

# NEWSLETTER



**International Association of Hydrogeologists**

**IAH TRANSBOUNDARY AQUIFERS COMMISSION**

## EDITOR'S MESSAGE

Alfonso Rivera  
Chair, TBA Commission



Dear friends of the Transboundary Aquifers Commission, this will be our only newsletter of 2024, but it is a substantial one with lots of information and good vibrations; I urge you to read it.

Our main story this time is based on the World Groundwater Congress IAH-Davos, which took place in Switzerland September 8-13, 2024. The Davos congress was a real success not only for its very rich technical-scientific program, but for its extensive networking opportunities during the fantastic field trips and social gatherings. Our commission was involved with two focus sessions, 20 presentations and two panel discussions, all of which are briefly described in this issue.

As usual, we complete our information round with news from the ISARM networks in four continents, cooperation and collaboration, events, people in the news, new faces in our commission, other short news, and recent TBA-related publications.

Your comments and/or suggestions are welcome.

Good reading!

## WHAT'S INSIDE THIS ISSUE:

Main story: the World Groundwater Congress IAH2024Davos, Switzerland Sept 8-13, 2024

Special session on TBAs

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Special session and panel discussion on conjunctive management of water resources

News from the ISARM Networks (Africa, Americas, Asia)

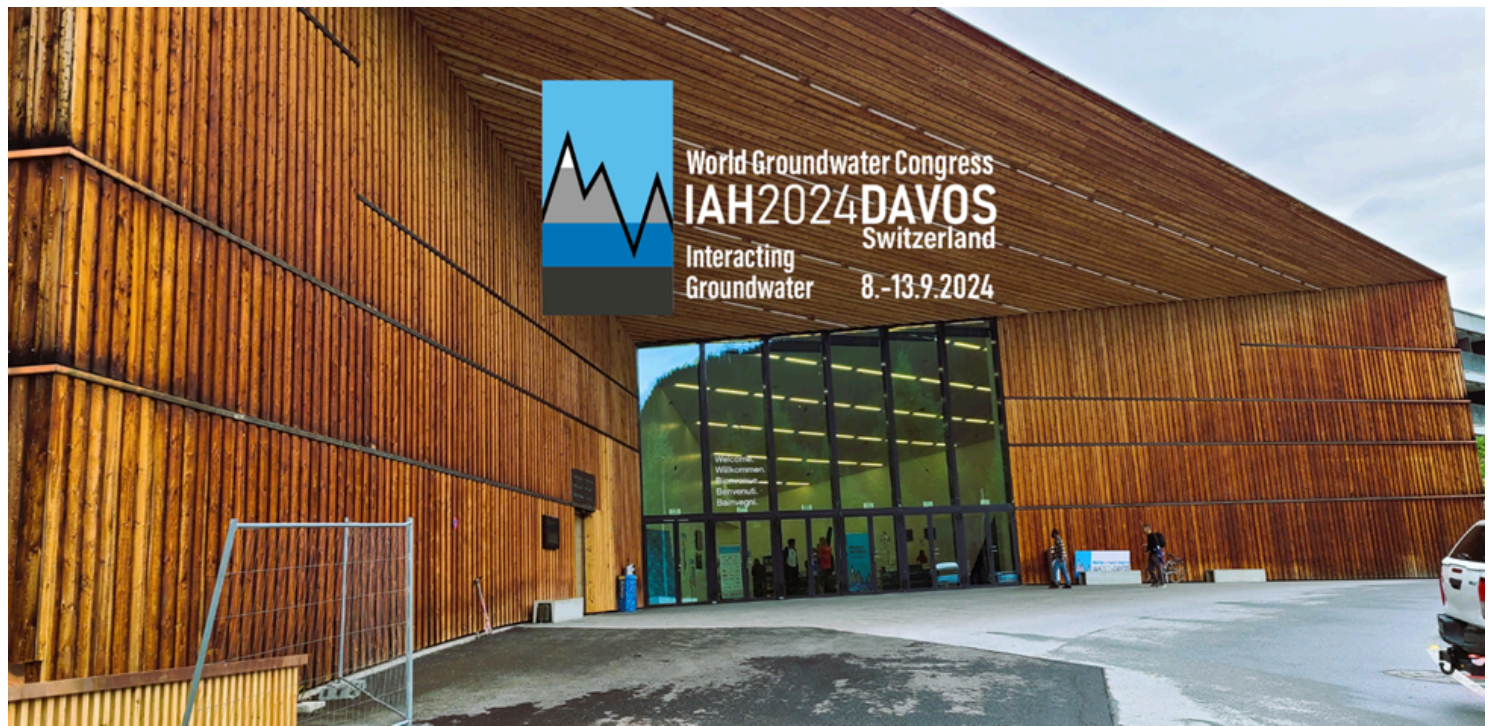
Events

People in the news

New TBA members

Other short news

Recent TBA-related publications



## **The 51st Congress of The International Association of Hydrogeologists September 8-13, 2024 Davos, Switzerland**

**By Alfonso Rivera**

The Swiss Society of Hydrogeology (SSH), the Centre for Hydrogeology and Geothermics of the University of Neuchâtel (CHYN) and the International Association of Hydrogeologists (IAH) organized the 51st World Groundwater Congress under the theme “Interacting Groundwater”.

It was a very dynamic congress under a friendly atmosphere with over one thousand participants of the global groundwater community.

The congress designed a well-balance program combining more than 50 parallel sessions with plenary sessions, focus events, panel discussions, posters, and many other interactive activities. The field trips were particularly delightful with all those beautiful Swiss sceneries. There were many opportunities for networking events, including national chapters and IAH commissions.

Our Transboundary Aquifers Commission was very active with one full session and a focus event with a very animated panel discussion on: “Groundwater for Peace: Transboundary areas for shared aquifer management”

The TBA Commission’s session: “On effective transboundary groundwater areas for shared aquifer management” included 12 very interesting presentations. Most of these are briefly described below.

The TBA Commission was also involved in another session on SW/GW, session 3.05. Conjunctive management of water resources: aquifers at the heart of of interactions.





### **SPECIAL SESSION 4.04 on TBAs**

#### **On effective transboundary groundwater areas (zoning) for shared aquifer management.**

Session Partners: IAH-Transboundary Aquifers Commission, Permanent Forum of Binational Waters, IGRAC, and UNESCO

Description:

When dealing with a shared aquifer with groundwater crossing from one jurisdiction to another, we often face difficult decisions regarding the assessment of the transboundary aquifer. We need to decide whether the assessments should be based on the whole aquifer (often the most expensive approach), or on aquifer zoning, hot spots, transboundary corridors, effective transboundary groundwater areas, groundwater flow systems, groundwater residence time, radius of influence, or capture areas. To do that correctly, however, the dynamics of groundwater within the aquifer (time and space scales) must be well understood closer to the jurisdictional boundary. Further, to complement the knowledge of groundwater dynamics, new elements and/or variables need to be added, e.g., social, economic, and political needs.

Although a full aquifer-wide transboundary assessment may be essential, often transboundary impacts are limited to border regions or hotspot zones. Here, to alleviate data scarcity, financing and capacity issues, it might be useful to focus on a more detailed assessment at smaller scales. However, a major challenge exists in identifying the appropriate transboundary groundwater management units, where transboundary implications are important (i.e., active groundwater flow across the international border, presence of well fields or pollution, etc.). This concept is still within its infancy and methodologies to carry out such a task are limited.

This special session examined those approaches with a series of key presentations and a panel discussion. The session discussed existing approaches on how to prioritize TBA areas (e.g., estimate zones) within transboundary aquifers that need additional attention to guide groundwater policy and decision makers. The session discussed the needs and the advances in this specific domain.

# Depletion and water competition in transboundary aquifers

By Prof. Dr. Marc Müller, Eawag, Swiss Federal Institute of Aquatic Science and Technology Switzerland

About a quarter of the world's irrigated cropland relies on transboundary aquifers, emphasizing their importance for global food production. Analyzing data from 170,000 wells worldwide, we found that while transboundary aquifers don't consistently deplete faster than non-transboundary ones, wells closer to international borders in shared aquifers do show higher depletion rates. This suggests intensified groundwater use due to competition near borders.

Our global analysis of groundwater exploitation patterns shows that about half of country pairs sharing an aquifer either do not use it for irrigation or only one side does. Among those where competition is possible, roughly 75%

pump within each other's radius of influence, indicating considerable water competition, though mostly within small aquifers that represent a small portion of each country's irrigation water use.

For the remaining cases—around 20% of all country pairs sharing an aquifer—these strategically valuable aquifers experience substantial border-adjacent pumping and hold potential for development further from borders. Cooperation on zone-based pumping restrictions could help ease competitive pressures, making these aquifers a priority for future transboundary water management efforts.





# Effective Transboundary Aquifer Areas in the US-Mexico border: The complete assessment

By Dr. Rosario Sanchez, Texas A&M University, United States.

The most recent research on identifying and prioritizing “effective transboundary aquifer areas” (ETAAs) across the complete border between Mexico and the United States was presented by Dr. Rosario Sanchez online. This new research expanded and refined previous efforts by Sanchez et al. 2020 to identify those “areas” or “hot spots” where groundwater development is concentrated and therefore could be used as a proxy for vulnerable areas at transboundary scale. Density of wells and well depth were used as the criteria to identify those transboundary hotspots with more robust and clear delineation of areas of interest across the border. Additionally, this study also differentiate minor versus major ETAAs, being mayor ETAAs the focus of the analysis (areas with more than 1 well per kilometer square). Results indicate that the states of New Mexico and Chihuahua have the most vulnerable groundwater hot spots in the border region, followed by Arizona and Sonora. Interestingly, minor ETAAs were predominantly on the Texas border side, showing an interesting pattern of consistency along and across the border. The study also highlights potential impacts of transboundary groundwater flows on a more local scale, rather than on a regional scale. This assessment helps and supports the prioritization of areas to promote transboundary collaboration with a more efficient and targeted areas of attention.

Complete publication can be accessed here: [Effective transboundary aquifer areas between Mexico and the United States: A border-wide approach - ScienceDirect](#)



# Problems of the object for joint interstate management of shared aquifer resources in Central Asia

By

Dr. Oleg Podolny, Hydrogeoecological Research & Design Company "KazHYDEC" (Ltd.),  
Kazakhstan

The problem of areal units of transboundary aquifers (TBAs) for joint inter-State management where its transboundary consequences are important, remains insufficiently developed.

In 1991, the overall length of state borders of five new independent states in Central Asia (CA) increased 4.4 times to 31500 kilometers. Accordingly, the amount of TBAs has increased to 45. The main issue is that these have become new water management objects.

We define a transboundary TBA problem as a problem when the impact on the hydrogeological system of the TBA in one of the neighbouring countries causes consequences in another one. This allows for an assessment of the risks of occurrence and development of such problems for each specific TBA.

The presence of such risks is determined by the hydrogeological structure of the TBAs and their hydrodynamics, by the degree of hydraulic connection between surface and ground waters, as well as socio-economic factors, etc. The position of the state border relative to the hydrogeological zones of the TBA is of no small importance.

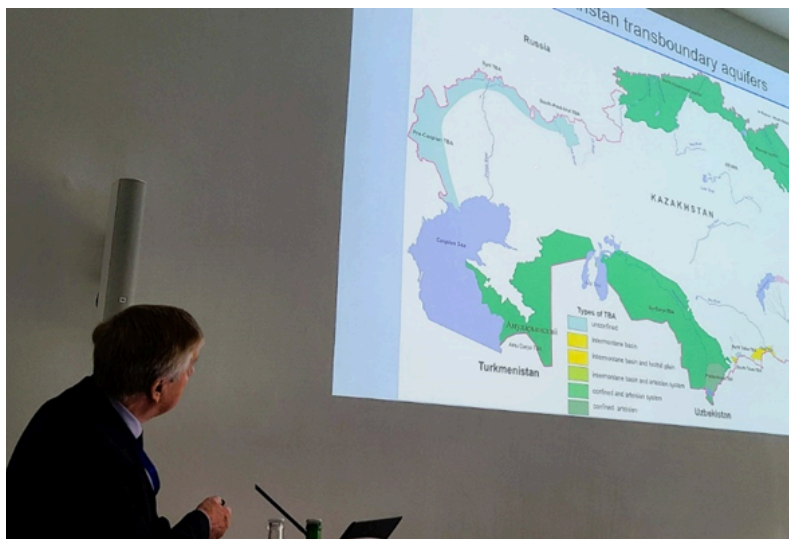
1. If there are groundwater contamination plumes in the TBA in the upstream country, there may not be a TBA problem for the downstream one. There are two examples of contamination plumes in alluvial TBA in Kazakhstan. The task of their elimination is being solved within the State.

2. A problem specific to new TBAs in Central Asia, which requires joint pre-agreed management of the groundwater abstraction, because of the new state border crossing a designed line of the intake water-wells.

3. When operating confined TBAs, of which there are 9 in CA, there is a risk of depletion of groundwater resources. In two of the TBAs – Pretashkent (shared by Kazakhstan and Uzbekistan) and Irtysh-Obzky (shared by Kazakhstan and Russia) - this process has been going on for a number of years. That requires a joint management agreement. The area unit of such management will be the entire TBA or a very large part of it.

4. Specific hydrogeological systems of intermountain depressions and foothill plains (the majority of such TBAs in CA). Their hydrogeological system is very dynamic and closely linked to surface runoff. Interstate conjunctive management of their groundwater and surface water resources is necessary.

5. The Fergana Valley as an example of the integrated aquifer system. The aquifers are confluent cones of rivers flowing down from high mountain ranges. Under natural conditions, each alluvial cone stands out as an independent hydrogeological region with its inherent features of groundwater runoff formation. When assessing them, 15 were identified. However, due to the distribution of surface runoff by main irrigation canals over the area of several transboundary aquifers, they had become hydrodynamically interconnected. Thus, the whole Fergana Valley as the hydrogeological region is integrated into a transboundary aquifer system, which has to be an object of joint conjunctive management of its surface and groundwater resources.







## **The Geneva aquifer as an example for establishing a cross-border agreement for the management of common groundwater resource**

By

**Gabriel de los Cobos, Hydrogeologist, former head of hydrogeology branch, canton of Geneva. Independent groundwater expert Geneva – Switzerland**

The agreement on the Geneva aquifer, signed more than 40 years ago, is recognized internationally for being the first agreement on transboundary aquifers. This agreement was signed not at a national level but between a Swiss canton and communities located on French border; it is a small aquifer as compared to large systems such as the Guarani or the Senegalese-Mauritanian-Gambian aquifer.

Nevertheless, basic elements on this groundwater management, resource protection and effective political-administrative management can be put forward as examples of application for current and future transboundary works.

Based on our Franco-Swiss experience, we can highlight several important points:

- The ability to focus on the common water resource;
- Management at local level;
- Trust between the parties;
- Scientific and technical knowledge of the aquifer;
- Sharing of hydrogeological and technical data between the parties; and
- The establishment of a commission in charge of monitoring and managing the resource with political support to create a link between managers and beneficiaries in an administrative, legal, technical, scientific and political context.

Even if the management of the Genevese aquifer has been at a turning point in recent years following the increase in water needs and climate changes, this situation demonstrates that a continued constructive relationship between the parties is essential to successfully lead to strong cross-border agreements and sustainable resource management.

# Inducing a dialogue on transboundary cooperation on the Senegal-Mauritanian Aquifer Basin.

By Jean Willemin, Geneva Water Hub

As highlighted by the Global High-Level Panel on Water and Peace, knowledge and cooperation frameworks on groundwater and aquifers, representing more than 90 percent of unfrozen global freshwater reserves, should be enhanced as a matter of priority. In regard to transboundary water resources, the Panel called for new forms of agency capable of proposing pre-negotiation consultations to engage states into water cooperation.

Four states sharing the Senegal-Mauritanian Aquifer Basin (SMAB), namely Guinea-Bissau, Mauritania, Senegal and The Gambia, were sensitive to this priority. To induce such a dialogue on transboundary cooperation, the Geneva Water Hub jointly with the UNECE Water Convention Secretariat and IGRAC, endorsed a facilitation role aiming to host discussions to first verify mutual interests to cooperate, and further to support a state-led step-by-step process to define a common vision and operational axes to induce a concerted management on the SMAB. A Regional Working Group for Transboundary Cooperation on SMAB was thus mandated by Water Ministers of the four countries for that purpose. This enabled mutual trust and political will sanctioned with the signature in September 2021 of the Ministerial Declaration on the SMAB.

The presentation shared this experience that is innovative in two ways: first by its process of a state-led working group endorsing a leadership role to organise water cooperation and technical and financial supports, second by the institutional arrangement under discussion that for the first time involve two transboundary basin organisations, namely the Gambia River Basin Development Organisation (OMVG) and the Senegal River Basin Development Organisation (OMVS), in supporting states to engage in surface-groundwater conjunctive management.

First, the key takeaways stressed that such a political process is in line with the “spirit of the times” when it comes to state representatives' expectations on approach to international cooperation. This is demonstrated by the quick political uptake on engaging a negotiation process for an institutional arrangement.

Second, applying the principle of subsidiarity is key to devise an effective collaboration between transboundary basin organisations and water national services. National services should remain at the forefront of groundwater operations, while seeking support in domains such as pooling advanced expertise; leveraging regional projects and funds; building upon existing regional intersectoral water usages platforms for data sharing and dialogue; and raising up political and public awareness among countries.

Third, the vision set out by the Regional Working Groupe on SMAB is not only based on concerted management of transboundary flows. It aims beyond at creating a community of practise on groundwater management between states facing similar challenges also at national level. Such a cooperative framework is of inspiration for other regions that seek to bound technical ties and mutual learning processes. These cooperation dynamics constitutes an asset for peace in case political unrest threatens, reminding everyone that water remains mankind common denominator.







## **A global inventory of cross-border groundwater impacts related to transboundary aquifers**

**By**

**Dr. Arnaud Sterckx, IGRAC, Netherlands**

The latest UN-SDG Indicator 6.5.2 report shows that cooperation on transboundary aquifers (TBAs) is lagging behind. TBAs generally fail to attract sufficient attention and “political willingness” to develop joint assessments, monitoring and management strategies. Our global inventory of cross-border groundwater impacts and joint management interventions further demonstrates the need for and relevance of TBA cooperation. It also provides key insight into cross-border groundwater impacts and the type of joint management interventions implemented.

At the moment, the inventory contains 17 cases, with potentially more cases to come. Much of the information was found in the grey literature, and most of the cases are from countries where hydrogeological data and studies are relatively abundant. It suggests that many more cases of cross-border groundwater impacts remain unidentified.

The majority of cases concern groundwater quantity issues, which were identified in aquifers where the recharge rate is low. The cases show that abstraction can dramatically alter groundwater flow across the border, within a couple of years, causing a depletion of groundwater in the neighbouring country. Upstream countries can be impacted, and it is not uncommon to observe groundwater flow reversals. In some cases, abstraction results in a decrease of streamflow. In addition to quantity impacts, cross-border groundwater pollution has been identified in a few cases, in aquifers that are particularly vulnerable to pollution.

Most of the cross-border groundwater impacts and joint management interventions were identified within a short distance from the border, suggesting that cooperation efforts could be prioritized over these areas.

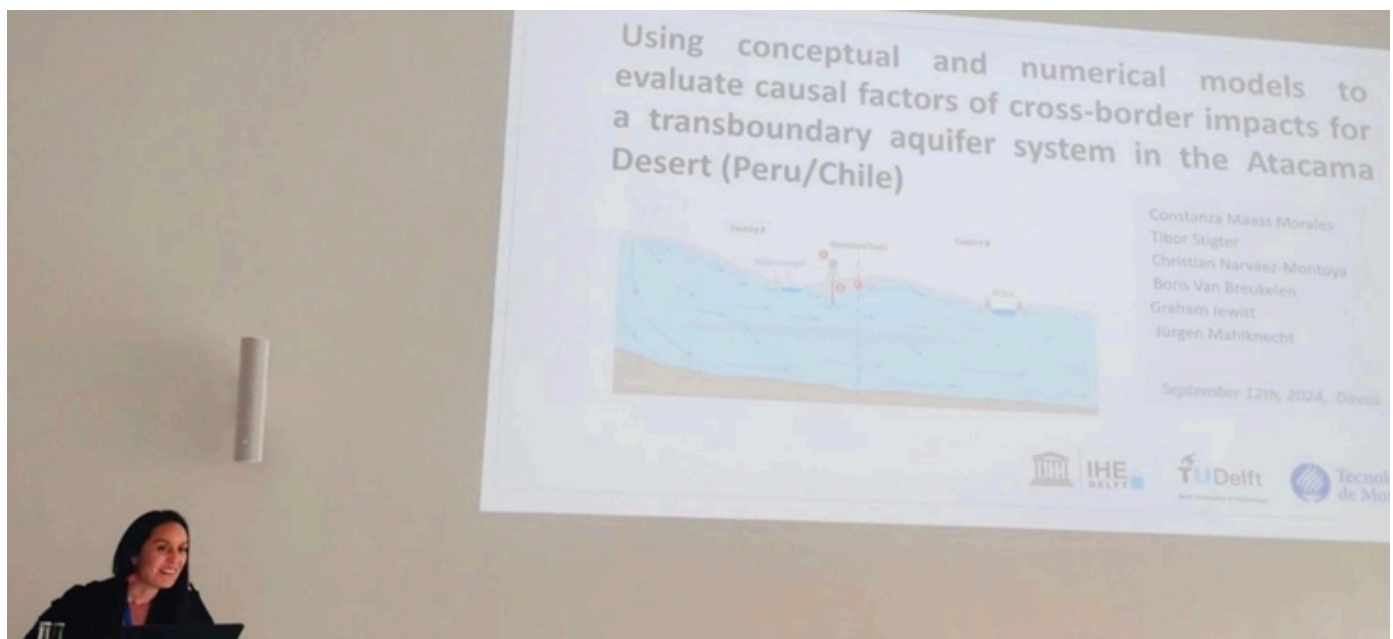
# Using conceptual and numerical models to evaluate causal factors of cross-border impacts for a transboundary aquifer system in the Atacama Desert (Peru/Chile)

By Constanza Maass-Morales, IHE Delft Institute for Water Education / Delft University of Technology, Netherlands

Cross-border groundwater impacts refer to adverse effects from human activities that extent into the territory of another country. The Caplina-Concordia transboundary aquifer system is a coastal aquifer located in the south of Peru and north of Chile, within the Atacama Desert. A numerical modelling assessment by Narvaez et al. (2021) suggested that groundwater abstraction, for irrigation and domestic supply in both countries - but primary in Peru - has declined the water levels and induced sea water intrusion in Peru and Chile between 2001 and 2020.

In this research we use the existing conceptual and numerical flow model of the case study to analyse the significance of various factors in the transmission of groundwater impacts between Peru and Chile.

The factors analysed include the location, intensity, and duration of groundwater abstraction and pollution activities, as well as physical factors with high data uncertainty: recharge and hydraulic conductivity of the border area. We examine the effects of these factors on impact transmission by simulating scenarios in which the factors are varied. Four indicators were formulated and used to quantify the variation in impacts transmission: (1) cross-border flow water decrease (2) cross-border flow gradient decrease, (3), water table decline, (4) sea water intrusion increase. The results of the research are expected to be finalised by March 2025. These outcomes will be used to provide recommendations on impacts responses in the case study and in similar transboundary aquifers.





# Focus attention on the ‘near field’ - postpone it for the ‘far field’ ... so that critical actions can be taken, and avoid leaving decisions in limbo

By Shaminder Puri, Sustainable Solutions with Practical Hydrogeology, United Kingdom

The subject of transboundary aquifers has now entered into the mainstream of the global water agenda, where their significance is being increasingly stressed. Recent science literature abounds with analyses and cases studies that have a rather more academic perspective, thus leaving a gap in the adoption of practical measures, through which the science links to policy, and following on from that, to access to finance and investment. This presentation, therefore sought to illustrate the means to make the in-depth hydrogeological systems analysis, more accessible to the policy maker, which is a plea to the science community to re state their analysis in concepts that are more digestible at the policy level.

The presentation also commented on some terms that are being used in literature that may contribute to imprecisions, which are not helpful. This issue was illustrated through personal experience of the case history of the Rum-Saq transboundary aquifer, tracing the in-depth hydrogeological field-based investigations (from 1991), through the current (2025) operation of well fields producing over 200 MCM/y in Jordan and over 800 MCM in Saudi Arabia, straddling the international boundary between the two States. The most critical moment in time was the process of stepping from the scientific investigations to the bidding, and award of an operational concession – the scientific findings of transboundary aquifer dynamics only played a pivotal role for ‘merely one second’ – inter country, sovereign risk, and the multi bank investment financing agreements, as well as the sovereign guarantees, were a far more critical issue. Hidden out of view – but a fundamentally crucial element was the sovereign guarantee that the concessionaire would not be liable for was the risk related to the availability and reliable access to water from the aquifer for the length of the concession – 25 years. Such a guarantee was only possible through the main conclusion coming out from the almost 10M Euro worth of scientific hydrogeological investigations, analyses and assessments. Based also on the latter hydrogeological conclusion (which still remains in confidential studies), it has also enabled the two countries to sign an international bi-lateral treaty – which incidentally does not adhere to quite a few of the norms on international transboundary water law.



Some post conference reflections related to the Rum-Saq transboundary aquifers are that in the intervening years since 2010, a number of academic and somewhat curious, far removed from reality studies have been conducted on this transboundary aquifer system, which seem to be for (comical) academic curiosity!



## **The neglected role of sub-national institutions in setting priority areas for shared aquifer management in Southern Africa**

**By**

**Dr. Kevin Pietersen, SADC-GMI, South Africa**

The boundary asymmetries between transboundary aquifers (TBA) and sub-national, national, and international level institutions compound the challenges associated with increasing multi-stakeholder, participatory decision-making styles considered prerequisites for legitimacy and accountability. Much focus has been on the aquifer scale assessment of transboundary aquifer systems and their institutional arrangements, but sub-national institutions (formal and informal) have received less attention for prioritising cross-border implications.

TBA boundaries rarely encompass all the physical, social, or economic factors impacting the area within its borders. Southern Africa has several TBA, which include the Stampriet Transboundary Aquifer System (STAS), Eastern-Kalahari-Karoo TBA, Khakhea/Bray Dolomite TBA, Tuli-Karoo Sub-Basin TBA and Ramotswa/Zeerust/Lobatse Dolomite Basin TBA.

Creating an enabling environment for shared aquifer management through policy, legal and regulatory frameworks is one of the Southern African Development Community–Groundwater Management Institute (SADC GMI) aims. The work to support institutional building includes baseline assessments, strategic action planning through stakeholder engagements (focus group discussions and key informant interviews), gender equality and social inclusion (GESI) assessments, and the setting of groundwater institutions at the international, national, and sub-national levels.

The challenge for cooperation is that (i) negotiations occur between diplomats and government members from riparian countries and river basin organisation (RBO) managers; high-level political discussions to set priorities, and decision-making processes incorporate only a limited number of participants, who make decisions capable of impacting the entire population that depends on the shared waters. The majority of strategic action planning processes have weak local-level stakeholder engagement.

The findings show that the current data, information and knowledge on local groundwater conditions are inadequate for reliable diagnostics and optimal decisions regarding groundwater resources management policy and measures. The provisions for stakeholder participation at the sub-national levels in policy and legislation have not been enacted as a reflection of limited awareness of groundwater. The neglected role of sub-national institutions results in TBA priority settings weakly aligned with integrated development plans.

## PANEL discussion, Session 4.04

Title: **Groundwater for peace: Transboundary areas for shared aquifer management**

Subject:

The panelists debated the most appropriate focus area for the shared management of transboundary aquifers: the assessment of the full aquifer or focusing on aquifer zoning. They discussed the effectiveness of existing methods used in selecting appropriate management units, such as hotspots, transboundary corridors, groundwater flow systems, groundwater residence time, radius of influence, capture areas, or effective transboundary aquifer areas (ETAAs) with reference to the presentations provided in the session. To complete the debate and in addition to the physical assessment, panelists discussed the emerging variables or elements needed in shared management scenarios, e.g., social, economic, and political needs, designed as complementary approaches to promote cooperation and peace.

Invited panellists:

1. **Constanza Maass Morales**, UN-IHE
2. **Karen Villholth**, Water Cycle Innovation
3. **Jean Willemin**, The Geneva Water Hub

Moderator: **Alfonso Rivera**, TBA Commission

### SUMMARIES

#### **How to use the findings to move from research to policy**

**Constanza Maass Morales**, IHE Delft Institute for Water Education

HTBA assessments based on physical variables are widely recognised as a challenging yet fundamental task for guiding transboundary groundwater management. However, integrating other variables, such as environmental, socioeconomic, and political factors, emerges as a complementary and equally relevant tasks for management responses.

To bridge the gap between research and policy, it is essential for hydrogeologists to collaborate with experts from other fields, such as economists, urban planners, lawyers, and sociologists. Multidisciplinary collaboration is likely to produce more comprehensive and practical inputs for policymakers.

Examples of these inputs are risk-based assessments. Risk maps can illustrate the interplay between physical, socioeconomic, and environmental factors, which is essential for regulating and protecting transboundary groundwater. Groundwater risk has not been explored enough in TBAs as it has been in domestic aquifers. Valuable tools for policymakers could be, for example, maps that show vulnerability, hazard, and risk to cross-border groundwater impacts such as depletion and pollution. Despite the physical vulnerability of the aquifer, groundwater risk can also incorporate the environmental and socioeconomic vulnerabilities of groundwater-dependent ecosystems and populations. Additionally, the risk of cross-border groundwater impacts can include human and natural hazards, such as groundwater pumping and droughts. Transboundary groundwater risks assessments can help translate research to policy, integrating physical and non-physical variables and addressing current and future challenges



## On water for peace

Jean Willemin, Geneva Water Hub

The Global High-Level Panel on Water for Peace addressed groundwater as a special topic while stressing out the need to improve the level of knowledge relating to water quality and quantity issues at all levels. It called to recognise the political implications of certain aspects of water resource management that tends to be treated as technical. With this vision, the Panel recommended to engage on hydrodiplomacy to prevent water-related conflicts at local, intersectoral and transboundary level, and utilize the potential of water to induce peace and cooperation.

When it comes to tackling groundwater challenges and its relation to peace, a relevant entry point may be to consider surface water cooperation practises and draw the links with the specificities of groundwater. I see three topics that could be used as a leverage for such reflection.

### 1. Visualizing interdependences

Groundwater knowledge enlightens our understanding of underground usages and their likely interferences. This knowledge reveals information on how stakeholders are connected and the risks of hampering the resource. Given human nature and its tendency to react only when an issue hits their backyard before serious policy replies are activated, it should be stressed that groundwater does not enjoy the luxury of time because of the heavy financial, technical means needed to resolve issues. Thus, groundwater knowledge has a dramatic role to play in improving anticipatory societal capacities of preventing conflicts.

### 1. Political prioritization

In comparison to the stake and interests driven by surface water through big dams and other sizable infrastructures, groundwater has in many cases been overlooked in priority within water ministries, arguably because a groundwater-related infrastructure is less appealing to embody a milestone in a political career. We should find ways to improve awareness raising and incentives to advance on groundwater cooperation including philosophers, artists and cultural factors that may contribute to celebrate our ties and societal achievements on water cooperation.

### 1. Generational responsibility

With respect to challenges of sustainable and equitable uses, there is need to build upon experiences of treaties that enabled stakeholders to adapt in time to the evolving challenges affecting groundwater. The Genevese aquifer is a case in point having work on quantitative overexploitation since the 1970's, tackling water quality afterwards, and more recently climate change impacts. A living treaty is one that may anchor political commitments in a cooperative framework while putting the stakeholder representatives at the centre of a collective learning process that increases anticipatory and reactive capacities to address sensitive issues.

There is a need to reconcile the land and the water expertise that tends to function in silo fashion. Without proper cooperative framework on current and projected usages and land tenure, groundwater exploitation may leave communities behind, often in insidious ways. Economic marginalisation remains one of the main drivers of conflicts, of which violent ideologies are a syndrome as pointed out by the peacebuilding community. This should be factor in prospective and strategic planning that groundwater knowledge support if we want to avoid tomorrow's conflicts and work towards groundwater for peace.

## **On Transboundary areas for shared aquifer management**

**Alfonso Rivera**, TBA Commission

The essential points that emerged from this panel discussion were:

- Define transboundary impacts based on causal interpretation.
- Include both groundwater quantity and quality in TBA assessments.
- Define effective areas through hotspots.
- Start with a far-field analysis and focus on a detailed near-field evaluation; for instance, using groundwater flow nets, groundwater flow systems, residence times, capture areas, and areas of influence.
- Depending on the context and stakeholders' involvement (on each side of a TBA), we are going through a paradigm shift from before, now and the future.
- BEFORE we used to evaluate TBAs by defining physical and chemical boundary conditions; NOW we consider social economic and political boundary conditions; we are moving into a FUTURE where we need to increase cooperation and collaboration, hydro-diplomacy, and how to move from research to policy development.

**SPECIAL SESSION on Conjunctive management, Session 3.05**  
**Conjunctive management of water resources: aquifers at the heart of interactions.**

Convened by Shammy Puri, Karen Villholth, and Alice Aureli

Session Partners: UNESCO-IHP, UNECE, IGRAC, GEF-IW:LEARN, SADC-GMI, IAH Transboundary Aquifers Commission

Description

Conjunctive management of water resources is already known to be a powerful means to addressing crises arising from climate change, water shortages and quality deterioration. So many of the world's water basins are facing declining surface water resources, in which groundwater is now being spontaneously utilised as replacement. Unfortunately, groundwater remains the 'Cinderella' of water resources – it is there in the background but remains unseen in explicit policies, legal regimes, and accessible financing. This, 'spontaneous conjunctive use' approach is becoming more widespread, resulting in chaotic resources governance and further undermining of water security. These symptoms have been recognised by many actors in the water sector. There is a real interest in moving from "chaos to order" and the recognition that aquifers are at the heart of fundamental hydrological interactions and hence need to be explicitly addressed (see for example **UNECE 2023** and **GEF IW:LEARN**). Enhanced conjunctive management, where groundwater is at the centre of attention, may require retrofitting of policies and practices, which may be complex in some situations, but holds great potential to address the common issues faced in many regions. This session, developed in cooperation with UNECE, helped inform the process towards establishing a programme area on Promoting Conjunctive Management of Transboundary Surface Waters and Groundwaters in the Water Convention Programme of Work for 2025-2027 (see also Short News below on 10th Session of the UNECE Water Convention, Ljubljana, Slovenia).

Speakers:

1. **Shammy Puri**, Practical Hydrogeology, UK
2. **Lucia Samaniego**, CeReGAS, Uruguay
3. **Matteus Van der Velden**, HELVETAS, Switzerland
4. **Shilpi, Chakraborty**, National Institute for Urban Affairs, India
5. **Neno Kukurić**, Nile Basin Initiative
6. **Jose Luis Martin Bordes**, UNESCO Intergovernmental Hydrological Programme
7. **Leunell Chris Buela**, Univ. Philippines Los Baños
8. **Aurelien Dumont**, UNESCO Intergovernmental Hydrological Programme

Chair: **Andres Marandi**, Geological Survey of Estonia



## PANEL discussion, Session 3.05

Subject: Conjunctive water resources management: An assessment of current practices and review of their effectiveness – can they resolve the problem?

Invited panellists:

1. Oimuhammadzoda Ilhomjon, Director, Main Department of Geology, Tajikistan
2. Dimitrija Sekovski, Team Leader, Integrated Water Resources Management, Kosovo
3. Shilpi, Chakraborty, National Institute for Urban Affairs, India
4. Andres Marandi, Geological Survey of Estonia
5. Lucia Samaniego, Centro Regional para la Gestion de Aguas Subterraneas America Latina y el Caribe (CeReGAS), Uruguay

Moderator: Karen Villholth, Water Cycle Innovation



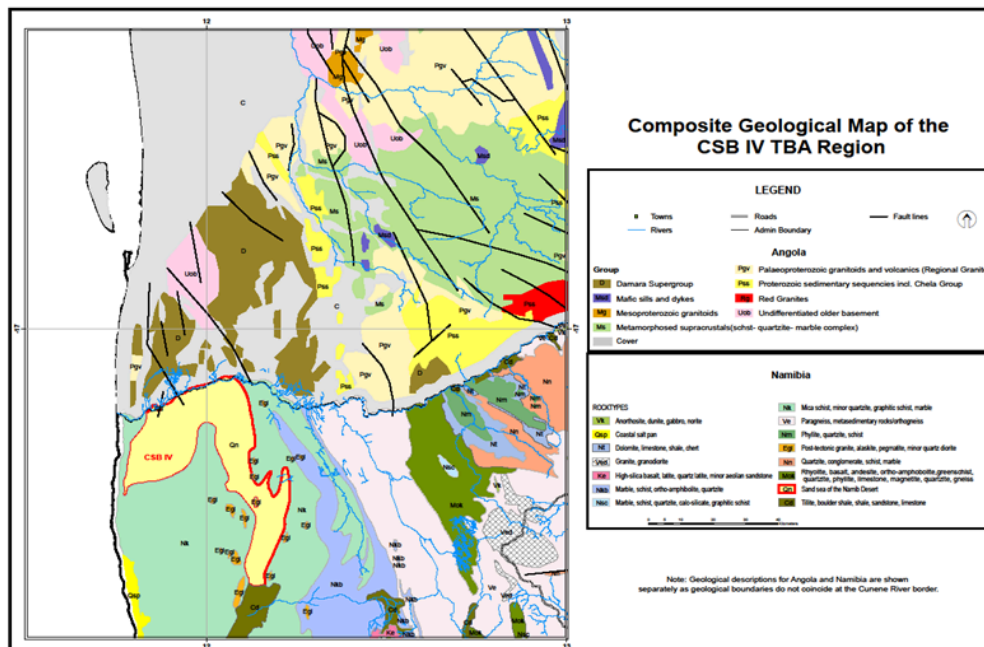
# ISARM Africa TBA News

Contributed by Kevin Pietersen



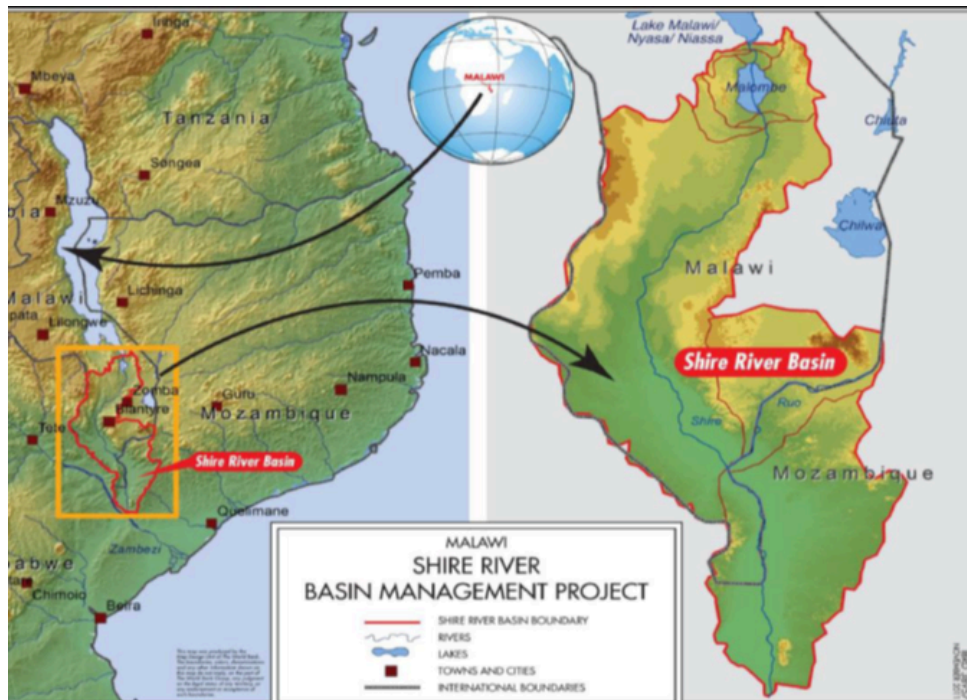
## Investigating the Coastal Sedimentary Basin IV (Transboundary Aquifer AF015)

The SADC-GMI investigated The Coastal Sedimentary Basin IV (Transboundary Aquifer AF015) shared between Angola and Namibia, which has not been subjected to any detailed studies. An airborne aeromagnetic data and remote sensing interpretation was undertaken to delineate the spatial extent and geometry of the basin. The remote sensing and image interpretation found the following: margins of quaternary sediments were clearly defined in both countries, but these are not contiguous; relatively thick sediments were mapped in Namibia, but the presence of thick sediments did not translate to the presence of an aquifer, as these could be unsaturated dunes or sands; across the Cunene River into Angola, aeromagnetic data show very shallowly to outcropping bedrock, indicating the likely absence of any aquifer north of the Cunene River; basement rocks have been mapped from imagery along the Cunene River banks, showing discontinuity in the quaternary sediments across the border. Hence, the unlikely presence of a transboundary aquifer for outcropping to sub-cropping basement rocks is also mapped on geological maps, further supporting the discount of sedimentary units across the international boundary. The geophysical and remote sensing analysis findings indicate a low likelihood of the currently denoted CSB IV being classified as a transboundary aquifer.



## Shire River Alluvial TBA Groundwater Study

A study is underway to establish the hydrological/hydrogeological (quantity and quality) status of water resources in the Shire River Transboundary Aquifer System, considering climate change scenarios and enhancing data and information on the aquifer-river system.



Map of the Shire River Basin

### 6th SADC Groundwater Conference, Lesotho

The sixth iteration of the SADC groundwater conference was held under the theme “Promoting Peace Across Borders through Conjunctive Water Management”. The number of attendees was more than 150 from 10 countries. The conference modalities included keynote presentations, oral presentations, special sessions, panel discussions and video poster presentations. Although the countries have tried to tackle climate change and disaster risk reduction at the basin level, more work is needed. There was a call to increase understanding and awareness of the benefits of conjunctive water management, especially for climate change adaptation, by moving from spontaneous to planned conjunctive water management. Adoption of conjunctive management requires funding and investments for aquifer identification, delineation, monitoring, and interactions with surface water ecosystems and related monitoring infrastructure. Water does not respect geopolitical boundaries, and groundwater institutions have a critical role in translating decisions into action in this context.



**ISARM Americas  
TBA News**

Contributed by Lucia Samaniego



**Meeting of the ISARM Americas Program Working Group: Advances in the Management of Transboundary Aquifers in the Region**

On August 21, 2024, the ISARM Americas Program Working Group held a virtual meeting with the participation of representatives from the following countries: Argentina, Brazil, Canada, Chile, Colombia, Ecuador, El Salvador, Guyana, Mexico, Nicaragua and Uruguay. UNESCO and CeReGAS (coordinator of the ISARM Americas Program Working Group) were also present.

During the meeting, progress in updating information on the Transboundary Aquifer Systems of the Americas was presented and discussed. Through a standardized form sent to all countries, the collection of updated data has begun, which will allow for better management of these shared water resources. This methodology will not only facilitate access to homogeneous and comparable information between nations, but will also allow the identification of new transboundary aquifer systems.

The compilation and analysis effort will culminate in the publication of a new technical report (“Book 5” of the ISARM-Americas series), which will provide a comprehensive overview of the current situation of transboundary aquifers in the region. This initiative reinforces the commitment of the countries and organizations involved to promote sustainable and cooperative management of shared groundwater resources, which is essential for the development and water security of the region.

**ISARM Asia  
TBA News**

Contributed by Han Zaisheng



The China Hydrogeological Survey team has obtained a large amount of first-hand data in the field in Xinjiang, which is adjacent to Kazakhstan. To carry out groundwater sampling, testing and investigation. Water resources in this area are very precious, and agriculture is very dependent on groundwater resources. The project on the transboundary aquifer hydrogeological survey aims to manage the sustainable utilization of precious groundwater resources, to guide the Xinjiang groundwater resources application, service the rural production and living, at the same time its achievements to promote lasting peace and common prosperity of international relations, is of great significance.

## ISARM MENA TBA News

Contributed by Avi Burg



The MENA is a region where freshwater scarcity due to its dry climate has significantly affected its population throughout history and up to the present day. According to data from 2019, sixteen of the twenty-five most water-scarce countries in the world are found in this region. On March 22, 2024, the United Nations released its “World Water Development Report 2024”, where it was determined that MENA is the most “water-stressed” region, with 83% of people exposed to extremely high stress. Moreover, by 2050, all MENA countries will live under extremely high water stress (see the impressive presentation built by Natasha Hall, CSIS: <https://features.csis.org/surviving-scarcity-water-and-the-future-of-the-middle-east/>).

Along with the constraints of natural water resources, climate changes, security crises (political instability and military conflicts), a rapidly growing population (from 1950 to 2000 the population almost quadrupled), displacement of large communities, urbanization, uneven economic development, poor water management, massive pollution and salinization, all of which exacerbated the problem of water availability with reasonable quality. This crisis is in many cases transboundary and thus requires countries to act together, however, the complicated political situation, the suspicion, the age-old conflicts and the failed state management, all prevent agreements on common challenges and increase the complexity of the problem for many more years.

The year 2024 was one the hottest in this region ever (see: <https://foreignpolicy.com/2024/08/19/climate-change-is-making-the-middle-east-uninhabitable/>) and was accompanied by security tension and even violent wars, which manifested in many studies and publications describing the water problems, the transboundary water sources, as well as in the proposals for solutions. Long-term planning as well as cooperation within and between countries are essential to improve water supply and security, however, for many reasons (mainly political), this issue is far from achieving means of progress and continues to appear extremely challenging. It should also be noted that, unfortunately, political aspects and interests poison some of those studies and publications.

The most prominent transboundary water-sharing challenges or controversial issues that have also received a lot of attention recently, are the struggles along the Nile Basin (Ethiopia, Sudan, Egypt), the Euphrates-Tigris River basin (Türkiye, Syria, Iraq), between Saudi Arabia-Jordan, and between Israel-the Palestinians in the West Bank. However, there are actually more transboundary disputes, which currently receive less attention, but may be found in the headlines soon.

In the United Nations document - “World Water Development Report 2024”, it was stated that two-thirds of the freshwater resources in the Arab region are transboundary, and fostering cooperation can be challenging due to “lack of data on water resources (especially groundwater) and competing demands for limited water resources among riparian states.” The North-Western Sahara Aquifer System (NWSAS) shared by Algeria, Libya, and Tunisia and the Saq-Ram/Disi belonging to Saudi Arabia and Jordan were cited as examples of transboundary cooperation that improved sustainable management of water resources.

## COOPERATION & COLLABORATION

Cooperation never means the absence of conflict of interest. It means a set of rules for negotiating conflicts of interest in a way that resolves them.”

Danny Grunbaum

## EVENTS

### Curso Regional Gobernanza de Aguas Subterráneas con énfasis en Acuíferos Transfronterizos



EMBAIADA  
DE ESPAÑA  
EN BOLIVIA



aecid



Cooperación  
Española  
CONOCIMIENTO/SANTA CRUZ

### REGIONAL GROUNDWATER GOVERNANCE WITH AN EMPHASIS ON TRANSBOUNDARY AQUIFERS

Three members of our TBA Commission were invited by CODIA, UNESCO and CeReGAS to deliver a course on Regional Groundwater Governance with an Emphasis on Transboundary Aquifers to Latin American countries, in Spanish (“Curso Regional Gobernanza de Aguas Subterráneas con énfasis en Acuíferos Transfronterizos”).

Laura Movilla, Lucia Samaniego and Alfonso Rivera helped developed this high-level course online from September 3 to 20, 2024.

<https://intercoonecta.aecid.es/programaci%C3%B3n-de-actividades/gobernanza-de-aguas-subterr-neas-con-nfasis-en-acu-feros-transfronterizos>

The course included: the evolution of the transboundary concept, challenges, the global and the North-American scales, basic concepts of governance and International Law, governance and shared management of transboundary waters, and others.





## PEOPLE IN THE NEWS

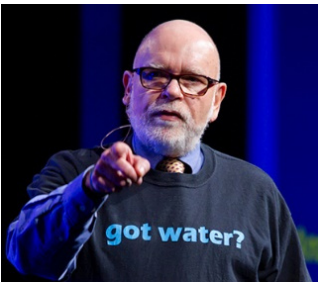
by A. Rivera



### **Joel Carrillo Rivera (1943-2024)**

It is with regret and sadness that I share the news of the passing of Joel Carrillo Rivera. Joel was a well-known and respected Mexican hydrogeologist with a strong geological background. For many years he was a professor at the UNAM Department of Geography in Mexico City and president of the IAH Mexican Chapter. He also participated in the design and was co-chair of the Regional Groundwater Flow Commission of the IAH. Joel was a former colleague and good friend of mine for over 40 years.

Joel was known in Mexico and elsewhere to stand up for his opinion and to defend his arguments and knowledge. He was very strongly engaged and worked with others to change Mexico's water laws by extensively fighting Mexican politicians. I also remember him for the many strong discussions we had over time and how hard we tried to alter each other's point of view... At the end, however, we always converged on groundwater-related scientific approaches for which we both were passionate about. Rest in peace my friend.



### **Michael Campana (1948-2024)**

Sadly, Michael Campana, Professor emeritus at OSU passed away end of the summer from injuries sustained in an automobile accident. He received a doctorate in hydrology from the University of Arizona, and conducted extensive research internationally on transboundary water resource issues over the years. Michael coined the term "hydrophilanthropy" to describe his philanthropic efforts to improve water resources in developing countries. He maintained an active blog, [@WaterWired](#) about water resources matters; a very friendly, informative and humorous blog with wit, for which he was known. His deep and broad contributions earned him the nickname "aquadoc." We at the TBA commission and many people involved in water resources around the world will miss him.

## New faces in the TBA Commission

The TBA Commission welcomes one new member in its team, increasing the commission members to 18 individuals from four continents. Welcome Avi Burg!



### Dr. Avihu (Avi) Burg

Senior researcher, Water and Natural Resources Division  
Geological Survey of Israel.

Avi's main research interests include Hydrogeology, Water geochemistry, and combustion metamorphism (the Hatrurim Formation of Israel)

He is an active member of the IAH as co-chair of its Karst Commission

## OTHER SHORT NEWS

UNECE

Good Practices and Lessons Learned  
in Data-sharing in Transboundary Basins



### UNECE publication “Good Practices and Lessons Learned in Data-sharing in Transboundary Basins

A new publication by ECE-Water (UNECE) was recently launched on [transboundary basins](#) with good Practices and Lessons Learned in Data-sharing. This 214-page book contains **43 lessons learned**, supported by **78 case studies** provided by different actors from around the world. Our TBA-Commission contributed five cases.

Our contributions were provided by members of our TBA Commission: Amélie Pétré, Kevin Pietersen, Oleg Podolny, Alfonso Rivera, Rosario Sanchez and Arnaud Sterckx: case studies; 2, 5, 8, 56, and 74.

- **Case study 2:** *Governance and management of the Stampriet Transboundary Aquifer System (STAS)*
- **Case study 5:** *Open data access in South Africa and the Gambia*
- **Case study 8:** *Informal cooperation on transboundary aquifers along the Mexico-U.S.A. border*
- **Case study 56:** *Sharing of data and information in the Pretashkent Transboundary Aquifer*
- **Case study 74:** *Informal cooperation on hydrogeological assessments of the Milk River Transboundary Aquifer.*

The cumulate experiences in those cases covered most of the lessons learned as defined by ECE-Water.

## 10th Session of the UNECE Water Convention, Ljubljana, Slovenia

The Water Convention Programme of Work for 2025-2027 has been adopted by the tenth session of the Meeting of the Parties to the Water Convention (Ljubljana, 23-25 October 2024). In the draft programme, you will notice a proposed new sub-programme area 3.4: Promoting Conjunctive Management of Transboundary Surface Waters and Groundwaters. We have confirmed Estonia and the Gambia as lead parties for the sub-programme area. The full Program of Work is available here. At the event, two UNECE reports with explicit reference to the global advancement on cooperation on transboundary aquifers were launched:

1. The third report on the SDG indicator 6.5.2 (UNECE, UNESCO, 2024), which shows that only 28 countries worldwide have all their shared waters covered by operational arrangements for water cooperation, and that the global lag on water cooperation undermines resilience to worsening floods and droughts

2. The new publication on data and information sharing (see above), which presents a global collection of case studies building on real-life experiences across political, sectoral and institutional boundaries. It demonstrates the crucial importance of data and information sharing for informed decision-making and building trust among riparian countries.

The representative of IAH took the floor during the plenary to express its willingness to collaborate with UNECE and Member States to advance collaborative transboundary water management by providing its expertise, particularly through the contribution of its Commission on Transboundary Aquifers and in particular for the implementation of the new established UNECE Water Convention programme area on conjunctive surface water and groundwater resources management.

### Update of the global TBA map

The global map of transboundary aquifers (TBAs) shows the delineation of aquifers extending over multiple countries: <https://ggis.un-igrac.org/view/tba/>. It is the result of over 20 years of efforts by UNESCO-IHP and IGRAC to compile data and information from regional and global TBA projects and initiatives. More information on the history of transboundary aquifer assessment can also be found in the brochure Transboundary Aquifers, a Global Outline (<https://www.un-igrac.org/sites/default/files/resources/files/TBA%20brochure%20-%20web.pdf>).

An updated version of the map is in preparation, which will incorporate the latest developments in TBA mapping and assessment since the last version of the map in 2021. Particular efforts will be made to map TBAs in Europe, as the current map contains limited information on that region. The updated map will also provide some basic information about each TBA, including an indication of the level of data and information that is available. This should allow distinguishing TBAs that are well established and characterized from TBAs requiring additional assessment efforts.

Anyone with relevant information from recent TBA mapping and assessment activities is invited to communicate with the authors: [arnaud.sterckx@un-igrac.org](mailto:arnaud.sterckx@un-igrac.org).

## Book on Mexico-United States relationship from a water perspective by Rosario Sanchez



Breve historia lúcida de las aguas compartidas entre México y Estados Unidos: Un desahogo crónico y casual sobre nuestra relación con el agua (Spanish Edition).

Water is naturally a common resource. It is shared. However, the geopolitical borders between countries make it a strategic resource, and in the case of Mexico and the United States, an element of discord where complexes are manifested and the future is compromised.

This book reviews the Mexico-United States relationship from a water perspective, but using analogies to associate knowledge with daily life. A chronic, after-dinner relief that seeks to reach a common understanding of our relationship with water both on the border and beyond it. It addresses the myths, the wounds, the deceptions, the masked impudence, the immaturity, the emergencies.

Our role as citizens, our responsibility as human beings in everyday language, which delves into the questions that we all have, but which we delegate their answers to at the speed of the inertia in which we grew up, live and consume.

In the face of growing water scarcity and the challenges of climate change, the shared waters of our borders will be proof of that neighborhood so close that it is almost toxic and so far, that it is incomprehensible. Book is available on [Amazon](#).



Previous TBA-Commission's Newsletters can be accessed [HERE](#)

## RECENT TBA-related PUBLICATIONS

Lezzaik, K., and Milewski, A., 2018. A quantitative assessment of groundwater resources in the Middle East and North Africa region. *Hydrogeology Journal*, 26(1), 251-266.

Mahmoud, M., 2024. The Looming Climate and Water Crisis in the Middle East and North Africa. Carnegie Endowment for International Peace.  
<https://carnegieendowment.org/research/2024/04/the-looming-climate-and-water-crisis-in-the-middle-east-and-north-africa?lang=en>

Rubin, G.I.; Nagabhatla, N.; Londono-Escudero, C.; Vignola, R. Transboundary Aquifer Management Across the Americas: HydroDiplomacy as an Accelerator of Adaptive Groundwater Governance Amid Climate Change Challenges. *Water* 2024, 16, 3117.  
<https://doi.org/10.3390/w16213117>; <https://www.mdpi.com/2073-4441/16/21/3117>

Sanchez, Rosario, 2024. Breve historia de las aguas compartidas entre México y Estados Unidos. Un desahogo crónico y casual sobre nuestra relación con el agua. TACK Editorial. ISBN: 978-607-29-5490-8. Primera edición, junio de 2024.

UNECE, UNESCO and UN-Water, 2024. Progress on Transboundary Water Cooperation. Mid-term status of SDG Indicator 6.5.2, with a special focus on Climate Change. UN ISBN 978-92-1-003183-7. <https://unece.org/environment-policy/publications/progress-transboundary-water-cooperation-mid-term-status-sdg>.

UNECE, 2024. Good Practices and Lessons Learned in Data-sharing in Transboundary Basins. 118 pp. Contributed as Member of the Expert Group. ISBN: 978-92-1-003146-2.  
<https://unece.org/environment-policy/publications/good-practices-and-lessons-learned-data-sharing-transboundary>.

Walschot, M. and Katz, D., 2024. Desalination and transboundary water governance in conflict settings. *Journal of Environmental Management*, 355, 120509.

Zarza, L.F., 2024. World Water Day 2024: Water as a conflict trigger and a tool for peace, *Transboundary Waters and Conflicts*. Smart Water Magazine.