh Chaudhary, and Executive Committee members for their everlasting support throughout the creation of this edition.

Before I pen this, I sincerely request all members, particularly young hydrogeologists, to come forward and add their contributions to make this quarterly newsletter more informative and readable for a large audience. This is an open newsletter; members may circulate it to an individual or group for wider publicity. This is the only way to grow and make INC-IAH a beautiful place.

Ashok Kumar
Editor, INC-IAH Newsletter, April Edition of 2025

Governing Body (2024-2026)

President

Dr. A. K Sinha

Vice President (Asia), IAH Council
Former Vice Chancellor, Chhatrapati Shivaji Maharaj University, Navi Mumbai, Maharashtra
9829010304 groundwater2008@gmail.com

Vice President

Dr. Anadi Gayen

Regional Director, CGWB, Min. of Jal Shakti, GoI, Kolkata
9433588814 anadigayen1968@gmail.com

Secretary

Dr. Bhagwan Singh Chaudhary

Professor, Dept. of Geophysics, Kurukshetra University, Kurukshetra
7027666480 bschaudhary@kuk.ac.in

Treasurer

Dr. Ashok Kumar

Principal Consultant (Modelling), Former Advisor, Cairn India, New Delhi
9818174707 ashok.kumar@inciah.org

Members

Mrs. Chirashree Mohanty

Scientist, CGWB, Min. of Jal Shakti, GoI, Kolkata
9437431735 chirashreebaral@gmail.com

Sh. Sujit Sinha

Atal Bhujal Yojana, Min. of Jal Shakti, GoI, Former Scientist, CGWB, Faridabad
9868843860 sujitsinha95@gmail.com

Dr. Ashwani Kumar Tiwari

Asst. Professor, SES, JNU, New Delhi
9507686521 ashwaniktiwari@mail.jnu.ac.in

Dr. Bhavana N. Umrikar

Professor, Dept. of Geology, Savitribai Phule Pune University, Pune
9225527407 bnumrikar@gmail.com

Dr. R. P. Singh Kushwah

Professor & Dean, Chhatrapati Shivaji Maharaj University, Navi Mumbai
9782329164 engineerrajp@gmail.com

INC of IAH
Reg. Off.: O/o Central Ground Water Board, Bhujal Bhawan, NH-IV, Faridabad – 121001
E: ashok.kumar@inciah.org
www.inciah.org

IAH membership Form 2025 (Renewal / New Membership)

Indian National Chapter
of International Association of Hydrogeologists (INC of IAH)
(Registered under Haryana Registration and Regulation of Societies Act 2012, Registration No. HR-019-2016-02281)
Reg. Off. c/c Central Ground Water Board, Bhujal Bhawan, NH-IV, Faridabad – 121001
https://inciah.org

Application for membership *(Membership through Indian Chapter and payment in India Rupees)*

To join IAH use our quick online service at http://www.iah.org (credit or debit card payments only)
or complete this form and send by email (as a pdf for security), mail or fax to:
swarden@iah.org
IAH Secretariat, PO Box 4130, Goring, Reading, RG8 6BJ United Kingdom: Fax: +44 118 380 5225

Title (e.g. Dr/Mr/Mrs/Miss)_____ Family name_____

Given names_____ Gender: Male/Female

Full mailing address_____

_____

Town_____ Post/zip code_____

Country_____ Telephone_____

Email_____

Employer/Organisation/University_____

Experiences/interests in groundwater/hydrogeology_____

_____

Please indicate number of years' experience: student/early career /10+ / 20+ / 30+/retired

Categories & fees 2025	Applicable Fee in EURO for India (Transitional Country)	Applicable Fee in INR for India through INC-IAH
Member	€ 46.00	INR 4,200
Online Member	€ 36.00	INR 3,300
Student Member	€ 22.00	INR 2,000
Student Online Member	€ 14.00	INR 1,300
Retired Member	€ 24.00	INR 2,200

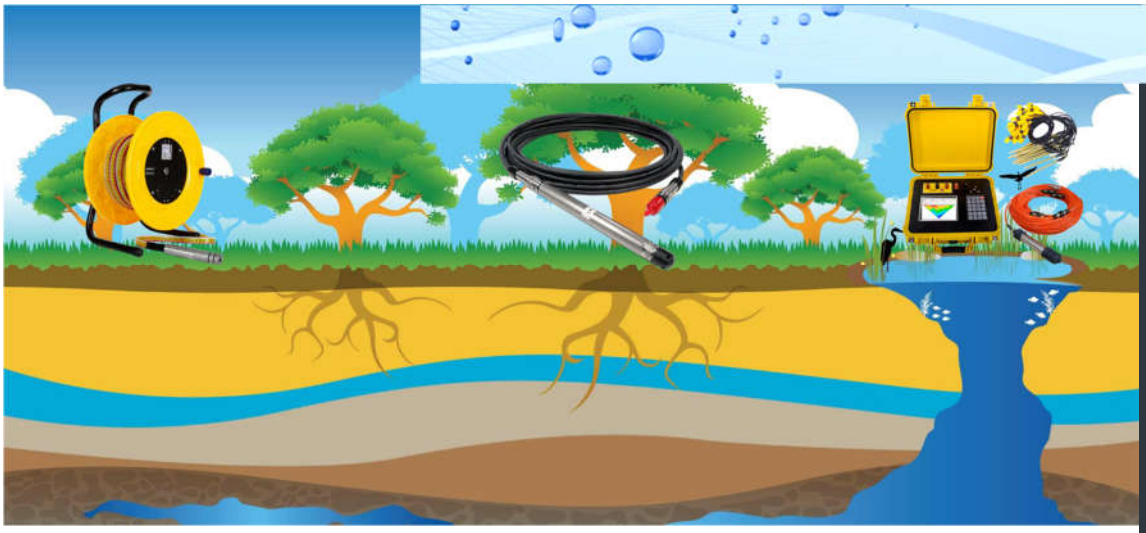
Fee payment method to become / renew IAH membership for 2025 in Indian currency through INC-IAH Option:

1. Through INC-IAH: Depositing membership Fee by cheque in Bank of Baroda in the name of "INC of IAH" A/C No. 26430200000544 (Bank of Baroda, CGO Complex, NH-IV, Faridabad-121001 (Haryana).
2. Through INC-IAH: Online transfer to "INC of IAH" Bank of Baroda A/C No. 26430200000544, IFSC Code: BARB0CGOFAR.
3. Direct payment to IAH on http://iah.org (in EURO)

Details Required: (A). Renewal: Payment proof with membership number and category of membership opted **B. New Membership:** Fill up the form and send details to the Treasurer, INC of IAH on ashok.kumar@inciah.org (Mobile # 9818174707).

Note: The fee amount in Indian Rupees includes administrative costs for transferring the fee to IAH in Euro.

Contact: President – 9829010304, Vice President – 9433588814, Secretary – 7027666480, Treasurer – 9818174707



Groundwater News in Media

Groundwater recharge declined marginally in 2024, dip in water availability too

NEW DELHI: Total annual groundwater recharge in the country marginally declined in 2024, compared to 2023, and so did water availability due to higher groundwater extraction last year, with northwest India, including parts of Punjab, Haryana, Delhi and western Uttar Pradesh, being the bigger culprits.
https://timesofindia.indiatimes.com/india/groundwater-recharge-declined-marginally-in-2024-dip-in-water-availability-too/articleshow/117182060.cms

Earth has tilted 31.5 inches in less than two decades due to…, reason will leave you shocked and it is connected to India

Recent research reveals that in under 20 years, Earth's tilt has shifted by 31.5 inches as a result of excessive groundwater extraction. While the change might appear minor, it carries serious consequences.
https://www.india.com/news/world/earth-has-tilted-31-5-inches-in-less-than-two-decades-due-to-excessive-groundwater-extraction-reason-will-leave-you-shocked-and-it-is-connected-to-india-7730626/

65% increase in groundwater extraction in Goa over 12 years, shows govt data

Panaji: Though Goa has been catergorised as 'safe' with 21.4% groundwater extraction, the latest groundwater assessment for the state by the water resources department has shown that the level of extraction from 2011 to 2023 has increased by 65% over the 12-year period.
https://timesofindia.indiatimes.com/city/goa/65-increase-in-groundwater-extraction-in-goa-over-12-years-shows-govt-data/articleshow/119955817.cms

Parts of Telangana stare at drought this summer as groundwater levels deplete rapidly

Hyderabad: The rapid depletion of groundwater in parts of Telangana is emerging as a major threat to the standing Rabi (Yasangi) crops that are in a crucial stage. With wells and borewells running dry and tanks and ponds empty, the groundwater situation is becoming increasingly dire.

https://telanganatoday.com/parts-of-telangana-stare-at-drought-this-summer-as-groundwater-levels-deplete-rapidly

Water crisis in Pune: As water levels dip in reservoirs, a look at steps taken to tackle the issue

As summer is approaching fast, Pune is experiencing a major water shortage, despite assurances from the Canal Advisory Committee. Reduced supply times and low pressure are affecting several localities. A loot at steps taken by the government to tackle the water crisis.

https://www.news9live.com/india/water-crisis-in-pune-as-water-levels-dip-in-reservoir-a-look-at-steps-taken-to-tackle-the-issue-2836098

Open-Source Groundwater Modelling Software options besides MODFLOW

iMOD: iMOD is an easy-to-use Graphical User Interface (GUI) that accelerates the Deltares-version of MODFLOW. It offers fast, flexible, and consistent sub-domain modeling techniques. iMOD facilitates large-scale, high-resolution MODFLOW groundwater modeling and allows geo-editing of the subsurface.

Modflow OWHM: The MODFLOW One-Water Hydrologic Flow Model is an integrated hydrologic model based on MODFLOW-2005. It's designed for analyzing conjunctive-use management. The term "integrated" refers to the tight coupling of groundwater flow, surface-water flow, landscape processes, aquifer compaction and subsidence, reservoir operations, and conduit (karst) flow.

IWFM (Integrated Water Flow Model): IWFM is a computer program used for water resources management and planning within a basin. It calculates groundwater flows, soil moisture movement in the topsoil, stream flows, land surface flows, and flow exchange between groundwater, streams, and land surface.

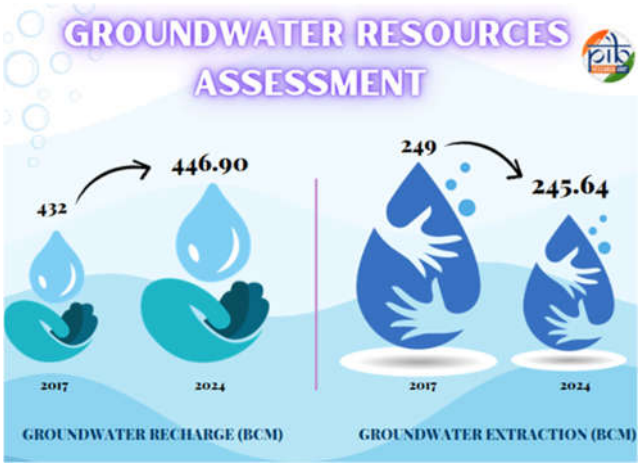
WRF-Hydro (Weather Research and Forecasting Model Hydrological): WRF-Hydro is a community-based, open-source model coupling framework. It links multi-scale process models of the atmosphere and terrestrial hydrology. Its goal is to provide comprehensive hydrological modeling, including surface water and groundwater interactions.

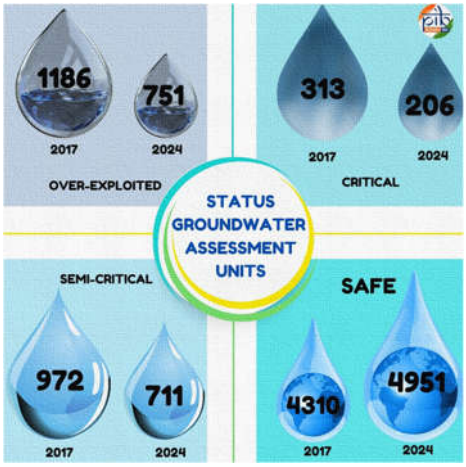
अप्स्वन्तरमृतमप्सु भेषजम् ।
जल में अमृत है, जल में औषधि है।
There is nectar in water; there is medicine in water.
ऋग्वेद १.२३.१९ । Rigveda 1.23.19

अजीर्णे भेषजं वारि, जीर्णे वारि बलप्रदम् ।
भोजने चामृतं वारि, भोजनान्ते विषप्रदम् ॥

Some facts about groundwater

India's Groundwater Resources: According to the 'National Compilation on Dynamic Ground Water Resources of India, 2024', the total annual groundwater recharge is assessed at 446.90 billion Cubic Meters (BCM), with an extractable resource of 406.19 BCM and an annual extraction of 245.64 BCM. The report highlights increased recharge, mainly due to water bodies, tanks, and conservation structures and shows improvements in groundwater





SOFTWARE

Geographical Information Systems

1. QGIS: QGIS is a completely open-source GIS tool and can be executed in any operative system.
www.qgis.org

2. SAGA GIS: It is a GIS platform oriented to spatial analysis. It is a simple but powerful tool for spatial analysis and characterization of basins.
www.saga-gis.org

River modeling

3. HEC-RAS: This model uses the gradient and topography to evaluate the flow depth, velocities and flooded zones.
www.hec.usace.army.mil/software/hec-ras/

4. iRIC: iRIC is a software offers a complete simulation environment of the riverbed
http://i-ric.org/en/

Hydrologic modeling

5. HEC-HMS: HEC-HMS is designed to simulate the hydrologic processes in basins.
www.hec.usace.army.mil/software/hec-hms

6. PRMS: The modeling code PRMS is a modular system of spatially distributed parameters, which represent the physical processes of a basin.
www.brr.cr.usgs.gov/projects/SW_MoWS/PRMS.html

7. SWAT: It is a tool to evaluate soil and water at a basin scale.
www.swat.tamu.edu

Hydrogeological modeling

8. MODFLOW: This code performs groundwater modeling based on finite differences developed by the USGS.
http://water.usgs.gov/ogw/modflow/

9. MT3DMS: The MT3DMS package is a mass transport model coupled to a flux model in MODFLOW.
http://hydro.geo.ua.edu/mt3d/ P.5

Computational fluid dynamics modeling

10. OpenFOAM: Pretty much any physical phenomenon associated to fluid dynamics can be represented with this software.
www.openfoam.org

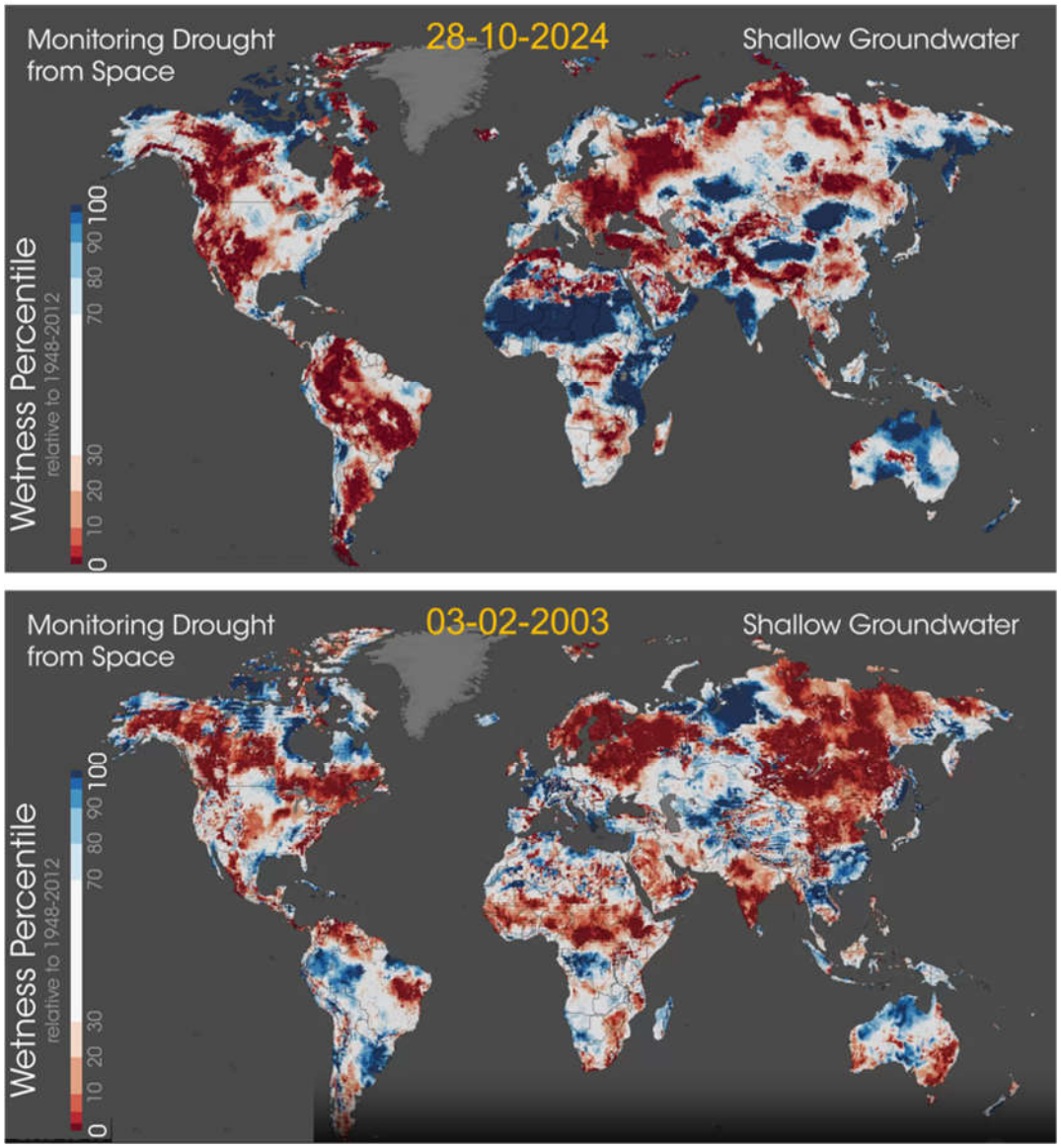
Hydrochemical modelling software

11. PHREEQC: It is a computer program is designed to perform a wide variety of aqueous geochemical calculations.
https://www.usgs.gov/software/phreeqc-version-3

P.09

Monitoring Global Groundwater from Space

(Source: https://svs.gsfc.nasa.gov/31178)

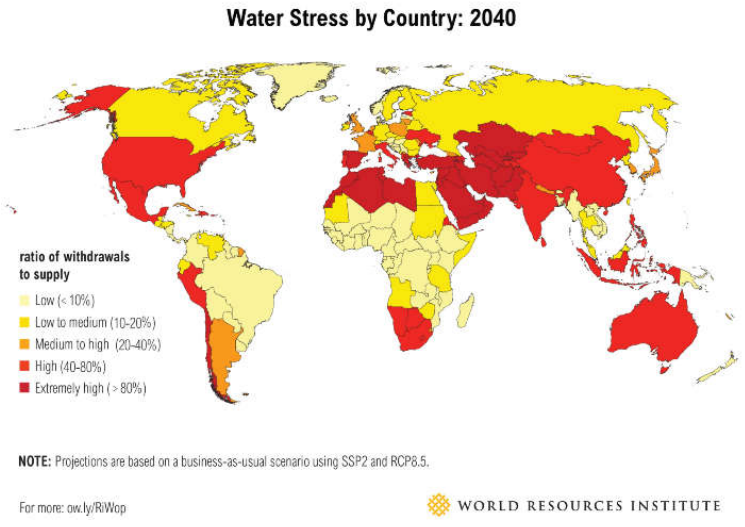


Aqueduct Projected Water Stress Country Rankings

By Tianyi Luo, Robert Young and Paul Reig, World Resources Institute

Using an ensemble of climate models and socioeconomic scenarios, WRI scored and ranked future water stress—a measure of competition and depletion of surface water—in 167 countries by 2020, 2030, and 2040. We found that 33 countries face extremely high-water stress in 2040

https://reliefweb.int/report/world/aqueduct-projected-water-stress-country-rankings



Uncertainty in Groundwater Modeling

NGWA WHITE PAPER

Uncertainty is inherent in the groundwater modeling process. This paper discusses sources of uncertainty and highlights some of the tools, methods, approaches, and good practices to help evaluate, quantify, and communicate model uncertainty.

Conceptual / Model Error:

Model is a simplified version of reality, and system completeness is not known, or when conceptualizing / constructing a model, system assumptions have to be made. These assumptions can lead to various types of error and include the following general categories:

- Incorrect hypotheses
- Missing processes
- Structural complexity
- Temporal complexity

Parameter Error

Measurement errors

- Interpolation errors
- Scaling errors

Structural Noise

Predictive Error

Approaches for Managing Uncertainty

Sensitivity analysis

- Parameter sensitivity analysis
- Scenario sensitivity analysis

Tools

Single conceptualization tools

- Basic scenario analysis
- Monte Carlo method

Multiple conceptualization tools

- Generalized Likelihood Uncertainty Evaluation (GLUE)
- Bayesian uncertainty analysis

https://www.ngwa.org/docs/default-source/default-document-library/2024-white-papers/groundwater-modeling-paper-3.pdf

Felicitation of Veteran Hydrogeologists

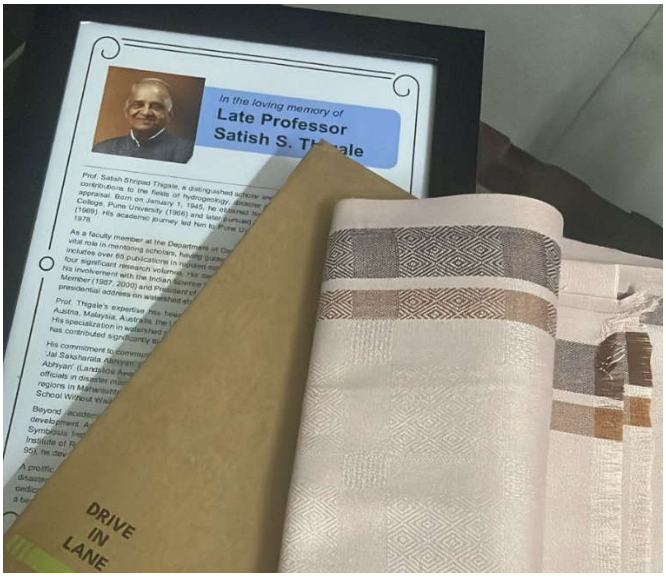
Veteran Hydrogeologists have been felicitated during in ceremony during the INC-IAH Seminar on EARTH SCIENCE PERSPECTIVE ON GROUNDWATER SUSTAINABILITY - RECENT ADVANCES (1st to 2nd March 2025) at Amity University, Jaipur

In the loving memory of Late Professor Satish S. Thigale,

Prof. Satish Shripad Thigale, a distinguished scholar and academician, has made pioneering contributions to the fields of hydrogeology, disaster management, and geo-environmental appraisal. Born on January 1, 1945, he obtained his B.Sc. (Hons) degree from Fergusson College, Pune University (1966) and later pursued an M.Sc. (Tech) from Nagpur University (1969). His academic journey led him to Pune University, where he completed his Ph.D. in 1978.

As a faculty member at the Department of Geology, Pune University, Prof. Thigale played a vital role in mentoring scholars, having guided 13 Ph.D. students. His prolific research output includes over 65 publications in reputed national and international journals and the editing of four significant research volumes. His dedication to knowledge dissemination is reflected in his involvement with the Indian Science Congress Association, where he served as Sectional Member (1987, 2000) and President of the Earth Science Section (2004), delivering a seminal presidential address on watershed studies.

Prof. Thigale's expertise has been recognized globally through academic engagements in Austria, Malaysia, Australia, the USA, Japan, Yemen, Iran, the Netherlands, and Switzerland. His specialization in watershed management, RS-GIS applications, and disaster management has contributed significantly to environmental sustainability and public awareness.



Professor G. Krishna Rao

Prof. G. Krishna Rao was born on June 15, 1943, in Bondada village, West Godavari district, Andhra Pradesh. He had an outstanding academic career, earning his B.Sc. (Hons), M.Sc., and Ph.D. in Geology from Andhra University (1961–1971) and undergoing Geological Survey of India (GSI) Officer's field training in 1971. He began his professional career as an Assistant Hydrogeologist with the State Groundwater Department, A.P., in 1972, later joining the Central Ground Water Board in 1974. In 1979, he moved to academia as a Lecturer in Geology at Andhra University, where he served until retirement in 2003. From 1986 to 1991, he was deputed as a Colombo Plan Expert to Tribhuvan University, Nepal, by the Government of India. He also held key administrative roles, serving as Dean of Examinations (1998–2002) and later as Coordinator (Director) of the Delta Studies Institute (2002–2005). Post-retirement, he was honored with an Emeritus Professorship.

Prof. Rao guided ten Ph.D. and one M.Phil. scholar, along with seven M.Sc. dissertations in Nepal. His research resulted in 83 national and international journal papers (five from Nepal), 13 special volume articles, and 68 conference presentations, covering topics such as Bauxite, Groundwater studies, and environmental geology. His extensive fieldwork included groundwater exploration, well spacing studies, drilling supervision, long-duration pumping tests, and water supply investigations. He also raised public awareness on groundwater pollution, overexploitation, mining, and land subsidence due to natural gas extraction from the Krishna-Godavari Basin, providing critical insights to government agencies.

Dr. S. P. Sinha Ray

Dr. S. P Sinha Ray, born in April 1942 got his Post Graduate degree in Applied Geology from Jadavpur University in 1964 and obtained PhD (Science) degree from J.U. in 1974. He joined Geological Survey of India in 1966, subsequently his service was transferred to Central Ground Water Board in 1972. He retired as Member (SML), Central Ground Water Board in 2002. He has more than 50 years of extensive experience in ground water exploration, development and management. By virtue of his long association with the apex body of the country dealing with ground water resources, he has acquired a very rich experience in the particular subject. Besides having vast knowledge about the subject within the country, he has also gained knowledge and working experience in other countries like Algeria, Bangladesh. USA, Korea and Zimbabwe. He has also contributed in various national and international publications. He attended Training on "Ground Resources Development organized by Overseas Technical Cooperation agency, Japan, Tokyo in 1973 and training on "Computer and databases" in San Juan, Puerto Rico, by U.S. Geologist Survey in 1992.

He is a distinguished hydrogeologist with significant contributions to groundwater research and policy. Currently, he serves as the Chairman of the Fluoride Task Force, PHED, West Bengal; a Member of the Arsenic Task Force, West Bengal; and Chairman of the R&D Committee for Earth, Atmosphere, Ocean, Planetary Science, and Water Resources under the Department of Science & Technology, Government of West Bengal. A Fellow of the West Bengal Academy of Science and President Emeritus of the Centre for Ground Water Studies (CGWS), he has played a pivotal role in advancing hydrogeological research. In 1982, he established the Indian National Chapter of the International Association of Hydrogeologists (INC-IAH) in Kolkata in consultation with Dr. Romijn, then Secretary General of IAH, and served as its secretary under the leadership of the late Dr. K. K. Prasad. He has organized key seminars in Kolkata and Patna, edited influential books on groundwater development and contamination published by Springer, and co-edited a volume on water resources in Eastern and Northeastern India. After retiring in 2002, he founded CGWS in 2003, an organization accredited by CGWA in 2021, which has since completed over 100 hydrogeological research projects. His contributions also include being the first member from the Hydrogeological Branch in both the Central Ground Water Board (CGWB) and the CGWA, cementing his legacy in groundwater science and management.

Professor V. Subramanian

Professor V. Subramanian is a renowned scientist, professor and a pioneer in the field of Environmental Sciences. A retired but RE-TYRED Professor from the School of Environmental Sciences, JNU and UGC Emeritus professor, he has recently been declared by Stanford University study to be amongst the top 2% scientists in the world in the field of Environmental Sciences. Highlights of his personal achievements in training/education include a gold medal in the Masters in Geosciences from Jadavpur in the year 1966. A Fulbright scholar all-through his stints in Yale University, Univ. Illinois, Chicago, culminated in a PhD from Northwestern University, USA 1973.An exemplary academic, he has pioneered the field of environmental sciences in India with seminal research contributions. Significant academic positions include Emeritus Fellow, UGC, Advisor, Amity Univ., coordinator, DRS Prog. In Biogeochemistry, Professor and Dean, School of Environmental Sciences, JNU, Asst. Prof. McGill University, Canada, Guest Faculty DU, DCE.A visiting faculty at a number of international and national institutions including Oxford brooks university, UK, University Antwerpen, Belgium, CNRS, Toulouse, France; Hamburguni university, Bremen university, Germany, University of Delaware, USA and University of Upsala, Sweden. He continues to deliver keynote and invited lectures in institutions, conferences and meetings national and international. As a hands-on researcher and a scientist in water chemistry, geology, environment and climate sciences, he has supervised over 35 PhDs and 85 MPhils in the last 40 years with his many students currently VCs in Universities, UN, Policymakers in the government and of course professors and scientists around the world. His areas of expertise and specialization encompasses Environmental Chemistry, River water quality and quantity, Environmental quality, EIA, Water and Environment, Geochemistry and natural mineral and water resources, Pollution, River basins, Hydrology and Impact assessment. Authoring over 13 books. Honors: Hanse fellow, Institute of advanced Study, Delmenhorst, Germany (May 2004-July, 2004). Palme Fellow, University of Uppsala, Sweden. 2003-2006.Nominated for Stockholm Water Prize,2003 by University of Uppsala and valid till 2008.

Dr. V. B. Khilnani

Dr. V.B. Khilnani is the Founder, Chairman, and Managing Director of Hydro-Geosurvey Consultants Private Limited, Jodhpur, Rajasthan, India, since 1988. He is now 87 years old, born on 5th April, 1938 and son of a freedom fighter who was imprisoned thrice by British Government during 1940 to 1942. After returning from foreign deputation from Tanzania in 1980, he sought voluntary retirement from the Government of Rajasthan where he was working as Superintending Hydrogeologist, Ground Water Department, Jodhpur and established partnership firms and worked as its Chief Executive, HYDROGEOSURVEY, undertaking ground water investigations and GEOSURVEY conducting mineral investigations from 1981-88. Since 1988, he formed a groundwater consultant organization when his two sons and daughter -in –law joined as Executive Directors after qualifying M. Tech in Applied Geophysics and Applied Geology from Roorkee University. Dr. Khilnani is working with large Indian Corporate houses owning cement plants, thermal power plants, steel plants, Zinc smelters, paper and breweries, base metal and limestone mines, open cast coal and underground mines etc. by conducting comprehensive hydrological and hydrogeological assessment studies comprising remote sensing, long- duration pumps, impact of mining and plants on the surface and ground water regime as these studies were necessary to get environmental clearances from MoEF and NOC from CGWA. He also visited and conducted investigations in foreign counties like Chad, Vietnam, UAE, and Madagascar.

He also worked on Asian Development Bank assisted projects as Hydrogeologist with Project Management Consultants for J & K and Gaya city (Bihar) to identify and assess new groundwater resources of water supply of these cities for next 15 and 30 years and with Cairn Energy Pty. Ltd for identifying saline water source providing 2500 KLD for injection for enhancing the crude oil recovery during 2003-06 and got its NOC from CGWA.

While working with Groundwater Department, he proved Ferruginous Jodhpur sandstone as a potential aquifer of Jodhpur-Nagaur districts capable of yielding moderate to high discharge of potable ground water for drinking and irrigation, which was not earlier identified as potential aquifer by GSI, ETO & ONGC. He also located new potential aquifers along Indo-Pak border for Border Road Organization which are now the sites of Army cantonments. His company has been accredited by QCI-NABET as Groundwater Consultant Organization effective from 3rd December, 2020.

INC of IAH Award – 2023

INC of IAH Award -2023 has been distributed in ceremony during the INC-IAH Seminar on EARTH SCIENCE PERSPECTIVE ON GROUNDWATER SUSTAINABILITY - RECENT ADVANCES (1st to 2nd March 2025) at Amity University, Jaipur

Life Time Achievement Award

Dr. N. J. Pawar, *Vice-Chancellor, Dr. D. Y. Patil Vidyapeeth (Deemed to be University), Pune*

Professor Dr. N. J. Pawar, a distinguished geologist, has made significant contributions to hydrogeology, environmental geochemistry, and higher education. Born in June 1957, he earned his B.Sc. from Shivaji University, Kolhapur (1974), M.Sc. from the University of Pune (1980), and Ph.D. (1985). His research excellence earned him the Young Scientist Award (1984) from the Indian Science Congress Association and two British Council Fellowships for postdoctoral research at the University of East Anglia, U.K. With over 35 years in academia, Dr. Pawar has served as Lecturer, Reader, and Professor at the University of Pune, holding key positions, including Head of the Geology Department. As Vice-Chancellor of Shivaji University, Kolhapur (2010-2015), he introduced major academic reforms, including the semester system at the undergraduate level and the Choice-Based Credit System at the postgraduate level, enhancing the university's national and international standing.

Ground Water Excellence Award

Prof. Prasoon Kumar Singh, *Department of Environmental Science & Engineering at IIT (ISM) Dhanbad*

Prof. Prasoon Kumar Singh is a distinguished Professor in the Department of Environmental Science & Engineering at IIT (ISM) Dhanbad, with over 30 years of expertise in Environmental Hydrogeology. His research focuses on groundwater contamination, hydrogeochemical assessments, aquifer vulnerability, and water stress zones, particularly in coal mining and industrial regions. As a Principal Investigator (PI) and Co-PI, he has led multiple R&D projects funded by Coal India Limited (CIL), Ministry of Jal Shakti (MoJS), UGC, GMDC, DVC, and Birla Corporation Limited, developing strategies for groundwater potential assessment, contamination evaluation, and AI/ML-based water-stress analysis. His GISbased groundwater vulnerability mapping aids decision-making for sustainable resource management. Prof. Singh has mentored 25 Ph.D. and 38 M.Tech. scholars and published over 50 research papers in high-impact journals on groundwater sustainability, pollution indices, and remediation techniques. Recognized by MOEF&CC, DEAC, AICTE, QCI-NABET, and UPSC, he serves as an expert member and journal reviewer. He also teaches two popular SWAYAM-NPTEL courses on groundwater management and environmental geosciences. Recently, he was appointed Chairman of the Technical Committee for Accreditation Scheme for Prospecting Agency (APA) and Mining Plan Preparing Agency (MPPA) by QCI-NABET. A Gold Medallist in his post-graduation, he has received numerous accolades, including the Prize Book Award, Best Paper Award, and Research Ratna Award, reflecting his impactful contributions to groundwater research and management.

Young Scientist Award

Dr. Rambabu Singh, *In-charge, Hydrogeology Division, Central Mine Planning & Design Institute Limited, Regional Institute-IV, Coal India Limited, Nagpur.*

Dr. Rambabu Singh holds an M.Sc. Tech and Ph.D. in Applied Geology from IIT(ISM), Dhanbad. He is a QCI-NABET certified Project Coordinator (GWCO) and Functional Area Expert (Cat-A) in Hydrogeology. He serves as a Member of the Board of Studies (BoS), Department of Geology, Central University of Punjab and has fourteen years (2011–present) of industry experience. Throughout his tenure, he has held key positions,including In-charge of the Hydrogeology Division, Nodal Officer (Mine Water Cell), and Manager (Geology) at CMPDIL, Coal India Limited (A Maha Ratna PSU, Government of India). Dr. Singh has played a pivotal role in implementing remedial and water conservation measures to safeguard water resources and promote ecologically sustainable industrial development (ESID) in coal mining regions. He has made outstanding scientific contributions, authoring 37 research publications, including 24 papers in high-impact Q1-Q3 Web of Science journals. His research includes a landmark study in Scientific Reports (Nature Research), a pioneering contribution to medical geology in India, and a key publication in Ore Geology Reviews, offering new insights into placer deposits along India's east coast.

Best Paper Award: Female category

Dr. Yogita Dashora, *Postdoctoral researcher, DANIDA-IWRM Project, The University of Copenhagen MARVI Project, Vidya Bhavan Polytechnic College, Udaipur*

Dr. Yogita Dashora is a postdoctoral researcher specializing in hydrogeology, with a focus on Managed Aquifer Recharge (MAR) and community-based groundwater management in semi-arid regions. She is currently working on the DANIDA-IWRM Project with the University of Copenhagen and is also associated with the MARVI Project at Vidya Bhavan Polytechnic College, Udaipur. She holds a Ph.D. in Irrigation Water Management Engineering from Maharana Pratap University of Agriculture and Technology (MPUAT), Udaipur, where her research focused on MAR structures in the Dharta Watershed. She has worked as a Senior Research Fellow (SRF) on major water projects, including the Som Kamla Amba Irrigation Project and MARVI. Over the past decade, Dr. Dashora has contributed to three major research projects led by Western Sydney University (Australia), Central Water Commission (India), and the University of Copenhagen (Denmark). She has secured prestigious grants and fellowships, including the DANIDA Fellowship (2023), UNESCO Grants (2016, 2017), South Australian Rajasthan Water Management Fellowship (2017), and IWMI Fellowship (2013-2015).

Best Paper Award: Male category

Dr. Abhishek Pandey, *Project Associate and Ph.D. Scholar, AcSIR, CSIR-CIMFR, Dhanbad*

Mr. Abhishek Pandey Bharat is currently a Project Associate and pursuing his Ph.D. at the AcSIR, CSIR-Central Institute of Mining and Fuel Research, Dhanbad. He completed his B.Sc. in Geology from Dr. Harisingh Gour University and his M.Sc. in Geology from Jiwaji University, Gwalior, in 2017, securing first merit. He was awarded the prestigious DST-INSPIRE Fellowship and worked as a Junior Research Fellow (2018-2020) and Senior Research Fellow (2020-2023). His research focuses on coal mine water geochemistry, particularly water quality assessment, contaminant source evaluation, and the impact of mining on surrounding groundwater resources. His key areas of interest include major ion chemistry, rock-water interaction, ion exchange processes, heavy metal geochemistry, source apportionment of contaminants, water quality indexing, human health risk assessment, stable isotope geochemistry for understanding groundwater recharge mechanisms, and sustainable mine water management and utilization. Mr. Bharat has published research articles in reputed SCI journals such as the International Journal of Environmental Analytical Chemistry, Chemistry and Ecology, and Chemosphere. Additionally, he has contributed a book chapter, currently in pre-print, for CRC Press (Mining Impact on Soil and Water Resources).

Best Ph. D. Thesis Award

Dr. Tanveer Ali Dar, *Postdoctoral Researcher, Department of Earth, Geographic, and Climate Sciences, University of Massachusetts, Amherst*

Dr. Tanveer Ali Dar is a distinguished hydrogeologist specializing in groundwater hydrogeology, surface-groundwater interactions, isotope hydrology, and climate change impacts on water resources. He earned his Ph.D. in Earth Sciences from IIT Roorkee, where he investigated surface water-groundwater interactions in the Upper Jhelum Basin using integrated geochemical, isotopic, and modeling approaches. Currently, he is a Postdoctoral Researcher at the University of Massachusetts Amherst, USA working on climate-driven changes in groundwater recharge patterns in the U.S. Northeast, funded by USGS. His expertise includes hydrological modeling, isotopic tracer studies, and advanced geochemical analyses. Dr. Dar has been recognized with the Young Researcher Award (InSc-2024), and the prestigious Co-PREPARE Indo-German Conference Grant (2021). He has served as a Student Volunteer at AOGS 2024, South Korea, and has been actively engaged in groundwater research initiatives at the National Institute of Hydrology (NIH), Roorkee. He has published extensively in high-impact international journals and has contributed significantly to understanding groundwater sustainability in Himalayan and intermontane basins. His research integrates hydrogeological fieldwork, isotopic techniques (Picarro CRDS, IRMS, ICP-MS), and numerical modeling (MODFLOW, SWAT, HYDRUS) to address emerging challenges in water resource management.

Award received by relatives on behalf of **Dr. Tanveer Ali Dar**

Best Post-Graduate Dissertation Award

Mr. Aditya Shandilya, *Post-graduate student, Department of Geology, Savitribai Phule Pune University, Pune*

Dr. Mr. Aditya Shandilya is a geologist with a strong background in hydrogeology and remote sensing. He completed his B.Sc. from The Maharaja Sayajirao University of Baroda and his M.Sc. from Savitribai Phule Pune University. His research focuses on groundwater quality, land-use changes, and environmental impact assessments. He completed his dissertation work on the topic “Hydro chemical Characterization of Phreatic Groundwater from Dang District, Gujarat”, evaluating its suitability for drinking water. His research contributes valuable insights into groundwater management and sustainable water resource planning for the region. He has extensive field experience across various geological settings, including formations of Central Gujarat, as well as the mainland Kutch region. He has worked in various projects including groundwater quality assessments in Ahmednagar, landslide assessments in Varanda Ghat, and evaluating the impact of water harvesting structures in Satara. Through his diverse fieldwork and research, Mr. Shandilya continues to contribute to the understanding of groundwater systems and environmental geology.

Indian National Chapter of the International Association of Hydrogeologists

National Seminar
on
Earth Science Perspective on Groundwater Sustainability - Recent Advances

1-2 March 2025 at Jaipur, Rajasthan, India

In an era of climate change, rapid urbanisation and ecosystem degradation, groundwater sustainability has emerged as one of the most pressing challenges facing the Earth System. With approximately 2 billion people relying on groundwater resources for their daily needs, understanding its sustainability is crucial for ecosystems, economies, and communities alike.
Join us for a comprehensive seminar that brings experts in Earth Science, hydrology, and sustainability management to the fore. Delving into the critical issues surrounding groundwater resource management, the Seminar provides an opportunity to learn about the latest scientific research and explore innovative strategies for ensuring the long-term viability of this vital resource.

Major Themes of the Seminar:

- Integrated Hydrogeological Modelling
- Water Quality and Emerging Contaminants
- Coastal, Island and Inland Aquifer System and Aquifer Recharge- Natural & Managed
- Climate Change Impact on Groundwater Resources and Adaptation Strategies
- Innovative techniques, Practices and Policies for Sustainable Groundwater Resource Management
- Rock-Groundwater-Surface Water Interactions
- Geological and Geophysical Methods for Deeper Aquifers
- Land use, Groundwater Depletion and Recovery
- Community Engagement, Stakeholder Involvement and Education

Special Announcement for Young Researchers:

✓ A Special Session for Young Researchers below 40 Years.
✓ Assistance to a limited number of young researchers depending upon the availability of funds.

Abstract and Registration information:

We are inviting the original / review research from prospective students, researchers, academicians/scientists and professionals relevant to the seminar's themes.

Call for abstract	**up to 31 January 2025**
Abstract format	Max. 250 words with max. five keywords in MS format mentioning the title, affiliations, authors and presenter name, email and mobile
Submission to	secretaryinciah@gmail.com
Registration	**Open**
Registration fee	**Students: ₹750, Research Scholar: ₹1500, Academician/Scientist: ₹2500, Corporate: ₹4000**
Account Name	INC of IAH
Bank	Bank of Baroda
A/C No	**26430200000544**
IFSC Code	BARB0CGOFAR

Note: For Sponsorship/advertisement, please get in touch with us

For more information, please contact us

Prof. A. K. Sinha (President INC-IAH, E: groundwater2008@gmail.com, M. 9829010304)
Prof. B. S. Chaudhary (Secretary, INC-IAH, E: secretaryinciah@gmail.com, M. 7027666480)

NATIONAL SEMINAR ON
EARTH SCIENCE PERSPECTIVE ON GROUNDWATER SUSTAINABILITY - RECENT ADVANCES (1-2 MARCH 2025 AT JAIPUR, RAJASTHAN, INDIA)

COMMITTEE MEMBERS FOR NATIONAL SEMINAR

CHIEF PATRONS

- **Sri Bhaskar A. Sawant**, IAS; Principal Secretary, PHED & Groundwater Dept., GoR, Jaipur
- **Dr. Aseem Chauhan**, Chancellor - Amity University Rajasthan, Jaipur
- **Dr. Sunil Kumar Ambast**, Chairman, CGWB, Ministry of Jal Shakti, GoI, New Delhi

PATRONS

- **Prof. (Dr) Amit Jain**, Vice Chancellor, Amity University Rajasthan, Jaipur
- **Prof. A. K. Sinha**, Vice-President Asia, & President, Indian Chapter of IAH
- **Shri Suraj Bhan Singh**, Chief Engineer, Ground Water Dept., GoR

CO-PATRONS

- **Prof (Dr.) G. K. Aseri**, Pro Vice Chancellor, Amity University Rajasthan Jaipur
- **Dr Anadi Gayen,** Regional Director, CGWB (ER), Kolkata, GoI
- **Dr Ramakant Mishra**, Superintending Engineer, Ground Water Department, GoR

ORGANISING SECRETARY

- **Prof B S Chaudhary**, Secretary INC-IAH & Chairman, Dept. of Geophysics, KU, Kurukshetra
- **Dr. Pankaj Sharma**, Assistant Professor, Amity University, Rajasthan, Jaipur

ASSOCIATE ORGANISING SECRETARY

- **Dr Ashok Kumar**, Treasurer, INC-IAH & Former Advisor – Hydrogeology, Cairn India, New Delhi
- **Dr Vijay Pal Meena**, Assistant Professor, University of Rajasthan, Jaipur

ADVISORY COMMITTEE

- **Prof. David Kreamer**, Past President, IAH
- **Dr Teodara Szocs**, President, IAH
- **Prof. A. D. Sawant**, Former Vice-Chancellor, University of Rajasthan, Jaipur
- **Prof. Vinay Sharma,** Dean (Research), Amity University Rajasthan, Jaipur
- **Dr IAN Dave**, Executive Manager, IAH
- **Prof S.L. Kothari**, Distinguished Prof. & VP, ASTIF, Amity University Rajasthan
- **Prof. Jagdish Prasad**, Coordinator-ASAS, Amity University Rajasthan, Jaipur
- **Prof. P.V.S. Raju**, Director- Amity COAST, Amity University Rajasthan, Jaipur
- **Shri Anand K Agrawal**, Former Chairman, CGWB, Ministry of Jal Shakti, GoI, New Delhi
- **Sri Sushil Gupta**, Former Chairman, CGWB, Ministry of Jal Shakti, GoI, New Delhi
- **Dr. T. B. N. Singh**, Member Secretary, CGWA, Ministry of Jal Shakti, GoI, New Delhi
- **Dr O P Mishra**, Advisor, MoES & Director, NCS, GoI, New Delhi
- **Sri M. S. Rathod**, Regional Director, CGWB (WR), GoI, Jaipur

TECHNICAL COMMITTEE

- **Prof Bhawna Umarikar**, Member, GB, INC-IAH & Dept. of Geology, Savitribai Phule Pune University
- **Dr Ashwani Kumar Tiwari**, Member, GB, INC-IAH & Assistant Professor, SES, JNU, N.Delhi
- **Mrs. Chirashree Mohanty**, Member, GB, INC-IAH & Scientist-D, CGWB, ER, Kolkata, GoI
- **Shri Sujit Sinha**, Member, GB, INC-IAH & Former Scientist, CGWB, Faridabad, GoI
- **Dr. R P Singh Kushwah**, Member, GB, INC-IAH & Director, CWDM, CSMU, Navi-Mumbai
- **Dr. Jabbar Khan**, University of Jaipur, Jaipur
- **Ms Suhani Srujanika**, Member, INC-IAH, Dept. of Geology, Savitribai Phule Pune University

- **ORGANISING COMMITTEE**
- **Dr. Era Upadhay**
- **Dr. Shweta Kulshreshtha**
- **Dr. Manmohan Singh Chauhan**
- **Dr. Rajeev Sharma**
- **Dr. Vinod Kr. Sharma**
- **Mr. Ronak Parikh**
- **Dr. Era Upadhay**
- **Dr. Shweta Kulshreshtha**
- **Dr. Manmohan Singh Chauhan**
- **Dr. Rajeev Sharma**
- **Dr. Vinod Kr. Sharma**
- **Mr. Ronak Parik**

Inaugural Function of the Conference

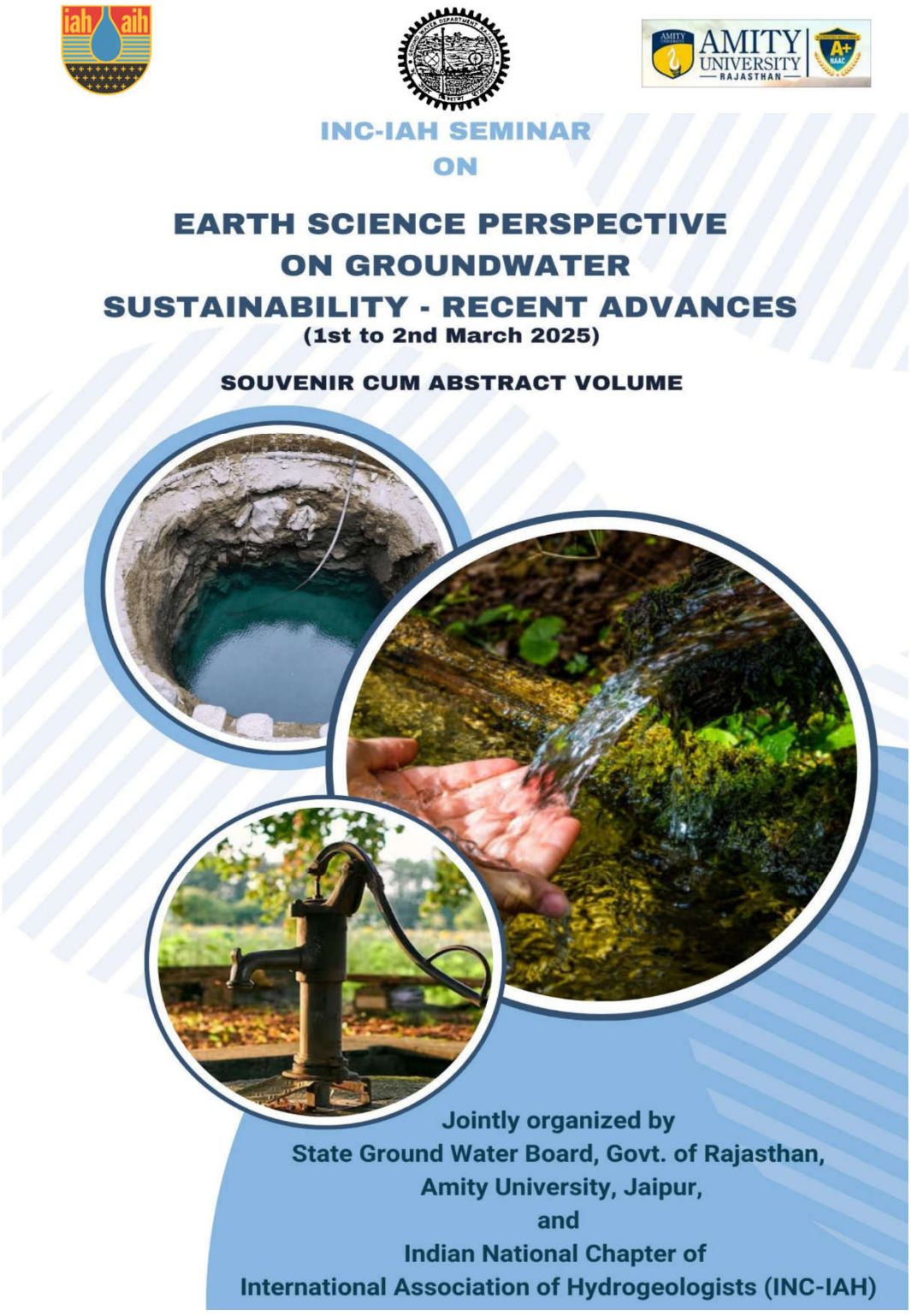
Release of Souvenir cum Abstract Volume

Glimpses of Participants

Glimpses of Participants

Glimpses of Participants

Group photograph Participants



Souvenir Cum Abstract Volume

National Seminar on Earth Science Perspective on Groundwater Sustainability - Recent Advances at Amity University, Jaipur, Rajasthan, India (1-2 March 2025) Jointly organised by State Ground Water Board, Govt. of Rajasthan, Amity University, Jaipur and Indian National Chapter of International Association of Hydrogeologists (INC-IAH)

Download Souvenir Cum Abstract Volume

POPULAR TALK

Popular Talk Series of Indian Chapter of IAH

Mine Dewatering Design For Open Pit And Underground Mines

Dr Kym L Morton, *PhD, MBA, C Geol FGS FSAIMM Pr Sci Nat DIC*
Water Strategist and Consulting Mining Hydrologist
KLM Consulting Services Pty Ltd
Johannesburg, Gaborone and London

The hydrogeologic setting in which a mine is located is a key feature in both the development of a mine plan and its successful execution. Mine dewatering is the action of removing groundwater from a mine. When a mine extends below the water table groundwater will, due to gravity, infiltrate the mine working. On some projects groundwater is a minor impediment that can be dealt with on an ad-hoc basis. In other mines, and in other geological settings, dewatering is fundamental to the viability of the mine and may require the use of very large resources and management.

Dewatering a totally or partially flooded mine, or even as a normal procedure in normal mine activity, may carry a number of problems, most of which can be prevented by early planning and monitoring of the sources and distribution of the water. Large problems are also developing with abandoned mines that have accumulated acid mine drainage that are growing to become a larger problem. There can be mitigation through proper scientific intervention

27th Sept, 2024
4.00 PM IST
Google Meet link
meet.google.com/ptn-facd-nxv
Dial-In: +1 530-618-7176
PIN: 249 183 964#

Host

Prof. (Dr.) A. K. Sinha
Vice-President (Asia), IAH Council
President, INC-IAH
Founder Vice-Chancellor, CSMU
Navi Mumbai
groundwater2008@gmail.com

Moderator

Prof. (Dr.) B. S. Chaudhary
Secretary, INC-IAH
Professor of Geophysics,
Kurukshetra University
bschaudhary@kuk.ac.in

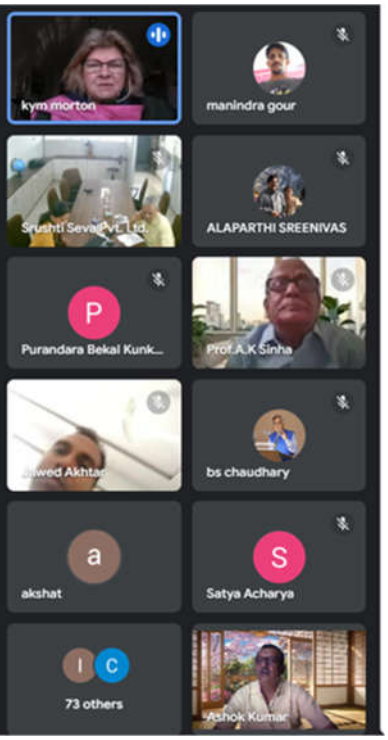
INC of IAH
www.inciah.org

Meeting Admin:
Dr Ashok Kumar
M: 9818174707
E: ashok.kumar@inciah.org

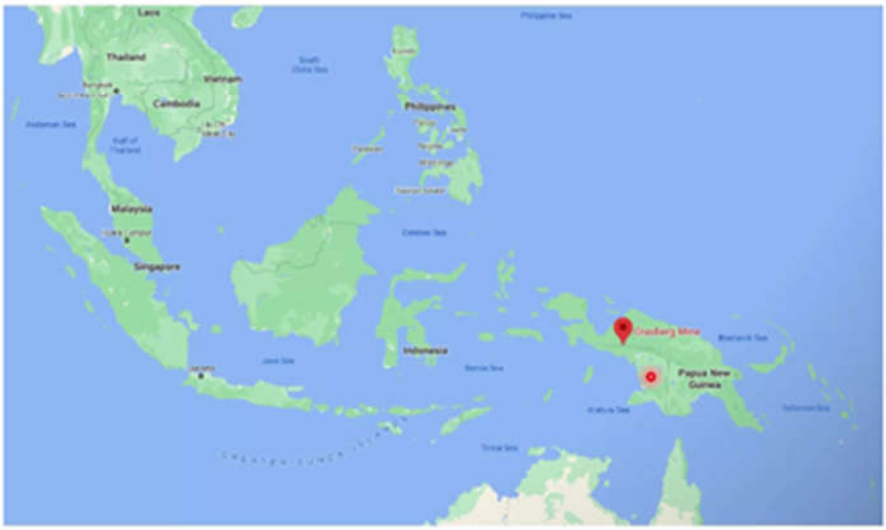
Save Water

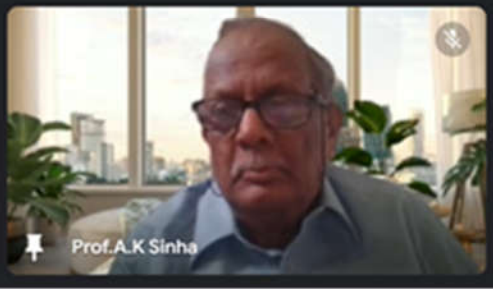
Content of talk by Dr Kym Morton

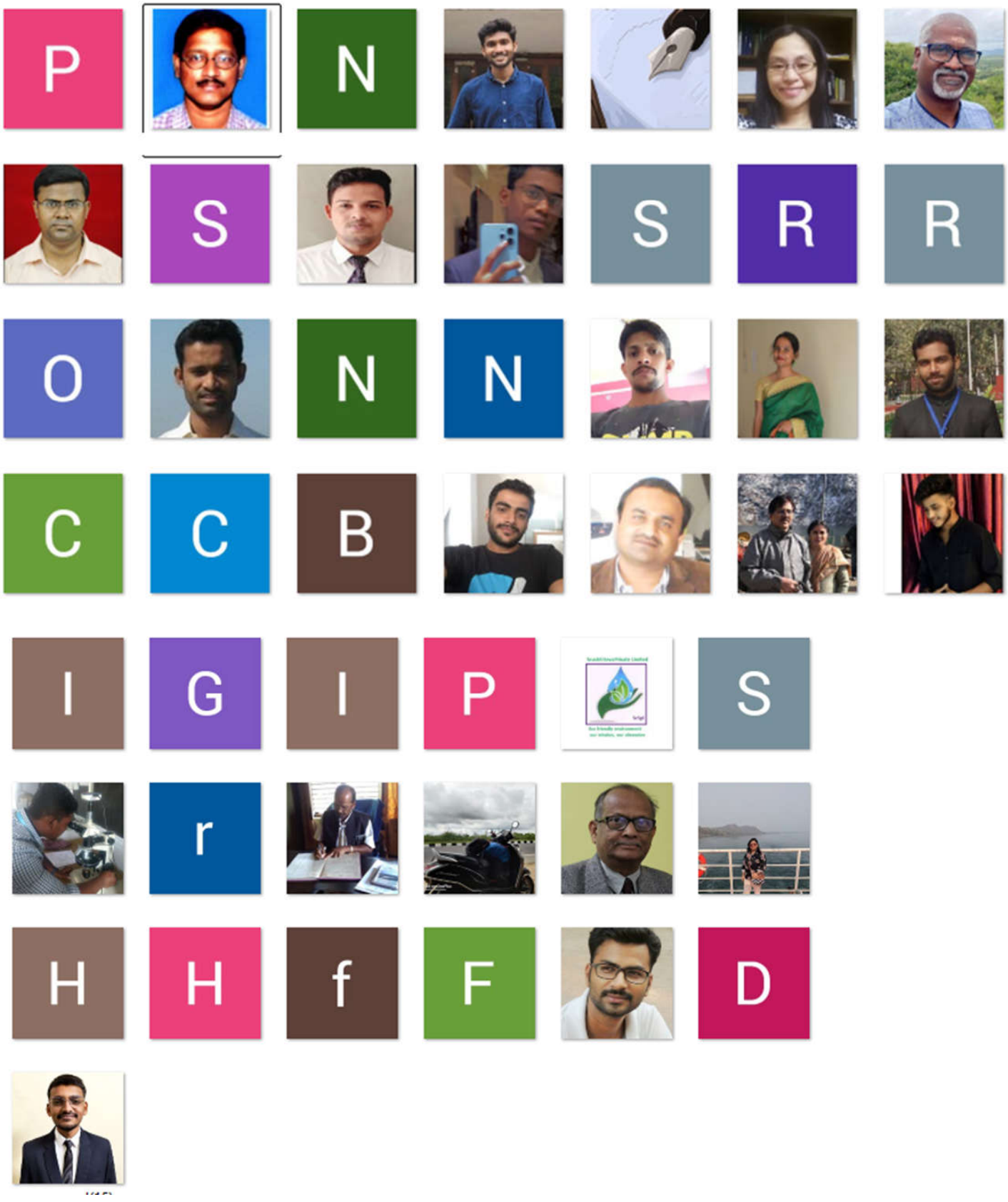
- Equation for calculating water production in a mine
- Slope stability monitoring in open pit mines
- Design of dewatering systems for open pit mines.
- Design of dewatering systems for underground mines
- Case studies including Pilbara mine, Australia
- Tailings storage facility (TSF) monitoring



Grasberg mine location – Indonesia 5m rainfall a year






P
N
S
S
R
R
O
N
N
C
C
B
I
G
I
P
S
r
H
H
f
F
D

POPULAR TALK

Popular Talk Series of Indian Chapter of IAH

Dr. Yoshitaka Sakata

Associate Professor, College of Geoscience and Civil Engineering, Kanazawa University, Japan

In unconsolidated gravelly aquifers, which serve as shallow reservoirs in sedimentary basins, identifying preferential pathways for mass and heat transfer is particularly challenging due to the heterogeneous and trending permeability. Geostatistical methods offer advantages over deterministic approaches to realize heterogeneity considering spatial correlation of variables.

The lecturers demonstrated the elucidation of transitional heterogeneity, particularly vertical trends derived from in-situ data, in the gravel layers of the Toyohira River alluvial fan, Japan. Sensitivity analysis of these trends was conducted using sequential Gaussian simulation, showing that the most plausible permeability distributions—those that aligned observed and simulated temperatures—were obtained only under trending heterogeneity conditions. The results further indicated that while numerical approaches are effective in identifying preferential groundwater pathways in gravelly aquifers, their accuracy is constrained by the availability of calibration data.

14th Nov, 2024
4.00 PM IST
Google Meet link
meet.google.com/gns-powt-gzd
Dial-in: (US) +1 575-567-3152
PIN: 192 607 722#

Host

Prof. (Dr.) A. K. Sinha
Vice-President (Asia), IAH Council
President, INC-IAH
Founder Vice-Chancellor, CSMU Navi Mumbai
groundwater2008@gmail.com

Moderator

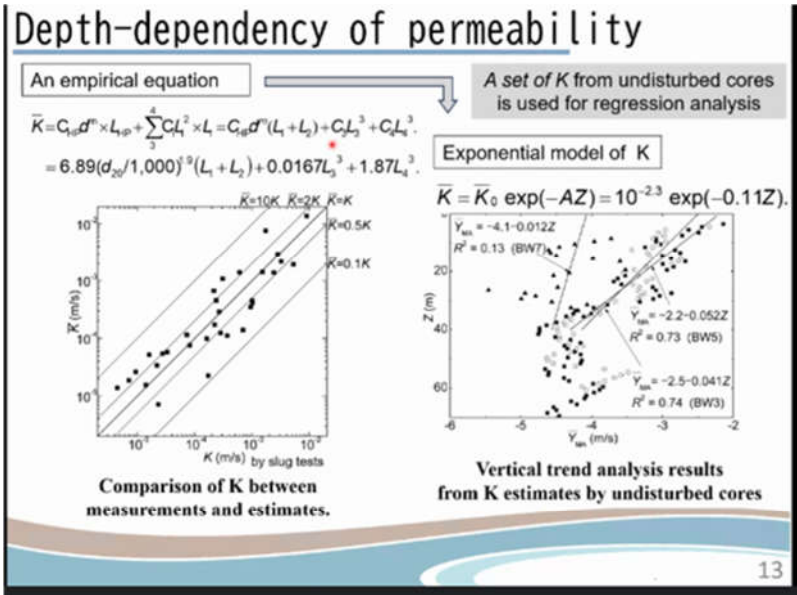
Prof. (Dr.) B. S. Chaudhary
Secretary, INC-IAH
Professor of Geophysics, Kurukshetra University
bschaudhary@kuk.ac.in

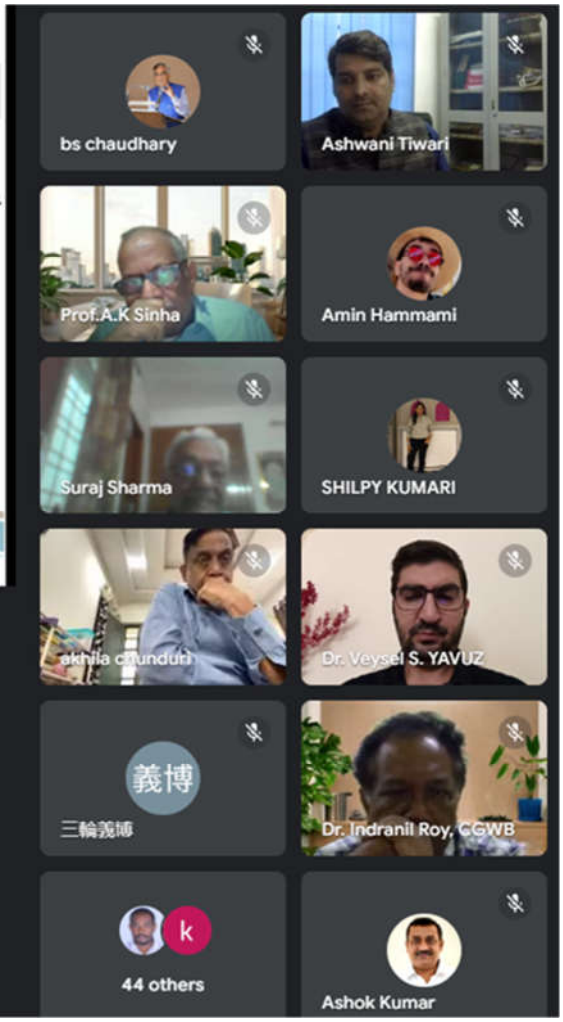
INC of IAH
www.inciah.org

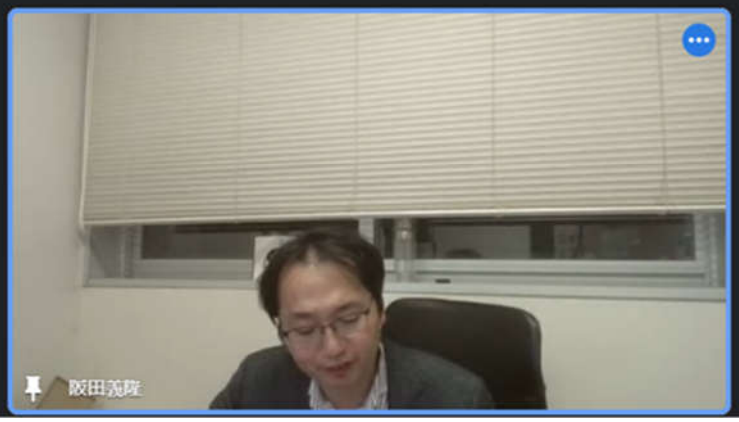
Meeting Admin:
Dr Ashok Kumar
M: 9818174707
E: ashok.kumar@inciah.org

Meeting coordinator:
Dr Ashwani Kumar Tiwari
M: +91 95076 86521
E: ashwani.enviro@gmail.com

Save Water

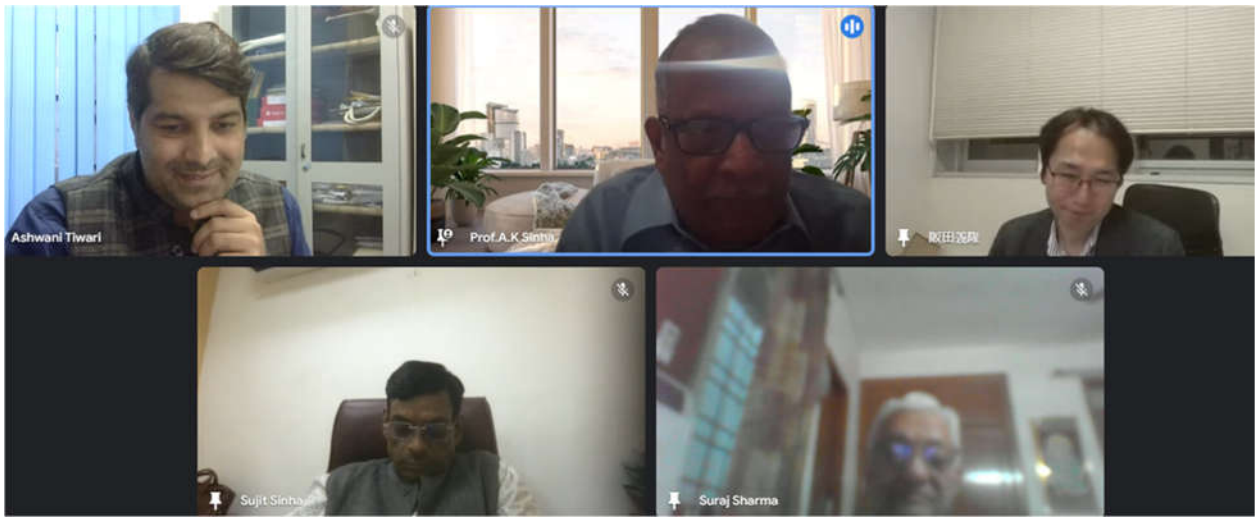

Depth-dependency of permeability
An empirical equation
A set of K from undisturbed cores is used for regression analysis
Exponential model of K
Comparison of K between measurements and estimates.
Vertical trend analysis results from K estimates by undisturbed cores
13

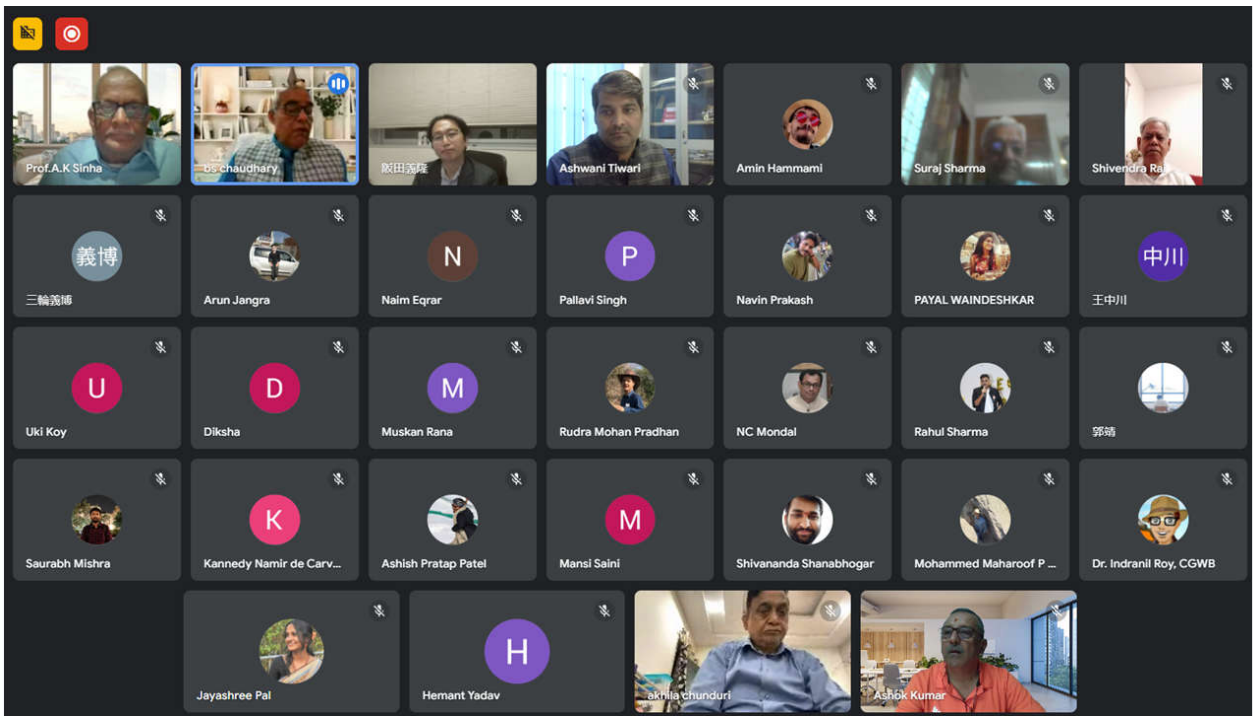

bs chaudhary
Ashwani Tiwari
Prof.A.K Sinha
Amin Hammami
Suraj Sharma
SHILPY KUMARI
akhila chunduri
Dr. Veysel S. YAVUZ
三輪義博
Dr. Indranil Roy, CGWB
44 others
Ashok Kumar


阪田義隆


Prof.A.K Sinha
阪田義隆
bs chaudhary
Ashwani Tiwari


Ashwani Tiwari
Ashok Kumar


Ashwani Tiwari
Prof.A.K Sinha
Suraj Sharma


Prof.A.K Sinha
Ashwani Tiwari
Amin Hammami
Suraj Sharma
三輪義博
Arun Jangra
Naim Eqrar
Pallavi Singh
Navin Prakash
PAYAL WAINDESHKAR
王中川
Uki Koy
Diksha
Muskan Rana
Rudra Mohan Pradhan
NC Mondal
Rahul Sharma
郭靖
Saurabh Mishra
Kannedy Namir de Carv...
Ashish Pratap Patel
Mansi Saini
Shivananda Shanabhogar
Mohammed Maharoof P ...
Dr. Indranil Roy, CGWB
Jayashree Pal
Hemant Yadav
Ashok Kumar

Exploration of Deep Aquifers: Global scenario and regional perspective from West Bengal, India

Dr. Debasish Bagchi

Scientist-D, Central Ground Water Board, Eastern Region, Kolkata

E: bagchid-cgwb@gov.in

Dr. Hrushikesh Behera

Executive Engineer, Central Ground Water Board, Division-XV, Kolkata

Dr. Anadi Gayen

Regional Director, Central Ground Water Board, Eastern Region, Kolkata

The term “deep aquifers” usually denotes the aquifer system (either a single aquifer or a group of aquifers) occurring below a depth of >350 m, which can range even up to 1000 m. Generally, the impermeable layers protect the deep aquifers from anthropogenic influences (Dietmaier and Baumann, 2023). A study in northeastern Namibia, focused on exploration and characterization of “semi-fossil and partially renewable groundwater” has shown the effectiveness of adopting an interdisciplinary approach involving structural and tectonic study, geophysical sounding (Transient Electromagnetic), hydrochemical analysis, modelling with stable isotopes and conceptual-cum-numerical modelling of the aquifer system (Bäumle, 2018). In the Ñuble Aquifer in central Chile, the role of geophysical techniques in exploration of deep aquifer (350 to 500 m) was studied using electrical, electromagnetic and gravimetric methods to decipher geometry of the “deep aquifer system” in conjunction with magnetometric methods to reduce ambiguity in interpretation (Aguirre et al., 2022). A schematic diagram of “deep alluvial aquifers” is shown in Figure 1.

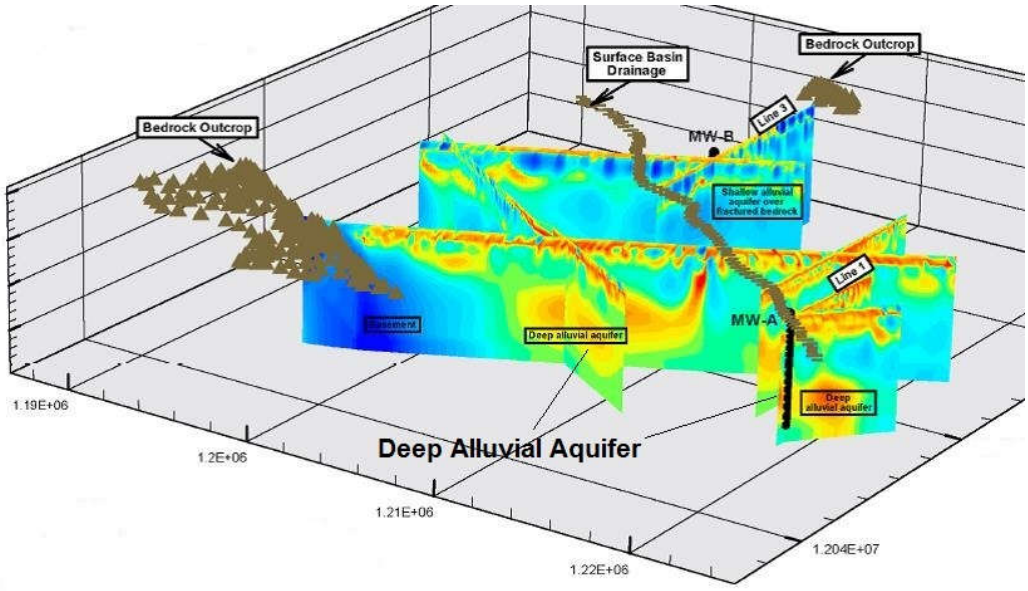


Figure 1. Schematic diagram showing deep alluvial aquifers (Source: Zonge International; http://zonge.com/services/explorationists/groundwater; accessed on 07-4-2025)

The effect of lag time on climatic variability for the deep aquifers in the Nubian Sandstone Aquifer System, Sudan was studied in detail (Abdelmohsen et al., 2019) wherein it was concluded that for the Nubian aquifers, a much faster response of climatic variability in the

INC of IAH

HQ. c/c Central Ground Water Board, Bhujal Bhawan, NH-IV, Faridabad – 121001

E: ashok.kumar@inciah.com

www.inciah.org

deep aquifers occur due to a dense network of faults and fractures in the karst topography, which was also supported by the GRACE satellite data.

The impact of climate change and variability spans from thousands to tens of thousands of years for infiltration and deep percolation of rainwater and the groundwater flow from recharge to distant discharge areas (Sturchio et al., 2004). However, the concept of time-lag response in the deep aquifer systems has been challenged with reported sub-annual deep aquifer response to short-lived climatic variability in the United States (Russo and Lall, 2017). Venkata Pavan et al. (2024) explored the possibility of carbon sequestration and storage of carbon dioxide in deep, saline aquifers by developing a numerical model to evaluate the leakage rates through poorly sealed and abandoned wells, faults and fracture networks. Recently, it has been documented that groundwater in the deep aquifers in the United States, flowing along regional to continental scales, significantly contributes to the base flow in streams (Yang et al., 2025). The study also concluded that the length of groundwater flow paths in the deep aquifer systems often exceeds 50 km.

Deep Groundwater Exploration in West Bengal

Dr. Debasish Bagchi
Dr. Hrushikesh Behera
Dr. Anadi Gayen

Exploration of deep aquifers (>350 m depth) was taken up by the departmental drilling Rigs of Central Ground Water Board during the 1970s and 1980s in the Gangetic alluvial plain. A total of 112 deep exploratory drilling sites (drilled depth >350 m) were completed during the in-house (departmental) groundwater exploration programme, with a majority (50% of the total) having drilled depths varying from 400 to 500 m. Available data indicate that aquifer systems occurring below a depth of 350 m have been tapped in the North 24 Parganas, South 24 Parganas and Birbhum districts of West Bengal. The deeper aquifers (>350 m) were tapped in 43 locations in three districts. The depth-wise variation in drilled depth (>350 m) is shown in Figure 2. The district-wise variation in the number of exploratory wells tapping deeper aquifers (>350 m) is depicted in Figure 3.

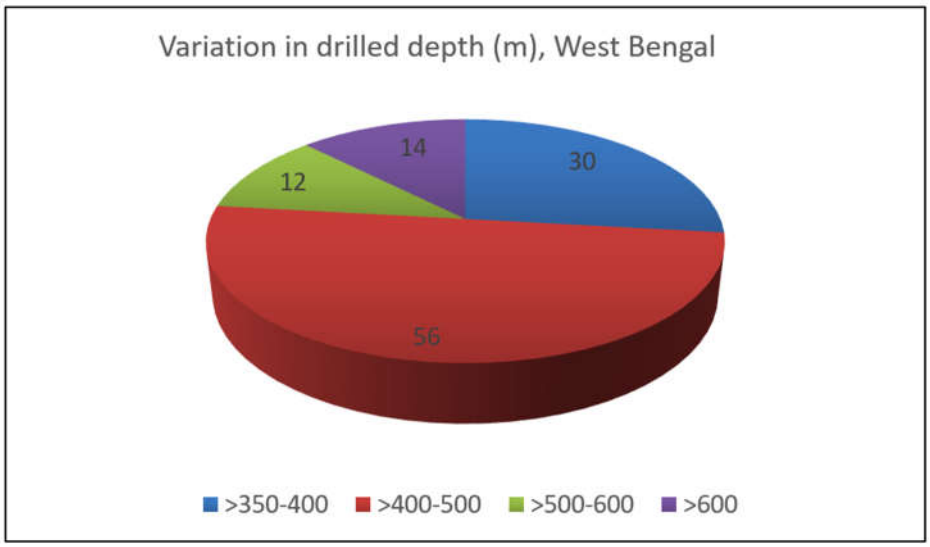


Figure 2. Variation in drilled depth of deep exploratory wells (>350 m), West Bengal

INC of IAH
HQ. c/c Central Ground Water Board, Bhujal Bhawan, NH-IV, Faridabad – 121001
E: ashok.kumar@inciah.com
www.inciah.org

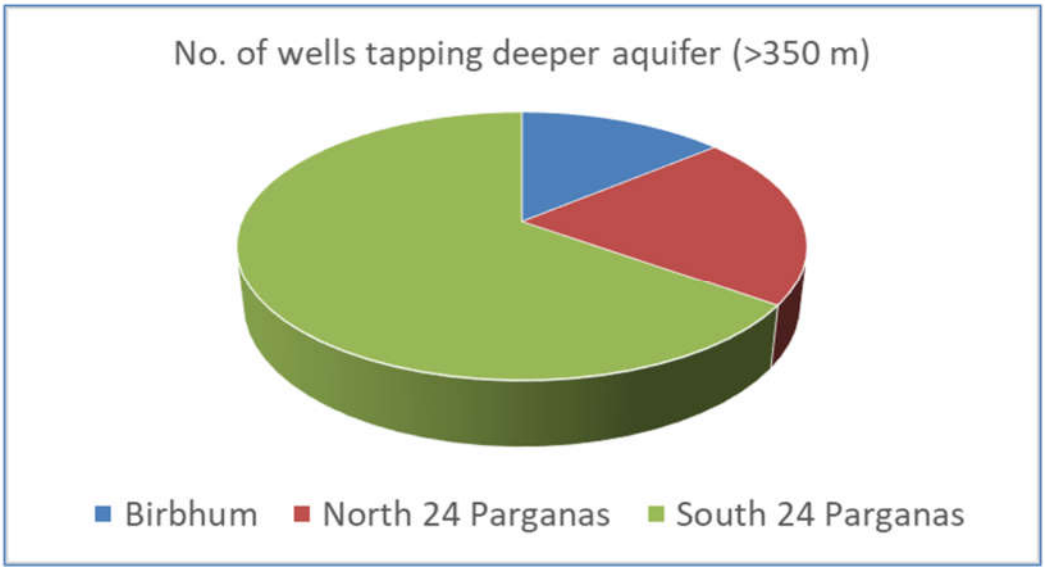


Figure 3. District-wise variation in wells tapping deeper (>350 m) aquifers, West Bengal

A majority of the deep aquifers (64% of total) are explored in the coastal tract of the deltaic flood plain of the Bengal Basin. Total 28 deep exploratory drilling took place in the Younger Alluvium of Holocene age in coastal South 24 Parganas, where an alternate succession of deep freshwater aquifers and saline aquifers are found to occur in depth range from ~350 to ~500 m. The extraction of fresh groundwater from such deep wells is a challenging issue, especially due to the alternating fresh and saline aquifers. Analysis of the exploratory drilling data indicates the highest drilled depth of 614.0 m at Budge Budge Exploratory Well (22.47482 °N, 88.17381 °E) in South 24 Parganas district. The maximum depth range of freshwater aquifer explored is from 448.0 to 490.4 m at Mostala Exploratory Well (23.57243 °N, 87.81321 °E), Bolpur-Sriniketan block, Birbhum district. Another deep freshwater aquifer was tapped from 472.0 to 479.0 m depth at Dholtukari Exploratory Well (22.58191 °N, 88.89707 °E), Hasnabad block, North 24 Parganas district.

Deep freshwater aquifers are found to occur from 313.0 to 319.2 m at Sagar Island and from 360.0 to 384.0 m at Balabalia (22.28333 °N, 88.45833 °E), Baruipur block, South 24 Parganas district. Deep saline aquifers occur at many locations in South 24 Parganas district, such as Krishnagar Hat (21.77500 °N, 88.10472 °E) in the Sagar Island (a part of Sundarbans Archipelago), where two freshwater aquifers (342.0 to 375.0 m, 422.0 to 436.0 m) were explored. At Bamankhali (21.83334 °N, 88.13083 °E), Pathar Pratima block, saline aquifers alternating with clay layers were found in depth range from 326.13 to 509.02 m. At Goalberia (22.27000 °N, 88.48334 °E), Joynagar-I block, South 24 Parganas district, freshwater aquifers occur in depth range 317.0-327.0 m, 330.0-335.0 m and 337.0-342.0 m; brackish water aquifers (EC: 1800 µS/cm, Cl: 400 mg/L) from 342.0 to 396.0 m and the deep saline aquifers (EC: 5790 µS/cm, Cl: 1978 mg/L) below 396.0 m depth.

Dr. Debasish Bagchi
Dr. Hrushikesh Behera
Dr. Anadi Gayen

INC of IAH
HQ. c/c Central Ground Water Board, Bhujal Bhawan, NH-IV, Faridabad – 121001
E: ashok.kumar@inciah.com
www.inciah.org

References

Abdelmohsen K., Sultan M., Ahmed M., Save H., Elkaliouby B., Emil M., Yan Y., Abotalib A.Z., Krishnamurthy R.V., Abdelmalik K. (2019). Response of deep aquifers to climate variability. Science of the Total Environment, 677, 530-544. DOI: https://doi.org/10.1016/j.scitotenv.2019.04.316

Aguirre I., Maringue J., Santibāñez I, Yāñez G. (2022). The role of the geophysical exploration in deep aquifers in semi-urban and rural environments in Andean forearc basins, study case in the aquifer of Ñuble river, Central Valley of Chile. Andean Geology, 49(1).

Bäumle R. (2018). Hydrogeology of the Kalahari Aquifers in the Zambezi Region, Northeastern Namibia. Internal Technical Report, Federal Institute for Geosciences and Natural Resources (BGR), Hannover.

Dietmaier A. and Baumann T. (2023). Assessing Sustainable Development of Deep Aquifers. Water Resources Management, 37:3857-3874. DOI: https://doi.org/10.1007/s11269-023-03529-6.

Russo T.A., Lall U. (2017). Depletion and response of deep groundwater to climate-induced pumping variability. Nature Geoscience, 10, 105-108. DOI: https://doiorg/10.1038/ngeo2883.

Sturchio N.C., Du X., Purtschert R., Lehmann B.E., Sultan M., Patterson L.J., Lu Z.-T., Műller P., Bigler T., Bailey K., O'Connor T.P., Young L., Lorenzo R., Becker R., El Alfy Z., El Kaliouby B., Dawood Y., Abdallah A.M.A. (2004). One million year old groundwater in the Sahara revealed by krypton-81 and chlorine-36. Geophysical Research Letters, 31, 2-5, DOI: https://doi.org/10.1029/2003GL019234.

Venkata Pavan T.N., Devarapu S.R., Govindarajan S.K. (2024). Characterization of Leaky Deep Saline Aquifers for Storing sc-CO2. Energy and Fuels: American Chemical Society, 38(12).

Yang C., Condon L.E., Maxwell R.M. (2025). Unravelling groundwater-stream connections over the continental United States. Nature Water, 3(70-79). DOI: https://doi.org/10.1038/s44221-024-00366-8.

Dr. Debasish Bagchi

Dr. Hrushikesh Behera

Dr. Anadi Gayen

INC of IAH

HQ. c/c Central Ground Water Board, Bhujal Bhawan, NH-IV, Faridabad – 121001

E: ashok.kumar@inciah.com

www.inciah.org

Groundwater Management in India: Challenges and Innovative Tools for Sustainable Utilization

Dr. Fenil R Gandhi

Research Scholar (E), Department of Civil Engineering, Sardar Vallabhbhai National Institute of Technology, Surat, India
fenilgandhi15@gmail.com

Professor (HAG), Department of Civil Engineering, Sardar Vallabhbhai National Institute of Technology, Surat, India

Introduction

Groundwater is a critical resource in India, providing essential support for agriculture, drinking water, and sanitation. As one of the primary sources of fresh water, its sustainable management is vital for the well-being of millions. However, the current state of groundwater resources in India reveals a concerning reality marked by over extraction, pollution, and regional disparities. Historically, India's groundwater resources have been both a blessing and a curse. The Green Revolution of the 1960s propelled India into a new era of agricultural productivity, largely due to the widespread adoption of groundwater irrigation. However, this boon has come with significant consequences, as unregulated extraction has led to alarming rates of depletion (Chaudhuri et al., 2021). The interplay of political, economic, and social factors over the decades has contributed to the complex landscape of groundwater management today. Consequently, the need for effective strategies to address these issues is pressing, as over 600 million people are affected by water scarcity across the country, leading to adverse effects on livelihoods and public health (Biswas et al., 2025). In various regions within India, stark contrasts exist regarding water availability and quality. While some areas, such as parts of Punjab and Haryana, have experienced severe groundwater depletion, others may struggle with contamination from agricultural runoff or industrial waste (Jain et al., n.d.). Thus, understanding these regional disparities is critical for developing tailored management practices. Furthermore, the increasing frequency of extreme weather events, driven by climate change, compounds these existing challenges, making it imperative to explore adaptive and innovative solutions for groundwater management.

This article will delve into the multitude of challenges associated with groundwater resources in India, illustrating the necessity for comprehensive management frameworks. The following chapters will build upon the themes presented in this introduction, beginning with an in-depth analysis of the current state of groundwater resources. This examination will reveal the key issues at both local and national levels, highlighting the complexities involved in addressing them.

Subsequent chapters will explore state-of-the-art technological innovations and policy frameworks that can enhance groundwater management. For instance, Remote sensing, specifically using Landsat imagery and the Normalized Difference Water Index (NDWI), provides a cost-effective and efficient method for monitoring water changes in

INC of IAH

HQ. c/c Central Ground Water Board, Bhujal Bhawan, NH-IV, Faridabad – 121001

E: ashok.kumar@inciah.com

www.inciah.org

geographically challenging areas. The integration of technology in monitoring and managing groundwater resources is essential, as it can offer real-time data to inform decision-making and drive effective water use practices.

Additionally, the role of community engagement will be highlighted, emphasizing how local stakeholders can contribute to sustainable practices. The importance of involving communities in water management cannot be overstated, as local knowledge and participation harness more effective and culturally appropriate solutions. The chapter on community engagement will also discuss how such collaborations can address research gaps in existing literature, ultimately enhancing the practice of sustainable groundwater management in diverse contexts.

As the article progresses, recommendations for an integrated management framework will be proposed, building on the insights gleaned from previous chapters. This framework will seek to combine technological, social, and policy dimensions to create a multi-faceted approach that warrants consideration by both policymakers and practitioners. The comprehensive nature of this study aims to provide a roadmap for navigating the complexities of groundwater management in India while addressing the challenges posed by climate change and other factors.

Ultimately, this article will pave the way for future research directions, illustrating how understanding groundwater issues can be improved through innovative practices and integrated management. Through this exploration, the subsequent chapters will collectively build a solid foundation for examining the myriad dimensions of groundwater utilization and sustainability, fostering a deeper understanding of its vital role in India's socio-economic landscape.

Problem Analysis

The challenges facing groundwater resources in India are deeply rooted and multifaceted, influenced by a variety of environmental, socio-economic, and political factors. One of the most pressing issues is the depletion of groundwater, which has been exacerbated by unsustainable extraction practices. Many regions in India rely heavily on groundwater for irrigation and drinking purposes, leading to over-extraction that far exceeds natural recharge rates (Raghav et al., 2024). This imbalance is most pronounced in states like Punjab and Haryana, where aggressive agricultural practices have resulted in water tables dropping at alarming rates. The complexity of this problem is heightened by regional disparities, as certain areas face extreme scarcity while others might grapple with water quality issues.

The relationship between regional differences in groundwater availability and local communities is significant. In areas where groundwater is scarce, agricultural productivity

Dr. Fenil R Gandhi
Dr. Jayantilal N Patel

INC of IAH
HQ. c/c Central Ground Water Board, Bhujal Bhawan, NH-IV, Faridabad – 121001
E: ashok.kumar@inciah.com
www.inciah.org

suffers, directly affecting farmers' livelihoods and food security. These communities may face increasing poverty, making them more vulnerable to fluctuations in crop yields due to water scarcity. Farmer interviews often reveal a sense of frustration as they navigate these water-related challenges, straddling the line between maintaining productivity and conserving this dwindling resource. Their experiences underscore the need for localized solutions that consider both the availability of groundwater and the socio-economic frameworks that depend on it.

Contamination further complicates the groundwater crisis in India. Pollution emanating from agricultural runoff, industrial waste, and urban areas has created significant threats to both human health and ecosystems. The primary sources of groundwater contamination include excessive use of pesticides and fertilizers and improper disposal of industrial effluents. This contamination not only jeopardizes drinking water quality but also affects agricultural practices and aquatic life, thereby creating a cycle of degradation that is difficult to break. The implications of poor water quality on public health are increasingly concerning, given the rising incidences of water-borne diseases linked to contaminated sources.

Dr. Fenil R Gandhi
Dr. Jayantilal N Patel

Engagement with local stakeholders is crucial in navigating the groundwater challenges in India. Insights from farmers reveal on the ground realities and coping mechanisms that are often overshadowed by broader policy discussions. Policymakers, on the other hand, might focus on regulatory frameworks that do not always align with the lived realities of those directly affected by water scarcity and quality issues. This disconnect highlights the necessity for participatory approaches that integrate local knowledge and experiences into groundwater management strategies. Such approaches enable the development of targeted interventions that address both the immediate and systemic issues at play.

The diverse experiences of various stakeholders also highlight the complexities in current groundwater management strategies. For instance, policies may fail to address the unique circumstances of marginalized communities or may be misaligned with sustainable agricultural practices. As noted in some assessments of groundwater governance, there is a pressing need for policies that consider environmental sustainability alongside socio-economic pressures. Without such integrative strategies, attempts to manage groundwater resources may lead to discord among stakeholders and can inadvertently perpetuate cycles of inequality and resource depletion.

The impacts of climate change compound the existing challenges related to groundwater use in India. Changes in weather patterns, such as increased frequency of droughts and erratic rainfall, exacerbate the pressures on this vital resource. As The monitoring of glacial lakes has gained significant attention due to the increasing impacts of climate change, which have accelerated glacier mass loss and expanded glacial lake sizes in high-altitude

INC of IAH
HQ. c/c Central Ground Water Board, Bhujal Bhawan, NH-IV, Faridabad – 121001
E: ashok.kumar@inciah.com
www.inciah.org

Himalayan region. This phenomenon not only threatens the replenishment of groundwater sources but also poses risks to communities that depend on these resources for their daily needs. As these shifts continue, the need for adaptive and resilient management practices becomes increasingly critical.

Thus, the multifaceted nature of groundwater challenges in India necessitates a nuanced understanding of the interplay between depletion, contamination, and stakeholder experiences. Addressing these issues requires a clear recognition of the diverse factors contributing to groundwater scarcity and quality problems. Integrating local perspectives with scientific insights and policy frameworks can forge pathways toward sustainable groundwater management. As the dialogue continues, it is vital for all stakeholders to collaborate toward common solutions that not only protect groundwater resources but also ensure the well-being of the communities that rely on them. This chapter has provided an overview of the critical challenges facing groundwater resources in India, setting the stage for further exploration of potential strategies for improvement in the following sections.

Dr. Fenil R Gandhi
Dr. Jayantilal N Patel

Innovative Tools and Strategies

Groundwater management in India necessitates innovative tools and strategies to tackle the complex challenges posed by depletion, contamination, and inefficiencies in distribution. Emerging technologies offer promising solutions that can enhance the monitoring, usage, and conservation of this vital resource. One significant advancement in this area is the application of remote sensing technologies paired with Geographic Information Systems (GIS). These tools enable policymakers and resource managers to gather, analyze, and visualize data regarding groundwater levels, quality, and availability across different geographical regions. Remote sensing, specifically using Landsat imagery and the Normalized Difference Water Index (NDWI), provides a cost-effective and efficient method for monitoring water changes in geographically challenging areas. This approach is particularly invaluable in areas where traditional data collection methods are logistically challenging or economically unfeasible.

By leveraging remote sensing and GIS technologies, stakeholders can monitor groundwater resources and establish baselines for future assessments. These technologies facilitate the identification of trends, patterns, and anomalies in groundwater availability, thereby enabling targeted interventions. For instance, the use of the study showcases the use of remote sensing technology for monitoring evolutionary patterns of mountain lakes under climate stress in the mid-hills and hard to reach glacial terrains. Such applications are critical for understanding the effects of climate change and extreme weather on groundwater supplies, ensuring that management practices are both responsive and anticipatory.

INC of IAH
HQ. c/c Central Ground Water Board, Bhujal Bhawan, NH-IV, Faridabad – 121001
E: ashok.kumar@inciah.com
www.inciah.org

Alongside technological advancements, the development and implementation of water-saving technologies are essential for enhancing agricultural efficiency, particularly in water-scarce regions. Innovations such as drip irrigation, rainwater harvesting, and soil moisture sensors allow for more precise water application, reducing waste and increasing crop yields. These technologies not only conserve groundwater but can also positively impact local economies by promoting sustainable farming practices. In addition, the promotion of crop varieties that require less water can help mitigate the stress on groundwater resources.

Despite these technological advancements, the effectiveness of groundwater management in India is significantly influenced by existing policies. Current policy frameworks governing groundwater use often vary in effectiveness, with many failing to adequately address regional disparities or stakeholder needs. A thorough analysis reveals that the strengths of these policies include their potential for regulation and oversight, while weaknesses often lie in inconsistent enforcement and a lack of adaptability to local conditions. To address these shortcomings, key reforms are necessary to enhance effectiveness; this includes establishing collaborative governance structures that involve local communities in decision-making processes.

Dr. Fenil R Gandhi
Dr. Jayantilal N Patel

Local community engagement plays a pivotal role in successful groundwater management initiatives. Incorporating local knowledge into management strategies can lead to more culturally relevant and sustainable practices. Communities that take an active part in monitoring and managing their groundwater resources tend to achieve better outcomes. Previous case studies have demonstrated the success of community-led initiatives in places like Rajasthan, where locals organized to manage village-level water resources, showcasing the effectiveness of grassroots involvement.

These community-driven efforts provide a wealth of lessons, showcasing how local actors can come together to address groundwater challenges. The success of these initiatives often rests on the availability of training and resources provided by external organizations, which can empower communities to take ownership of their local water management issues. Successful examples emphasize the importance of building trust and fostering cooperation among diverse stakeholders, including government agencies, non-governmental organizations, and community members.

Furthermore, the intersection of social equity and environmental sustainability cannot be overlooked in discussions about groundwater management. Policies that are perceived as inclusive and fair are likely to garner greater support from local communities, leading to better compliance and cooperative behavior. Thus, recalibrating policy frameworks to focus on equity and inclusiveness is essential for ensuring the long-term sustainability of groundwater resources. This could involve implementing policies that prioritize access to water for marginalized populations, thereby addressing existing inequalities.

INC of IAH
HQ. c/c Central Ground Water Board, Bhujal Bhawan, NH-IV, Faridabad – 121001
E: ashok.kumar@inciah.com
www.inciah.org

Another critical area for reform is the integration of alternative water sources into the groundwater management paradigm. This can include promoting the use of treated wastewater for irrigation and adopting sustainable practices for rainwater harvesting. By diversifying the sources of water supply, reliance on groundwater can be reduced, providing a buffer against climate variability and over-extraction.

As climate change continues to exert pressure on natural resources, the integration of adaptive management practices becomes increasingly vital. The ability to adjust strategies based on real-time data and feedback loops is essential for navigating the unpredictable nature of climate impacts. Climate change significantly impacts the HKH's cryosphere and hydrology, posing substantial risks to hydropower development. This underscores the need for a proactive approach to groundwater management that anticipates future conditions.

The case studies of innovative practices in groundwater management can further inform these adaptive strategies. Initiatives that incorporate traditional ecological knowledge alongside modern scientific approaches often yield richer understanding and more effective outcomes. The rich tapestry of India's cultural practices related to water management offers an array of potential frameworks for sustainable groundwater utilization. By fostering dialogues between traditional knowledge holders and scientists, innovative solutions can be developed.

Hence, the integration of innovative tools such as remote sensing and GIS, the development of effective water-saving technologies, equitable policy reforms, and community engagement are critical components for effective groundwater management in India. Each element plays a vital role in forming a comprehensive strategy that addresses both current challenges and future uncertainties, leading to more sustainable and resilient groundwater practices across various regions and stakeholder groups.

Case Studies

This chapter presents a thorough examination of groundwater management practices across selected Indian states, namely Punjab, Rajasthan, and Maharashtra. It highlights specific regional challenges and innovative solutions that have emerged through community engagement and technology integration. The groundwater situation in Punjab illustrates a pressing crisis of depletion exacerbated by historical agricultural practices. High-yield crops introduced during the Green Revolution have led farmers to rely heavily on tube wells. As a response to diminishing water tables, recent groundwater management initiatives have concentrated on promoting water-conserving practices. For instance, the Punjab Water Regulation and Development Authority implements measured extraction limits and encourages diverse crop rotations, gradually shifting some farmers away from traditional

Dr. Fenil R Gandhi
Dr. Jayantilal N Patel

INC of IAH
HQ. c/c Central Ground Water Board, Bhujal Bhawan, NH-IV, Faridabad – 121001
E: ashok.kumar@inciah.com
www.inciah.org

patterns that demand excessive water. This multifaceted strategy acknowledges the social and economic dependencies on groundwater while striving for sustainable solutions that also incorporate local knowledge.

In Rajasthan, community-led initiatives present a commendable example of grassroots engagement in groundwater sustainability. The revival of traditional water harvesting systems, particularly in arid districts, has demonstrated effectiveness. Local communities have organized to rebuild Johads, small earthen check dams designed to capture and store rainwater, which significantly enhances groundwater recharge. Research indicates that climate change-induced glacier retreat is the primary driver of glacial lake expansion, increasing GLOF risks. The state's proactive engagement with local stakeholders has fostered trust, allowing for collective ownership over water resources. This community-centric approach not only bolsters groundwater levels but also strengthens social cohesion among residents. Educational programs about water management and conservation further empower individuals, enabling them to make informed decisions that contribute to sustainability.

Maharashtra showcases another approach, concentrating on innovative strategies to tackle groundwater contamination while promoting quality improvement. The state has pioneered the use of bioremediation techniques to address pollution levels in groundwater caused by agricultural runoff and industrial waste. Localized efforts to plant marsh vegetation that absorb excess nutrients from contaminated water have been successful. This method addresses the dual problem of contamination and promotes biodiversity within the ecosystem. Furthermore, Pune's implementation of integrated water management policies attempts to link water quality with overall urban planning. Such strategies make evident that while the nature of groundwater issues may vary across regions, the integration of scientific methodologies with community involvement is crucial in combating contamination issues.

Understanding the socio-economic contexts within these three states enhances the effectiveness of groundwater management solutions. In Punjab, the predominance of agricultural activities coupled with socio-political factors creates a complex landscape where water management must navigate financial dependency on crop yields. Conversely, Rajasthan’s diverse community-driven efforts offer insights into achieving sustainable management without substantial government intervention. The effectiveness of these initiatives can be attributed to their inclusivity and shared vision among community members. Maharashtra's approach, while technologically advanced, reflects a need for alignment between policy measures and local realities to ensure comprehensive solutions to contamination scenarios.

These case studies illuminate significant lessons for policymakers at a national level. First, fostering community engagement results in more successful management practices as it

Dr. Fenil R Gandhi
Dr. Jayantilal N Patel

INC of IAH
HQ. c/c Central Ground Water Board, Bhujal Bhawan, NH-IV, Faridabad – 121001
E: ashok.kumar@inciah.com
www.inciah.org

customizes approaches to local needs. The integration of technological solutions is vital but should revolve around participatory methodologies that respect and utilize local knowledge. Second, aligning policies with socio-economic contexts is essential, especially in regions where water scarcity impacts livelihoods. For instance, educational initiatives in Rajasthan can be replicated in other areas to enhance understanding and participation among communities. Finally, South Asian countries can learn from these experiences to address their own groundwater challenges, aggregate localized solutions, and formulate frameworks that integrate technological advancements and community engagement strategies.

Each of these case studies provides insight into the remarkable strides made in groundwater management across India, demonstrating the potential for community-led initiatives intertwined with scientific innovation to alleviate some of the critical challenges facing groundwater resources today. The ongoing engagement between communities, technology, and policy can transform groundwater management into a sustainable practice that secures this essential resource for future generations.

Recommendations

Dr. Fenil R Gandhi
Dr. Jayantilal N Patel

An integrated management framework for groundwater resources is essential to address the multifaceted challenges faced in India. Such a framework must emphasize the convergence of technology, policy reforms, and community efforts. To begin with, fundamental components of this framework should include comprehensive data collection and analysis, which can be accomplished through the integration of advanced technologies such as remote sensing and Geographic Information Systems (GIS). These technologies enable the monitoring of groundwater levels, quality, and usage patterns across diverse regions, ultimately facilitating informed decision-making that is aligned with local needs.

Incorporating technology effectively into groundwater management practices can significantly improve both efficiency and sustainability. For instance, utilizing remote sensing for monitoring underground water systems allows for better tracking of groundwater depletion and recharge trends. It is vital to enhance this technology's accessibility, especially in rural areas, where farmers can be trained to utilize these tools effectively. "Remote sensing effectively monitors climate change impacts on mountain lakes," which can also be extrapolated to groundwater resource monitoring, providing critical insights into regional variations in groundwater availability (Khadka, Zhang, and Chen 2019). As real-time data becomes more accessible, policymakers can adapt their management strategies dynamically, tailoring them to emerging conditions and utilization patterns.

Policy reforms are also crucial in addressing regional disparities in groundwater management that exist across states in India. It is necessary to develop a decentralized framework for groundwater governance that allows for state-specific regulations while

INC of IAH
HQ. c/c Central Ground Water Board, Bhujal Bhawan, NH-IV, Faridabad – 121001
E: ashok.kumar@inciah.com
www.inciah.org

maintaining overarching national guidelines. This approach would enable states to address their unique groundwater challenges while fostering collaboration among them. Furthermore, policies should be aimed at incentivizing sustainable practices, such as crop diversification and the use of less water-intensive agricultural methods. As climate change exacerbates existing water challenges, the adaptation of policies must also reflect the increased variability in precipitation patterns. "An increase in precipitation is most likely for the upstream Ganges and Brahmaputra, but the magnitude is highly uncertain," underlining the need for flexible policy frameworks that can respond to changing climatic conditions (Lutz et al. 2015, 27).

Community engagement plays a pivotal role in enhancing local participation and trust in groundwater management strategies. A systematic approach to incorporating community voices into the decision-making processes can be achieved by establishing local water user associations that actively involve stakeholders in the management of groundwater resources. Educational initiatives aimed at raising awareness about sustainable water management practices can foster collective action among community members. It is essential to create social structures that support participation at all levels while respecting local knowledge and practices concerning water management. Strengthening these community networks can lead to more effective enforcement of policies and promote a sense of ownership over resources.

Examining successful case studies can provide insights into innovative practices that can be adopted in other regions facing similar groundwater challenges. For example, Rajasthan's revival of traditional water harvesting systems, including the building of Johads to enhance groundwater recharge, demonstrates the power of community-led initiatives. By promoting such scalable approaches, lessons learned could be adapted and implemented in regions where groundwater issues persist. Moreover, cross-state collaborations could enhance innovation sharing and allow for best practices to inform policy-making, focusing on comprehensive solutions tailored to local contexts.

Future research directions should focus on addressing gaps in current knowledge and practices surrounding groundwater management. Collaborative studies should analyze the interactions between socio-economic factors and water availability, providing deeper insights into how various communities can best approach sustainability. Furthermore, research into the effectiveness of different water-saving technologies and their acceptance among farmers is vital. Projects aimed at experimentally assessing the impacts of climate change on groundwater recharge rates, surface water interactions, and agricultural productivity should be prioritized to inform adaptive management strategies.

Dr. Fenil R Gandhi
Dr. Jayantilal N Patel

INC of IAH
HQ. c/c Central Ground Water Board, Bhujal Bhawan, NH-IV, Faridabad – 121001
E: ashok.kumar@inciah.com
www.inciah.org

Adaptive management strategies can be developed to respond effectively to the challenges posed by climate change on groundwater resources. Continuous monitoring, assessment, and adjustment of management strategies are essential to ensure resilience against climate fluctuations. Moreover, developing contingency plans that account for severe droughts or floods will improve the capacity to handle extreme events. Policies must facilitate the transition from reactive to proactive management approaches, thereby institutionalizing flexibility in response capabilities.

In summary, the proposed integrated management framework for groundwater resources in India emphasizes the merging of technology, informed policy reforms, and community engagement to tackle the pressing challenges related to groundwater sustainability. By actively promoting collaboration among these dimensions, India can pave the way for a more reliable and equitable groundwater management system amidst ongoing climate and socio-economic pressures.

Conclusion

The insights gathered from the examination of groundwater management challenges and innovations in India underscore the pressing need for an integrated approach. The current issues surrounding groundwater resources, including over-extraction, contamination, and regional disparities, necessitate a multifaceted response that considers technological advancements, policy reforms, and community engagement. The identified challenges have specific implications for future groundwater management policies in India. Policymakers must prioritize sustainable practices, focusing on strategies that not only tackle depletion but also ensure water quality. This requires a shift from reactive measures to proactive policies that anticipate the impacts of climate change and fluctuating water demands.

Integration of innovative technologies with traditional water management practices offers a promising avenue for enhancing groundwater sustainability. The application of remote sensing tools and data-driven analysis can significantly improve water monitoring and management efforts. As highlighted, Remote sensing, specifically using Landsat imagery and the Normalized Difference Water Index (NDWI), provides a cost-effective and efficient method for monitoring water changes in geographically challenging areas. This integration can lead to more informed decision-making processes and adaptive management strategies that align with local community needs.

Local communities play a pivotal role in the successful implementation of groundwater management strategies. Their engagement fosters a sense of ownership and responsibility towards water resources, encouraging sustainable practices at the grassroots level. Collaborations that involve local knowledge in the decision-making process can bridge gaps between policy frameworks and community realities.

Dr. Fenil R Gandhi
Dr. Jayantilal N Patel

INC of IAH
HQ. c/c Central Ground Water Board, Bhujal Bhawan, NH-IV, Faridabad – 121001
E: ashok.kumar@inciah.com
www.inciah.org

Lessons drawn from successful case studies within various regions of India illustrate the effectiveness of community-led initiatives in addressing groundwater challenges. Programs that revive traditional water management practices and promote collective action among community members have shown notable successes. These examples provide valuable insight into how localized solutions can inform broader policy frameworks and management strategies. To ensure equitable access to groundwater resources for marginalized communities, it is crucial to implement policies that prioritize inclusiveness and fairness. This approach not only rectifies historical imbalances but also fosters collaborative efforts that strengthen community resilience in the face of water-related challenges.

Finally, structuring adaptive management strategies that can respond to both immediate and long-term challenges is essential in the context of climate change. Continuous monitoring and iterative assessments will enable stakeholders to remain responsive to changing conditions, thus improving groundwater governance and sustainability. The path forward requires a concerted effort among policymakers, communities, and researchers to forge collaborative partnerships that effectively manage India's groundwater resources. Through this integrated and participatory approach, sustainable practices can be cultivated, thereby securing vital water resources for future generations.

Dr. Fenil R Gandhi
Dr. Jayantilal N Patel

References

A.F. Lutz, MSc., Dr. W.W. Immerzeel, Dr. M. Litt, Dr. S. Bajracharya, and Dr. A.B. Shrestha. “Comprehensive Review of Climate Change and the Impacts on Cryosphere, Hydrological Regimes and Glacier Lakes.” FutureWater, 2015. https://www.futurewater.nl/wp-content/uploads/2015/12/StatKraft_Review_final.pdf.

Biswas, A., Sarkar, S., Das, S., Dutta, S., Roy Choudhury, M., Giri, A., Bera, B., Bag, K., Mukherjee, B., Banerjee, K., Gupta, D., & Paul, D. (2025). Water scarcity: A global hindrance to sustainable development and agricultural production – A critical review of the impacts and adaptation strategies. Cambridge Prisms: Water, 3, e4. https://doi.org/10.1017/wat.2024.16

Bhagawat Rimal, Rabindra Adhikari, Saurav Shrestha, Sushila Rijal, Ripu Kunwar, Abdul Sahim Ansari, and Abhishek Tiwary. “Emerging Role of Remote Sensing For Monitoring Glacial and Surface Water Changes in Nepal.” International Journal of Science and Technology, 2025. https://sciresol.s3.us-east-2.amazonaws.com/IJST/Articles/2025/Issue-4/IJST-2024-1548.pdf.

Chaudhuri, S., Parakh, D., Roy, M., & Kaur, H. (2021). Groundwater-sourced irrigation and agro-power subsidies: Boon or bane for small/marginal farmers in India? Groundwater for Sustainable Development, 15, 100690. https://doi.org/10.1016/j.gsd.2021.100690

INC of IAH
HQ. c/c Central Ground Water Board, Bhujal Bhawan, NH-IV, Faridabad – 121001
E: ashok.kumar@inciah.com
www.inciah.org

Jain, S. K., Agarwal, P. K., & Singh, V. P. (n.d.). Problems Related to Water Resources Management in India. In Hydrology and Water Resources of India (pp. 871–936). Springer Netherlands. https://doi.org/10.1007/1-4020-5180-8_18

Nitesh Khadka, Guoqing Zhang, and Wenfeng Chen. “The State of Six Dangerous Glacial Lakes in the Nepalese Himalaya.” Taiwan Association for Ocean Research, 2019. http://140.112.66.168/tao/media/k2/attachments/v301p063.pdf.

OECD. “Integrating Climate Change Adaptation into Development Co-operation POLICY GUIDANCE.” OECD Publishing, 2009. https://ees.kuleuven.be/eng/klimos/toolkit/documents/387_policy_guidelines.pdf.

Raghav, R., Tiwari, K. K., & Kandwal, P. (2024). Challenges and Opportunities in the Management of India’s Water Resources (pp. 81–101). https://doi.org/10.1007/978-3-031-62079-9_5

Suresh Raj Chalise, Madan Lall Shrestha, Om Ratna Bajracharya, and Arun Bhakta Shrestha. “Climate Change Impacts on Glacial Lakes and Glacierized Basins in Nepal and Implications for Water Resources.” International Association of Hydrological Sciences, 2006. https://iahs.info/uploads/dms/13704.84-460-465-103-308-Chalise.pdf.

Teodor Nagy and Liss M. Andreassen. “Glacier Lake Mapping with Sentinel-2 Imagery in Norway.” Norwegian Water Resources and Energy Directorate, 2019. http://publikasjoner.nve.no/rapport/2019/rapport2019_40.pdf.

INC of IAH

HQ. c/c Central Ground Water Board, Bhujal Bhawan, NH-IV, Faridabad – 121001

E: ashok.kumar@inciah.com

www.inciah.org

Amit Sharma

Research Scholar
Department of Geology
University of Jammu, J&K
E: amitsharma.2@jammuuniversity.ac.in:

Melting Giants: The Impact and Urgency of Glacier Preservation in J&K and Ladakh

As per World Meteorological Organization, Glaciers dropped about 600 gigatons of water in 2023, the most substantial loss in last 5 decades. Glaciers occupy an important role in the Earth's cryosphere by storing freshwater and affecting both local and global temperature trends. Glaciers are essential to maintaining river systems, agriculture, and livelihoods in the Indian Himalayan region, especially in Jammu & Kashmir (J&K) and Ladakh. The theme of World Water Day 2025 is “Glacier Preservation”. In this piece, I want to share my key observations about the dynamics, behavior, and preservation tactics of glaciers, with a particular emphasis on the J&K and Ladakh regions. J&K and Ladakh posses hundreds of glaciers, primarily in the Karakoram, Zanskar, Pir Panjal, and Ladakh ranges which includes Siachen, Pangong, Drang drung, Pensilungpa, Machoi, Kolahoi etc. The destiny of the Himalayan glaciers has been the subject of much debate over the last ten years, particularly in light of the significance of future water supply scenarios and the effects of associated glacial lake outburst floods (GLOFs). Nonetheless, this conversation has brought to light important gaps in our understanding and discrepancies in projections about the future of the Himalayan glaciers. The scarcity of insitu data, which frequently prevents its application and interpretation, is one of the major obstacles to studying Himalayan glaciers. Because changes in climate variables like temperature and precipitation can be directly connected to changes in glacier dynamics, such as mass balance, thickness, and velocity. Understanding how glacial melt water affects rising sea levels, how different ice masses react to climate change, and even how regional and municipal water management is impacted, requires monitoring the shifting patterns of glaciers. The lack of on-site measurements is still a major problem, even with improvements in remote sensing and numerical modeling approaches. This is largely because to the challenging terrain and remote, high-altitude locations of the glaciers. In the past, intrusive techniques like coring and borehole surveys were frequently used to examine the subsurface conditions in glacial regions. However, these methods have drawbacks since they can interfere with subsurface natural processes and are costly and logistically difficult.

Glaciers in Western Ladakh (WL) have more debris on their surface compared to those in Eastern Ladakh (EL). While debris can sometimes slow down melting, rising temperatures have had a stronger impact, especially on the lower, flatter parts of these glaciers. Research shows that the slope of the glacier also plays a big role in how much ice is lost, explaining about 30–42% of the differences in melting between the two regions. Over the past 20 years, WL glaciers have lost more ice than EL glaciers. Studies on debris-covered glaciers worldwide show that the average debris thickness is about 0.15 meters, based on data from

INC of IAH

HQ. c/c Central Ground Water Board, Bhujal Bhawan, NH-IV, Faridabad – 121001

E: ashok.kumar@inciah.com

www.inciah.org

22 glaciers. When debris is considered, melting under the debris is reduced by about 37%, which can affect the region's ice loss by up to 0.40 meters of water equivalent per year. As glaciers in the Himalayas shrink due to climate change, new lakes are forming behind piles of loose rock and debris (called moraines). These lakes can be dangerous because if their natural dams break, they can cause severe floods. Additionally, these lakes can speed up glacier melting and make ice loss happen even faster over time. Rising temperatures in the western Himalayas are causing glaciers to shrink and leading to the formation and expansion of lakes near glaciers. Researchers have studied glacier changes using fieldwork and satellite data, looking at factors like glacier size, length, height, and slope. Their findings show that smaller, steeper glaciers melt faster than larger, flatter ones. Studies on glacier changes also focus on how debris (rock and dirt) affects ice loss. Clean, debris-free glaciers are retreating faster and losing more area, while glaciers covered in debris show slower ice loss at the front but still shrink in overall size.

Studies show that most Himalayan glaciers are retreating at a rate of 5 to 20 meters per year, with ice loss ranging from 0.2 to 1.2 meters of water equivalent per year. The elevation where glaciers remain stable (ELA) varies between 4,900 and 5,300 meters above sea level. Since glaciers are important indicators of climate change, it is crucial to monitor their changes in mass, volume, area, and length over time. However, despite their importance, there is still limited knowledge about how Himalayan glaciers behave and what factors influence them. Research shows that glaciers in different parts of the Himalayas melt at different rates, mainly due to variations in landscape and climate. However, inconsistent retreat rates and a lack of field data on ice loss, thickness, and movement make it difficult to get a clear understanding of how climate change is affecting them. Different methods used to study glaciers may give slightly different results, but they all show that Himalayan glaciers are getting thinner and losing a lot of ice. This affects how much ice moves and how much water flows into rivers. Recent research shows that glacier thinning has speed up over the past 40 years, mainly due to rising temperatures and increased heat from the atmosphere. In the Zanskar Himalaya, glaciers are shrinking mostly because of warmer temperatures and less snowfall. Even though there has been a slight increase in precipitation, it is not enough to make up for the ice loss caused by higher temperatures. As air temperatures keep rising—following global trends—glaciers will melt even faster. This could also change snowfall patterns, with more rain instead of snow at higher altitudes, affecting how glaciers grow in the summer.

Glacier retreat in the Western Himalayas has great consequences, impacting water resources, ecosystems, local communities, and disaster risks. Major river systems receive their melt water from the Himalayan glaciers. As a result of their withdrawal, there is less water available for hydropower and agriculture. Energy generation is unpredictable due to seasonal fluctuations. Further ice loss is accelerated by glacier melt, which both raises sea

Amit Sharma

INC of IAH
HQ. c/c Central Ground Water Board, Bhujal Bhawan, NH-IV, Faridabad – 121001
E: ashok.kumar@inciah.com
www.inciah.org

levels and warms the region. Temperature increases are amplified by variations in albedo (IPCC, 2021). River ecosystems are disturbed and habitat for animals like the snow leopard is lost as a result of glacier retreat. The impact of increasing river temperatures and shifting sediments on freshwater biodiversity is drastic and unfit for survival. In the Himalayas, especially in Ladakh, tourism is mostly reliant on snow-covered scenery and glaciers. Trekking and skiing businesses are suffering as glaciers recede, with glacier-related tourism in Ladakh declining, according to the Government of India's Ministry of Tourism (2023).

In order to lessen the effects of glacier decline and guarantee longevity, environmentally friendly policies, scientific discoveries, and community-based projects are essential. The main cause of global warming, greenhouse gas emissions must be reduced by governments through the implementation of robust climate policies. The necessity of group action is emphasized by international accords like the Paris Climate Accord. Enforceable policies are needed to support regional glacier protection initiatives and India's National Action Plan on Climate Change (NAPCC). For the purpose of comprehending retreat trends and forecasting future hazards, ongoing glacier surveillance is essential. Unmanned aerial vehicles, ground-based research, and satellite remote sensing aid in tracking glacier changes and identifying early warning indicators of glacial lake outburst floods (GLOFs). Climate models and policy responses will be enhanced by increasing research on the interactions between ice thickness, melt rates, and debris cover. Data collection and analysis are vitally dependent on organisations such as the International Centre for Integrated Mountain Development (ICIMOD), the Indian Space Research Organization (ISRO) & National Remote Sensing Center (NRSC). For glacier protection to be successful, local communities must be empowered. Sustainable techniques can be developed with the use of contemporary science and traditional wisdom. In order to alleviate water scarcity, projects like Ladakh's "Ice Stupas" build artificial glaciers to store winter ice for use in the summer. Deterioration of the ecosystem can be minimized and reliance on glacier-fed water reduced through ecotourism, sustainable agriculture, and alternate sources of income.

It can be concluded that Glacier retreat in the Himalayas, particularly in J&K and Ladakh, threatens water resources, ecosystems, and local communities. Rising temperatures and reduced snowfall accelerate ice loss, impacting river flows, agriculture, hydropower, and biodiversity. The formation of glacial lakes increases flood risks, while tourism declines due to shrinking snow cover. Limited field data hinders accurate predictions. Addressing glacier loss requires strong climate policies, advanced monitoring, sustainable water management, and community-driven initiatives like artificial glaciers. Collaborative efforts from governments, scientists, and local populations are essential to mitigate the effects of glacier retreat and ensure long-term environmental and economic stability.

Amit Sharma

INC of IAH

HQ. c/c Central Ground Water Board, Bhujal Bhawan, NH-IV, Faridabad – 121001

E: ashok.kumar@inciah.com

www.inciah.org

World Water Day 2025

Glacier Preservation

World Water Day Celebrations

What is World Water Day?

World Water Day celebrates water and inspires action to tackle the global water crisis. A core focus of World Water Day is to support the achievement of Sustainable Development Goal (SDG) 6: water and sanitation for all by 2030.

World Water Day is an annual United Nations Observance – held on 22 March – focusing on the importance of freshwater, coordinated by UN-Water and led by one or more UN-Water Members and Partners with a related mandate.

World Water Day 2025: Glacier preservation

To maximize attention on the critical issue of rapidly melting glaciers and their impact on billions of people's lives, the World Water Day 2025 theme - "Glacier Preservation" - is in support of the first-ever World Day for Glaciers.

Protecting frozen water resources for the future

The theme of World Water Day 2025 is 'Glacier Preservation'.

Glaciers are critical to life – their meltwater is essential for drinking water, agriculture, industry, clean energy production and healthy ecosystems.

Rapidly melting glaciers are causing uncertainty to water flows, with profound impacts on people and the planet.

Global reductions in carbon emissions and local strategies to adapt to shrinking glaciers are essential.

This World Water Day, we must work together to put glacier preservation at the core of our plans to tackle climate change and the global water crisis.

Key messages for World Water Day 2025

- Glaciers are melting faster than ever. As the planet gets hotter due to climate change, our frozen world is shrinking, making the water cycle more unpredictable and extreme.
- Glacial retreat threatens devastation. For billions of people, meltwater flows are changing, causing floods, droughts, landslides and sea level rise, and damaging ecosystems.
- Glacier preservation is a survival strategy. We must work together to reduce greenhouse gas emissions and manage meltwater more sustainably for people and the planet.

INC of IAH

Reg. Off.: O/o Central Ground Water Board, Bhujal Bhawan, NH-IV, Faridabad – 121001

E: ashok.kumar@inciah.org

www.inciah.org

World Water Day 2025

Glacier Prese-rvation

Indian Chapter

INDIAN NATIONAL CHAPTER (INC) OF INTERNATIONAL ASSOCIATION OF HYDROGEOLOGISTS (IAH)

Panel Discussion

23rd March, 2024 at 7.00 pm to 8.00 pm

Meeting at link: meet.google.com/sna-ftxf-vqk

On the occasion of

World Water Day-2025 : Glacier Preservation

Topic: Need for preserving the Glaciers towards sustaining groundwater replenishment and hydro-hazard mitigation

Distinguished Panelists

Prof. (Dr) A. K. Sinha
President, Indian Chapter of IAH, & Vice President (Asia), IAH Council

Dr. Sunil Kumar
Former Chairman, CGWB, Govt. of India, Faridabad

Prof. Milap Chand Sharma
Professor, Centre for the Study of Regional Development, JNU, New Delhi

Dr. Yogesh Jadeja
Director, Arid Communities and Technologies, Bhuj-Kutch, Gujarat

Sh. Sujit Sinha
Atal Bhujal Yojana, Min. of Jal Shakti, GoI, Former Scientist, CGWB, Faridabad

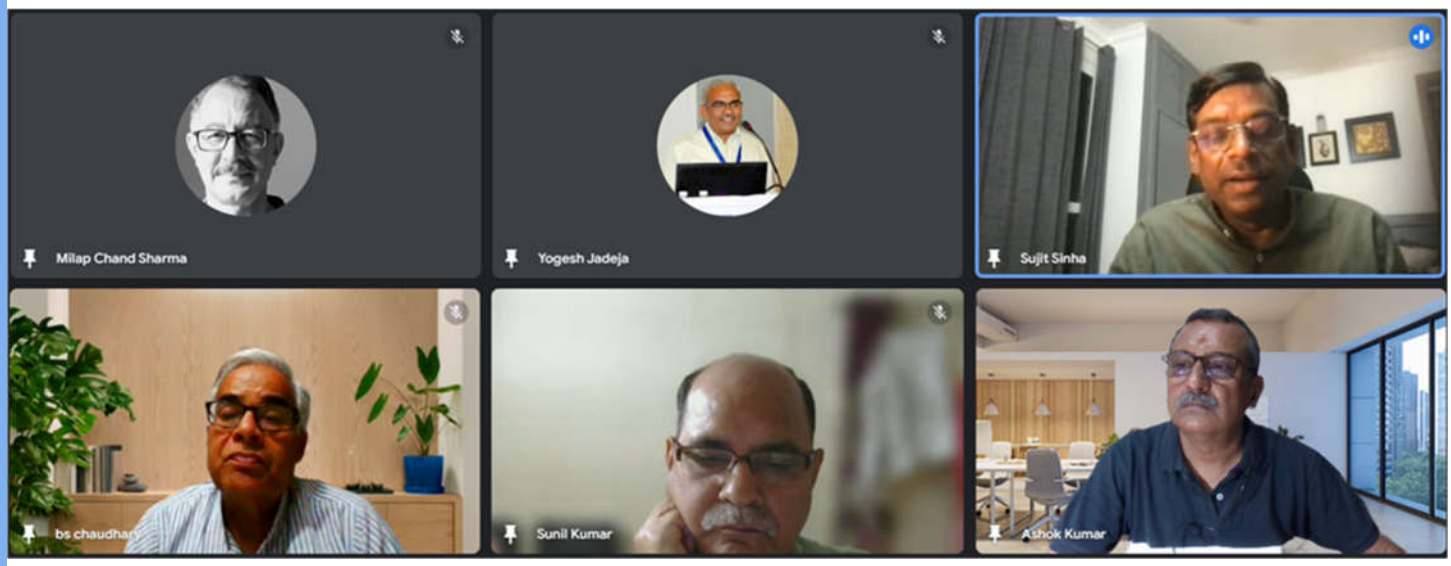
Welcome

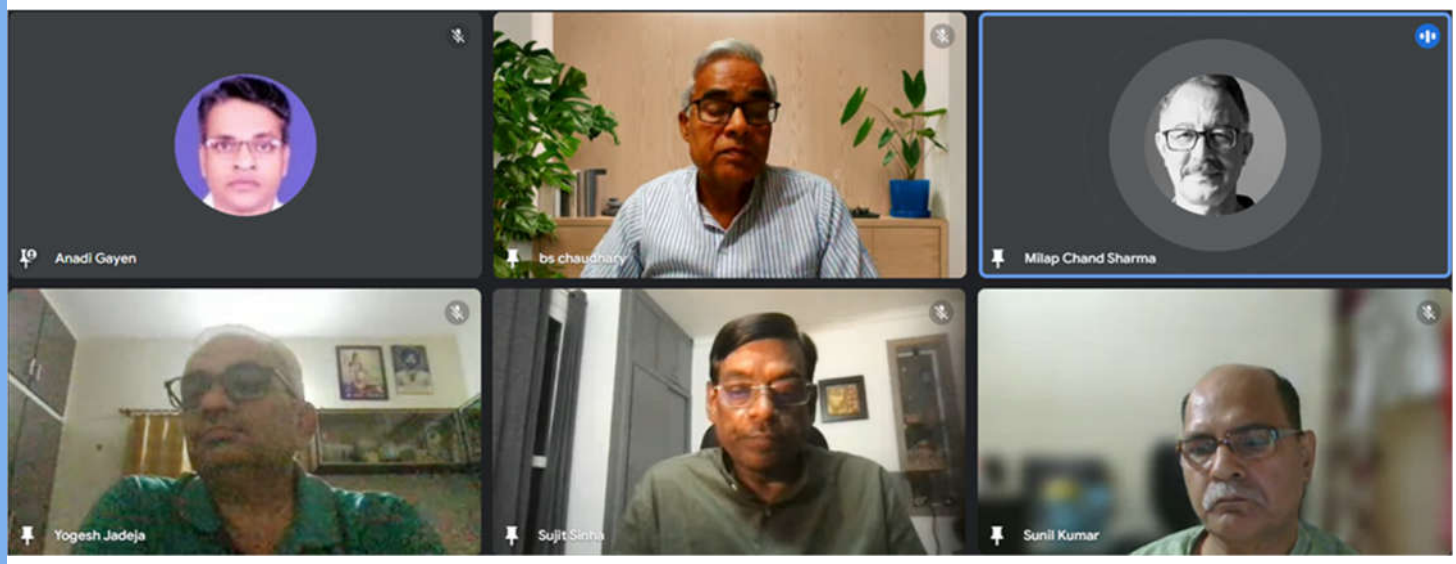
Dr Anadi Gayen
Vice President (INC-IAH), Regional Director, CGWB, Kolkata

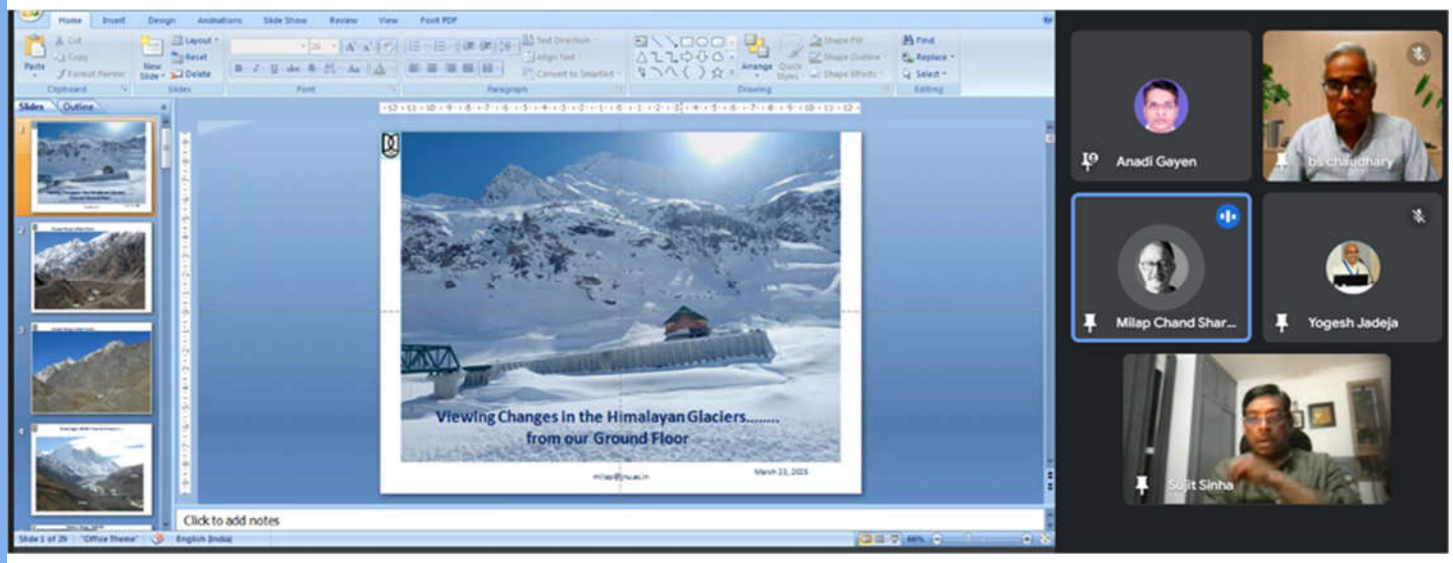
Moderator

Dr BS Chaudhary
Secretary, Indian Chapter of IAH, Professor, Department of Geophysics, Kurukshetra University, Kurukshetra

Meeting Admin: Dr. Ashok Kumar, Treasurer (INC-IAH)
M: 9818174707 E: ashok.kumar@inciah.org
Meeting at link: meet.google.com/sna-ftxf-vqk

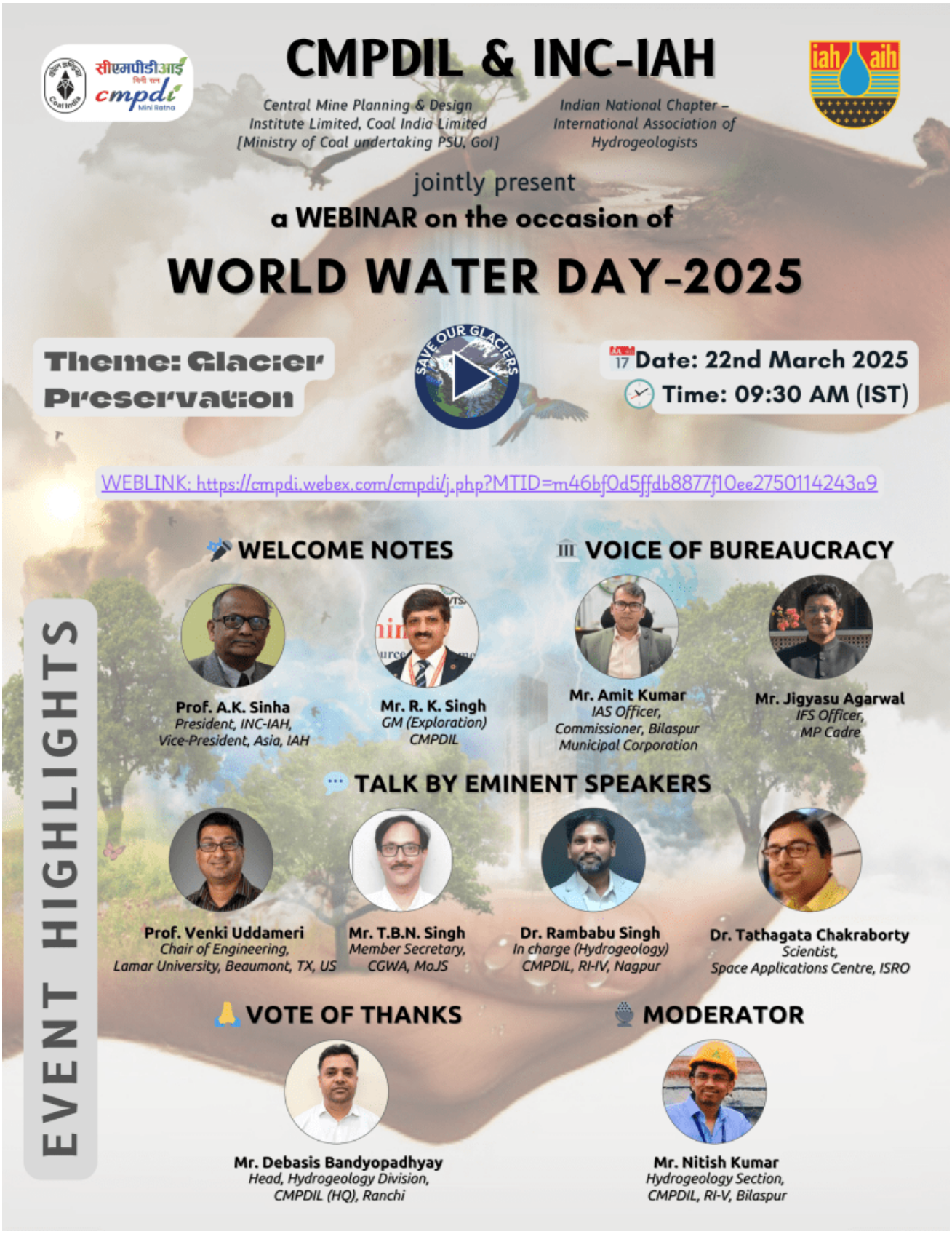

Milap Chand Sharma
Yogesh Jadeja
Sujit Sinha
bs chaudhary
Sunil Kumar
Ashok Kumar


Anadi Gayen
bs chaudhary
Milap Chand Sharma
Yogesh Jadeja
Sujit Sinha
Sunil Kumar


Viewing Changes in the Himalayan Glaciers.....
from our Ground Floor
Click to add notes
Anadi Gayen
bs chaudhary
Milap Chand Shar...
Yogesh Jadeja
Sujit Sinha

World Water Day 2025

Glacier Prese-rvation



World Water Day 2025

Glacier Prese-rvation

Amity Institute of Biotechnology
Amity Centre for Water Studies and Research

in collaboration with

Indian National Chapter of International Association of Hydrogeologists (INC - IAH)

Organises

WEBINAR ON

NATIONAL WATER SECURITY THROUGH GLACIERS' PRESERVATION

3rd April, 2025 (Thursday) | 03:00 PM to 04:00 PM

Guest Speaker

Prof. (Dr.) B.S. Chaudhary
Secretary
INC -IAH and Chairman
Dept. of Geophysics
Kurukshetra University
Kurukshetra

Speaker

Prof. (Dr.) Vinay Sharma
Dean-Research
Director
Amity Institute of Biotechnology

Coordinator -Amity Centre for Water Studies and Research

Dr. Shweta Kulshreshtha
Associate Professor
Amity Institute of Biotechnology

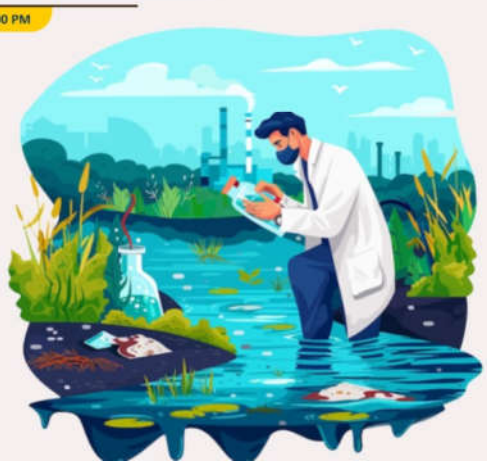
Coordinator

Dr. Avimanu Sharma
Assistant Professor
Amity Institute of Biotechnology

Moderator

Dr. Shikha Pandhi
Assistant Professor
Amity Institute of Biotechnology

on the occasion of
World Water Day 2025 and
the UN Glaciers' Preservation Year 2025



Sanatan Dharma College, Ambala Cantt.

YRC, Women Cell and NSS

in collaboration with

Indian National Chapter of International Association of Hydrogeologists (INC-IAH)

are celebrating

WORLD WATER DAY

by organising

EXTENSION LECTURE

On

World Water Security: Preserving Glaciers

Date: March 21, 2025 | Time: 11:30 AM | Venue: Seminar Hall (First Floor)

RESOURCE PERSON

PROF. BHAGWAN SINGH CHAUDHARY
CHAIRMAN, DEPARTMENT OF GEOPHYSICS, KUK
&
SECRETARY, INC-IAH

Ms. Zeenat Madan (Convener) — Dr. Rajinder Singh (Principal)

IAH 52nd World Groundwater Congress in Melbourne, Australia

15-19 Sep 2025 – Melbourne, Australia

Join us for an extraordinary gathering of groundwater expertise at the Melbourne Convention and Exhibition Centre, from September 15-19, 2025. This event, held in conjunction with the 2025 Australasian Groundwater Conference, marks a significant return of the World Groundwater Congress to Australia after 12 years.

Here are the key details about the 52nd IAH World Groundwater Congress:
Date: September 15th to 19th, 2025
Location: Melbourne, Australia
Venue: Melbourne Convention and Exhibition Centre
Abstract notifications: 15 April 2025
Organizers: ICMS Australasia
Purpose: To explore the latest international developments in groundwater research and their relevance for society
Participants: Delegates from academia, government, and industry

During this week-long event, participants will engage in knowledge exchange, present cutting-edge research, and network.

If you're passionate about groundwater and its impact on our world, this congress is an excellent opportunity to connect with like-minded professionals and stay abreast of the latest developments in hydrogeology.

https://iah2025congress.com/ info@iah2025congress.com

Upcoming Groundwater Events

Upcoming Groundwater Events

28 Apr - 2 May 2025 – Stellenbosch, South Africa

IAH Events, Other Events

12th International Symposium on Managed Aquifer Recharge (ISMAR 12)

From Theory to Implementation and Operation. The 12th International Symposium on Managed Aquifer Recharge (ISMAR12) will be held in the wine heartland of South Africa, Stellenbosch, from 28 April to 2 May 2025. The main theme “From Theory to Implementation and Operation” places the focus on the latest research, implementation of MAR sites and the practicality of operating MAR schemes. The 8 Sub-themes cover multiple aspects in the field of MAR in the domestic/municipal, agricultural, and mining sectors. Oral and Poster presentations, multiple workshops and social interactions will allow the delegates to present innovative solutions and discuss pressing societal challenges. Various exhibit opportunities and sponsoring opportunities exist. Pre-conference courses will allow the delegates to gain practical knowledge for our expert presenters. 3 end-of-the-week excursions are planned to showcase the latest MAR sites and the landscape of the Cape Town and Saldanha areas with networking opportunities.
Organised by IAH, ASCE, UNESCO.

http://ismar12.org.za/

11-14 May 2025 – University of Ottawa, Canada

IAH Events

Geoscience Beyond Boundaries | Géosciences au-delà des Frontières

The Geological Association of Canada - Mineral Association of Canada - International Association of Hydrogeologists - Canadian National Chapter annual conference is Canada’s premier geoscience gathering, bringing together hundreds of the best geological minds in the country to celebrate our achievements, discuss new findings and develop further relationships. This year's conference will be divided into five themes: Earth, Knowledge, Life, Minerals, Space and Water. Currently there are three symposia, 63 special sessions, and 9 general sessions planned for the technical program, including oral and poster presentations.
Abstract submission deadline: 16th February 2025.
Early bird registration deadline: 11th April 2025.
Organised by The Geological Association of Canada - Mineral Association of Canada - International Association of Hydrogeologists - Canadian National Chapter.

https://event.fourwaves.com/ottawa2025/pages gacmaciah2025@gmail.com

19-23 May 2025 – Bogotá, Colombia

IAH Events

VIII Congreso Colombiano de Hidrogeología | VIII Colombian Congress of Hydrogeology

Groundwater for a Resilient Society. The Asociación Colombiana de Hidrogeología (ACH), with the goal of fostering the personal, professional, and scientific growth of its members, offers a wide range of participatory activities open to all its members and the general community. This aims to facilitate interaction between different sectors, including associations, academia, and industry, to discuss topics of both national and regional interest.

The theme of the VIII Congreso Colombiano de Hidrogeología, "Groundwater for a Resilient Society," aims to raise awareness among hydrogeology professionals about the importance of ensuring access to a sustainable and safe supply of groundwater.

Organised by Asociación Colombiana de Hidrogeología (ACH) / IAH Colombian Chapter.

https://www.asociacioncolombianadehidrogeologos.org/ congresoach@gmail.com

INC of IAH

HQ. c/c Central Ground Water Board, Bhujal Bhawan, NH-IV, Faridabad – 121001

E: ashok.kumar@inciah.com

www.inciah.org

Upcoming Groundwater Events

20-22 May 2025 – Donovaly region near Banská Bystrica (Central Slovakia)

IAH Events

7th Field Hydrogeological Seminar

Groundwater interactions with anthropogenic activities. The seventh year of the field hydrogeological seminar will be focused on the ways of building and maintaining groundwater intake facilities used for water supply in an environment with intensive anthropogenical influence. The expert discussion will take place on-site at localities of hydrogeological interest aligned with the seminar theme, such as the Harmanecká Cave, mine drainage adit, and the former spa in Korytnica.

Organised by Slovak National IAH Chapter & Slovak Association of Hydrogeologists.

https://www.sah-podzemnavoda.sk/cms/page.php?6 terenny.seminar@sah-podzemnavoda.sk

11-13 Jun 2025 – Turin, Italy

IAH Events

Flowpath 2025 | National Meeting on Hydrogeology

The Italian Chapter of the International Association of Hydrogeologists (IAH) is pleased to invite you to the 7th Edition of FLOWPATH, the National Meeting on Hydrogeology. Following the tradition of the previous editions of FLOWPATH, the conference will be an opportunity for hydrogeologists and professionals to exchange ideas and discuss different issues on groundwater resources.

https://www.iahitaly.it/news/flowpath/flowpath-torino-2025-first-announcement

2-6 Nov 2025 – Pamukkale University, Denizli, Turkey

IAH Events

4th International Multidisciplinary Conference on Mineral and Thermal Waters "MinWat-2025-TÜRKİYE

On behalf of the Organizing Committee, we would like to announce that 4th International Multidisciplinary Conference on Mineral and Thermal Waters "MinWat-2025-TÜRKİYE" take place in Pamukkale University, Denizli, Turkey, between 2nd and 6th of November 2025. The official website of the conference: www.minwat2025.org
The Conference is organized by members of the Commission on Mineral and Thermal Waters (CMTW) of International Association of Hydrogeologists (IAH) and Pamukkale University Geothermal Application and Research Center. It represents one of the largest periodic meetings of the working group CMTW of IAH focused exclusively on mineral and thermal waters.
We count on a wide participation of professionals from various countries of Europe and the world to share their experience, to shed light on real problems in the field and to make exchange of know-how more fruitful. The Organizing Committee supports also participation of young researchers and students giving significant discount of conference fee.
Ali Bülbül, Adam Porowski, Natalia A. Vinograd.

Price: 400 Euros

Organised by Commission on Mineral and Thermal Waters (CMTW) of IAH and Pamukkale University Geothermal Application and Research Center.

http://www.minwat2025.org oasis@oasis.com.tr

INC of IAH

HQ. c/c Central Ground Water Board, Bhujal Bhawan, NH-IV, Faridabad – 121001

E: ashok.kumar@inciah.com

www.inciah.org

Upcoming Groundwater Events

17 Mar - 8 May 2025 – Online, Blended

Other Events

Introduction to Applied Groundwater Flow Modelling with GW Vistas (March-May 2025)

Groundwater Modeling. The training course Introduction to Applied Groundwater Flow Modeling will take place at the SYMPLE school in Vetralla, Italy, with the option of participating online. The course is divided into three parts: the first is theoretical and entirely conducted online, the second part is a blend of online and on-site attendance, emphasizing practical applications of MODFLOW models. A final session, focused on a pumping test analysis and a dewatering project, will commence on-site and continue online later on.

The course will cover essential practical criteria necessary for constructing a numerical flow model. This includes topics like defining parameters, boundary conditions and inputs, both in stationary and transient conditions. Practical applications using MODFLOW packages will be demonstrated through explanatory lectures and computer exercises facilitated by the proprietary GUI Groundwater Vistas 8. Each participant will have access to Groundwater Vistas for a duration of 2 months.

To ensure accessibility and flexibility, all course sessions, whether conducted online or on-site, will be recorded. These recordings will be uploaded to our e-learning platform, allowing participants to review the material at their convenience.

Price: 600

Organised by SYMPLE.

https://hydrosymple.com/en/prodotto/introduction-to-applied-groundwater-flow-modelling-with-groundwater-vistas-feinstein/ info@hydrosymple.com

6-27 May 2025 – Online

Other Events

Undressing MODFLOW

Groundwater Modeling. This short course focuses on how to understand and modify MODFLOW 6 input and output files. The course will also touch on files that are read/written by other members of the MODFLOW family (MODFLOW-USG and MODFLOW 2005).

Why should you care about the contents of MODFLOW input and output files?
- Firstly, programs that write MODFLOW input files for you sometimes either make mistakes, or do not understand your intentions. In the end, the only way that you can be sure that MODFLOW is receiving the information that you want to provide to it is to check these input files yourself.
- Secondly, what if you need to provide some inputs to MODFLOW, and/or process some MODFLOW outputs, in ways that your GUI or other software does not support? You need to know MODFLOW's input and output protocols to do this
- Then there is PEST/PEST++. These can be used for history-matching and uncertainty quantification of a MODFLOW model, as well as for other tasks such as management optimization (under uncertainty). Members of the PEST/PEST++ suites interact with MODFLOW through MODFLOW's input and output files.

The course is run by John Doherty (author of PEST) and involves three sessions of three-hour duration. These sessions would be interactive so that you can ask as many questions as you like and additional meetings can be arranged if more time is required.

Price: 350

Organised by SYMPLE SRL.

https://hydrosymple.com/en/prodotto/undressing-modflow-may-

INC of IAH

HQ. c/c Central Ground Water Board, Bhujal Bhawan, NH-IV, Faridabad – 121001

E: ashok.kumar@inciah.com

www.inciah.org