

7-8 December 2022

UN Paris HQ

summit co-coordinated by



Groundwater Financing

Leveraging groundwater financing

Context

The Sustainable Development Goal 6 of the Agenda 2030 is to ensure access to water and sanitation for all. The Indicator SDG 6.a.1 monitors the progress on international water cooperation and reports on the official development assistance (ODA). In 2020, USD 8.7 billion of ODA is reported for water and sanitation globally. However, achieving only SDG indicator 6.1.1 “Universal and equitable access to safe and affordable drinking water for all by 2030” requires an additional investment of USD 1.7 trillion and more broadly projections for water infrastructures range from US\$6.7 trillion by 2030 to US\$22.6 trillion by 2050 (not covering water resources for irrigation or energy; OECD, 2018¹). Therefore, the current financial model is highly insufficient for the achievement of the 2030 Agenda (UN-WWDR, 2022²).

The SDG6 Global acceleration framework identified 5 accelerators, including “Financing: optimized financing is essential to get resources behind country plans”. Despite groundwater systems are the predominant reservoir and strategic reserve of freshwater on Earth (OECD, 2017³), groundwater financing is not monitored by specific metrics.

Groundwater makes up approximately 99 percent of global liquid freshwater reserves (UN-WWDR 2022). Yet, it needs to be taken into account that only a part of it is exploitable within sustainability threshold and that some aquifers are non-renewable. Furthermore, groundwater can serve as a buffer to the impact of climate change since groundwater shows

¹ OECD. 2018. *Financing water: Investing in sustainable growth*. OECD environment policy paper 11.

² UN-WWDR. 2022. *The United Nations World Water Development Report 2022: Groundwater: Making the invisible visible*. UNESCO, Paris. <https://www.unesco.org/reports/wwdr/2022/fr>

³ OECD. 2017. *Groundwater allocation – Managing growing pressures on quantity and quality*. OECD Studies on Water, Organization for Economic Co-operation and Development, Paris.



relatively delayed responses to climate patterns with increasing aquifer's depth (FAO, 2022⁴). Thus demand for groundwater is affected by increased precipitation variability due to climate change and increased reliance on groundwater as a reliable resource. Meeting such demand for this invisible resource will result in rising capital, as well as operation and maintenance costs. Due care should be given to the sustainability threshold of groundwater resources in the investments plans. The acceleration of finance for water-related investments to close the persistent gap between investment needs and financing capacities (OECD, FAO and IIASA, 2020⁵) is thus even more valid for the groundwater infrastructures.

Groundwater uses

Groundwater is the drinking water source for around half of the global population (OECD, 2017). In addition, globally groundwater accounts for over 30 percent of freshwater withdrawals for irrigated agriculture and continues to grow at around 2.2 percent per year reaching 820 km³ in 2018. Groundwater-sources irrigation on 108 million ha in 2018, i.e. 33 percent of the equipped area (FAO, 2022). Regions heavily reliant on groundwater for irrigation include North America and South Asia, where 59 percent and 57 percent of the areas equipped for irrigation use groundwater, respectively. In Sub-Saharan Africa, where the opportunities offered by the vast shallow aquifers remain largely underexploited, only 5 percent of the area equipped for irrigation uses groundwater (UN-WWDR, 2022). Approximately 70 percent of groundwater withdrawals are used to irrigate food, fiber and industrial crops, and for livestock. More is used in arid and semi-arid regions.

In the Near East and North Africa (NENA), another region which heavily relies on groundwater, improving the way in which water is stored, allocated, distributed and used could lead to an estimated USD 7–10 billion in welfare gains per year, amounting to about 0.5 percent of GDP for the NENA region (FAO, 2019⁶).

Groundwater withdrawals have risen sharply; nearly tenfold in the past 50 years. At the same time, the resource is becoming increasingly degraded due to pollution and saline intrusion. Unsustainable groundwater use creates negative environmental externalities, including land subsidence, saline intrusion and the deterioration of groundwater-dependent ecosystems. Groundwater depletion including the changes in hydrodynamics also increases the cost and energy of use, as pumping is required from ever-increasing depths, which disadvantage small scale users. This depletion can also result in water shortage directly affecting users, with an impact on economic activities (OECD, 2017). Renewable groundwater resources are already stressed in some regions facing competition within the water-food-energy nexus.

⁴ **FAO. 2022.** *The state of the world's land and water resources for food and agriculture: Systems at breaking point (SOLAW 2021). Main report.* Food and Agriculture Organization of the United Nations, Rome.

⁵ **OECD, FAO and IIASA. 2020.** *Towards a G20 Action Plan on water.* Background note to the G20 Saudi Presidency.

⁶ **FAO. 2019.** *Why invest in agricultural water? Case for action and investment.* Food and Agriculture Organization of the United Nations, Cairo

Groundwater investments

Advances in low-cost drilling (OECD 2017) and pumping technology have lowered the cost of groundwater abstraction and contributed to greater exploitation of the resource. In most of the regions, public spending is still the key source of agricultural water finance. However, in contrast with surface water, where capital costs tend to be covered by the public sector, groundwater development infrastructure is usually financed by the end user, be it an industry, a household, a farmer, or a community (UN-WWDR, 2022).

Private investors, including farmers, play a significant yet often unaccounted for, role in agricultural water investments, in particular in irrigation expansion through groundwater wells and in their operation and maintenance costs. This is despite the fact that many governments have taken action to redefine groundwater ownership and use rights as within the public domain to respond to the rapid growth of unregulated groundwater use (OECD, 2017).

In developing countries, bilateral and multilateral donors are becoming important sources of investment and new forms of funding are gaining importance, such as the Green Climate Funds (GCF), Clean Development Mechanism, green bonds and blended finance. Almost 70 percent of national climate action plans now directly prioritize action on water security including groundwater (GCF, 2022⁷). And agricultural water received about 1 percent of the development assistance in the NENA region, that is mostly groundwater related (FAO, 2019).

The financial information on project related to groundwater are scarce and mostly combined in the water supply or irrigation infrastructure investment.

African Development Bank (AfDB)

In Africa, groundwater development and management is financed as part of water infrastructure financing by multilateral development banks. However, inadequate finance remains a constraint to groundwater governance in most countries, including those where groundwater represents a significant share of the supply for domestic, irrigation, or industry/mining sectors. The paucity of groundwater development mimics a broader gap in water development with potential implications on achieving SDG 6 targets.

To assess the level of integration of groundwater into investment programming, 95 Project Appraisal Reports (PARs) of the AfDB active portfolio have been assessed. PARs outline project objectives and components. They are reliable guides for the degree to which groundwater is integrated into projects in the planning phases. The active portfolio (September 2022) is estimated at USD 5.13 billion, 14 percent (USD 0.82 billion) comprising groundwater based water sector programs..

Financing needs in the groundwater domain include: (i) rehabilitation/construction of new, groundwater infrastructure for multiple uses (ii) infrastructure to support aquifer sustainability (iii) generating data and information needed for decision making on

⁷ GCF. 2022. Sectoral guide: water security. Green Climate Funds, Incheon.

groundwater management (iv) monitoring of ground water use, depletion and recharge using digital systems (v) groundwater quality management (vi) capacity strengthening and (vii) watershed management for aquifer recharge.

World Bank portfolio on groundwater

From 420 groundwater-related records available in the World Bank repository of project, 262 projects have financial data with a total funding of USD 2 575M in around 60 years of recording. The World Bank recently started “Sustainable Groundwater Management in SADC Member States Project Phase 2” (USD 9 million) and the “Horn of Africa - Groundwater for Resilience Project” (USD 385 million). The largest on-going (2018-2025) groundwater project is the “Atal Bhujal Yojana (Abhy) - National Groundwater Management Improvement” project in India for USD 450 million.

The Global Environment Facility (GEF) International Waters

The GEF international waters focal area supports cooperation between countries and sectors in shared waterbodies – rivers, lakes, aquifers, coastal and marine areas. Support by the GEF is country driven and provided to countries via 18 GEF agencies.

Globally, more than 300 watersheds and an even greater number of aquifers cross the political boundaries of two or more countries. These watersheds, which cover about half of the Earth’s land surface, are home to about 40 percent of the global population. Cooperation on water, therefore, is a must in most international basins to support the need for water, food, energy, and ecosystems security and increase resilience for each nation.

GEF grants support to countries to embark on a dialogue to cooperate, institutional arrangements and investments to support sound management of shared aquifers therefore fills an important niche in international financing. Since its inception in 1991, the International Waters Focal Area of the GEF has provided such support to 19 transboundary aquifers. GEF grants provided to countries, via regional projects mainly focusing on transboundary aquifers, so far totals USD 174 million in grant finance and USD 832 million co-finance. Interest from countries to engage in transboundary aquifers appears to show an upward trend in the wake of increasing water scarcity and extreme events and the recognition of groundwater in increasing resilience. GEF grants in support of transboundary aquifer management prior to 2010 totals about USD 50 million and later up to 2022 around USD 124 million. In addition, the GEF provides support to protection on groundwater from pollution and to its sustainable management in the context of biodiversity and sustainable land management focal areas and via adaptation finance on national level.

Asian Development Bank (ADB)

The ADB direct groundwater investments for the period 2015-2022 amounts to over USD 4.3 million in Pakistan only shared between groundwater monitoring, capacity development and infrastructures. The overall investments in water management is much larger. The larger

project is located in Balochistan and finances the pilot testing of high-value agriculture through the installation of cost-effective solar-powered drop irrigation systems from conjunctive use.

GCF active portfolio on groundwater

Africa receives the largest share of the GCF water portfolio in the pipeline, while the Asia Pacific region already hosts most of the approved GCF project as of October 2022. Current GCF water portfolio reaches over USD 1 300 million, of which over 200 million provided by GCF and almost 500 million of co-funding. The share corresponding to groundwater is not available.

Funding challenges and priority areas

Groundwater resources data

Groundwater is an invisible resource and groundwater data is very often indirect and requires scientific interpretation subject to a high level of uncertainty. Sound investment planning for financing groundwater water-related investments is impeded by a lack of largely shared and well understood scientific data and patchy information (OECD, FAO and IIASA, 2020). This is especially true for groundwater quality data and information. Feedback from projects insists on the need for consensus on the quality of the interpretation of the data (groundwater data is always indirect) and its accuracy.

Groundwater knowledge is the most difficult to finance. Both training of groundwater specialists and exploration of the groundwater resource need long-term secure financing, hardly compatible with most of the financing need which is water supply. Most of the exploration and related financing is then project based, resulting in lost of capitalization.

Monitoring and sharing of the state of groundwater resources, on quality and quantity, and their use is scarce and incomplete (OECD, 2017) but should be funded by government together with related operating and maintenance costs (UN-WWDR, 2022). The financing of the monitoring, should also cover the data sharing aspect within the administration and across sectors, but also with scientific community and more largely with the water users for better community management. In shared aquifers, the lack of information on the resource and its use on national level is another basic hurdle to enter into negotiations and agreements on transboundary aquifers.

The 4th industrial revolution relates to the recent digital changes underway at a global scale, consisting of remote sensing and drones, artificial intelligence, machine learning, block chain technologies, and others. Taken together, these technologies are proving useful as cost-effective options to improve mapping and data gathering for monitoring of the sector and thus closing data gaps, improving groundwater governance for better sustainability and inform future investment decisions. Although, the use of remote sensing technologies for groundwater remain limited due to the underground nature of groundwater, the innovation in technology is essential for groundwater monitoring, data processing and sharing.

Groundwater financing data

Data on current and required investments in groundwater development, governance and management are insufficient (UN-WWDR, 2022). Specific indicator to monitor investment on groundwater are missing in most of the funding mechanisms on water and sanitation.

The OECD Global Observatory on Financing Water Supply, Sanitation and Water Security was one of the 2021-2022 OECD programme of work with the aim to raise the level of ambition and broaden engagement. It is expected to: i) document and share good practice on financing water-related investments, ii) encourage peer-to-peer learning about the policies, institutions arrangement and financing approaches required to scale up investment and iii) enhance thought leadership and horizon scanning for new development.

Over-exploitation and degradation of groundwater and dependent ecosystems

The sustainability of groundwater-irrigated food production (OECD, 2015⁸) in particular is often dependent on energy subsidies because cost recovery is less common for groundwater (OECD, 2022⁹).

Paradoxically, some water related funding such as energy subsidies may lead to overexploitation of groundwater. Policy coherence is therefore a key area for countries to address.

When pollution of surface and groundwater remains unregulated and not subject to charges there is little incentive to invest in pollution reduction via input substitutions, pre-treatment, spill prevention or other measures.

In some sectors, like mining industry, water is heavily used in processing ore and can generate water pollution from discharged mine effluent. The water productivity in terms of economic gain, generated per cubic meter of fresh water used can be relatively high in mining sector. However there is a growing awareness of the environmental legacy of mining activities. This may lead to increasing the vulnerability and affecting the sustainability of groundwater systems and related ecosystems.

Lack of water governance and management strategies

Critically, poor practices associated with the overexploitation of surface water resources, groundwater depletion and inadequate governance practices of the agricultural water sector have negative effect on other water-connected SDGs via ecosystem contamination, increased competition, and related factors including access to finance.

⁸ **OECD. 2015.** *Drying wells, rising stakes: Towards sustainable agricultural groundwater use.* OECD Studies on Water, Organization for Economic Co-operation and Development, Paris

⁹ **OECD. 2022.** *Financing a water secure future.* OECD Studies on Water, Organization for Economic Co-operation and Development, Paris.

Several of the largest groundwater systems for example in the NENA region are transboundary with limited governance mechanism and agreements. These include the Nubian Sandstone (Egypt, Libya, and Sudan), North Western Sahara (Algeria, Libya and Tunisia), and Disi Aquifer (Jordan and Saudi Arabia).

Funding opportunities

Climate finance: Water is climate

Groundwater as a buffer against water shortages: Climate change will increase variability in precipitation making groundwater an even more strategic resource (OECD, 2017) although with corresponding variation in groundwater recharge. This is the ultimate source of water for most of the world (FAO, 2022).

Solar energy groundwater pumping: reduce greenhouse gas emissions but need to be regulated to avoid overexploitation. Also, it is worth to note, the fluctuations in energy prices would impact subsidies for groundwater pumping, particularly in the Gulf countries.

The cost of not investing: Expected economic losses from climate change-induced water scarcity are significant and could cost between 6 and 14 percent of GDP by 2050 in the NENA region (FAO, 2019). The Arab region faces the largest expected GDP losses from climate change-induced water scarcity in the world (FAO, 2019b¹⁰). Water projects are currently only raising a fraction of the climate finance.

Groundwater investments are expected to increasingly focus on climate change mitigation and adaptation (efforts to be made on the quality of the groundwater infrastructures: low quality water wells and boreholes negatively impact the mitigation agenda).

Nature-based solutions: Aquifer recharge through constructed wetland-treated wastewater and tanks collecting rainwater run-off (FAO, 2021¹¹)

Payment for Environmental Services (PES) schemes (e.g. Water Funds) to fund investments in watershed management and sustaining recharge to maintain water supplies for cities and industries.

GCF could de-risk investments and mobilize the private sector, improve water security and community resilient while help reduce the greenhouse gas emissions and support carbon market through:

- promoting treating water as a new Asset Class for wastewater and sanitation services including Managed Aquifer Recharge (MAR), a well-established methodologies and tools stabilizing or reversing declining groundwater levels and qualities for sustainable groundwater management;

¹⁰ **FAO. 2019b.** *Towards a new Generation of policies and investments in agricultural water in the Arab region. Fertile ground for innovation.* Executive summary. Background paper prepared for the High Level Meeting on agricultural water policies and investments, Cairo, 4 April 2019. Food and Agriculture Organization of the United Nations, Cairo.

¹¹ **FAO. 2021.** *Nature-based solutions in agriculture: project design for securing investment.* Food and Agriculture Organization of the United Nations, Rome.

- finance the transition and de-risk private investment in address financial market barriers and ensure affordability and bankability to unlock water reuse and desalination investment;
- Supporting new financial models accompanied with acceptable revenue in line with Paris agreement targets and SDG.

Pollution reduction finance

Accessible, high-quality groundwater is diminishing. Land use change and zoning can alleviate groundwater pollution (FAO, 2022).

Enabling environment for financing groundwater (OECD)

OECD work on the enabling environment suggests it combines several dimensions; some are water specific (appropriate policy and regulatory frameworks); others are broader and related to the policy framework for investment and policy coherence with domains, which affect the supply and demand for groundwater, or exposure and vulnerability to water risks.

Growing awareness of the need for national government to become better enablers of private investment (FAO, 2019) and leverage private investment by funding initial exploratory and management initiative (UN-WWDR, 2022).

Policy framework for a new generation of agricultural water policies and investments: private sector engagement, innovation, policy coherence, inclusiveness and sustainability principles for three strategic directions (value water, accelerate agriculture sector transition and target efficient social protection) (FAO, 2019b).

The UN Food system summit endorsed a global consensus on the need for a more systemic and less sectoral approach and call for production in harmony with Nature (UN, 2021¹²).

Recommendations

1. Groundwater is a common good and needs to be regulated as such.
2. Better monitoring of groundwater financing data: OECD Global Observatory on Financing Water Supply will allow more efficient and sustainable use of the existing groundwater investments to crowd in alternative funding and subsidies
3. Better attract climate finance as groundwater is key in both adaptation and mitigation to climate change, as well as pollution finance.
4. Better align financing criteria to support the restoration and recharge of degraded and depleted groundwater and contribute to sustainable groundwater resources management and governance.

¹² UN. 2021. The United Nations Food System Summit Compendium. United Nations, New York. <https://foodsystems.community/food-systems-summit-compendium/>

5. Explore the full economic, but also the ecologic, social and cultural values of groundwater to make a better case for investments
6. Advocate for international funding mechanism to improve knowledge on qualitative and quantitative state and trend of groundwater resources.
7. Characterise, with a view to review and enhance, the enabling environment for groundwater finance, at national and aquifer level including transboundary systems.