DESALINATION: THE RED SEA – DEAD SEA CONVEYOR PROJECT

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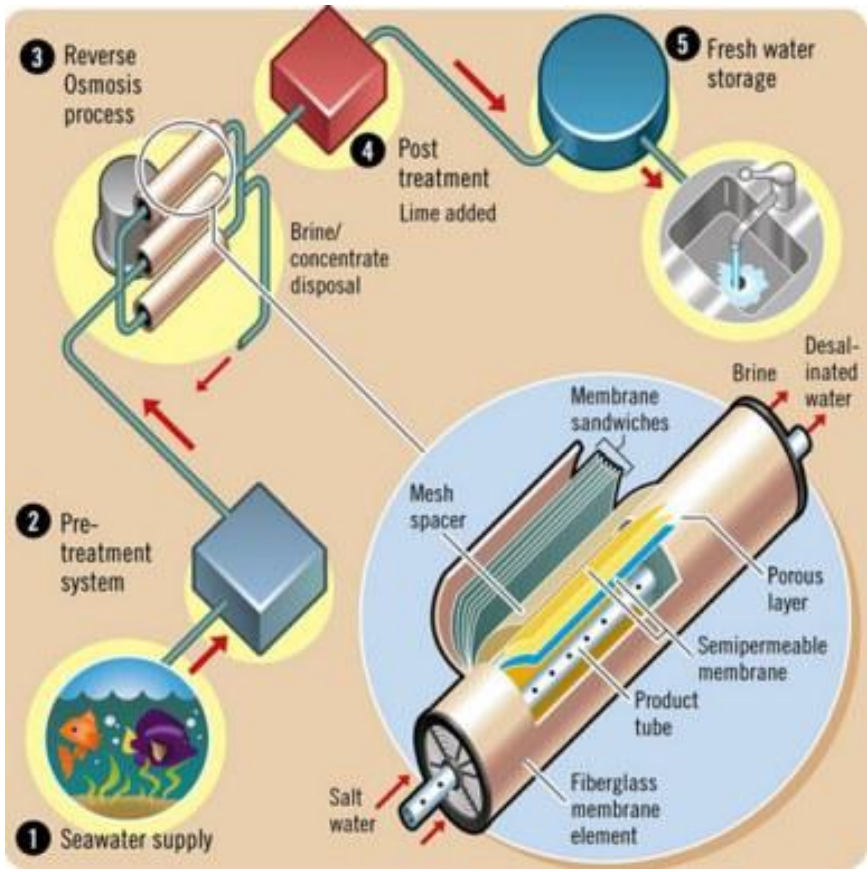
Desalination

- What is Desalination?
  - 5 Key Elements
    - Intakes
    - Pretreatment
    - Desalination
    - Post-Treatment
    - Concentrate Management



https://waterenergymatters.wordpress.com/tag/desalination-capacity/

Desalination Technologies

- Membrane Desalination
  - Semi-permeable membranes are used to selectively allow or prohibit the passage of ions
  - More commonly used to desalinate brackish water
  - Two categories of membrane technologies
    - Pressure Driven
      - Reverse Osmosis
      - NanoFiltration
      - Ultrafiltration
      - Microfiltration
    - Electrical Potential
      - Electrodialysis
      - Electrodialysis reversal

Desalination Technologies

- Thermal Evaporation
  - Generally have higher capital costs and energy requirements than membrane technologies
  - Primarily used in the Middle East
  - Technologies
    - Multi-state flash distillation
    - Multi-effect distillation
    - Vapor compression
- Other Technologies
  - Ion-exchange methods; Freezing; Membrane Distillation; Solar Distillation

Concentrate Management

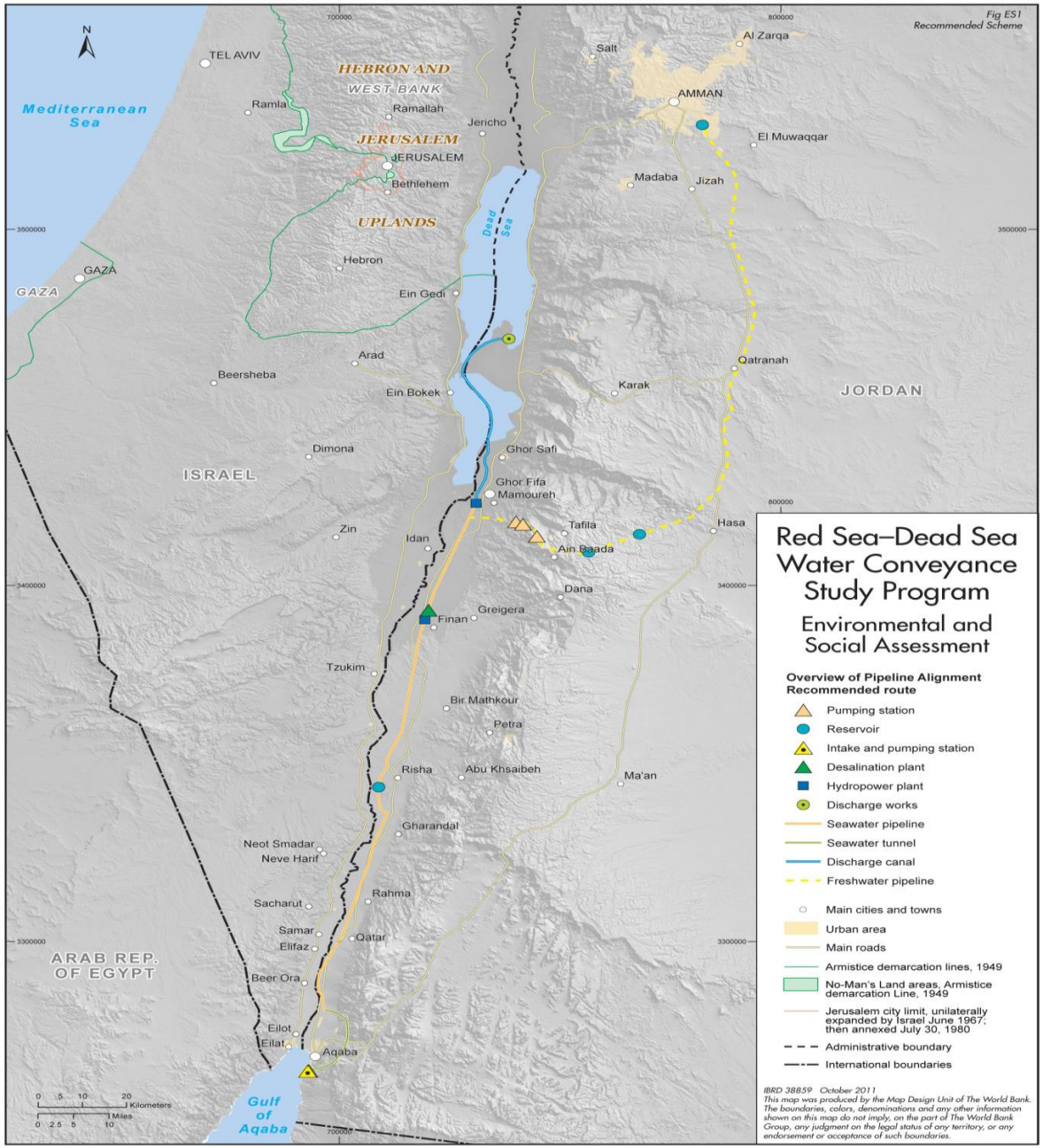
- Desalination produces a byproduct known as concentrate or brine
  - Has to be disposed of or reused
- The amount of concentrate produced depends on the technology used and the salinity content of the source water
- Disposal Methods
  - Surface water discharge
  - Sewer discharge
  - Deep well injection
  - Evaporation ponds
  - Zero Liquid Discharge

Environmental Impacts of Concentrate

- Composition of the concentrate depends upon the source water
  - May contain more than just high concentrates of salts
    - Lead
    - Magnesium
    - Iodine
    - Chemicals used during desalination
- Can raise the salinity level of the water at the discharge site
- Can lead to stratification
- Concentrate disposal method should be selected on a site-specific basis based on economic and environmental considerations

The Red Sea–Dead Sea Conveyor Project

- The Red Sea – Dead Sea conveyor project will convey water from the Red Sea to the Dead Sea
  - A 180-kilometer pipeline will carry up to 2 billion cubic meters of sea water per year
  - Will provide up to 850 million cubic meters of potable water per year to be shared among the project beneficiaries
- Project Beneficiaries: Israel, Jordan, The Palestinian Authority
- The concentrate will be discharged into the Dead Sea
- Estimated cost of the project is $10 billion dollars



http://siteresources.worldbank.org/INTREDSEADEADSEA/Resources/Environmental_and_Social_Assessment_Summary_EN.pdf

The Red Sea–Dead Sea Conveyor Project

- Ecology of the Two Seas
- According to the team leader for the World Bank's Red Sea- Dead Sea Study Program, the studies done indicate that the environmental and social impacts of the project can be mitigated to acceptable levels
  - With one exception
- Other Challenges
  - Financing
  - Politics

The Red Sea–Dead Sea Conveyor Project

- Some proposed alternatives to the project include:
  - No Action
  - Restore the Lower Jordan River
  - Water transfers
  - Other Desalination options
  - Combination of alternatives

- In conclusion further investigation of the alternatives should be conducted