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INVENTORY OF
SHARED WATER RESOURCES IN WESTERN ASIA (ONLINE VERSION)

german cooperation
DEUTSCHE ZUSAMMENARBEIT

BGR Bundesanstalt für Geowissenschaften und Rohstoffe

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United Nations Economic and Social Commission for Western Asia

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OVERVIEW

KEY FINDINGS

Wadi Rum, Jordan, 2009. Source: Maarten Schäfer.

This Inventory of Shared Water Resources in Western Asia is the first systematic effort to catalogue and characterize shared surface and groundwater resources across the Middle East. It provides detailed information on 7 shared river basins including numerous shared tributaries, and it identifies 22 shared aquifer systems in the region. For each of the described shared freshwater bodies, the Inventory addresses key aspects of hydrology, hydrogeology and water resources development and use, and examines the status of international water agreements and cross-border management efforts. As a descriptive reference document on shared waters in the region, the Inventory's main purpose is to provide a sound scientific basis for informing further discussion and analysis at the basin level. The main finding of this work is the identification of all the major shared surface water basins and aquifer systems in Western Asia, as listed in Tables 1 and 2 below.

In addition to identifying the number of shared water basins that are found in Western Asia, the 10 key findings below highlight important general and region-specific observations related to the state and assessment of shared water resources. These key findings synthesize and consolidate some of the main issues regarding the identification, state, use and management of shared water resources. In doing so, they offer ideas for further research into shared water resources and provide insights into how the Inventory can inform complementary research in the other important areas of concern for the region, such as climate change, food security, the water and energy nexus, and efforts to achieve sustainable development.

Table 1. **List of shared surface water basins in Western Asia**

	SHARED RIVER		RIPARIAN COUNTRIES	MAIN SHARED TRIBUTARIES[b]
MESOPOTAMIA	Euphrates-Tigris-Shatt al Arab Basin	Euphrates River	Iraq, Jordan,[a] Saudi Arabia,[a] Syria, Turkey	Sajur River Jallab/Balikh River Khabour River
		Tigris River	Iran, Iraq, Syria, Turkey	Feesh Khabour River Greater Zab River Lesser Zab River Diyala River
		Shatt al Arab River	Iran,[c] Iraq[c]	Karkheh River Karun River[d]
MASHREK	Jordan River		Israel, Jordan, Lebanon, Palestine, Syria	Hasbani River Banias River ---------- Yarmouk River
	Orontes River		Lebanon, Syria, Turkey	Afrin River Karasu River
	Nahr el Kabir		Lebanon, Syria	-
	Qweik River		Syria, Turkey	-

(a) Riparians that contribute surface water only under extreme climatic conditions.
(b) Not all shared tributaries listed are shared by all the displayed countries.
(c) Iran and Iraq are only riparians to the river, however all riparians to the Euphrates and Tigris Rivers are riparians to the Euphrates-Tigris-Shatt al Arab basin. See 'Overview and Methodology: Surface Water' chapter for more information.
(d) The Iranian Karun River does not cross any political boundary, but provides a significant freshwater contribution to the Shatt al Arab and forms an important part of the transboundary river system; it is thus included in the Inventory as part of the shared basin covered in the chapter related to the Shatt al Arab.

The Afrin River, Syria, 2009. Source: Andreas Renck.

Table 2. List of shared aquifer systems in Western Asia

	SHARED AQUIFER SYSTEM	RIPARIAN COUNTRIES
ARABIAN PENINSULA	Saq-Ram Aquifer System (West)	Jordan, Saudi Arabia
	Wajid Aquifer System	Saudi Arabia, Yemen
	Wasia-Biyadh-Aruma Aquifer System (South): Tawila-Mahra/Cretaceous Sands	Saudi Arabia, Yemen
	Wasia-Biyadh-Aruma Aquifer System (North): Sakaka-Rutba	Iraq, Saudi Arabia
	Umm er Radhuma-Dammam Aquifer System (South): Rub' al Khali	Oman, Saudi Arabia, United Arab Emirates, Yemen
	Umm er Radhuma-Dammam Aquifer System (Centre): Gulf	Bahrain, Qatar, Saudi Arabia
	Umm er Radhuma-Dammam Aquifer System (North): Widyan-Salman	Iraq, Kuwait, Saudi Arabia
	Tawil-Quaternary Aquifer System: Wadi Sirhan Basin	Jordan, Saudi Arabia
MASHREK	Ga'ara Aquifer System[a]	Iraq, Jordan, Saudi Arabia, Syria
	Anti-Lebanon[b]	Lebanon, Syria
	Western Aquifer Basin	Egypt, Israel, Palestine
	Central Hammad Basin[a]	Jordan, Syria
	Eastern Aquifer Basin[a]	Israel, Palestine
	Coastal Aquifer Basin	Egypt, Israel, Palestine
	North-Eastern Aquifer Basin[a]	Israel, Palestine
	Basalt Aquifer System (West): Yarmouk Basin	Jordan, Syria
	Basalt Aquifer System (South): Azraq-Dhuleil Basin	Jordan, Syria
	Western Galilee Basin[a]	Israel, Lebanon
MESOPOTAMIA	Taurus-Zagros[b]	Iran, Iraq, Turkey
	Jezira Tertiary Limestone Aquifer System	Syria, Turkey
	Neogene Aquifer System (North-West), Upper and Lower Fars: Jezira Basin	Iraq, Syria
	Neogene Aquifer System (South-East), Dibdibba-Kuwait Group: Dibdibba Delta Basin	Iraq, Kuwait, Saudi Arabia

(a) These aquifer systems are not covered in stand-alone chapters. See 'Table of Contents' and 'Overview and Methodology: Groundwater' chapter for more information.
(b) Aquifers in faulted and folded tectonic areas have been classified as one group. However, in practice they may represent more than one aquifer system.

1. There are more shared water resources in Western Asia than generally assumed.

More than 70% of the study area is part of a shared surface or groundwater basin. A quick look at a map of the region shows that most surface water is shared and originates from outside the region. However, the Inventory also identifies a number of transboundary aquifer systems, most of which are shared between Arab countries. Many of these had not been previously delineated or recognized as shared. The groundwater reserves in these large aquifer systems far exceed the discharged volume of all rivers combined.

2. Water quantity and allocation dominate the discourse on shared water resources in this water-scarce region.

As in other arid and semi-arid regions, water scarcity in Western Asia has led to a supply management approach that seeks to harness all available water resources and that prioritizes quantitative water allocation. Riparian countries are more intent on dividing the region's water resources than on sharing them. Both on the level of discourse and agreements, the focus lies on the quantity of available water, not on the potential benefits derived from its shared use.

3. Water quality is rapidly deteriorating, a fact that is largely neglected.

The problem of deteriorating water quality across the region is eclipsed by concerns over quantity. However, increasing levels of pollution and salinity of both surface and groundwater resources is increasingly affecting the ability to use the scarce water resources available in the region, and is heightening tensions between riparian countries. In addition, while environmental ministries consider the need for minimal environmental flows to maintain ecosystems, this issue is rarely incorporated in national water management planning in the region.

4. The lack of accurate data hampers joint water resources management.

Water remains a sensitive topic in the Arab region and data sharing between riparian countries is limited. As a result, there is no common understanding of the state and development of water availability, use and trends. On a national level, data is often lacking, incomplete or inaccessible, particularly when it comes to water use, which is rarely measured. Regionally, data from different countries can be contradictory, often because there are no unified standards for measuring hydrological changes. The fact that cooperation between riparian countries is limited further impedes the development of a common vision on shared water resources management.

Facts & Figures

More than 70% of the study region forms part of shared basins.

Aquifer with the most riparians: Umm er Radhuma.

Saudi Arabia shares all identified aquifer systems in the Arabian Peninsula.

Country that shares the most rivers: Syria.

River shared by most riparians: Jordan River.

About 40 BCM of surface water originate from outside the study region. 75% of the mean annual flow volume of surface water originates from outside the region.

Five largest transboundary rivers in terms of discharge: Tigris, Euphrates, Greater Zab, Lesser Zab, Diyala, Orontes.

Five longest rivers: Euphrates, Tigris, Diyala, Greater Zab, Khabour.

Basins with the most dams: Euphrates, Jordan, Tigris.

Number of agreements on water in Western Asia: 8.

5. Cooperation over shared water exists, but is never basin-wide.

Long-standing political instability in the region has hampered successful basin-wide cooperation. There is not a single basin-wide agreement on shared water resources in the Middle East. Existing bilateral agreements centre on water allocation, with an emphasis on infrastructure development and use. Water quality is not addressed in these agreements. While there are no river basin associations in place, bilateral cooperation over surface water does take place through technical committees and local projects.

6. There is not a single agreement on shared groundwater resources in the region.

There are no specific agreements on shared groundwater resources, though in a few cases bilateral agreements include groundwater-related provisions. Cooperation over shared groundwater is rare as resources are often not clearly delineated and may therefore not be recognized as shared by riparian countries.

7. The region's groundwater is largely non-renewable and aquifers are rapidly being depleted.

Most aquifer systems in the Arabian Peninsula are non-renewable. Their massive development over the past 30 years has led to aquifer depletion and unprecedented hydrogeological changes, which threaten the sustainability of groundwater use. In addition, the cross-border implications of high abstraction are generally neglected. In some cases, shared aquifer systems are developed so rapidly that they may be exhausted before being recognized as a shared resource.

8. Groundwater plays an important role in surface water basins, a link which is often overlooked.

The link between surface and groundwater is rarely explored. Groundwater forms the base flow of many rivers in this arid region, including the Jordan, Orontes and Nahr el Kabir. Similarly, groundwater over-abstraction has lowered water tables and led to the disappearance of freshwater springs, which has in turn affected surface water flows. Groundwater abstraction and the development of large-scale irrigation schemes also produces return flows, which contribute to the discharge of rivers. The understanding and management of shared basins may change if surface and groundwater are considered together.

9. A new thinking is required to deal with large regional aquifer systems from a shared perspective.

Regional aquifer systems in the Arabian Peninsula are among the most extensive and productive in the world, with some stretching into eight countries. Closer cooperation over these resources will require the delineation of more manageable units where cross-border impacts can occur. This regional Inventory can stimulate this discussion among riparian countries, but cannot replace more detailed hydrogeological studies needed for this process.

10. It is already too late to save some shared waters.

Man-made diversions of upstream surface waters the over-exploitation of some groundwater resources and intensive irrigated agriculture have already led to the disappearance of intermittent streams, the drying up of wadis, and rendered some groundwater resources too polluted or saline to use. This has fuelled tensions along international borders, affected health and livelihoods in rural communities, and increased costs to industry. More cooperative action and constructive dialogue is needed to sustain the shared water resources that remain.