Economic and Social Commission for Western Asia

Overview of Groundwater Status Globally and in the Mashreq, Institutional Governance, Challenges and Opportunities

Disruptive Technologies for Improved Groundwater Management in the Mashreq Region
Beirut, 15-17 June 2021

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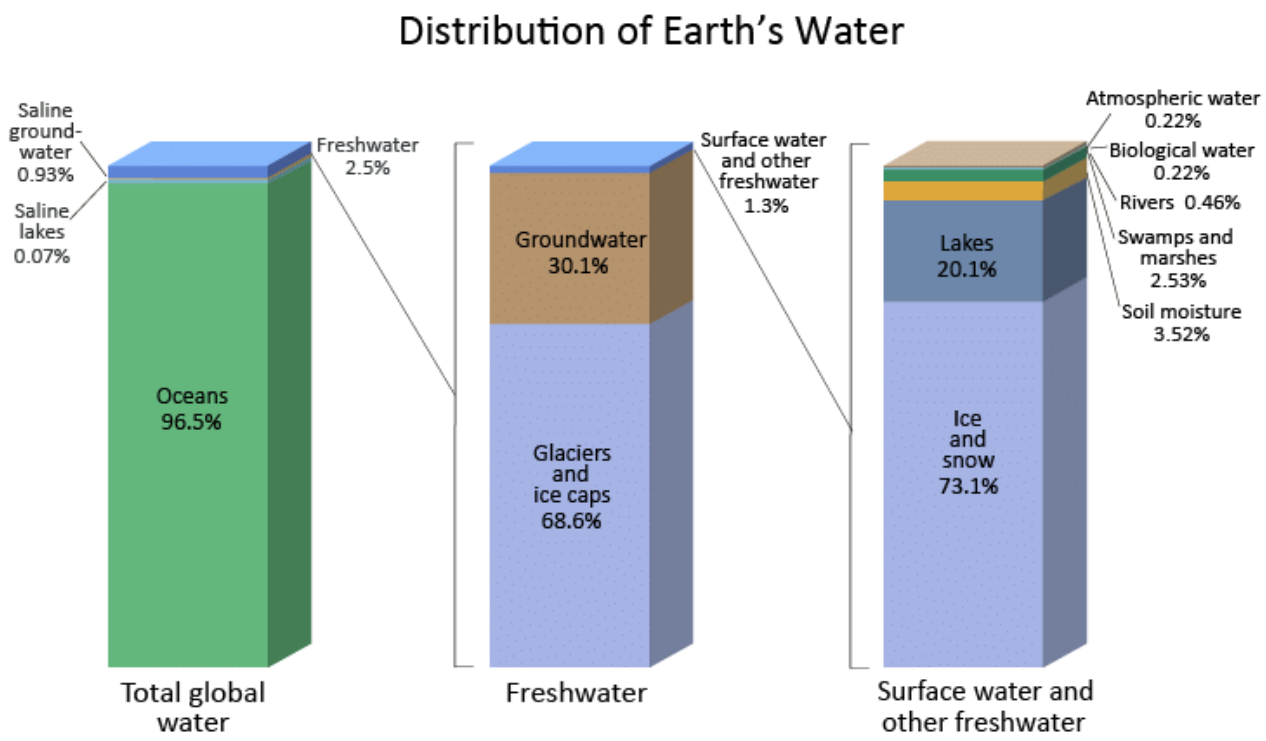
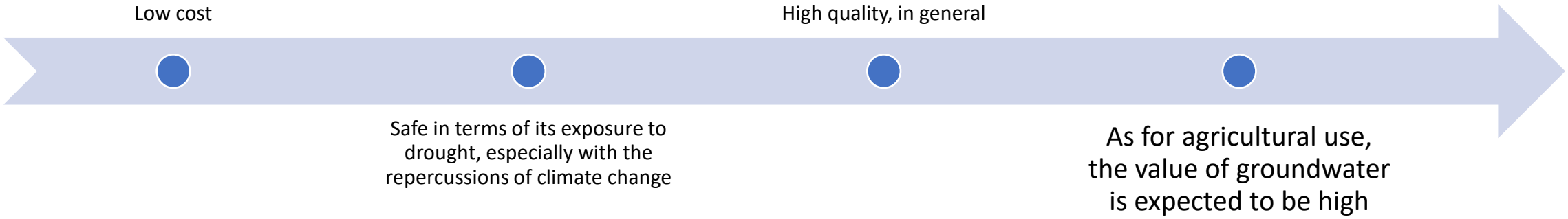
Global Water Resources Overview



- **Groundwater represents an important component of the world's total fresh water**

Importance of Groundwater

- Groundwater is of vital importance to many countries; as **more than 2.5 billion people**, countless farmers and many industrial facilities depend on its supply.
- About **50% of drinking water**, **40% of irrigation water**, and **35% of water for industries** globally are provided by groundwater.
- The accelerated development of groundwater - over the past few decades - has resulted in significant social and economic benefits through the provision of water supplies:



- The future use of groundwater will also be of vital importance to achieving the “Sustainable Development Goals” of the 2030 Development Agenda

Global Challenges
Managing the invisible

Groundwater = Invisible resource

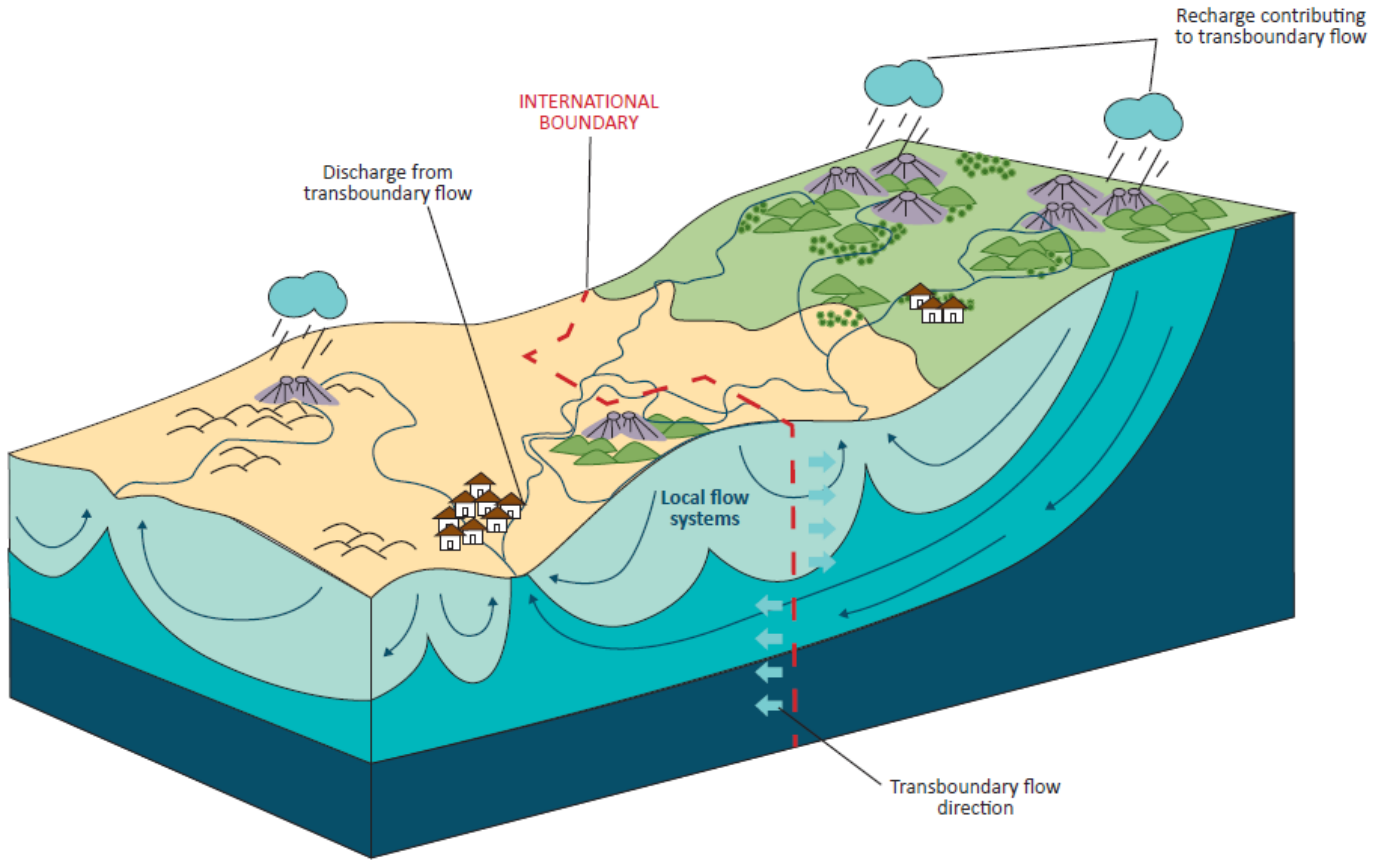
"Out of sight, out of mind"

⟶ Difficult to manage what you don't see

<u>Need for data and information on:</u>

- The availability and quality of the resource
- Its dynamic status
- The different uses

Importance of Data and Information to produce *useful* Knowledge



Source: Redrawn by ESCWA-BGR based on Puri and Arnold, 2002.

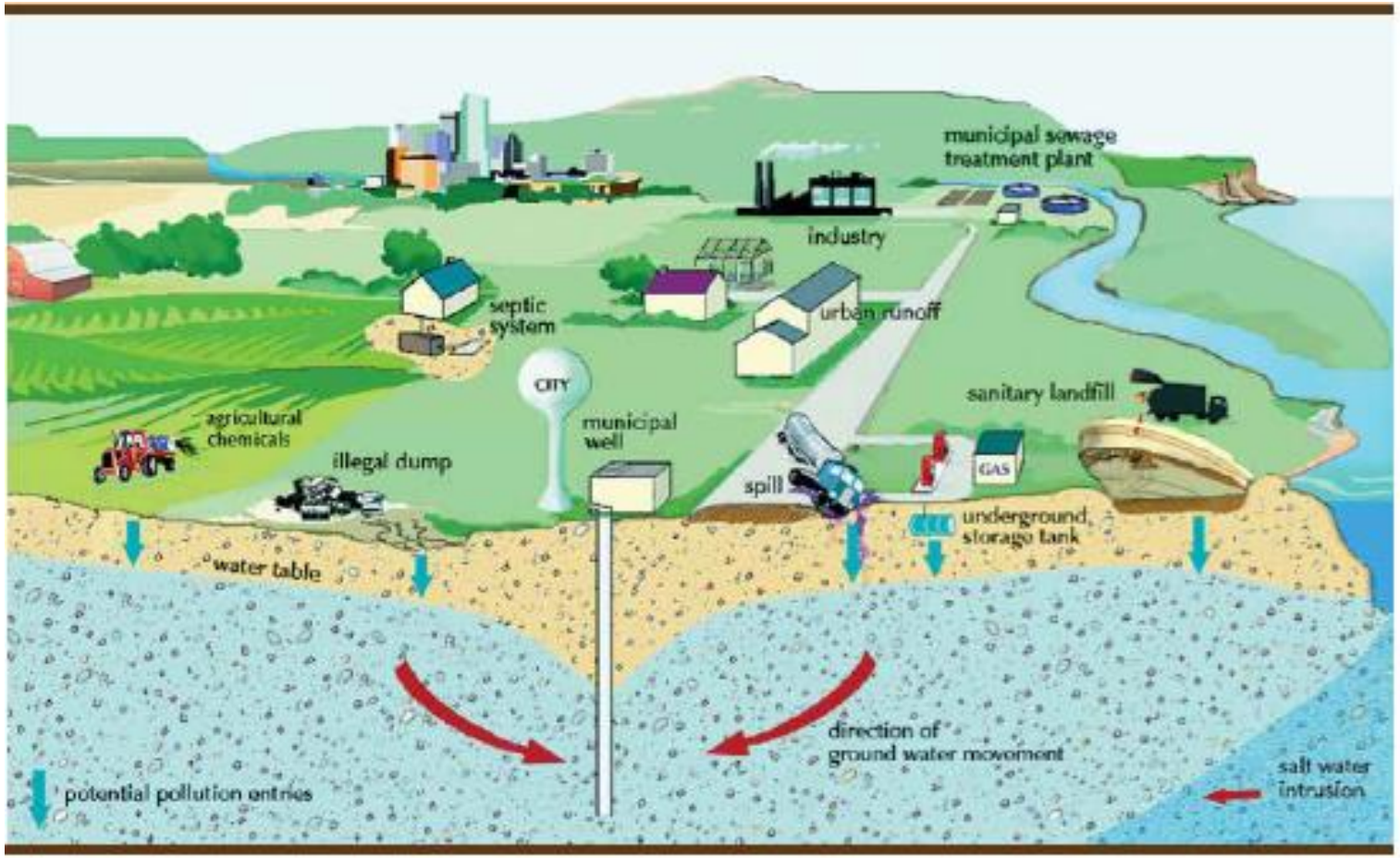
Global Challenges
Groundwater Quality

Impact of human activities

⟶ Need to control land use

⟶ Consideration of the geological formation and conditions

Management of groundwater goes beyond water only



Source: FAO, 2016

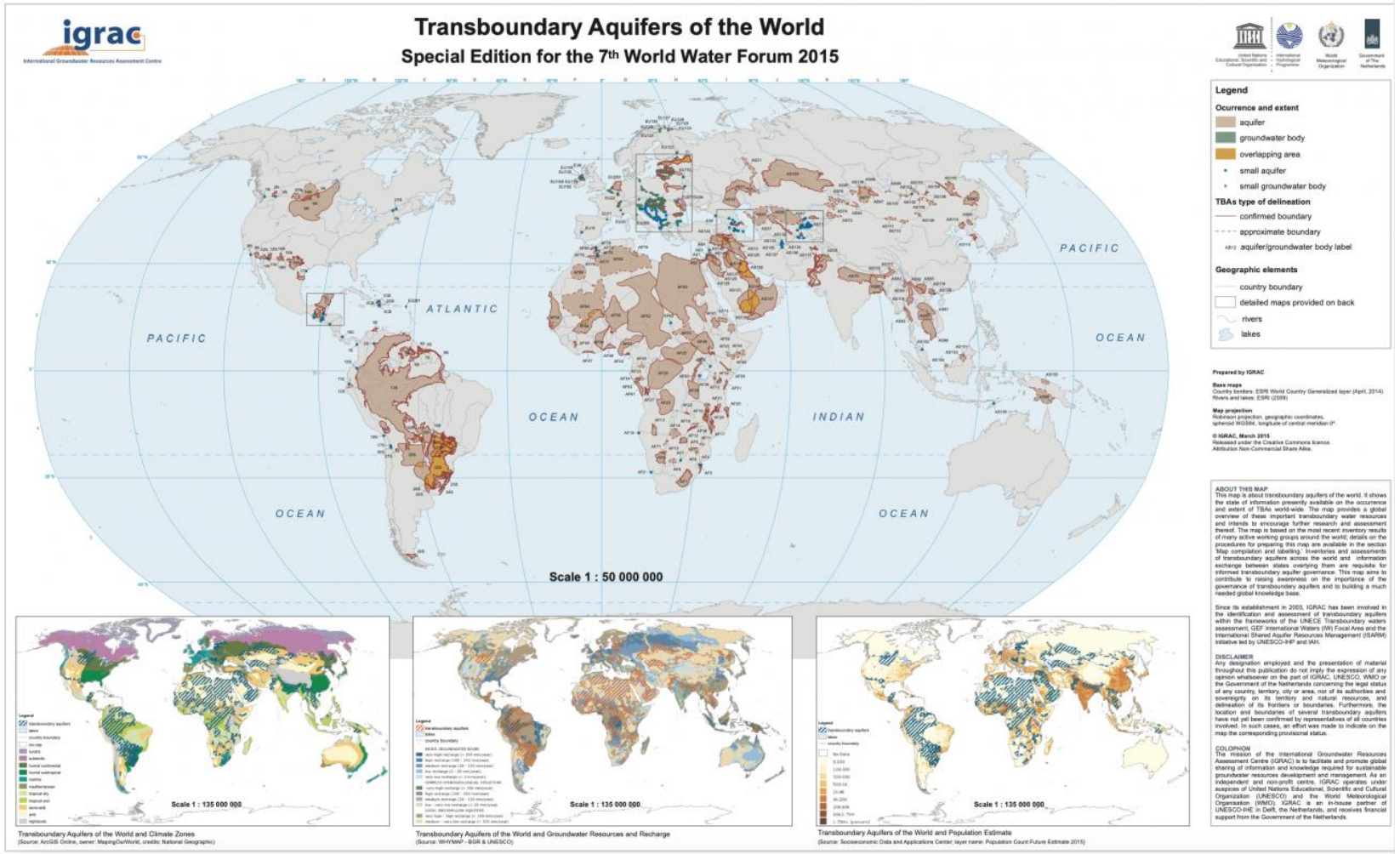
Global Challenges
Transboundary Groundwater

Water knows no border

Most of the Groundwater is in Transboundary Aquifers (TBA)

⟶ **366 TBA + 226 TB GW bodies**

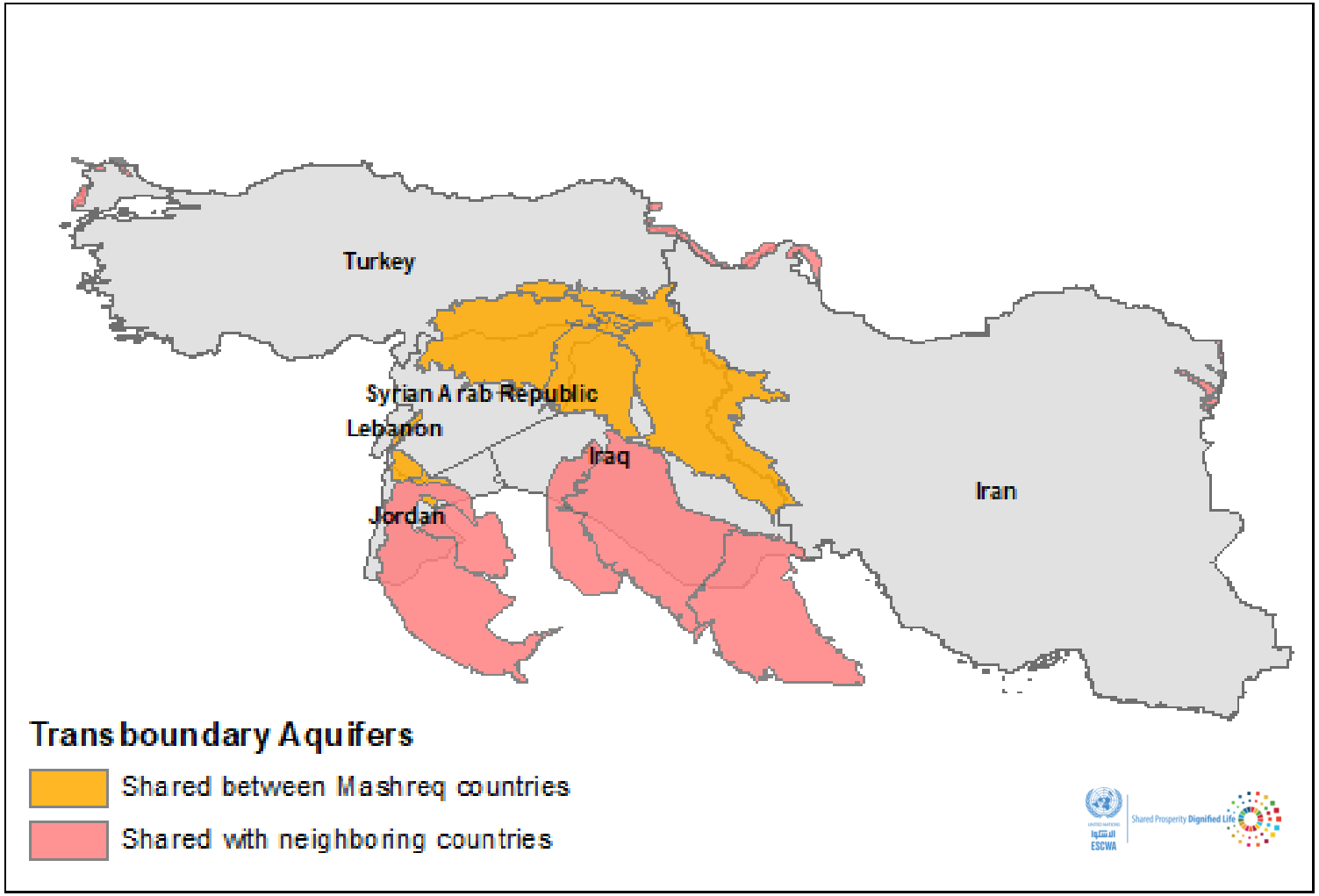
⟶ *additional challenge: the borders*



Source: IGRAC, 2015

Transboundary groundwater resources in the Mashreq Region

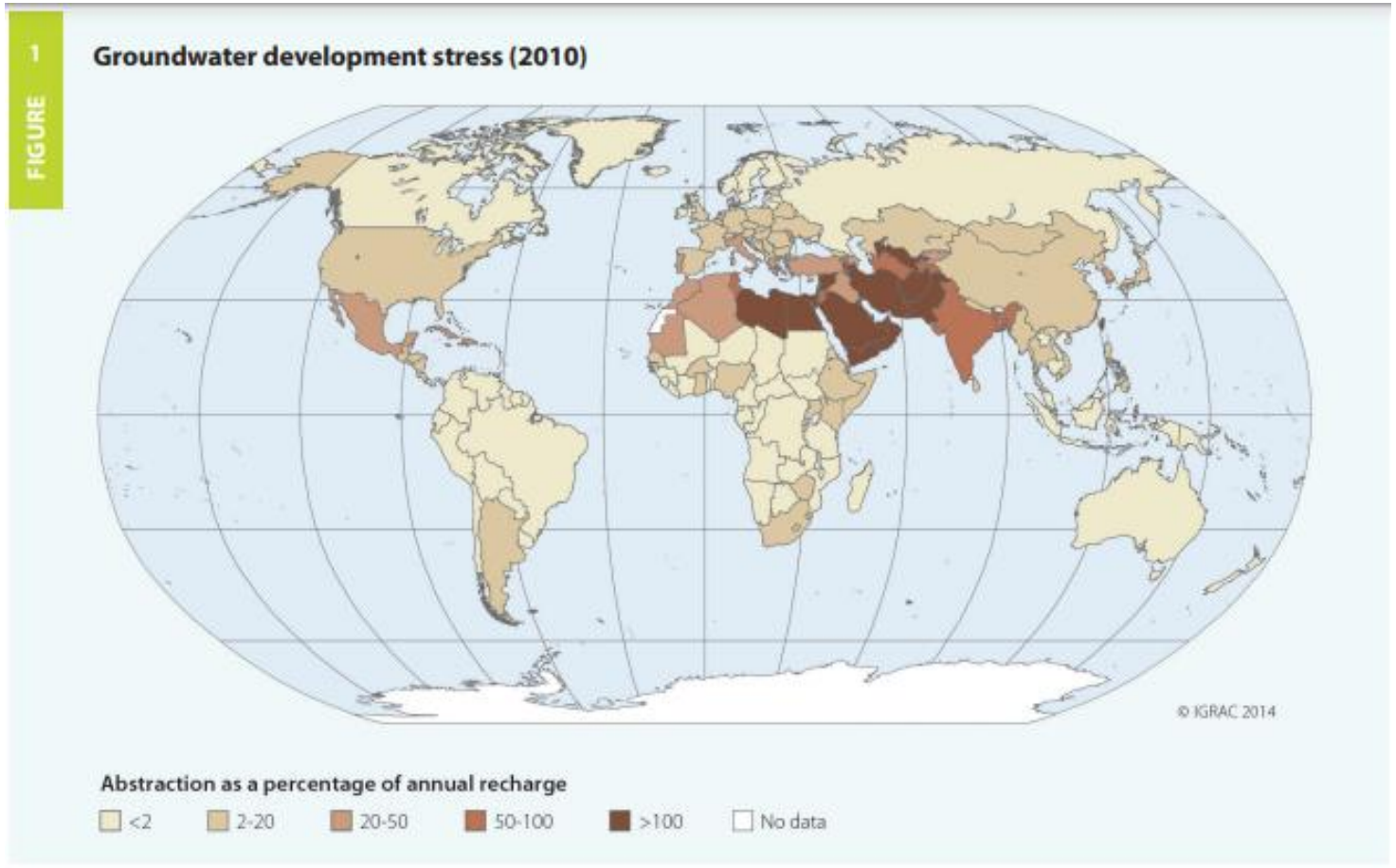
- All Mashreq countries share one or more of 24 transboundary aquifers.
- 24 aquifers are shared at least between 1 Mashreq country and its neighboring countries, where 7 aquifers are shared between the Mashreq countries only
- The shared aquifers cover around 30% of the total Mashreq region surface.



Source: Adapted from IGRAC, 2020, compiled by UNESCWA

Global Groundwater Situation

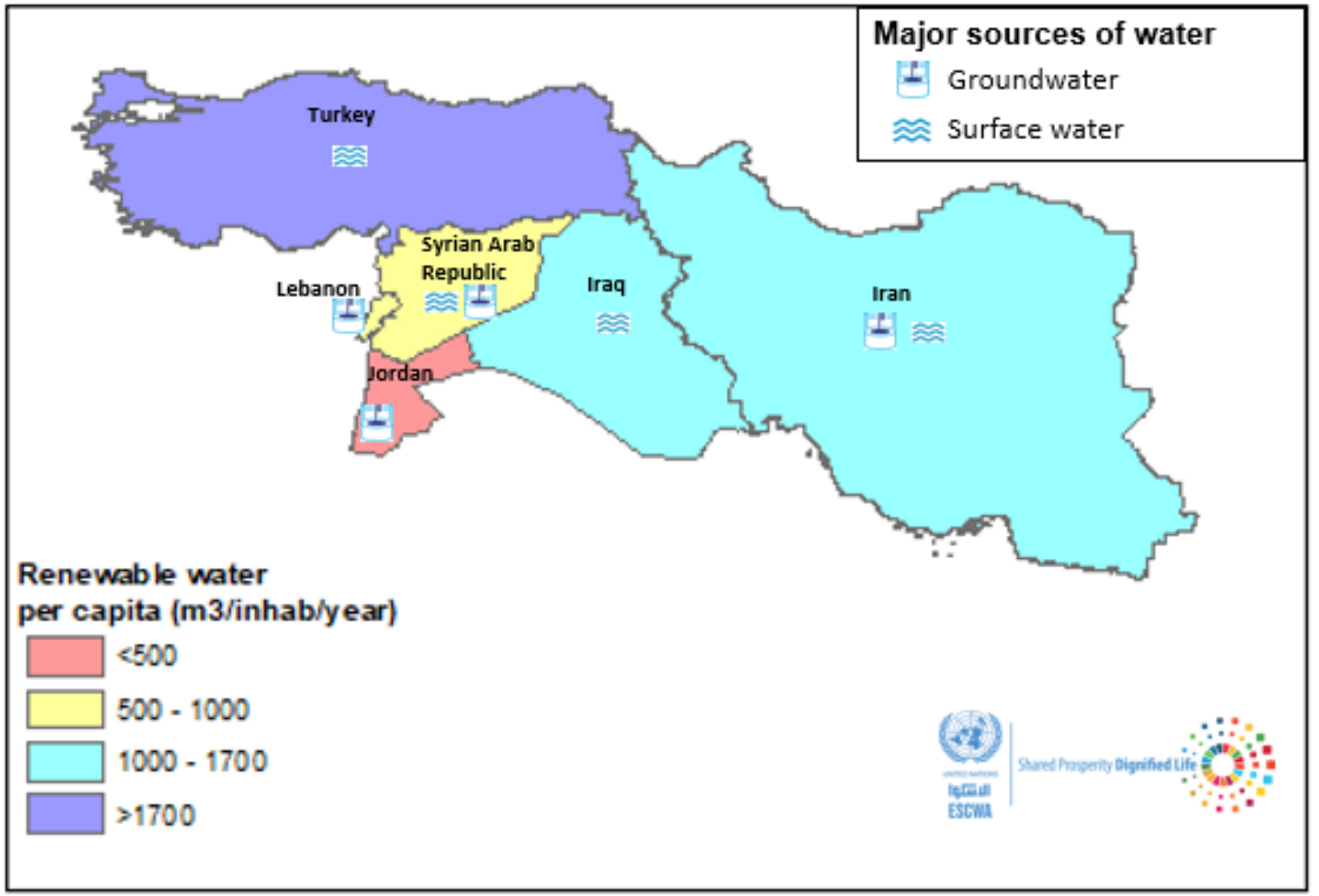
- The regions experiencing the highest groundwater stress are North Africa, West and Central Asia



Source: IGRAC (2014).
IGRAC (International Groundwater Resources Assessment Centre). 2014. Information System. Global Overview application. Delft, Netherlands, IGRAC. http://ggmn.e-id.nl/ggmn/GlobalOverview.html (Accessed December 2014). © IGRAC 2014.

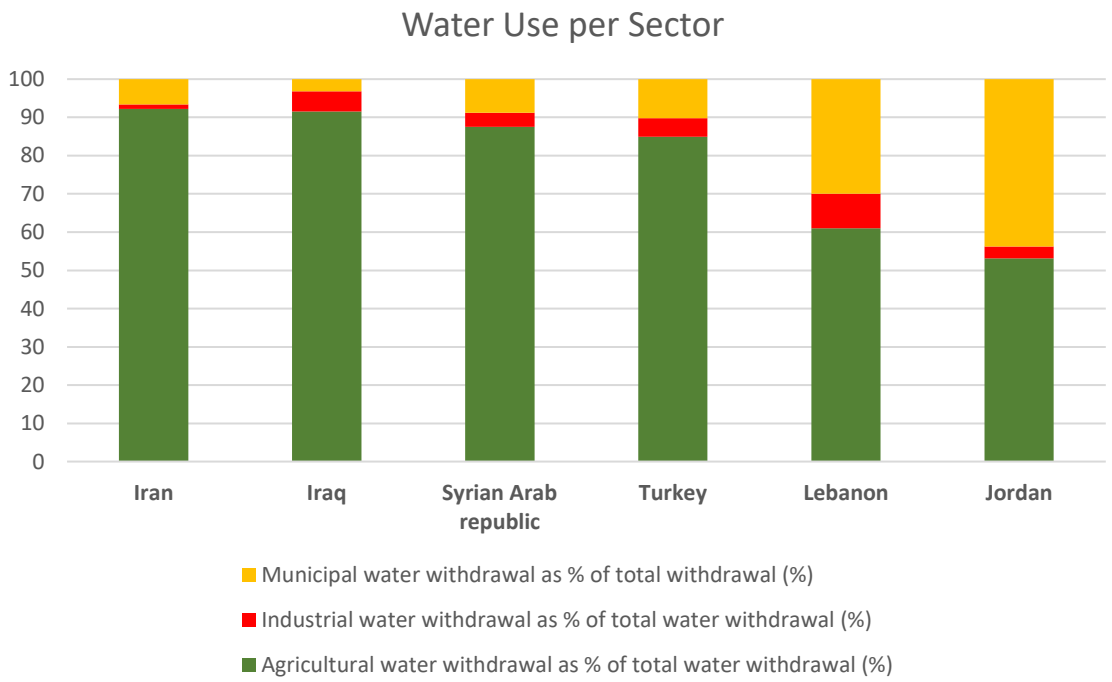
Water resources in the Mashreq Region

- Worldwide, the average water available per person is about 7000 m^3/inhab/year; in the Mashreq region, it is only around 1250 m^3/inhab/year.
- 3 out of 6 countries of the Mashreq region are below the renewable freshwater scarcity annual threshold of 1,000 m^3 per capita, where Jordan is below the absolute water scarcity threshold of 500 m^3.
- Groundwater is the major source of freshwater in half of the Mashreq countries



Source: FAO, 2017, ESCWA, 2019.

Water resources in the Mashreq Region

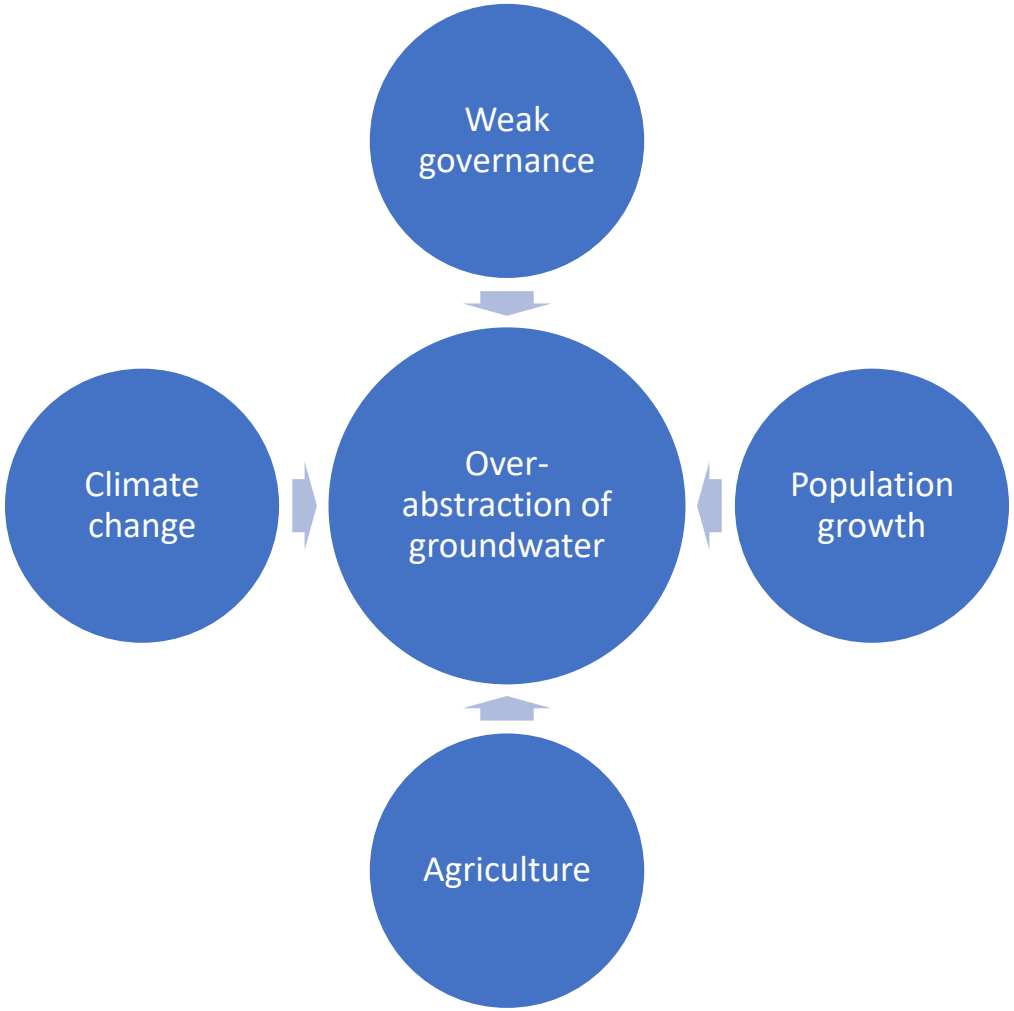


Source: FAO, 2017; Lebanon source: MoEW, 2010

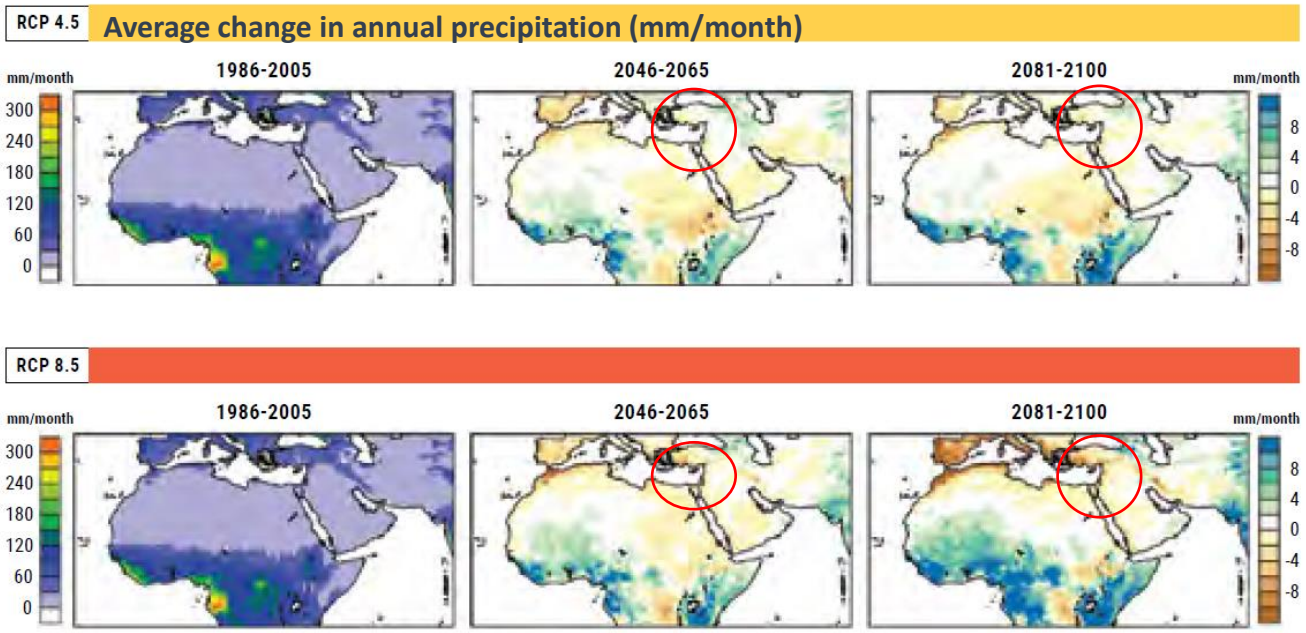
Mashreq Countries	% of irrigation water from groundwater	% of groundwater used from all available water sources
Iran	>60	57
Iraq (Islamic Republic of)	6	2 to 9
Jordan	53	59
Lebanon	22	61
Syrian Arab Republic	60	-
Turkey	-	26

Source: FAO, 2017, Abd El Mooty et. al, 2016 and Molle and Closas 2016,.

Groundwater pressures in the Mashreq region



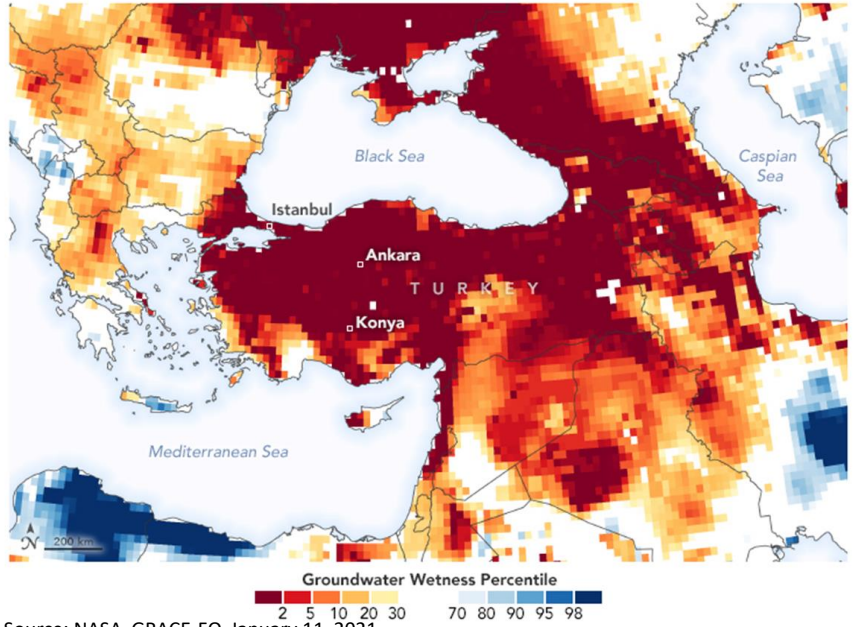
Groundwater pressures in the Mashreq region
Climate Change



Example from Turkey

- 2020 was the driest of the past 5 years, precipitation was 48% lower than the average for 1981-2010

- The GRACE-FO map from January 11, 2021, depicts how the amount of groundwater compares to long-term average records (1948-2010). Most of the country has a groundwater wetness percentile of less than 5%.

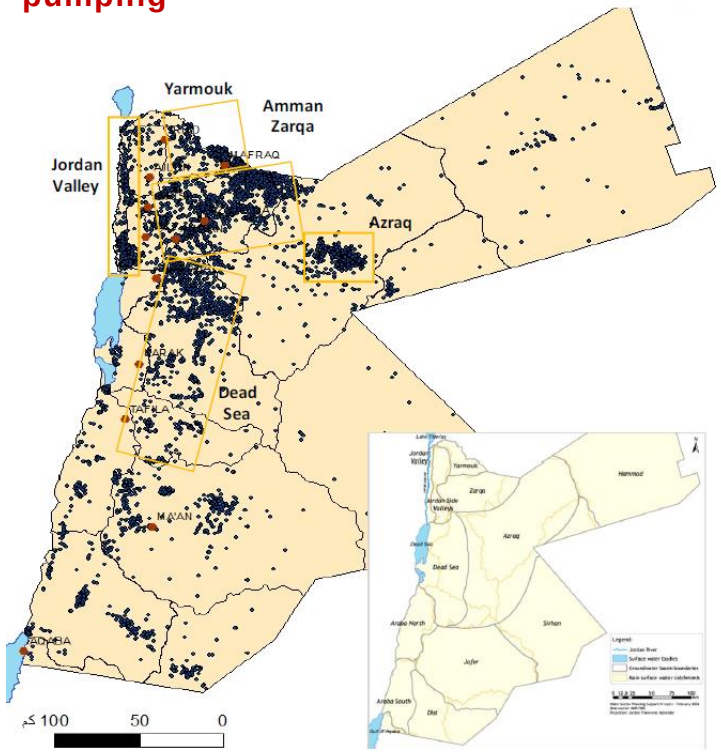


Source: NASA, GRACE-FO, January 11, 2021.
https://earthobservatory.nasa.gov/images/147811/turkey-experiences-intense-drought

Groundwater pressures in the Mashreq region
Groundwater Management

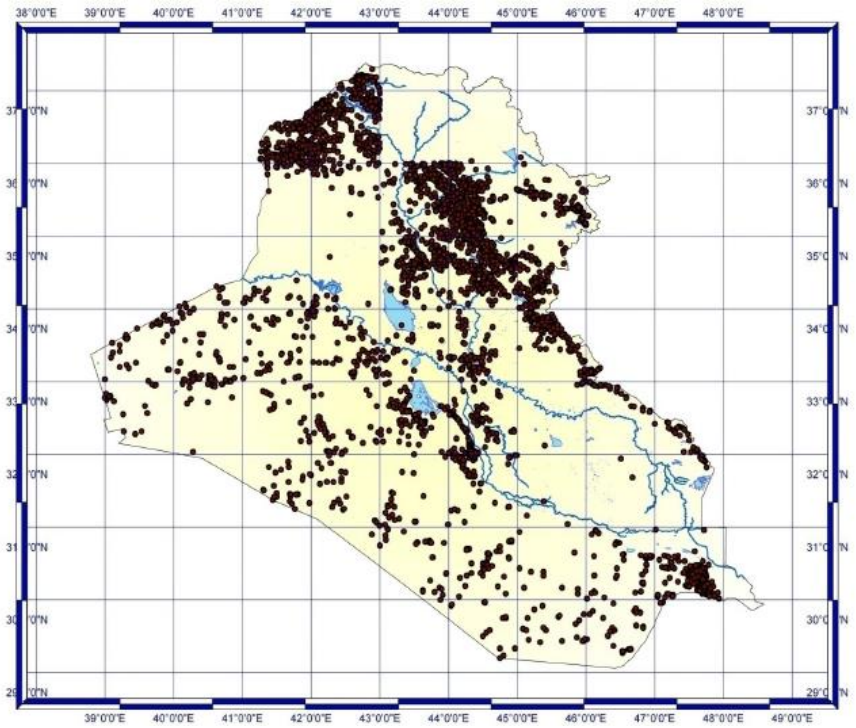
- Lack of good management and monitoring practices have led to an uncontrolled number of wells in most Mashreq countries

Water wells in Jordan and areas of major pumping



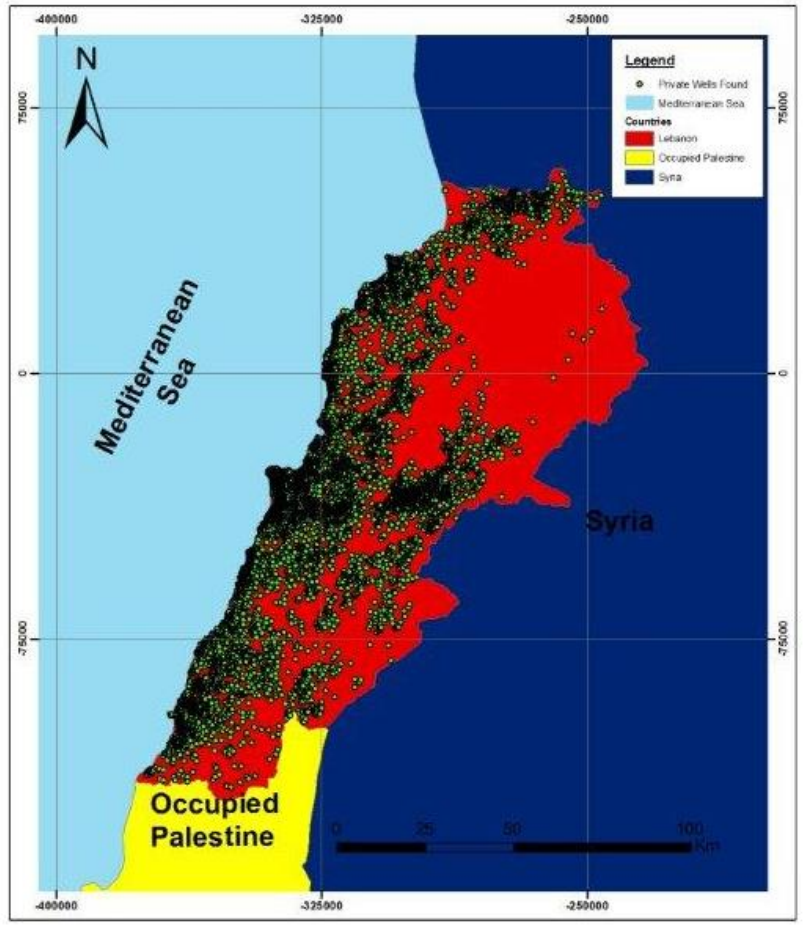
Source: Molle et. al., 2017

Water wells in Iraq



Source: Al-Sudani, 2018

Private wells in Lebanon



Source: UNDP, 2014

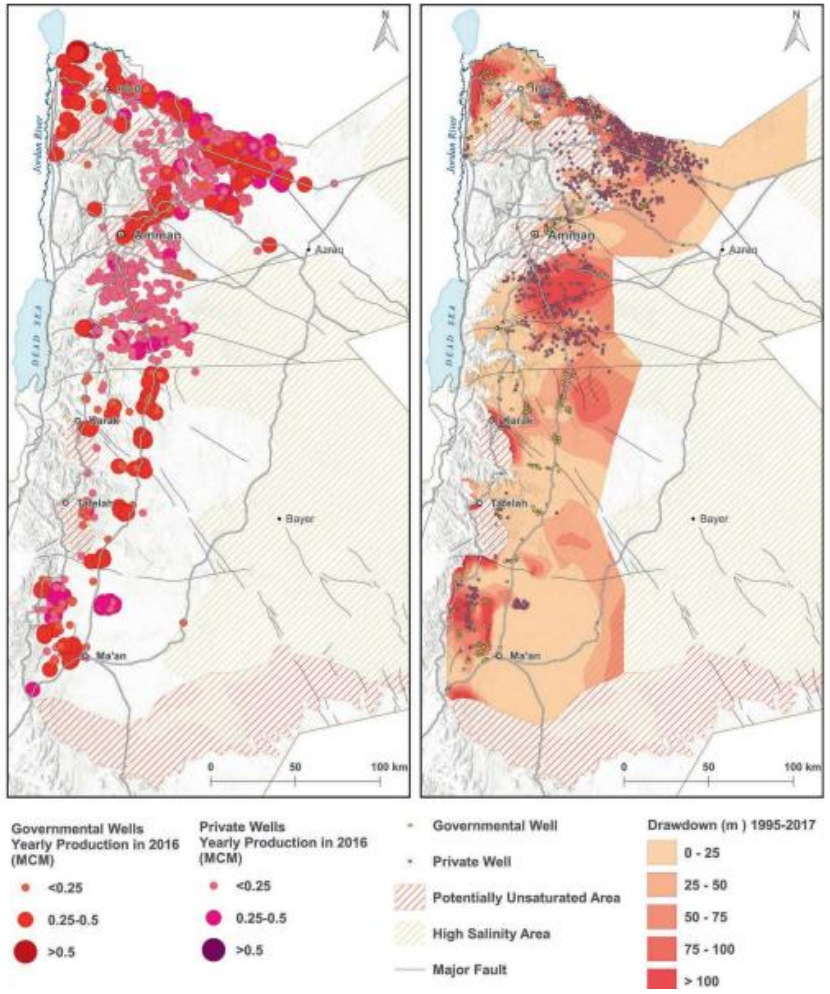
Consequences of groundwater over-abstraction

Groundwater scarcity

Over-abstraction of Groundwater

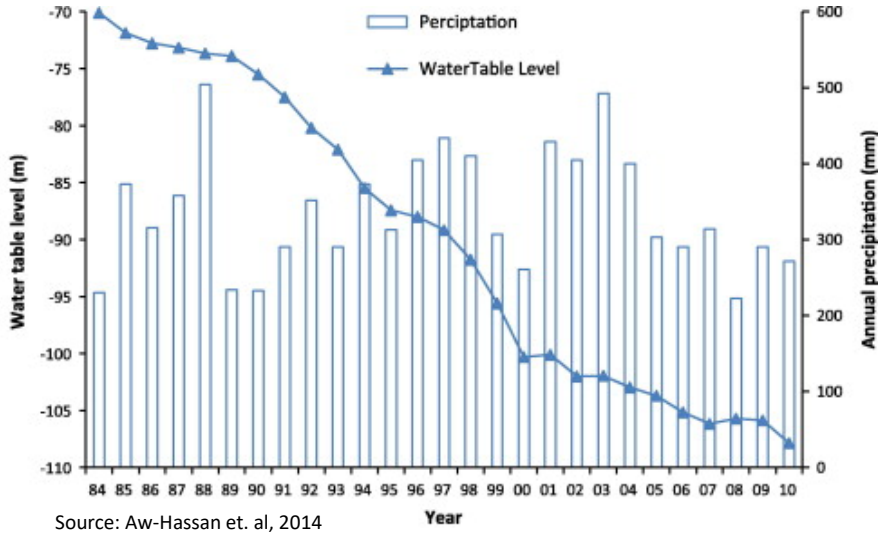
Groundwater quality deterioration

Water wells production and groundwater drawdown in Jordan (1995-2017)



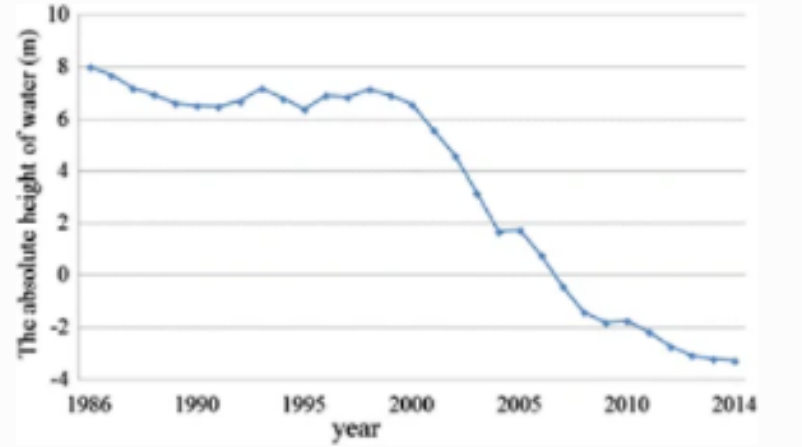
Source: BGR, 2017

Groundwater-level decline, Aleppo, Syria



Source: Aw-Hassan et. al, 2014

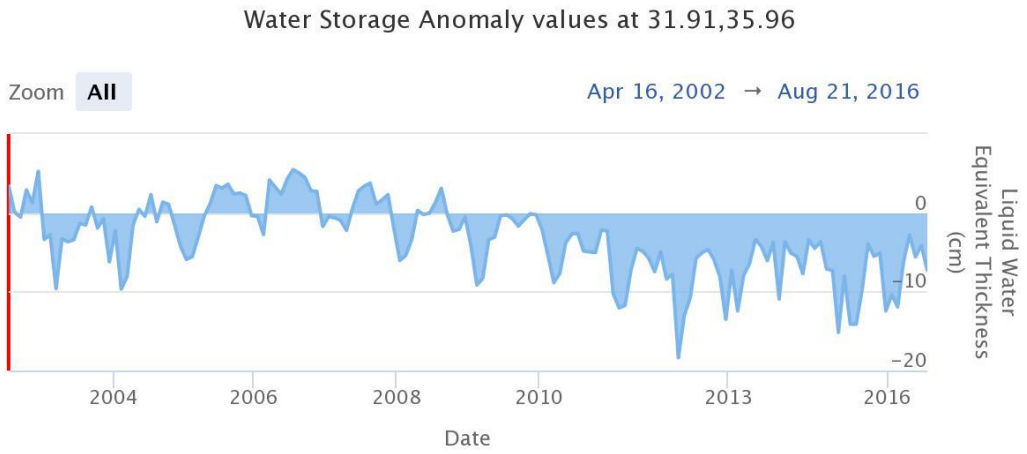
Groundwater-level decline, Minab Plain, Iran



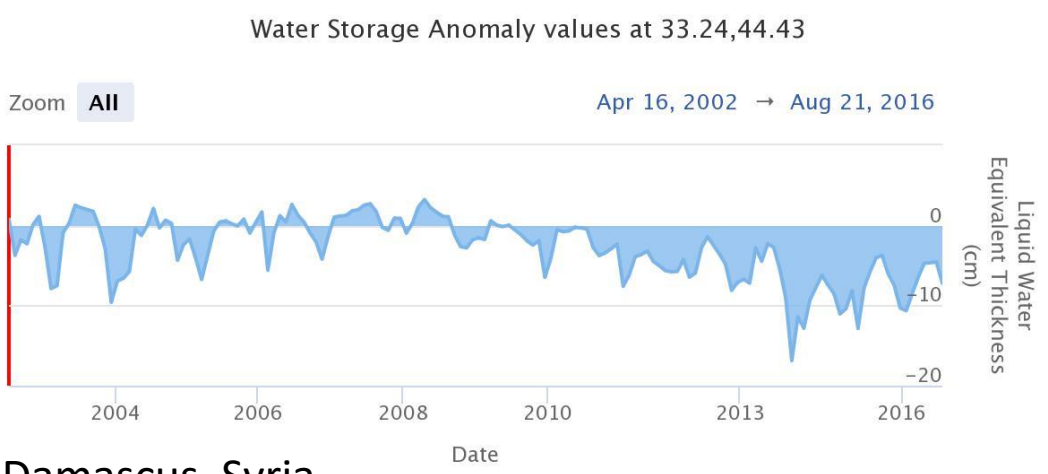
Source: Torkamanitombeki et al., 2018

Groundwater storage change-GRACE mission

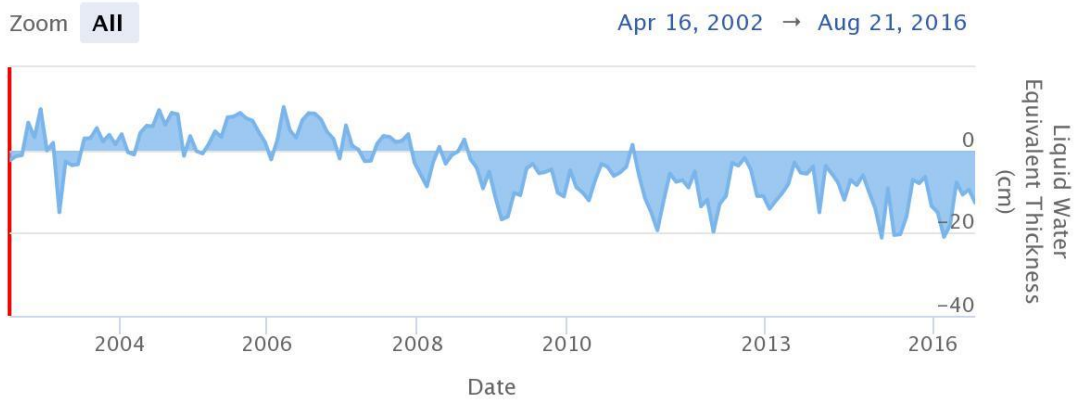
Amman, Jordan



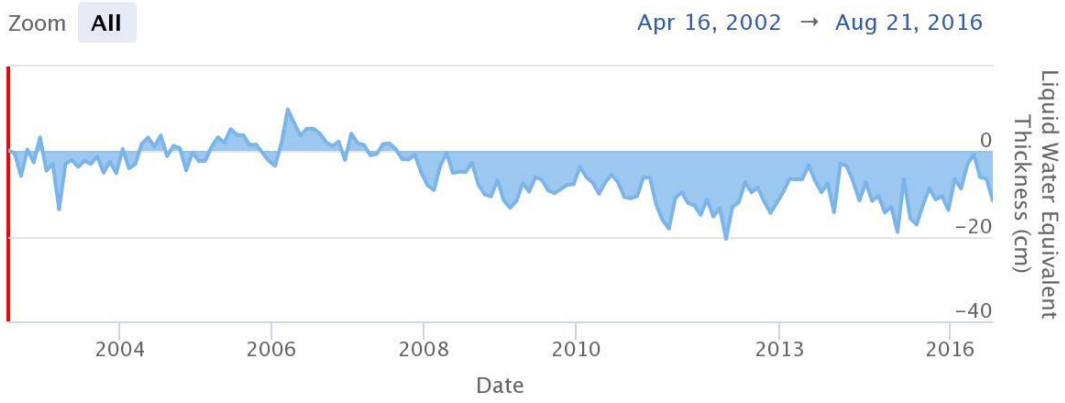
Baghdad, Iraq



Beirut, Lebanon



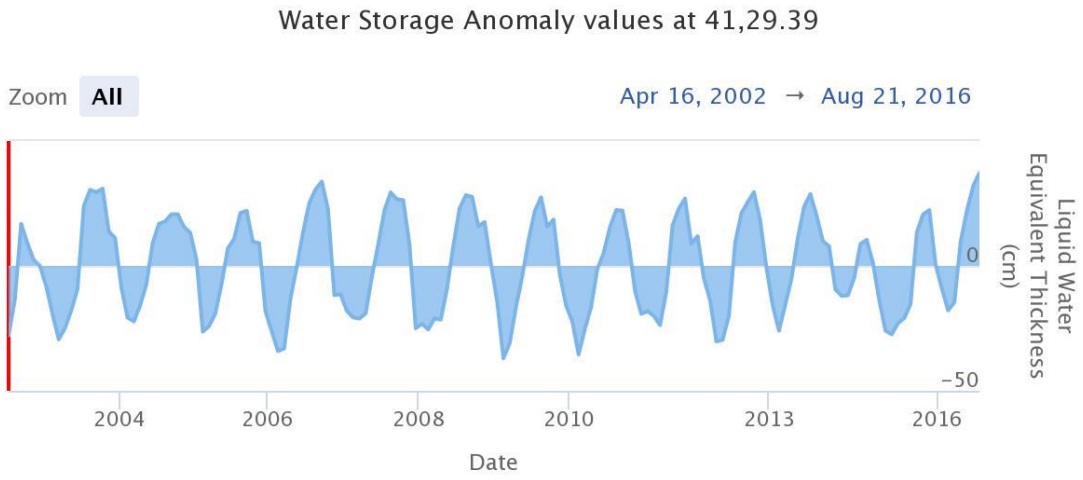
Damascus, Syria



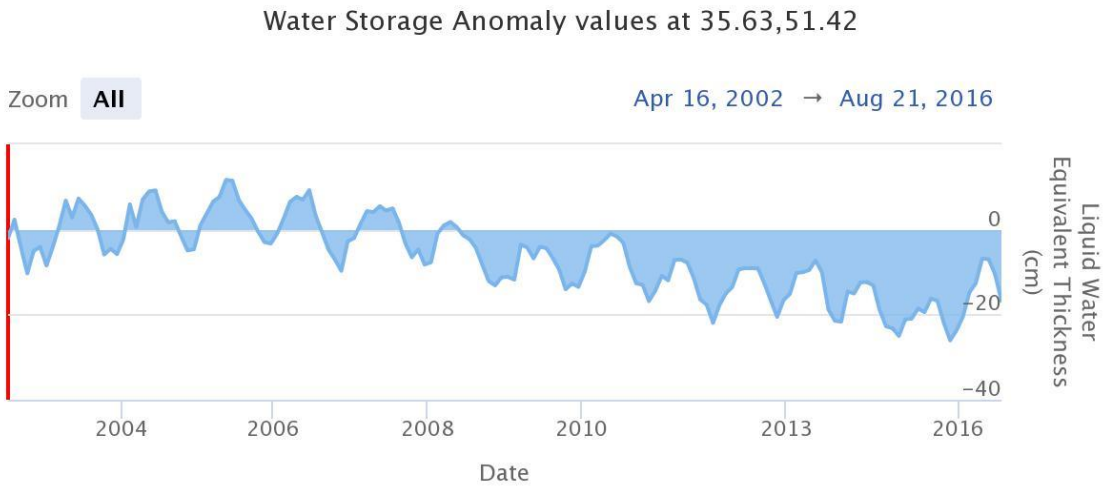
https://tethys2.byu.edu/apps/newgrace/global-map/

Groundwater storage change-GRACE mission

Istanbul, Turkey



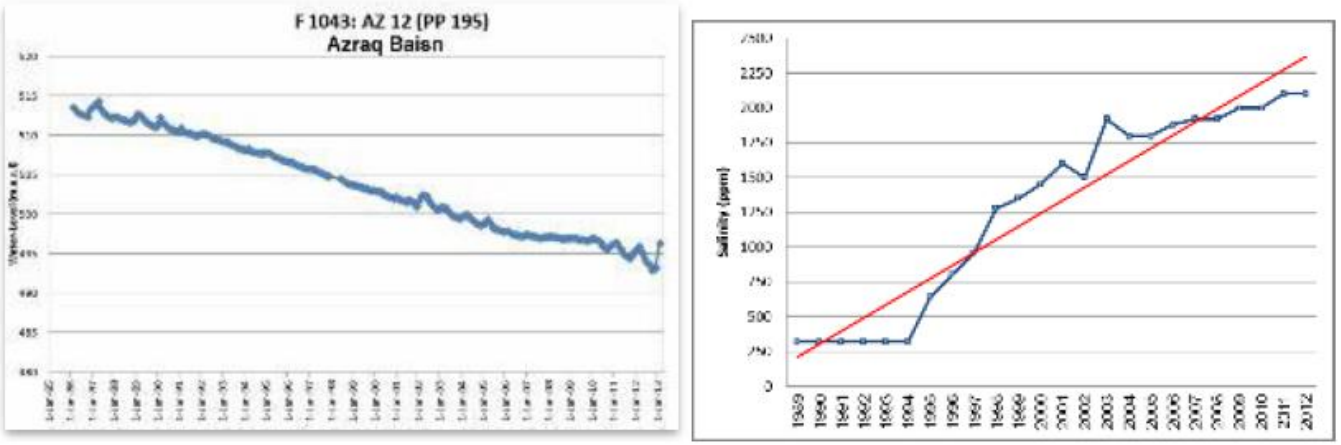
Tehran, Iran



https://tethys2.byu.edu/apps/newgrace/global-map/

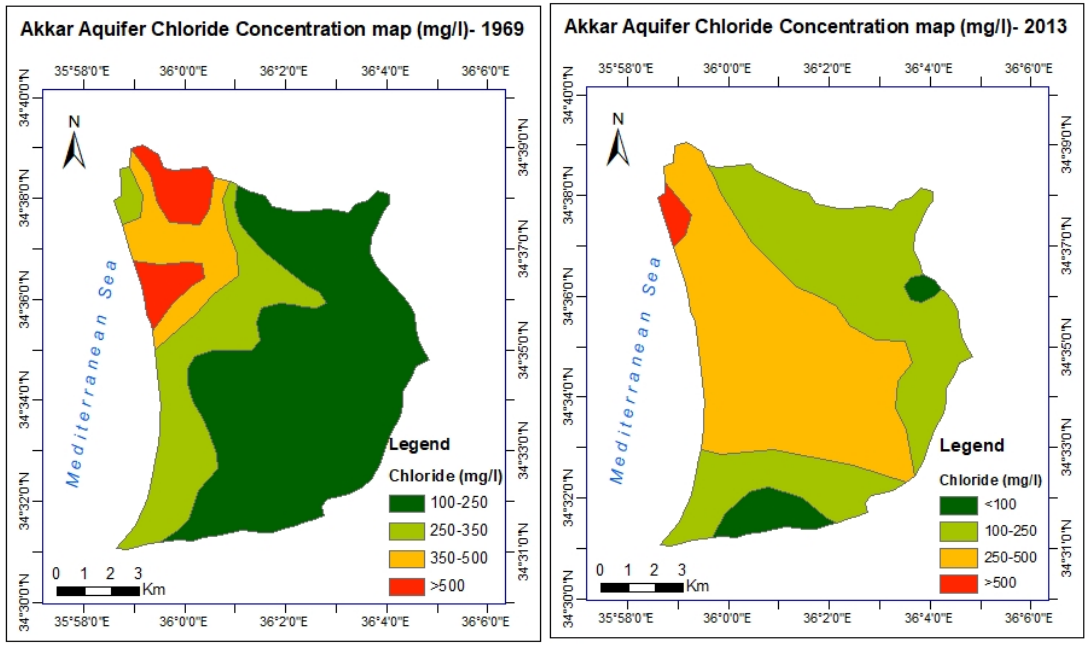
Consequences of groundwater over-abstraction
Quality consequences

Piezometric levels in Azraq, Jordan (1985-2013) and increase in salinity in one sample well



Source: Hadidi, 2014

Chloride concentration in Akkar aquifer, Lebanon, in 1969 and in 2013

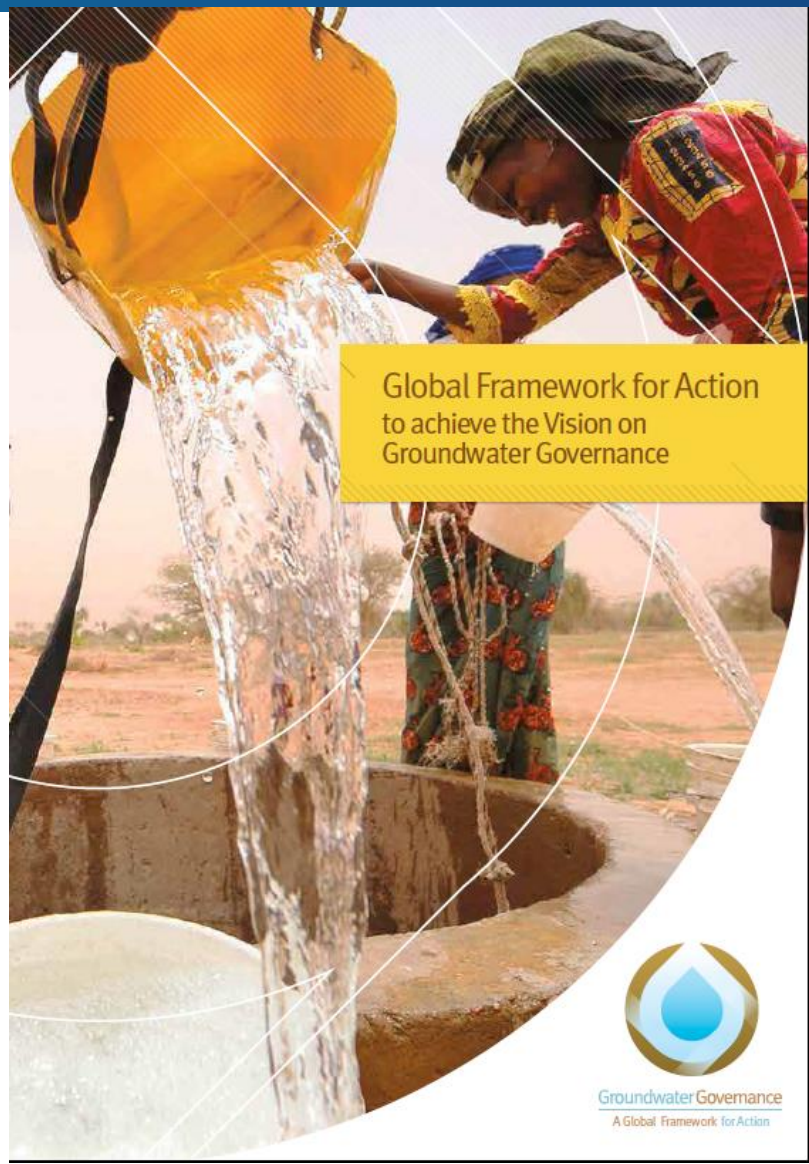


Source: Zaarour, 2017

Groundwater Governance Global Framework

"Development of groundwater has been rapid, outpacing the development of the governance frameworks that should have regulated it, and significant problems of allocation, depletion and quality impairment are emerging" (FAO, 2016)

- With a few positive exceptions, the governance of groundwater has not kept pace with the unprecedented and rapid changes. As a result, part of the valuable groundwater resources may be lost, and groundwater-related ecosystems and environment may be damaged.

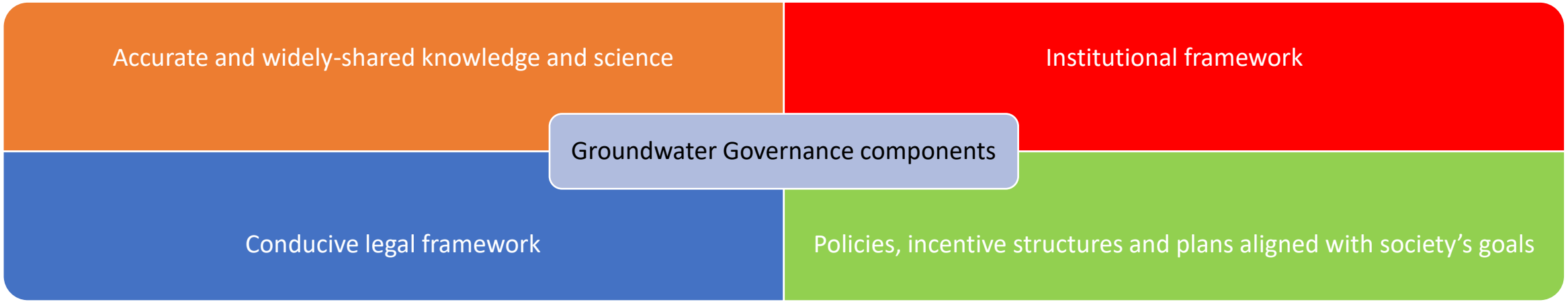


Source: FAO, 2016.

Groundwater Governance and Management

"Good groundwater governance is the basis for effective groundwater management" (FAO, 2015)

- Groundwater governance framework defines the management of groundwater resources and the use of aquifers.

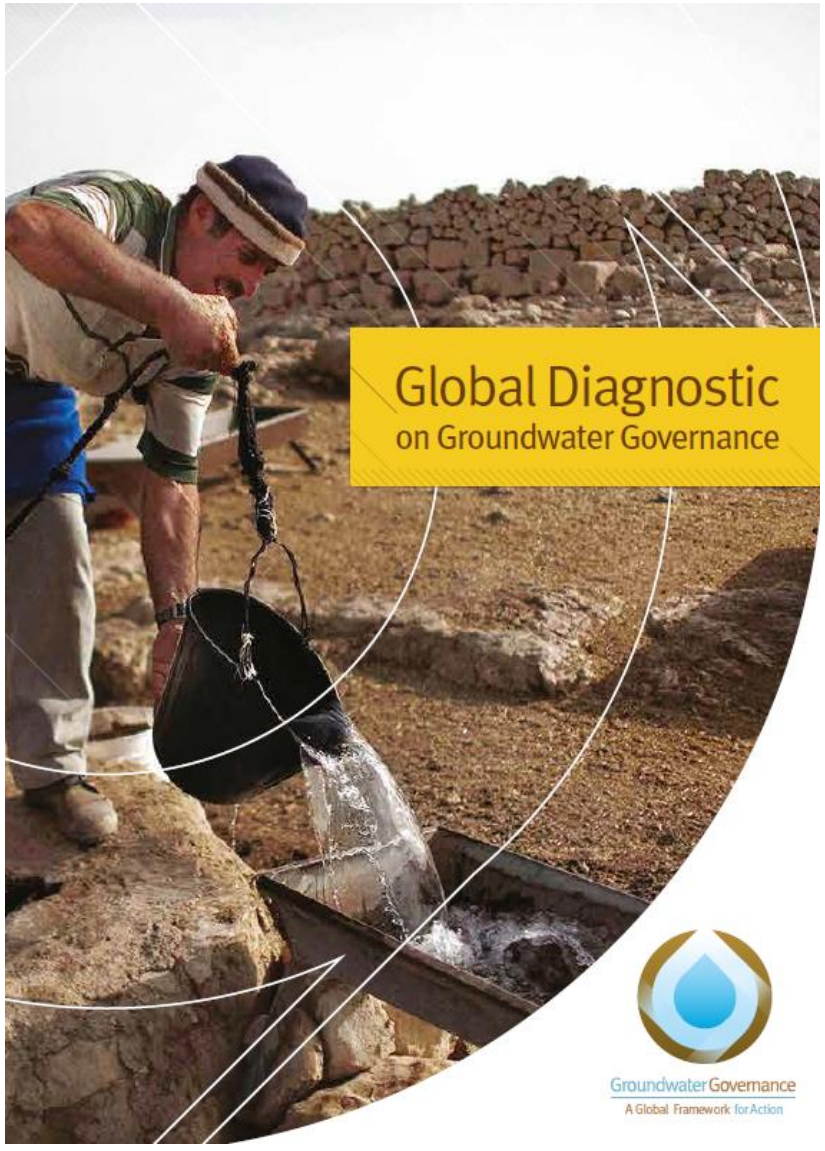


- Groundwater management is what actors do within the framework of governance; Activities related to the development and protection of groundwater to implement the established policies and plans. The hydrogeological conditions and the distribution of human activities will determine the place required for these management activities.

Groundwater Governance
Data collection, information generation and knowledge sharing

Groundwater Governance Problems

- Inadequate or lack of clear policies and legislation regarding groundwater
- Lack or insufficiency of **political will** to implement policies and legislation related to groundwater
- Weak groundwater institutions, fragmented or overlapping responsibilities, and weak coordination between the sectors involved
- Generally limited funding affecting management, monitoring and capacity development
- Insufficient understanding of groundwater systems and insufficient awareness
- Lack of scientific and technical knowledge about specific transboundary aquifers
- Weak monitoring systems and lack of necessary information, data and/or technology
- Limited community participation



Source: FAO, 2016.

2022: Groundwater Year

- ESCWA Water Development Report 9th edition will be focusing on groundwater in the Arab region
- UN-Water has set the theme for the World Water Day in 2022 as “Groundwater: making the invisible visible”
- This will also be the theme for the World Water Development Report
- A groundwater summit will be held 7-8 December 2022 in Paris, France

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SUMMIT 2022

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Thank You