

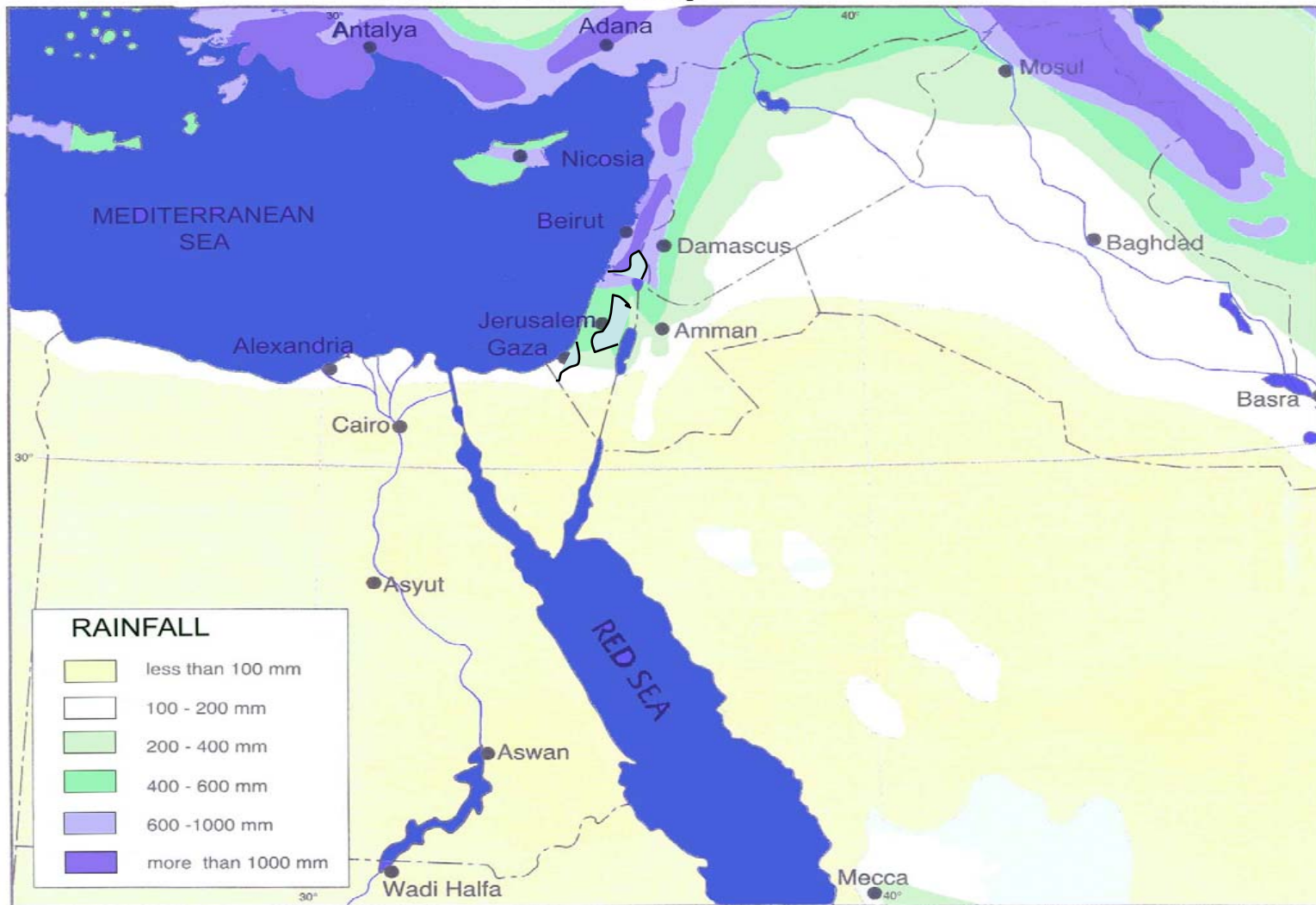
Water Sustainable Development A Challenge for Regional Cooperation



Shimon Tal

The Extent of Water Shortage

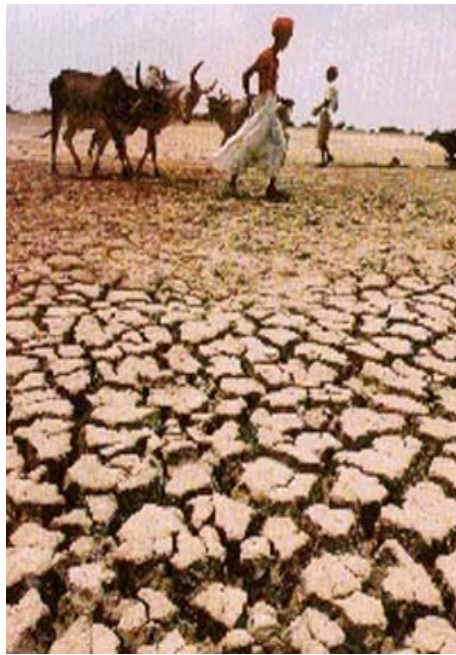
The Desert Strip in the Middle-East



Global Warming - the effect on water

changes in rain

- amount
- location
- period



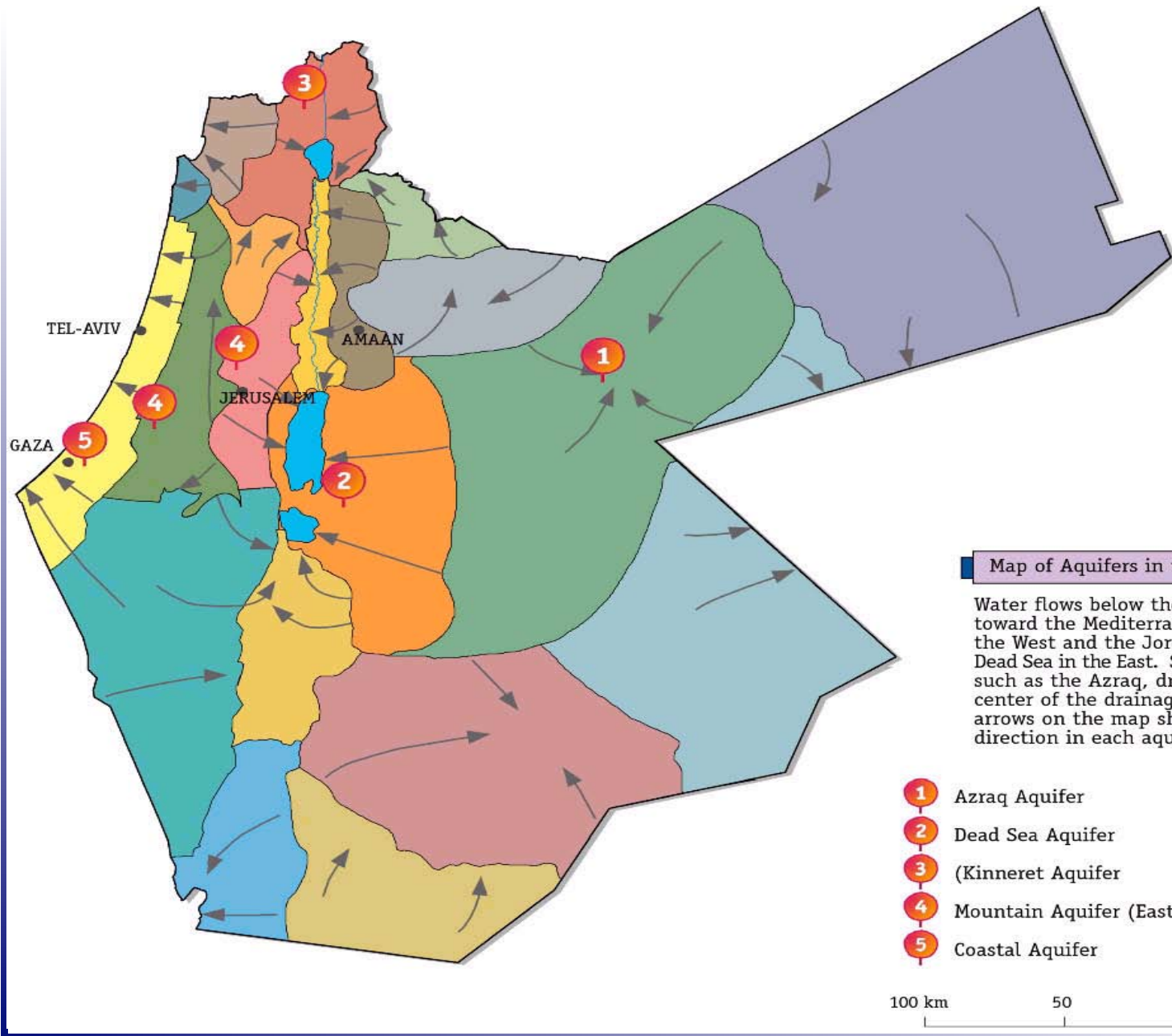
Increase of extreme conditions

- drought
- hurricanes
- storms



Climate Change ?!?!

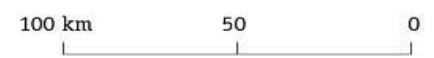


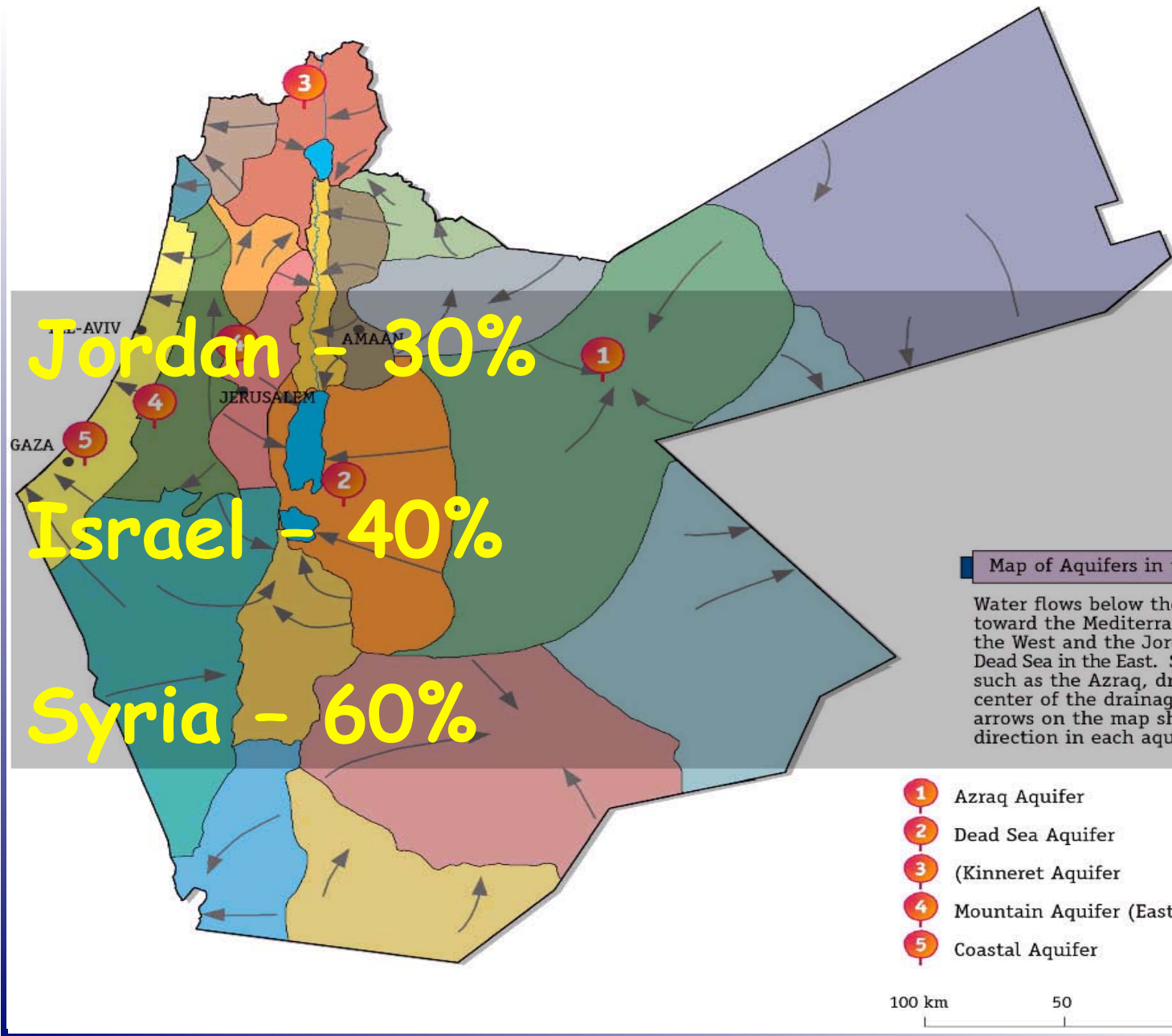


Map of Aquifers in the Region

Water flows below the surface toward the Mediterranean Sea in the West and the Jordan Rift and Dead Sea in the East. Some aquifers, such as the Azraq, drain into the center of the drainage basin. The arrows on the map show the flow direction in each aquifer.

- 1** Azraq Aquifer
- 2** Dead Sea Aquifer
- 3** (Kinneret Aquifer)
- 4** Mountain Aquifer (Eastern and Western)
- 5** Coastal Aquifer





Jordan - 30%

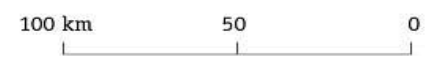
Israel - 40%

Syria - 60%

Map of Aquifers in the Region

Water flows below the surface toward the Mediterranean Sea in the West and the Jordan Rift and Dead Sea in the East. Some aquifers, such as the Azraq, drain into the center of the drainage basin. The arrows on the map show the flow direction in each aquifer.

- 1 Azraq Aquifer
- 2 Dead Sea Aquifer
- 3 (Kinneret Aquifer)
- 4 Mountain Aquifer (Eastern and Western)
- 5 Coastal Aquifer



The Extent of Water Shortage

Availability of Freshwater in 2000
Average River Flows and Groundwater Recharge

Natural Resources 2600 mcm - 157 m³/y/capita - 31% of "Shortage Red Line" of UN

2025 - Domestic and Municipal needs only

100% efficiency - complicated

Countries with the least freshwater resources

Egypt	:	26
United Arab Emirates	:	61

Countries with the most freshwater resources

Suriname	:	479 000
Iceland	:	605 000



Data not available

0 1 000 1 700 5 000 15 000 50 000 605 000 m³ per capita per year

PHILIPPE BEKAECHEWICZ
MARCH 2002

Source: World Resources 2000-2001, People and Ecosystems: The Fraying Web of Life. World Resources Institute (WRI), Washington DC, 2000.



The Water Cycle*

* Scientific American - Aug. 2008

		Bcm/y	per/c
Rainfall on lands	100%	110,000	16,240
Green Water	61.1%	67,210	9,920
Flows through the landscape	56%	61,600	9,090
Natural Irrigation	5.1%	5,610	830
Blue Water	38.8%	42,680	6,300
Flows to the ocean	36%	39,600	5,850
Agricultural Irrigation	1.4%	1,540	230
Municipalities & Industry	0.1%	110	16
Evaporation from surface	1.3%	1,430	1,430
Total Agriculture	6.5%	7,150	1,060
Direct use by man	1.5%	1,650	245



The Water Cycle*

* Scientific American - Aug. 2008

		Bcm/y	per/c
Rainfall on lands	100%	110,000	16,240
Green Water	61.1%	67,210	9,920
Flows through the landscape	56%	61,600	9,090
Natural Irrigation	5.1%	5,610	830
Blue Water	38.8%	42,680	6,300
Flows to the ocean	36%	39,600	5,850
Agricultural Irrigation	1.4%	1,540	230
Municipalities & Industry	0.1%	110	16
Evaporation from surface	1.3%	1,430	1,430
Total Agriculture	6.5%	7,150	1,060
Direct use by man	1.5%	1,650	245



The Water Cycle*

* Scientific American - Aug. 2008

		Bcm/y	per/c
Rainfall on lands	100%	110,000	16,240
Green Water	61.1%	67,210	9,920
Flows through the landscape	56%	61,600	9,090
Natural Irrigation	5.1%	5,610	830
Blue Water	38.8%	42,680	6,300
Flows to the ocean	36%	39,600	5,850
Agricultural Irrigation	1.4%	1,540	230
Municipalities & Industry	0.1%	110	16
Evaporation from surface	1.3%	1,430	1,430
Total Agriculture	6.5%	7,150	1,060
Direct use by man	1.5%	1,650	245



Virtual Water

Annual Global Trade in Virtual Water exceeds
800 Bcm/y - (10 times the Nile River)

Liberalizing trade of farm products +

Reducing tariffs restrictions = Truly free farm
trade

Global Virtual Water up to 1,700 Bcm/y



Food Supply Israel

Import of food 2005

Cereals and cereal products	95%	imported
Sugar, Sweets & Honey	100%	imported
Grains	52%	imported
Vegetables	33%	imported
Fruits	31%	imported
Oils & Fats	28%	imported
Meat - all kinds (Cattle)	12% (72%)	imported
Fish	81%	imported
Milk & Dairy	14%	imported
Coffee, Tea Cocoa	100%	imported



Population 2040

	W.B. 2007		2020		2040	
	%	m.inh	%	m.inh	%	m.inh
Israel	2.5	7.2	1.6	8.85	1.4	11.7
Jordan	3.5	5.7	2.8	8.16	2.5	13.4
Palestinians	3.7	3.7	3.0	5.43	2.7	9.25
Lebanon	1.9	4.1	1.7	5.1	1.5	6.9
Syria	2.6	20.0	2.0	25.9	1.8	37.0
Near Region		16.6		22.4		34.3
Wide Region		40.7		53.4		78.2



Water Balance - Near Region

	2007	2020	2040
Inhabitants	16.6	22.4	34.3
T. Cons/c/y	193	200	200
T. Consum. mcm	3,200	4,480	6,860
Nat.Resour. mcm	2,600	2,600	2,600
Sew. Efflu. Mcm	400 (750)	1,010	1,550
Add. Fresh Res. Mcm	200	870	2,710



Water Balance - Near Region

	2007	2020	2040
Inhabitants	16.6	22.4	34.3
T. Cons/c/y	193	200	200
T. Consum. mcm	3,200	4,480	6,860
Nat.Resour. mcm	2,600	2,600	2,600
Sew. Efflu. Mcm	400 (750)	1,010	1,550
Add. Fresh Res. Mcm	200	870	2,710



Water Balance - Near Region

	2007	2020	2040
Inhabitants	16.6	22.4	34.3
T. Cons/c/y	193	200	200
T. Consum. mcm	3,200	4,480	6,860
Nat.Resour. mcm	2,600	2,600	2,600
Sew. Efflu. Mcm	400 (750)	1,010	1,550
Add. Fresh Res. Mcm	200	870	2,710



Total Consumption per capita

Trends:

Municipal Standard of Living (+)

& Industrial Demand Management (-)

Employment (+)

Agriculture Efficient Use (-)

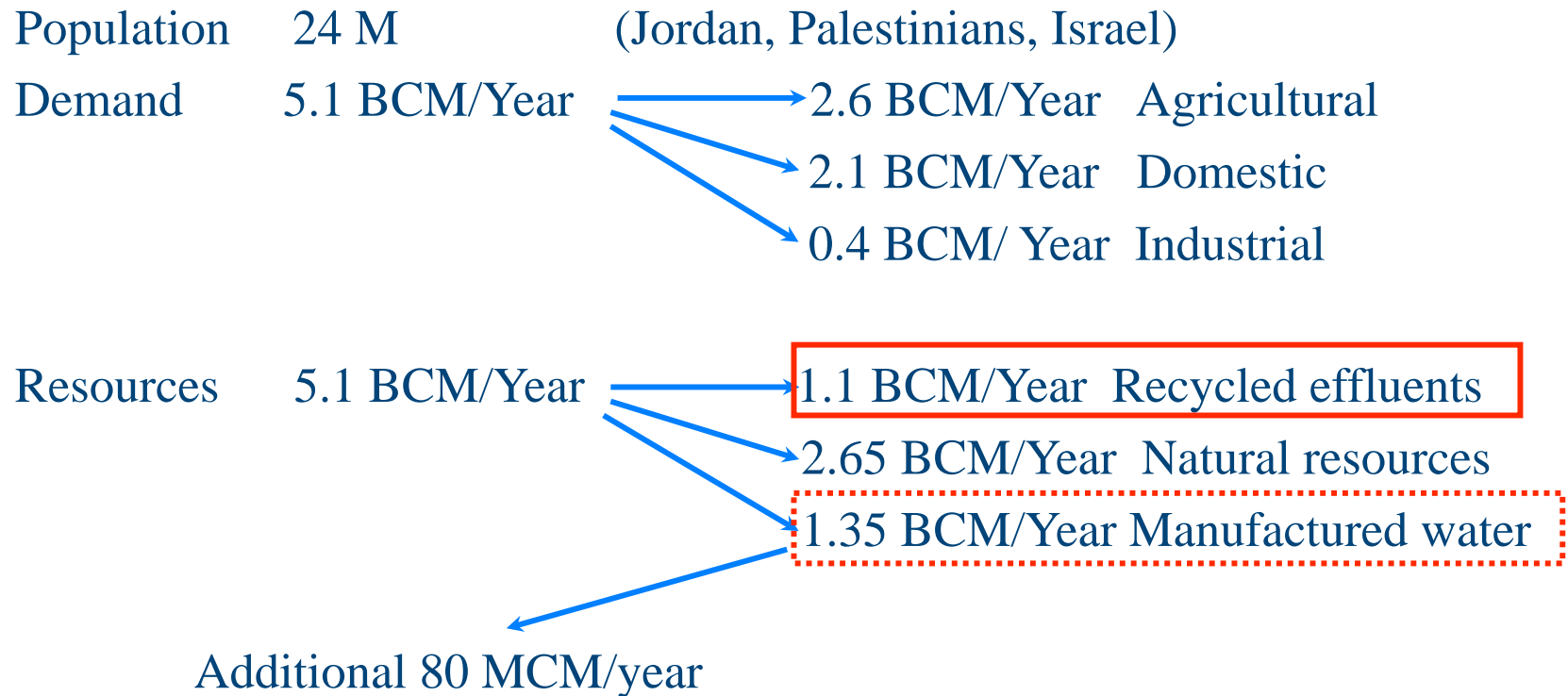
Need for More Food (+)

Limitation of National Interests (-)

Cost of Water (-)



Water Demand in the Region 2020



Regional Relationships and Solutions

Redistribution of scarce natural water resources is not a solution in Water-Stressed Environments.

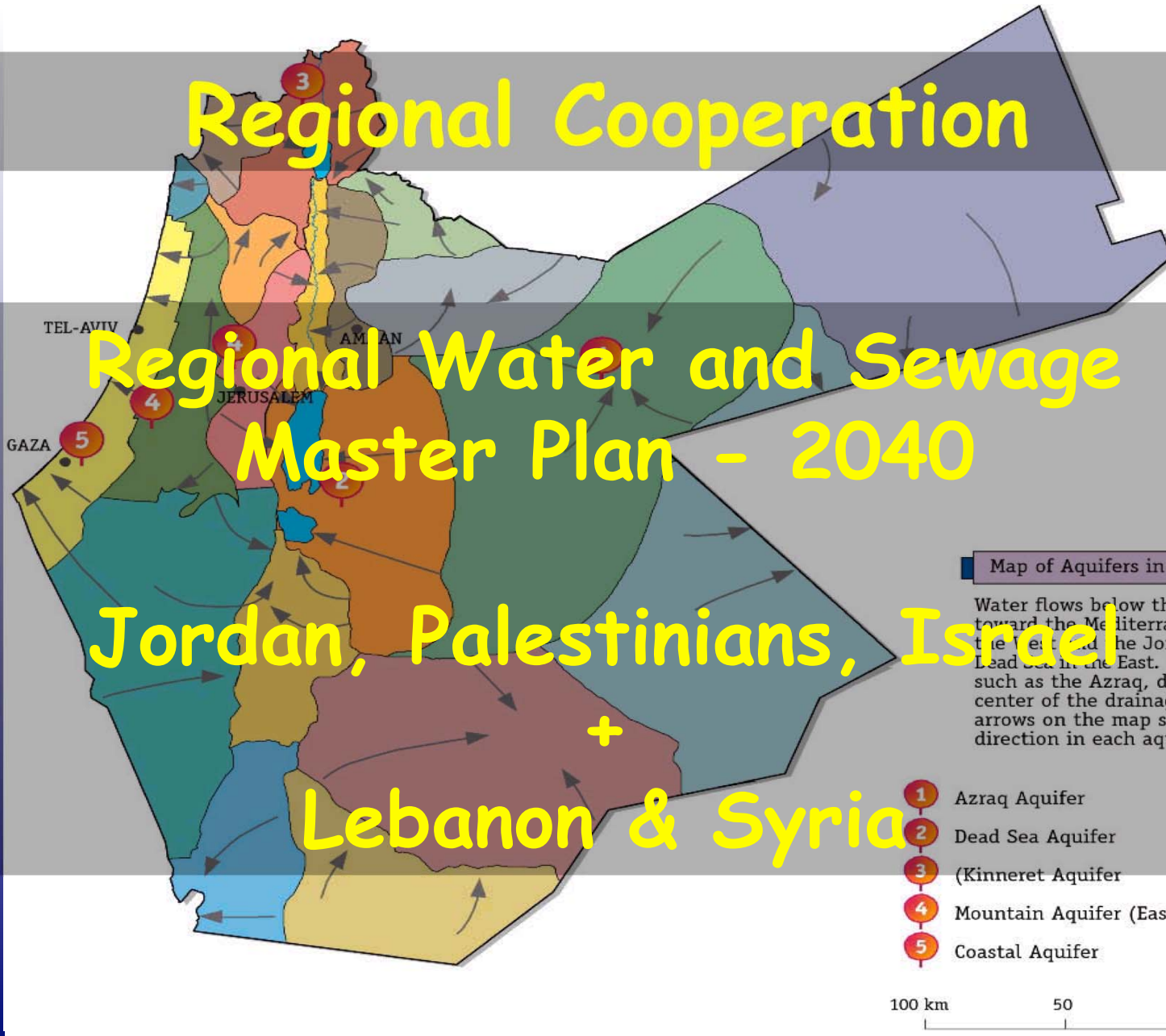
Water should be a catalyst for cooperation and not a cause for arguments and disputes.



Regional Cooperation

Regional Water and Sewage Master Plan - 2040

Jordan, Palestinians, Israel + Lebanon & Syria



Regional Cooperation

Regional Water Master Plan

Regional alternative solutions for additional water resources

Water Needs, Efficient Use and National Interests

Risks



Regional Cooperation



You overslept!

**Conservation of Natural
Water Resources -
Pollution**



Sustainable Management



TAL Co
CONSULTING & I

Regional Cooperation

Efficient use of Water

Unaccounted for Water 30% → 10%

Saving Water Technologies

Water recycle

Irrigation technologies





Regional Cooperation



Advanced Agriculture



**Sharing Knowledge Jordan , Feb.
2010**

Regional Cooperation

Manufactured New Water Resources



Reuse of All Sewage Effluents

An aerial photograph of a wastewater treatment plant. The foreground shows several circular clarifiers with central mechanical structures. Behind them are various industrial buildings and piping. In the background, there are large rectangular and circular storage tanks, some containing blue water. The surrounding landscape is arid and sandy.

Sewage Effluents -
Treatment - Adequate Quality
Reuse - Agr. + Mun. + Ind.

Regional Cooperation






Regional Projects for the production of fresh Water Resources in Large Scale

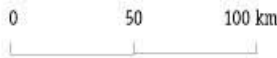
The JRSP



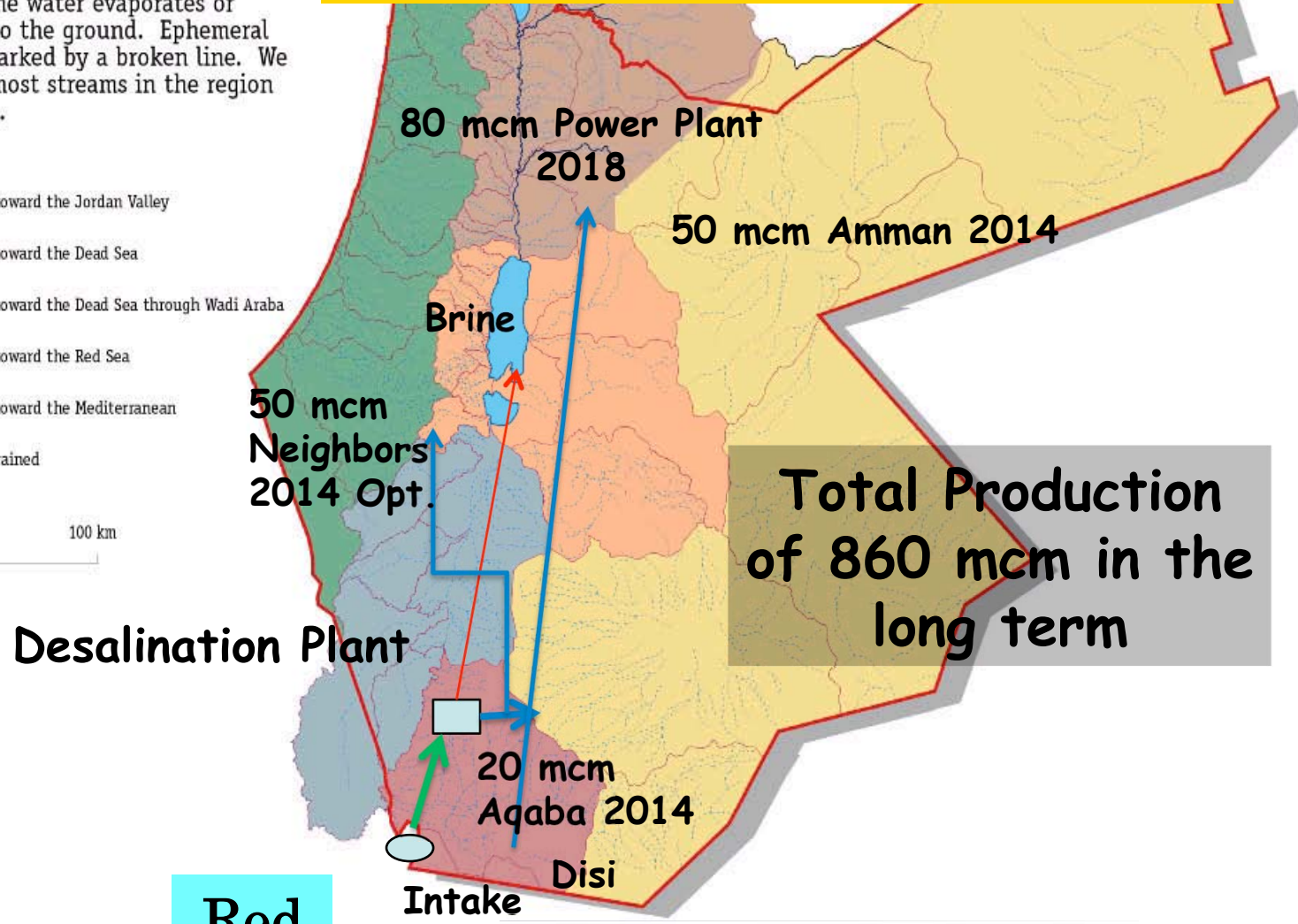
Map of Drainage Basins and Watersheds

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.

-  Flow toward the Jordan Valley
-  Flow toward the Dead Sea
-  Flow toward the Dead Sea through Wadi Araba
-  Flow toward the Red Sea
-  Flow toward the Mediterranean
-  Not drained



Jordan Red Sea Project - JRSP Phase I,II



Regional Cooperation

Regional Desalination Plants + Conveyance Systems

Sharing Knowledge Jordan , Feb. 2010





Join and
It's time to give water
a second thought.

Sharing Knowledge Jordan , Feb. 2010



Thanks

Sharing Knowledge Jordan , Feb. 2010

