GLOWA

GWSP GCI
Global Aspects of Water Research and Management
Jordan River Basin

Holger Hoff

Stockholm Environment Institute
Potsdam Institute for Climate Impact Research

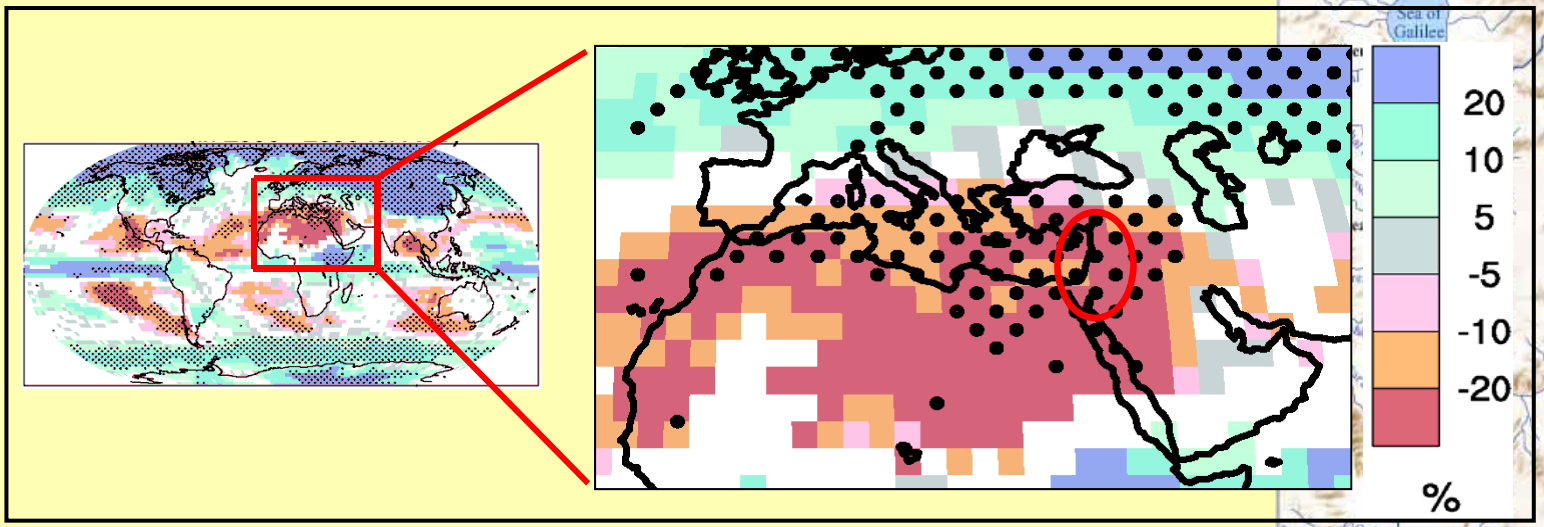
SEI STOCKHOLM ENVIRONMENT INSTITUTE

PIK

Global Change in the Jordan River Basin

- **extremely water scarce**
- **heavily modified „closed basin“**
- **rapidly increasing demands & decreasing supply**

Changes in climate, land use, demography and others.



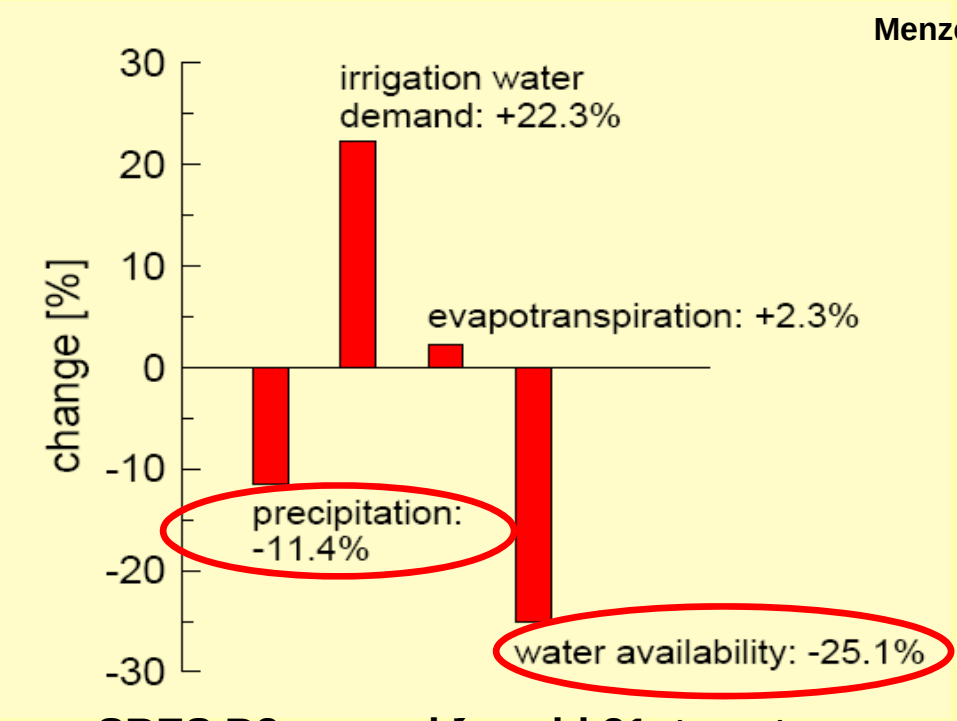
ensemble average DJF (A1B scenario, 2080-2099 minus 1980-1999)

non-linear response
to climate signal
in the water system

IPCC 2007

Changes in climate, land use, demography and others.

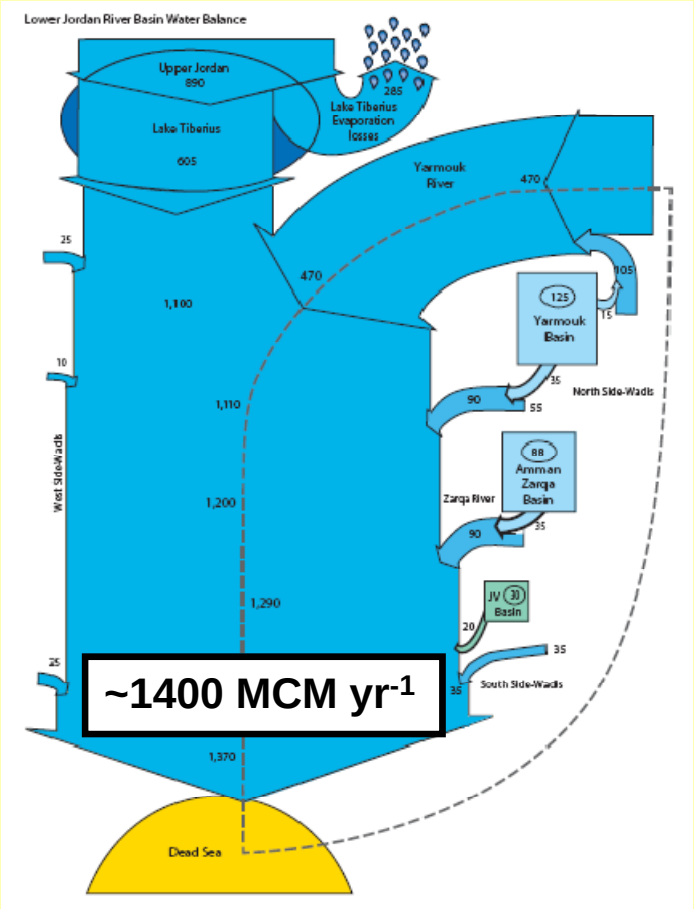
Menzel et al 2007



SRES B2 scenarió – mid 21st century

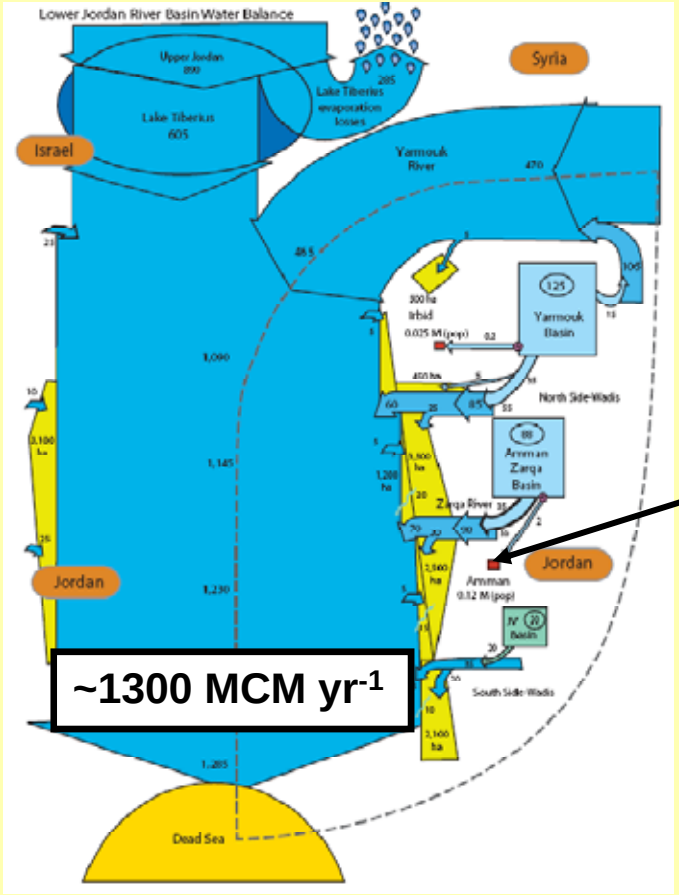
GLOWA

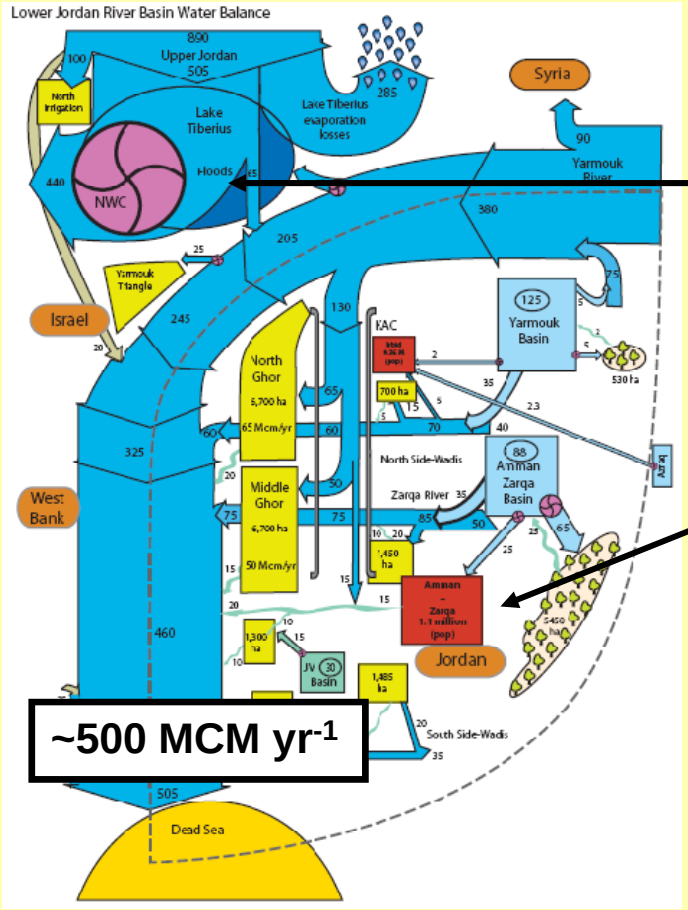
intensification of Jordan water use



Courcier et al 2005
CA report no 9

natural condition


Lower Jordan River Basin Water Balance
Upper Jordan
890
Lake Tiberias
605
Lake Tiberias
evaporation
losses
205
Syria
Israel
Yarmouk
River
470
Yarmouk
Basin
125
North Side Wadis
Amman
Zarqa
Basin
Zarqa River
Jordan
Amman
0.12 M (pop)
South Side Wadis
Dead Sea
1,090
1,145
1,230
1,285
~1300 MCM yr-1
Amman
120,000
1950

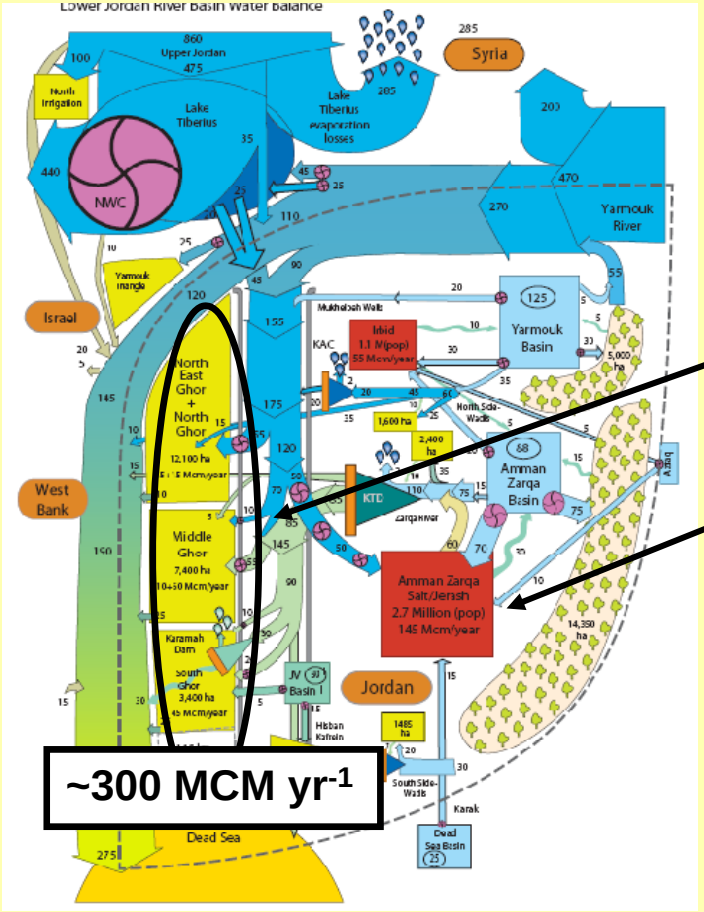


~500 MCM yr^{-1}

out-of-basin transfer

Amman 1,100,000

1975

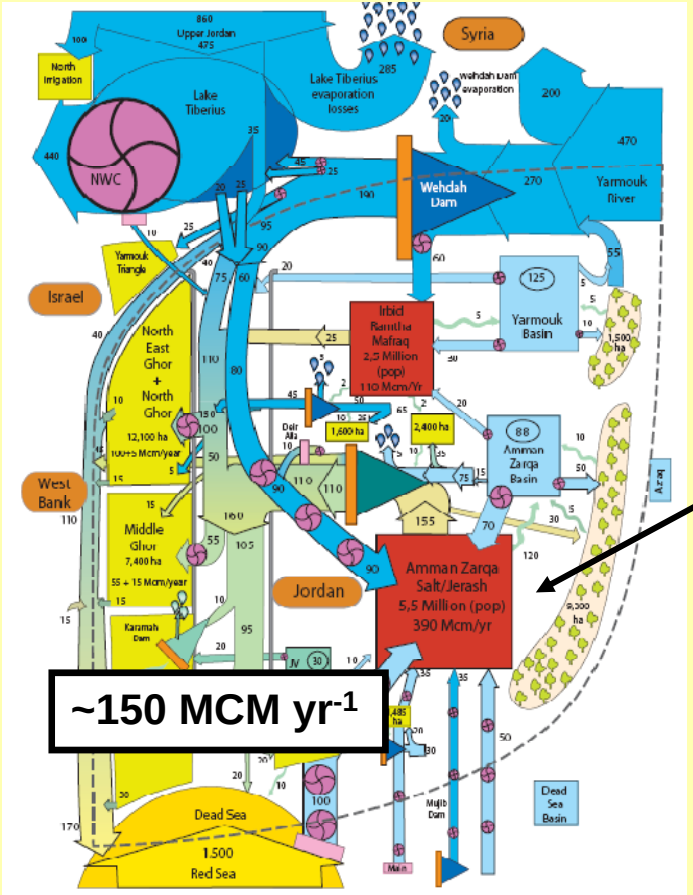


Jordan Valley fully developed

Amman 2,700,000

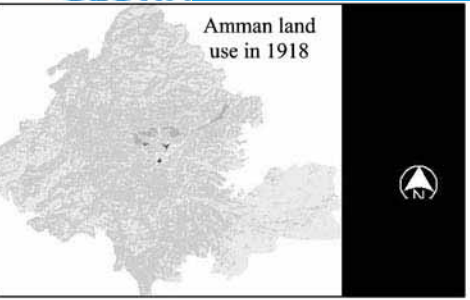
basin closure

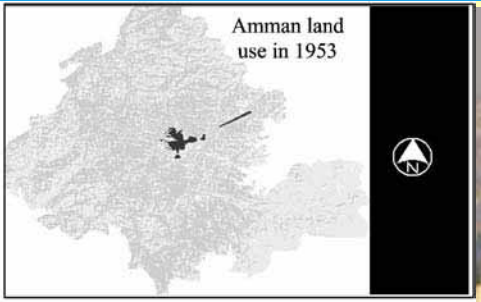
2000



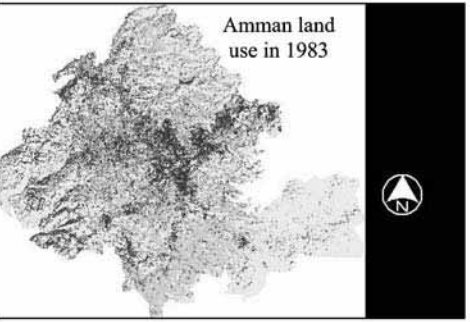
Amman
5,500,000

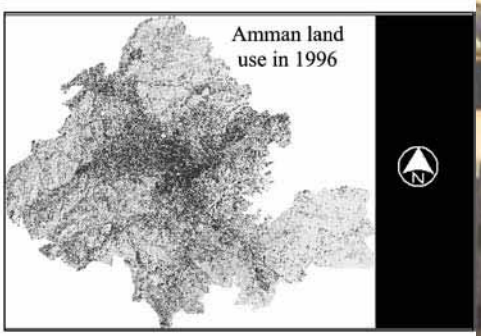
2025

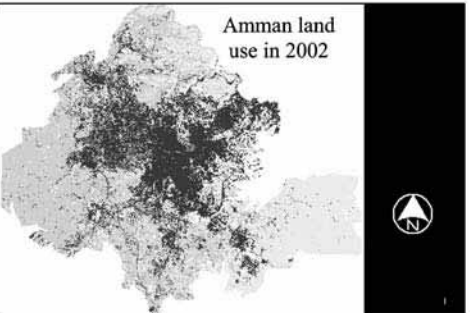




Al Rawashdeh et al 2006

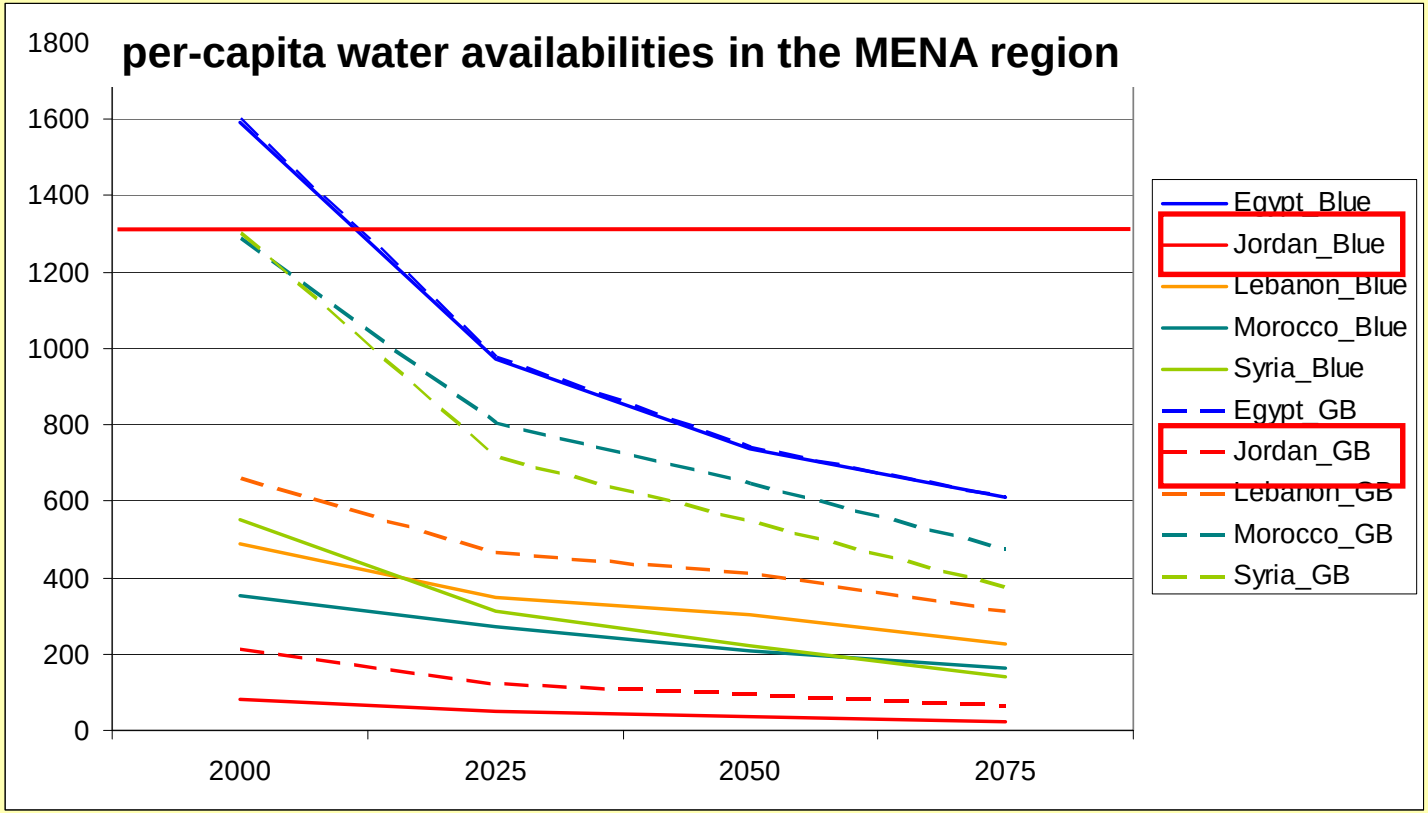






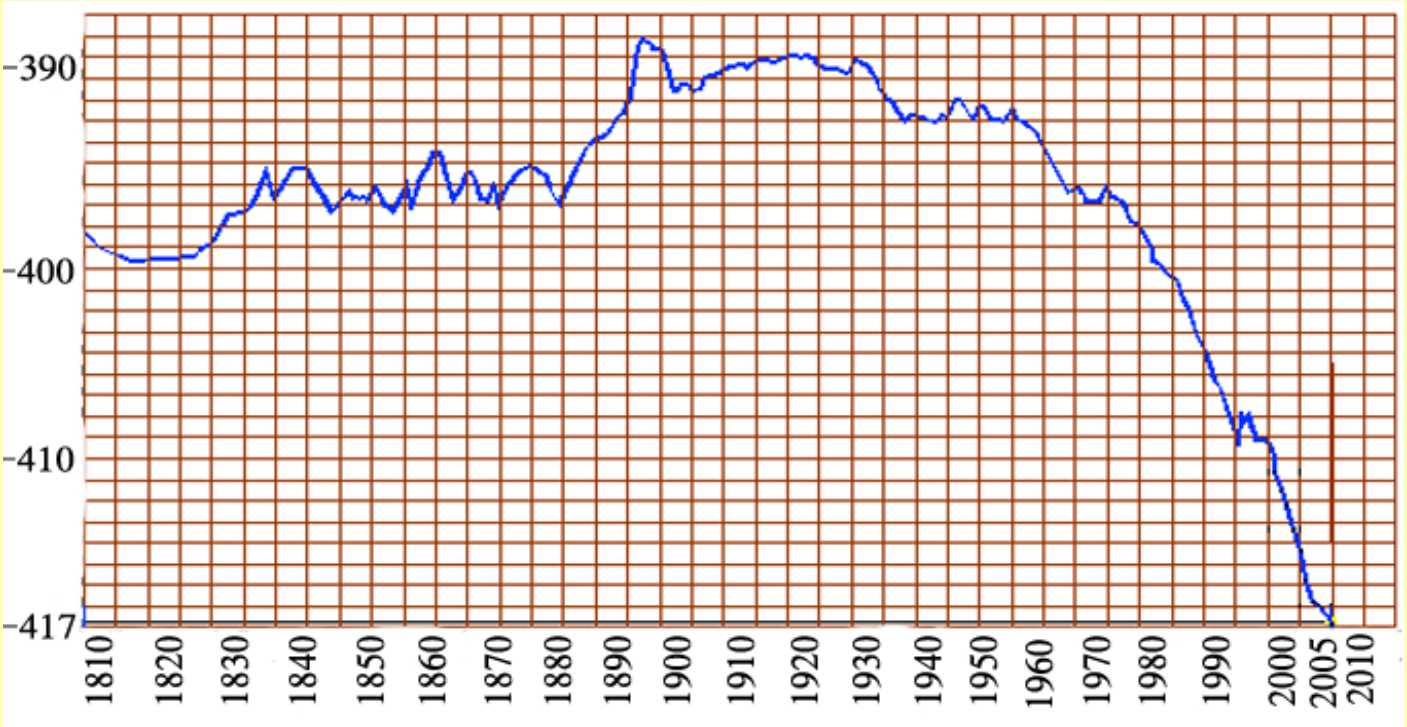
Amman:	1918	1953	1983	1996	2002
urban area	0.3	4.4	106	150	163 km^2
fertile land	384	383	332	301	297 km^2

Impacts of these changes: increasing water gap



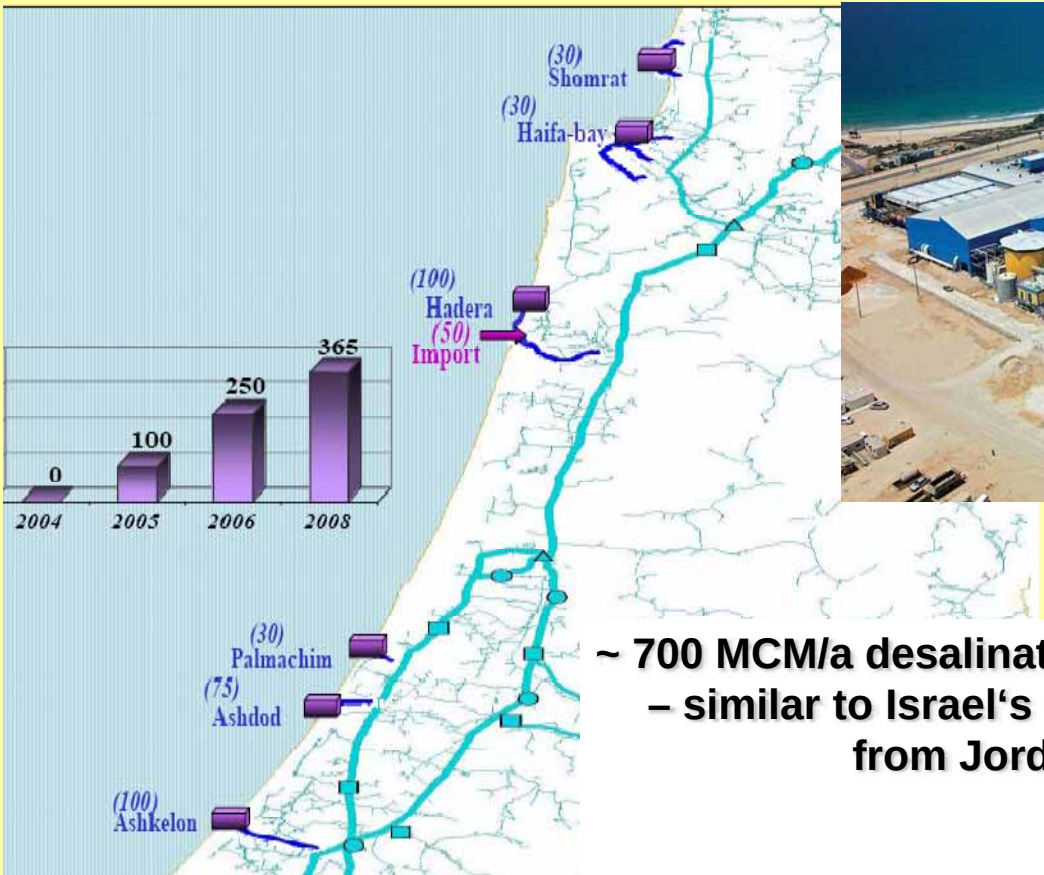
Impacts of these changes: aquifer depletion

Impacts of these changes: Dead Sea decline



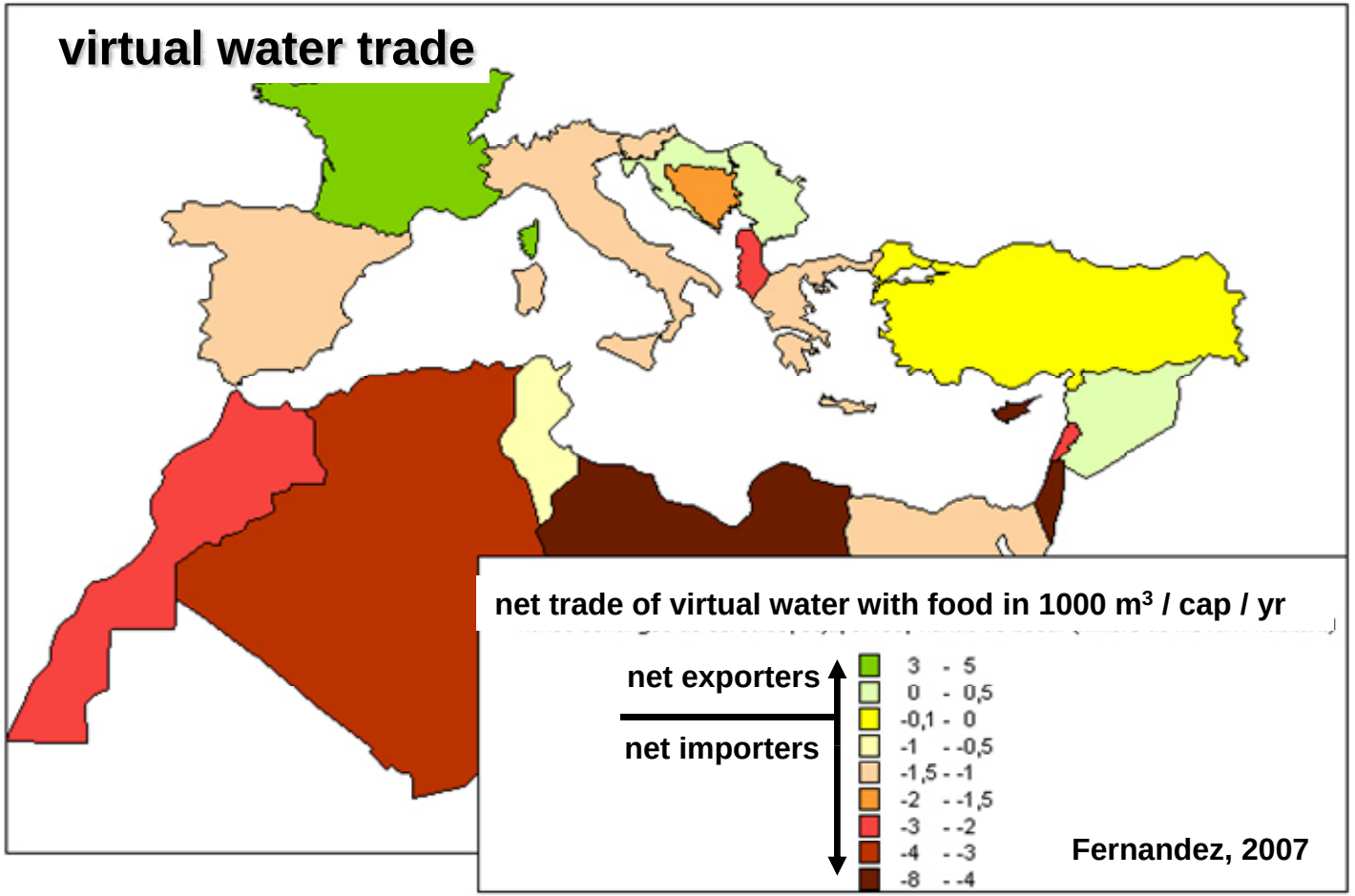
Impacts of these changes: Dead Sea decline

Interactions with the coastal zone



~ 700 MCM/a desalination capacity by 2015 – similar to Israel‘s water withdrawals from Jordan River

virtual water trade



virtual water trade

	Exports (MCM / yr)	Imports (MCM / yr)
Israel	786	6954
Jordan	287	4794

Net virtual water imports:

~ 4 times higher than natural renewable resource

Hoekstra 2004

Institutional settings as driving forces

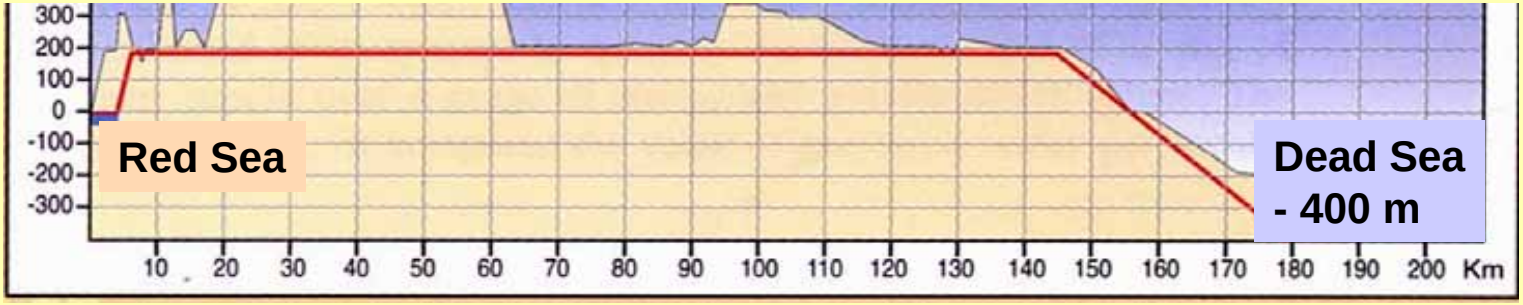
strong agricultural lobby
agriculture in Israel:
50% of water use, 2% of GDP
many absentee owners in Jordan
etc

strong water industries
dominant supply-side strategies

continued „hydraulic mission“
or „hard path“ solutions

e.g. desalination plants
e.g. Red-Dead Canal

Water and energy



rapidly increasing water demands in Jordanian and Palestinian highlands (+ 1000 m)

-> pumping required

desalination plants
all fossil fuel driven

International power relations – surface water

Jordan River	contributions (million m^3 / yr)	withdrawals (million m^3 / yr)
Jordan	530	320
Syria	435	360
Israel	160	~ 700
Palestian Authority	155	0
Lebanon	120	10

International power relations – groundwater

Mountain Aquifer Use:

Israel ~ 480 MCM / yr

PA ~ 140 MCM / yr

GLOWA

Thank you !