The Hashemite Kingdom of Jordan
Ministry of Water & Irrigation
Jordan Valley Authority

River Basin Management

By

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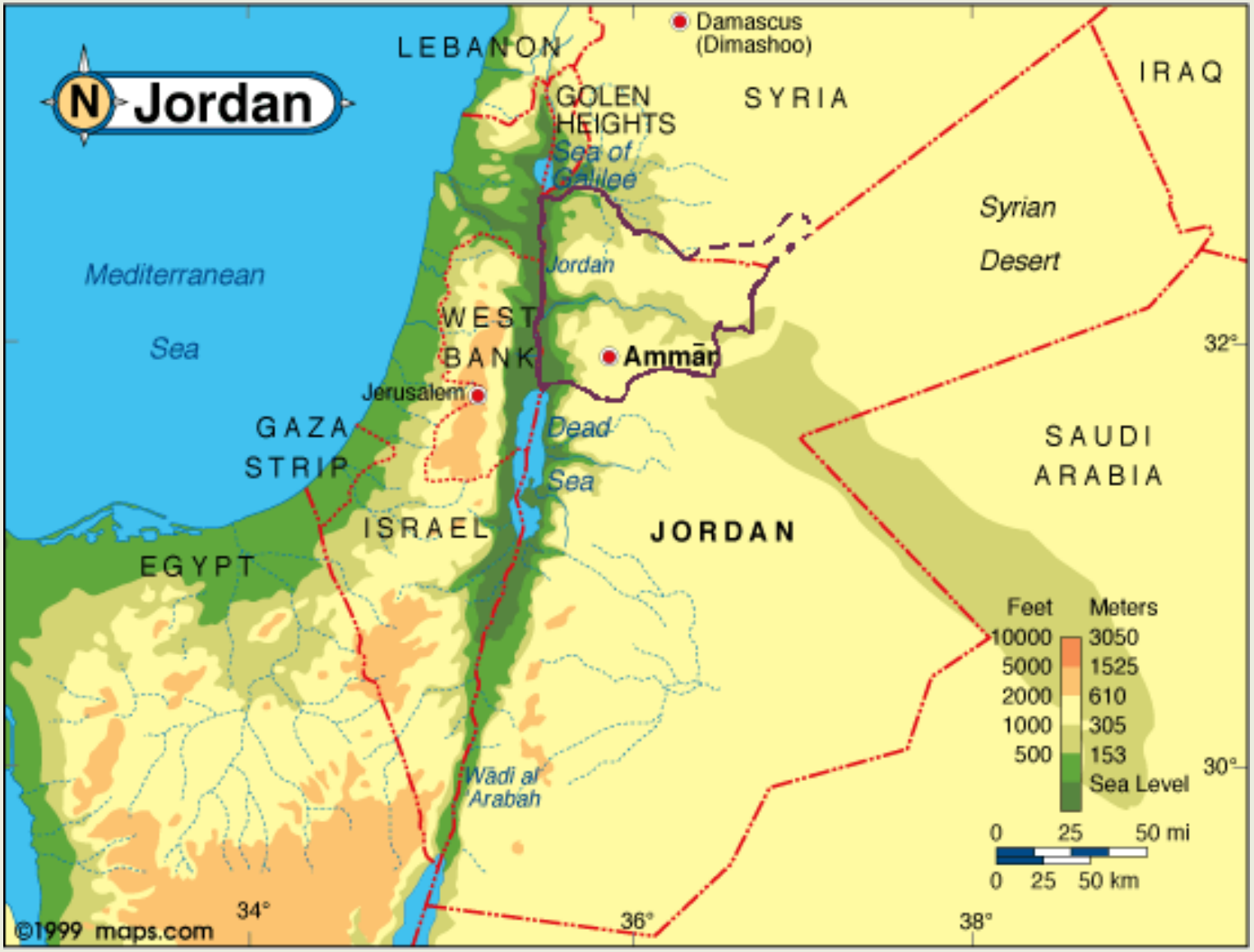
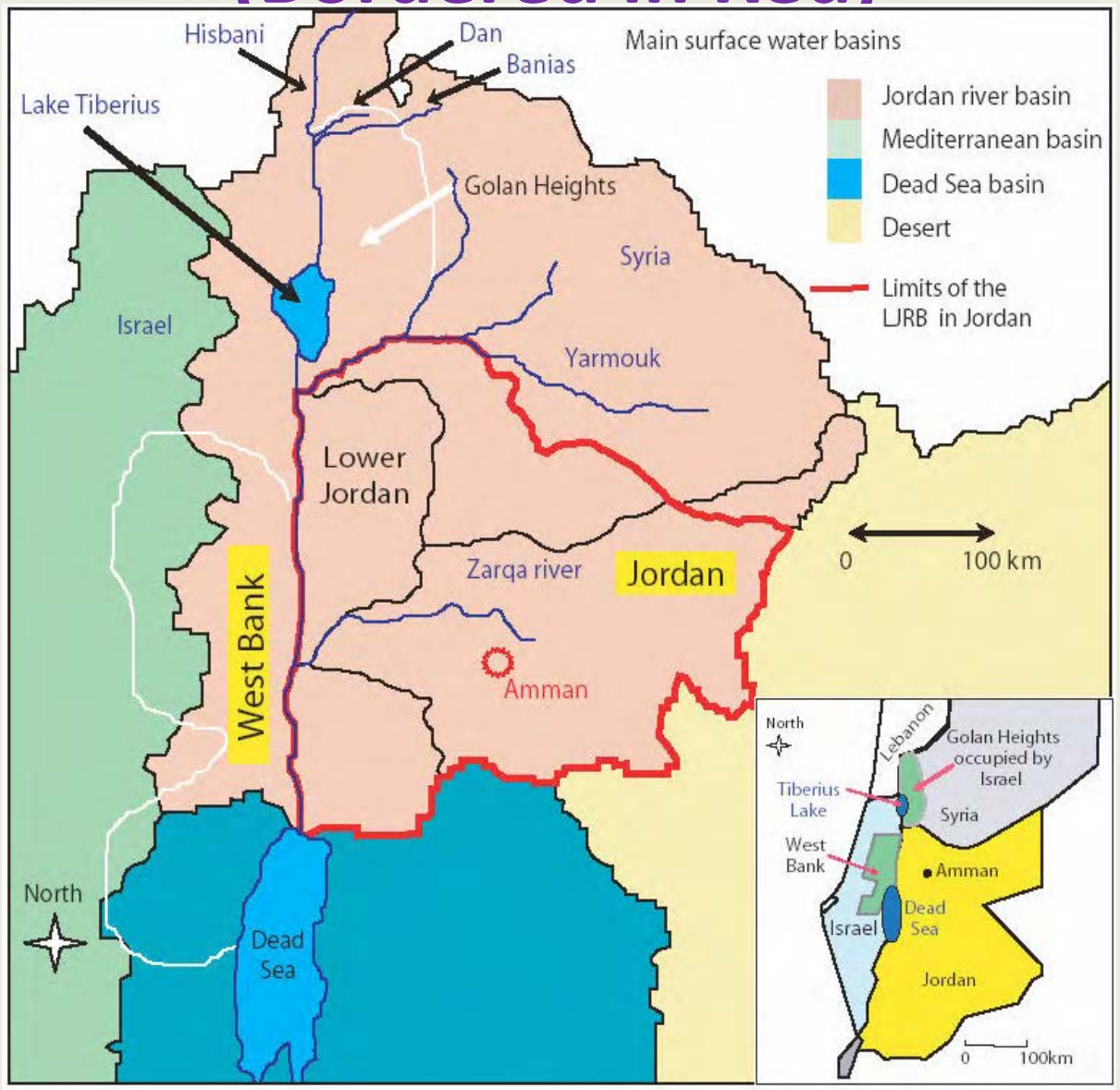
The Jordan River Basin Countries



The Jordan River Basin in Jordan (Bordered in Red)



Location

- The Jordan River Valley forms part of the Great Rift Valley that extends down from Turkey through Lebanon and Syria to the Dead Sea, then continues south through Wadi Araba and the Red Sea to the horn of Africa. This fissure was created 20 million years ago by shifting tectonic plates.

- The Jordan River Basin extends over 18850 km^2, the basin area south of Lake Tiberia is around 2727 km^2.

- The Jordan River is a multinational river flowing southwards through Lebanon, Syria, Israel, Jordan and Palestine.

- The river originates at Jabal–El-Shaik (Mount Hermon) were annual precipitation is around 1300 mm/y and continues its flow to Lake Tiberia, then through the Jordan Valley to the Dead Sea.

Main Sources

- The main sources of the Upper Jordan River are : Hasbani from Lebanon (125 mcm/y), Banias from Syria (125 mcm/y), and Dan from Israel (270 mcm/y).
- Many tributaries join the river along its course between Lake Tiberia and the Dead Sea, Mainly: Yarmouk River, Zarqa River, and Eastern and Western Side Wadis.
- The historical Jordan River has disappeared. Its average annual discharge of 1300 MCM has dropped down to 20-30 MCM.
- The River became a drain to the salty and low quality water remaining from the agricultural and municipal uses.

Water Resources Challenges in the River Basin

- Most of the region is arid to semi-arid
- Some of its aquifers are exploited at several times their replenishment rate
- Water and soil salination from salt-water intrusion and irrigation practices
- Climate variability, population growth and refugees influx due to the continued conflicts in the region.
- Wastewater treatment and reuse
- Water management practices affect aquatic and riparian ecosystems
- Overall, water impacts on economy, quality of life, health, and ecology.

Jordan River Basin Management

- Five countries (Lebanon, Syria, Jordan, Israel and Palestine) share the scarce water resources of the Jordan River Basin. Obtaining the agreements required for optimal development of the basin resources has proven elusive, although some pieces of the puzzle are in place.

- Peace agreements have been signed between Israel and Jordan, and between Israel and the Palestinian Authority that among other issues allocate water resources between them. Syria and Jordan had previously reached agreement on to the utilization of the Yarmouk River Water.

- Obviously these agreements will need to be updated in light of the increased upstream uses and downstream demand, and all the basin reparians have to take stake in the river basin management.

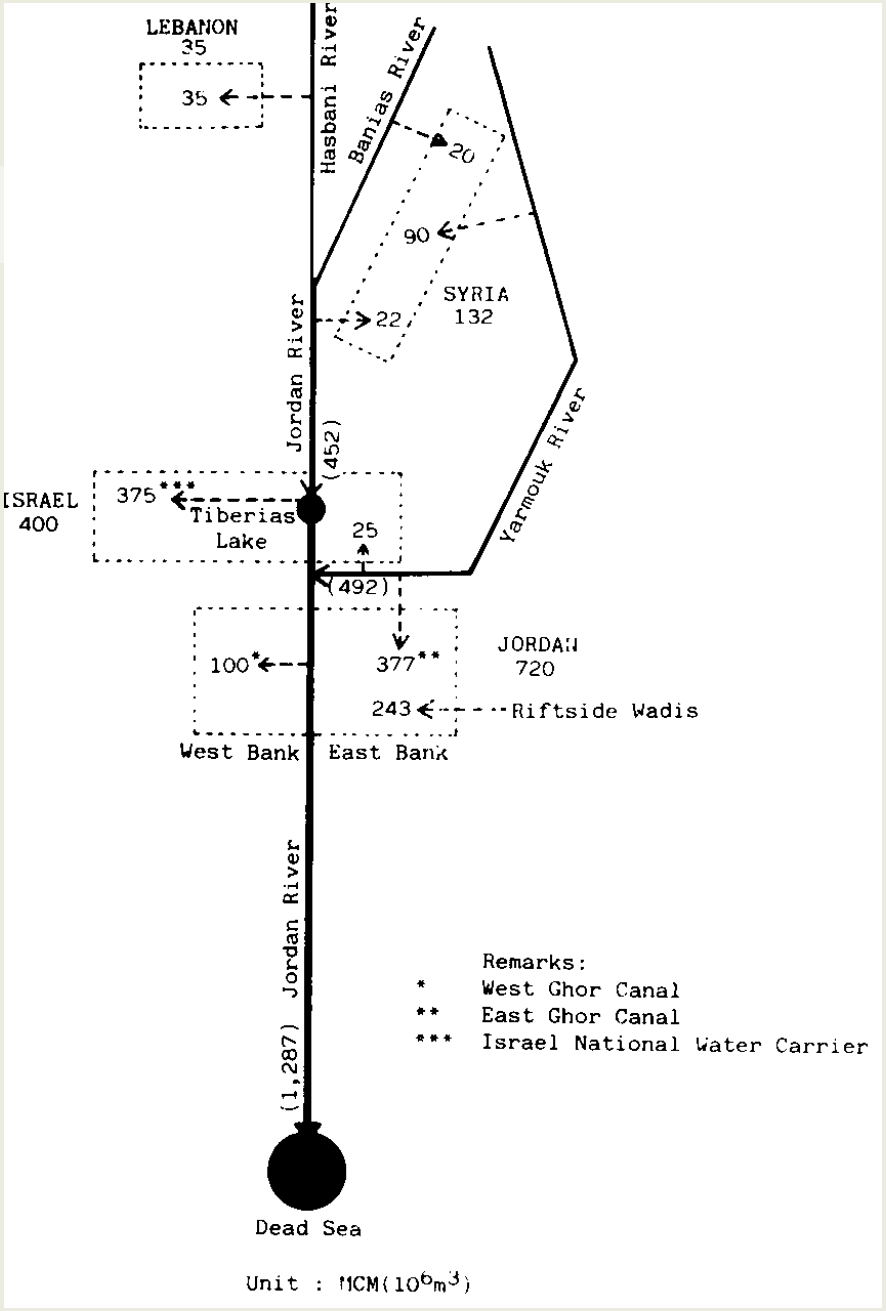
Early Plans for the Management of the Basin Water Resources

- **The utilization of the trans-boundary water resources of the Jordan River was the cause of many conflicts and confrontations between the users in the region. Many plans were introduced in this regard, the most famous of which was Johnston Plan of 1955 by Eric Johnston, the American President Eisenhower's envoy to the Middle East.**

- **Johnston Plan was the basis for the main regional water projects in Jordan and Israel, after which the King Abdullah Canal (East Ghor Canal) was constructed in Jordan and the National Carrier was constructed in Israel in the early sixties of the last century.**

Johnston Plan

Source	Lebanon	Syria	Jordan	Israel
Hasbani	35			
Banias		20		
Jordan (main stream)		22	100	375
Yarmouk		90	377	25
Side wadis			243	
Total	35	132	720	400



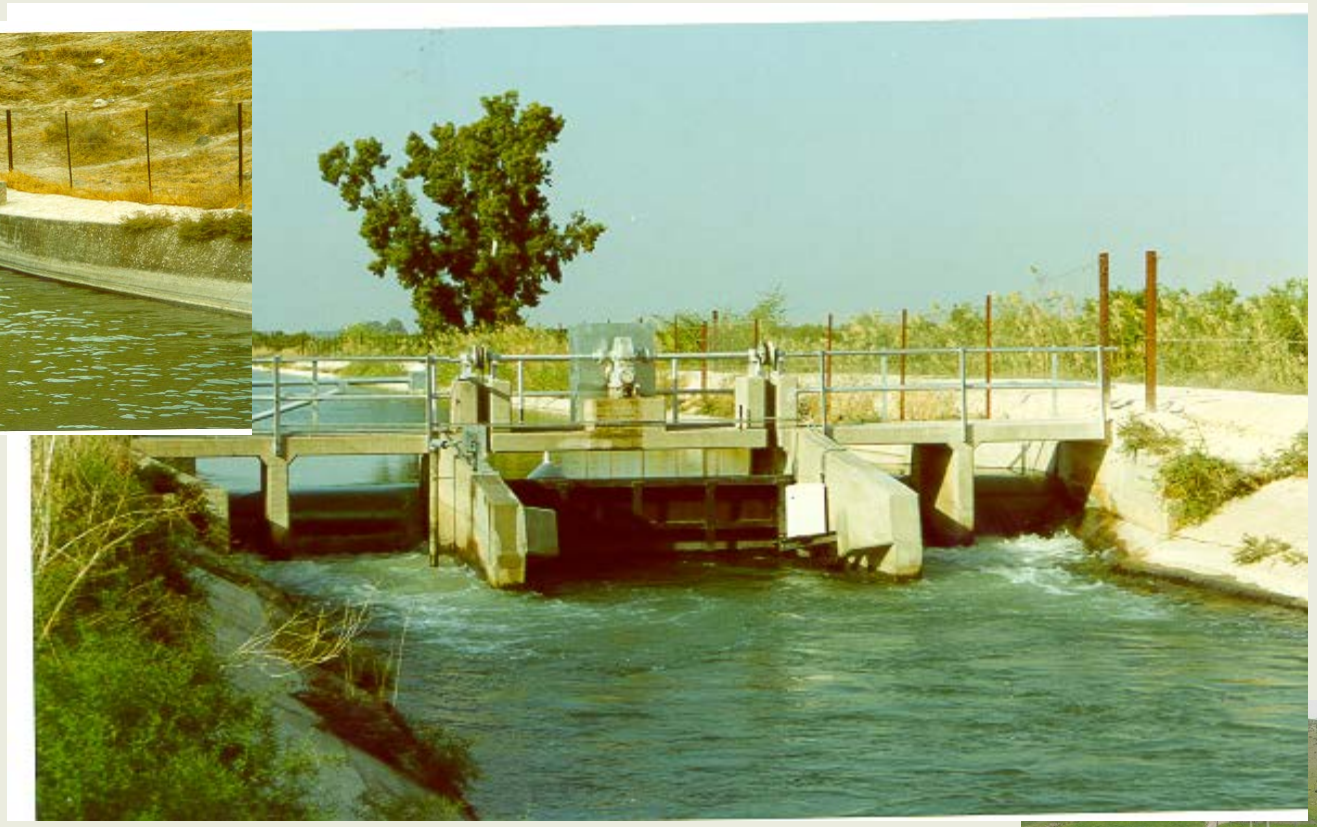
The River Basin Development in Jordan

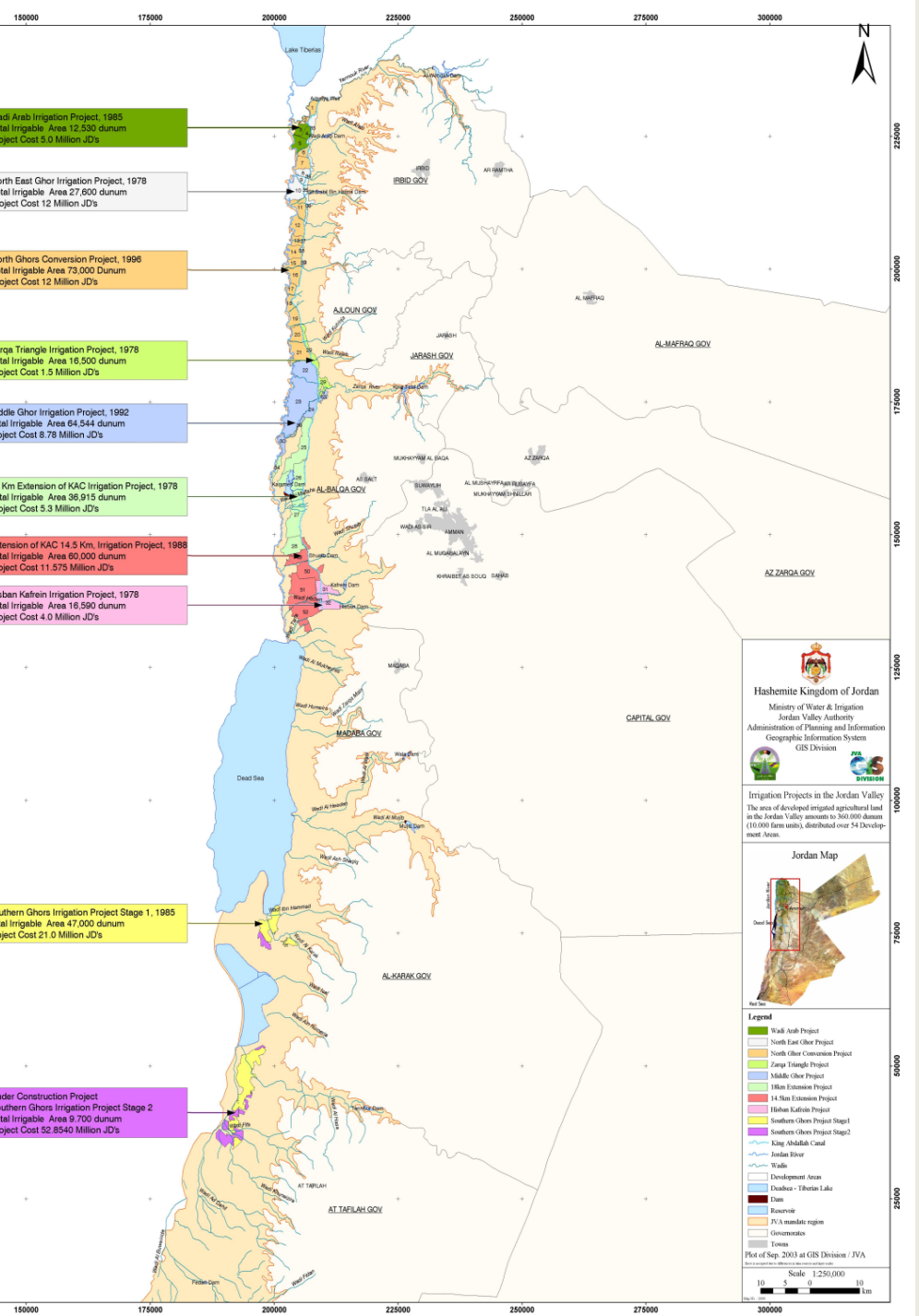
- **Jordan has started implementation of the development plans in the Jordan Valley since the early fifties of the last century.**

- **Many organizations were formed by the Jordanian Government for this purpose, the latest of which is the Jordan Valley Authority (JVA) that was formed in 1977 for the integrated development of the Jordan Valley.**

- **An area of 36 thousand hectares was developed for irrigated agriculture, 10 main dams of 325 MCM storage capacity were constructed, and the land was divided into farm units and distributed to the local farmers in the valley. The King Abdullah Canal (110 km) is the backbone of the hydraulic infrastructure in the Jordan Valley.**

King Abdullah Canal





di Arab Irrigation Project, 1985
tal Irrigable Area 12,530 dunum
oject Cost 5.0 Million JD's

rth East Ghor Irrigation Project, 1978
tal Irrigable Area 27,600 dunum
oject Cost 12 Million JD's

rth Ghors Conversion Project, 1996
tal Irrigable Area 73,000 Dunum
oject Cost 12 Million JD's

rqa Triangle Irrigation Project, 1978
tal Irrigable Area 16,500 dunum
oject Cost 1.5 Million JD's

ddle Ghor Irrigation Project, 1992
tal Irrigable Area 64,544 dunum
oject Cost 8.78 Million JD's

Km Extension of KAC Irrigation Project, 1978
tal Irrigable Area 36,915 dunum
oject Cost 5.3 Million JD's

tension of KAC 14.5 Km, Irrigation Project, 1988
tal Irrigable Area 60,000 dunum
oject Cost 11.575 Million JD's

sban Kafrein Irrigation Project, 1978
tal Irrigable Area 16,590 dunum
oject Cost 4.0 Million JD's

uthern Ghors Irrigation Project Stage 1, 1985
tal Irrigable Area 47,000 dunum
oject Cost 21.0 Million JD's

der Construction Project
uthern Ghors Irrigation Project Stage 2
tal Irrigable Area 9,700 dunum
oject Cost 52.8540 Million JD's

Irrigation Scheme in the Jordan Valley

Tiberia lake

Adasiyya Diversion Wier

Al Wehda Dam 110MCM

Yarmouk River

Tunnel

KAC Conveyor

Mukhaibeh Wells

Wadi Arab Dam16.8 MCM

Wadi Arab

Wadi Ziglab

N.E.G 4286 Ha

Ziglab Dam3.9 MCM

North Ghor 7300 Ha

Wadi Jurum

Wadi Rayyan

Wadi Kufrinja

Wadi Rajib

Zarqa CarrierIII

Jarash WWTP

Pumping to Amman

Zarqa CarrierII

Wadi Dhulail

Zarqa River

Middle Ghor 6450 Ha

Zarqa Siphon

Abu Zeghan Canal

Qaa Khanna Diversion

Tel Ad Dahab Weir

King Tala Dam 75MCM

Jordan River

Zarqa Carrier I

1650Ha

Baqaa WWTP

As Samra WWTP

Karama Dam 55 MCM

King Abdulla Canal

250Ha

Wadi Shueib

Wadi Shueib Dam1.43 MCM

18Km Extension 3650 Ha

14.5Km Extension 6200Ha

1659Ha

Kafrein Dam8.45 MCM

Wadi Kafrein

Wadi Hisban

Dead Sea

Legend

River

Canal or Carrier

Existing Dam

Proposed Dam

Diversion Wier

Irrigated Area

Water Right

Water Annex (II)
in the Peace Treaty with Israel

- **This annex was a part of the peace treaty signed in 1994 between Jordan and Israel to deal with the water issues between the two parties.**

- **A joint water Committee (JWC) was formed from high ranking officials supported with technical committees, and meets regularly to discuss and solve the shared water issues.**

- **A water release schedule is seasonally agreed upon between the two parties to regulate the flow of water in the two directions of the border line, and it is adjusted by mutual consent of the two parties in accordance with the situation.**

Water Quality and Protection

- **According to the Water Related Matters -Annex II of the Peace Treaty: ”Jordan and Israel will each prohibit the disposal of municipal and industrial wastewater into the courses of the Yarmouk and the Jordan Rivers before they are treated to standards allowing their unrestricted agricultural use”.**

- **Jordan from its side monitors the water quality of both rivers using real–time system to monitor temperature, pH, EC, turbidity , DO, T-N, T-P and COD.**

- **Monthly sampling are taken at nine locations along the Jordan River to monitor other physical and chemical parameters.**

Water Quality Monitoring Stations

The way ahead

- **Enforcement of the articles dealing with the environmental issues in the peace treaty between Jordan and Israel to preserve the eco - system the Jordan River basin and to rehabilitate the river. A master plan is currently underway to improve the environmental conditions in and around the river.**

- **Discussions are being conducted to construct a desalination plant at the Red Sea in Aqaba, which will add to the regional water resources around 80-100 MCM for the benefit of Jordan, Israel and the Palestinian Authority.**

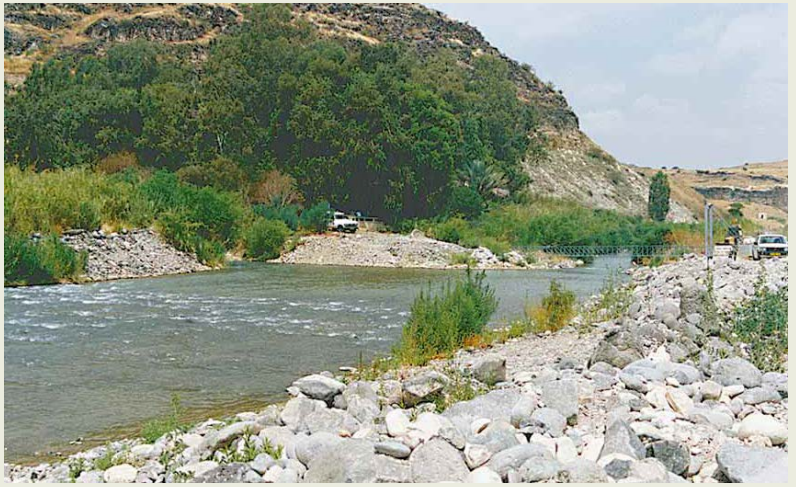
- **Water swapping principle will be implemented to reduce the cost of potable water transfer to the demand centers.**

The Jordanian – Syrian Agreement for the Utilization of the Yarmouk River

- **Sharing the Yarmouk River water resources is governed by the 1987 agreement between Jordan and Syria, which superseded the 1953 agreement.**

- **Al Wehda Dam was constructed in accordance with the agreement on the Yarmouk River to store the winter floods and regulate the base flow of the river.**

- **Due to the upstream uses (42 dams and more than 3000 wells), the river historical base flow discharge that enters Jordan from Syria dropped from 8 m^3/second to an average of around 1 m^3/ second which does not allow the use of the dam's full storage capacity.**



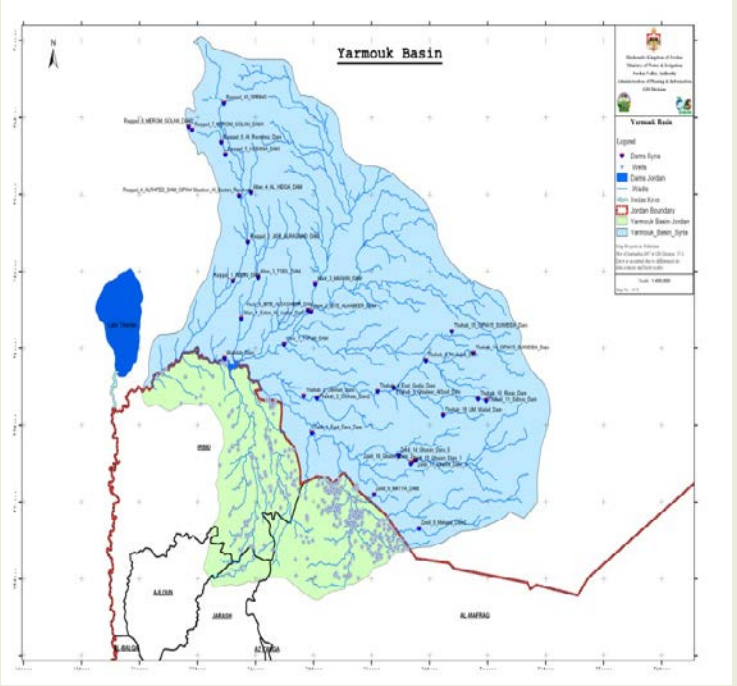
The Jordanian – Syrian Agreement for the Utilization of the Yarmouk River

- **The Jordanian – Syrian Joint Water Committee and the supporting Technical Committees meet regularly in Amman and Damascus to follow up the implementation of the agreement.**

- **Violations are recorded and discussed and plans are put to deal with them.**

- **A joint study was conducted at both sides of the Yarmouk River Basin to define the surface and ground water resources and the best methods for their utilization.**

- **Seven hydrometric stations have been installed (2 at the Jordanian side and 5 at the Syrian side of the basin) to record the discharge of the Yarmouk River tributaries.**



Lessons Learned

- **Jordan as downstream water user receives the residual discharge which continues to decline year after year with the augmenting utilization of the water resources from the upstream users.**

- **Bilateral agreements and Joint Water Committees can meet and discuss, but in most cases facts on ground are governed by the real needs of the riparians, which in most cases do not abide the international laws and conventions.**

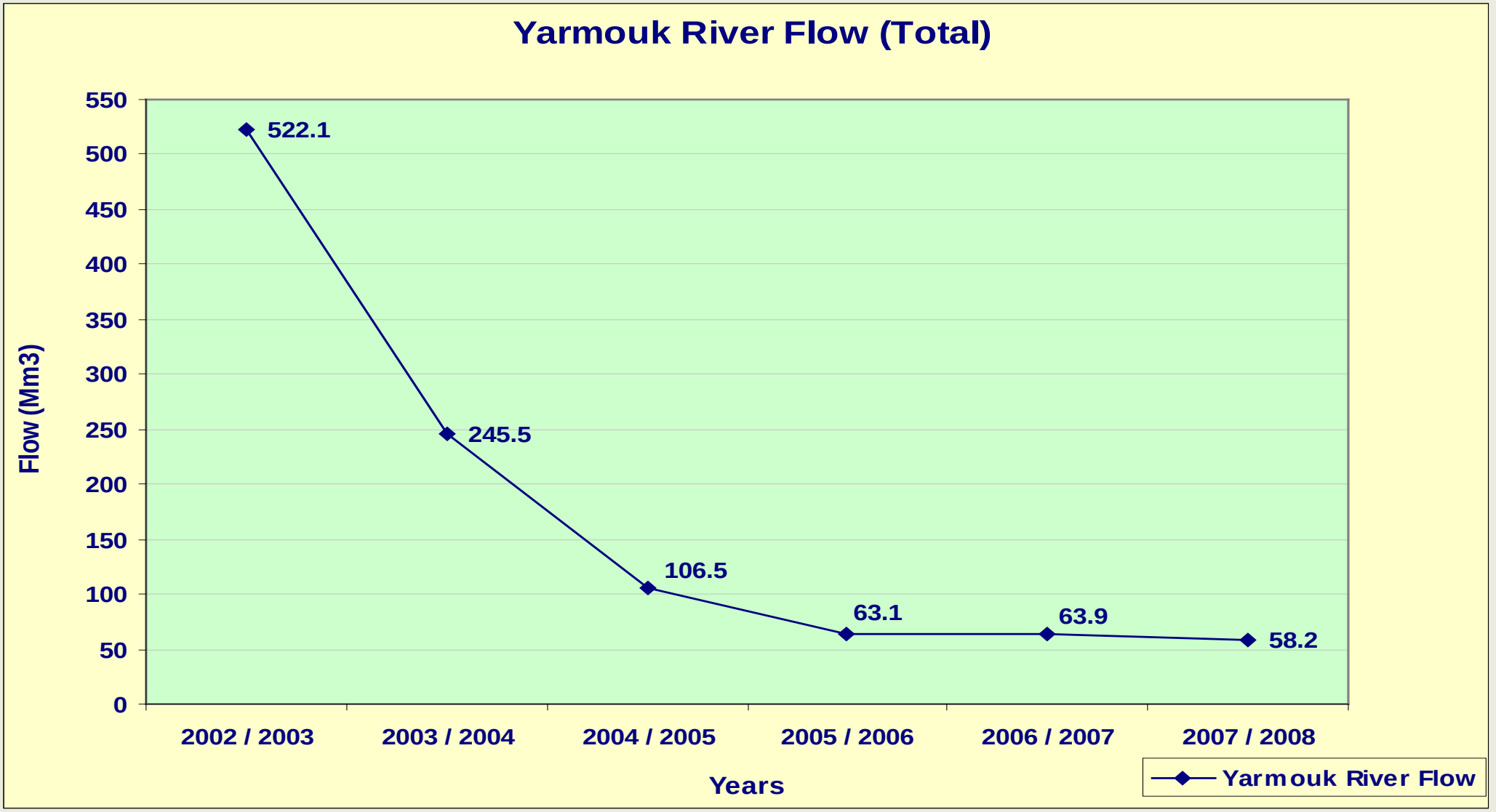
- **Integrated water resources management (IWRM) at the River Basin level including all the basin riparians has to be implemented if the basin water resources have to be fairly utilized by the upstream and downstream users.**

Lessons Learned

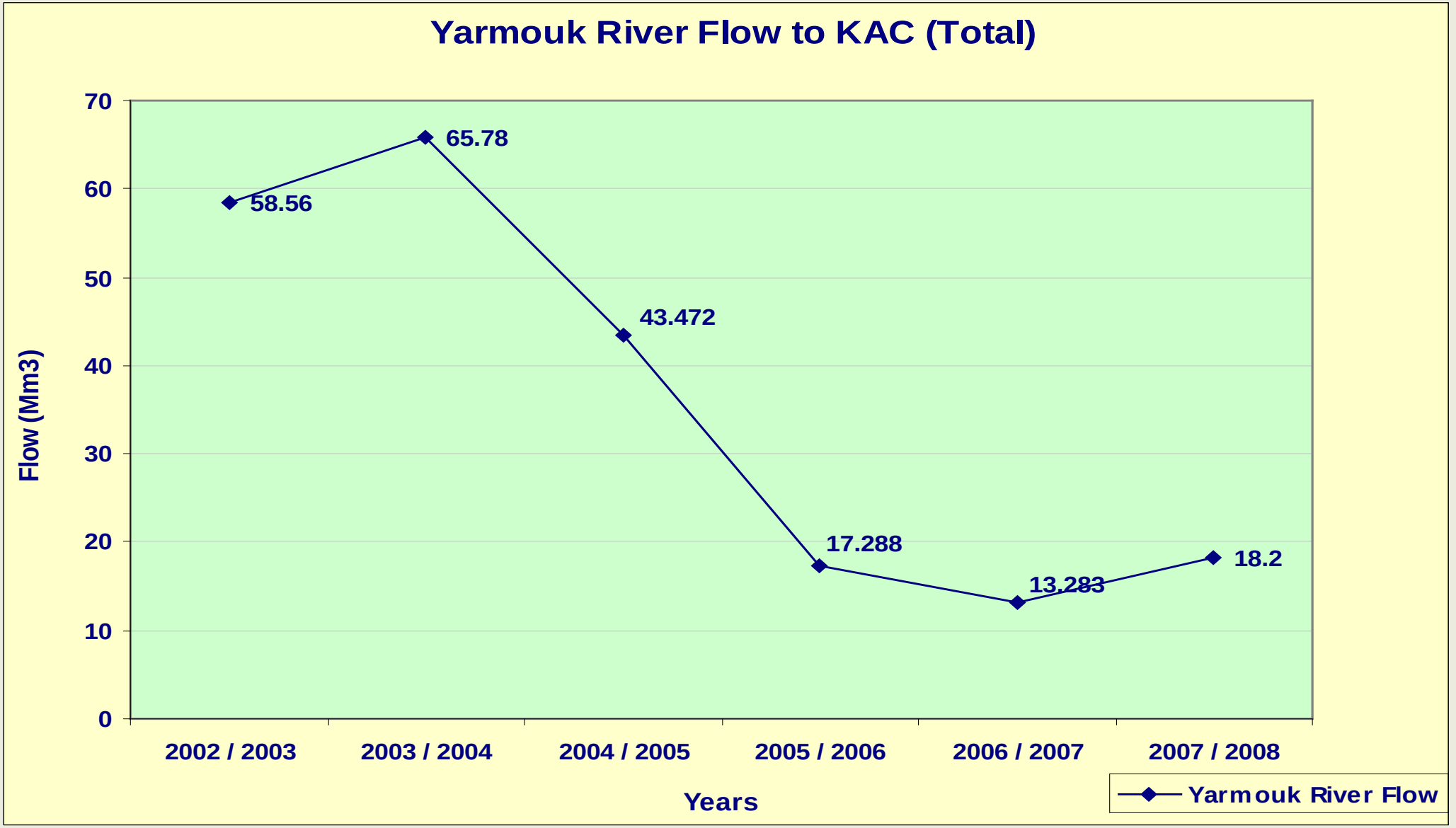
- **IWRM will require the coordinated development and management of water, land and related resources in order to maximize economic and social welfare in an equitable manner without compromising the sustainability of vital ecosystems and the environment (global water partnership definition).**

- **Sustainability of the water resources solutions in the River Basin will require regionally harmonized and internationally supported, definitive, and ecologically sound improvement in management of the natural and built water systems.**

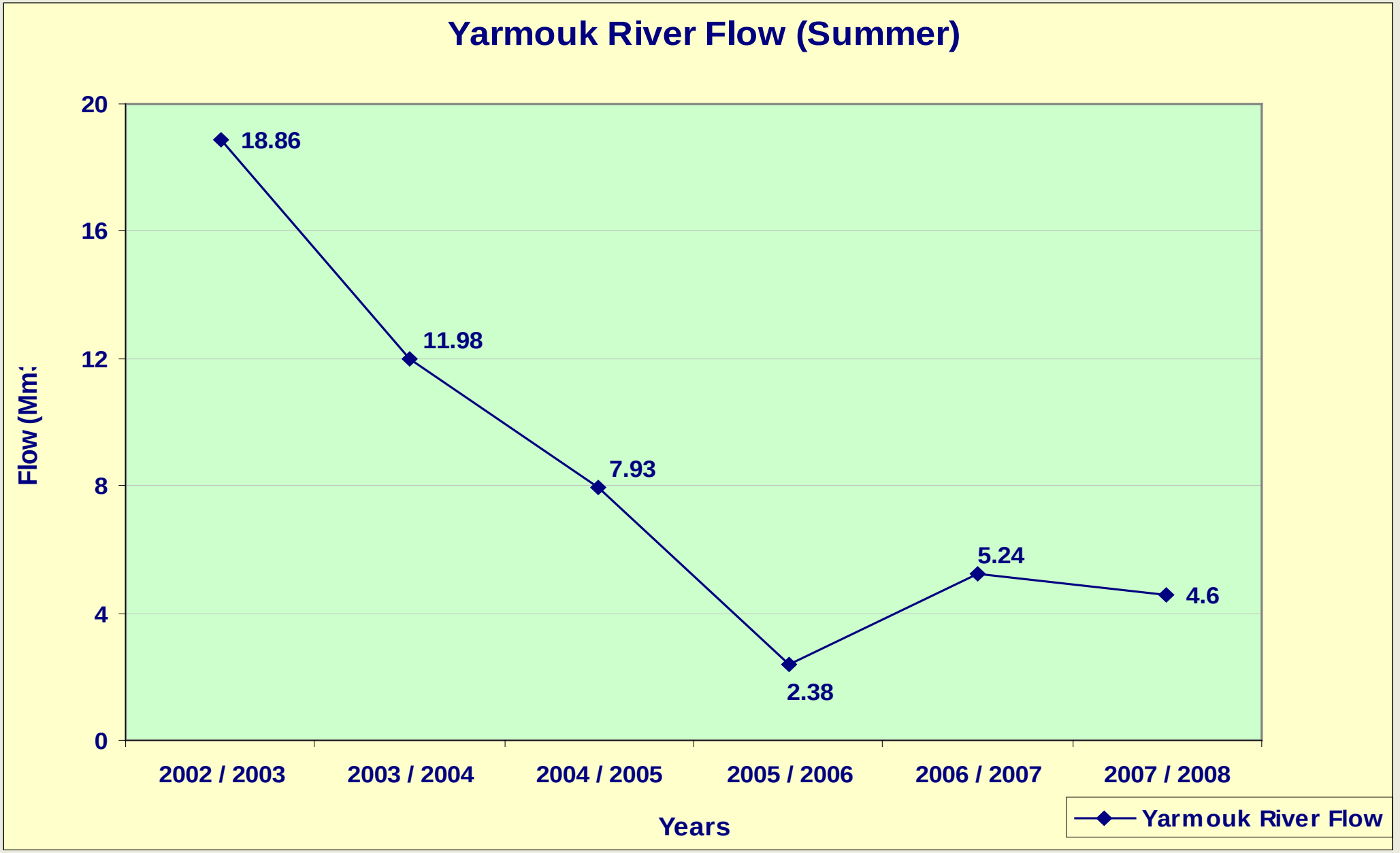
Yarmouk River total flow at Adasiyeh



Yarmouk River flow to King Abdullah Canal



Yarmouk River summer flow to King Abdullah Canal



Red Sea – Dead Sea

Water Conveyance Project

Importance of the Dead Sea

The Dead Sea is a unique international heritage.

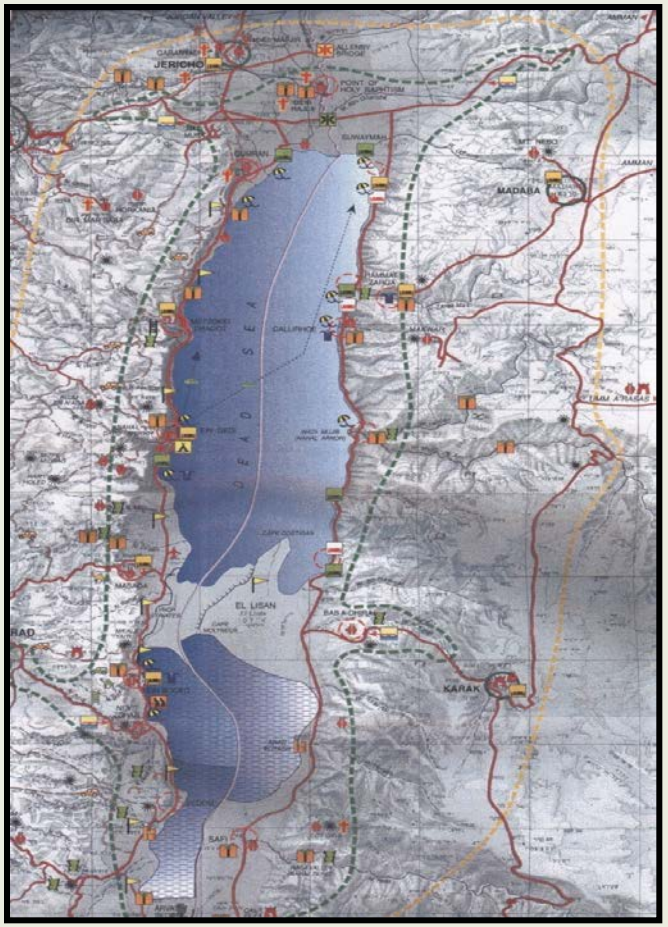
The uniqueness comes from:

1- Location, Climate and Properties

2- Cultural and religious treasure

3- Unique environment

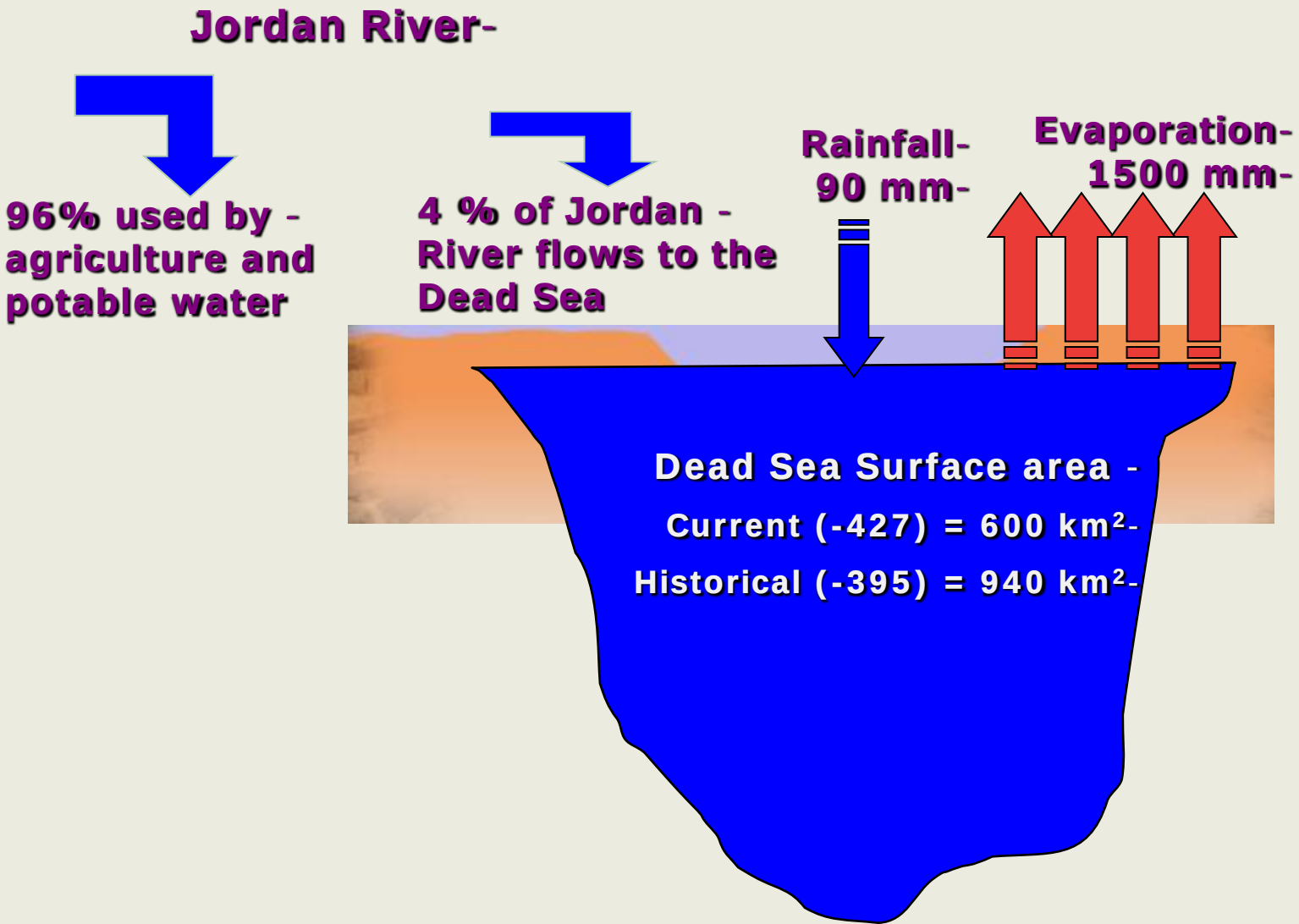
4- Economic attraction



The Problem ?

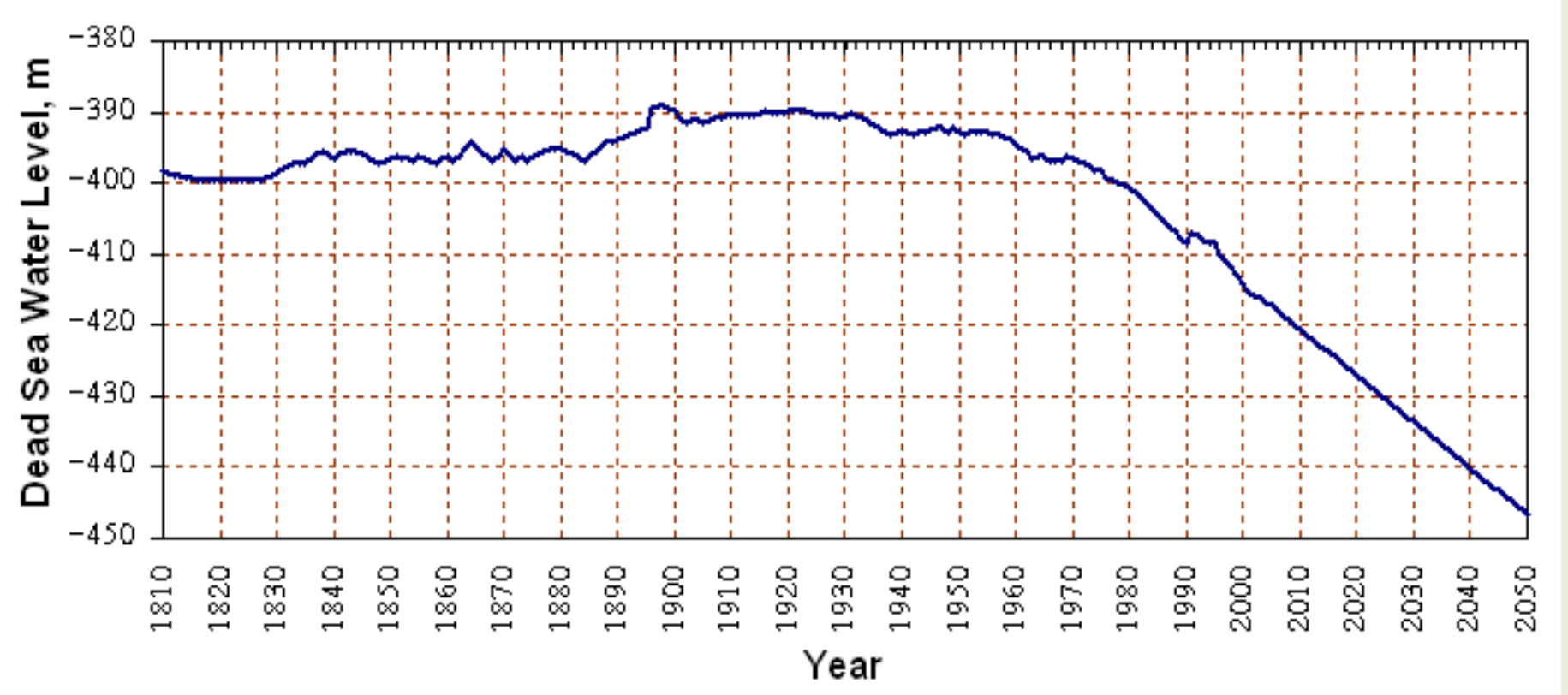

-There is an environmental degradation problem facing the Dead Sea

Dead Sea Schematic



Consequences

- Dead Sea level has fallen from 393 to 427 meters below sea level in less than 60 years
- More than 30 meters of sea level fall
- Current rate of decline is approximately 1m per year



The Dead Sea . . . in time

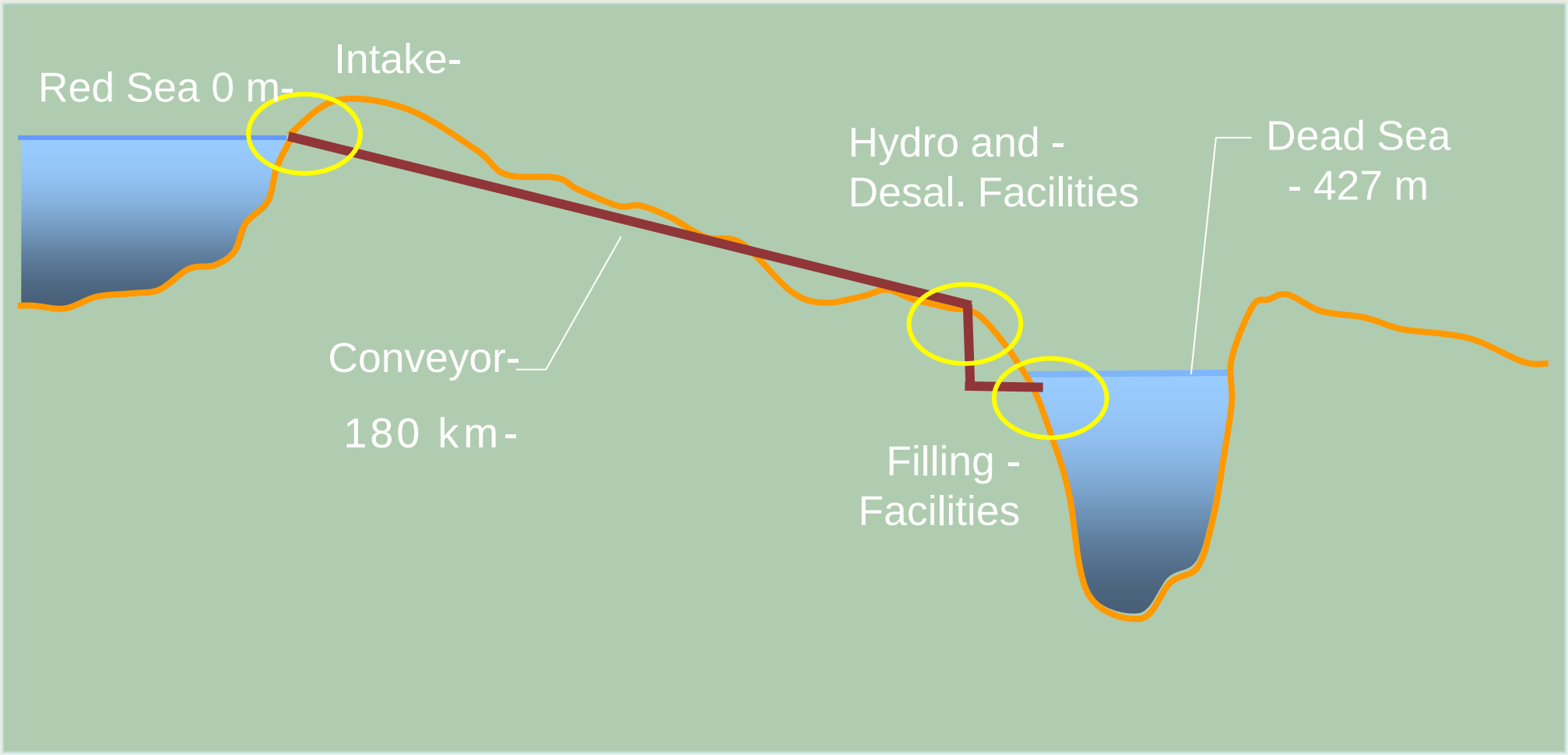
Shared vision
Red Sea - Dead Sea Water Transfer

As stated by the beneficiary parties..

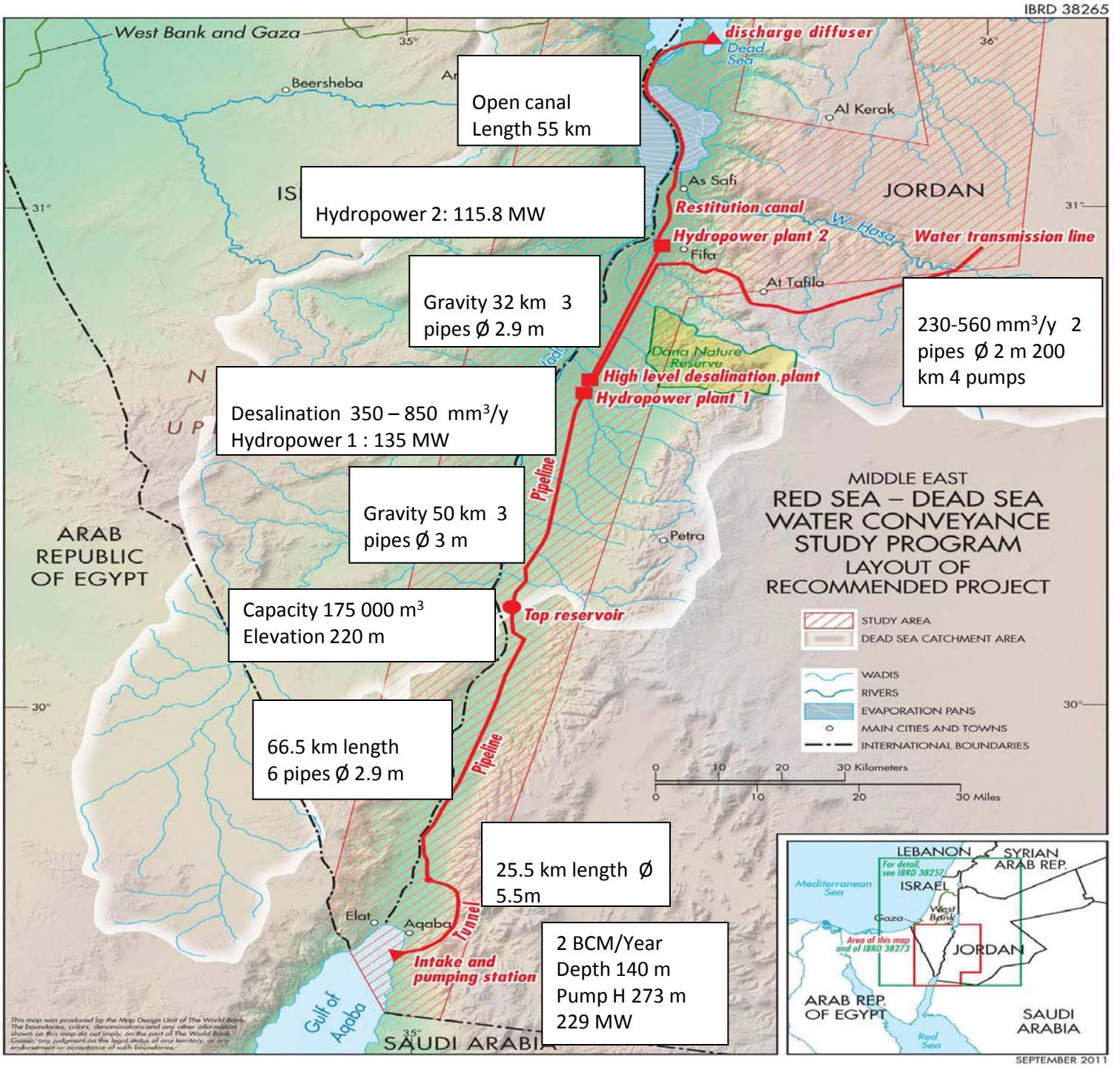
- **Save the Dead Sea from further environmental degradation**
- **Desalinate water/ generate energy at affordable prices for Jordan, Israel, and the Palestinian Authority**
- **Build a symbol of peace and cooperation in the Middle East**

Red Sea - Dead Sea Water Transfer

Proposed Red Sea Dead Sea Water Transfer



Red Sea – Dead Sea Water Conveyance Project



Open canal
Length 55 km

Hydropower 2: 115.8 MW

Gravity 32 km 3 pipes Ø 2.9 m

230-560 mm^3/y 2 pipes Ø 2 m 200 km 4 pumps

Desalination 350 – 850 mm^3/y
Hydropower 1 : 135 MW

Gravity 50 km 3 pipes Ø 3 m

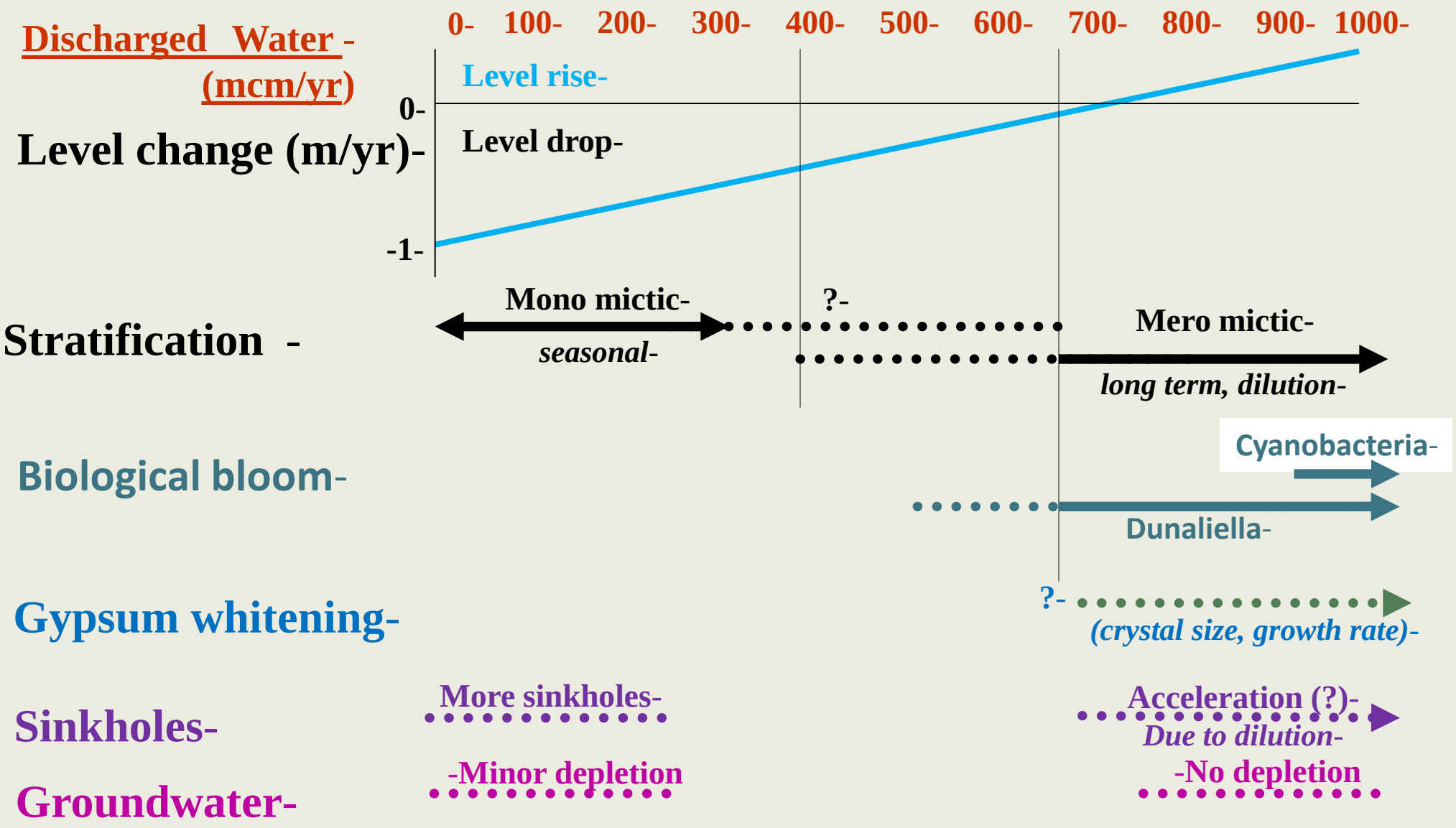
Capacity 175 000 m^3
Elevation 220 m

66.5 km length
6 pipes Ø 2.9 m

25.5 km length Ø 5.5m

2 BCM/Year
Depth 140 m
Pump H 273 m
229 MW

WB- Environmental and Social Assessment – June 2012-



Aqaba Desalination Plant

- **The proposed plant will have a desalination capacity of (80-100) mcm/year. (30-40) mcm/year will be dedicated for Aqaba city, and (50-60) mcm/year will be purchased by Israel, in condition to provide Jordan with the same quantity from Lake Tiberia for use in the Northern part of Jordan at a cost that was agreed upon in the MOU signed by the JWC Chairs in 2010.**

- **The Capital cost of the system is expected to be around US$ (900) million, and the operational cost will be around US$ (40) million. The unit cost of one cubic meter of the desalinated water will be around US$ (1.2 – 1.4) based on the financial conditions of the project.**

- **Water quantity of (20 – 30) mcm/year will be provided to the West Bank cities through a special arrangement between Israel and the Palestinian Authority.**


To Dead Sea
Maan
Top Reservoir@ Ar Rishah
Aqaba
Proposed PS#2 @ 950m asl
Desi Regulatig Tank @ 1110 asl
Desalination Plant, GI=35m
New Reservoir @ 830 m asl
M 13 (ED 1510)
M 9 (ED 1535)
M 13 (ED 1531)
QA 6 (ED 1406)
Intake PS
© 2012 Google
© 2012 ORION-ME
US Dept of State Geographer
© 2012 Cnes/Spot Image
2009 Google
Imagery Date: Nov 22, 2005
29°58'39.55" N 35°21'08.99" E elev 1066 m
Eye alt 198.96 km

Than you