Water- Needs, Research and Capability
At the Technion

Prof. Raphael Semiat
The Global Need for Water

Water shortage have reached crisis proportion in many parts of the world:

- Estimated 1.5 billion people do not have access to adequate supplies of safe water
  - Estimated 10,000 people die every day and thousands more suffer from a range of debilitating illnesses due to water related diseases
  - This includes estimated 2.2 million child death annually

Availability of fresh water resources is fixed

- Per capita availability continues to decrease as
  - Population increases
  - Developing countries improve their quality of life and level of industrialization
  - Salinity levels in many fresh water aquifers increases
Over half the world’s population will face severe water shortage in the next 50 years.

- In 1990, poor water supply and sanitation was the 2nd leading cause of death and disability worldwide.
- Over 50% of world’s major rivers are dry or heavily polluted.
- By 2025, 20% more fresh water will be needed for irrigation and 40% more for cities to maintain current per capita water levels.
- **NONTRADITIONAL** water resources will need to be used to address these shortages.

“Water promises to be to the 21st century what oil was to the 20th century: the precious commodity that determines the wealth of nations.”
*Fortune Magazine, May 15, 2000*
The desalination market is set to grow at an average annual rate of 12% until 2010 according to a forecast to be published in November new edition of the Desalination Market Report. This will take total installed desalination capacity to 63 million m³/d by 2010, compared to 40 million m³/d today. It is expected to reach 94 million m³/d by 2015.
Desalination Sites

Large plants:

- Hadera (100+)
- Ashdod (45)
- Palmahim (30)
- Brackish inland (50)
- Ashkelon (100)
- Ktziot (3)

Tenders - BOOT projects for 25 years
Ashkelon Plant

On Sept 2006 completed first 100 Million m$^3$
Man made polluted waters: Industrial, agriculture and urban effluents

Cooperation – UNSW, Victoria, UCLA, Technion

Modern Sewage Treatment

- Straining
- Micro/Ultra-Filtration
- Adsorption
- Reverse-Osmosis or Nano-Filtration
- Concentrate disposal
- Sludge/solids treatment
- Energy
- Compost
- Polishing

MBR

Secondary treatment

RDL GWRI Technion
Driving Forces for Desalination R&D

Need for Water

Global need, Industry, Agriculture, Remote Locations, Desertification, Etc.

Cost Difference - (Industry/Urban - Agriculture)

Cost Difference - (Thermal Processes - Membrane Processes)

Technologies for Export
The dead sea problem

Bathymetric and Satellite Map of the Sea of Galilee.

Ben Avraham Zvi, Amit Gideon and Golan Arik
(contour interval 1 m)
Energy Canals

Med – Dead

Red - Dead
The HARZA JRV Group

Figure 4: HARZA JRV Group – Red Sea – Dead Sea Canal Project

Jordan Rift Valley Integrated Development Study
Red Sea – Dead Sea Canal Project
RSDBC PROJECT SCHEMATIC
The Grand Water Research Institute: Mission Statement

• The Stephen and Nancy Grand Water Research Institute at the Technion operates as the Israeli national institute for research in the science, technology, engineering and management of water resources

• The mission of the GWRI, established in 1993, is to be a center of excellence of international caliber, the leading water research institute in Israel

• The GWRI concentrates in particular on topics of relevance and importance to Israel
Membership and Collaboration

- 54 members from 7 Faculties of the Technion
- 6 professors from other universities
- Participation in projects: from universities, research institutes, agencies, government ministries, industry, private sector
Major Research Areas

• Water Treatment
• Desalination
• Treatment and reuse of wastewater
• Preservation of water quality and quantity in the sources
• Hydrology – quantity and quality
• Water and environmental microbiology
• Management in and of the urban water sector
• Water resources management and policy