



Groundwater in the Arab region: making the invisible visible

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ABSTRACT

The Arab region is one of the most water scarce regions in the world with 19 states below the water scarcity threshold including 13 states below the absolute water scarcity. Groundwater is heavily relied upon and it is the primary source of freshwater in more than 11 Arab States, yet the invisible and complex character of groundwater being underground and out of sight has not given it the due attention it deserves. Hence, this report explores the importance of groundwater and the challenges it is facing, with the aim of bolstering its status to a strategic resource for the Arab region.

Amid the water scarcity situation, limited renewable groundwater resources continue to be exploited at an unsustainable rate, exceeding the natural recharge rates. Excessive use of groundwater, especially by the agricultural sector combined with low efficiency, has led to the decline in groundwater storage in more than two thirds of the Arab region, where the area of decline has doubled in 2018–2019 compared to 2002. In some countries over 88% of all irrigation water comes from groundwater compared to a global average of just over 37%. Moreover, it is projected that by 2050, available groundwater per capita will have decreased by more than half since the beginning of the century and 17 Arab States, accounting for 79% of the total population, will be below the absolute water scarcity threshold.

In addition to their excessive use, groundwater resources are also threatened by anthropogenic pollution sources, from agricultural and industrial practices and from sea water intrusion in coastal cities. The deterioration in the quality of groundwater resources, both due to overexploitation and pollution is aggravating the problem of water scarcity. For example, in Beirut, seawater intrusion has shifted inland between 500 and 1,200 m from 1970 reference point. In Gaza, only 25% of wastewater is treated due the lack of proper wastewater collection and treatment infrastructure, which is further complicated by the occupation that has restricted access to natural resources.

This is alarming knowing that groundwater is central to achieving the Sustainable Development Goals (SDGs) and targets adopted in the 2030 Agenda for Sustainable Development in the region. It is directly linked to SDG6 and central to achieving many other SDGs such as SDG2 for ending hunger. It is also an important component of climate change adaptation, having a high buffer capacity against drought. Accordingly, the projected impacts of climate change on water resources in the region, will further increase dependency on groundwater at a time when groundwater recharge is also projected to decrease, necessitating conjunctive management of surface water and groundwater. The impacts of climate change on groundwater at the aquifer level is showcased by ESCWA on the Beni-Amir aquifer, Morocco and the Eocene aquifer, Palestine. Results from the study on Beni-Amir aquifer indicate that the water table is expected to decrease 10 to 25 m (RCP4.5 and RCP8.5, respectively) by end of century, resulting in partial depletion of resources in the top three layers of the aquifer system, particularly in the northern Beni-Amir area. In the case of Palestine, the results on the Eocene aquifer showed that in the 2041–2060 horizon, the average precipitation is expected to decrease in all scenarios between 3% and 12%, whereas the recharge in 5 out of 6 precipitation scenarios showed a reduction by 12%–16%. Consequently, with no decrease in the aquifer pumping, the water levels in all scenarios will drop.

The declining availability of groundwater resources due to increased consumption, development demands, inefficient use and climate change should prompt Arab States to explore innovative and integrated governance frameworks to improve groundwater resources management and

ensure equitable access for current and future generations to this strategic resource. Groundwater governance has been historically weak in the Arab region, characterized by fragmented legislations and policies, limited funding, lack of coordination and lack of data and knowledge. More recent evaluation of the management of groundwater resources through the SDG indicator 6.5.1 reporting mechanisms on the degree of implementation of IWRM has unfortunately reinforced some of the main challenges listed above in the Arab region mainly in terms of lack of implementation of management tools and proper financing. In response to the lack or fragmentation of groundwater management policies, ESCWA developed regional groundwater abstraction management guidelines offering a unified approach to deal with uncontrolled groundwater exploitation and use.

Groundwater governance is further complicated by transboundary aquifers. In fact, all countries, except for Comoros, share at least one aquifer with their neighboring countries. These transboundary aquifers cover almost 58% of the Arab region's total area. Some of these aquifers are directly connected to surface-water hydrological systems and should also be conjunctively managed. Other transboundary aquifers contain fossil groundwater reserves requiring specialized legal, policy and management frameworks that consider their non-renewable character. The status of regional transboundary water cooperation is captured in a recent regional report prepared by ESCWA on the progress on SDG indicator 6.5.2 in the Arab region for the year 2021. The report revealed the challenges faced by the Arab states that hinder the establishment of well-developed cooperation frameworks which are mainly linked to lack of knowledge and data exchange and financial constraints. However, there are encouraging signs where cooperation on transboundary aquifers has progressed, 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 Sahar Aquifer System. These cooperation agreements should be maintained and further developed by holding regular meetings, coordinating objectives and management plans, and regularly exchanging data and information. Regional knowledge exchange around these agreements should be enforced.

Advances in technologies provide an opportunity to fill the data and information gap that hinders the management of groundwater. Integrated remote sensing data offer a solution to assess the groundwater status. In addition, Managed Aquifer Recharge (MAR) is one of the most important solutions to consider for securing water supply and for improving groundwater quality where it is deteriorating. MAR is already used in more than 44 sites across the Arab region. Technologies can assist in selection of where MAR can be a potential solution for the region and for improving the water security.

Furthermore, in response to the need for availing more data and information on groundwater and improving access to such data as established through the reporting on SDG indicators 6.5.1 and 6.5.2, ESCWA will be initiating an Arab Groundwater Digital Knowledge Platform. This platform aims to increase access to regional knowledge and information on groundwater resources through a dedicated digital interactive platform.

Finally, the relation of groundwater to water scarcity, human activity, transboundary water cooperation, climate change, and water governance is highlighted in the following key findings.

1. Groundwater and water scarcity

- Action by countries has not been able to address the groundwater challenges yet, which underscores the need for immediate action on several fronts including socio-economic, environmental, and governmental.
- The use of integrated tools such as remote sensing data and in-situ data offers a great opportunity for adequate groundwater monitoring leading to improved management.
- Managed Aquifer Recharge is one the most promising approaches in the Arab region to alleviate water scarcity impacts and improve water security.

2. Groundwater and human activity

- Management of groundwater must extend beyond water only into a coherent cross-sectoral governance approach.
- Food security is largely dependent on groundwater in many Arab countries. This necessitates improved efficiency and productivity through coherent management of water and agriculture sectors benefiting from enhanced use of technologies.

3. Transboundary groundwater

- There are encouraging signs where cooperation arrangements in the region on groundwater have progressed.
- Transfer of experience and knowledge from regional groundwater cooperation arrangements are essential to accelerate progress at the full regional scale.
- Leveraging innovative approaches and technologies can help fill the information and knowledge gap.

4. Climate change and groundwater

- While it is well recognized that protecting and preserving groundwater contributes to increasing society resilience to climate change, there is still insufficient action recognizing and acknowledging this role for groundwater.
- In the face of projected climate variability in terms of availability and reliability of surface water and precipitation, groundwater can be used as a reliable buffer resource to offset climatic variability however its management has to be integrated across sectors such as water and agriculture with conjunctive management of surface water and groundwater.

5. Groundwater governance

- Good groundwater management requires good information based on sufficient and reliable data with the needed investment to produce useful knowledge to guide decision makers thus enabling informed decisions to be made and stakeholders behavior to adapt.
- ESCWA proposed regional groundwater abstraction management guidelines offer a unified approach to tackling overexploitation.

The importance of groundwater for the Arab region's water security under a changing climate demands improved governance through innovative management approaches, enhanced use of technologies and dedicated funding for better understanding of the resource and heightened regional cooperation.

The above-mentioned findings are discussed in more details in the forthcoming ESCWA Water Development Report 9.