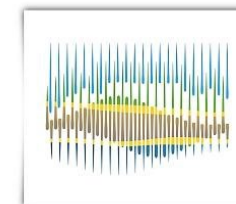




21 September 2023

Open meeting
IAH Commission on
Groundwater and Climate Change

<https://gwclimate.iah.org/>
iah.cgcc@gmail.com





WELCOME

ABOUT US

OUR CHALLENGES

NEWS AND EVENTS

PUBLICATIONS

HOW TO JOIN?

Chair



Tibor Stigter
IHE Delft Institute
for Water Education

Co-chair



Jodie Miller
IAEA

Co-chair



Jianyao Chen
Sun Yat-sen
University

Support

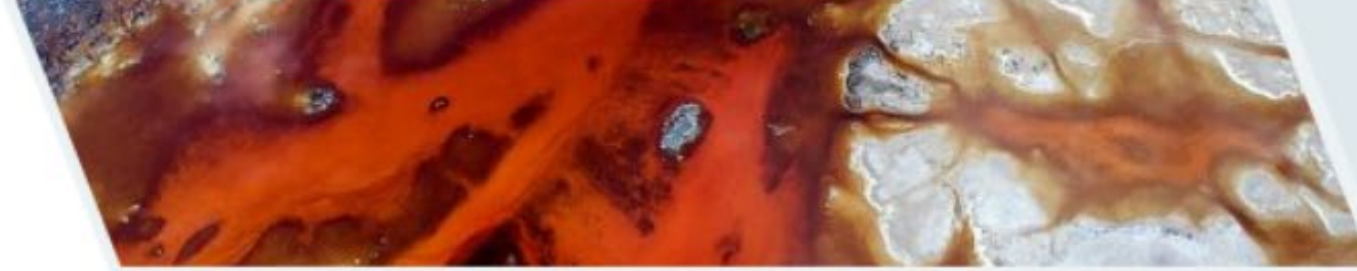


Saulo Vieira
GroundwatCh student
IHE, IST, TUD



Our GWCC (Com)mission – Where you can contribute

- 1. Promote research and development** to advance scientific and technical knowledge in the field of groundwater and climate change, and related fields (e.g. agriculture, energy, health);
- 2. Foster inter-disciplinary collaborations** with research institutions, water managers and policy makers;
- 3. Engage with key international organisations**, agencies and programmes (e.g. UNESCO-IHP, IGRAC, IAEA, FAO);
- 4. Disseminate research and development outcomes** to the global research community and global development community including governmental and non-governmental organisations;
- 5. Create awareness of the IAH-CGCC among IAH members**, related professions and wider water resources and water supply communities.



IAH CGCC Activities 2022/2023

1. Awareness raising

- UN WWDR 2022, UN Summit 2023
- Groundwater and Climate Change in the news

2. Promoting research and development

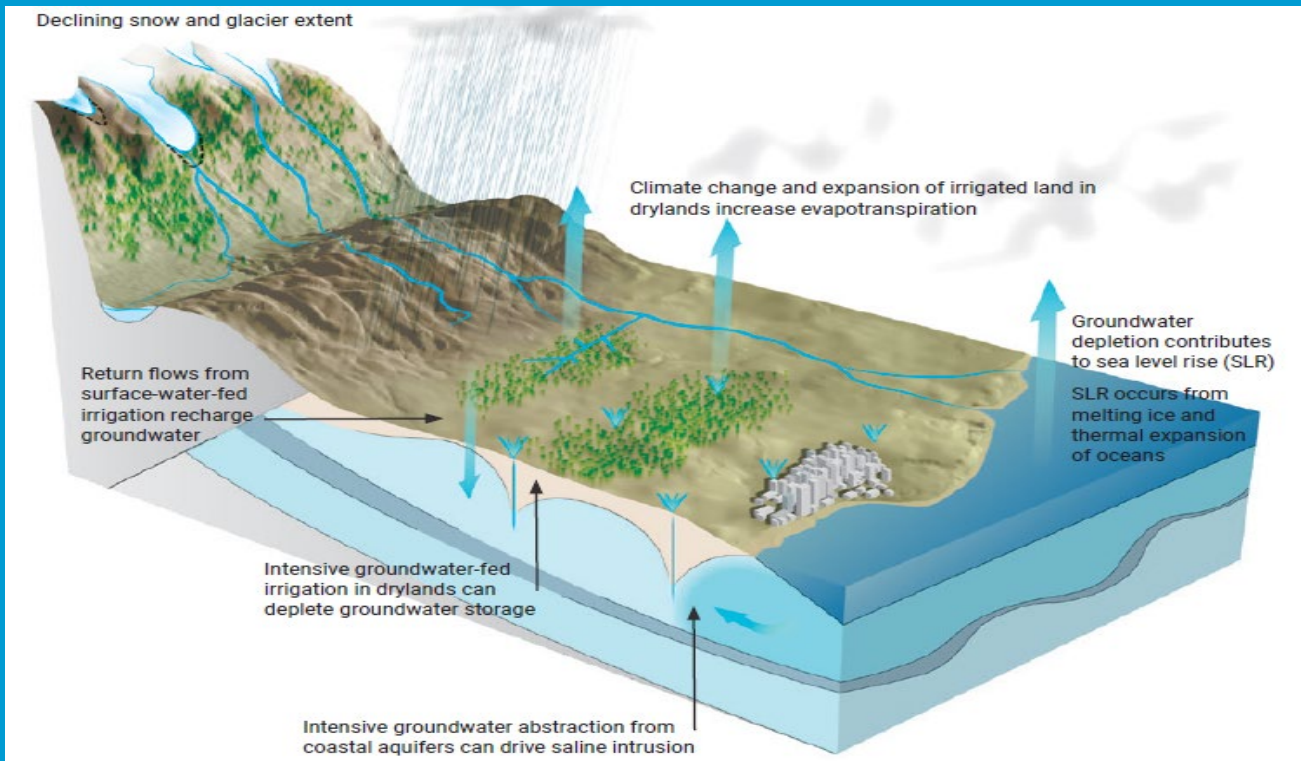
- Contributions to Congresses, Conferences, Technical meetings (EGU, IAH, IAEA)
- Essay on Groundwater and Climate Change in Hydrogeology Journal
- Contributions to journal special issues
- Latest publications and ongoing research in Groundwater and Climate Change

3. Education

- Joint International Master Programme on Groundwater and Global Change

Groundwater: Making the invisible visible (UN-WWDR 2022)

<https://www.unesco.org/reports/wwdr/2022/en>



Groundwater, aquifers and climate change

UNESCO-IHP

Richard Taylor and Alice Aureli

IAH

Diana Allen, David Banks, Karen Villholth and Tibor Stigter

With contributions from:

Mohammad Shamsudduha (UCL-IRDR), Maxine Akhurst (BGS), Niels Hartog (KWR), Harmen Mijndieff and Rory Dalman (TNO), Bridget Scanlon (UTexas-Austin), Timothy Green (USDA), Yuliya Vystavna (IAEA), Tommaso Abrate (WMO), Pedro Arrojo-Agudo (Special Rapporteur on the human rights to safe drinking water and sanitation), Tatiana Dmitrieva and Mahmoud Radwan (UNESCO-IHP), Guillaume Baggio Ferla (UNU-INWEH), Ziad Khayat (UNESCWA), Eva Mach (IOM) and Enric Vázquez Suárez (IDAEA-CSIC)

I. Climate change impacts on groundwater recharge

Associated to changes in precipitation patterns

○ IHE Delft recent studies

- **Substantial reduction of rainfall in “hotspot” areas** (e.g. Stigter et al. 2014; IPCC 2021; Reinecke et al. 2021)

- **More frequent droughts**

- increase in irrigation demand
- lower outflow during long dry periods
- increased need for capture and storage



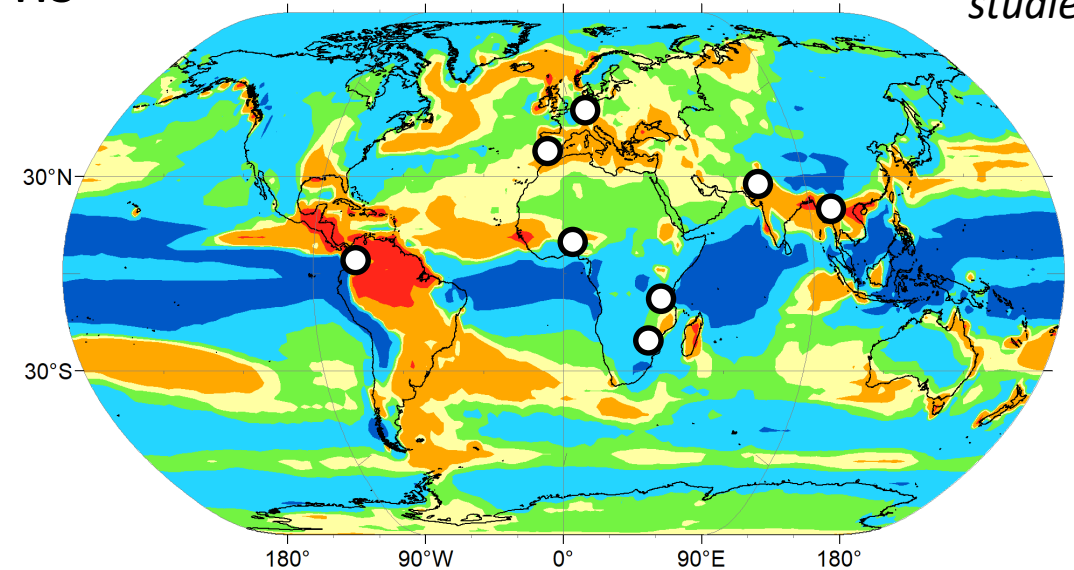
- **Intensification of precipitation**

- higher recharge (Tropics, Australia, USA) (e.g. Jasechko and Taylor 2015; Boas and Mallants 2022)
- more flooding (temperate regions)

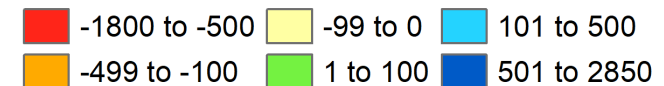


- **Uncertainty in global projections**

- Complex interaction topography, climate, geology LULC



Changes in mean annual precipitation (mm)



**Difference between projected (2071-2100)
CMIP5 ensemble and observed (1979-2019)**

Source: based on CMIP5 data from Taylor et al. (2012a)
and GPCP data from Adler et al. (2003)

UN 2023 Water Conference

22 - 24 March 2023

Lindsey Kenyon & Valentina Uribe
Groundwater and Global Change



- Participation in the event titled 'Building Youth Leadership for Accelerating Change'.
- Active speaking role on side event on capacity development. Valentina Uribe: "The other side of the coin of capacity development"
- Rapporteur in event about Big Earth Data: a game changer to promote Implementation SDG6.
- Participation on side event about *Inclusive science for Water Security*.

"Without collaboration across different levels of capacity building, passion alone cannot save the world".

"In developing countries, environmental issues often take a back seat to social issues, and professionals in this area miss out on opportunities to apply their knowledge and grow professionally"



Technical Meeting “Defining Groundwater Vulnerability under a Changing Climate”

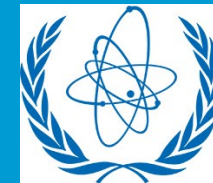
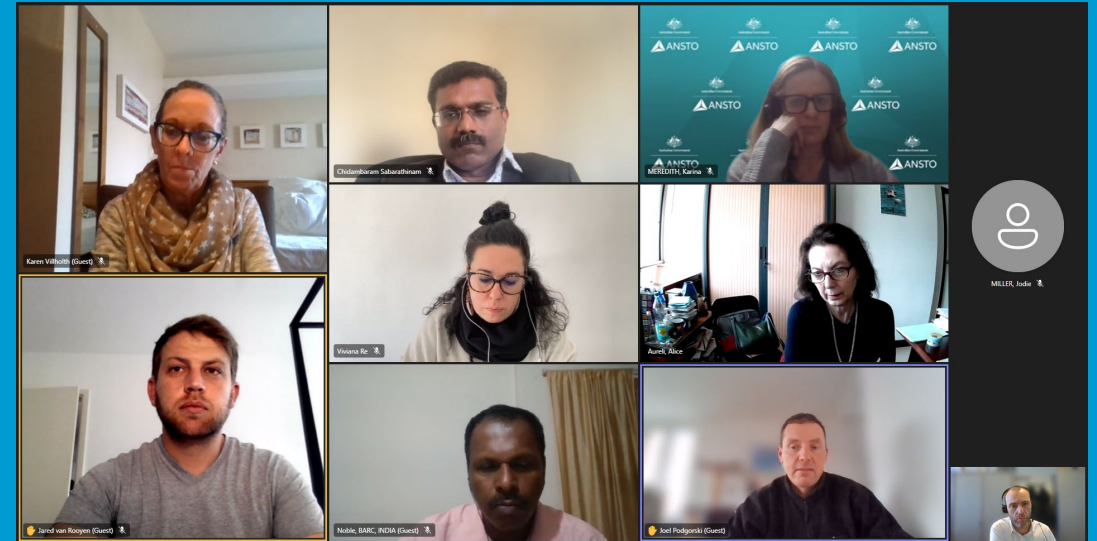
17-21 April 2023

Importance of contaminant type and climate change in groundwater vulnerability assessment

Tibor Stigter

IHE Delft Institute for Water Education

t.stigter@un-ihe.org



IAEA

International Atomic Energy Agency



Institute for Water Education
under the auspices of UNESCO



Commission on
Groundwater and
Climate Change





ESSAY



Groundwater and climate change: threats and opportunities

Tibor Y. Stigter¹ · Jodie Miller² · Jianyao Chen³ · Viviana Re⁴

Received: 28 February 2022 / Accepted: 4 October 2022 / Published online: 21 October 2022
© The Author(s) 2022, corrected publication 2023

Abstract

The important role of groundwater in adaptation to climate change is explored, and the competing threats and opportunities that climate change pose to groundwater systems are evaluated. This has been achieved through a review of current thinking on the complex interactions between human activities, climate and the hydrological cycle affecting groundwater quantity and quality, across different regions and time scales.

<https://link.springer.com/article/10.1007/s10040-022-02554-w>



EDITORIAL article

Front. Water, 12 April 2022

Sec. Water and Climate

Volume 4 - 2022 |

<https://doi.org/10.3389/frwa.2022.872982>

This article is part of the Research Topic

Water Harvesting Methods in Drylands to Increase Climate Resilience

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Editorial: Water Harvesting Methods in Drylands to Increase Climate Resilience



Alison Parker¹



Tibor Y. Stigter^{2*}



Daniel Olago³

¹ Cranfield Water Science Institute, Cranfield University, Bedford, United Kingdom

² Department of Water Resources and Ecosystems, IHE Delft Institute for Water Education, Delft, Netherlands

³ Department of Earth and Climate Sciences, Faculty of Science and Technology, University of Nairobi, Nairobi, Kenya

SHARE ON





Collection

Groundwater, climate change, adaptation and mitigation

Submission status

Closed

The UN Water theme for 2022 is "Groundwater: making the Invisible Visible". Important feedback mechanisms exist between groundwater and climate change. For instance, groundwater discharge into rivers and wetlands sustains surface moisture levels that feed back into the atmosphere.

— [show all](#)

Editors



[Tibor Stigter](#)

News and events

Groundwater in the news: The USA Chapter

Underreporting of Groundwater in U.S. News Media Despite Critical Importance

Authored By: [Lindsey Kenyon](#) and [Alexander Dickel](#)

March 2023

Groundwater is, without question, a topic of fundamental importance to the continued survival of ecosystems and economies on earth. However, the topic of groundwater is rarely mentioned in American news – despite evidence of shifting climate patterns, intensified extreme events, and the endangerment of groundwater resources. And while the decline of groundwater quality and quantity will impact all people, the UN indicates that the burden will fall heavily on marginalized groups. Per the UN Water Conference Stakeholder Online Consultation Summary Report^[1], a highly disproportionate impact of water scarcity and water quality will be towards indigenous peoples, women, and girls.

QUESTIONS OR COMMENTS?



Do you have any comments or need more information? Contact the team: iah.cgcc@gmail.com

CLIMATE CHANGE AND GROUNDWATER IN THE NEWS

UMUT TAHA APANOĐLU

HYDROGEOLOGIST AT GENERAL DIRECTORATE OF MINERAL RESEARCH AND EXPLORATION

TURKEY, ANKARA

TAHA.CAPANOGLU@MTA.GOV.TR



UNCHARTED WATERS

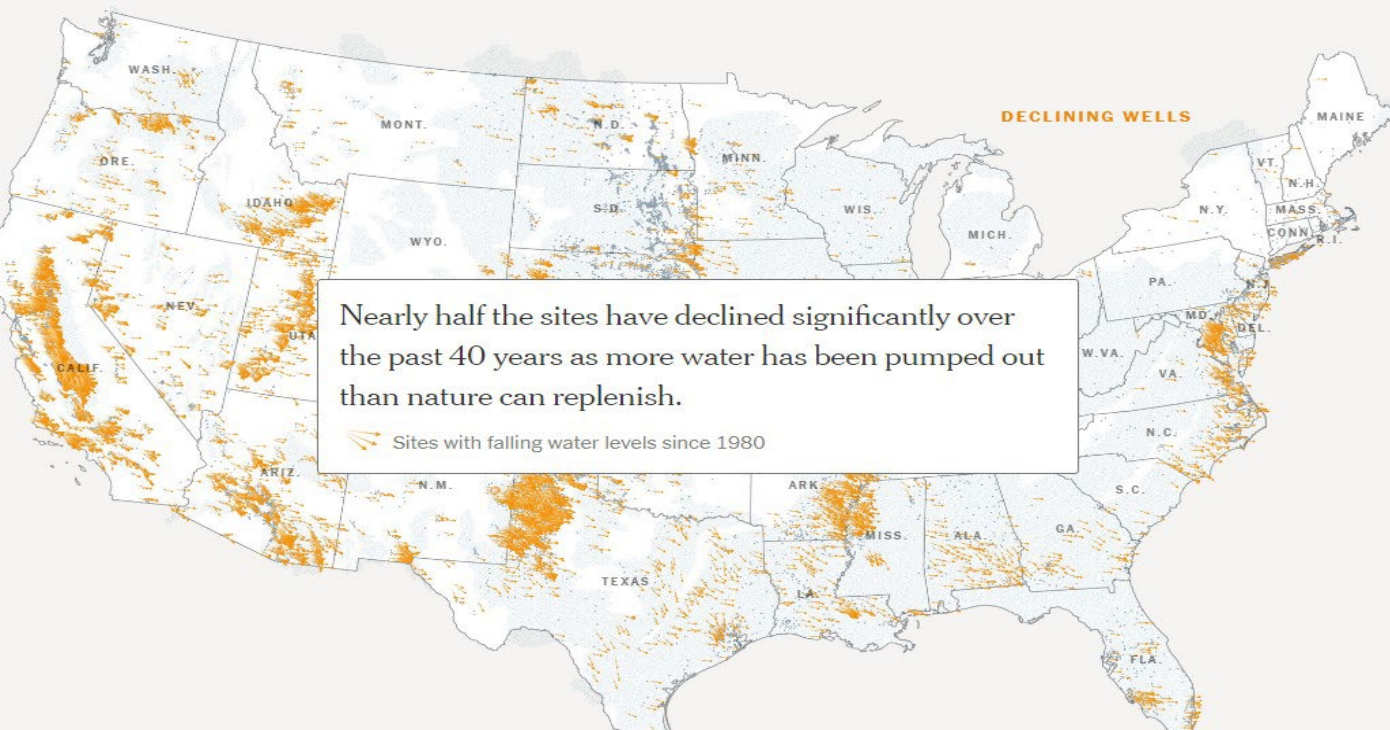
America Is Using Up Its Groundwater Like There's No Tomorrow

Overuse is draining and damaging aquifers nationwide, a New York Times data investigation revealed.

By [Mira Rojanasakul](#), [Christopher Flavelle](#), [Blacki Migliozi](#) and [Eli Murray](#)

The first article in a series on the causes and consequences of disappearing water.

Aug. 28, 2023



- Global warming has a focused concern on land and sky as soaring temperatures intensify hurricanes, droughts and wildfires. But another climate crisis is unfolding, underfoot and out of view.
- Global warming is shrinking the snowpack that feeds rivers, increasing the reliance on groundwater to sustain communities, lawns and crops, even as rising temperatures mean that plants need more water. A warmer world also causes more surface water to evaporate, leaving less to seep through the ground to replenish overstressed aquifers.
- Even in places experiencing more violent rainstorms because of climate change, the heavier rainfall only helps so much. That's because much of the water from extreme downpours races away quickly to the ocean, before it can sit and soak into the aquifer below.

N.H.'s coastal communities are trying to protect drinking water access from climate change

August 28, 2023 | By Adriana Martinez-Smiley, New Hampshire Public Radio

CLIMATE CHANGE

Rising Groundwater Threatens New York City – Researchers to Study How Much

Water tables that rise with sea levels can inundate basements, ruin underground infrastructure and render anti-flooding strategies ineffective. After a nearly decade-long hiatus, the feds are starting up monitoring again.

BY SAMANTHA MALDONADO | SMALDONADO@THECITY.NYC | JAN 18, 2023, 1:00PM GMT+3

CLIMATE CHANGE

Climate change unveils new methane source: Groundwater springs of Norway

Emissions to further increase if warming continues, finds study



NEXT NEWS >

By Rohini Krishnamurthy
Published: Thursday 06 July 2023



WHO WE ARE

WHAT WE DO

WHERE WE WORK

UNDERSTANDING POVERTY

WORK WITH US



FEATURE STORY | JUNE 14, 2023

The Hidden Wealth of Nations: Groundwater's Critical Role in a Changing Climate

Publications

An outlook of 2023

- Abd-Elaty, I., Abdoulhalik, A., & Ahmed, A. (2023). The impact of future hydrology stresses and climate change on submarine groundwater discharge in arid regions: A case study of the Nile Delta aquifer, Egypt. *Journal of Hydrology: Regional Studies*, 47, 101395. doi:10.1016/j.ejrh.2023.101395
- Alghamdi, A. G., Aly, A. A., Majrashi, M. A., & Ibrahim, H. M. (2023). Impact of climate change on hydrochemical properties and quality of groundwater for domestic and irrigation purposes in arid environment: a case study of Al-Baha region, Saudi Arabia. *Environmental Earth Sciences*, 82(1), 1–17. doi:10.1007/s12665-022-10731-z
- Aouati, H., Demdoun, A., Kada, H., & Kouadra, R. (2023). The impact of climate change on groundwater quantity and quality in a semi-arid environment: a case study of Ain Azel plain (Northeast Algeria). *Acta Geochimica*. doi:10.1007/s11631-023-00633-7
- Asprilla-Echeverría, J. M. (2023). Aquifers and climate: Incentives, information and institutions. *Groundwater for Sustainable Development*, 20(September 2022), 100900. doi:10.1016/j.gsd.2022.100900

gwclimate.iah.org/resources-and-links/publications

>50 publications 22/23

QUESTIONS OR COMMENTS?

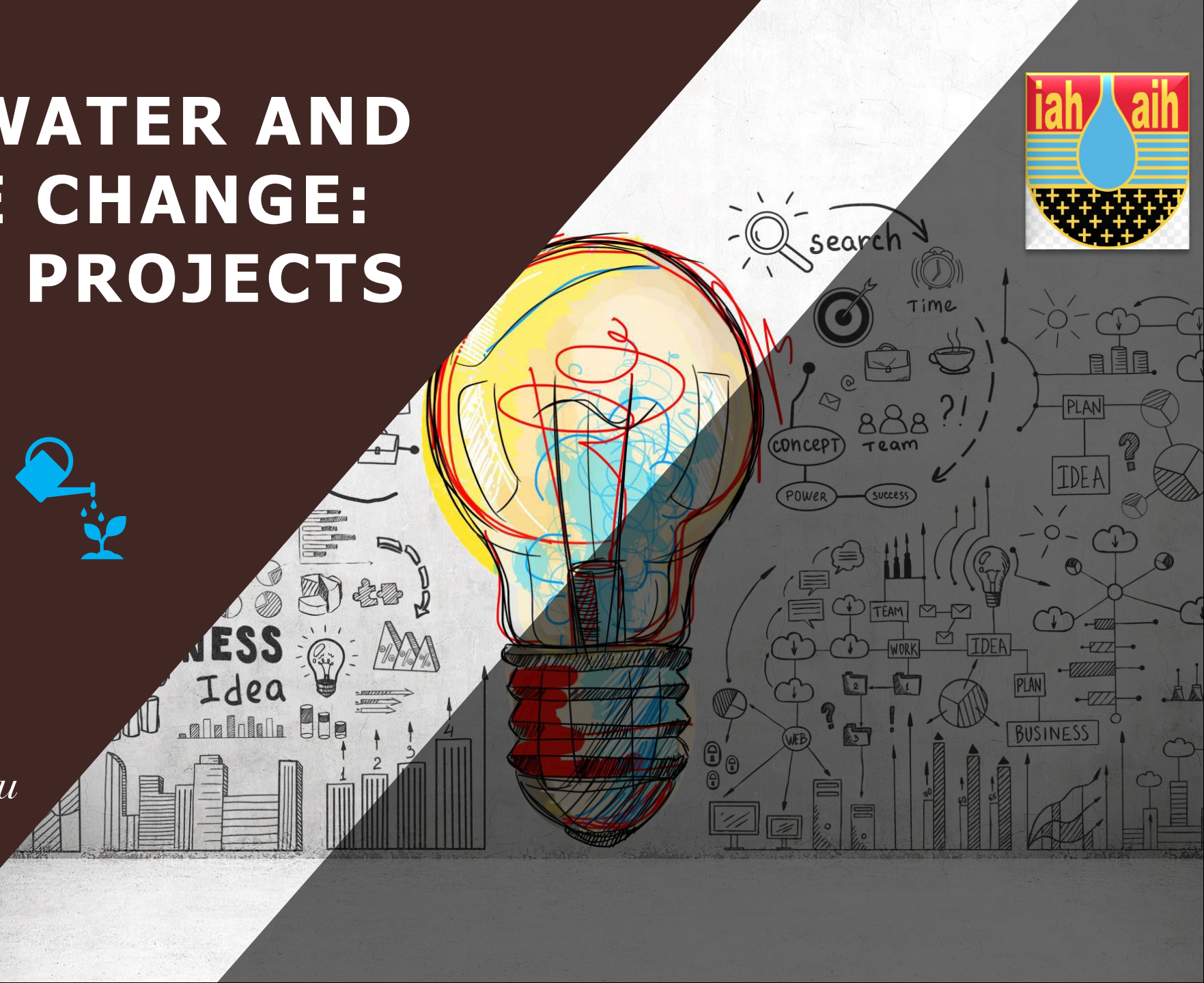


Do you have any comments or need more information? Contact the team: iah.cgcc@gmail.com

GROUNDWATER AND CLIMATE CHANGE: CURRENT PROJECTS



*Keneth Kaunda,
Umut Taha Çapanoğlu*



Groundwater and Surface Water Interactions/Water Availability Modeling under Climate Change at Oklahoma State University

University 

Oklahoma State
University

Supervisors 

Dr. Yipeng Zhang,
Assistant Professor

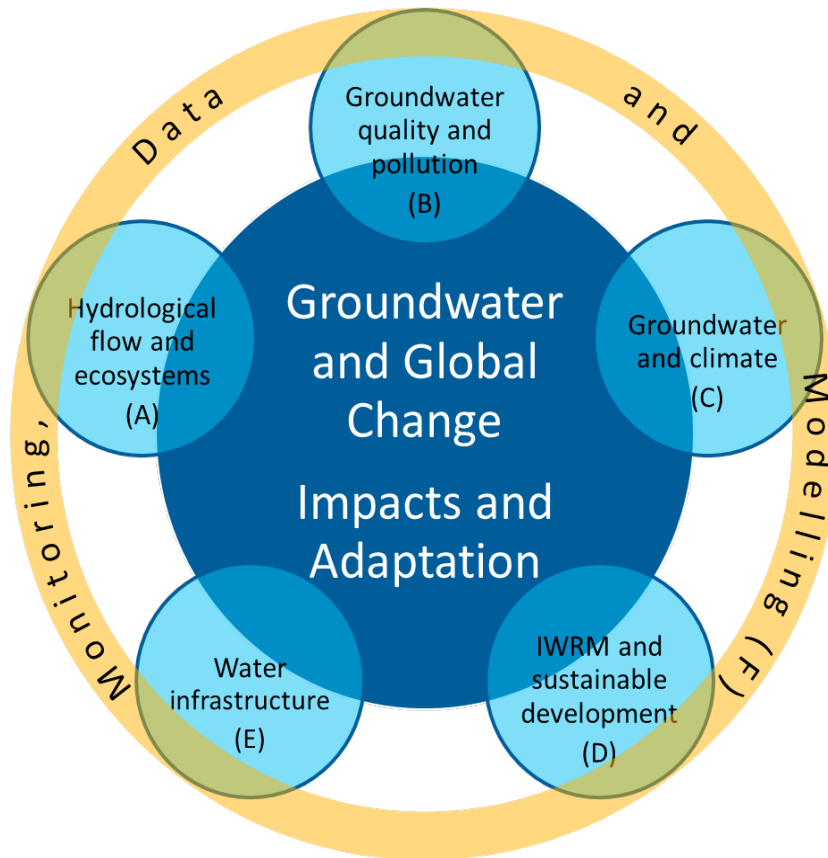
Project start date 

Spring 2023, Spring
2024 or Fall 2024

About the project: The research will focus on developing and applying numerical models of groundwater and surface water interactions to evaluate the climate change impact on the availability of groundwater/surface water to ensure sustainable development of southwest U.S. that experience exponential population growth and extended mega-drought. Other possible projects include numerical simulation of Managed Aquifer Recharge (MAR) and risk assessment of CO₂ storage in the subsurface.

GROUNDWATER AND GLOBAL CHANGE

IMPACTS AND ADAPTATION

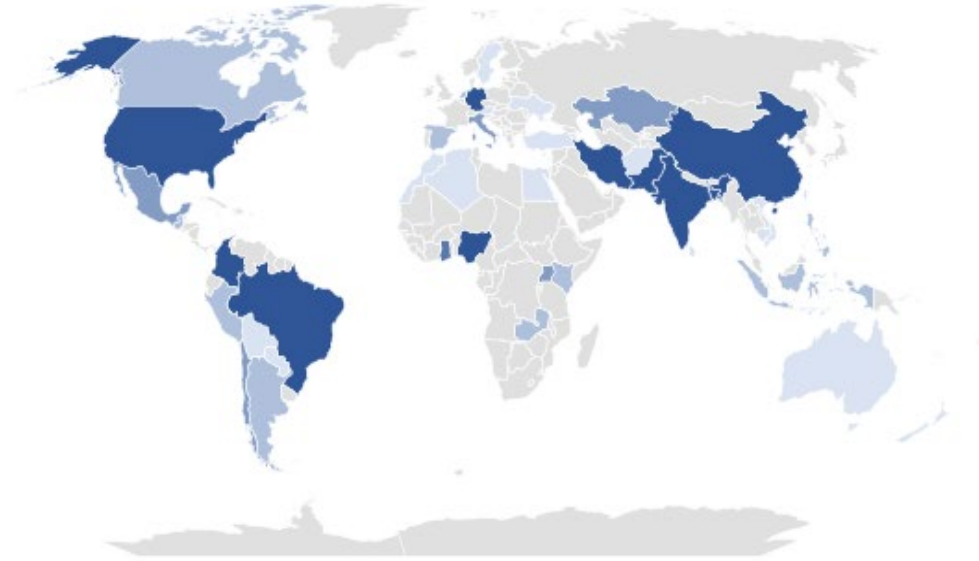


- International Joint Master Programme
- Central theme of Groundwater and global change – impacts and adaptation linked to six thematic fields
- GroundwatCh seeks to address:
 - the study of groundwater and its interactions with surface water, climate, ecosystems and global change;
 - the role of groundwater in adaptation solutions;
 - the emerging challenges and opportunities around groundwater;
 - the links to the societal needs;
 - related labour market needs.

Countries of the 145 GroundwatCh participants since 2015 (number per country)

Countries of the ~5000 GroundwatCh applicants since 2015 (number per country)

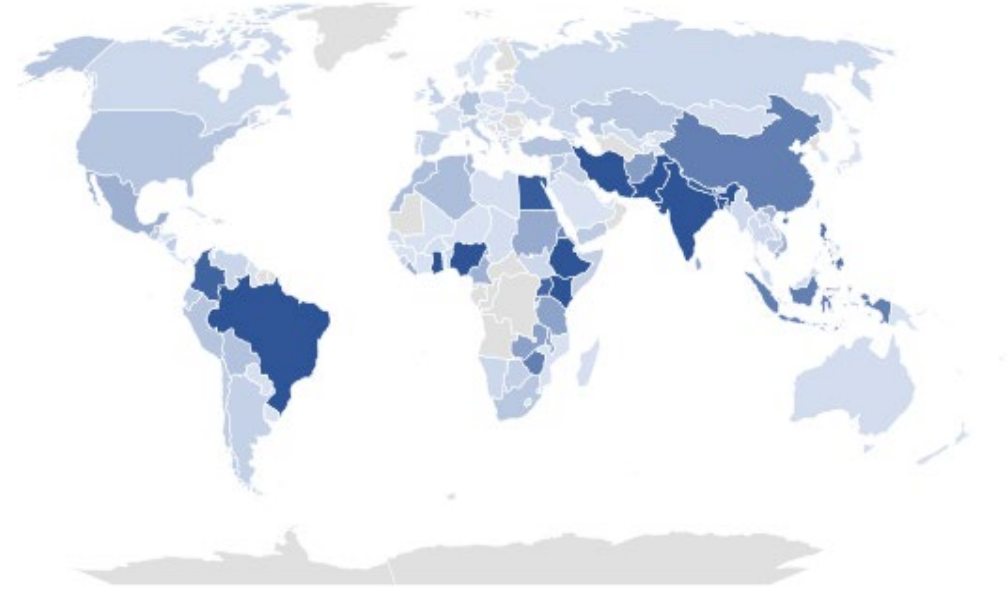
Nr. particip.



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Nr. appl.



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- Three full partners
- > 45 associated partners
- ~150 MSc thesis on Groundwater and Global Change

IHE DELFT Institute for Water Education
under the auspices of UNESCO

GroundwatCH
Groundwater / Global Change

Assessing the Vulnerability to Seawater Intrusion and the Link to Recharge Potential in the Coastal Strip of Lagos and Ondo States, Nigeria.

Deborah Oluwafunmilayo Ayodele

Thesis Identifier: WSE-GW.23.03

Student number: 1077568

August 2023

IFT TÉCNICO LISBOA

Groundwater recharge characterization in the Pacific slope of Guatemala combining water balance modelling and environmental tracers' approach.

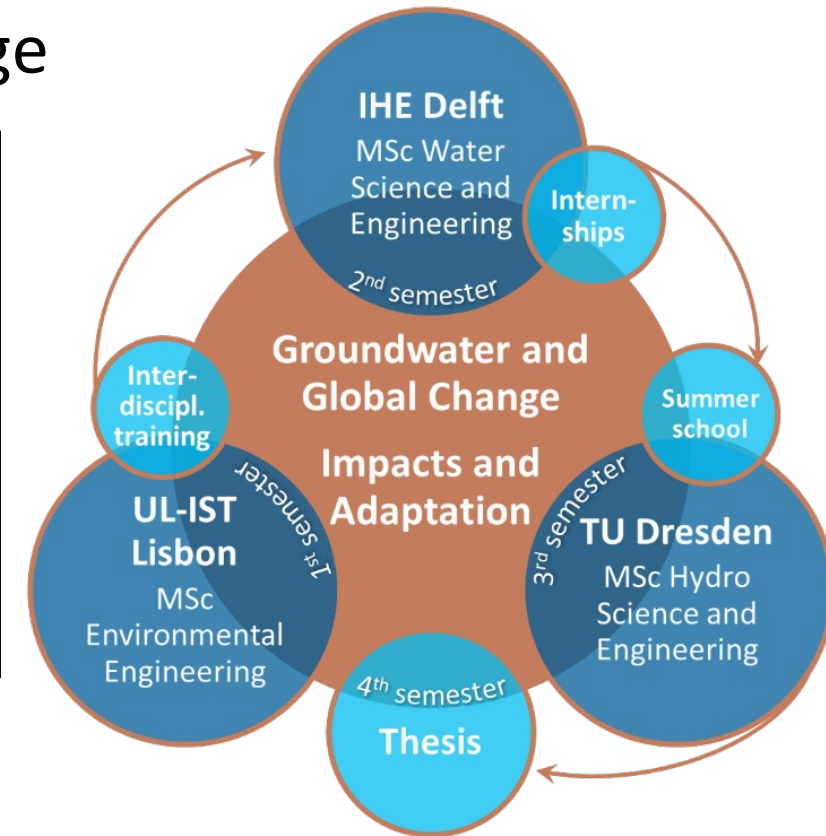
César Augusto Espinosa Espinosa

Thesis to obtain the Master of Science Degree in **Environmental Engineering**

GroundwatCH **TÉCNICO LISBOA** **TECHNISCHE UNIVERSITÄT DRESDEN** **IHE DELFT**

Developing a 3D groundwater multi-model to analyze MAR strategies in Shiraz Aquifer (south-central Iran)

Master of Science Thesis
by
Maryam Azari Rad



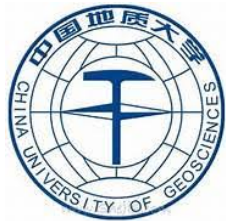
Associated partners



International Groundwater Resources Assessment Centre



Enabling Delta Life



GROUNDWATCh website

<http://www.groundwatermaster.eu/>



Welcome to GroundwatCh

Erasmus programme to face SDGs 2030



About

WHAT?

? Joint Master Programme in Groundwater and Global Change - Impacts and Adaptation (acronym GroundwatCh).
[More information](#)

WHEN?

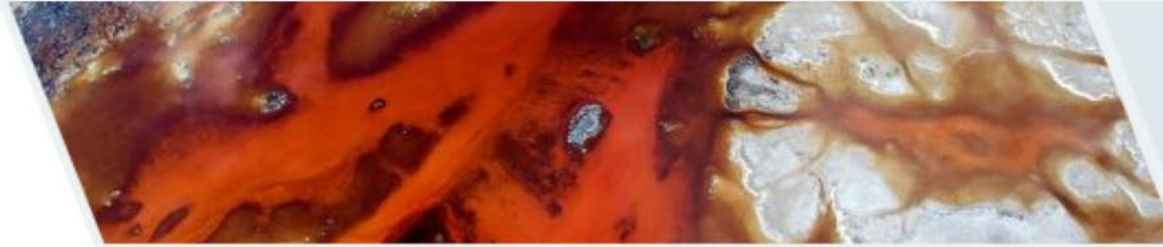
L Stay tuned for the presentation of the renewed GroundwatCh programme in June 2023!

From October 2023 onwards you will be able to apply for the edition of 2024-2026.

HOW TO APPLY?

✓ No upcoming deadlines

Groundwater and Climate Change Commission



International Association of Hydrogeologists

WELCOME

ABOUT US

OUR CHALLENGES

NEWS AND EVENTS

PUBLICATIONS

HOW TO JOIN?

How to Join?

Everybody is welcome to contribute to the activities of the IAH Commission on Groundwater and Climate Change. You do not have to be an IAH member to participate in the commission's efforts. In fact we encourage wide involvement, as this will help discussion and dissemination to thrive and give greater authority to our work.

If you are interested in participating, email Tibor Stigter (t.stigter@un-ihe.org).

About IAH

The International Association of Hydrogeologists (IAH) is a scientific and educational charitable organisation for scientists, engineers, water managers and other professionals working in the fields of groundwater resource planning, management and protection. Founded in 1956, it has grown to a world-wide membership of more than 4000 individuals in 135 countries.

QUESTIONS OR COMMENTS?



Do you have any comments or need more information? Contact the team: iah.cgcc@gmail.com



Commission on Groundwater and Climate Change



Our GWCC (Com)mission – Where you can contribute

- Are you looking to play a role in the Commission?
- Do you want to share ideas, projects, initiatives or publications?
- Help create awareness, disseminate research?
- Do you want to become a member for these or other reasons?
- Contact us at [**iah.cgcc@gmail.com**](mailto:iah.cgcc@gmail.com)