

Groundwater for Sustainable Development in the MENA Region

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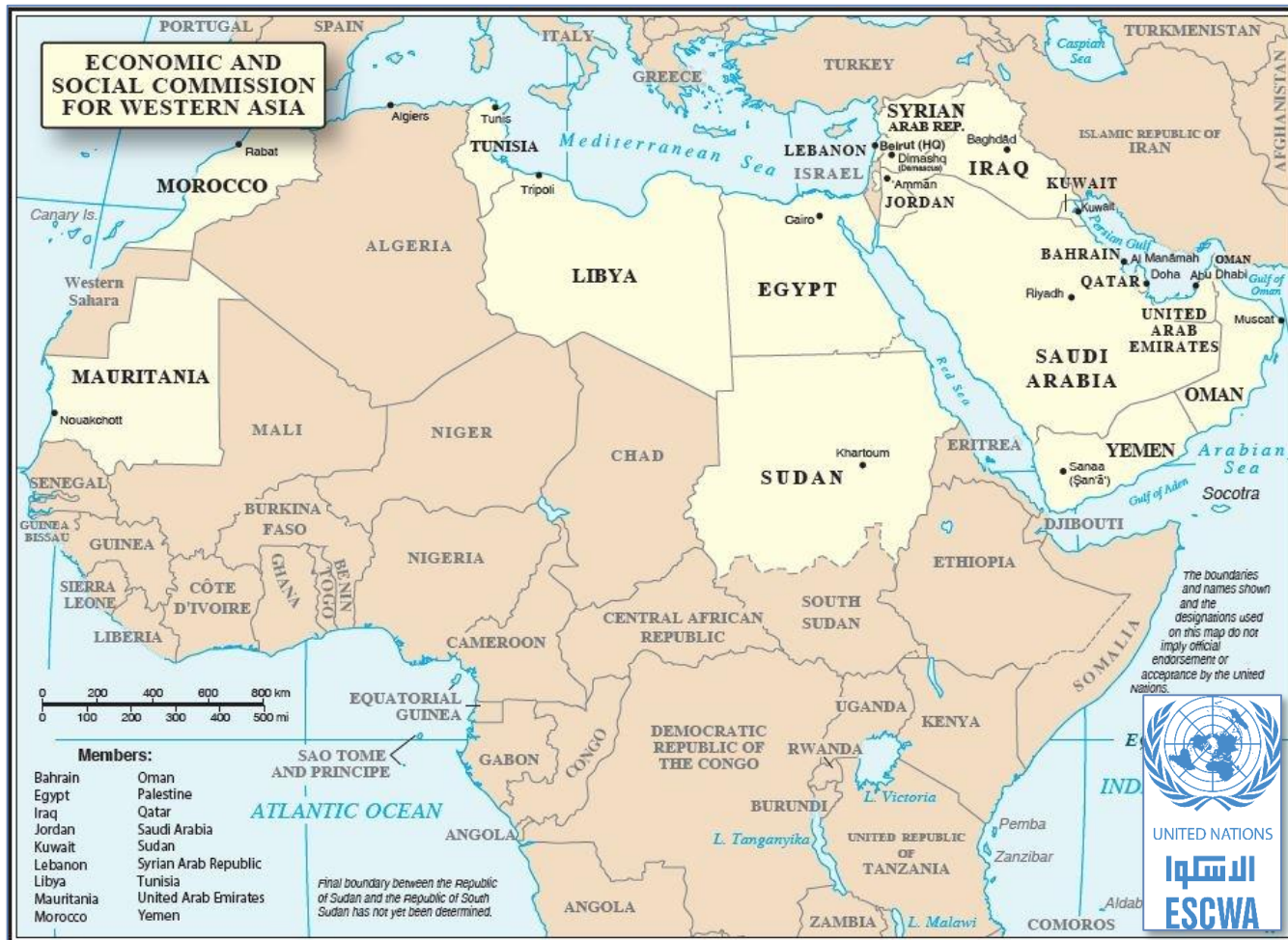
Presentation at
IAH Congress 2016



Middle East North Africa (MENA) Arab / UN ESCWA Region

- 22 Arab countries
- 18 UN ESCWA member states
- Sub-regions
 - Maghreb
 - Mashreq
 - GCC
 - ... plus

www.unescwa.org



Overview

- Groundwater challenges in the MENA region
- Groundwater links to Sustainable Development Goals (SDGs) & 2030 Agenda for Sustainable Development
- Way forward - proposals for future work

Groundwater challenges in the MENA region

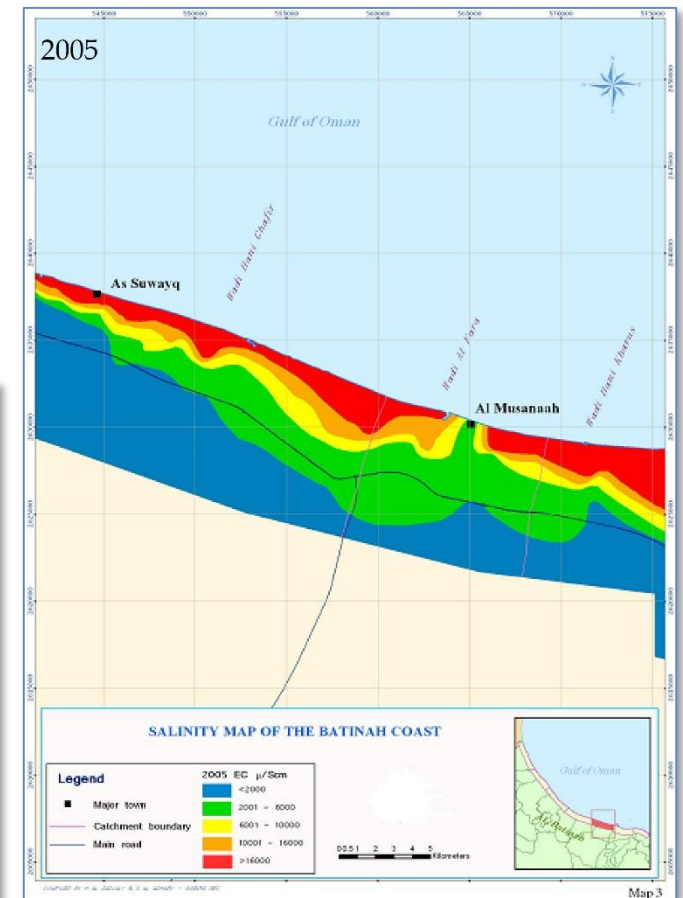
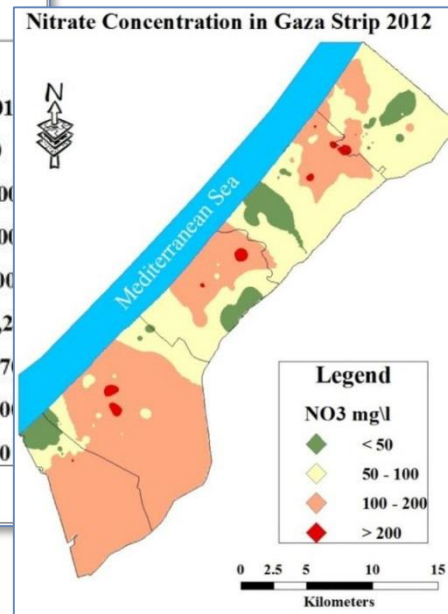
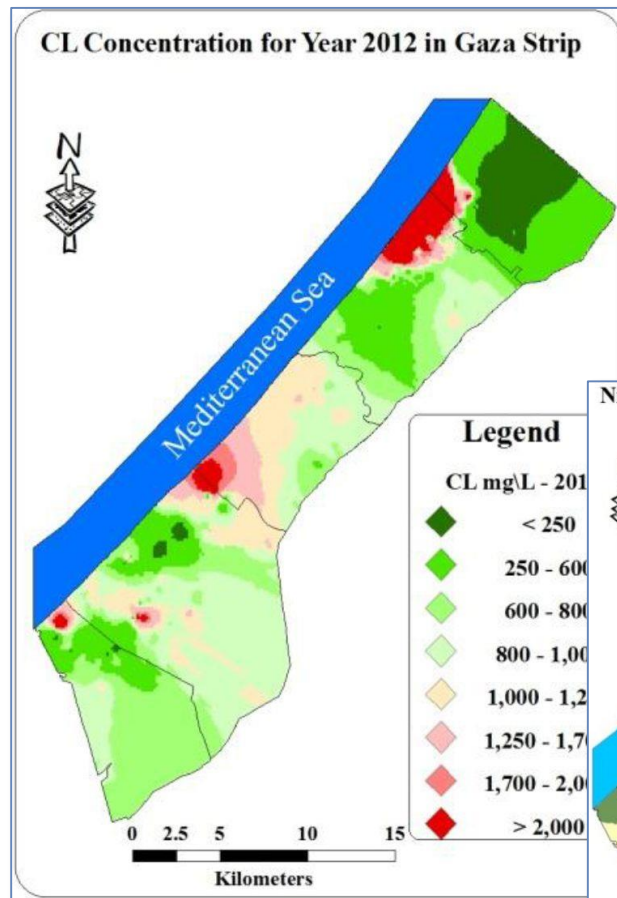
- Groundwater quality
- Scarcity and droughts
- Non-renewable vs. renewable
- Governance of common pool resource
- Transboundary aquifers



Groundwater Quality - Gaza / Palestine, Batinah / Oman

Saline Water Intrusion

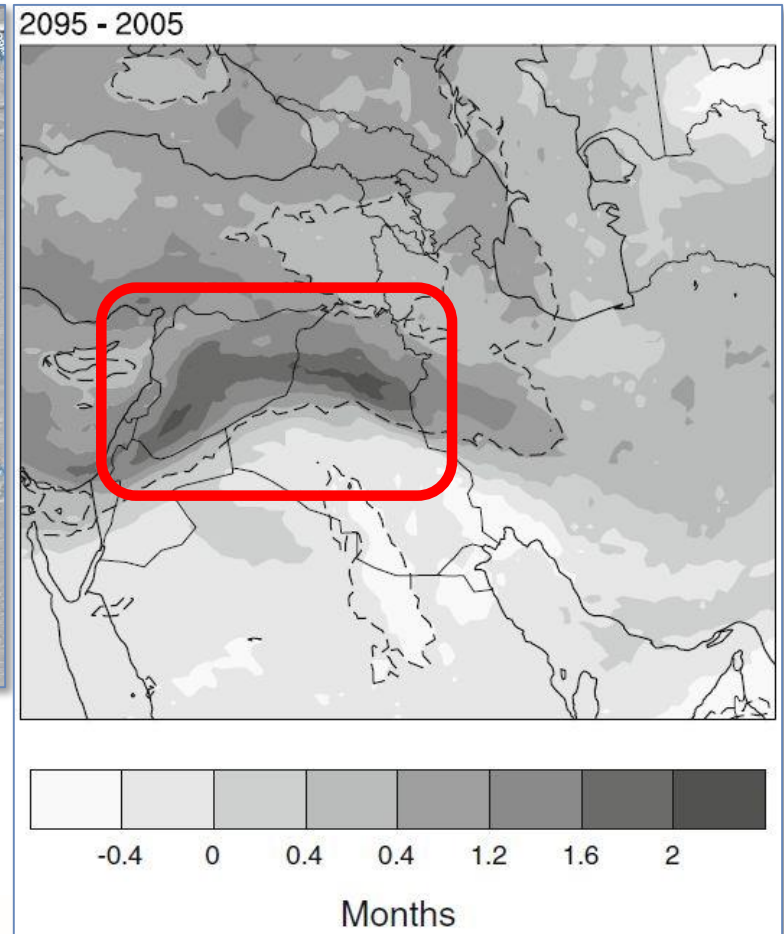
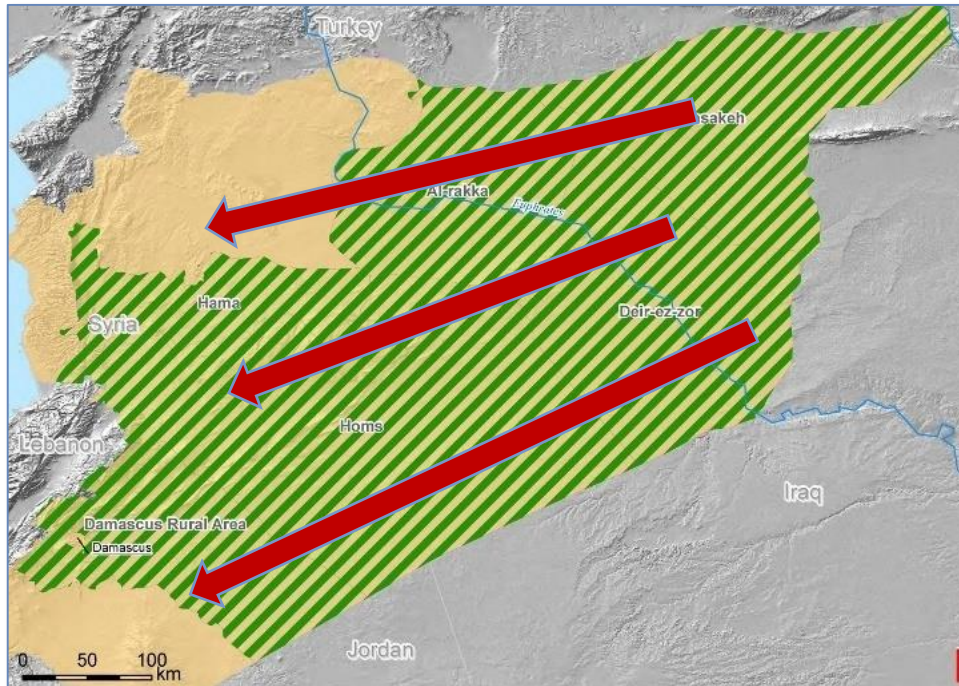
Sanitation / Agricultural Return Flows



PWA, 2013 and Zekri, 2015, after AL-Barwani & Helmi, 2006.

Scarcity and Drought - Syria

Scarcity of water and groundwater – or scarcity of adequate water governance?



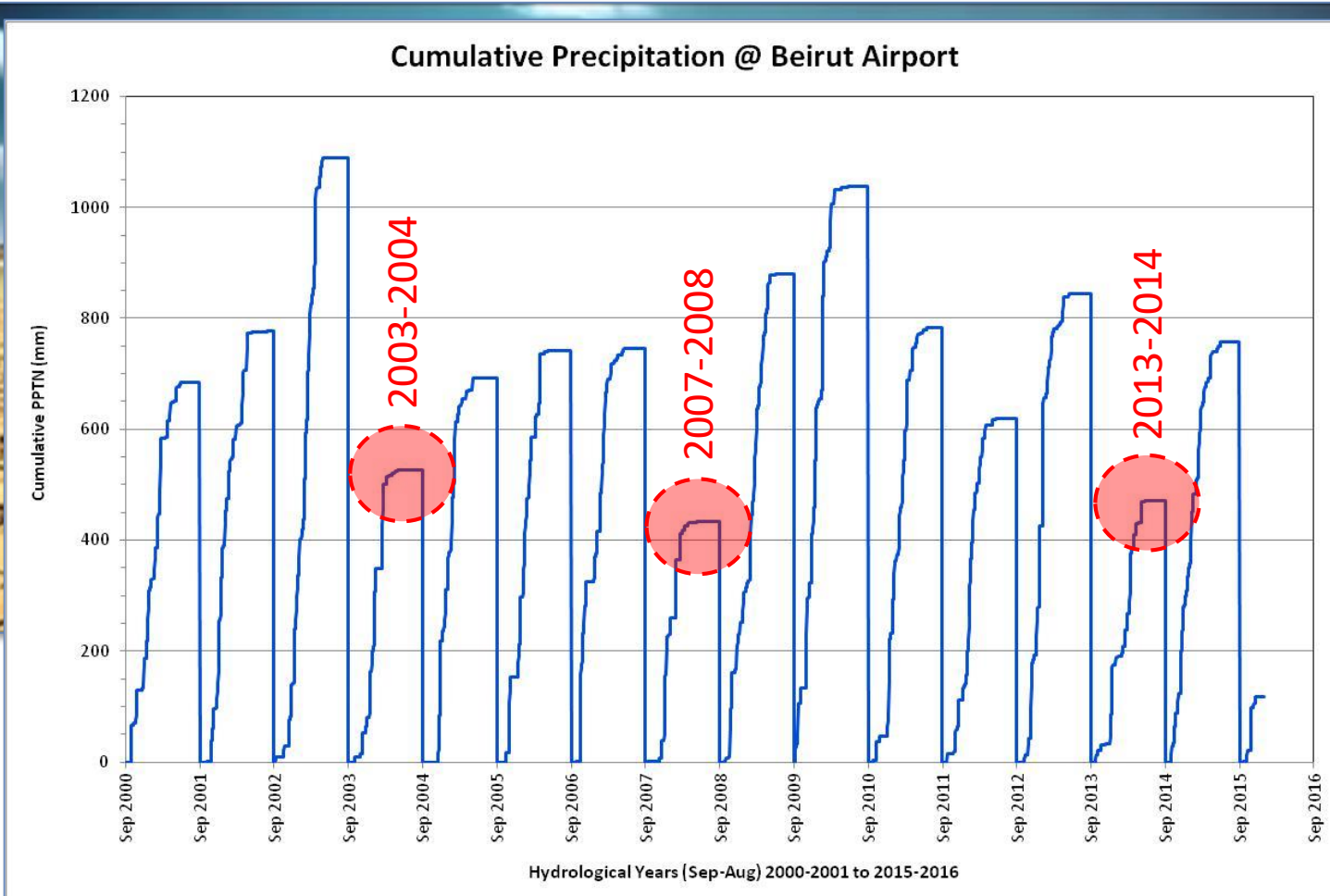
Triggers for migration / displacement:

- Drought, physical scarcity,
- Economic scarcity, inappropriate governance, ...

Left: irinnews.org, 2009. Syria's drought-affected provinces as of Aug 2009, right: Evans, J.P., 2009. 21st Century Climate Change in the Middle East.

Scarcity and Drought - Lebanon

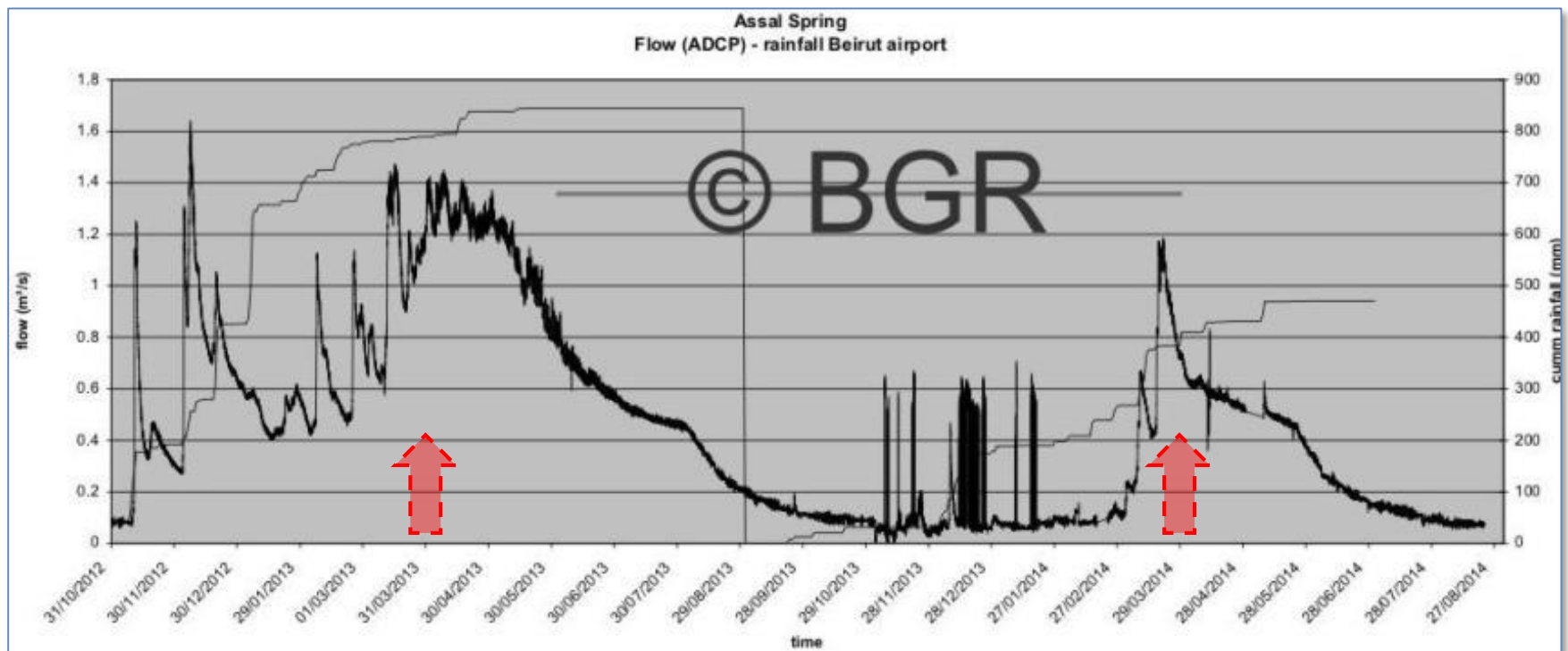
2014 - One drought comes rarely alone



bg: MEW, 2014. National Water Conservation Campaign, Lebanon, <http://en.tutiempo.net>, 2016. <http://en.tutiempo.net/climate/ws-401000.html>.

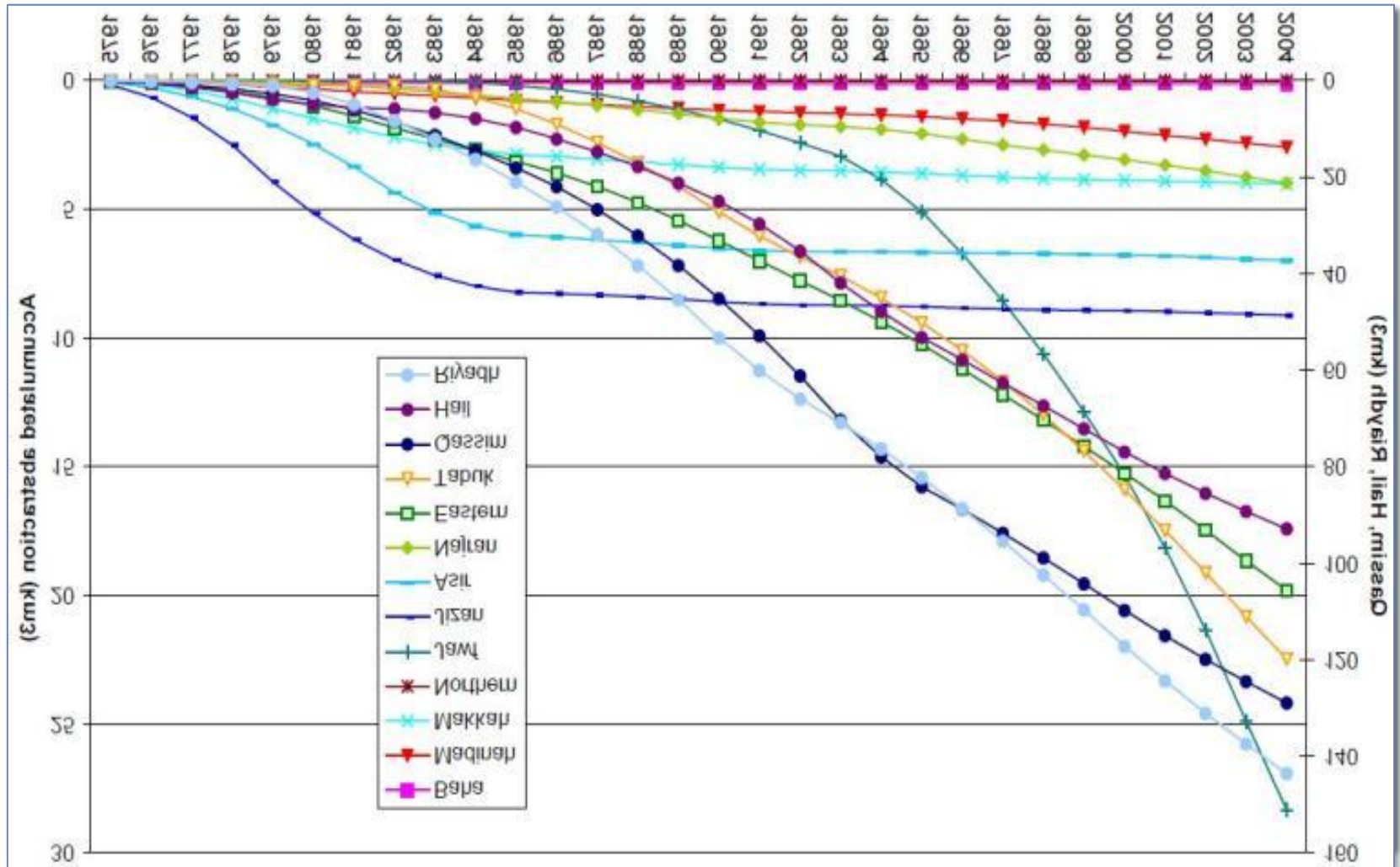
Scarcity and Drought - Lebanon

2014 drought impacted on groundwater and spring discharges



Margane, BGR, 2014.

Non-Renewable Groundwater Irrigated Agriculture, Saudi Arabia



WaterWatch, 2006



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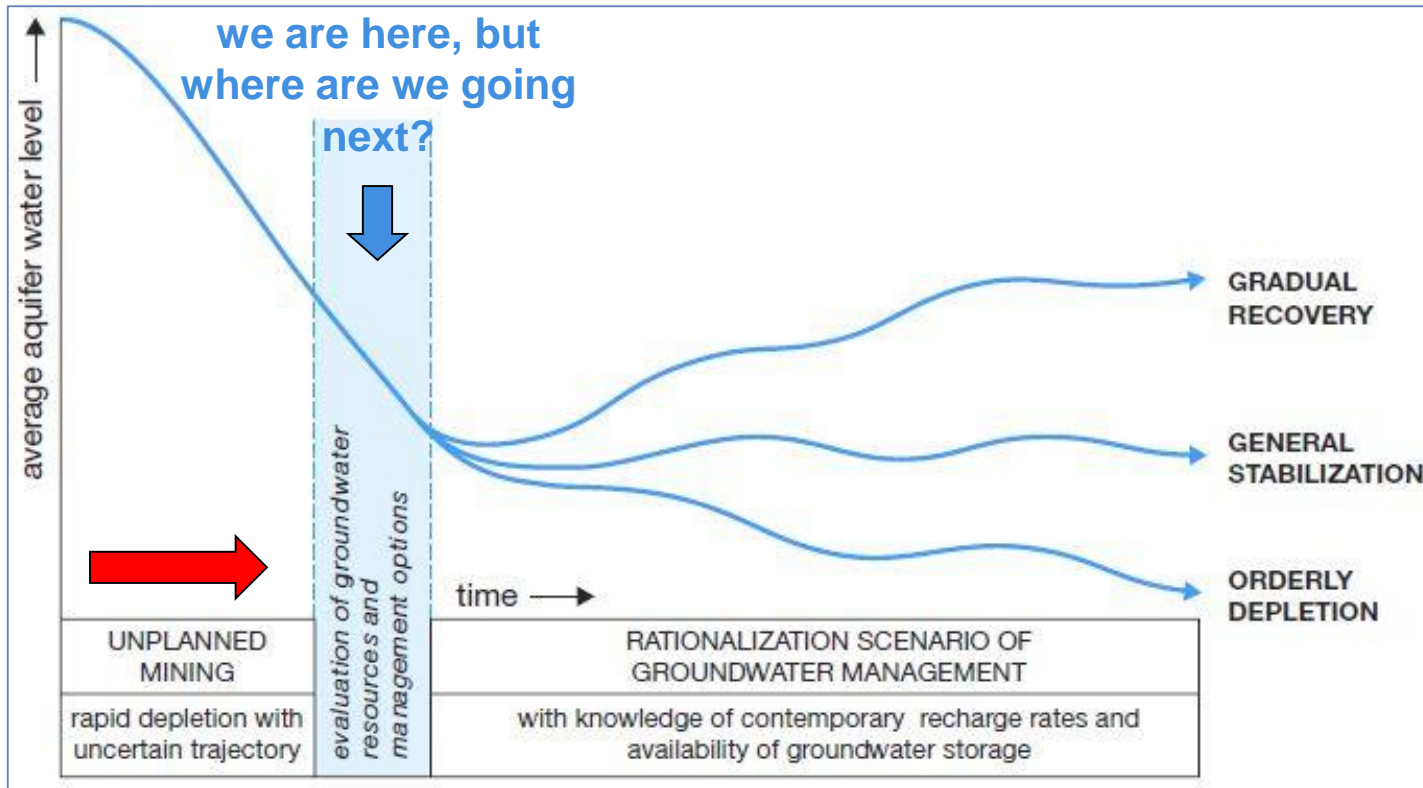
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Non-Renewable Groundwater Challenges with “Sustainable Use”

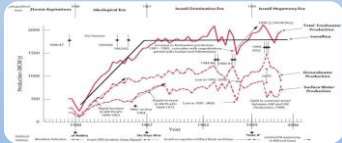


- Clear improvement of human well-being and livelihood
- An “exit strategy” as the aquifer is depleted
- Incorporation of inter-generational equity into its development
- Balance between short-term benefits and long-term costs

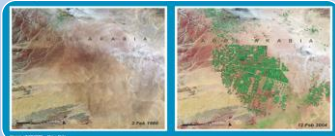
After: Foster, S. et al., 2003. Utilization of Non-Renewable Groundwater. GW-Mate.

Challenges for Cooperation on Transboundary Water Resources

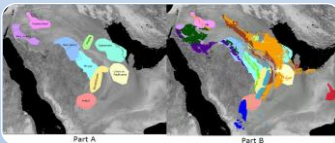
Shared Groundwater – Transboundary Aquifers



Historic and Prior Use



Renewable vs. Non-renewable
Groundwater



Differences between Recharge and
Use and Abstraction Areas



Spatial Extent of Surface and
Groundwater Catchments

**Aquifer Mgmt Unit:
Groundwater Body**

Aquifer Management Units \neq
Entire Aquifer / Aquifer System

Klingbeil & Al-Hamdi, 2010.

Shared Groundwater - Transboundary Aquifers – Transboundary Water Cooperation Inventory of Shared Water Resources in Western Asia



UNITED NATIONS

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INTRODUCTION

- Location
- Area
- Climate
- Population
- Other aquifers in the area
- Information sources



HYDROGEOLOGY

- Aquifer configuration
- Stratigraphy
- Aquifer thickness
- Aquifer type
- Aquifer parameters
- Recharge
- Flow regime
- Storage
- Discharge
- Water quality
- Exploitability



GROUNDWATER USE



- Abstraction and use
- Quality issues
- Sustainability issues

AGREEMENTS, COOPERATION & OUTLOOK

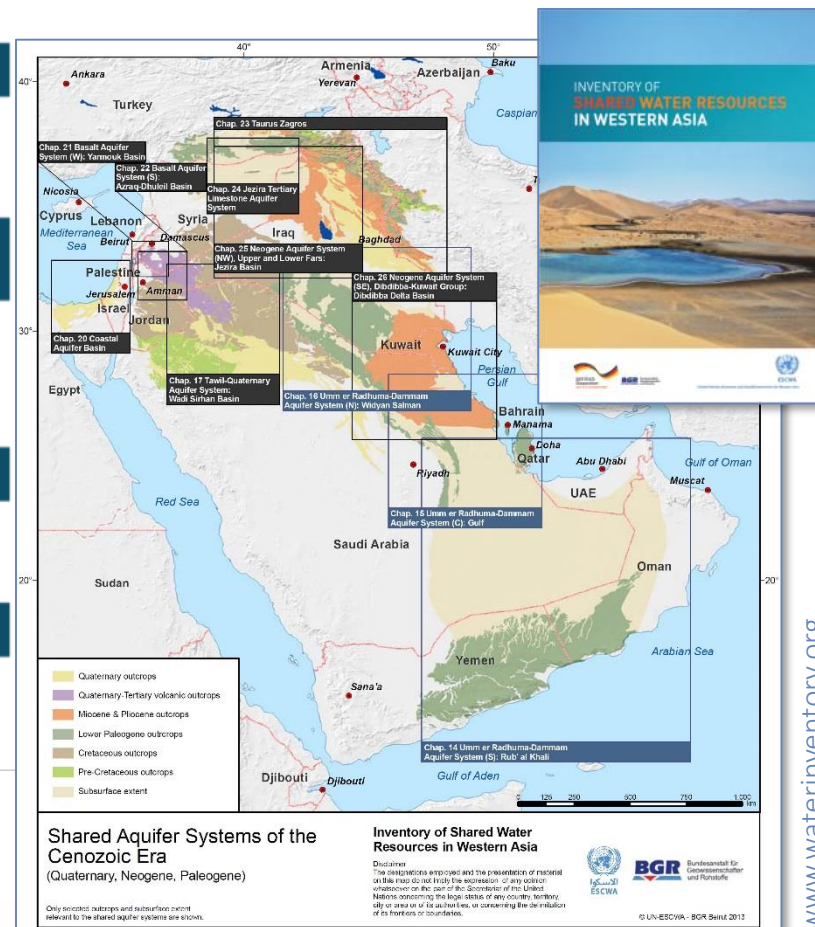


- List of agreements
- Cooperation between riparian countries
- Outlook

NOTES



BIBLIOGRAPHY



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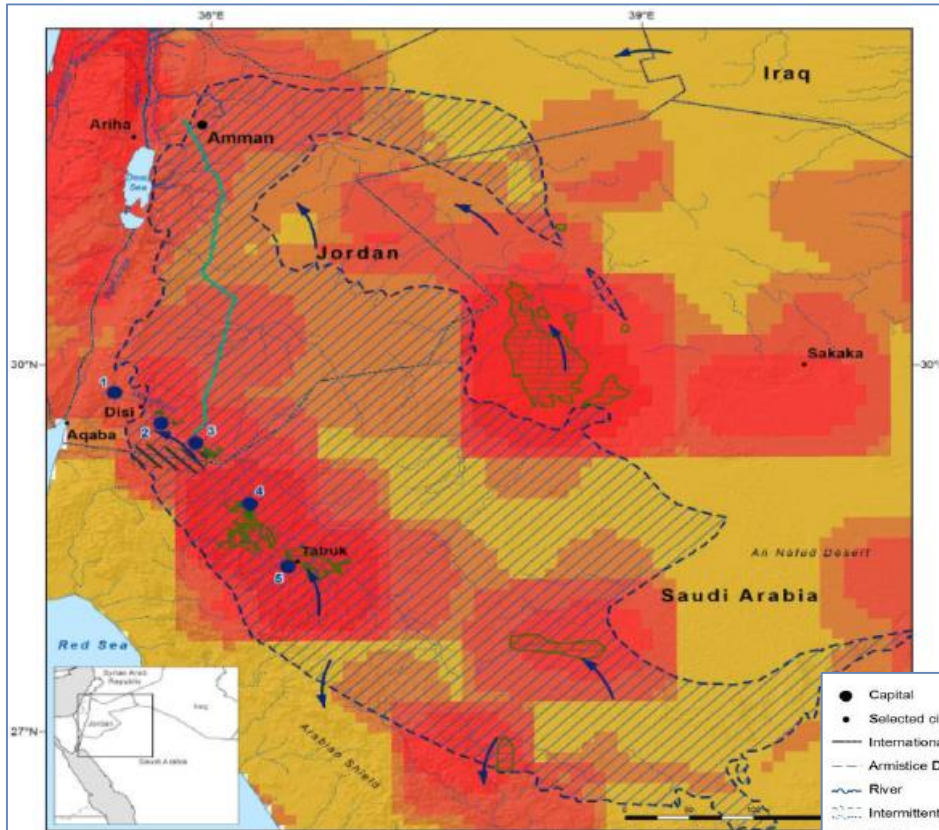
Water, energy and food in the MENA Region

Groundwater between Jordan and Saudi Arabia



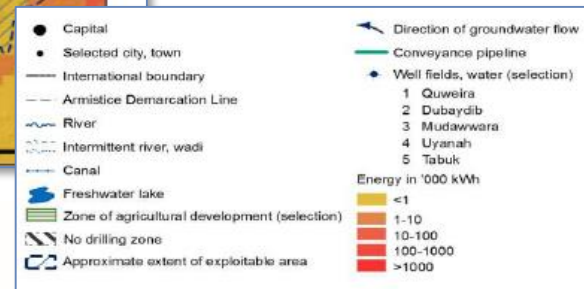
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Energy for Water: Saq-Ram Aquifer System

- Exploitable area,
- Irrigation areas,
- Energy use for groundwater pumping



2030 Agenda for Sustainable Development

- 17 Sustainable Development Goals (SDGs)
- 169 Targets
- 231 Indicators



2030 Agenda for Sustainable Development 17 Sustainable Development Goals (SDGs), 169 Targets, 231 Indicators



<https://sustainabledevelopment.un.org>

2030 Agenda for Sustainable Development SDG for water and sanitation



<https://sustainabledevelopment.un.org>
www.unwater.org

2030 Agenda for Sustainable Development



Target 6.3

Water quality and wastewater

6.3 By 2030, improve **water quality** by reducing pollution, eliminating dumping and minimizing release of hazardous chemicals and materials, halving the proportion of untreated **wastewater** and substantially increasing **recycling** and safe reuse globally

6.3.2: Proportion of **bodies of water with good ambient water quality**

Percentage of water bodies (area) in a country with good ambient water quality. (...)

electric conductivity/total dissolved solids;

percentage dissolved oxygen;

dissolved inorganic nitrogen/total nitrogen;

dissolved inorganic phosphorus/total phosphorus; and

faecal coliform/Escherichia coli bacteria. (...)

How relevant is quality of groundwater?



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2030 Agenda for Sustainable Development



Target 6.4

Water use and scarcity

6.4 By 2030, substantially increase **water-use efficiency** across all sectors and ensure sustainable withdrawals and supply of freshwater to address **water scarcity** and substantially reduce the number of people suffering from water scarcity

6.4.1: Change in **water use efficiency** over time

Output from a given economic activity (...), per volume of net water withdrawn by the economic activity. (...)

**Should non-renewable groundwater have different value?
Mining and groundwater?**



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Target 6.4

Water use and scarcity

6.4 By 2030, substantially increase **water-use efficiency** across all sectors and ensure sustainable withdrawals and supply of freshwater to address **water scarcity** and substantially reduce the number of people suffering from water scarcity

6.4.2: Level of water stress: **freshwater withdrawal as a proportion of available freshwater resources**

Ratio between total freshwater withdrawn (...) and total renewable freshwater resources. (...)

Non-renewable vs. renewable groundwater?



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Target 6.5

Water resources management

- 6.5 By 2030, implement **integrated water resources management** at all levels, including through **transboundary cooperation** as appropriate
- 6.5.2: Proportion of **transboundary basin area** with an **operational arrangement** for water cooperation

Percentage of transboundary basin area within a country that has an operational agreement or other arrangement for water cooperation. For the purpose of the indicator, “basin area” is defined (...) for groundwater as the extent of the aquifer. (...)

**Overlapping surface and groundwater catchments?
“Whole aquifer” approach?**



2030 Agenda for Sustainable Development



Target 6.6

Water-related ecosystems

6.6 **By 2020,** protect and restore water-related ecosystems, including mountains, forests, wetlands, rivers, aquifers and lakes

6.6.1: Change in the extent of water-related ecosystems over time

Changes over time in

(1) the spatial extent of water-related ecosystems (wetlands, forests and drylands);

(2) the quantity of water in ecosystems (rivers, lakes and groundwater); and

(3) the resulting health of ecosystems.. (...)

“Aquifers”: Underground zones that contain sufficient saturated permeable material to yield significant quantities of water to wells and springs



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Way forward – need for more research

- Valuation and socio-economic assessments of groundwater use – renewable vs. non-renewable
- Social and inter-generational justice – linkages to scarcity, drought and groundwater (miss-)management
- Transboundary cooperation through and beyond groundwater
- Improved governance of natural resources inc. groundwater

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