INC of IAH
Indian National Chapter
International Association of Hydrogeologists

Newsletter

VOLUME 11 ISSUE 02 August, 2024

this issue

Edited, designed and composed by

Dr Ashok Kumar
Treasurer, INC-IAH

INC of IAH
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www.inciah.org

President's Message

Prof. A. K. Sinha

President, INC of IAH
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 Colleagues and Friends

It is great pleasure indeed to greet you all on behalf of INC IAH and on my behalf while presenting this Newsletter during the auspicious month of August.

August is one of the most vibrant months of the year that fills Indians with zeal as most of the important episodes of India's freedom movement, leading to the freedom of the India took place during this month only. Almost last 77years of freedom, with a rich heritage of continuous innovation and technological excellence, India has now fastened its pace towards sustainable development within the framework of global sustainable development goals (SDGs). INC IAH with 309 members, highest ever recorded, is full of commitment to support policy makers of India and that of foreign countries in achieving the Sustainable development goals through sustaining the groundwater resources.

Globally there are various innovative approaches and efforts to sustain the groundwater resources. Our national chapter besides following the emerging best practices has chosen approaches involving meaningful Education, skilling and outreach activities to empower our youngsters and ground level Groundwater user community with an objective to create a conducive environment for present and future availability of the groundwater

resources.

Pursuant to the said objective our chapter has launched Mentor Mentee program; Financial support to youngsters; Lecture series by eminent experts; Annual Awards under various categories for promotion of Hydrogeology; Honour to eminent elderly hydrogeologist of the country; publication of e-newsletter and e-journals. No doubt some of these programs are at its very nascent stage of execution owing to various challenges. We are alive to these challenges and making necessary efforts to address them at soonest possible. Our governing body has taken decision to constitute one Advisory committee of senior members and also to constitute various committees such as Editorial Committee for E-newsletter and e -Journal; Events Committee (to support the organisation of the workshop/seminar/conference//Webinar etc.) and Financial Committee to boost financial status of the INC IAH.

I invite our chapter's members willing to drive these committees to join us in giving time bound performance and outcome which may be replicated elsewhere as well.

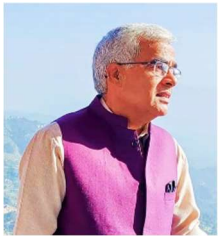
INC IAH is highly thankful to Dr Ashok Kumar Treasurer INC IAH who takes extra pain and put in extra efforts to maintain the flow of the e-Newsletter at regular intervals.

I solicit cooperation of all members to extend support, give some time for the INC IAH and make practical and positive suggestions to make INC -IAH a more useful and purposeful organisation. We need to be highly active partners and not a passive onlooker in the development and in achievement of goals of INC of IAH.

Thanks you very much

(Amarendra K. Sinha)

Secretary's Message



Prof. (Dr) B.S. Chaudhary

Secretary, INC of IAH

Professor, Department of Geophysics, Kurukshetra University, Kurukshetra -136 119 (Haryana) India,
E: bschaudhary@kuk.ac.in

Esteemed INC IAH members

Greetings for Happy Independence Day!

I am happy to see that the second issue of the E-Newsletter of new INC-IAH is in hands on the occasion of Independence Day. I on behalf of INC IAH and on my own behalf share this joy and bliss of breathing in free independence environment due to the great sacrifice of the freedom fighters. Today, we are facing altogether a different challenge in the form of optimal management of the natural resources of the earth. We all are aware about the UN SDG which envisages making this planet more hospitable and livable by setting the target for achieving these 17 goals by 2030. Sustainable Goal no. 6 which focuses on clean water and sanitation is very important in the context of International Association of Hydrogeologists.

As India is embarking on Vikasit Bharat mission by 2047, 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. As we all are aware, India faces several significant challenges related to groundwater management. Groundwater is heavily relied upon for irrigation, industrial, and domestic use. This has led to over-extraction, causing groundwater levels to drop alarmingly. Historically, there has been little control over groundwater extraction. The availability of cheap electricity has further exacerbated this issue, especially in agricultural states like Punjab, Haryana and Uttar Pradesh. Further, Irrigation accounts for about 90% of the total groundwater usage in India. This practice popularized since the 1970s and has led to socio-economic benefits but is not sustainable in the long term due to excessive use of groundwater. The continuous stress on the groundwater resources is accentuated by its contamination from industrial effluents, agricultural runoff, and inadequate waste management practices leading to degraded groundwater quality. Climate change is leading to changes in the hydrological cycle thereby adversely affecting the groundwater recharge rates. There is also a lack of comprehensive and integrated land use planning, which affects the conservation and management of soil and water.

INC of IAH

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Looking this gigantic task and the challenges which the country is facing as far as the climate resilient groundwater management is concerned, the members of INC IAH have to be pro-active in popularizing various measures for sustainable water resources management for which groundwater is a key component. INC IAH has a long way to go when it gets its appropriate place as policy interventionist at the regional, national and international level and it can be achieved through continuous involvement of its members in various activities involving result-oriented dialogue at various levels. It gives me immense pleasure to acknowledge the active involvement and single-handed handling of the stupendous work of preparing the E-Newsletter of INC IAH by Dr. Ashok Kumar Ji, Treasurer INC-IAH. He deserves all appreciation and kudos for the same. President, INC IAH, Prof. (Dr.) A.K. Sinha; Vice-President, Dr. Anadi Gayen and all the members of the Executive are thankfully acknowledged for their support and guidance to make this chapter recognized at the International level. Wishing you all a worthy reading of the new issue of E-Newsletter of INC IAH,

Happy Independence Day to you all!

(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)

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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 Independence Day edition for 2024.

In this edition, we will recount the various activities in which INC-IAH since the first quarter of 2024 until the end of July 2024. It provides an overview of major activities, such as Earth Day celebrations, Popular Lectures, Announcement of INC of IAH Award – 2023, ongoing IAH Council Election and Article on Ancient water conservation, updated list of INC-IAH members.

I also as 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 guidelines and application form for applying under various categories of INC-IAH Award 2023 has also been included in this edition. My sincere request to participate and also publicise about the award among the Indian Groundwater Community to make this award more competitive.

This volume contains one article titled "Water Heritage and Traditional water Conservation in Ancient Indian History" by Dr. Satyabrata Chakrabarti, General Secretary, Asiatic Society, Kolkata and Dr. Keka Adhikari Banerjee, Curator, Asiatic Society, Kolkata.

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, 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, August Edition of 2024

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Nomination Open for INC-IAH Award (2023)

Closing Date: 16th of September, 2024 at 05.00 PM

About the Award

The INC- IAH Award has been instituted by the Indian National Chapter (INC) of International Association of Hydrogeologists (IAH) as an instrument for the promotion, motivation, and recognition of the excellence in the domain of the science of the groundwater and its sustainable management.

The INC-IAH award is an open competitive annual program for the members of INC- IAH. However, non-members may also be considered for the award subject to the compliance of certain conditions as laid down in guidelines. In each year there will be six awards in the individual categories.

Award & Sponsorship

The Award shall carry a citation, plaque, and prize money. The quantum of the prize money may vary from year to year depending upon the fund available with the INC IAH and received from the sponsors. INC-IAH will make necessary endeavour to accumulate the inhouse funds through various activities, advertisements as also from the sponsorship, so that the expenses pertaining to giving away the awards can be met. However, in case of non-availability of the fund in any particular year the cash amount may not be given. For this, the INC- IAH will sincerely pursue to find out the sponsors for the award so that the awardee may be felicitated with the prize money too besides the citation and memento.

Awards Category

- Lifetime Achievement Award - One
- Groundwater Excellence Award – One
- Young Scientist Award – One
- Best Paper Award – Two (one for male and one for female)
- Best Post Graduate Dissertation / Project in Hydrogeology / Groundwater - one
- Best PhD Thesis in Ground water / Hydrogeology – One

Nomination for INC-IAH Award 2023 is now open. All eligible individuals are invited to submit their applications under different categories. Please refer to the guidelines and, accordingly, submit the application within the deadline. We also encourage non-members with remarkable excellence and track records in the field of groundwater to also submit their nominations. An INC-IAH active member may also nominate the veteran for the Lifetime Achievement award.

Guidelines, Categories of Award and Application Form are available on the link given below

INC-IAH Award Guidelines (2024)
Application Form: Lifetime Achievement Award (2023)

Application Form: Groundwater Excellence Award (2023)

Application Form: Young Scientist Award (2023)

Application Form: Best Paper Award (2023)

Application Form: Best PhD Thesis Award (2023)

Application Form: Best Post Graduate Dissertation / Project Award (2023)

Closing Date: 16th of September, 2024 at 5.00 PM

The International Association of Hydrogeologists 2024 Council Elections

Voting Now Open!

10 Jul 2024 | IAH News

The balloting stage of the 2024 council elections is now open. Elected members make important contributions to IAH and the international groundwater community, and will represent the IAH membership for the next four years. As IAH members you have the opportunity to vote for the candidates who you think will best serve the IAH membership and ensure IAH's success as a charitable organization.

List of Standing Candidates in IAH – Council Election 2024

President – Dr Teodóra Szőcs (Hungary)

Secretary General – Jane Dottridge (UK)

Vice President, Finance and Membership – Julian Conrad (South Africa)

Vice President, Programme and Science Coordination – Marco Petitta (Italy)

Vice President, Asia (Three Candidates against one Post)

- Prof. Amarendra K. Sinha (India)
- Yan Zheng (China)
- Yongje Kim (Korea)

Vice President, Australasia and the Pacific - Sarah Bourke (Australia)

Vice President, Eastern Europe and Central Asia- Valentina Rakhimova (Kazakhstan)

Vice President, Latin America and The Caribbean- Luis Camilo Suescún (Colombia)

Vice President, Middle East and North Africa- Joanna Doummar (Lebanon)

Vice President, North America (Two Candidates against one post)

- Grant Ferguson (Canada)
- Tim Parker (USA)

Vice President, Sub Saharan Africa – Seifu Kebede Gurmessa (Ethiopia)

Vice President, Western and Central Europe – (Two Candidates against one post)

- Bartolomé Andreo Navarro (Spain)
- Tim Besien (UK)

The voting process is being administered on behalf of IAH by Mi-Voice, a UK based independent election provider. All members of IAH are eligible to vote in this election, and should have received an email with an invitation to cast their votes. Members can also follow the link here and enter the unique voter code sent via email.

The results of the elections will be declared at the Annual General Meeting of IAH, which will be held in Davos on Wednesday 10th September. All IAH members may vote for all posts; you are not restricted to voting only for the Vice President of the region in which you live.

To vote please enter your Unique Voter Code in the box below to access the voting site.

Your code will have been sent to you from elections@mi-voice.com. If you are unable to find your code please enter your details on the right to be resent your voting details.

Voting will close at 12:00 BST on Friday 6 September 2024!

If you need assistance please contact Mi-Voice Support using the email address below.
Email: support@mi-voice.com
Mi-Voice Support are available from Monday-Friday, 9am-5pm.

Want to find out more about the candidates?

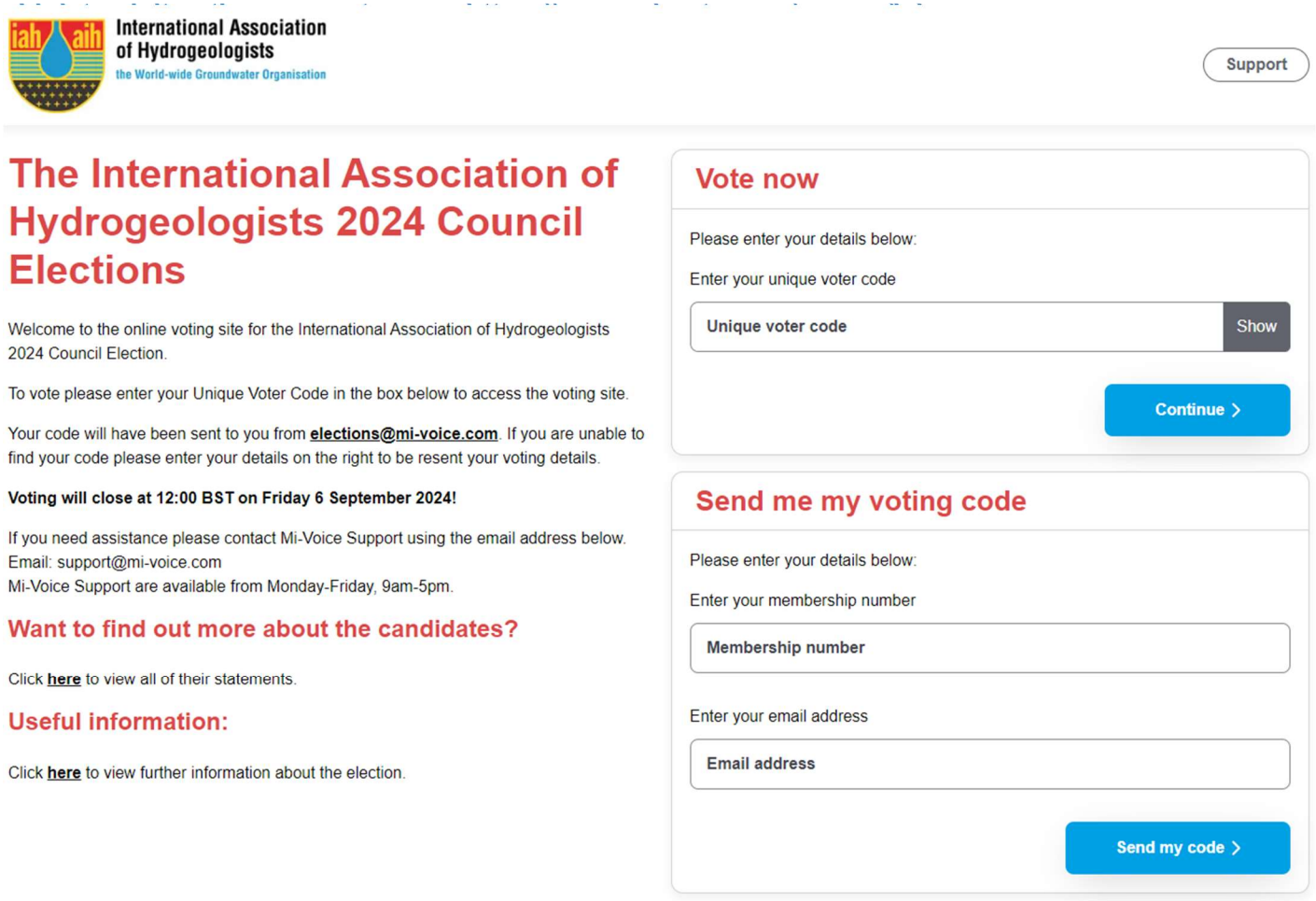
Click **here** to view all of their statements.

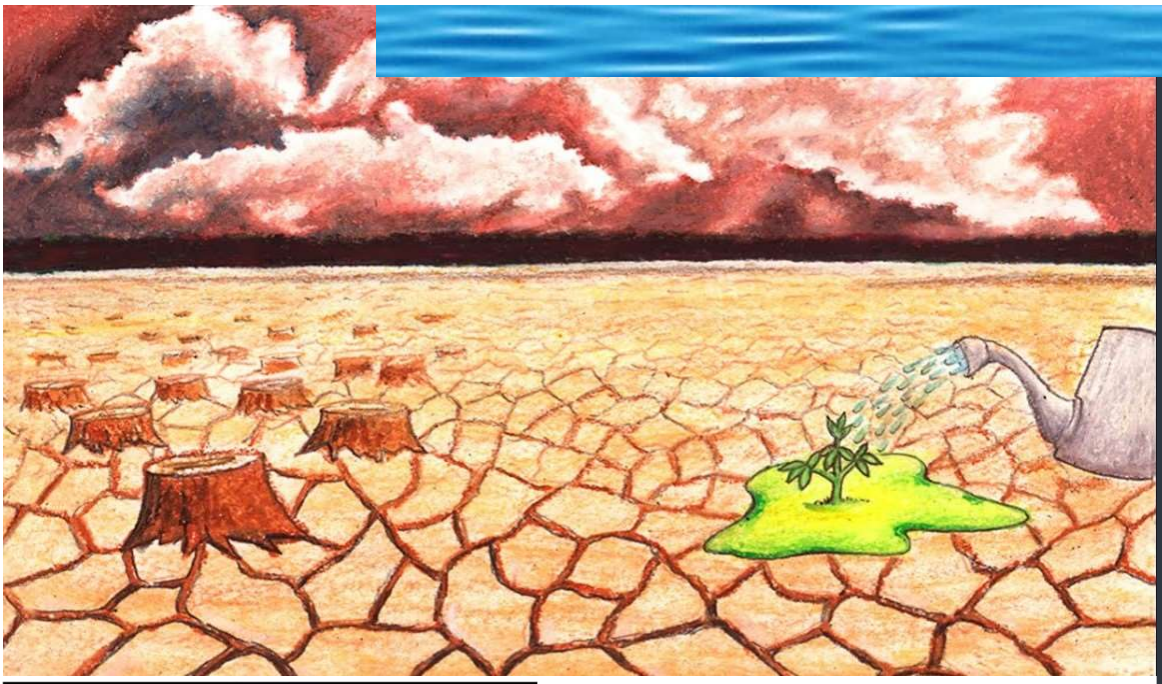
https://www.mi-vote.com/files/IAH/2. Candidates 2024.pdf

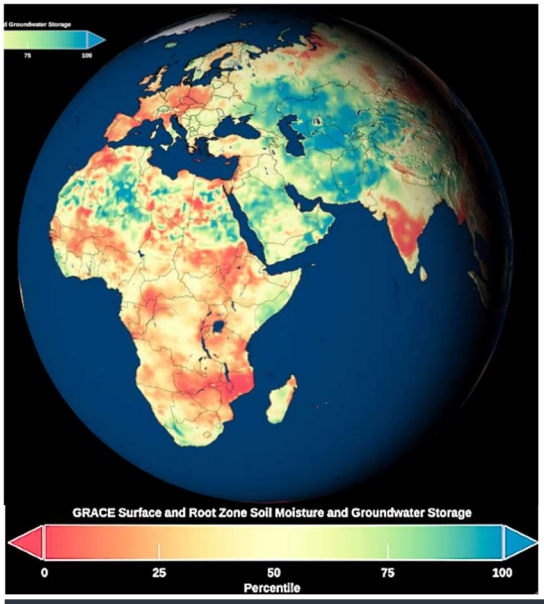
Useful information:

Click **here** to view further information about the election.

https://www.mi-vote.com/files/IAH/1. General Election Information v2.pdf







Hydrology and water resources management in ancient India *(Pushpendra Kumar Singh, Pankaj Dey, Sharad Kumar Jain, and Pradeep P. Mujumdar)*

Brihat Samhita discusses about the geographical pointers such as plants, reptiles, and insects as well as soil markers to gauge the groundwater resources (occurrence and distribution) (chap. 55, “Dakargalam”). It explains groundwater recharge as “the water veins beneath the earth are like vein's in the human body, some higher and some lower” as given in the following verses (NIH, 2018):

धर्म्यं यशश्यं वा वडाभयतोहं डाकरगलं येन जलोपलाब्धिहा
पुंसं यथाग्देशु शिरस्तथैव छितवापि प्रोन्नात्निम्नसंस्थः।

एकायण वरदायन रसायना चम्भ्याश्च्युतं नमस्तो वसुधा विशयशन्त नाना रस्त्वां बहुवर्णतं च गतं पारीक्ष्यं छिततुल्यामयव।

Facts About Global Groundwater Usage

- Groundwater is the world’s most extracted raw material with withdrawal rates currently in the estimated range of 982 km3 /year.
- About 70% of groundwater withdrawn worldwide is used for agriculture.
- Groundwater provides almost half of all drinking water worldwide.
- Globally, about 38% of irrigated lands are equipped for irrigation with groundwater.
- The total volume of groundwater in the upper 2 km of the Earth’s continental crust (not inclusive of high-latitude North America or Asia) is approximately 22.6 million km3, of which 0.1 million km3 to 5.0 million km3 is less than 50 years old (judged as “modern” or recently recharged).
- The volume of modern groundwater is equivalent to a body of water with a depth of about 3 m spread over the continents.

The 15 nations with the largest estimated annual groundwater extractions (2010) are (km3/yr): (1) India -251, (2) China - 111.95, (3) United States - 111.7, (4) Pakistan - 64.82, (5) Iran - 63.4, (6) Bangladesh - 30.21, (7) Mexico - 29.45, (8) Saudi Arabia - 24.24, (9) Indonesia - 14.93, (10) Turkey - 13.22, (11) Russia - 11.62, (12) Syria - 11.29, (13) Japan - 10.94, (14) Thailand - 10.74, (15) Italy - 10.4

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/

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

Groundwater News in Media

Threat to food security with depletion of groundwater in North India: Study

Jitendra Choubey Updated on: 08 Aug 2024, 8:06 am

NEW DELHI: A study has found that consistent weaker summer monsoons and warmer winters — the fallout of global warming-induced climate change — have led to a massive loss of groundwater in North India in last two decades. https://www.newindianexpress.com/nation/2024/Aug/08/threat-to-food-security-with-depletion-of-groundwater-in-north-india-study

Groundwater level falling fastest in Punjab, 70% wells register dip — some by 4 metres

The National Capital Delhi, Union Territories of Chandigarh and Jammu and Kashmir, and Himachal Pradesh, Uttarakhand and Rajasthan recorded an overall rise in the water levels in the corresponding period. https://indianexpress.com/article/cities/chandigarh/groundwater-level-punjab-wells-register-dip-9501789/

Bill on groundwater management sent for reconsideration by panel

TNN / Aug 2, 2024, 04:47 IST

Jaipur: The Groundwater (Conservation and Management) Authority Bill, 2024, was tabled in the state Assembly and referred to a select committee for reconsideration on Thursday following opposition from various quarters. The development is seen as a setback to the govt's efforts to establish a Groundwater Management Authority in the state. https://timesofindia.indiatimes.com/city/jaipur/bill-on-groundwater-management-referred-for-reconsideration-by-panel/articleshow/112208537.cms

Groundwater in Malwa shallow wells unfit for drinking due to high uranium, fluoride levels: CU Punjab new study Bathinda, Fazilka, Muktsar and Barnala found to be the worst affected

By: Express News Service Ludhiana | August 2, 2024 10:29 IST

The study cautioned the groundwater in the four worst-affected districts of Fazilka, Sri Muktsar Sahib, Bathinda and Barnala is “extremely unsafe for human consumption”.
https://indianexpress.com/article/cities/chandigarh/groundwater-malwa-unfit-high-uranium-fluoride-levels-cu-punjab-9490472/

Amid IPL, NGT warns cricket bodies: Submit report on use of rainwater for ground maintenance or face action

Nikhil Ghanekar, New Delhi, May 4, 2024, The Indian Express

The Central Groundwater Authority (CGWA) had revealed to the tribunal last year that of 26 stadiums, 24 had borewells or tubewells for extracting groundwater. https://indianexpress.com/article/india/ngt-to-cricket-bodies-submit-report-on-use-of-rainwater-for-grounds-or-face-action-9304548/

How quickly does groundwater recharge? The answer is found deep underground

June 25, 2024 6.46am BST

You would have learned about the “water cycle” in primary school – water’s journey, from evaporation to rainfall to flowing in a stream or sinking into the ground to become groundwater. Despite how simple it sounds, there are actually some large unknowns in the cycle – especially concerning groundwater. https://theconversation.com/how-quickly-does-groundwater-recharge-the-answer-is-found-deep-underground-230943

Open-Source Groundwater Modelling Software options besides MODFLOW

ParFlow hydrologic model

ParFlow is a parallel, integrated hydrology model that simulates spatially distributed surface and subsurface flow, as well as land surface processes including evapotranspiration and snow. ParFlow is a numerical model that simulates the hydrologic cycle from the bedrock to the top of the plant canopy. It integrates three-dimensional groundwater flow with overland flow and plant processes using physically-based equations to rigorously simulate fluxes of water and energy in complex real-world systems. It solves saturated and variably saturated flow in three dimensions using either an orthogonal or terrain-following, semi-structured mesh that enables fine vertical resolution near the land surface and deep (~1 km) confined and unconfined aquifers. The model uses robust linear and nonlinear solution techniques and exhibits efficient parallel scaling to large processor counts, more than 100K cores, enabling very large extent simulations with fine spatial resolution.

Getting ParFlow

ParFlow is released under the GNU LPGL license agreement. The latest stable release is avilable on https://github.com/parflow/parflow

Earth Day 2024

POPULAR TALK

The significance of groundwater in earth system sustainability

Dr. Himanshu Kulkarni
Scientist (Emeritus) ACWADAM &
Visiting Professor ADCPS (IIT-B)

For both present and future generations, groundwater is an essential resource, yet in many regions of the world, its usage is not sustainable. The need for having sustainable groundwater is a key element in global resilience to climate change, as a shield against ecosystem loss, and as a defense against human deprivation and poverty. Groundwater is the underpinning of irrigated agriculture and energy production. It therefore supports food security and economic development. It is essential to the health of all living things.

Groundwater is a hidden and vulnerable resource and is not physically visible, which can make it difficult for the general population and decision-makers to connect up with the challenges affecting this resource.

Appreciation of groundwater is not taught in elementary schools. Many university programs do not have hydrogeology courses in their undergraduate curricula.

- Prof. David Kreamer, President of IAH

22nd April (Earth Day), 2024
4.00 PM IST

Google Meet link
https://meet.google.com/cpo-skqp-gag
Dial-In: +1 781-570-3055
PIN: 446 225 453#

Host

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

Moderator

Prof. (Dr.) B S Chaudhary
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Professor of Geophysics, Kurukshetra University
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Meeting Admin:
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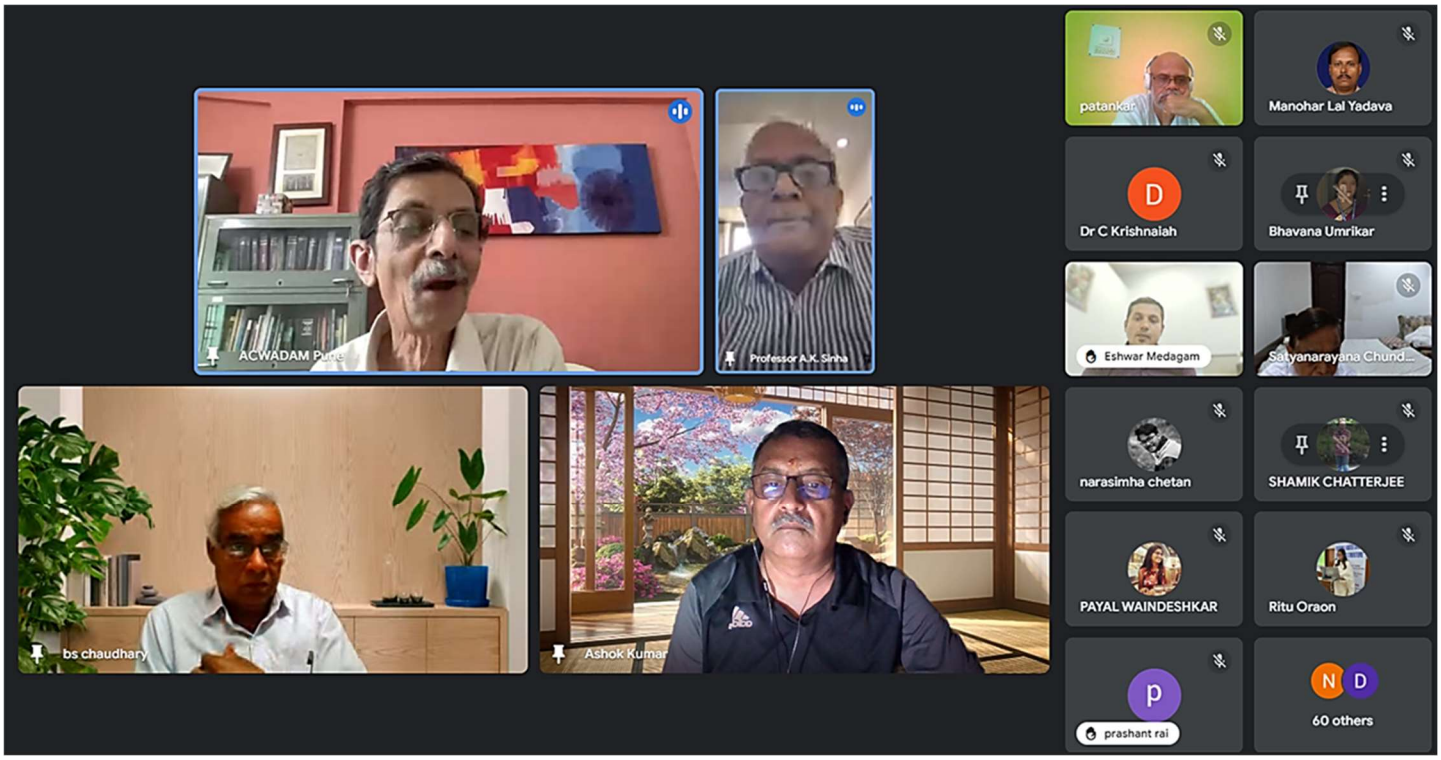
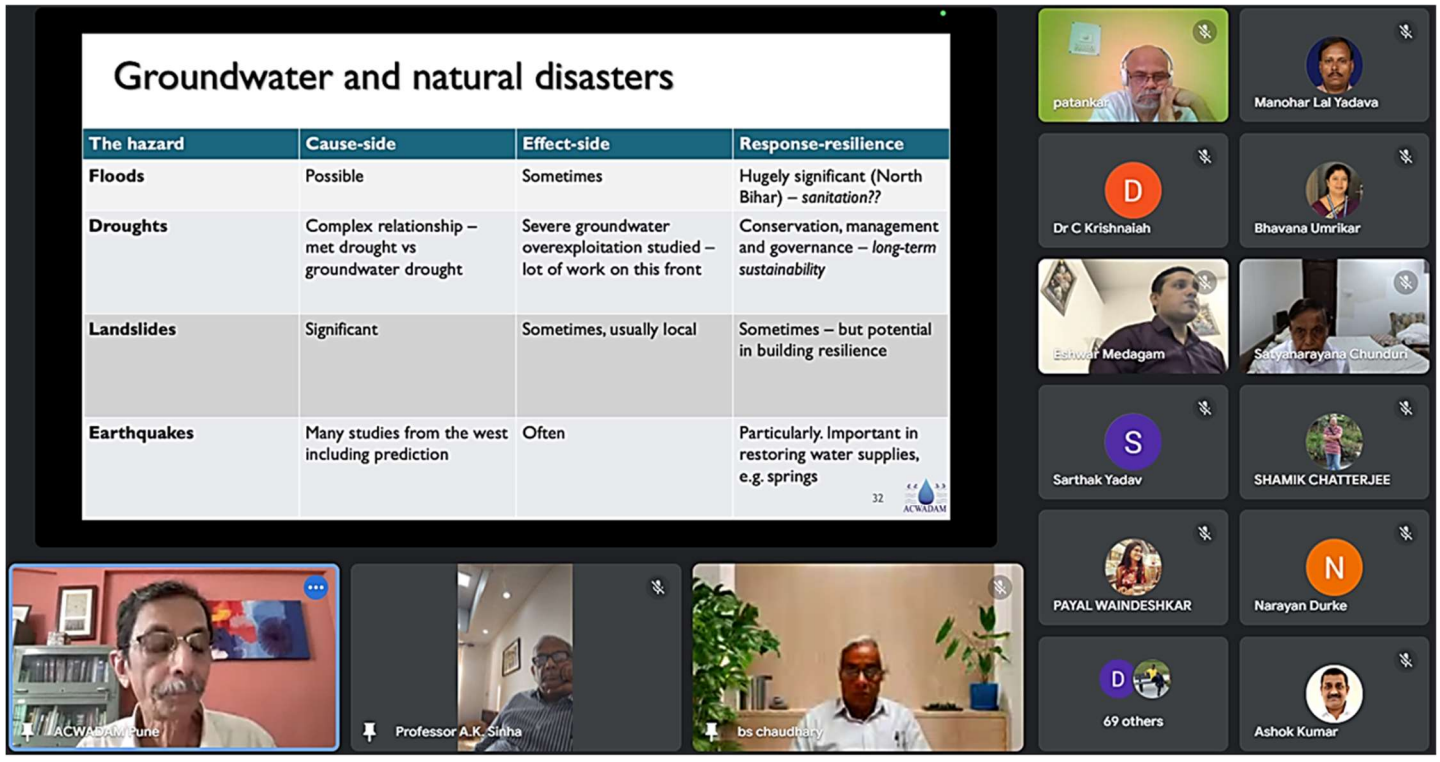
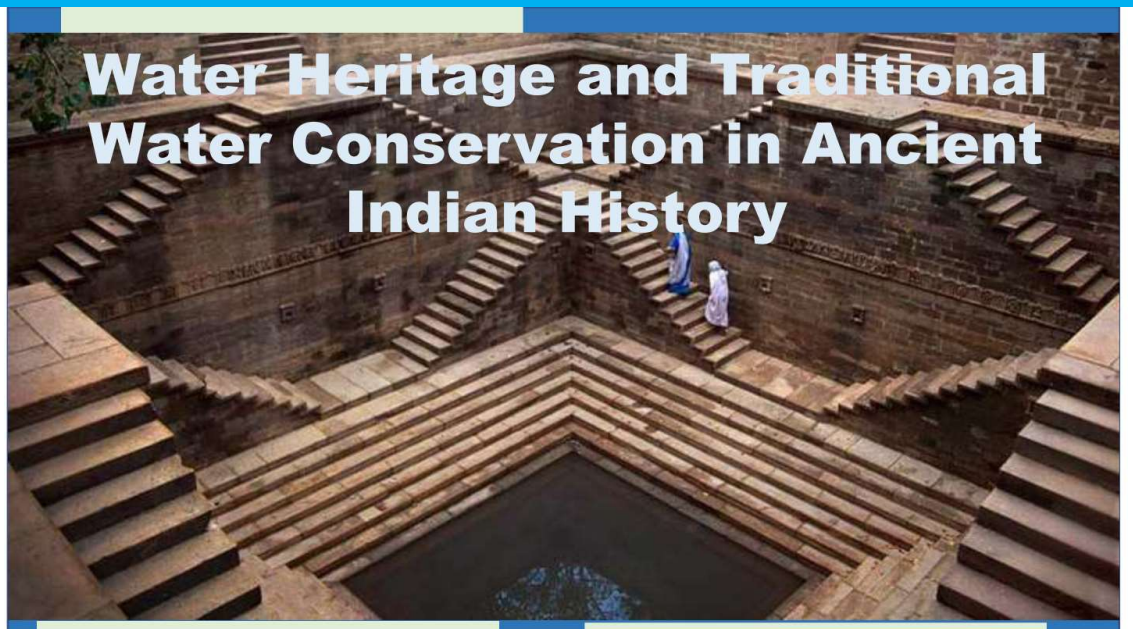

ACWADAM Pune
Professor A.K. Sinha
bs chaudhary
Ashok Kumar
patankar
Manohar Lal Yadava
Dr C Krishnaiah
Bhavana Umrikar
Eshwar Medagam
Satyanarayana Chund...
narasimha chetan
SHAMIK CHATTERJEE
PAYAL WAINDESHKAR
Ritu Oraon
prashant rai
60 others


Groundwater and natural disasters
The hazard | Cause-side | Effect-side | Response-resilience
Floods | Possible | Sometimes | Hugely significant (North Bihar) – sanitation??
Droughts | Complex relationship – met drought vs groundwater drought | Severe groundwater overexploitation studied – lot of work on this front | Conservation, management and governance – long-term sustainability
Landslides | Significant | Sometimes, usually local | Sometimes – but potential in building resilience
Earthquakes | Many studies from the west including prediction | Often | Particularly. Important in restoring water supplies, e.g. springs
32
ACWADAM
ACWADAM Pune
Professor A.K. Sinha
bs chaudhary
patankar
Manohar Lal Yadava
Dr C Krishnaiah
Bhavana Umrikar
Eshwar Medagam
Satyanarayana Chunduri
Sarthak Yadav
SHAMIK CHATTERJEE
PAYAL WAINDESHKAR
Narayan Durke
69 others
Ashok Kumar

POPULAR TALK



Water Heritage and Traditional Water Conservation in Ancient Indian History

Dr. Satyabrata Chakrabarti
General Secretary,
Asiatic Society, Kolkata

Dr. Keka Adhikari Banerjee
Curator,
Asiatic Society, Kolkata

Archaeological evidence suggests that water conservation is deeply entrenched in ancient Indian knowledge. Excavations reveal that the towns of the Indus Valley Civilisation had outstanding water collection and drainage systems. The town of Dholavira, built on a hill between two storm water canals, is a prime example of water engineering. Chanakya's Arthashashtra describes irrigation with water gathering methods. Sringaverapura, in Allahabad, featured a clever water harvesting system that leveraged the land's natural slope to store floods from the Ganga. Chola King Karikala erected the Grand Anicut or Kallanai across the Cauvery River to redirect water for agriculture (it is still operational), and King Bhoja of Bhopal created India's largest manmade lake. Drawing on millennia of experience, Indians proceeded to create shelters to capture, contain, and store monsoon rainfall for future dry seasons. These old procedures, while less popular now, remain in use and effective.

3rd July, 2024
3.00 PM IST

Google Meet link
meet.google.com/bew-ckyy-nza
Dial-In: +1 413-338-2108
PIN: 968 835 392#

Host

Prof. (Dr.) A. K. Sinha
President, INC-IAH
Founder Vice-Chancellor,
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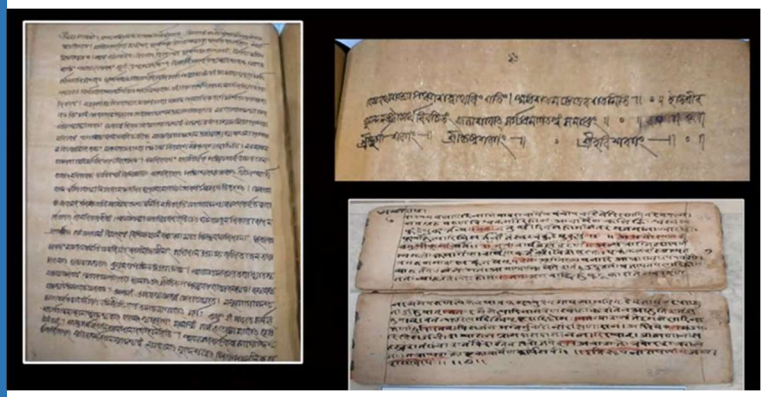

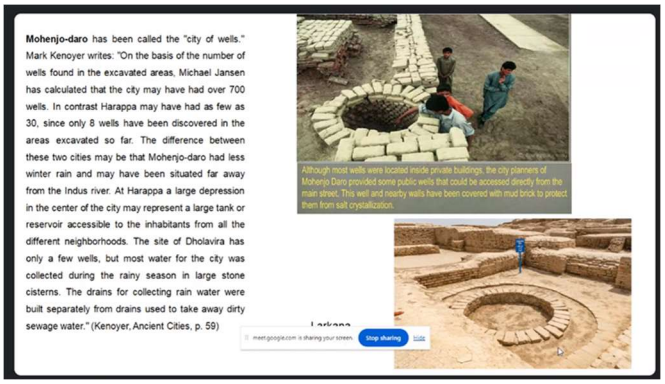
Mohenjo-daro has been called the "city of wells." Mark Kenoyer writes: "On the basis of the number of wells found in the excavated areas, Michael Jansen has calculated that the city may have had over 700 wells. In contrast Harappa may have had as few as 30, since only 8 wells have been discovered in the areas excavated so far. The difference between these two cities may be that Mohenjo-daro had less winter rain and may have been situated far away from the Indus river. At Harappa a large depression in the center of the city may represent a large tank or reservoir accessible to the inhabitants from all the different neighborhoods. The site of Dholavira has only a few wells, but most water for the city was collected during the rainy season in large stone cisterns. The drains for collecting rain water were built separately from drains used to take away dirty sewage water." (Kenoyer, Ancient Cities, p. 59)
Although most wells were located inside private buildings, the city planners of Mohenjo Daro provided some public wells that could be accessed directly from the main street. This well and nearby walls have been covered with mud brick to protect them from salt crystallization.
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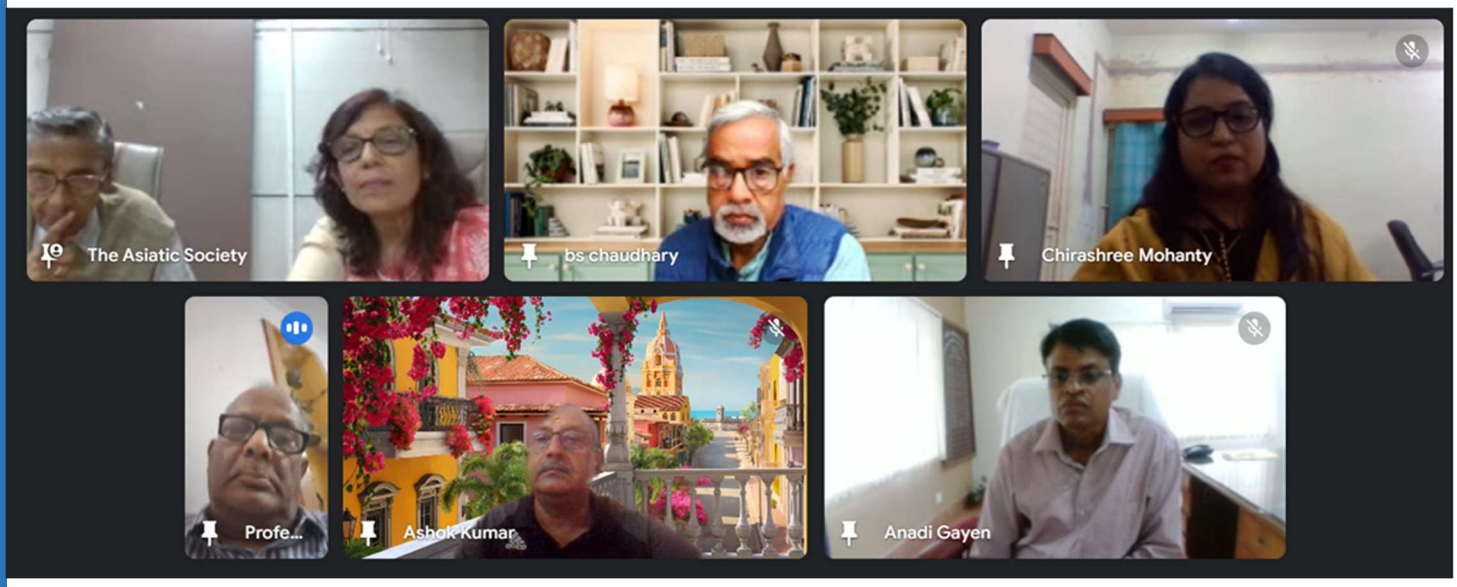
The Asiatic Society
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Water Heritage and Traditional water Conservation in Ancient Indian History

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While preparing this paper, my eyes stucked into the report published in The Times of India on 30th June which re-established the importance of preserving water, especially in the modern era due to increased global warming, low availability of potable water, and destruction of Man-Nature relationship. It is also reflected in the report that how Arthashashtra described the necessity and methods of conservation of water during the 4th century BCE.

Water, the lifeblood of civilization, has been a vital resource throughout human history. It is a prerequisite for existence of life and source of societal and cultural development. It is essential for agriculture, the source of food needed for the survival of life. Ever since man appeared on the surface of the earth, he must have understood the importance of water as is apparent from the fact that all the ancient civilizations known to history and archaeology thrived on the banks of rivers such as Indus, Ganges, Saraswati, Nile, Tigris, Yang-si kiang, Euphrates etc. Rivers are often personified as goddesses and revered with immense devotion. In India, the deification of rivers like the Ganges, Yamuna, Svaraswati, Narmada etc reflects a deep spiritual connection between nature and people. It emphasizes the sacredness of water, its life-sustaining properties, and its role in spiritual purification and renewal. This cultural practice underscores the reverence Indians have for natural resources and their belief in the divine presence within them.

Water conservation in ancient India was a significant aspect of life, influenced by both practical and religious considerations. While specific manuscripts dedicated solely to water conservation may not exist in the modern sense, ancient Indian texts and scriptures often contain valuable insights and practices related to water management, preservation, and sustainability. Here are some key sources and concepts related to water conservation in ancient India:

The Vedas, among the oldest scriptures of Hinduism, emphasize the sacredness of water. The Rigveda (c. 1500 BCE) contains hymns that extol the life-sustaining properties of water, urging its preservation and respect. The Vedic people had very clear knowledge about water cycle: evaporation, condensation, rainfall, stream flow etc. They were accustomed in occasional rainfalls in arid regions (1-38-7). The phenomenon of rain is described in a context of victory of Indra, the god of rain over Ahi, a demon obstructing the flow of water from the clouds.

Nāsnai vidyunna tanyatu niṣedha nā jāng mihamakirada brāduniṃ
Indrascha jadyujudhāte ahischotāparībhyo maghavā bi jigye (1-32.12-13).

Even the wells for drinking water were well known in the Rigvedic society (1-55-8). The Atharvaveda highlights the medicinal and purifying aspects of water, illustrating a reverence that necessitates its careful management. The system of irrigation by wells and canals were known to the Vedic people.

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Ancient India, under the guidance of visionary thinkers like Chanakya, demonstrated remarkable expertise in water management. The Arthashastra, an ancient Indian treatise on statecraft, economic policy, and military strategy, written by Kautilya (Chanakya) around the 3rd century BCE, provides detailed guidelines on water conservation. It discusses the construction and maintenance of irrigation systems, reservoirs, and canals, emphasizing state responsibility in ensuring water availability for agriculture and daily use. Hence, setubandha or irrigation works form an important activity of the state.

Sahodakamāhāyoradakaṁ vȧ setuṁ badhnayet (AS, .1,20)

The word setu refers primarily to the embankment or dam which is built for holding water. Two types of setu are distinguished, the sahodaka setu and the āharyodaka setu (Kangle, 1965). The former appears to refer to tanks, wells etc., which are fed by natural springs of water, while the latter seems to imply the storing of water in reservoirs by means of embankments. It highlights the significance of maintaining water quality, suggesting measures like regular cleaning of water sources and treatment of wastewater.

There is also mention of the privately owned irrigation tanks which were very useful at that time. A rule was in vogue which states that 'the ownership of a tank is lost if it is not used for five years, except in times of distress'. Another rule mentioned is that a person is free to sell or mortgage his tank (Kangle 1965, P-172). Different amount of fines were incorporated for polluting water. According to Kautilya, the lowest fine for violence (sahasa) was to be imposed if one obstructed a customary water-course in use or made a new one which is not customary. Also it has been proposed that, one should be drowned in water if one breaks a dam holding water. A city-superintendent was appointed whose duty was to constantly inspect the places of supplying water, water-course etc.

Nityamudakasthāna ----abekshṇaṁ----(AS, 2.36.43)

The Junagadh rock inscription of Rudradaman, also known as the Girnar Rock inscription of Rudradaman, is a Sanskrit prose inscribed on a rock by the Western Satraps ruler Rudradaman I. It is located near Girnar hill near Junagadh, Gujarat, India. The inscription is dated to shortly after 150 CE. The Junagadh rock contains inscriptions of Ashoka (one of fourteen of the Major Rock Edicts of Ashoka), Rudradaman I and Skandagupta. The inscription is significant as a historical record of public works in ancient India-those nearly 500 years before the inscription was created. It mentions the construction of a water reservoir named Sudarshana nearby, during the reign of the Maurya Empire founder Chandragupta Maurya by Vaishya Pushyagupta. Later, during the reign of Ashoka, it mentions a Yavana king named Tushaspha building conduits.

The inscription goes on to tell us that during the reign of the Maha Kshtrapa Rudradaman in the Saka year 72 there was a terrible storm. The rain that accompanied the storm had converted the earth into one ocean. Sudarshana Lake was badly damaged. The embarkments were broken and all water flowed out. So great was the damage, that Rudradaman's ministers throught was beyond repair. But Rudradaman ordered the job to be done. The lake was repaired and made three times as strong in length and breadth than before, in a very short time without oppressing the inhabitants of the town by taxes and forced labor. The inscription tells us that all this was done in order to benefit the cows and Brahmanas for thousands of years and for the sake of Dharma and Kirti.

During the Mauryan Empire there were departments concerned with the rivers, excavating, and irrigation along with a number of regional and other superintendents such as the superintendent of rivers; agriculture; weights and measures; store house; space and time; ferries, boats, and ships; towns; pasture grounds; road cess; and many others.

The epic Mahabharata (verse II, 184-15-16) mentions about seasonal rainfall and evapouration process. Again the epic Ramayana says “The water from deep earth comes out by force continuously through the holes created by arrows of lord Rama”. Besides, many puranas like Vāyu, Matsya, Brahmāṇḍa etc, and texts like Vrihat Samhita, Krishi parasara , Anguttaranikaya, Buddhist jataka stories and Jain texts clearly reflect on the knowledge of rain and other source of water bodies for different purposes.

Varaha Mihira’s Vrihat Samhita, a Sanskrit text, was probably composed in early 6th century AD, is an encyclopedic work on architecture, planetary motion, eclipses, astrology, seasons, cloud formation, rainfall, agriculture, mathematics, gemology, perfumes, groundwater and many more topics. 54th chapter of this work entitled – ‘Dakargalam’ meaning groundwater exploration. Variation in the height of water table with place, hot and cold spring, groundwater utilization by means of well, colour of water as per quality, well construction methods and equipments are also described.

The mention of udakapānaśāla, pakkhariṇī or Puṣhkariṇī in Aṇguttaranikāya and Nakulapitu Sutta (SN 22.1), Kumbha Jataka (512), mention of lake in Nalinika Jataka (526), Maha-umagga Jataka (546) give references of waterbodies for public uses in early centuries. The “Apannaka” Jataka states several climatological facts. The Buddhist literature refers to two general classes of clouds: monsoon cloud and storm clouds or accidental ones (Tripathi, 1969).

Manuscripts like the "Manasara," an ancient treatise on architecture, outline the construction of water bodies and the importance of integrating water management into urban design. Traditional water harvesting methods, such as the construction of johads (earthen check dams), have been documented extensively in texts like the "Rajatarangini," a historical chronicle of Kashmir written by Kalhana in the 12th century CE.

The Asiatic society museum and archives have good repositories of manuscripts on different subject matters. While going through this topic we have noticed a good number of manuscripts on Jalāśayotsargavidhi, Taḍāga Utsarga, Puṣhkariṇī, kūpa, vāpī etc. which give information about the importance of water in public life. Generally, we get 4 types of principal waterbodies those were dug for public interest- Kūpa, Vāpī, Taḍāga, Puṣhkariṇī. About digging of well is also discussed in Matsyapurana with elaborate illustration.

Digging of wells not only met the public demands but also was regarded as a good and pious work. There are many commentators mentioned in the Astavimsati Smrititattva like Kasirama, Narayana etc. Gopala Nyayapancarana has compiled such kind of texts in late 17th or early 18th CE.

Here one manuscript may be mentioned-“Tadagautsargavidhi” where it is mentioned that besides digging of wells or tadaga for personal use, wells were also constructed in public interest.

Tadaqa- [definition]: In manuscript it is written about Desa-Visesya- that means the identification of place of digging of such waterbodies through which travellers get drinking water during their long travel. Even they used to dig these water bodies selecting a suitable time by which it may be done without any obstacle.

They used to plant trees surrounding a waterbody [Ref: Varahapurana 5.F] from which it is understood how conscious they were about man-nature relationship. Importance of plantation to prevent soil erosion as well as to provide shade is also mentioned. F. 2a Ref. of Mahabharata where it is said that Gandharvas, Raksasa/ancestors wait for waterbodies. Even the act of digging jalasaya is compared with Asvamedha sacrifice. Not only human beings but also animals, birds need water for their drinking. [Tirjak Yoni animals]

[Sali'lam Pivati Mrga Paksinam] Here Mrga means all animals. So though Mahabharata is an epic yet it was conscious about different aspects of social life.

The manuscript ensures about the utilisation of the water. Bathing in the jalasaya dedicated for the drinking water was completely prohibited. Not only bathing but the urinating and other works which destroy the purity of drinking water were also strictly prohibited.

Bhabisya Purana, Manvartha Muktavali, Brahmandah Purana, Boudhayana Smritisastra, Madana Parijata, Devala Smritisastra etc mention elaborately about this digging of water bodies and utsarga vidhi.

Coming to the archaeological excavations we have enough evidences of ancient Indian architecture and town planning which also reflect advanced water conservation techniques. The Indus Valley Civilization (c. 3300–1300 BCE) exhibited sophisticated urban planning with well-organized drainage systems, rainwater harvesting structures, and public baths. The stepwells (baolis) and tanks (kunds) found across various parts of India are testaments to the indigenious methods of water storage and management practiced historically.

Agriculture was the main economic activity of the Harappan society and an extensive network of reservoirs, wells, canals as well as low-cost water-harvesting techniques were developed throughout the region at that time (Nair, 2004). Mohenjo-Daro and Dholavira, the two major cities of the Indus Valley, are the best examples of advanced water management and drainage systems. The Great Bath of Mohenjo-Daro of the Indus Valley is considered the "earliest public water tank of the ancient world" (Mujumdar and Jain, 2018). Adequate archaeological evidence exists to testify that the Harappans of the Indus Valley were well aware of the seasonal rainfall and flooding of the Indus River during the period between 2500 and 1700 BCE, which is corroborated by modern meteorological investigations (Srinivasan, 1976). [ref ; P Singh]

Dholavira is flanked by two storm water channels; the Mansar in the north, and the Manhar in the south. In the town square, there is an area high above the ground, called the "Citadel".

Bisht, who retired as the Joint Director-General of the ASI, said, "The kind of efficient system of Harappans of Dholavira, developed for conservation, harvesting and storage of water speaks eloquently about their advanced hydraulic engineering, given the state of technology in the third millennium BCE. One of the unique features of Dholavira is the sophisticated water conservation system of channels and reservoirs, the earliest found anywhere in the world."

Even recent excavation at Kunal, another Pre-Harappan site in Fatehabad district of Haryana state in India, has revealed the channelization of the river Saraswati for multipurpose use. Excavation at Kunal show three successive phases of Pre-Harappan indigenous culture. Kunal, along with its other contemporary sites Bhirrana and Rakhigarhi on Sarasvati-Ghaggar river system, is recognised as the oldest Pre-Harappan settlement (C14 dates 5700-6000 B.C).

from pit dwelling to that of square and rectangular mud brick houses, which are supposed to be the earliest remains of pre-Harappan culture in India. Also copper furnace, steatite bead making workshop and kiln were found. The water channelized from the river was used by the people for fishing, agriculture and other purposes. [courtesy Dr. Banani Bhattacharya and Dr. B.R.Mani]

The Pandavleni caves, located at the outskirts of Nashik city on Nashik Mumbai road (NH3) are a group of 24 caves of the Buddhist Hinayana faith (B.C.250- A.D.600). These caves were built on the Trirasmi hill about 3004 feet above the sea. Their northern frontage saves them from the sun and the south-west rains hence much of the carved work and many long and most valuable inscriptions have passed fresh and unharmed through 1500-2000 years. The Pandavleni caves have beautiful sculptures, chambers, unique water structures and stone ladders built inside the cave. The caves had an excellent arrangement for water, with skillfully chiseled water tanks, exquisitely carved into the rocks.

At Sringaverapura, on the left bank of the river Ganges in the district of Allahabad in Uttar Pradesh, a simple but effective series of interconnected reservoirs, some of them with a well dug at the bottom, was fed by a channel from the Ganges some 2,000 years ago. In this site an extraordinary example of hydraulic engineering is found which dates back to the end of the 1st Century BCE. It comprises three percolation cum storage tanks, fed by an eleven meter wide and five meter deep canal that used to skim the flood waters off the monsoon-swollen, Ganga.

It is worth mentioning that in 2nd Century CE, Chola King Karikala built the Grand Anicut or Kallanai across the river Cauvery to divert water for irrigation (it is still functional) while King Bhoja of Bhopal built the largest artificial lake in India in 11th Century CE.

J D Cunningham in his account of 1847 mentions Bhojpur as the most southerly up the river Betwa than the other places in the Bhopal Agency. He tells the lake made by king Bhoj was sixteen or seventeen miles long and about seven or eight miles wide. Bhopal, the minister of king Bhoja, in order to bring the ninety-ninth stream to the lake made a rivulet that rises southwest of Bhopal to run south-easterly into the Betwa and thus into the lake. The lake continued to exist until it was destroyed by Sultan Hoshang Shah who lamented over the loss of so much good land. According to a common belief, three hundred and sixty villages now fill the bed of the lake of king Bhoj, and it is certain that the tract in question is one the most fertile in Bhopal.

The king constructed an artificial lake by building dams on the river Betwa and a temple on its bank in the town. The lake covered an area of approximately 30 km by 12 km. The low hills on its periphery served as its boundaries. It was constructed by first building a dam over river Betwa that allowed water to be collected in the depression surrounded by the hills. Then a second dam was constructed in the gap between the two hills. A third dam was constructed to divert a small river Kaliasot into the lake. This lake was dismantled by Sultan Hoshang Shah who breached two dams and emptied the lake. An image of Jain Tirthankara enshrined in a Jain Temple at Bhojpur carries an inscription that mentions king Bhoja.

The thirty-first chapter of Samarāṇgaṇa-sūtradhāra is called Yantra-Vijñāna deals with hydraulics: The flow and water pressure of water can be converted into motion. The water flow moves the machine with effect that increases with height, pressure, and speed.

Jagajjibanpur or Jagajivanpur is an archaeological site in Habibpur block of Malda district in West Bengal state in eastern India. The importance of this site was first indicated by the chance discovery of a copper plate inscription of the Pala

emperor Mahendrapala on 13 March 1987 who was not known from any other sources till the date of this discovery. The excavations resulted in discovery of a part of the brick built Vihara, stupas, cells with corbelled niches, verandah and many antiquities, which include terracotta plaques, terracotta seals and sealings, an inscribed potsherd, beads and other objects for daily use. It states that the emperor Mahendrapala, the son and successor of Devapala, announced before the body of the officers and other persons assembled on the occasion of a land grant ceremony that his mahasenapati (general) Vajradeva had intended to donate the land adjacent to the Nandadirghika Udranga Mahavihara, erected by him for attainment of religious merits for his parents and all people on earth for the worship of the Buddhist deities and maintenance and performance of religious rites which include copying (manuscripts) by the monks residing in the Vihara. The notable fact is that this is the first time in India that a monastery is named after a water body – Nandadighi which still exists in the village.

Dhamdha is one of the district of Chhattishgarh which provides information about the conservation of water of at least 126 ponds which were interlinked. These were primarily dug during 11th century CE and later Gond kings dug 126 ponds to protect their fort as well as for drinking, bathing and irrigation in 14th century. Presently Dharmadham Samity is trying to renovate these water bodies again for future ecological balance.

The Kirari wooden pillar was a rare find. The pillar first came to light when the villagers were cleaning up the water tank in the village of Kirari in the district Bilaspur. Dr. Hirananda Sastri then made a careful study of the inscription and said that the pillar came from c. 2nd century ce. Which meant that it was almost 2000 years old.

Uttarakhand is known for its traditional water-management practices. Rural communities here have historically been dependent on the area's natural resources. Glaciers replenish their rivers, and thick oak forests help recharge groundwater. All of that is under threat today, and so is the culture that once helped maintain water security and keep their springs flowing.

Similar to the baolis or stepwells found elsewhere in the country, naulas are uniquely designed to fit local culture, climate and vegetation. Man-made structures, they have been providing local communities an almost-perennial source of clean drinking water for centuries; the oldest naula found in Uttarakhand dates back to 7th century BCE. Naulas are emblematic of the region's rich culture the four-sided roof resembles a temple,. Naulas are fine examples of dry-masonry, stone architecture as well as the art and science of water purification. While the roof and walls are built using local stone, the floor is kept natural or lined with small pieces of stone to allow filtration. Deeper naulas have steps to allow people to enter, and interestingly, you will always find they have an odd number of steps, either 3, 5 or 7.

In the past, this would ensure that people preserved the cleanliness and sanctity of these structures. In some naulas, you can still see signs that request people to refrain from using soap or dirtying the water. Others have their own dedicated buckets or jugs so that people don't use their own vessels.

The health and permanence of naulas is highly dependent on the health of the forests around them. Traditionally, communities have planted trees around these structures to ensure a sustained supply of water, reflecting an age-old understanding of the connection between forests and water.

In Kumaon, natural springs can emerge anywhere based on sub-surface water flows. A naula is built around a dhara by digging a hole to harvest its water and constructing stone walls around it for protection.

In Bengal proper miniature tanks dug usually in the courtyard of their houses largely into the religious ceremonies performed by women and girls. This practice is also found in Odisha but to a less extent. To dig a tank is a virtuous and meritorious action which may be performed either to please the gods and thus to obtain happiness in this world or as an expiration of some known or unknown sins. The chief tank ceremony of Baisakh and perhaps the most widely observed by all is the Punyapukur or Dharmapukur (In Rajsahi District). In jalpaiguri, 20 smaller tanks are adorned with flowers and vermilion are dug round the central tank. Such kind of miniature tanks worship is very common in Bengal throughout the year known as Punyapukur Brata (JASB, NS, Vo.II, No.10, P : 491-492)

In this respect, I would like to mention the article of Captain Cautley, Superintendent of Doab Canal 'On the use of wells and its foundation ; as practised by the natives of the Northen Doab' published in the journal of The Asiatic Society of Bengal, 1839, Vol.VIII, PP : 327 – 340. According to Cauteley indigenous process practised in upper India for digging wells was far more advanced than England. The native engineers and villagers with their handmade tools were more expert in hydraulic architecture which was cost effective.

Water conservation has been a pivotal element in ancient Indian civilization, deeply embedded in the cultural and spiritual ethos of the society. Ancient Indian texts and manuscripts offer profound insights into sustainable water management practices that are remarkably relevant today.

The ancient Indian texts and manuscripts not only highlight the historical precedence of water conservation but also offer timeless wisdom. In a modern context where water scarcity poses a global challenge, revisiting these traditional practices can inspire sustainable water management solutions, ensuring the preservation of this precious resource for future generations.

Chanakya's Arthashastra offers invaluable insights into ancient India's water management practices, showcasing a sophisticated understanding of hydrology, engineering, and sustainability. As we face modern-day water challenges, the timeless wisdom of ancient India's water management systems serves as a powerful reminder of the importance of efficient, equitable, and sustainable water management. By drawing inspiration from the past, we can build a more resilient future for generations to come.

Tadaga : deep dug waterbody measuring panchasatadhanu paramita jalasaya,

Kupa: fr. Ku, ap-water, a hole, hollow, cave, a pit, well

Kupaka: small waterbody, even the hole filled with rainwater

Vapi: shatahasta dirgha jalasaya, 10 times of Drone (160 hasta)

satahasta bhaved vapi

dronad dasaguna vapi

sometimes tadaga are as vapi,.

Pushkarini- pond, satahasta bhaved vapi dviguna pushkarinapi

Chanakya's iconic treatise, the Arthashastra, to uncover the wisdom of ancient India's water management systems.

I. Water Harvesting and Storage

- Chanakya emphasized the construction of reservoirs, tanks, and dams to collect and store rainwater for future use.
- He advocated for building structures like kuṣmāṇḍas (stepwells) and vāpīs (small reservoirs) to harness and conserve water.

II. Irrigation and Distribution

- The Arthashastra describes sophisticated irrigation systems, including canals, channels, and aqueducts, to supply water to agricultural fields and urban centers.
- Chanakya stressed the importance of equitable water distribution, prioritizing allocation based on land ownership and crop requirements.

III. Water Conservation and Efficiency

- He encouraged farmers to adopt efficient irrigation methods, like the use of clay pipes and sprinklers, to minimize waste and optimize water usage.
- Chanakya also promoted water-saving techniques, such as crop rotation and soil conservation.

IV. Water Quality and Management

- The Arthashastra highlights the significance of maintaining water quality, suggesting measures like regular cleaning of water sources and treatment of wastewater.
- Chanakya assigned specific responsibilities to officials for monitoring water management and ensuring its efficient use.

IAH World Groundwater Congress in Davos

This year the IAH World Groundwater Congress is organized by The Swiss Society of Hydrogeology (IAH Switzerland National Chapter) and the Centre for Hydrogeology and Geothermics of the University of Neuchâtel. It will be held on 8-13 September 2024 in Davos, Davos, Switzerland.

The IAH World Groundwater Congress is a significant event organized by the International Association of Hydrogeologists (IAH). This premier international groundwater congress provides a platform for experts, researchers, and professionals to share their findings, discuss innovative solutions, and address pressing societal challenges related to groundwater.

Here are the key details about the 51st IAH World Groundwater Congress:

Date: September 8th to 13th, 2024

Location: Davos, Switzerland

Organizers: The Swiss Society of Hydrogeology (IAH Switzerland National Chapter) and the Centre for Hydrogeology and Geothermics of the University of Neuchâtel

Venue: The renowned Davos Congress Centre

Theme: Interacting Groundwater

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 in the scenic Alpine setting of Davos.

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://www.iah2024davos.org/

Upcoming Groundwater Events

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Upcoming Groundwater Events

25-29 August 2024 - World Water Week 2024: Stockholm, Sweden

World Water Week has been organized every year since 1991 by Stockholm International Water Institute (SIWI), which curates the content. It is the leading conference on global water, championing cooperation across sectors and national boundaries.

World Water Week 2024 is centered on water cooperation, for peace and security in its broadest sense. The theme, Bridging Borders: Water for a Peaceful and Sustainable Future, asks us to recognize the regional and global interconnectivity of communities and nations, and underscores the collaborative effort needed to achieve a peaceful and sustainable future.

World Water Week is the leading conference on global water issues, held every year since 1991. A non-profit event, co-created with leading organizations, World Water Week attracts a diverse mix of participants from many professional backgrounds and every corner of the world.

Prize ceremonies. The world's most prestigious water award, the Stockholm Water Prize, is presented in a royal award ceremony during World Water Week. You can also follow the exciting finals of the international competition, the Stockholm Junior Water Prize.

Together we develop solutions to the world's greatest water-related challenges, with topics ranging from food security and health to agriculture, technology, biodiversity, and the climate crisis.

https://www.worldwaterweek.org/about worldwaterweek@siwi.org

15-18 Sep 2024 – Montréal, QC, Canada

GeoMontréal 2024

Resilient geosciences for future generations. The Canadian Geotechnical Society (CGS) in collaboration with the Canadian National Chapter of the International Association of Hydrogeologists (IAH-CNC) invite you to GeoMontréal 2024, the 77th Canadian Geotechnical Conference and the 16th Joint CGS/IAH-CNC Groundwater Conference.

The conference will be held at the Hotel Bonaventure in Montréal, QC, Canada from Sunday, September 15 to Wednesday, September 18, 2024.

The theme for GeoMontréal 2024 is Resilient geosciences for future generations and will feature technical sessions on subjects of broad interest in the geotechnical and hydrogeological fields. In addition to the technical program and plenary sessions, the conference will include a complement of distinguished keynote speakers, high calibre short courses, technical tours, and social events.

Organised by The Canadian Geotechnical Society (CGS) in collaboration with the Canadian National Chapter of the International Association of Hydrogeologists (IAH-CNC).

https://www.geomontreal2024.ca/

Upcoming Groundwater Events

17-20 Sep 2024 – Santa Rosa city (La Pampa - Argentina)

XII Argentine Congress of Hydrogeology and the XVI Latin American Congress of Hydrogeology

Groundwater: Challenges for a sustainable management. The main topics to be developed include: Regional Hydrogeology, Hydrochemistry, Quality and Contamination, Hydrogeology of Salars, Urban Hydrogeology, Surface water - groundwater interaction, Planning, Management and Legislation, Public Policies and Water Governance.

Our expectation is that this congress will constitute a general call to contribute to the strengthening of the systems of study, evaluation and communication of groundwater understanding. This will allow us to redefine ideas that will promote progress and success in the professional activity of hydrogeologists, with special reference to the Latin American region.

Price: From $50 (students) to $250 (non IAH members); early bird discounts available

Organised by National University of La Pampa, ALHSUD and IAH Argentine Chapter.

https://congresohidrogeologia.unlpam.edu.ar/ hydrolapampa2024@exactas.unlpam.edu.ar

25-27 Sep 2024 – La Coruña - Spain

Congreso Ibérico de las Aguas Subterráneas. CIAS 2024

Groundwater and all related topics. The International Association of Hydrogeologists (AIH) brings together more than 3,700 members from 135 countries. Its purposes are the exchange of knowledge and the promotion of activities in the field of hydrogeology. To this end, it organizes conferences, conferences and meetings; edits scientific-technical monographs and the international journal Hydrogeology Journal. The Spanish partners have formed the AIH Spanish Chaoter (AIH-GE) which represents and coordinates the activities of the AIH in Spain, in addition to promoting activities of interest to Spanish members and sometimes internationally. It also organizes round tables, debates and conferences on current issues.

One of the main objectives of the Spanish Group of the AIH is to promote meetings of scientists, technicians and water managers to advance the knowledge of the problems and the search for solutions to the problems related to the water cycle understood as a whole and with groundwater in particular

The Spanish Group of the International Association of Hydrogeologists, as part of its activities to promote activities in the field of hydrogeology, is going to organize the “Iberian Groundwater Congress 2024” giving continuity to the congresses held previously in an attempt to stage the return to normality after "The Great Pause."

The purpose of this conference is to bring together groundwater professionals to share knowledge and experiences. In this sense, the call is open to consultants, drillers, academics, students and, in general, to all those who direct their activity to hydrogeology.

The Congress will be held from September 25 to 27, 2024 at the Universidade da Coruña.

Price: From 175 to 600

Organised by AIH - Spanish Chapter.

http://cias2024.webs.upv.es/?page_id=21 aih-ge@aih-ge.org

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Upcoming Groundwater Events

8-10 Nov 2024 – Hammamet Tunisia

AGIC5 Special session: Groundwater recharge in arid and semi-arid regions with focus on the MENA

Groundwater recharge, Managed aquifer recharge, Mena region. Assessing groundwater recharge in the Middle East and North Africa (MENA) regions is critical in the face of escalating drought hazards induced by climate change and exacerbated by groundwater over-abstractions. This challenge is further compounded by significant data gaps, mainly spatiotemporal information, emphasizing the urgency for comprehensive studies to bridge knowledge disparities and formulate resilient strategies for sustainable groundwater management, and to guide managed aquifer recharge (MAR) activities. The session will focus on groundwater recharge assessment in the MENA region. This session promises to feature a collection of valuable papers that delve into the latest methods and advancements in understanding, measuring, assessing and managing groundwater recharge. Attendees can anticipate perusing papers on various topics, including cutting-edge techniques for observations, data analysis, modeling approaches, and the integration of remote sensing methods and Geographic Information Systems (GIS) to enhance precision in groundwater recharge assessments at regional or local scales. The session will also address the crucial aspect of climate change, exploring projections and impacts on groundwater recharge. Papers dedicated to rainwater harvesting and managed aquifer recharge solutions, emphasizing their role as adaptive strategies to drought and groundwater overexploitation, and to address the challenges posed by climate change and increasing demand are also encouraged.

Price: https://agic.tn/international-participants/

Organised by IAH Tunisia (CTH), IAH MENA.

https://agic.tn/groundwater-recharge/ info@agic.tn

28 Apr - 2 May 2025 – Stellenbosch, South Africa

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/

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