ENVIRONMENTAL IMPACTS OF MEGA DESALINATION PROJECT: A CASE STUDY OF THE RED- DEAD SEA CONVEYOR

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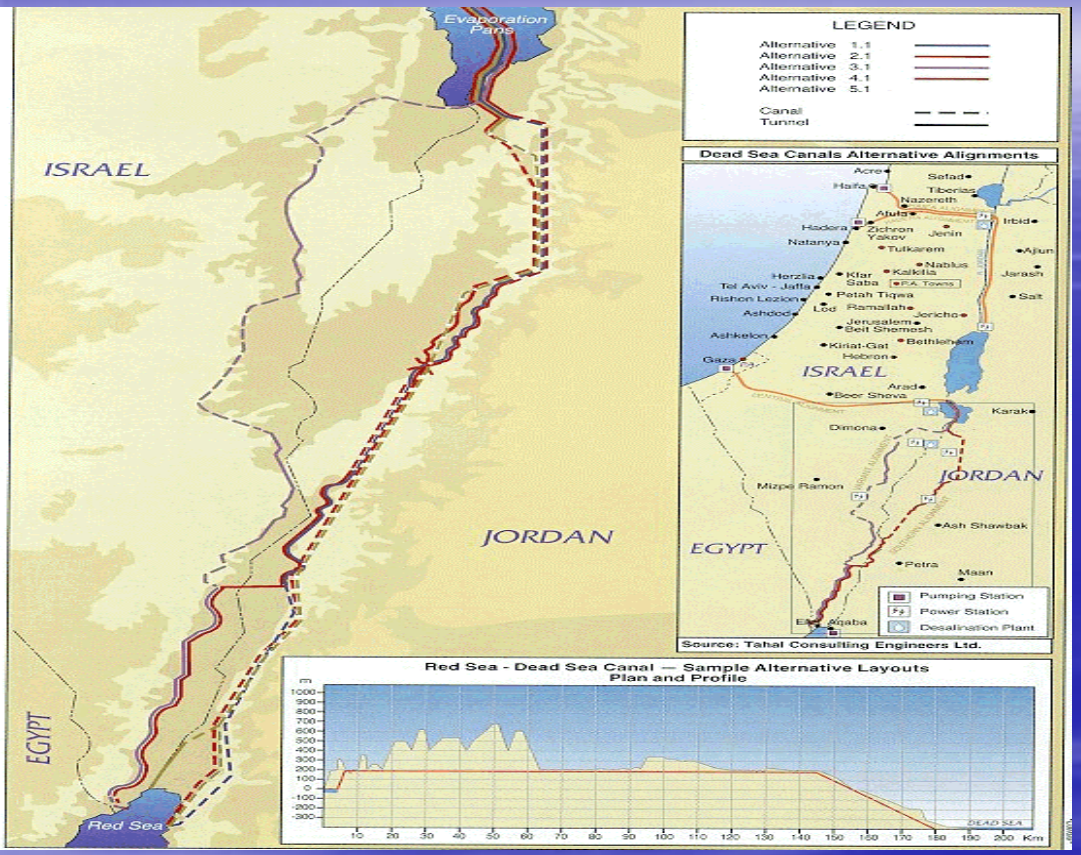
Water Availability

- Most Middle Eastern countries are facing a chronic water shortage
- Some of the countries are considered among the water poorest countries worldwide
- Need for reliable water resources

RED DEA CONVEYOR

PROJECT DETAILS



Phase 1: Water transfer from Red Sea to Dead Sea

- At a cost of US$1 billion
- Distance : 180 km
- Annual water transfer: 1,900 mcm/yr
- Alignment – Wadi Araba

Phase 2: Hydropower and freshwater production

- At a cost of US$1-1.5 billion
- Hydroelectric power generation
- Reverse osmosis desalination facility
- Freshwater production capacity – 850 mcm/yr

Phase 3: Freshwater and excess electricity distribution

- Freshwater Transmission and distribution system to demand centers
- Transmission system for of electricity

Why The Red-Dead Project?

- Meeting the ever increasing water demand (850 MCM of Fresh water)
- Generating Power
- Preserving the DEAD SEA from vanishing

Why The Red-Dead Project?

- **Importance of The Dead Sea**
- **The uniqueness comes from:**

1- Location, Climate and Properties

2- Cultural and religious treasure

3- Unique environment

4- Economic attraction

Location, Climate, Properties

- The Dead Sea is the lowest spot on earth (417 meters below sea level)
- Dead Sea water contains more than 30% mineral rich salts. Salinity is 10 times higher than sea water.

- It has a unique mud that is rich in minerals,

A Cultural and Religious Treasure

- Origin and/or center of religions and cultures
- Biblical history and places of pilgrimage

Dome of the Holly Rock

Mount Sodom and Lot's wife

Pop John Paul II visit to Baptism site

Unique Environment

- A unique eco-system housing rare wildlife and endangered species
- Sandstone Formations
- Spectacular landscape with rare attributes
- Multiple Natural Reserve

Economic Attraction

- **Huge tourism potential**
- **Unique medical and health resources**
- **Mineral Dead Sea products**
- **Potash Industry**

What is the problem ?

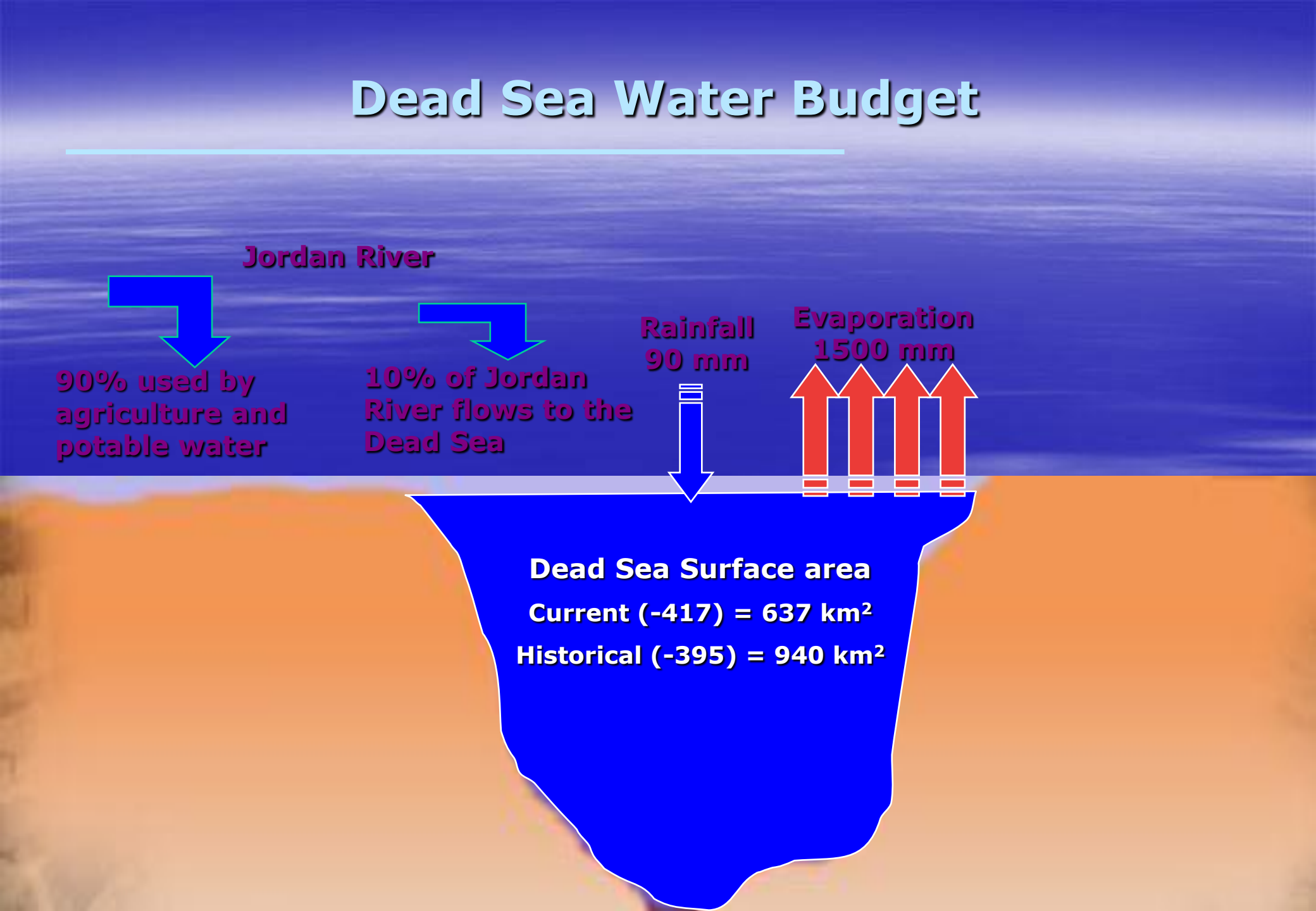
WATER SHORTAGE

- **High rate of population growth implies higher demand on the limited water resources.**

DEAD SEA VANASHING

- Average annual inflow to the Dead Sea has decreased from natural 1,200 mcm/yr to about 250 mcm/yr, leading to a water level decline of about 1 m/year.
- This decline resulted from the vital human water requirements in this water-scare and arid region.
- Water level dropped by 24 meters, surface area shrank by about 33% in the last 55 years. 80% of this decline has occurred since the 1970's.

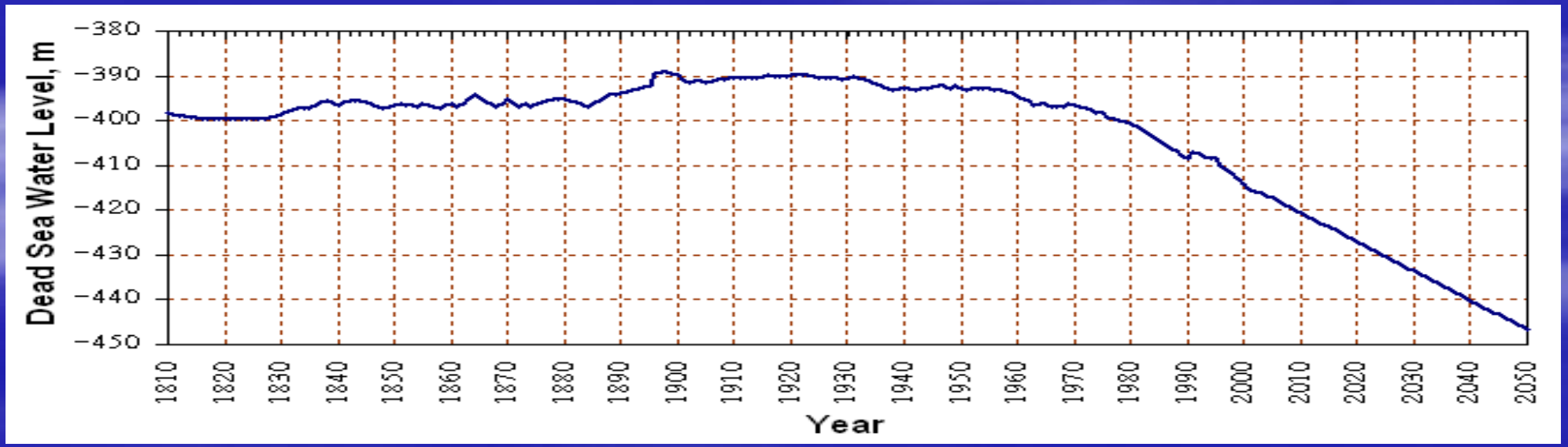
Dead Sea Water Budget



Consequences

- **Dead Sea level has fallen from 393 to less than 417 meters below sea level in less than 55 years**
- **More than 24 meters of sea level fall**
- **Current rate of decline is approximately 1m per year**

Year	Level, m	Area, Sq. Km
1950	-393	1043
1975	-397	926
2000	-414	642
2005	-417	637
2020	-427	622
2050	-447	582

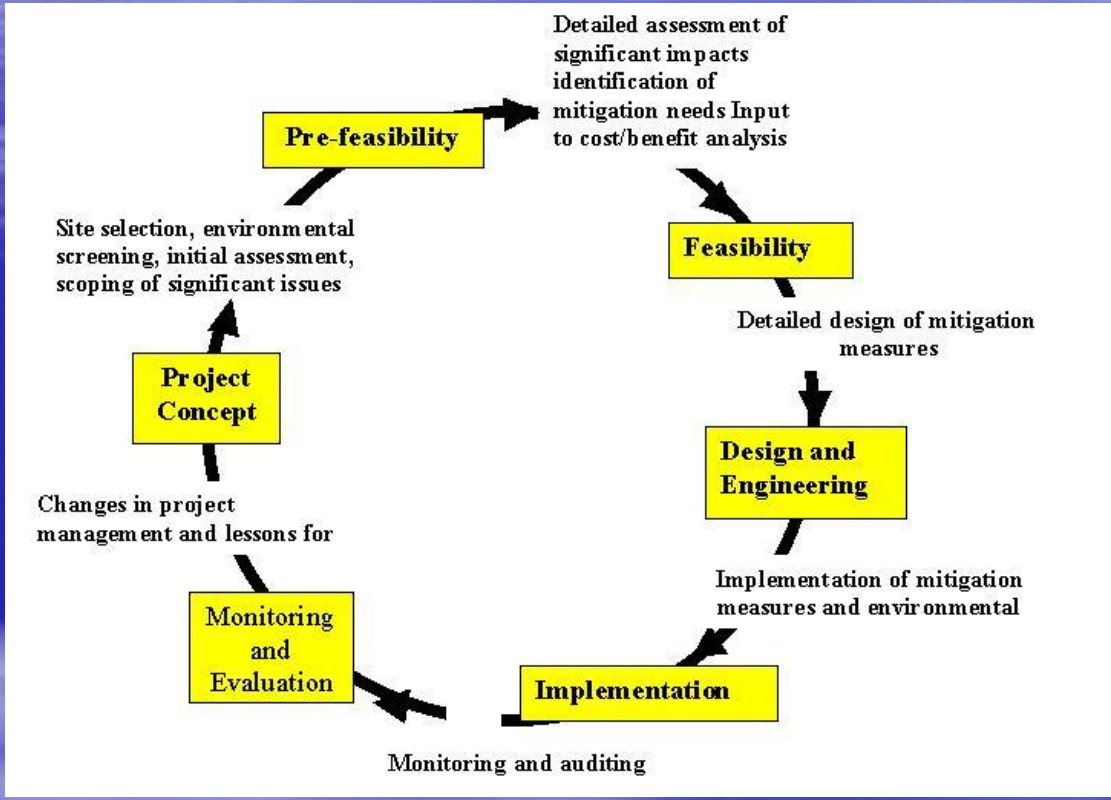


The Dead Sea . . . in time

If no action is taken…

- **Loss of historic Dead Sea within 50 years**
- **Loss of valuable ground water resources and formation of sink holes**
- **Ecological Imbalances: hydrologic systems, land quality, plant and wildlife habitats**

ENVIRONMENTAL COST OF MEGA PROJECTS



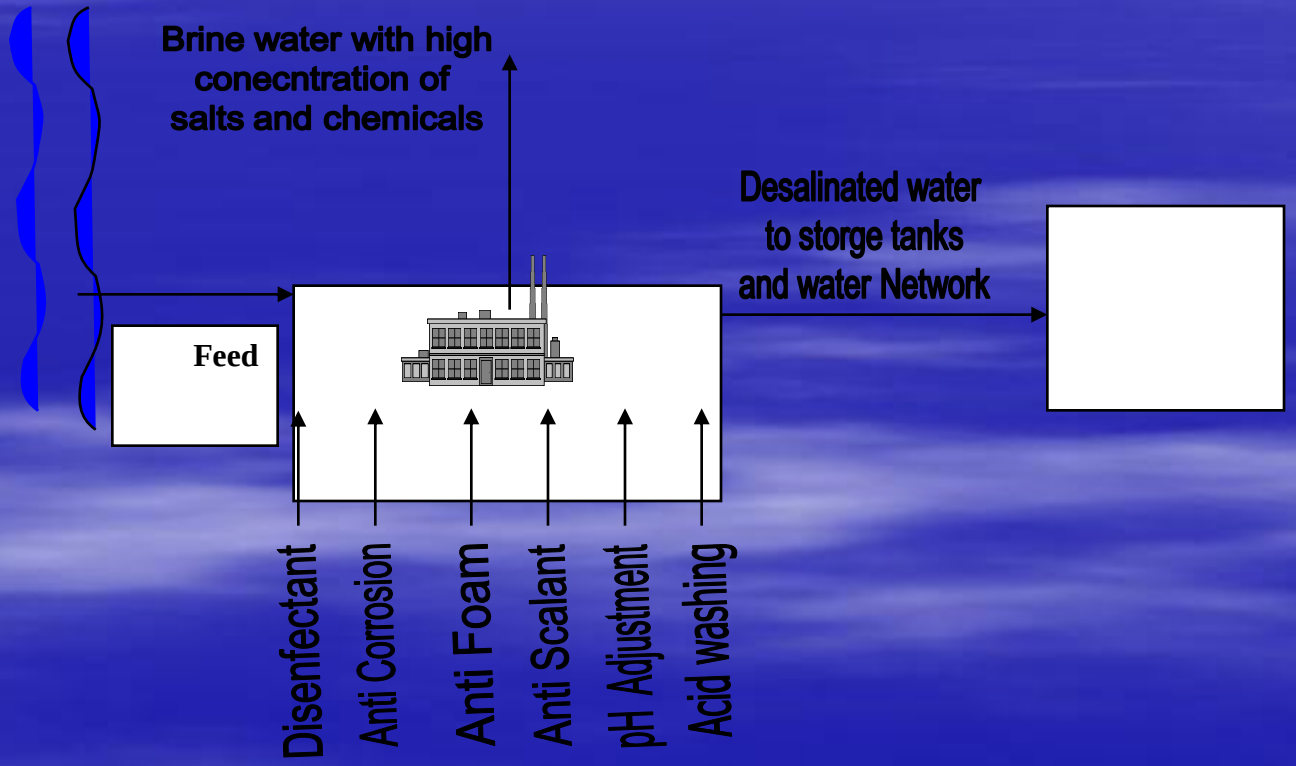
Both positive and negative impacts should be considered

POSITIVE IMPACTS

- Creating a reliable source of water on a regional scale that will relive the pressure from the already exhausted conventional water resources
- Positive impacts on the regional socio-economic development
- Restoring the Dead sea to its historical level
- Preventing the formation of sink holes
- Creating hundreds of jobs

ADVERSE IMPACTS

There is a mutual interaction between the desalination plants and the sea environment.



Impacts on the Gulf of Aqaba

- The Gulf of Aqaba is considered as a semi enclosed water body with fragile environment. Gulf length (180 km) to the Strait of Tiran outlet width (6 km).
- Atypical oceanographic characteristics of this semi-enclosed portion of the Red Sea have resulted in the evolution of biological diversity that is unique to the Gulf of Aqaba (Coral reefs)
- Impacts during construction and operation

Impacts on the Gulf of Aqaba
Construction phase

- Excavation will disturb the beach sand and produce sediments
- Heavy equipment that will compact the beach sand and affects the biodiversity
- Noise from the construction equipment
- Spill of chemical and machinery oil

Impacts on the Gulf of Aqaba
Operation phase

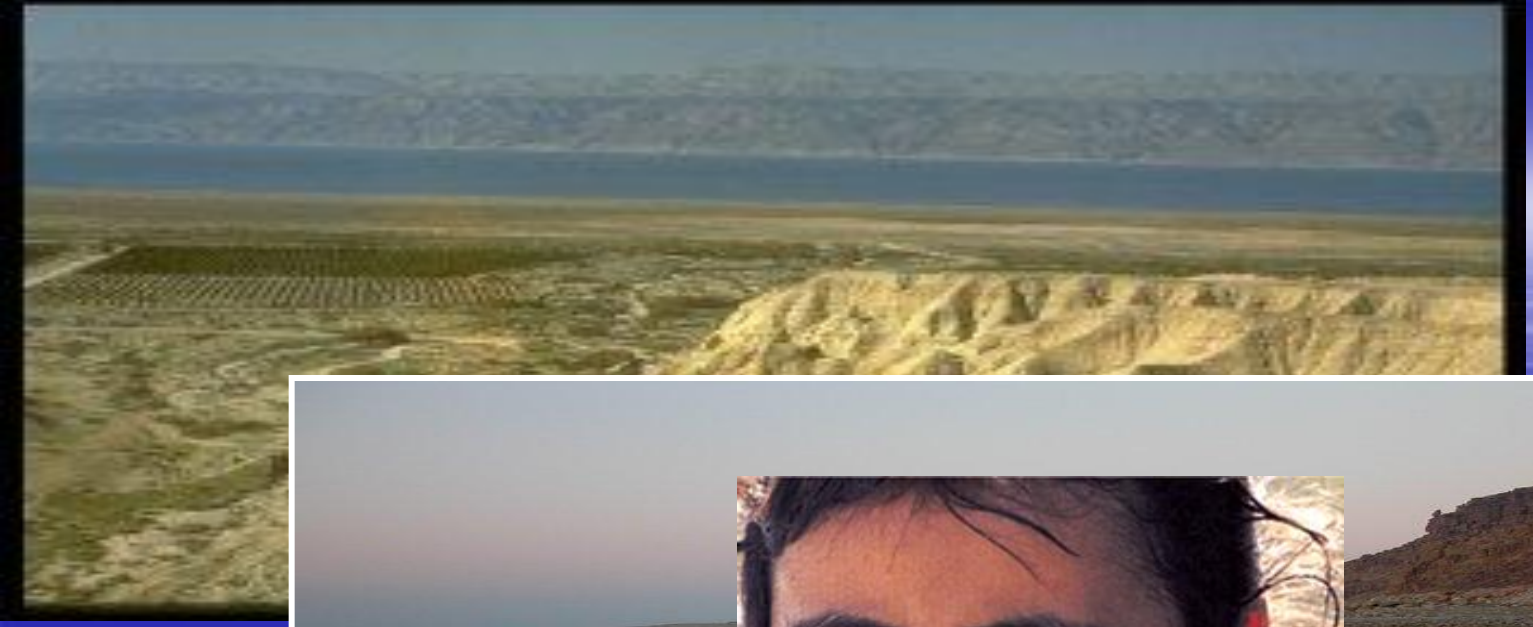
- During the operation phase, intake of water directly from the sea usually results in loss of marine species as a result of impingement and entrainment
- Noise of the pumping equipment
- Spillage of oil and grease that will be used for the operation and maintenance of the pumps

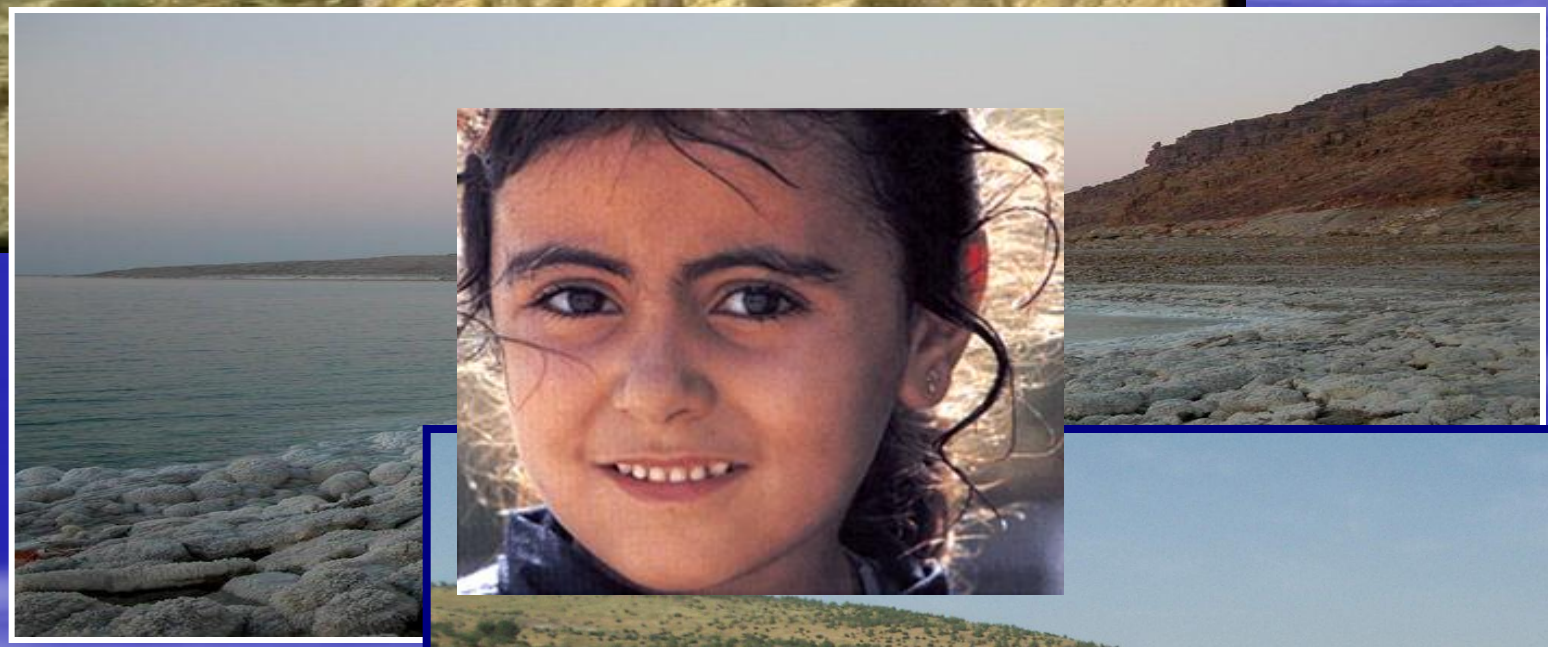
Impacts on the Dead Sea

- Brine Discharge of 72,220 mg/l to a dead sea water which is a hyper saline water body (Different Densities)
- Chemicals will be introduced into the dead sea water
- Solid waste (Spent membranes)
- Geological and Seismological impacts

Conclusions & Recommendations

- Red-Dead project is a Mega Scale project and first of its type
- A well designed Environmental Impact Study should be conducted to maximize the Benefits and Eliminate and/or minimize the adverse impacts
- A comprehensive environmental management plan should be placed and applied during the construction of the intake structure.





Thank you