

# **MANAGEMENT ASPECTS OF TRANSBOUNDARY WATERS BETWEEN PALESTINE AND ISRAEL**

**IV International Symposium on Transboundary Water Management  
Thessaloniki, Greece  
15<sup>th</sup> – 18<sup>th</sup> October 2008**

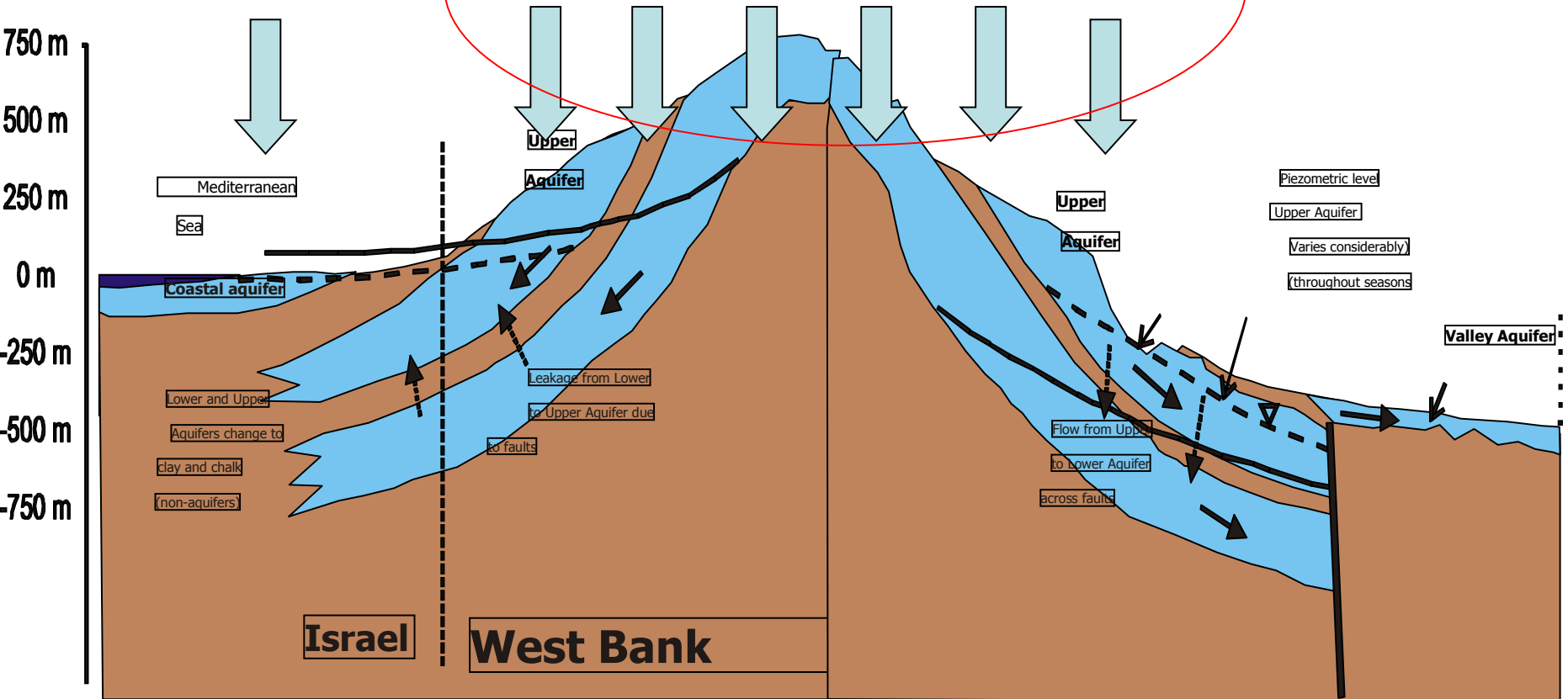
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# Rainfall is the main Source of Aquifer Recharge

About 70-90% of Groundwater Recharge originates inside West Bank



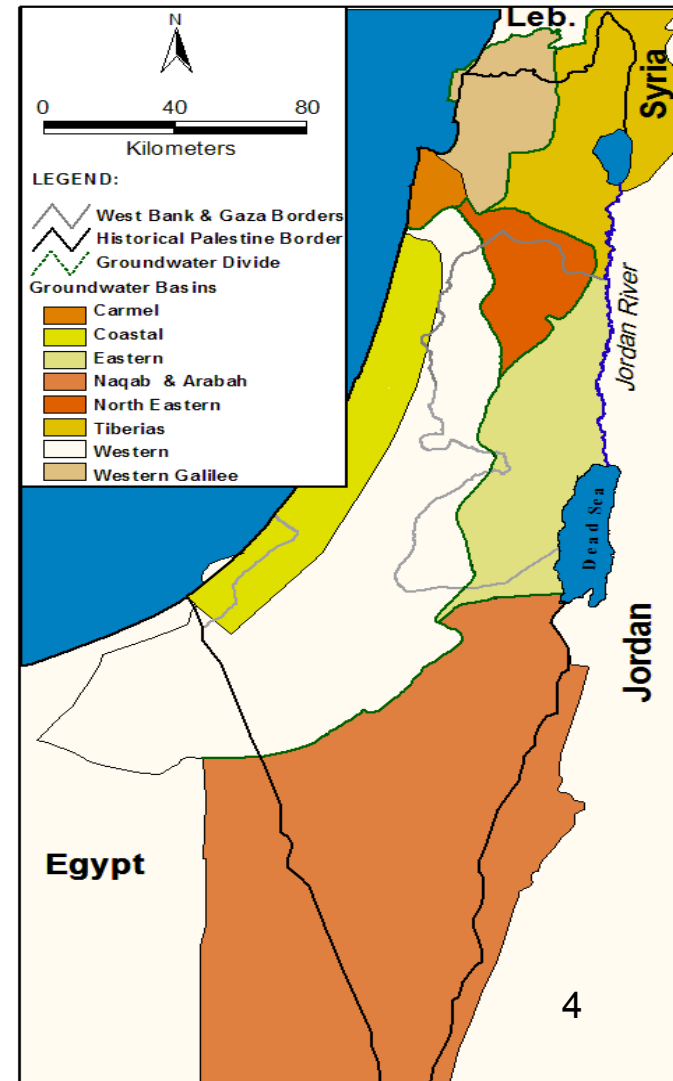
# Water Resources in Palestine

- Groundwater Resources
- Jordan River
- Wadis Runoff



# Groundwater Basins in Historical Palestine

- The Coastal Aquifer Basin
- The Western Aquifer Basin
- The Western Galilee Aquifer Basin
- The Carmel Aquifer Basin
- The Tiberias Aquifer Basin
- The Eastern Aquifer Basin
- The Northeastern Aquifer Basin
- The Negeb and Araba Aquifer Basin



# Water Balances for the groundwater basins in historical Palestine [Mcm/yr]

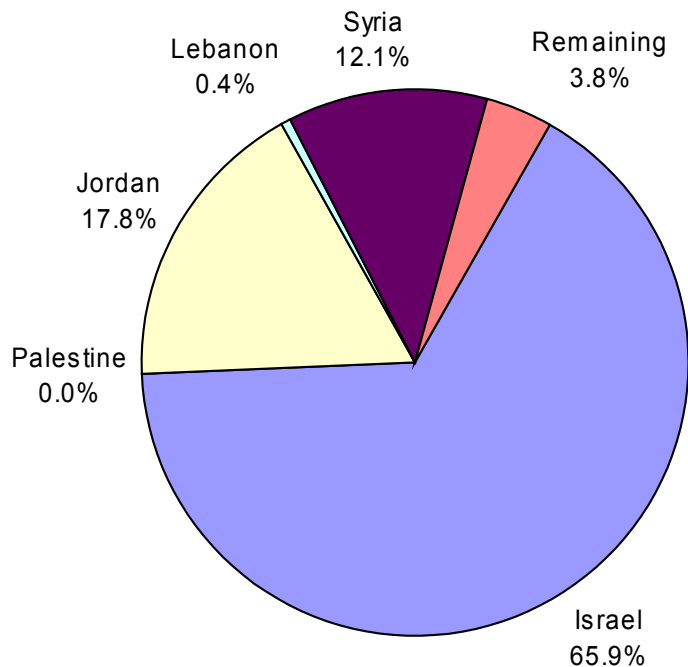
Basins	Natural Recharge	Return Flow	Abstraction	Spring Discharge	Yield
Coastal	299	136	420	-	420
Western	366	16	399	52	451
Western Galilee	194	-	82	51	133
Carmel	39	-	36	6	42
Tiberias	550	-	58	466	542
Eastern/Northeastern	330	-	148	238	386
Negeb and Araba	55	67	89	-	89
<b>Total</b>	<b>1833</b>	<b>152</b>	<b>1232</b>	<b>813</b>	<b>2045</b>

Source: Hydrological Service of Israel 1999 (Modified)

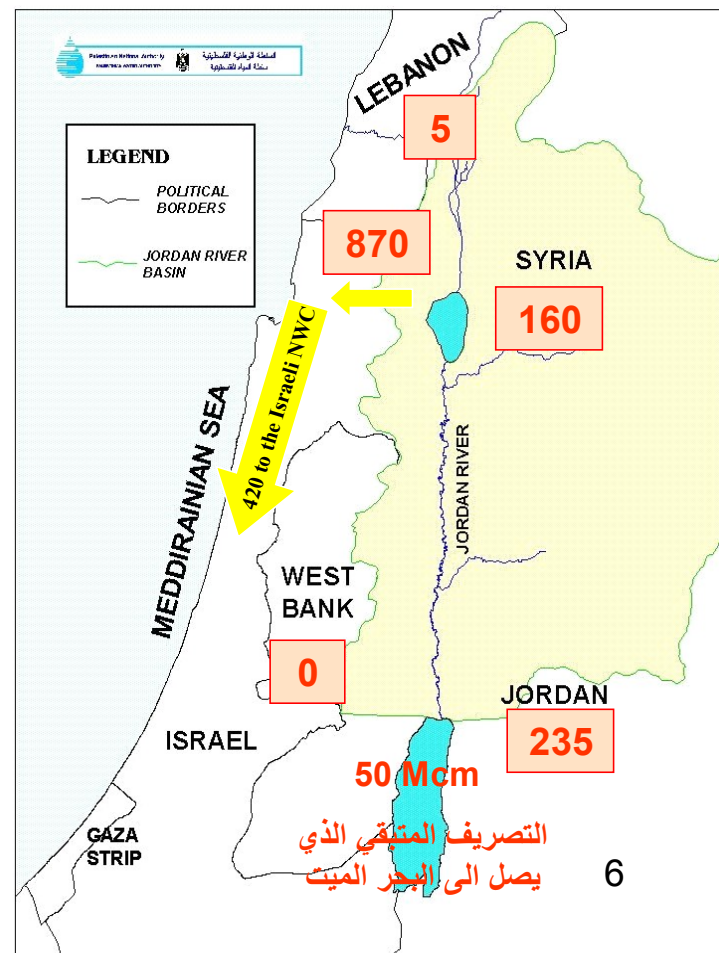
**Total available from groundwater is 2 billion m<sup>3</sup>/yr**

# Water Resources in The Historical Palestine – Jordan River

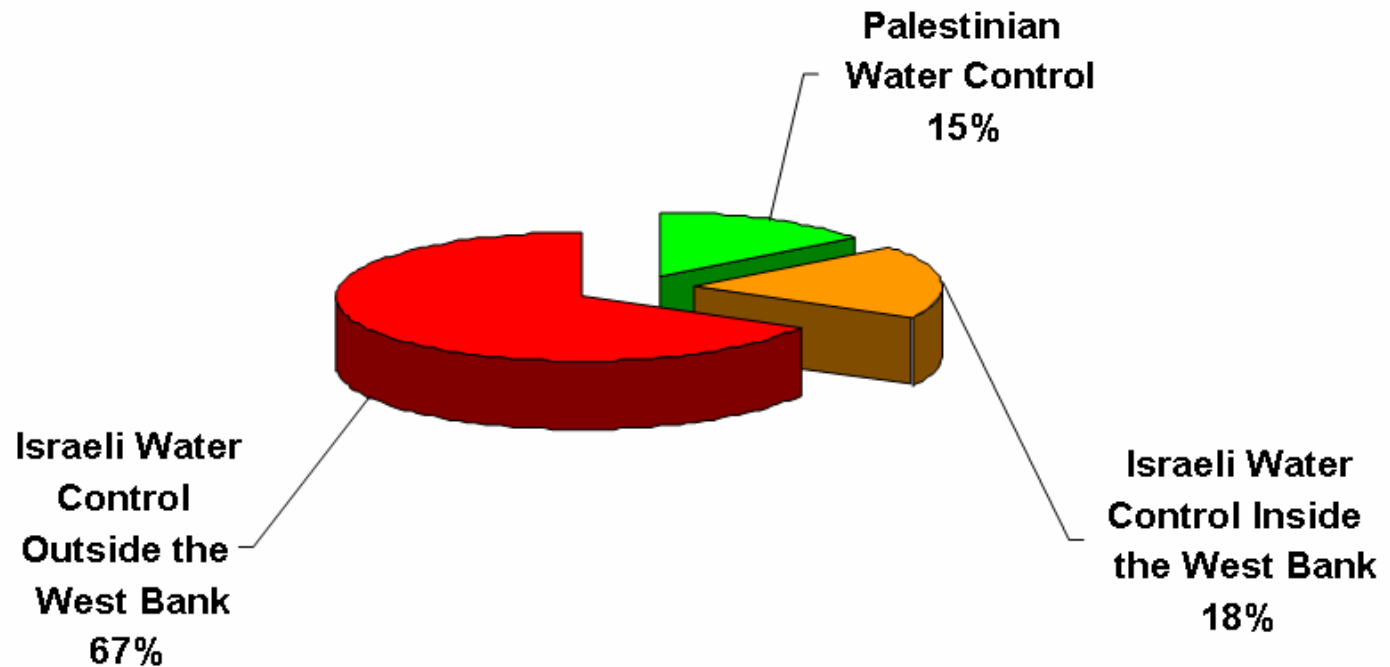
## Utilization of the Jordan River (Mcm/yr):



**Total flow: 1320 Mcm/yr**



## All Basins Water Shares (Eastern, Northeastern and Western)



# Management Aspects: Challenges





# The Environmental Challenge

- Demand in Palestine exceeds the available water supply by 350 Mcm/yr in the year 2005.
- Agriculture accounts for 59% of total water supply.
- High rate of population growth, 3.0 - 3.5%
- Saline intrusion in Gaza and saline upconing in Jordan Rift Valley.
- Climate change is expected to lead to more irregular and less rainfall creating major constraints for agriculture and water supply.
- Desertification increases as a result of loosing 50% of the grazing are to Israeli settlements and military camps and "nature reserves".



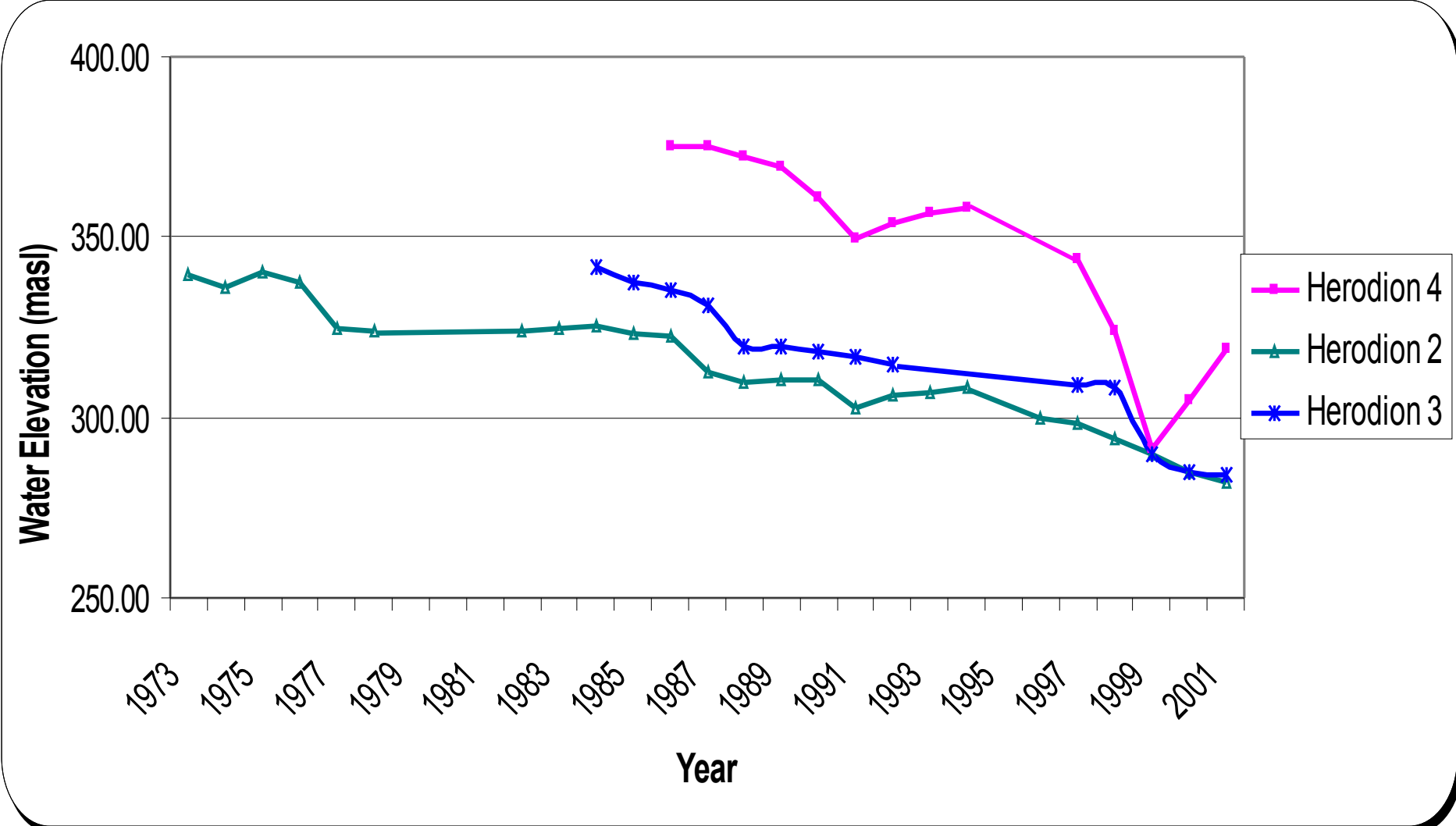
# The Environmental Challenge

- Drop in groundwater levels due to heavy pumping.
- Poor sanitation services; over application of fertilizers and pesticides in the agricultural sector.
- Pollution to Aquifers and their environment.
- A large construction work (infrastructure) is needed for water supply.
- Years of neglect and lack of waste water treated and management.
- Inadequate cesspools and direct effluent discharges to wadis
- Solid waste dumping (only one sanitary landfill in the West Bank).



# Long-term Fluctuation of Water Levels

Significant drop in water level reach to more than 50 m during the past 15 years.



# The Environmental Challenge

## *Wadis of untreated sewage*



# The Environmental Challenge

*A Dumping Site*



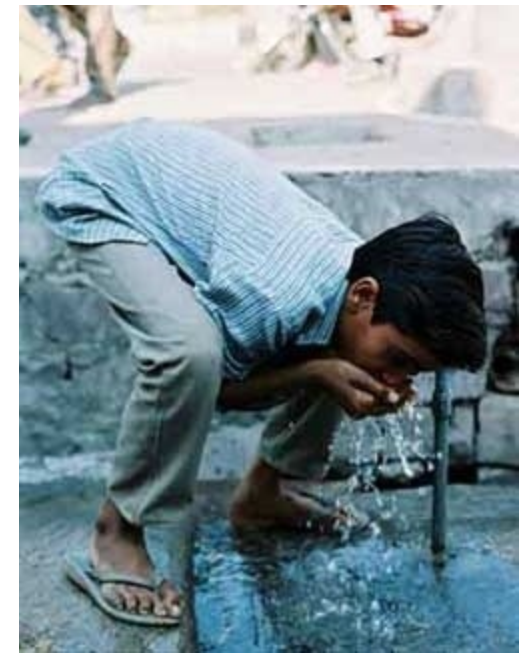
# The socio-economic and governance challenge

- 40% of the Palestinian communities are not served with essential water supply and sanitation.
- 25% of population of the West Bank are without proper services of water supply and 67% without safe sanitation.
- People with no services buy water from tankers at 3 times the average cost.
- Average consumption around 50 l/c/d.
- Strengthen water institutions with integrated approaches.
- Establish plans, policies and strategies.



# The socio-economic and governance challenge

- 38% decline in Gross National Income (GNI).
- Unemployment that reached 37% (and even higher).
- Real per capita income is 46% lower.
- Poverty is affecting 60% of the population.
- Imports and exports are down by one-third.
- Investments are down by 60%.
- In these circumstance, agriculture plays the most important role to provide subsistence livelihoods and essentials. However, agriculture is constrained by the overall limitations on land and water resources imposed by Israel.



# The challenge of political environment

- Israeli settlements and their infrastructure consume some 50 Mcm/yr from wells drilled in the West Bank and owned by Israel.
- In 1996 and according to Oslo II agreement, the responsibilities and authorities over the West Bank Water Department (WBWD) should have been transferred to the PWA, but this never took place since then.
- The complex system is not limited to sources of water only but the same is true for the water supply system (Mish- Mash).
- Desertification (Israeli military camps, ...etc).





# Management of Transboundary Aquifers

The Palestinians see management of transboundary aquifers to cover the following:

- Equitable utilization and control.
- Optimal use of transboundary resources.
- Ecological protection of transboundary resources.
- Sustainable development of transboundary resources.



Instead Israel over-utilizes the transboundary waters and further pollute the shared aquifers by the Israeli settlements in the West Bank which further bedevil the cross-national implications of water scarcity in the Palestine-Israel region.





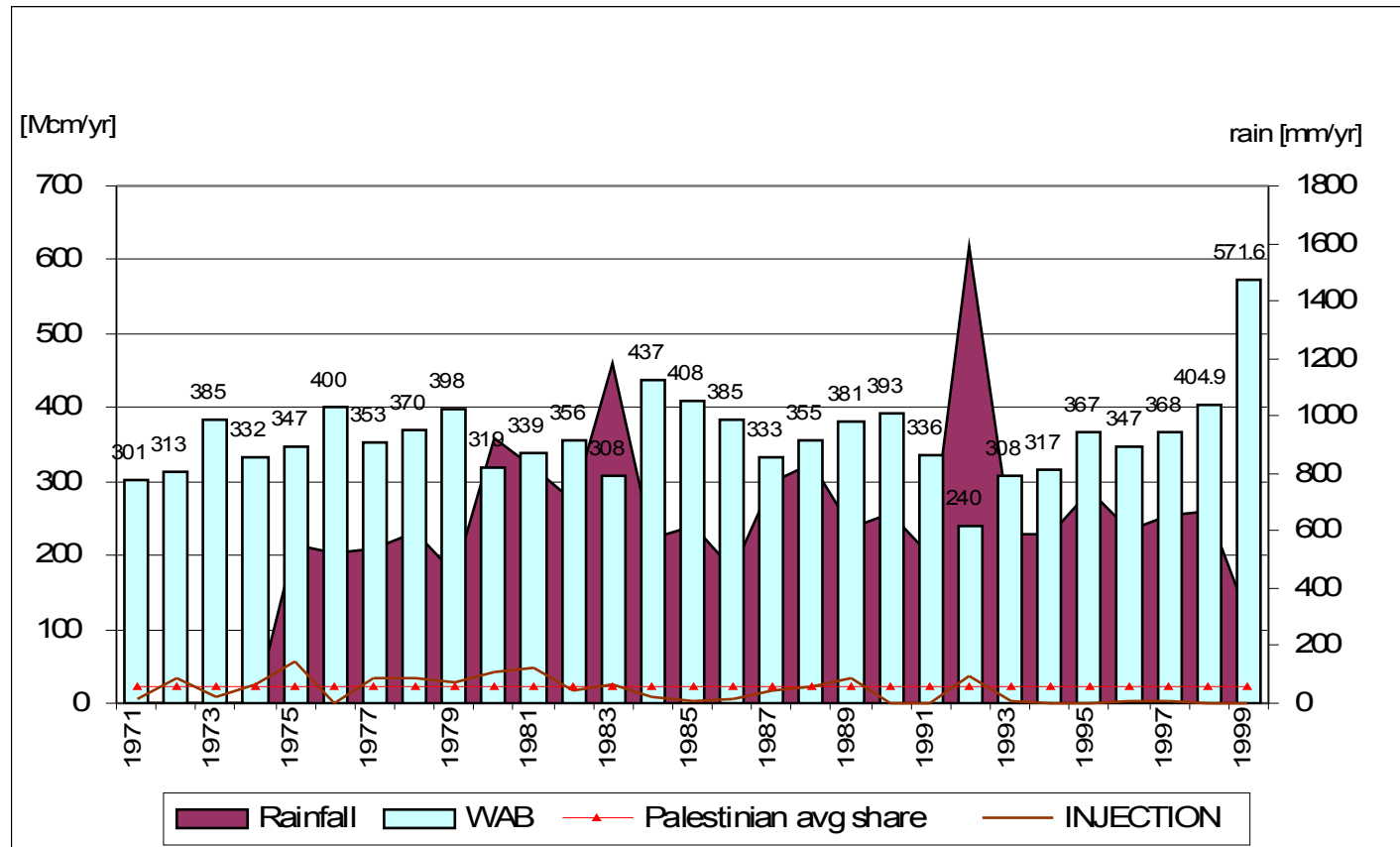
## Sewage from an Israeli Settlement



- For many years, raw sewage effluents from Israeli settlements in the West Bank have been discharged in the Wadis. Moreover, leachate from Israeli dumping sites, industrial wastes, agricultural returns rich with agro-chemicals and hazardous wastes in addition to over-pumping of aquifers have caused groundwater quality of Palestinian aquifers to deteriorate.
- Since the carbonate aquifers of the West Bank have pronounced mature karst features, both above and below the water table, these aquifers show high potential for extensive pollution.



# Mismanagement of Western Aquifer Basin By Israel since they alone control this shared Aquifer Basin

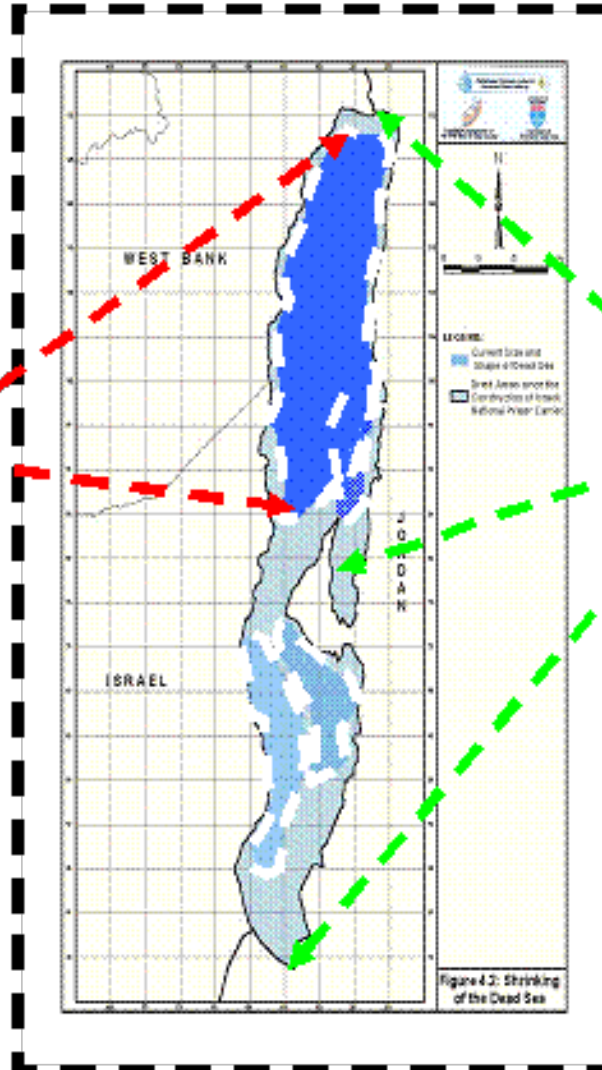


- In 1999 Israel pumped 572 Mcm/yr when recharge in that year was about 225 Mcm/yr, meaning they abstracted 2.5 times its recharge.



# Shrinking of the Dead Sea

## Shrinking ~~OF THE SEA~~



The Past Situation of  
The Dead Sea



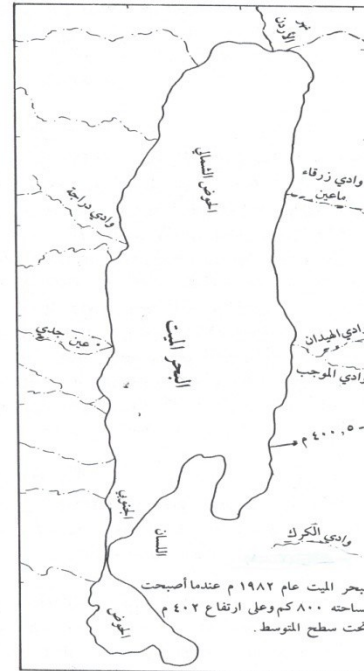
# The Dead Sea is Dying



1948



1967



1982



1990

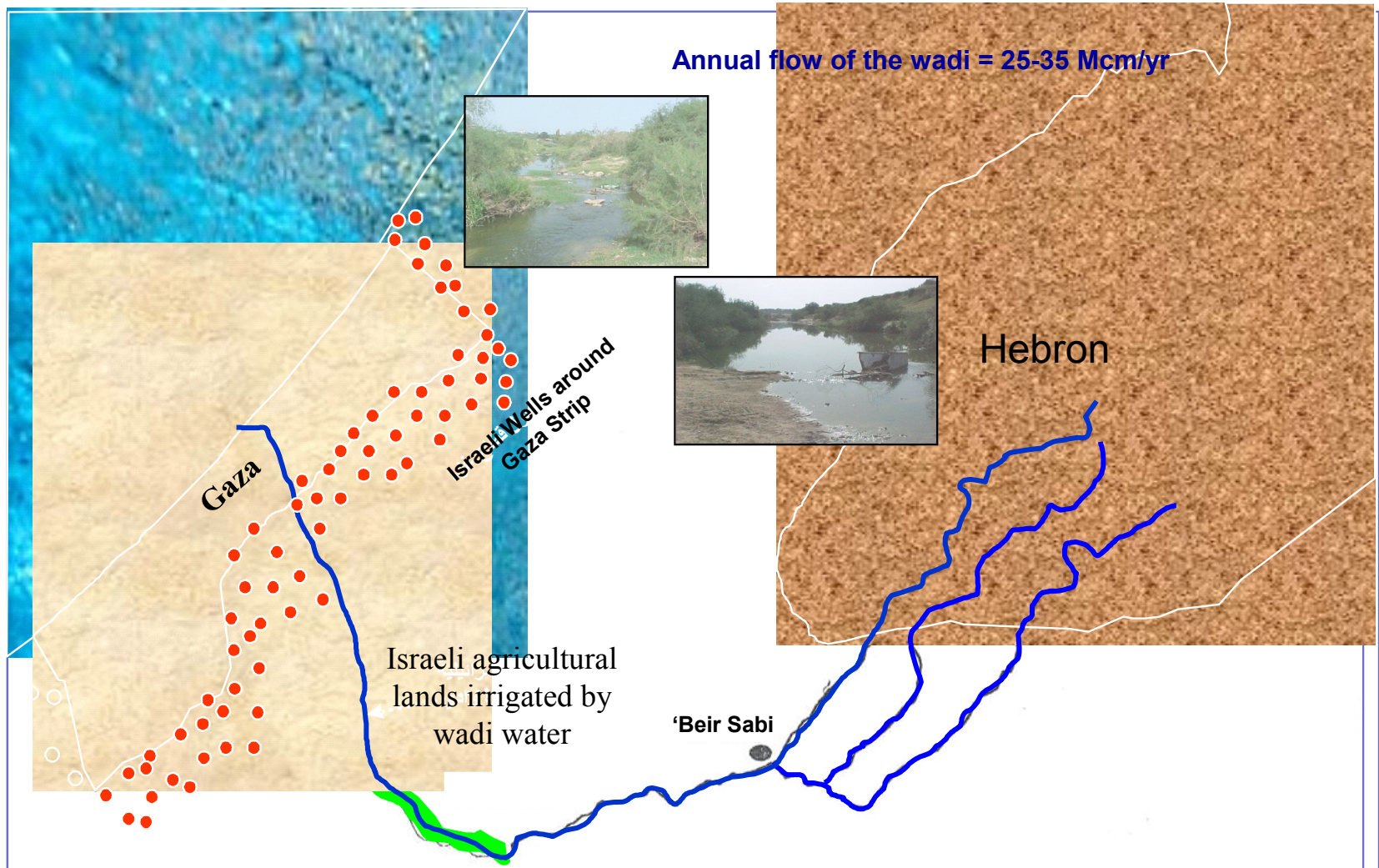


# ■ Diverting the route of the Jordan River to the Negev





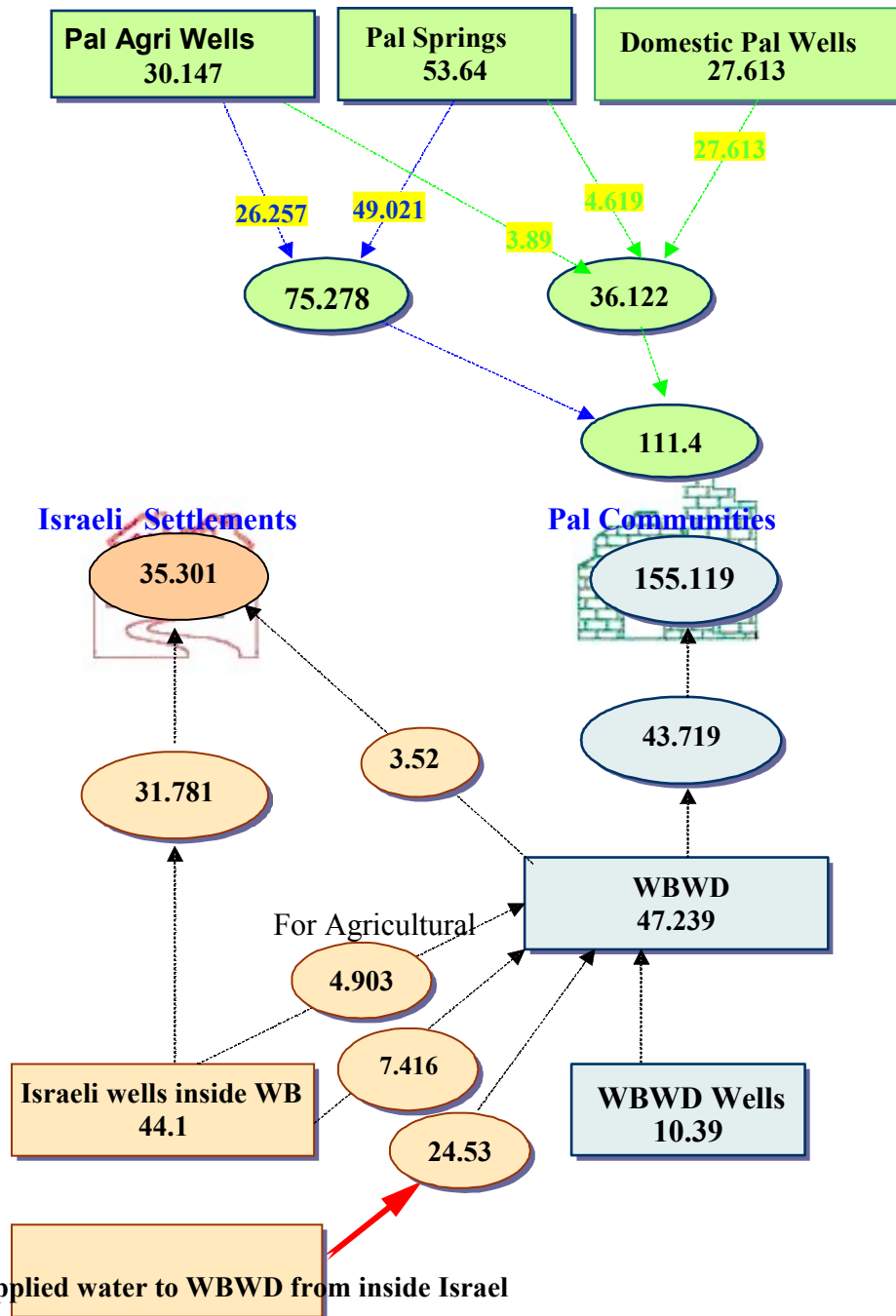
- Intercepting groundwater from reaching the Gaza coastal aquifer
- Intercepting surface wadis flowing to Gaza.



Intercepting Gaza Wadis and intercepting groundwater flow to Gaza

- The overall per capita supply rate (including losses) for urban domestic purposes in the West Bank was estimated to vary between 30 l/c/d and 70 l/c/d with an average of about 50 l/c/d. These estimated domestic water consumption rates are substantially lower than the WHO minimum value of 150 l/c/d due to the Israeli restrictions on water usage by the Palestinians.
- In the Gaza Strip, of the total water supplied to the domestic sector only some 8.9 Mcm/yr may be considered of acceptable quality (based on health considerations). This 8.9 Mcm/yr corresponds to only 18% of the water supplied by municipal wells and translates to an acceptable per capita supply rate for domestic use of only about 13 l/c/d – less than 150 l/c/d of the WHO recommended levels.





## Water Supply Quantities in West Bank for the (Year 2005 (Mcm/yr (Mixed System)



At present, the Palestinian citizens pay about \$1.5 per 1m<sup>3</sup> of water which is a high cost compared to the average income of the Palestinian citizen. At a minimum, Palestinians argue that Palestinian citizens should be entitled to receive a basic quantity of water (basic human right to water) amounting to at least 150 liter per day at an affordable cost. This water should be safe, acceptable and physically accessible.



# Palestinian Water Rights

Source	Quantity Mcm/yr	Shared or indigenous	Possible Palestinian share (Mcm/yr
1. Eastern Aquifer Basin	172	indigenous	172 (100%)
2. Northeastern Aquifer Basin	150	shared	90 (60%)
3. Western Aquifer Basin	443	shared	266 (60%)
4. Gaza Coastal Aquifer	65	indigenous in Gaza	65 (100%)
5. Jordan River including eastern Wadis	1500	shared	173 (11%)
6. Western Wadis	72	shared	72 (100%)
7. Dead Sea Wadis	17	shared	17 (100%)
8. Wadi Gaza	25	shared	25 (100%)
Total			880 Mcm/yr



The specific quantities that should be allocated to the Palestinians constitute a core political matter in the final status negotiations. But even so, a sustainable solution to the Palestinian water crisis will require effective management, development and planning of the resources. A consensus in this regard among Palestinians includes the following points:

- Palestinian water rights should be solved according to international legal principles which will guarantee sufficient quantities and grant sovereignty to Palestinians to utilize and control their water resources.
- Palestinian water rights should extend to their indigenous and transboundary aquifers as well as surface water including the Jordan River.
- Final agreements will have to ensure removal of any obstacles in Palestinian lands that limit to Palestinian (e.g., access to wells currently controlled by Israel inside the West Bank, the separation wall constraints imposed by Israeli settlements, etc.).
- Bi-lateral and multi-lateral cooperation remain key elements in any final status negotiations over Palestinian water rights in indigenous and transboundary water.



# Finally

- The Israeli management of transboundary waters and aquifers is a critical one as they over utilize aquifers by two orders in drought periods.
- The Palestinian water rights in transboundary waters and aquifers are yet to be recognised and respected by Israel.
- This study is calling for international law to be implemented between Palestine and Israel to solve the dispute of water rights over transboundary waters and aquifers between them.

