



NEAR EAST SOUTH ASIA
Center for Strategic Studies

Energy and Water Security in Jordan and Israel

David Katz



אוניברסיטת חיפה
University of Haifa
جامعة حيفا



Geostrategic Implications of Water & Energy in the Mid-East

Talk Outline:

1. **Environment, Natural Resources & Security**
2. **Geopolitics of water, especially shared waters**
3. **Water situation in Israel, Jordan & Palestine**
4. **Energy situation in Israel, Jordan & Palestine**
5. **Water-Energy Nexus**
6. **Potential solutions in the region**

Security & the Environment

Environmental issues affecting conflict

- We have to prevent further environmental degradation. If we fail these problems will cause terrorism, tension and war” (US President, Bill Clinton, 1994).
- The Darfur conflict began as an ecological crisis, arising at least in part from climate change.” (UN Secretary General Ban Ki Moon, 2007)



**NATIONAL SECURITY
AND THE THREAT OF
CLIMATE CHANGE**

SecurityAndClimate.cna.org

- Projected climate change poses a serious threat to America’s national security.
- Projected climate change will add to tensions even in stable regions of the world.

Security & the Environment

Conflict affecting the environment



Security & the Environment

Environmental issues affecting conflict

We have to prevent further environmental degradation. If we fail these problems will cause terrorism, tension and war” (US President, Bill Clinton, 1994)

The next war in the Middle East will be fought over water, not politics” (Egyptian Foreign Minister, and later UN Secretary General, Boutros Ghali)

The Darfur conflict began as an ecological crisis, arising at least in part from climate change.” (UN Secretary General Ban Ki Moon, 2007)

Geopolitics of Water

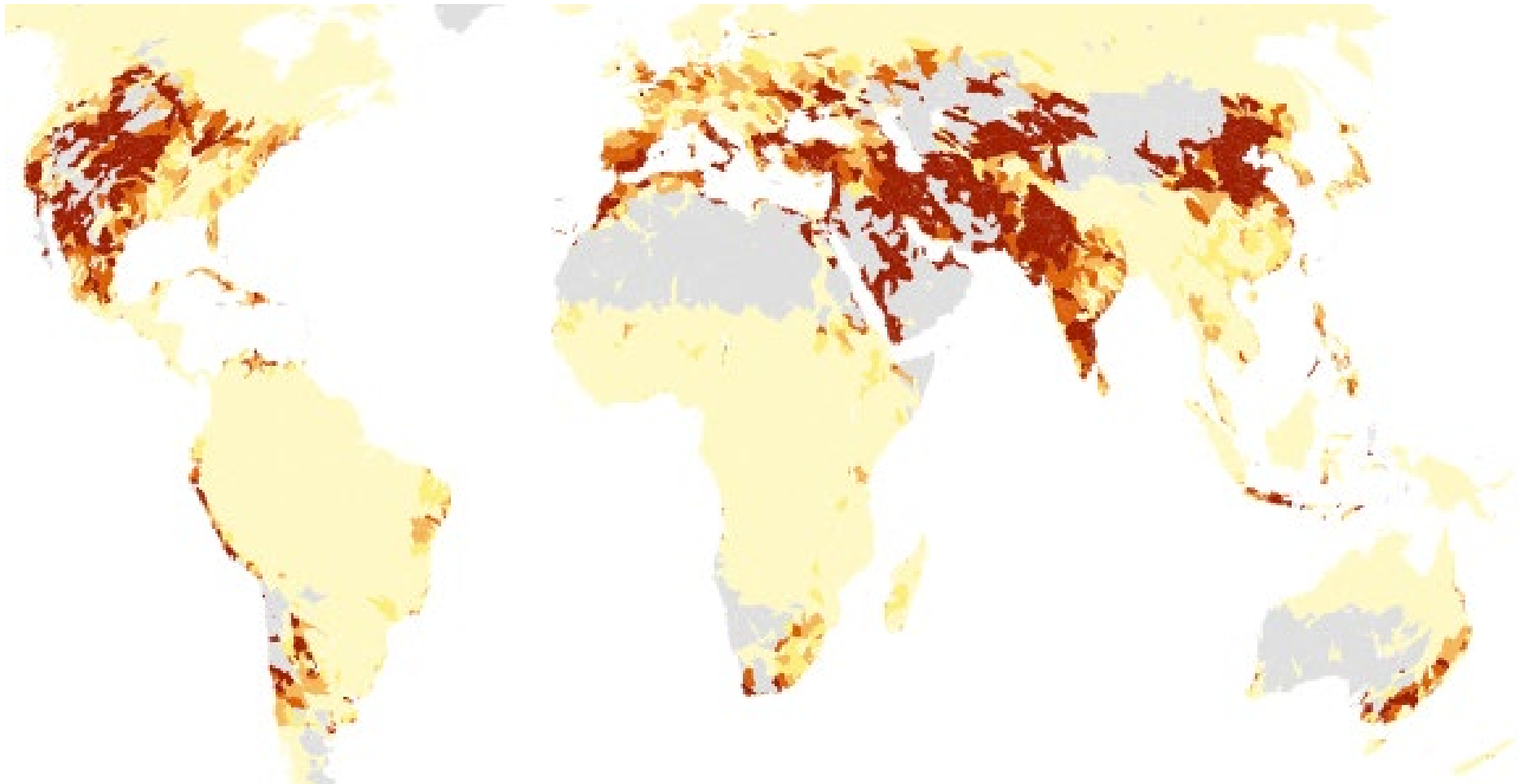
- **Water is perhaps the most critical resource, not only for drinking, but for agriculture, industry and commercial development.**
- **Therefore, access to freshwater of good quality is essential for political stability and economic progress.**
- **Growing populations and higher standards of living are causing increasing demand, while at the same time climate change and mismanagement are reducing available supplies.**
- **This is a recipe for trouble.**

A Quarter of Humanity Faces Looming Water Crises

By Somini Sengupta and Weiyi Cai Aug. 6, 2019



2020

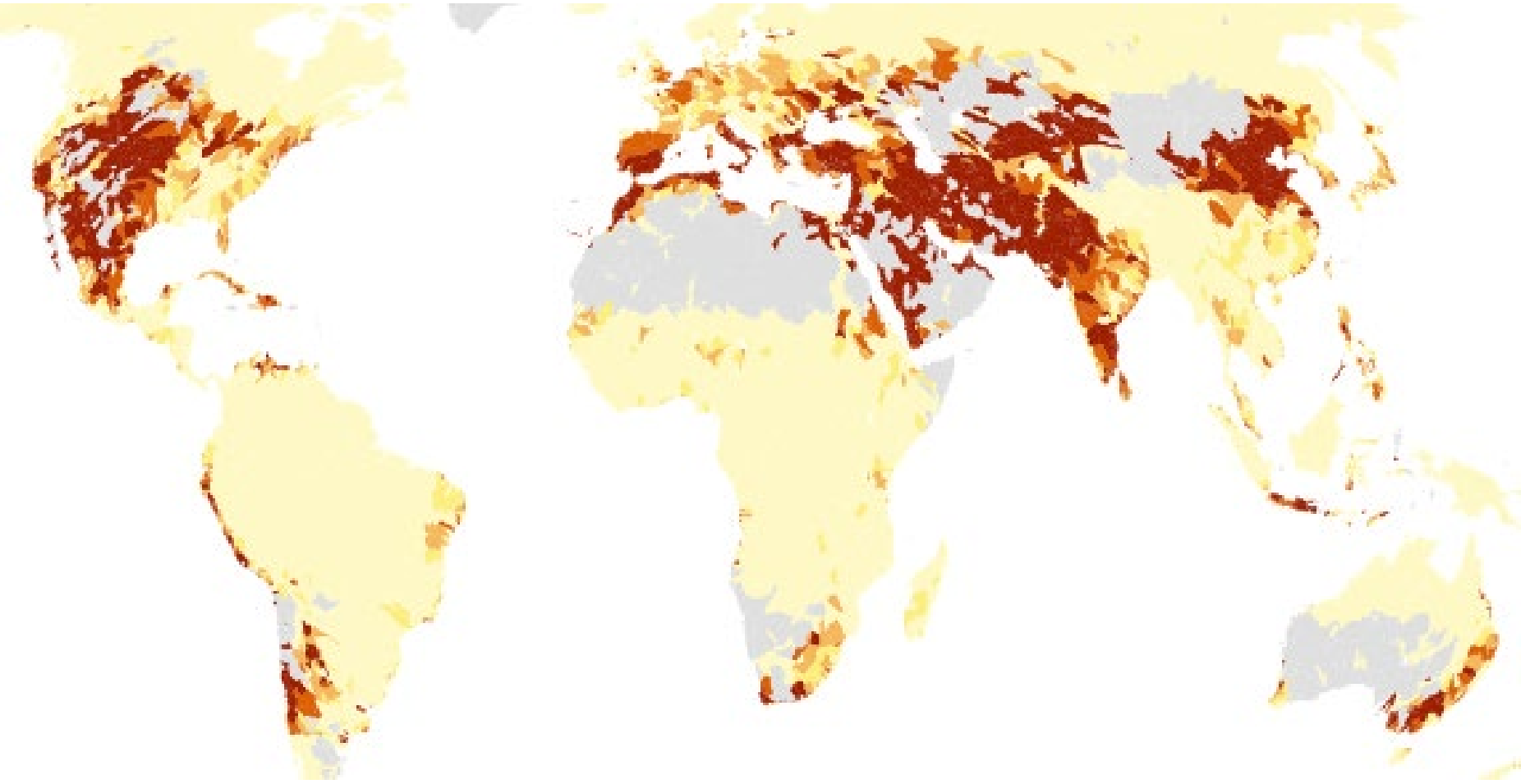


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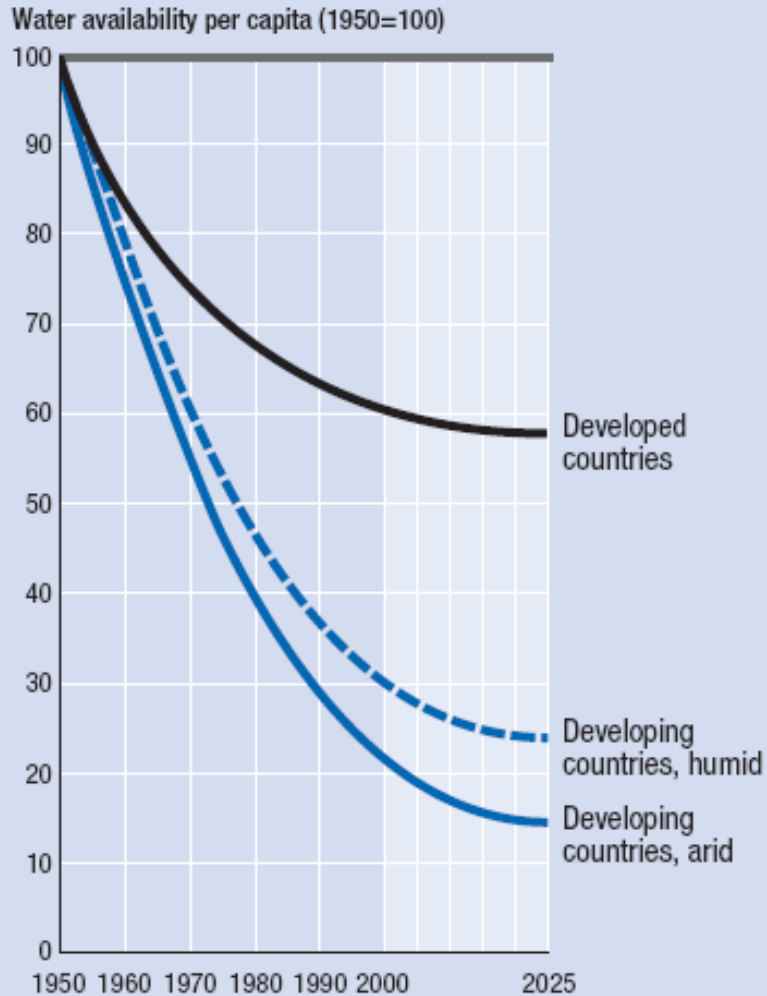


2040



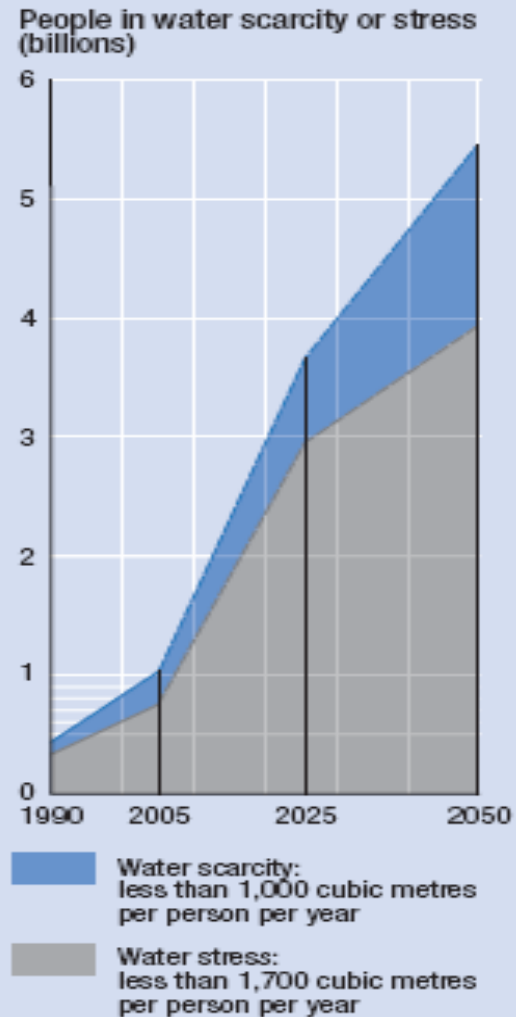
Global Water Scarcity Trends

Figure 4.1 Water availability in decline



Source: Pitman 2002.

Figure 4.3 Global water stress intensifying



Source: Calculated on the basis of FAO 2006.

Geopolitics of Water

Deadly street protests over Iran water shortages

July 26, 2021



BBC

Deadly fighting on Kyrgyzstan-Tajikistan border kills at least 31

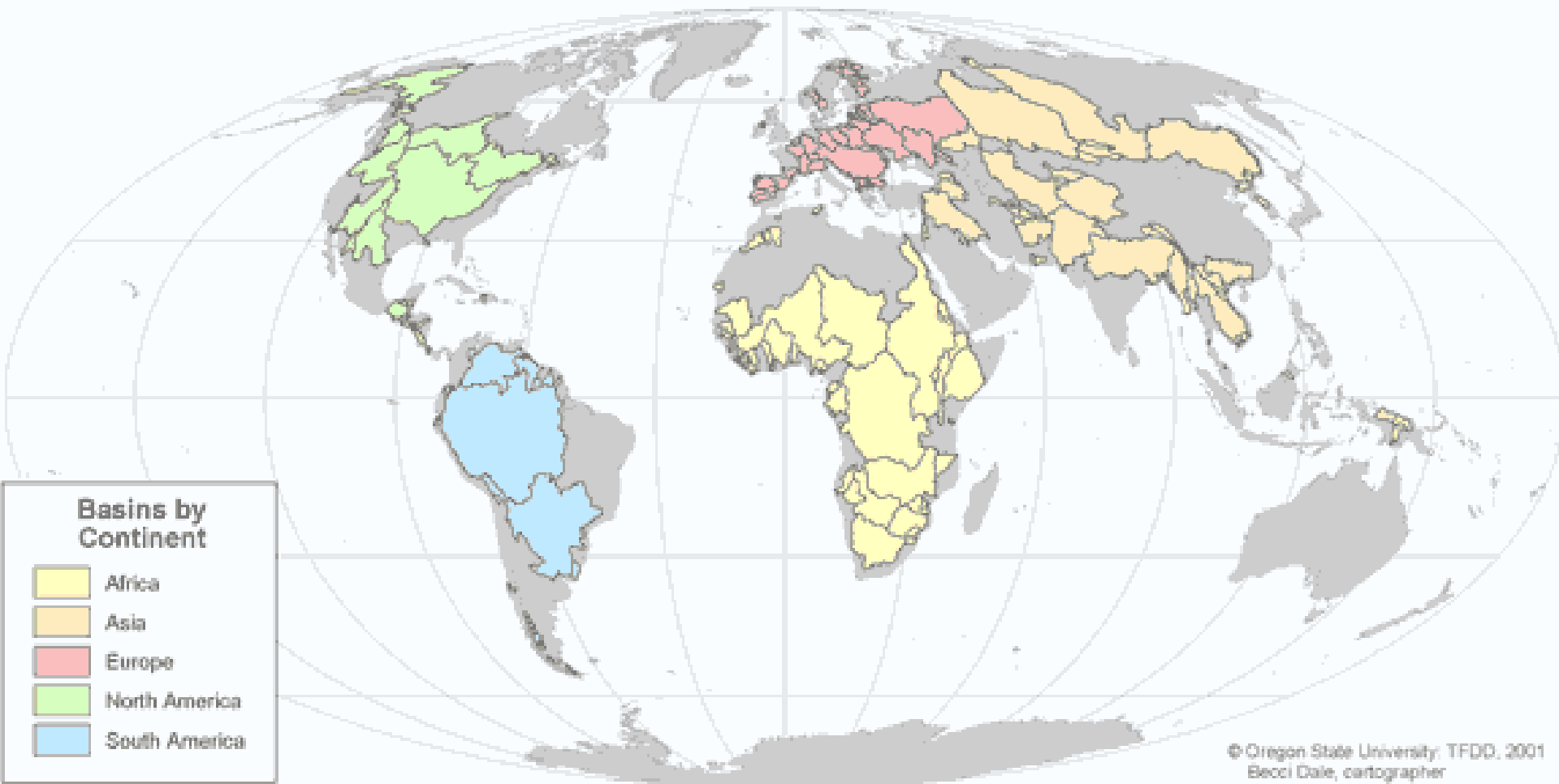
🕒 30 April

Geopolitics of Water

Water resources that cross international boundaries are particularly sensitive.

- ❑ At least 310 international river basins
- ❑ Over 230 international aquifers (groundwater reservoirs)
- ❑ Over 52% of the world's population lives in international river basin
- ❑ 80% of the world's freshwater is in international basins
- ❑ Over 90% of the world's population lives in countries with shared basins

Transboundary Rivers



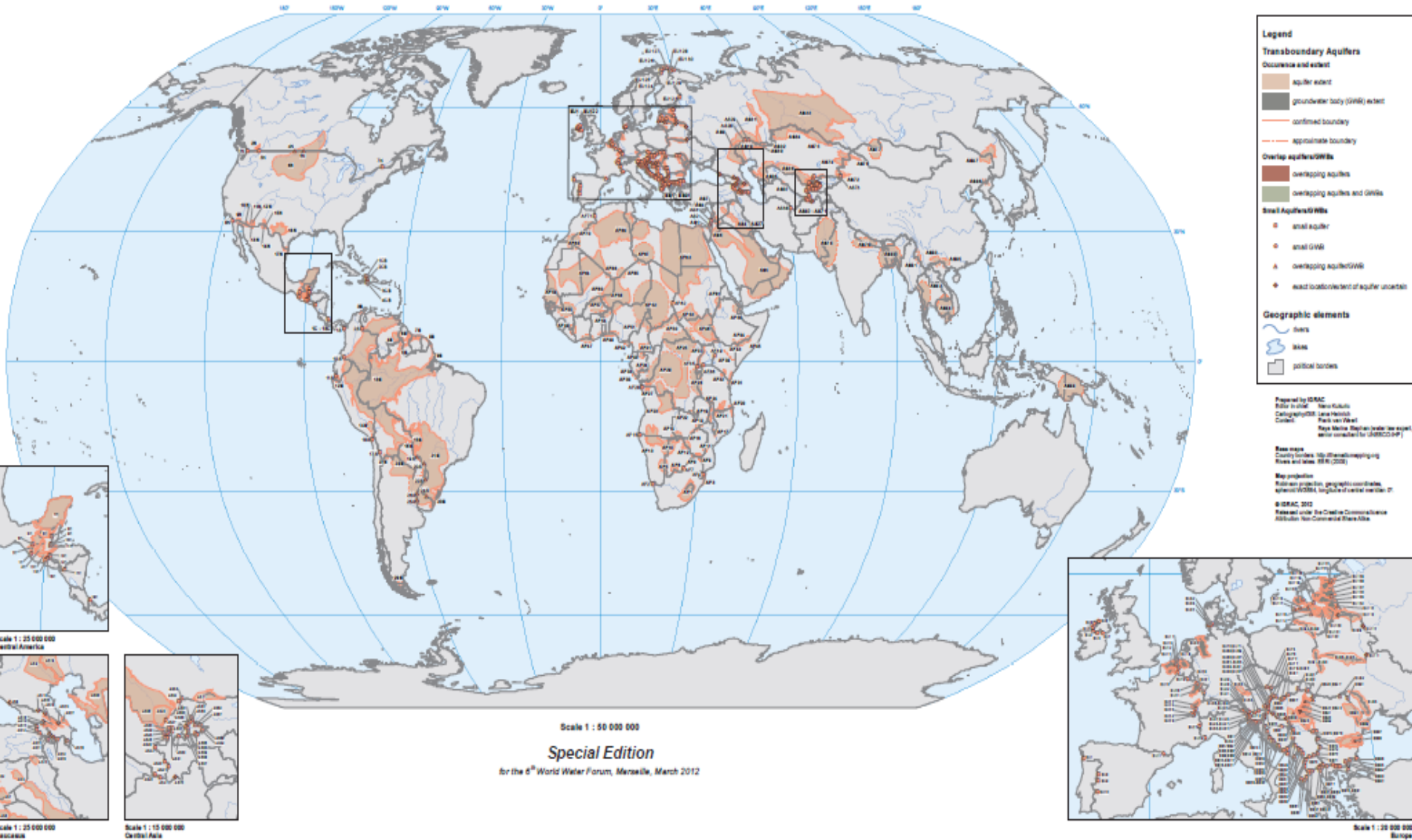
Transboundary Aquifers



International Group of Experts for Transboundary Aquifers

Transboundary Aquifers of the World

- Update 2012 -



Transboundary Waters

Characteristics of Transboundary Waters:

- Cross borders, and often are borders
- Common pool resource
- Raise questions of sovereignty
- Multiple uses: municipal, agricultural, industrial, ecological, navigation, power generation, fishing, recreation, and other uses
- Create situations of interdependency, often asymmetric and geographically determined

Transboundary Waters

Lots of declarations about the chance of conflict over scarce water.

- **Anwar Sadat** said that “the only thing that will lead Egypt to war again is water.”
- **Boutros Boutros Ghali** (Foreign Minister of Egypt & later Secretary General of U.N.) stated that Egypt’s “next war would be over water, not politics.”
- **Ismail Serageldin** (Vice President of the World Bank) said “the wars of the next (21st) century will be over water, not oil.”

Transboundary Waters

U.N Secretary Generals Kofi Annan and Ban Ki Moon, among others, have attributed at least part of the conflict in the **Darfur** region of Sudan to water shortages.

Several studies (e.g., Gleick, 2014; Kelley et al 2015) tie the political unrest in **Syria** to drought and climate change.



Transboundary Waters

But Not all Doom and Gloom

- Most cases don't lead to conflict
- Economically it usually doesn't pay
- Other relationships between states are just as or more important
- Can often reach agreements that are win-win or at least not zero-sum
- Often there are incentives to lots of actors (politicians, journalists, analysts) to exaggerate the risk of conflict.

Transboundary Waters

Analytical Outlooks for Transboundary Waters

Realist:

Limited resource → Not enough for all → Conflicts likely
(Zero-sum game)

Idealist/Functionalist:

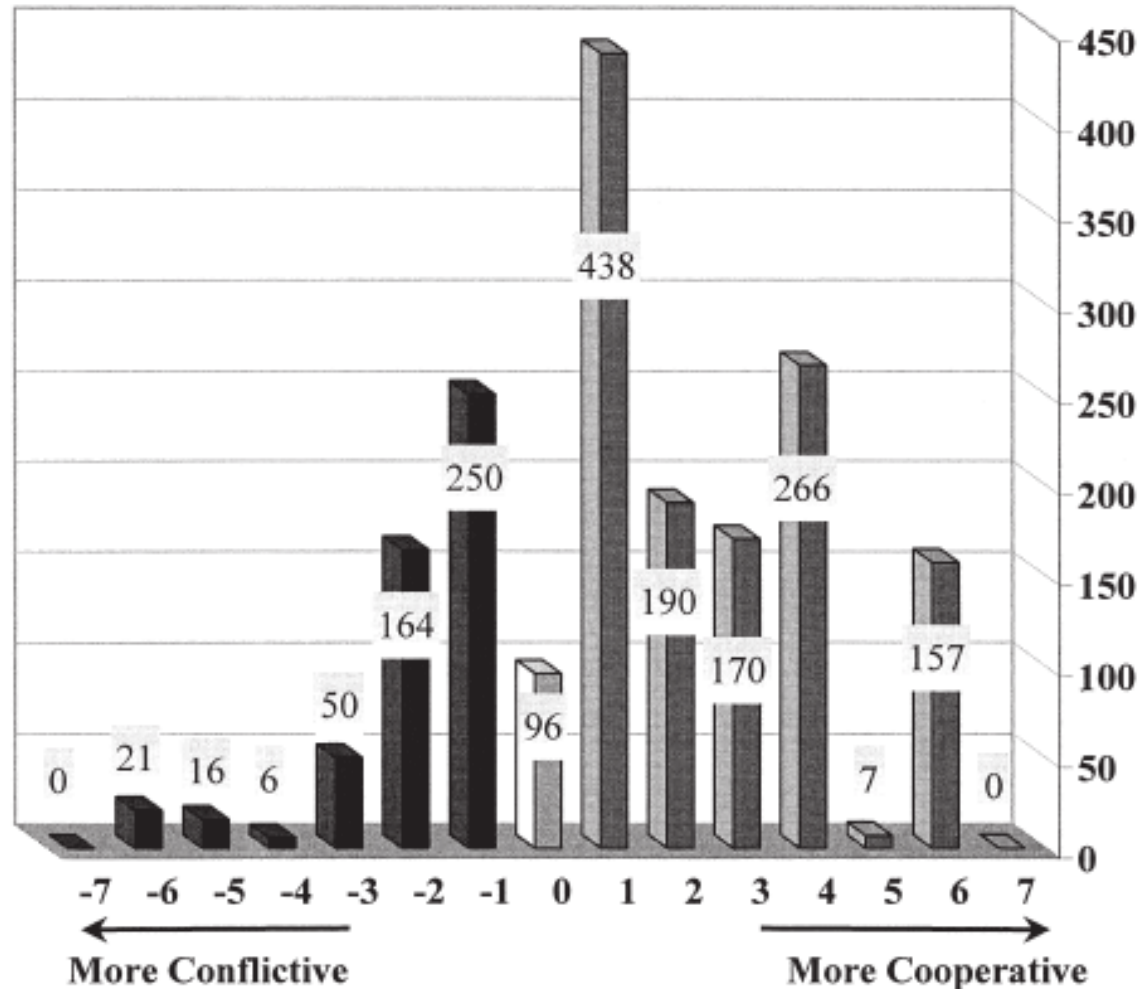
Limited resource → Not enough for all → Countries interdependent
→ Cooperation likely
(Positive sum game)

Cornucopian (Economic/Engineering):

Limited resource → Not enough for all → Countries interdependent
→ Need for efficiency and new sources (demand mgt. and supply mgt.) → Reduced scarcity and reduced dependency

Transboundary Waters

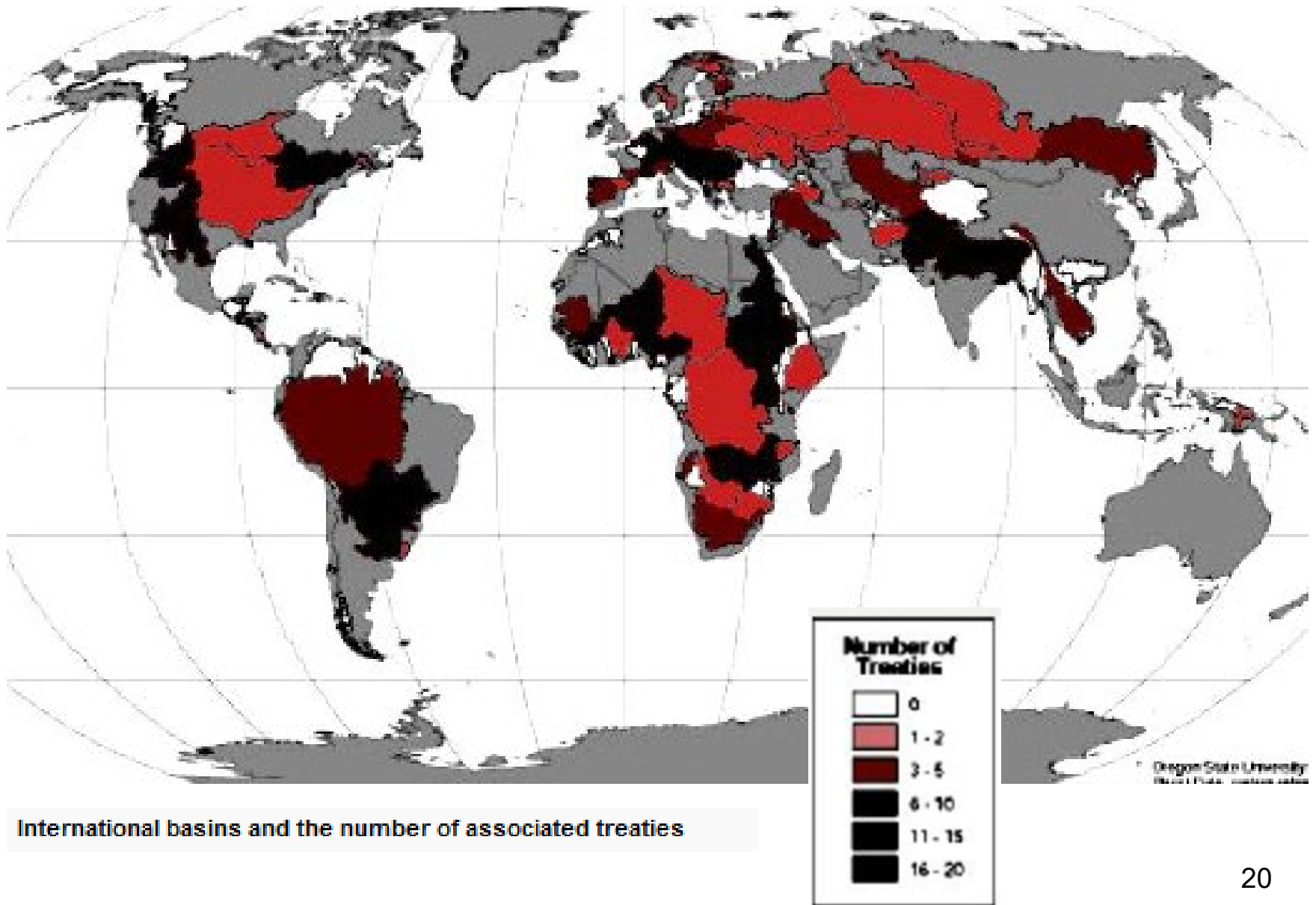
CONFLICT AND COOPERATION OVER INTERNATIONAL FRESHWATER RESOURCES: INDICATORS OF BASINS AT RISK



מקור: Yoffee et al 1998

Figure 1. Total Number of Events by BAR Intensity Scale.

Transboundary Waters



International basins and the number of associated treaties

International Law on Transboundary Waters

- **Helsinki Rules** (1967) (International Law Association) .First attempt to design criteria for international water sharing.
- **The Seoul Rules on International Groundwaters** (1986)
- **Berlin Rules** (2004) Update and integration of both the previous rules.
- **UN - Convention on the Law of the Non-navigational -Uses of International Watercourses** 1997. Attempt by U.N. to coordinate criteria for water sharing. Went into effect in 2014.
- **Bilateral and Multilateral Agreements** – over 450 of them dealing with a range of issues including allocation, pollution prevention, flood management, hydro-power, ecological issues, fishing rights, and others.
- **Water agreements within the context of other more general agreements.** Many broad international agreements have sections dedicated to water. This allows for issue linkage and broadens the scope of possible arrangements.

Water Law Allocation Criteria

According to international law, neither upstream or downstream riparian states have exclusive rights to shared waters.

Rather, all parties are obligated to the principle of “**Equitable Apportionment**”.

Lots of criteria for equitable apportionment:

- Historical use
- Geography (*share of flow, share of basin, access to other waters*)
- Demography (*population dependent on shared resources*)
- Economics (*importance to economy*)
- Environmental impacts*

But there are no relative weights to each criteria, which basically means each party can stress the issues it feels are most important.

In practice, negotiated agreements between countries or pure power politics tend to dictate transboundary water relations. 22

Water Geopolitics Summary

- **Water is an essential resource and is a an important geostrategic resource.**
- **Lack of access can serve as a direct source of conflict or, more often, as a “threat multiplier”, making existing instability worse.**
- **Transboundary waters are particularly sensitive politically.**
- **International water law sets out principles, but does not have a huge impact on international water management.**
- **In most cases, it has to be settled directly through negotiations and agreements between states.**

Water in the Mid-East

Most of Israel & Jordan's fresh water resources are shared, including:

- **The Jordan River Basin** (Israel, Jordan, Lebanon, West Bank, & Syria)
- **Mountain Aquifer** (Israel & West Bank)
- **Coastal Aquifer** (Israel & Gaza Strip)
- **Arava/Araba Aquifer** (Israel & Jordan)
- **Other aquifers** (Jordan with Iraq, Saudi Arabia, & Syria)

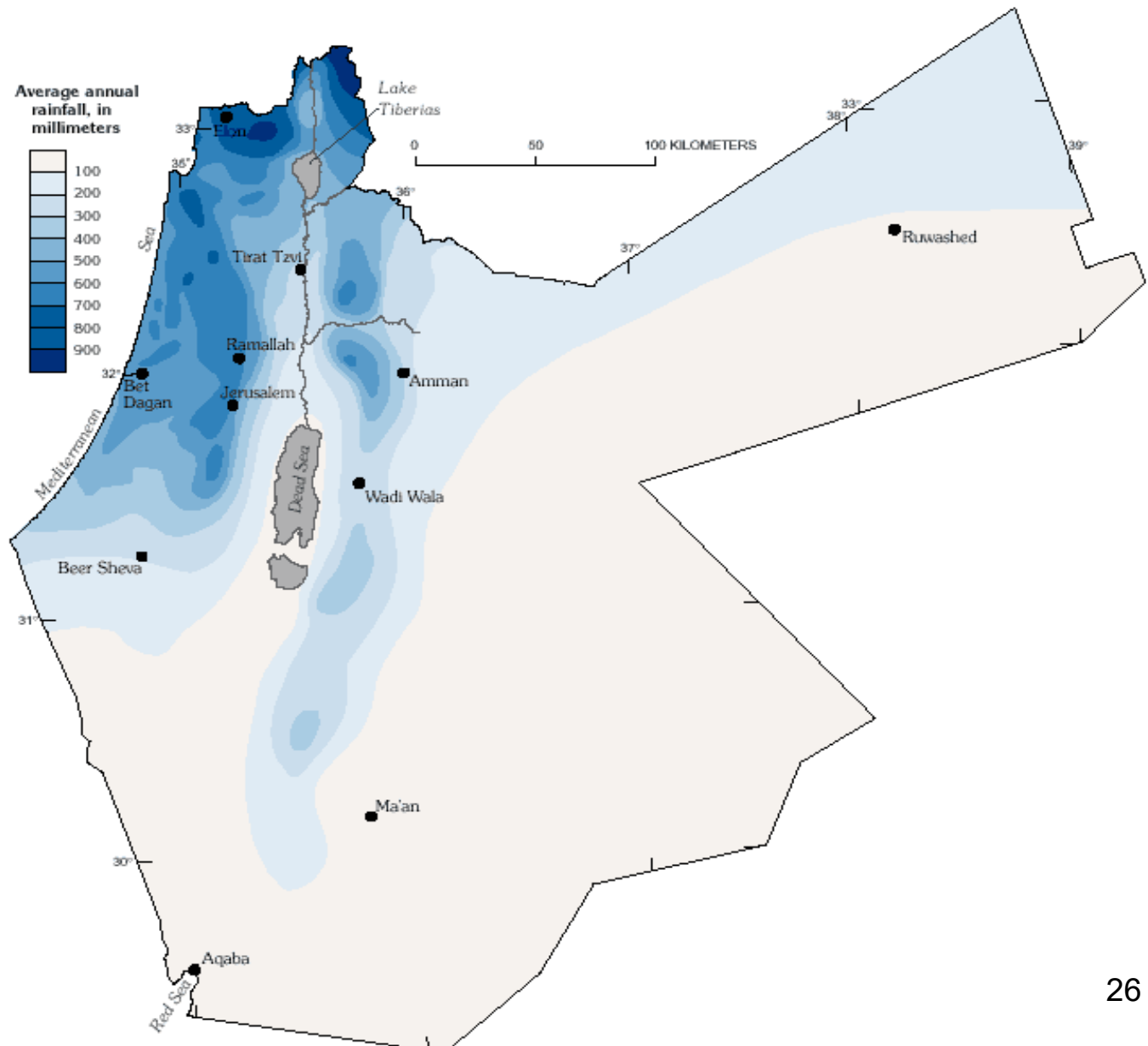
Most of Israel & Jordan's fresh water resources are located in a small portion of the territory of the countries.

Water in the Mid-East

Mediterranean climate

- **Rainfall concentrated in a few months**
- **Hot dry summers**
- **High evaporation rates**
- **High variability between years.**

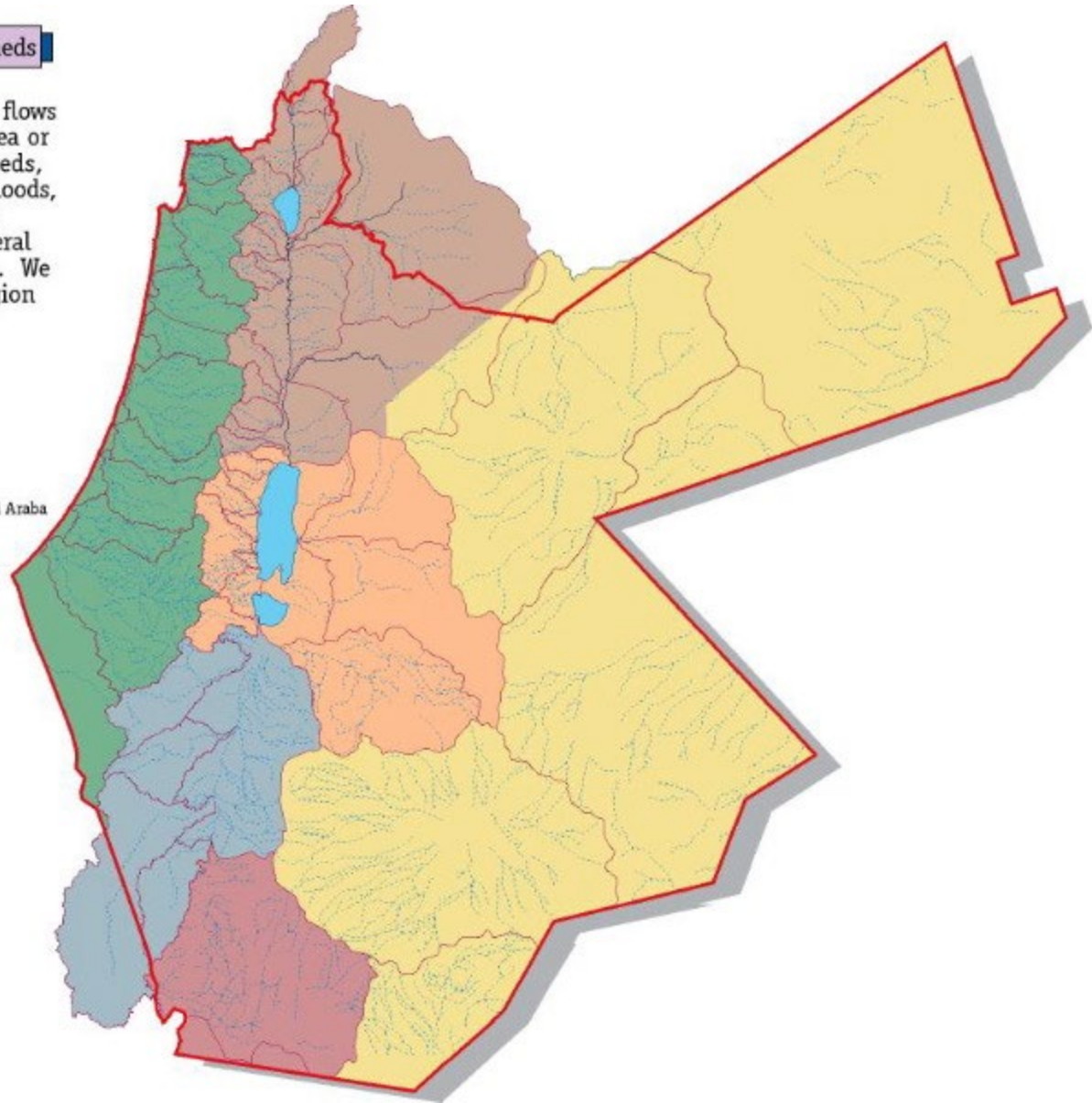
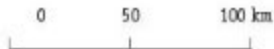
Water in the Mid-East



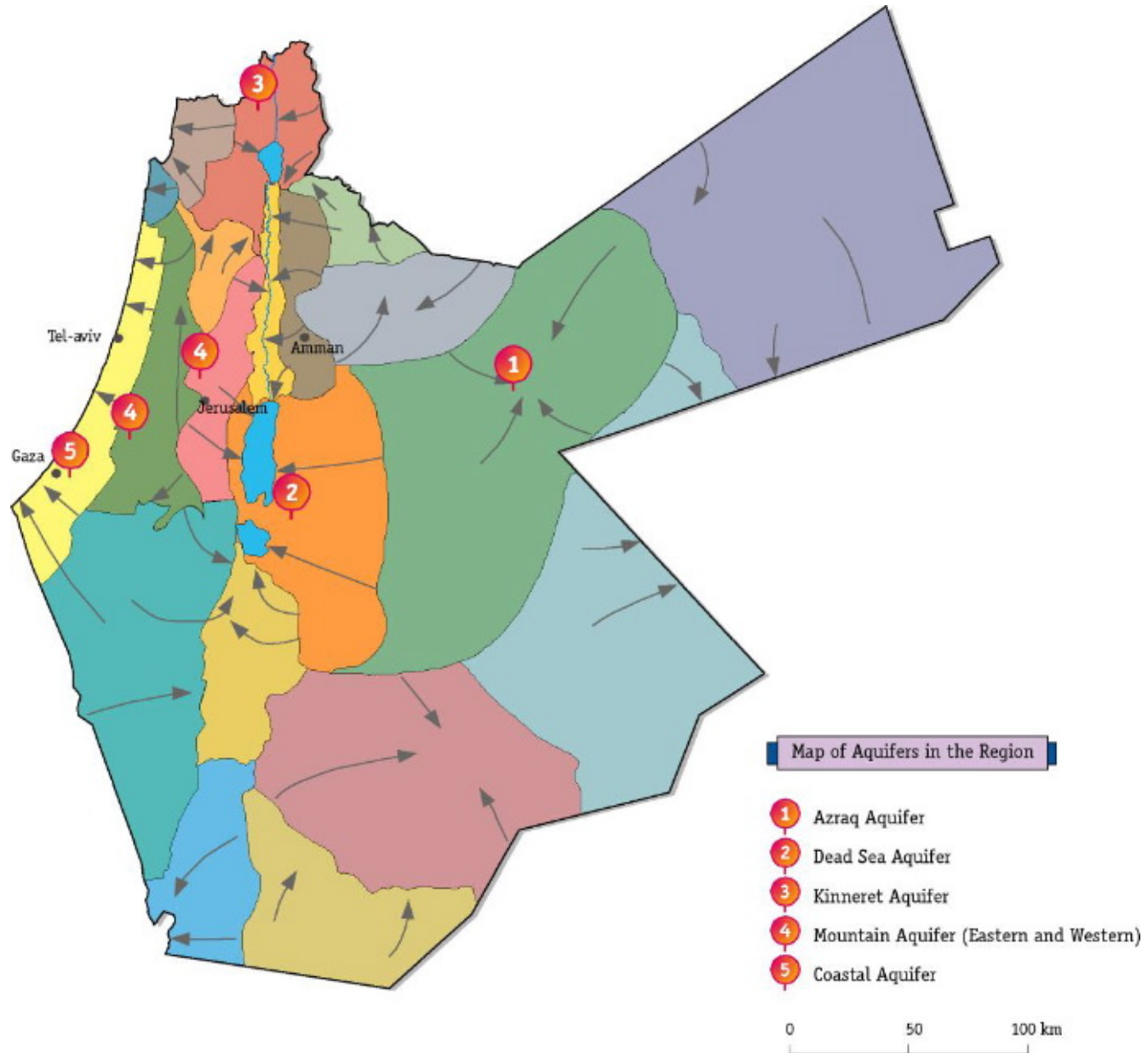
Water in the Mid-East

Map of Drainage Basins and Watersheds

Surface water in the region ultimately flows to the Mediterranean Sea, the Red Sea or the Dead Sea. In the desert watersheds, water flows on rare occasions during floods, and most of the water evaporates or penetrates into the ground. Ephemeral streams are marked by a broken line. We can see that most streams in the region are ephemeral.



Water in the Mid-East



Measures of Water Scarcity

Falkenmark Index

<1700 m³/cap/yr - Water Poor

<1000 m³/cap/yr - Water Poor

<500 m³/cap/yr - Chronic Water Scarcity



Water Scarcity in Mid-East Region

	Population (as of 2020) (millions)	Natural Renewable Freshwater Supplies (mcm/yr)	Per Capita Natural Renewable Freshwater Supplies (m ³ /yr/cap)
Falkenmark Water Stress Water Scarcity Chronic Water Scarcity			1700 1000 500
Israel (freshwater) (w/desal & wastewater)	9	1200-1500 2300-2600	130-170 250-290
Jordan	citizens 6.5-7 residents 10.5	800-1000	105-155 75-95
Palestine * West Bank Gaza	2-2.5 1.7-2.0	180 60	72-90 30-35
Lebanon	6.9	4500	650
Syria	~20	17,000	~850
World	7.8	55,000	7,000

Israeli-Jordanian Water

- Prior to the peace agreement, there were low-level unofficial contacts between the countries for minor coordination.
- Under peace treaty, Joint Water Committee set up to address water issues
- Jordan allows 20 mcm to flow from Yarmuk in winter, and Israel supplies 50 mcm in summer months.
- Israel got to work two enclaves of land in Jordan Valley & Arava for 25 years, with potential to renew.
- Since Arab spring, Israel also sells to Jordan additional water at cost.
- Commitment to jointly develop new sources of water, including desalination.

Future of Water in Mid-East

Israel, Jordan & Palestine already use more than 100% of renewable water resources.

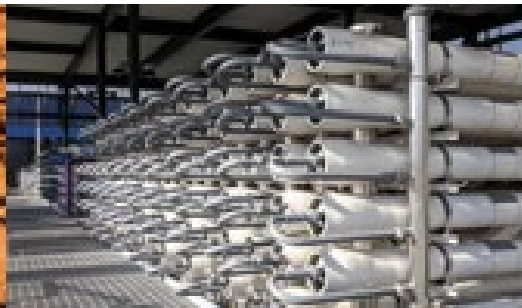
- **Climate change means:**

Less rainfall, more droughts, less predictability, more evaporation, more storms → more runoff, less recharge

- **Growing populations mean:**

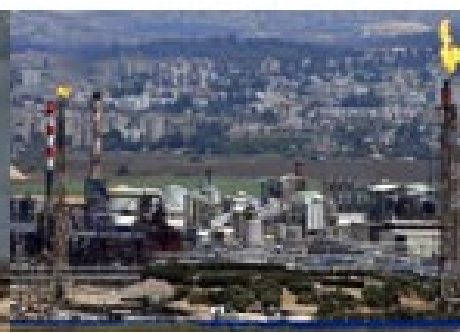
More demand, more development → more runoff, less recharge.

All three will need to invest in water conservation, wastewater reuse, and development of new sources of water, primarily via desalination.



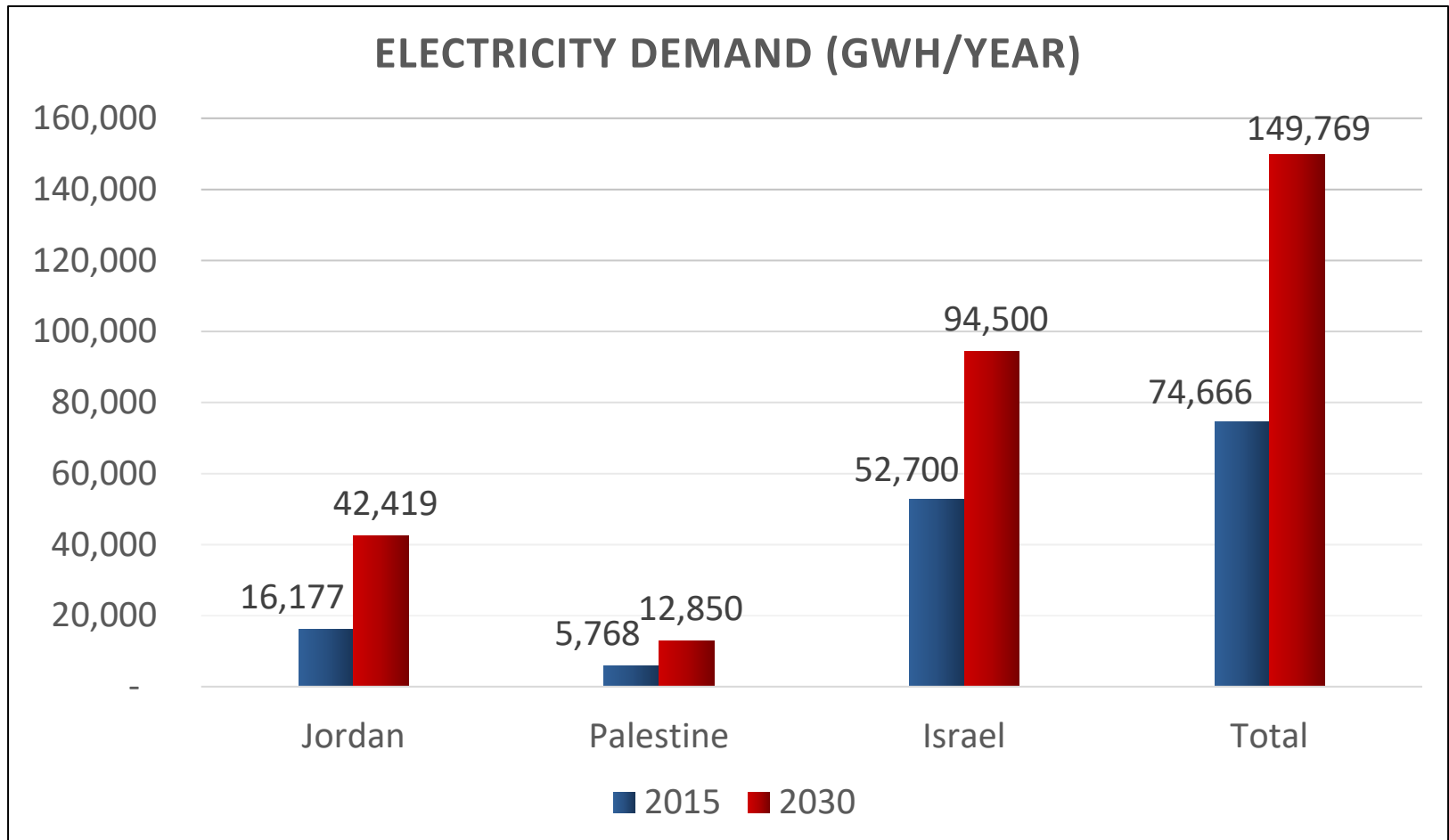
Energy in Region

- Israel and Jordan have limited local energy sources.
- Until recent finds of natural gas in Mediterranean by Israel, both countries almost completely dependent on imports of fossil fuels for energy.
- Jordan imports over 90% of energy fuels, & Israel roughly 70%, including almost all petrol and coal.
- Gas imports from Egypt to both countries bombed several times in Arab Spring, and have ceased. Since then, Israel agreed to sell natural gas to Jordan (and Egypt).



Energy in Region

Energy in both countries (and Palestine, which gets most of its energy from Israel) is expected to increase dramatically in the near future.



Energy in Region

- **Both countries have committed to substantially develop renewable energy.**
- This is beneficial for environment, and reduces dependency on foreign fuels and saves foreign exchange.
- Because of natural endowments, biggest potential for renewable energy is solar, but also wind, wave & other.
- Solar energy costs are decreasing and now competitive with new fossil fuel power plants.
- Still issues of intermittent supply.

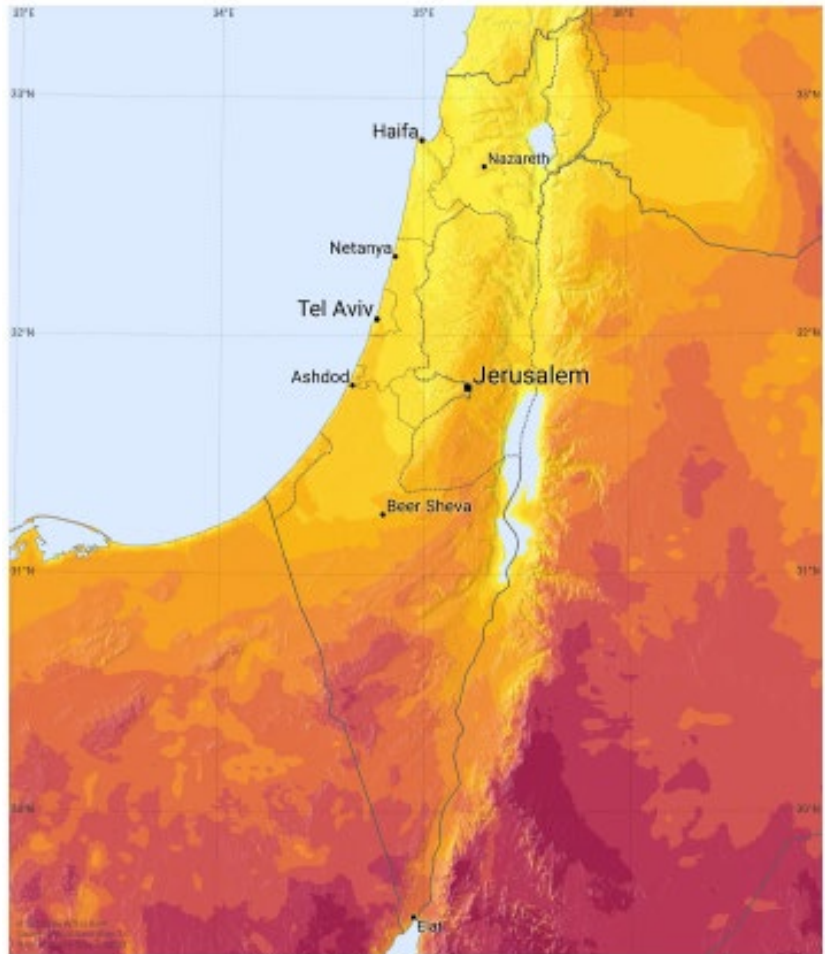


Energy in Region

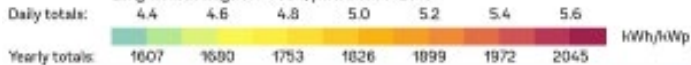
SOLAR RESOURCE MAP

PHOTOVOLTAIC POWER POTENTIAL

ISRAEL



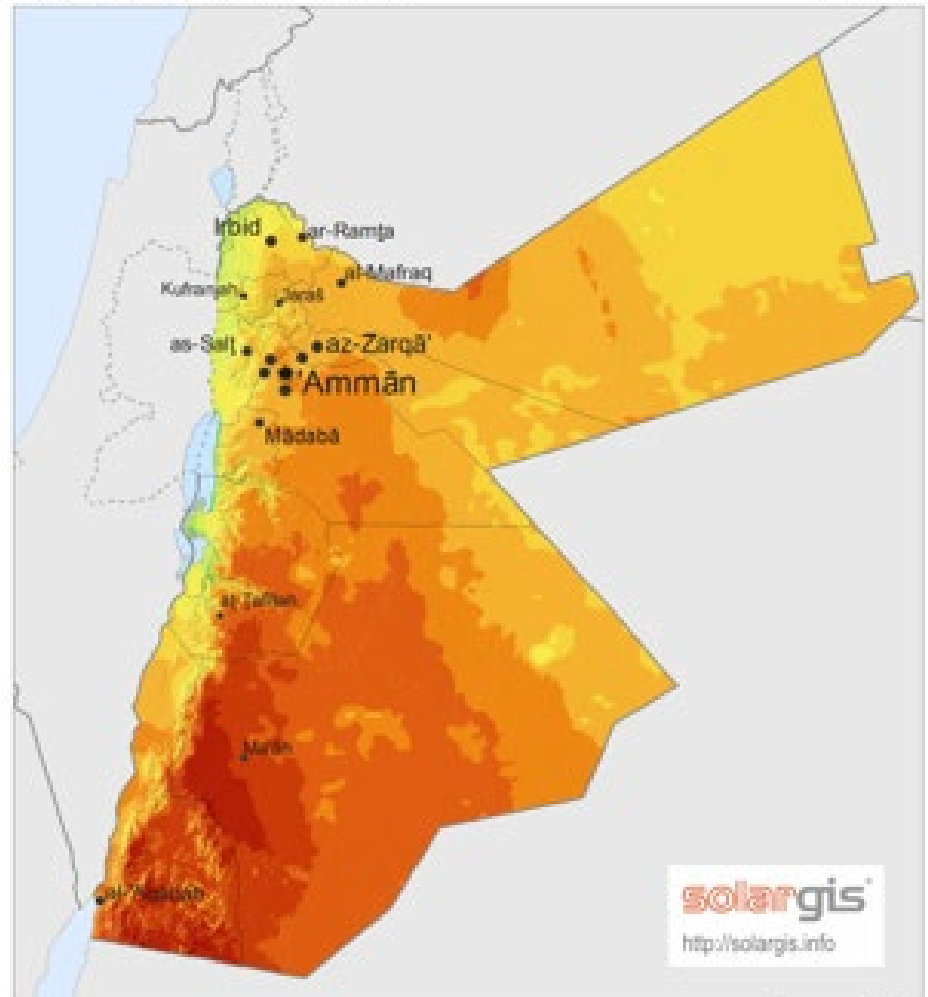
Long term average of PVOUT, period 1999-2018



This map is published by the World Bank Group. Funded by ESMAP and prepared by Solargis. For more information and terms of use, please visit <http://globalhelio.com/>.

Direct Normal Irradiation

Jordan

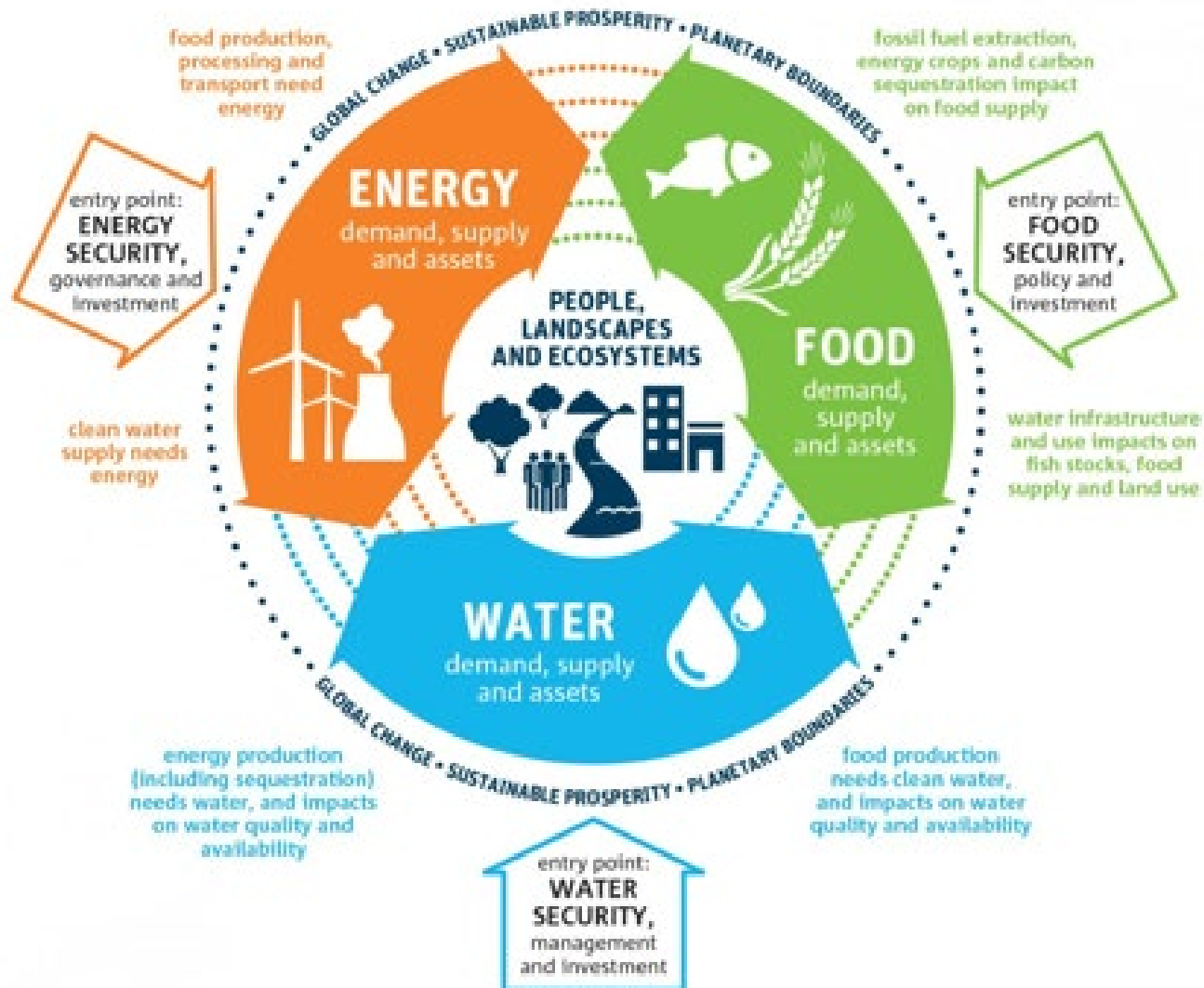


Average annual sum, period 1994-2010



Water-Energy Nexus

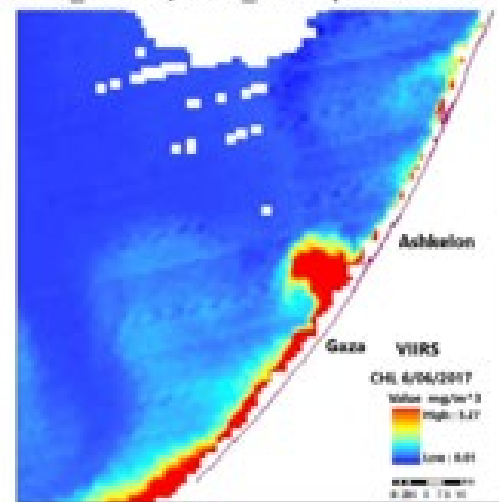
Water and energy resources are extremely interconnected



Water-Energy Nexus

- **Water and energy resources are extremely interconnected**
- **The water sector (pumping, desalination, treatment) is one of the largest consumers of energy in each country.**
- **Water is need for cooling and cleaning of energy facilities.**

VIIRS_ June 6, 2017_ Chl-a (not calibrated)



Potential Solutions

Water Sharing and the Red-Dead Transfer



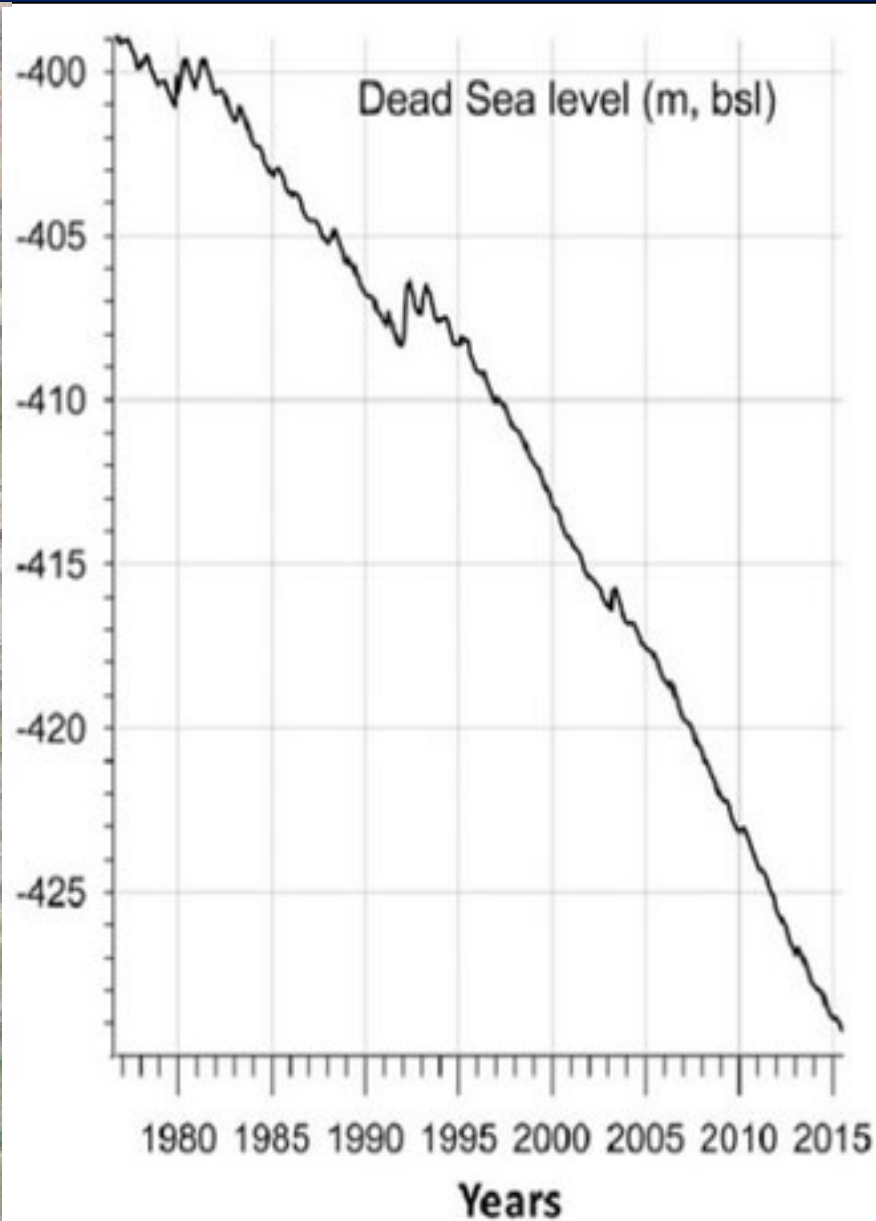
Basemap courtesy ESRI, USGS, NOAA.
mcm = million cubic meters

Red-Dead Canal

- Desalinate seawater in Aqaba to supply freshwater to Jordan
- Send brine water to Dead Sea to stabilize sea levels
- Regional water swaps to increase economic efficiency



Potential Solutions



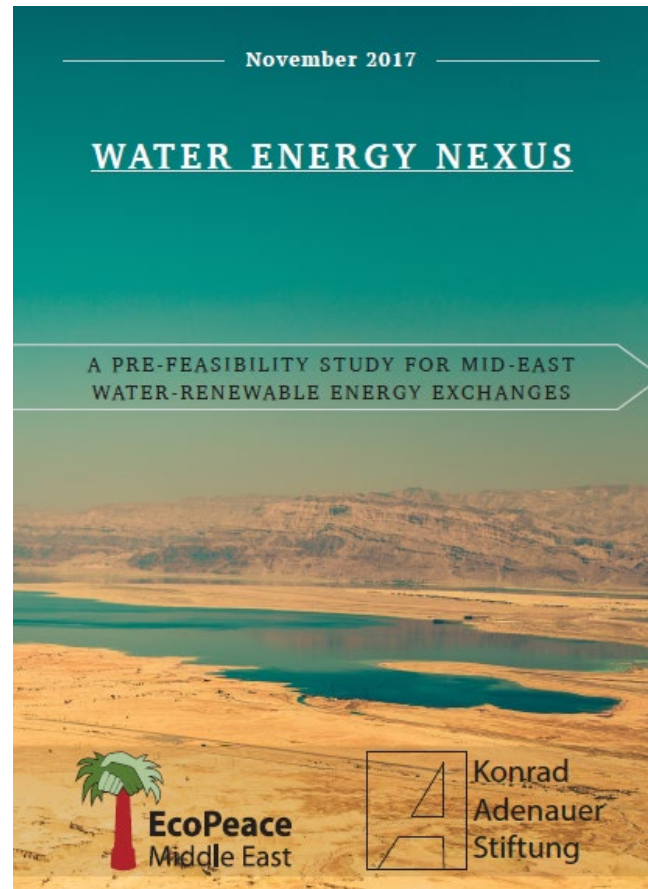
Potential Solutions

Red-Dead Canal

Pros	Cons
Much needed freshwater for Jordan	Expensive (billions of dollars)
Jordanian control of water resources	Inefficient – Aqaba far from population
International funding	Potentially environmentally damaging to Gulf of Aqaba, Arava/Araba and to Dead Sea
Joint cooperative project	
Stabilize Dead Sea levels	Along earthquake fault line
Energy produced by difference in sea-levels can offset some of project energy consumption.	

Potential Solutions

Water Energy Swaps



Potential Solutions

Water Energy Swaps - Rationale:

- Israel and Palestine are both densely populated.
- Land available for large scale renewables in both countries is relatively scarce and development of the land for such purposes faces many regulatory obstacles.
- Jordan has plentiful open land suitable for renewable energy.
- Israel and Palestine both have ready access to the sea and can desalinate easily, while Jordan's access to the sea is limited to the Red Sea, far from its population centers.
- **Therefore, all countries could potentially benefit from a regional project in which Jordan supplies renewable energy to all countries and Israel and/or Palestine supplies Jordan with desalinated seawater.**

Potential Solutions

Water Energy Swaps - Rationale:



Potential Solutions

Water Energy Swaps

	Pros	Cons
Israel	Water supplier	Reliance on Jordan for energy
	Renewable energy w/out land	
	Network/grid Integration	
Jordan	Cheaper supply of water	Reliance on Israel for water
	Regional energy supply hub	
	Gives Jordan leverage vis-à-vis Israel	
Palestine	Renewable energy w/out land	
	Reduced reliance on Israel	
	Increased integration with Jordan & Arab world	

Potential Solutions

Water Energy Swaps

	Pros	Cons
General	Joint regional cooperation	Increased dependencies for water and energy
	Efficient use of land & resources	Need to solve issue of energy storage / intermittency
	Regional electrical grid integration	Political opposition
	Potential international funding	Risk of sabotage
	Environmentally sound	Need for significant infrastructure investment
	Could be private sector led	May not help Dead Sea

Potential Solutions

Where things stand today

- **Red-Dead still official policy of Jordan & Israel.**
- **First stage – Desal in Aqaba with regional swaps is in planning stages.**
- **Israel less enthusiastic**
- **Israel's officially called for investigating potential of import of renewable energy from Jordan.**

Summary

- **Water & energy are both important for assuring national and regional economic & political security.**
- **Water & energy supplies are interconnected.**
- **Region suffers from chronic water scarcity and is highly dependent on outside resources for energy supplies.**
- **Increased demand for water will almost certainly be met by desalination, and future energy demand will be increasingly supplied by renewable sources.**
- **There are potential opportunities for cooperation that could reduce scarcity and environmental impacts. Need for creative solutions.**

Thank you

