

7-8 December 2022
UN Paris HQ



summit co-coordinated by

REGIONAL DIALOGUES

Overview

Groundwater provides the primary access to water in remote areas and areas where public water networks are inaccessible or unavailable, it is part of climate change adaptation and of societal resilience to climate change and in sustaining rivers baseflow. Globally it provides nearly half of drinking water supplies, 40 per cent of irrigation water and plays a major role in food security, and about one-third of industry demands (IGRAC, 2018). Yet, groundwater is undervalued with aquifer systems poorly understood and managed in many parts of the world.

With discussions refocused on groundwater for the year 2022 under the UN-Water campaign “Groundwater: making the invisible visible”, this session moves discussions from the global to the regional level by initiating a dialogue between representatives from the regions of the five United Nations regional commissions: the Economic Commission for Africa (ECA), the Economic Commission for Europe (ECE), the Economic Commission for Latin America and the Caribbean (ECLAC), the Economic and Social Commission for Asia and the Pacific (ESCAP) and the Economic and Social Commission for Western Asia (ESCWA).

In fact, groundwater status varies from a region to another depending on the climatic conditions, environmental conditions, hydrogeology, and human activity. The discussions during this session will raise awareness on the groundwater status by region and will showcase challenges and best practices. This session will finally set the stage for dialogues and future actions tailored for each region.

Objectives of the session

The session will draw on the Water Action Decade Regional Preparatory Meetings for the UN 2023 Water Conference to inform dialogues on overcoming challenges and promoting sustainable solutions in groundwater management. Therefore, the main objectives of this session are:

- Making groundwater more visible on a regional level
- Exposing status, challenges, and opportunities of groundwater in each region
- Defining actions towards more responsible, sustainable use and protection of groundwater on a regional level
- Contributing to the 2030 Agenda for Sustainable Development and the SDG 6 Global Acceleration Framework



I. Economic Commission for Africa (ECA)

Sub-Saharan Africa

1. Background

In Sub-Saharan Africa, extensive increase in water demand due to population growth and rapid urbanization adds to the pressure and amplifies the need for an expansion in climate-resilient water services. The development of groundwater has thus great potential to satisfy the need for rapidly increasing water supply across Sub-Saharan Africa, both for human survival as well as to promote economic development (Cobbing and Hiller, 2019). However, the increasing development of groundwater may threaten the ecosystem service that groundwater provides as baseflow to rivers and aquatic ecosystems.

Groundwater, as the largest freshwater resource available, is highly reliable to support livelihoods, especially during extended periods of inadequate rainfall or dry spells and could help to address issues of water scarcity and drought-related shocks (World Bank Group, 2018; MacAllister et al., 2020).

2. Challenges

Most of the challenges faced in Sub-Saharan Africa are common across countries. The main challenges are listed below:

- The main governance challenge is to overcome inertia in the institutional setup.
- Regular monitoring of groundwater levels or quality is restricted to few countries.
- Data and information sharing is still at early stages.
- Regulatory frameworks to protect and safeguard groundwater at national levels are either weak or not enforced.
- Finance is a critical issue for developing groundwater resources. Groundwater withdrawal is low, mostly due to insufficient financial means for exploration and infrastructural investments, and lack of specialized capacity.
- Qualified personnel with the capacity to conduct hydrogeological and geophysical studies is rare. Africa demands considerable expertise which is difficult to find.
- The nature of the groundwater resources can be a challenge for groundwater development as the exploited aquifers have a limited yield due to the type of the bearing rocks.
- Groundwater quality is also a challenge due to anthropogenic contamination in urban areas and to the elevated fluoride levels in the East African Rift.

3. Opportunities

Many opportunities exist in Sub-Saharan Africa for the development of groundwater resources to meet the growing demand caused by population and economic growth, rapid urbanization, and the increasing demands of irrigation. In fact, groundwater is beginning to be taken more seriously, possibly due to the realization of the major role that groundwater plays in achieving water supply targets. The identified opportunities are listed below:

- Groundwater development across Sub-Saharan Africa is observed as a solution to the increase in population coupled with climate change, due to its high reliability and its buffer effect. Africa possesses large groundwater resources; their volume being estimated more than 100 times that of the annual renewal of its freshwater resources (MacDonald et al. 2012).
- The conjunctive use of groundwater and surface water offers considerable potential with groundwater supplies, adding resilience and capacity to existing surface water resources.
- In many circumstances, transboundary aquifers promote joint working and understanding rather than causing conflict. Noting that 106 transboundary aquifers have been identified so far, they cover 42% of the region and serve 30% of the population, and they are largely unexploited.
- Technical advancements can support the development of groundwater but must be accompanied by a strong professional groundwater community, to get the best from the technologies.
- The development of under-exploited groundwater resources in places like Sub-Saharan Africa offers opportunities for food security and economic growth.

4. Priorities

The abundance of groundwater resources will prove essential in meeting increasing global demands for water, especially during periods of severe water stress and due to the effects of climate change. However, there is a pressing need to find ways to unlock the potential of groundwater, to help develop sustainable livelihoods and achieve equitable growth. This involves investments in infrastructure, institutions, trained professionals, and knowledge of the resource:

- Investments to promote safer and more efficient construction standards will be necessary to improve the functionality of water points.
- Investments in the institutions required to manage groundwater are also necessary to ensure that future developments do not threaten the sustainability of the resource.
- Improved groundwater management and governance are needed in order to avoid overexploitation and contamination.
- All data and information about aquifer systems should be made available to groundwater managers

II. Economic Commission for Europe (ECE)

Europe and North America

1. Background

In Europe and North America, the share that groundwater makes up of the total withdrawal of freshwater varies greatly per country. In the European Union, groundwater makes up an important source of household water: some 75% of inhabitants depend on groundwater for their water supply (European Commission, 2008). For the purposes of industry and agriculture (irrigation), groundwater is also important. In the USA, the dependency on groundwater has been increasing over the years, while in Canada more than 30% of the population depends on groundwater.

2. Challenges

- In this region, challenges that either affect groundwater resources, and therefore the uses and socio-economic activities that depend on them, or in which groundwater is part of the solution are:
- Climate change and water scarcity. States across the region are grappling with the challenge of dealing with water abstraction pressures, further aggravated by climate change, and groundwater is a crucial resource in this regard, providing some possible solutions.
- Groundwater-dependent ecosystems. In the EU, the 2021 River Basin Management Plan cycle shows that the linkage between groundwater and its associated aquatic ecosystems and groundwater-dependent terrestrial ecosystems is increasingly considered by the Member States. Experience from the USA shows that water funds have allowed to protect green space in and around local communities.
- Pollution, including emerging pollutants. In many countries of Europe, groundwater is principally used for drinking water, which underscores the need to control water quality for potential health risks.

While there has been some progress in recent years, obtaining and sharing sufficient and accurate data on groundwater resources, particularly in transboundary contexts, remains problematic across the Pan-European region.

Despite scientific advancements in mapping and monitoring groundwater, complexity of the topic makes it difficult for scientists and practitioners to present the findings and possible solutions to the policymakers, as well as to the broader public. Groundwater knowledge and education is lacking and a shortage of groundwater professionals in many countries persists.

The number of agreements dedicated to transboundary aquifers is extremely small. For the vast majority of transboundary aquifers covered by agreements or arrangements within the region, such agreements or arrangements are not specific to an aquifer.

3. Opportunities

The diverse legal and governance systems result in different solutions being deployed in the European Union, Eastern pan-Europe (Eastern Europe, Caucasus and Central Asia) and North America.

In the European Union the following solutions are identified:

- Improving the quantitative and chemical status of groundwater in the overall objective of the framework of River Basin Management Plans.
- Harmonizing approaches across the EU.
- Improving policy coherence.

In Eastern pan-Europe the following solutions are identified:

- Implementing technical solutions to groundwater such as improving efficiency and modernizing water infrastructure.
- Strengthening environmental protection, including that of groundwater resources.

In North America the following solutions are identified:

- Market-based mechanisms and incentivizing (USA).

- Water markets, reallocation of water rights or storage credits.
- Partnerships between conservation organizations and economic sectors for multi-benefit projects.

ECE- Subregional activities to improve knowledge, management and protection of groundwater

Some subregional activities can be highlighted as contributing to improving knowledge, management and protection of groundwater, including:

- In the Dinaric Karst Transboundary Aquifer System (DIKTAS), a GEF project implemented by UNDP and UNESCO's International Hydrological Programme allowed improving the understanding of the karst aquifer system and facilitated harmonisation of policies. A regional groundwater monitoring network is expected to be designed to improve the management of sanitary protection zones and facilitate sustainable management and equitable use of the aquifer system.
- A pilot project in Albania and Montenegro designed and tested a groundwater monitoring network in line with requirements of the EU Water Framework Directive. Aquifer vulnerability maps were produced. Monitoring zones were proposed. The project is of particular importance for the 2030 Agenda as aquifers and related groundwater dependent systems provide a large number of ecosystem services needed in order to achieve the SDGs.
- The International Association of Hydrogeologists (IAH) designed several activities based on the principles of the Sao Paulo-Brussels Groundwater Declaration with the aim to address the lack of monitoring of groundwater, support policies and regulations adopting a sustainable groundwater management, and address lack of communication. Such knowledge sharing should be based on FAIR (Findable, Accessible, Interoperable, Reusable) principles.
- The European Geological Surveys (EGS) developed activities to take action on groundwater data and its importance for sustainable management of resources in the framework of the GeoERA project. The project disseminated spatial information related to groundwater quantity, groundwater quality, impacts of climate change and groundwater vulnerability.

In transboundary settings, the non-binding UNECE Model Provisions on Transboundary Groundwaters (2012) represent an important opportunity to improve transboundary water cooperation with regard to groundwater and strengthen integrated management of transboundary surface waters and groundwaters.

4. Priorities

- Data and information collection, monitoring and exchange is imperative to tackle data gaps and strengthen governance on groundwater. Improved access to existing groundwater data and knowledge is needed in the region, also because groundwater monitoring and analysis is expensive. Any data needs to be available and interpretable to all.
- In order to have cost-effective and sustainable monitoring in the long term, priorities have to be set to strike a balance between having sufficient coverage of monitoring but also adequate attention to specific pollutants.

- There is an urgent need for improved management and governance of groundwater resources in the region to ensure their sustainable usage especially as overuse of groundwater is a growing challenge in many sub-regions. Effective groundwater management is an important part of regional climate change solutions.
- Integrated policies for surface water and groundwater and efforts to ensure coherence are needed and are being developed.
- There is an increasing awareness of the transboundary nature of many groundwater resources, and, therefore, of the need for transboundary cooperation. Development of legal and institutional frameworks focused on effective management of groundwater resources and aquifer systems that can help ensure the sustainable use of groundwater is urgently needed, particularly in the case of transboundary aquifers. Existing joint institutions for transboundary water cooperation should enhance their attention to groundwater, e.g. through the creation of dedicated working groups. Pilot projects may provide solutions for enhancing information collection, monitoring and governance frameworks in transboundary aquifer systems.
- A significant gap in training and capacity-building in this field must be addressed across the region. Scaling up capacity development and communication on groundwater resources is crucial.

III. Economic Commission for Latin America and the Caribbean (ECLAC)

Latin America and the Caribbean

1. Background

In Latin American, specifically in arid and semi-arid zones, groundwater represents a key and strategic resource. It plays an important role in the water supply systems of most Latin American cities, and not only in those where groundwater is the main source of supply. Throughout the region there are shortcomings in groundwater's protection and monitoring, giving way to its intensive exploitation and/or contamination, ultimately endangering its sustainability (Campuzano et al., 2014) as well as the water access of the most vulnerable populations, who depend on these groundwater sources for their drinking water supply (WWAP, 2019).

2. Challenges

Several countries, including parts of Argentina, Brazil, Mexico, Paraguay and Peru face significant overexploitation and contamination of their groundwater. In the Caribbean, where surface water tends to be relatively scarce, groundwater represents about 50% of the water abstracted. There, groundwater quality is threatened by seawater intrusion due to hurricanes and sea level rise. Throughout the region, the most common groundwater quality problems are associated with unwanted elements of natural origin (mainly arsenic and fluoride), anthropogenic pollutants (nitrates, faecal pollutants, pesticides), various compounds of industrial origin (mining by-products, organochlorine solvents, hydrocarbons, phenolic compounds, etc.), and emerging pollutants, such as cosmetics, antibiotics, hormones and nanomaterials.

The above-mentioned challenges result in an increase in the number of conflicts over access to and use of water in the region. These conflicts are frequently related to water management decisions

across different users, and/or land access conflicts, or revolve around the impacts of activities concerning mineral ores and the extraction of building materials, fossil fuels, climate justice or energy projects. It is estimated that the number of conflicts related to groundwater pollution and depletion that started between 2000 and 2019 is more than four times higher than those started between 1980 and 1999 (ICTA-UAB, n.d.).

3. Opportunities

In Latin America and the Caribbean, monitoring, management, and governance of groundwater offer an opportunity to overcome challenges. Monitoring networks vary in modality, some countries have national monitoring programmes while others have local networks, requiring enhancement of network coverage. Besides enhanced coverage, frequency and continuity of monitoring tools and systems, the sustainable management of groundwater resources also requires technical knowledge, institutional changes, legal and economic instruments, and social participation. This should be accompanied with groundwater usage concessions and rights to contribute to the rational allocation. Through the Internationally Shared Aquifer Resources Management (ISARM) Americas programme (UNESCO, 2007; UNESCO/OAS, 2010), 52 transboundary aquifer systems with different degrees of knowledge have been identified in the region. One of these aquifers is the Guarani Aquifer System (GAS) shared by four countries in Latin America: Argentina, Brazil, Paraguay and Uruguay. One of the main features of the GAS is its governance arrangement, known as The Guarani Aquifer Agreement (GAA) that sets out a transboundary aquifer governance framework.

4. Priorities

- Sovereign states with both national and transboundary aquifers will require frameworks that help ensure the sustainable use of groundwater resources.
- The region needs to move towards political processes that harmonize decision-making, monitoring and groundwater management both nationally and internationally.
- There is an urgent need for improved management and governance to ensure their sustainable usage.
- Fieldwork and monitoring are expected to close existing knowledge gaps and provide a stronger basis for informed and coordinated decision-making.
- Ensuring access and affordability to safely managed drinking water and sanitation.

IV. Economic and Social Commission for Asia and the Pacific (ESCAP)

Asia and the Pacific

1. Background

The Asia-Pacific region is the largest groundwater abstractor in the world, containing seven out of the ten largest groundwater-extracting countries: Bangladesh, China, India, Indonesia, Iran, Pakistan and Türkiye. These countries alone account for roughly 60% of the world's total groundwater withdrawal. However, the region is home to only 36% of the world's water resources, making its per capita water availability the lowest in the world (ESCAP, 2021c). Groundwater serves as an important source of freshwater supply and has played a key role in the region's socio-economic development.

Nevertheless, the unsustainable abstraction of groundwater resources, coupled with the impacts of climate change and an increasing water demand for agricultural production, have led to aquifer depletion and increased water scarcity in several areas. Additionally, groundwater quality is under threat due to a variety of anthropogenic and geogenic drivers that further contribute to water stress in the region.

2. Challenges

Asia and the Pacific, as a region, is far from being on track to meet the SDG 6 Targets as set out in the 2030 Agenda for Sustainable Development, and sustainable water resources are increasingly under threat due to overuse and pollution, an increasing population, growing water demands, a changing climate, rapid urbanization, inadequate sanitation services and lack of transboundary cooperation.

Therefore, the region is facing several challenges as listed below:

- Groundwater usage is unsustainable in different areas across Central Asia, China, South Asia and certain urban centres in Southeast Asia (Jia et al., 2019; Kataoka and Shivakoti, 2013; Lee et al., 2018b; Mukherjee, 2018).
- Severe depletion threatens food production, livelihoods and industrial water supplies, and causes land subsidence, seawater intrusion and ecological damage.
- Despite this growing threat, most countries in the Asia-Pacific region do not have legal and institutional instruments to regulate the use of groundwater resources and only limited bilateral agreements exist for transboundary aquifers (Lee et al., 2018).
- Only 21% of countries in the region allocate quantities of groundwater extractions or monitor them (OECD, 2021).
- Climate change also impacts precipitation variability in the region, further exacerbating pressure on groundwater resources, particularly in areas with semi-arid to arid climates and on Pacific SIDS, where groundwater forms the only reliable source of freshwater but is threatened by rising sea levels (Ashfaq et al., 2009; Asoka et al., 2017; Bouchet et al., 2019; Dixon-Jain et al., 2014).
- Sea level rise combined with over extraction of groundwater is leading to salinization of coastal aquifers and land subsidence.
- Groundwater contamination from both anthropogenic and geogenic processes is an additional problem of equal concern.
- Many countries in Asia and the Pacific have not established unified water quality standards.

3. Opportunities

Some interventions have already been initiated in different Asia and the Pacific countries. These include:

- Groundwater recharge in Rajasthan (India). A programme was developed to help rural communities become self-reliant in meeting water needs, focusing on Managed Aquifer Recharge (MAR).
- Groundwater depletion interventions in the North China Plain. Actions include harvesting rainwater, diverting river water from the south, promoting water-saving irrigation technologies, subsidizing drought-resistant crops and 'Grain for Green' projects. As a result of these and other measures, the rate of groundwater decline appears to have been reduced in Beijing and part of Hebei province (Shao et al., 2017; Xu et al., 2018; Zhao et al., 2020).

- Kiribati's adaptation programme. From 2011 to 2018, the Government of Kiribati made several efforts to build the country's resilience to climate change at the national, island and community levels, with support and contributions from development partners.
- Groundwater management and ecosystem restoration in Timor-Leste has demonstrated success leading to (re)established reservoirs in more than 70 locations through peer-to-peer learning. The practice is under consideration as a potential UNESCO Ecohydrology demonstration site.

4. Priorities

It is critical that continued development and utilization of groundwater must be done in a sustainable manner, in order to reduce the pressure on these resources. Therefore, the following actions are needed:

- Improve groundwater governance, with popular support and enforcement capacity is highly needed.
- Share a common vision for transboundary and available forms of regional cooperation in Asia and the Pacific, including transboundary water resources management and adaptation to climate change and adequate disaster risk prevention and emergency response.
- Reinforce the commitment of governments to build, support and maintain institutional capacity related to groundwater, in recognition of the limited number of groundwater professionals among the staff of institutions and local and national government, as well as the limited mandates, financing and support of groundwater departments of agencies.
- Build capacity across multiple themes and in the technical, legal and diplomacy fields is needed to support better transboundary aquifer/groundwater cooperation.
- Focus efforts, building on existing IWRM efforts, on ensuring the protection and restoration of water-related ecosystems including aquifers, as ecosystems are critical to the health of water resources.
- Focus national efforts on improving healthy water-related ecosystems including natural and constructed wetlands, to provide pollution control (from wastewater, runoff, and plastics) and support resilience through flood and drought protection to support agricultural productivity and increase the reliability of both the quality and quantity of freshwater resources for multiple uses.
- Develop multi-stakeholder partnerships at all scales, as they are crucial for building political support, encouraging investment in water and sanitation, increasing water use efficiency, and building resilience through IWRM and ecosystem-based adaptation, and overall accelerate SDG 6 outcomes.
- Fully involve experts on the economic and political dimensions of water, not solely technical water experts.

V. Economic and Social Commission for Western Asia (ESCWA)

Arab region

1. Background

In the Arab region, groundwater is a strategic resource, where it constitutes the primary source of water in more than half of the Arab States, yet it has not been managed as such. In general,

groundwater resources continue to be depleted, particularly by the agricultural sector and high population growth in major cities, with most countries in the region extracting groundwater at unsustainable rates exceeding the natural recharge rates.

2. Challenges

Population growth, socio-economic development and climate change are increasing groundwater stress and threatening the water security in the region. The over-extraction of groundwater in many parts of the region has led to groundwater table declines, especially in highly populated and agricultural areas. This is especially alarming as groundwater is the primary source of water for vulnerable groups that are not formally connected or have access to public sources of water. Depletion of groundwater in aquifers and specifically in aquifers with non-renewable groundwater resources has been estimated at 317% of the renewable volume in the Member States of the Gulf Cooperation Council (Al-Zubari et al., 2017). Furthermore, groundwater resources are threatened by anthropogenic, agricultural, and industrial pollution. This combined with the projected negative climate change impacts on water resources in the region will make achieving water security more challenging for the region.

3. Opportunities

Some Arab countries are seeking new ways to managing this vital resource as follows:

- In Morocco, aquifer contracts have been introduced as a new participatory groundwater management measure to enhance sustainability based on local needs.
- Traditional knowledge in terms of local communal management also continues to be applied, such as with aflaj systems, which are ancient tunnels used to convey water by gravity for irrigation – mostly from groundwater sources.
- Many Arab countries are also increasingly pursuing Managed Aquifer Recharge (MAR) to offset groundwater depletion and improve groundwater quality.
- Leveraging innovative technologies such as remote sensing being used in some countries to monitor water use.
- The region contains four different types of groundwater cooperation modalities, including a Joint Authority for the Nubian Sandstone Aquifer, a cooperation framework for the Senegalo-Mauritanian Aquifer, a signed agreement for the Saq-Ram Aquifer and a consultation mechanism on the North-Western Sahara Aquifer System. These cooperation arrangements are promising as they encourage more transboundary agreements.

4. Priorities

In preparation for the United Nations conference for the global midterm comprehensive review of the Water Action Decade 2018-2028 (New York, 22-24 March 2023), ESCWA, in collaboration with the League of Arab States, organized an Arab Regional Preparatory Meeting from 18 to 19 May 2022 in Beirut. Representatives of Arab Member countries, in addition to senior representatives from relevant regional and national organizations, institutions, academia, private sector and civil society organizations engaged in water-related issues affecting Arab countries were invited to participate. During this meeting a side event on groundwater was held as preparatory dialogue for the Groundwater summit. A panel discussion including experts from the region highlighted the following key messages and priorities:

- Improving knowledge and information on groundwater systems. Aquifers' characterization is necessary to better manage the groundwater resources in a sustainable manner.
- Groundwater governance, especially for non-renewable groundwater resources needs to be strengthened.
- Transboundary aquifers cover more than half of the surface area of the Arab region, and all Arab states share at least one transboundary aquifer except for Comoros. Consequently, transboundary aquifer cooperation is an essential component for the sustainable management of groundwater and water security in the Arab region.
- Managed Aquifer Recharge (MAR) is a solution to water scarcity and climate change. More countries need to improve their capacity and conduct more studies on MAR to include it in their action plans.
- Groundwater is at the heart of climate change adaptation in the region. More studies are needed on the impact of climate change on groundwater to inform policymakers about the needed actions.
- Solar powered groundwater pumping is a double-edged sword. Although solar power is a green energy solution, monitoring its use for groundwater pumping is essential to limit over-abstraction.

Conclusion

It is evident that in all regions dependence on groundwater is significant and the challenges faced to manage this vital water resource are closely related. It is high time to raise awareness on the importance of groundwater and to find solutions to sustainably manage and protect it from different natural and anthropogenic threats.

The common challenges that have been given high priority relate to:

- Groundwater management and governance,
- Data accessibility and sharing,
- Groundwater monitoring,
- Transboundary cooperation and multi-stakeholder partnerships

Other priorities that were more region specific include:

- A pressing need to find ways to unlock the potential of groundwater, which involves investments in infrastructure, institutions, trained professionals, and knowledge of the resource
- Integrated policies for surface water and groundwater and efforts to ensure coherence
- Ensure political will to harmonize decision-making, monitoring and improved groundwater management
- Protection and restoration of water-related ecosystems including aquifers by recognizing the multiple benefits of these ecosystems
- Improving MAR capacity and conduct more studies on it

Although different environmental and hydrogeological settings characterize each region, sharing experiences across regions enables acceleration of progress on improving sustainable management of groundwater resources under a diversity of situations.