Integrated Water Resource Management and Security in the Middle East
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Environment and Security in the Middle East

Part V: Cooperative Opportunities: Addressing Environmental Security Challenges on Water, Soil, Food and Energy

Part 5: Development Opportunities:
Addressing these Local Challenges by Functional Cooperation for Sustainability: Water, Food, Energy

31. Goal: Sustainable Peace & Development
32. Need for a Shift in Security Concept and Security Perceptions
33. Functionalist Perspective towards Sustainable Development
34. Coping with Six Non-military Challenges of the Survival Hexagon
35. Regional Focus: Six Hydropolitical Geostrategic Contexts
36. Response to Water Scarcity: Renewable Solar Desalination
37. Functional Arab Cooperation: Solar Desalinat. for Egypt & Gaza
38. Functional Arab-Israeli Cooperation on Water for the West Bank: Solar Desalination in the Gulf of Aqaba
39. Conceptual Proposal for Functional Cooperation: Gulf of Aqaba
40. Peacebuilding by Functional Environmental Cooperation - Addressing Regional Impacts of Global Environmental Change

31. Goal: Sustainable Peace & Development

- **Four basic concepts: Conceptual Quartet (SPED)**
  - ✓ **Security: from national to human & environmental security**
  - ✓ **Peace: achieve end of violence to address common chall.**
  - ✓ **Environment: from destruction (war) to protection (peace)**
  - ✓ **Development: move to goals of sustainability and equity**
- **This requires a gradual shift in linkage concepts:**
  - ➢ **Security dilemma: from thinking in action-reaction patterns**
  - ➢ **Survival dilemma: to address common challenges of GEC.**
- **Two conceptual strategic policy goals:**
  - ❖ **Sustainable development: optimising resource efficiency**
  - ❖ **Sustainable peace: human & societal security & political peace with prosperity based on respect and equity! Utopia**

32. From Readiness to Action

The following are possible areas of co-operation between Israel and the Palestinian Authority. Please tell us whether you are in favour or against cooperation between the two entities in each area:

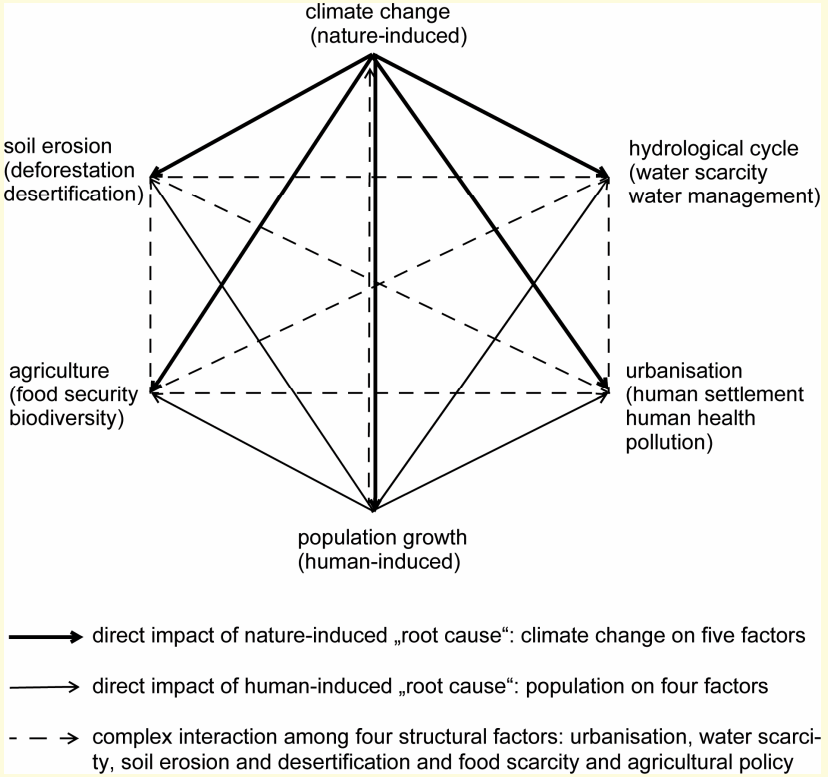
	% in favour	
	Israelis	Palestinians
Water desalination	**78**	**77**
Regional health	**79**	**73**
Environm. issues	**82**	**68**
Agricultural issues	**79**	**72**
Regional tourism	**76**	**55**
Reg. trade relations	**76**	**64**
IT and hi-tech	**67**	**68**
Culture & sports	**72**	**51**
Free movement of workers in between	**56**	**77**

- **Readiness** of both Israelis & Palestinians for **functional cooperation.**
- **Implementation** of this will of peoples requires a shift in concepts **from national to human & environmental security.**
- The visions of **Mitrany & Monnet** & policies of **G. Marshall & M. Gobachev** may contribute to such a mutual learning process.

33. Functionalist Perspective towards a Mutual Sustainable Development

- No environmental challenge can be solved by Hobbesian logic.
- East-West Conflict: Lack of trust: resulted in search for confidence & partnership building measures to prepare cooperation during conflict.
- First step: Agenda setting and problem recognition
- Near & Middle East: Need for environmental partnership building measures for mutual trust by addressing these joint environmental challenges by functional cooperation on freshwater, wastewater, solid & hazardous waste, conservation, energy and biodiversity.
- Second Step: Gradually building mutual trust by functional cooperation addressing the challenges to survival on water, soil and food specialists between Israel, Palestine and in the region.
- Third Step: Anticipatory learning to mitigate projections!

34. Mutual Preparation for Coping with Six Non-military Challenges of the Survival Hexagon



Climate Change: will affect water, soil and contribute to disasters

Population Growth: will increase the demand for water & food

Urbanisation: will contribute to

Desertification: affects agriculture

Water: will decline for drinking & agriculture: conservation

Food: low yields & higher demand, more imports: **„virtual water“**

Thesis: Joint policy response to common challenge of survival of individual, next generations on both sides of conflict.

34.1. Policy Goals for Water, Food, Energy Security

Water Security relying on desalination

- Israel, Jordan & Palestinian Authority need desalination to meet water needs: desalination plants are being planned & built.
- Cooperation in research, development & construction of des. plants?
- Research & development on solar desalinat. in Israel, OPT, Jordan?

Food Security by relying on virtual water

- With population food demand grows, water supply & crop yield drop due to climate change > Cereal import demand grows (SSR drops)
- Competitiveness of irrigated agriculture with desalinated water?

Energy Security by using solar energy

- Research & Development on use of renewable energy sources I,P,J?
- Cooperation among experts on jointly developing new survival industries?

35.Focus: Hydropolitical Geostrategic Context

- **Focus 1: Euphrates/Tigris**
  Turkey, Syria, Iraq, Iran
- **Focus 2: Nile River Basin:**
  Egypt & 9 African countries
- **Focus 3: Golan Heights**
  Israel,Lebanon, Syria, OPT

These three will be discussed

- **Focus 4: Jordan River**
  Israel, Jordan, OPT, Syria
- **Focus 5: Sinai and Gaza**
  Egypt, Israel, Palestine
- **Focus 6: Gulf of Aqaba**
  Egypt, Israel, Jordan & Saudi Arabia & Palestine

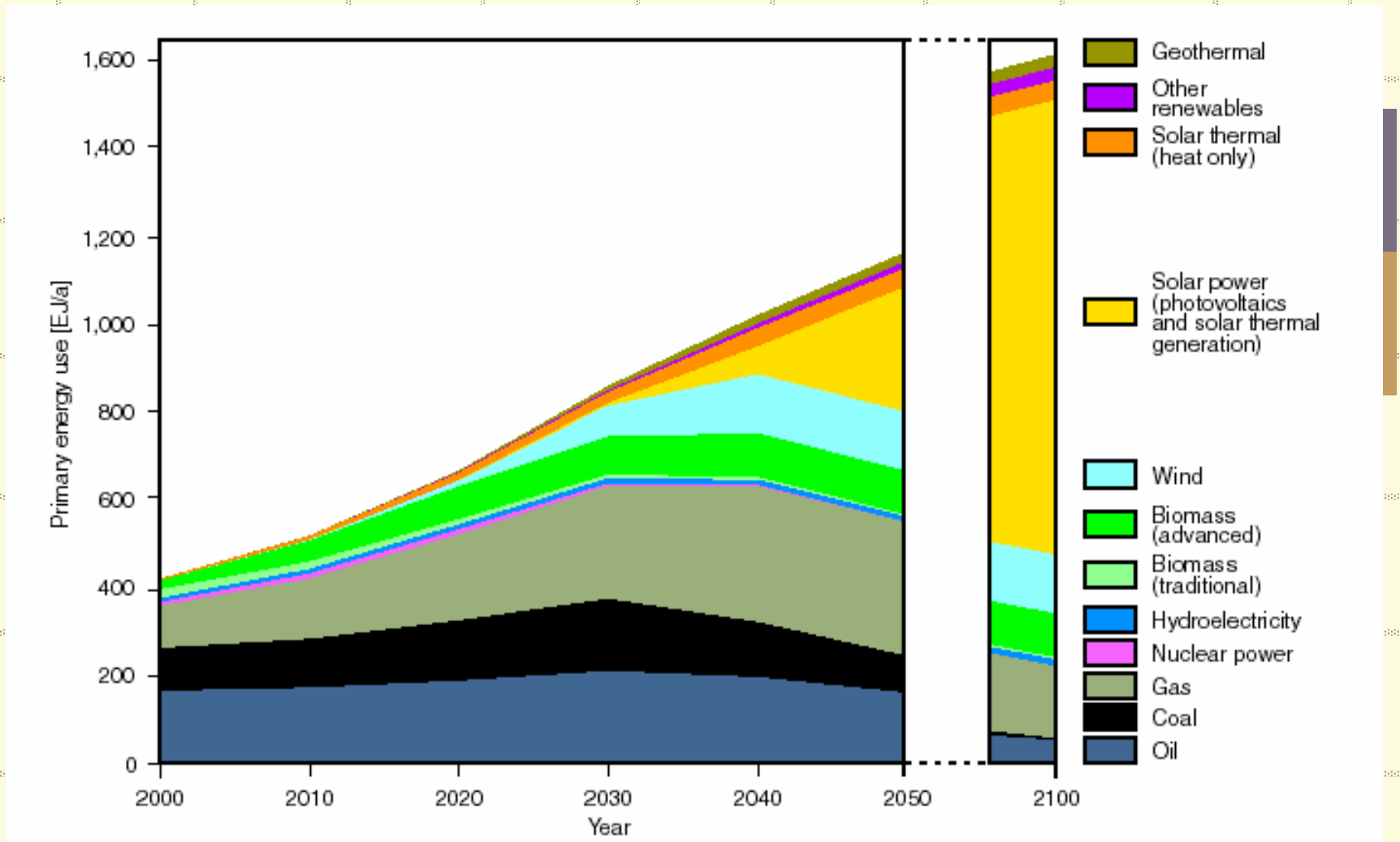
36. Solar Desalination with Renewables: Response to Water Scarcity in Middle East?

- Desalination – A costly solution for the region?
- Large hydrocarbon reserves in Saudi Arabia, Syria; limited reserves in Egypt, imports in Israel, OPT & Jordan
- Energy Needs: From fossil (Arab Gulf, Libya) to renewables
- Renewable potential: solar, wind, city & agricultural waste
- Renewable solar thermal desalination: Sinai, Negev and deserts in Jordan as a source of energy generation
- Water desalination for Gaza using renewable energy from the Sinai (Egypt)
- Water desalination for Israel: Greening the Negev
- Water desalination for the West Bank in the Gulf of Aqaba (Egypt, Israel, Jordan, West Bank).

36.1. Energy Potentials of Renewables

- Israel, Palestine & Jordan depend on fossil energy imports for electricity generation, transportation & desalination
- High demand fossil energy prices will increase in 21st cent.
- Renewable Energy Sources:
  - Wind power: some potential, offshore and in mountains?
  - Solar potential: high
    - solar thermal i) heating/cooling; ii) electricity; iii) desalination, iv) hydrogen
    - solar photovoltaic: i) electricity
- Constraint: higher cost (no economy of scale), exc. wind
- Mid & longer-term alternative for Middle East countries
- Potential area for research & technology co-development
- Geo-strategic advantages of solar energy for 3 countries:
  - High national technical and economic potential, energy independence
  - Renewable source and unlimited supply.

WBGU Exemplary Path: Global Energy Mix



36.2. Solar Thermal Technologies

- **Concentrating Solar Power Technologies:**
  - „use solar radiation to achieve high temperatures and to generate steam or air with high energy density, which can then be used for electricity generation and other purposes“. (Trieb et al. 2002)
  - alternatives: a) Fresnel concentrators, b) parabolic trough (400-600 °C), c) solar tower concept with surrounding heliostat field (1200 °C, up to 50 MW), d) solar dish (for small applications up to 50 kW).
  - Economic lifetime: at least 25 years; energy payback time of a solar plant: ca. 0.5 years (Trieb et al. 2002, 2005)



36.3. Solar Thermal Technologies (2)

Parabolic Trough & Solar Dish (for small applications)

36.4. Solar Thermal Electricity Activities

- Luz (now Solel) built 9 solar stations in Mojave desert in 1984, ca. 354 MW (30 to 80 MW each), price: 12 c/kWh, new: 10-5C/kWh
- Only commerc. installation
- CIEMAT (Spain) & DLR (Germany) at PSA Almeria developed technology
- Israel, Ministry of National Infrastructure approved plan to build a 100 MW station in the Negev to expand to 500 MW
- Spain: in planning stage
- GEF: projects in Mexico, Morocco, Egypt, India

36.5. Desalination: Technologies & Use

- **Combined solar power & desalination plants with proven technology**
  a) steam turbine co-generation system
  b) thermal seawater desalination
- **Trieb/Nitsch/Kronshage/Schillings et. al. (2002):**
  "a **200-MW plant** of this type with 7.500 full load operating hours/yr under conditions of Dubai would deliver approximately **1.5 bn. kWh/yr of electricity** and 60 million m3 of freshwater at approximately **4.3 €-cents/kWh and 1.30 €/m3 of water**, **water for 50.000 and electrictiy for 250.000 people, costs: 800 M€**
- **A. Cohen: Haaretz, 11.12.2003: Giza Financ. Consult.; 10 cents/kWh, cost of desalination decreased within a decade from 1 $ to 50 cents**
- **Middle East Desalinat. Research Centre, Muscat, Oman: 20 experts, budget US$ 1,000,000, desalination R& D in these areas:**
  a) thermal processes
  b) membrane processes
  c) **desalination & renew-able energy system integration**
  d) hybrid desalination processes
  e) non-traditional or alternative desalination processes
  f) common technical processes
  g) environmental Issues
  h) capacity building
  i) data banks & ref. material

36.6. Middle East Desalination Research Center (MEDRC) in Muscat, Oman

- **Middle East Desalination Research Cent.(MEDRC), Muscat, Oman developed a MENA Univers. & Research Institution Outreach Program:**
  - Al-Azhar University
  - Ben-Gurion University of the Negev
  - Jordan University of Science and Technology
  - Hashemite University
  - Hydraulic Research Institute
  - King Abdulaziz City for Science and Technology
  - King Fahd University of Petroleum and Minerals
  - Kuwait University
  - Kuwait Institute for Scientific Research
  - Royal Scientific Society
  - Sultan Qaboos University
  - The University of Qatar
  - University of Sfax
  - Technion-Israel Institute of Technology
  - University IBN Tofail
  - Water and Environment Research and Study Center (WE

36.7. Solel: Model of a Solar Desalination Process

Most effective with direct radiation & when the cost of electrical power is more than 7 cents kWh, for resort, recreation sites & remote locations requiring autonomous power &desalination (Solel).

- **Desalination** separates water from salt by evaporating and re-condensing water. Solar thermal desalination is effective: high efficiency of **solar collectors provide energy** (heat) for first evaporation. A desalination unit evaporates & condenses water using familiar & well tested **M.E.D. (Multi Effect Distillation)** plant IDE Technologies Ltd. adapted to solar desalination.
- **Solar thermal desalinat. system** operates as a **hybrid plant** 24 hours a day, with sunshine during daylight hours and a backup fuel at night. Optional heat storage system can extend operation beyond sunny hours. The most economically viable system incorporates **solar collectors driving a steam turbine for power generation** & **waste heat is used to drive the MED**.

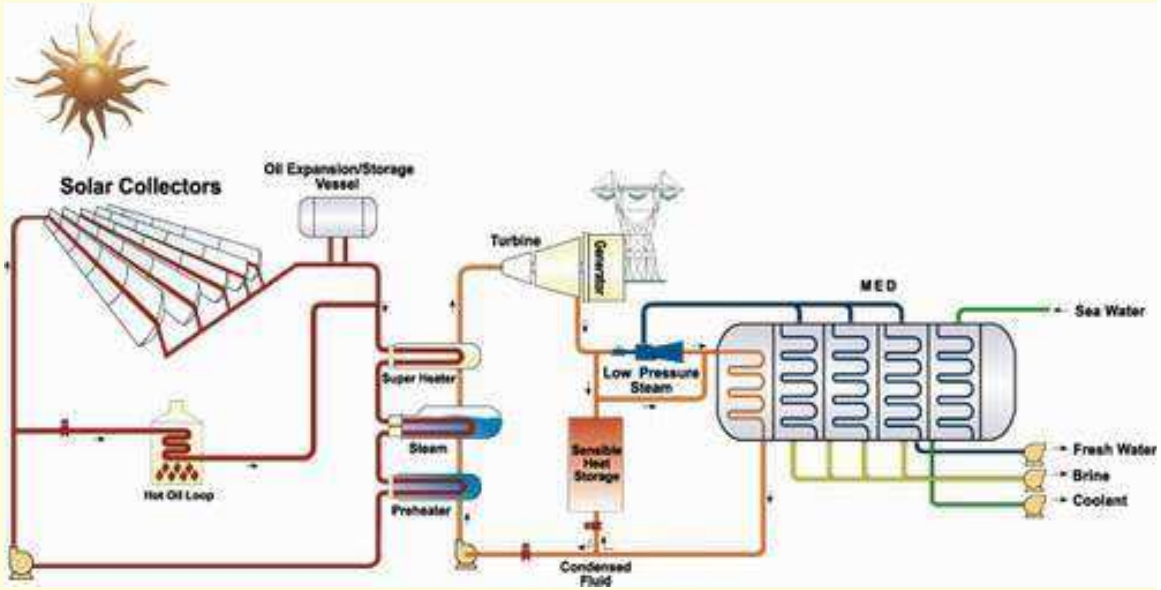
36.8. Solel: Model of a Solar Desalination Process

- **Components of combined Solar Power & desali-nation system include:**
  - Solar Field
  - Steam Generator
  - Power Block
  - Backup Storage System
  - Heat Storage Unit (Optional)
  - MED Multi Effect Distill. plant

Performance & cost effective

- ✓ Thermal efficiency of collec.
- ✓ Size of the field
- ✓ Steam pressure & temperat. at steam turbine inlet effects evaporation & condensation
- ✓ Time duration of operation
- ✓ Level of direct solar radiation at the site: at least 850 W/m2

Source: Solel website



Key Features

- •Technology available tested and proven
- •Suited to remote locations
- •Economic. viable: plants of 5,000-10,000 m3/day
- •Produces high quality water for potable & industry
- •Cost effective co-generation of power & steam
- •Reduces electricity consumption
- •Operates 24 hours a day seven days a week.
- •Solar energy during day, heat storage at night.

36.9. From Fossil to Renewable Desalination

- **Seawater desalination: 2002: 23 MCM/day most from oil in Arabian Gulf & Libya, 0.02% use renewable energy sources (46.000 CM/day):**

Source: Jenny Lindblom: Solar Thermal Techn., State of the Art, (Sweden, 2003)

- **Solar Thermal Desalination: A Future Solution?**
  - **Free energy, insignificant operation costs, low environm. Impact**
  - **Energy indepence & water insurance**

Solar thermal energy generation: 3 techn.options: dish, trough, tower

Desalination: a) Multi-Effect, b) Multi-Stage Flash, c) Reverse Osmosis

- **Direct Solar Desalination: Small production: less 200 m3/day**
- **Indirect Solar Desalination:**

a) Multi-Effect (ME), Arabian Gulf: plant: parabolic trough coll.: **6000 M3/day**

b) Multi-Stage Flash (MSF): produces globally **10 mill. ton** of fresh water daily

c) Reverse Osmosis (RO): possible combination with solar energy for cost-effective solutions.

Both technologies need development & economy of scale

37. Functional Cooperation: Solar Desalination for Egypt & Gaza

- **Step 1: Bilat. cooperation between Egypt & PNA on fossil & renewable desalination**
- Assessment of water needs & technological and economic feasibility study
- Goal: Research & development in Sinai on solar thermal desalination infrastructure for Sinai and Gaza
- CDM: as a tool for attracting foreign investments in the framework of the Kyoto mechanisms (Egypt to sign the Kyoto Protocol)
- Pilot Project: Capacity Building: Euro-Mediterranean R & D Facility for hybrid desalination with gas and solar thermal energy
- GEF and international donor community, incl. Arab Development Funds: Pilot projects
- **Goal: Establishment of a major desalination plant in Sinai at the Egyptian border to Rafah**
- **Contribute to Water & Health Security in Gaza**

37.1. Functional Arab-Israeli Cooperation: Solar Desalination for Egypt, Gaza & the Negev

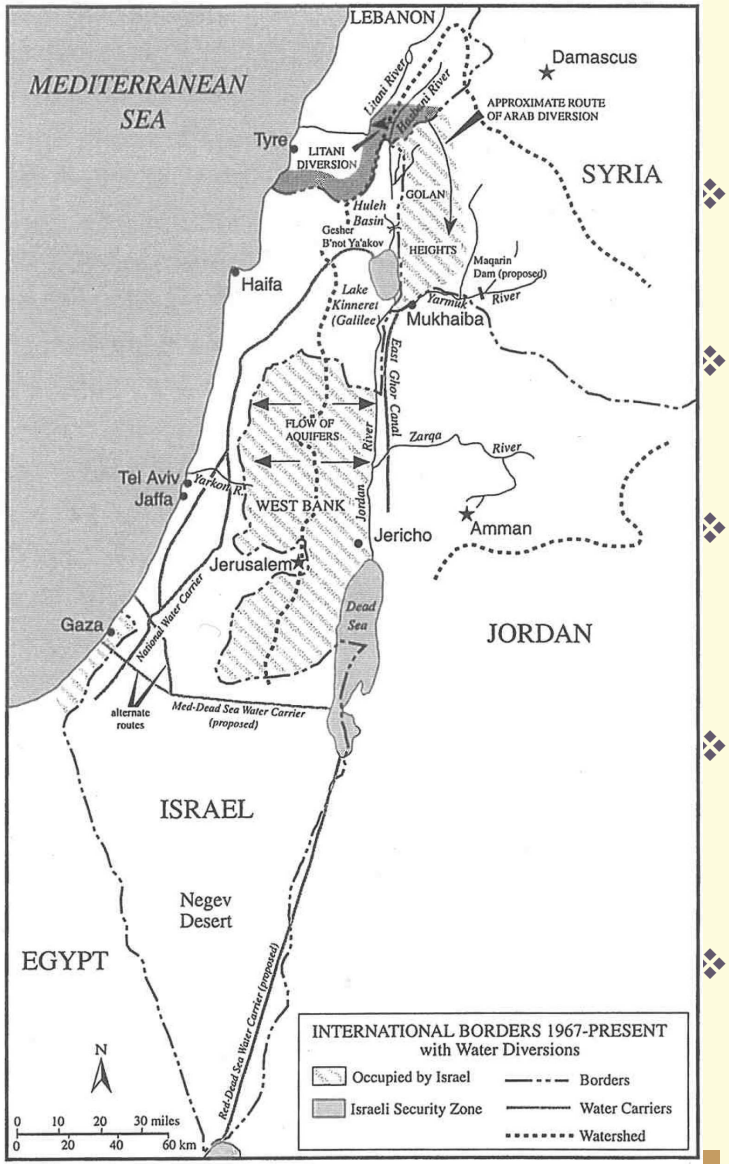
- Step 2: Cooperation with Middle East Des. Res.Cent. (MEDRC) of Arab & Israeli Institutes on Desalination Technologies
- Feasibility Studies on the Development of trilateral gas & solar thermal electricity & desalination plants for water needs of Sinai, Gaza & Negev.
- Sponsors: GEF, EU, USAID, WB, IMF, EIB, Japan, Arab Gulf countries etc.
- Reduce reliance on water from Lake Tiberias/Kinneret for greening the Negev.
- Goal: Trilateral functional community for developing a joint integrated infrastructure for peace, with vital components in Sinai, Gaza and in the Negev to enhance water and food security.

38. Functional Arab- Israeli Cooperation:

Water for the Jordan Basin: Solar Desalination in the Gulf of Aqaba for Egypt, Jordan, Palestine & Israel

- Step 3: Address the global environmental challenges affecting all countries
- Assessing water needs & technological potentials: Economic feasibility study
- Desalination infrastructure in Jordan for the West Bank in the Gulf of Aqaba and water pipelines on Jordanian territory
- GEF: Pilot projects
- CDM with EU countries: foreign investments in framework of Kyoto Protocol

38.1. Functional Cooperation in the Gulf of Aqaba

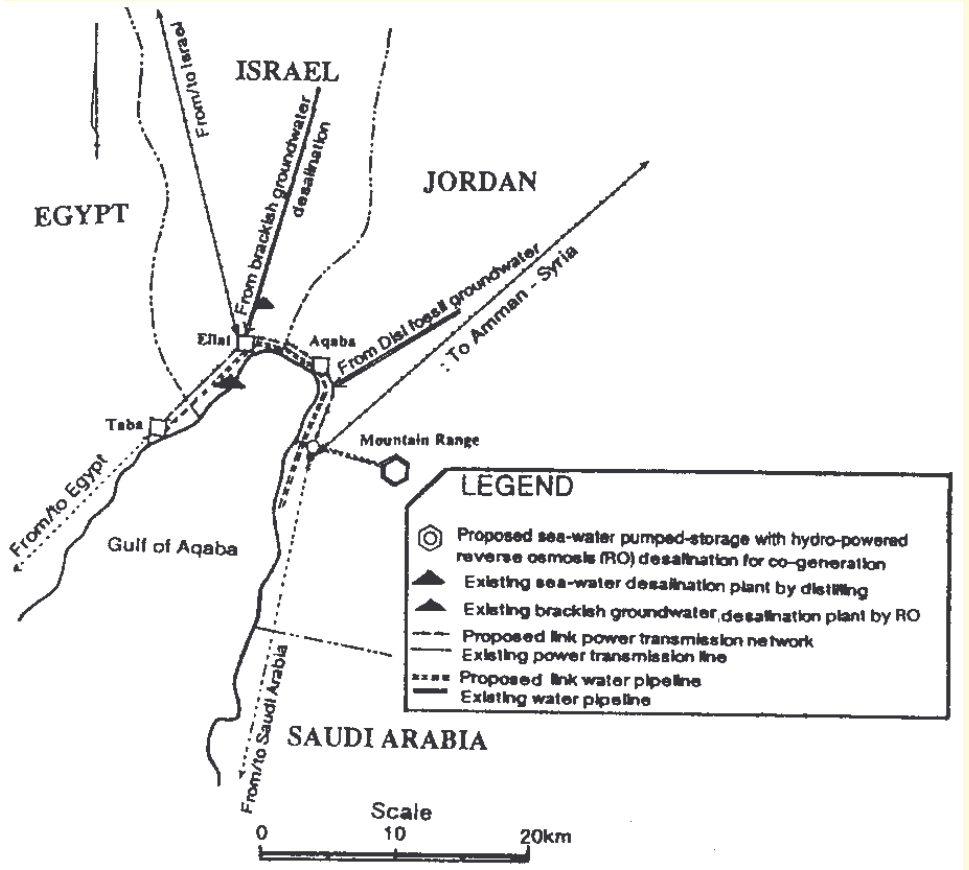


Existing project proposals for desalination in the Aqaba Region

- G. Fishelson (1995) Water Desalination
  a) the Red Sea-Dead Sea Canal;
  b) Mediterranean–Dead Sea (North Route)
- M. Murakami (1995: 167): Hydro-powered reverse-osmosis desalination in water-resources planning in Jordan (Aqaba-Disi)
- M. Murakami (1995: 202): Solar-hydro power & pumped-storage co-generation in hydro-powered reverse osmosis desalination in inter-state development of Jordan River basin
- Jordan Times (17.4.2002): Ministry of Water & Irrigation is studying a plan for a first sea-water desalination plant in Aqaba for the Aqaba Special Economic Zone (ASEZ)
- What is the status today?

38.2. Proposals for Water Desalination in Gulf of Aqaba

Water Ministry studies possibility of desalination plant in Aqaba (17.4.02)



- **Desalination plant in Aqaba was discussed since peace treaty with Israel in 1994. The proposed plant is one of 4 water projects to solve water supply in the Aqaba zone.**
- **Ministry & USAID develops Aqaba's wastewater treatment plant ($30-35 million) to irrigate parks & for industrial purposes.**
- **Fourth project to convey water from the Disi aquifer at a 4 million m3/ p.a. will provide Aqaba with drinking water, and meet the water demands of the industrial and tourism sectors in ASEZ for the next five years.**
- **Total investment cost of proposed hydro-powered seawater reverse osmosis desalination plant in Aqaba was estimated at US$389.4 m.**

39. Functional Cooperation in Gulf of Aqaba

- **Three Partners entered into peace treaties: Egypt – Israel – Jordan; plus Saudi Arabia and Palestine.**
- **Building on existing foundations**: cooperation of water & food specialists
- **Model:** Creating **regional interdependence** that requires daily cooperation
- **Comp. 1: Research** on common challenges for the region: Possible tasks for a new **UNU centre** funded by the EU in **Taba, Elat and Aqaba**
- **Comp. 2:** Creating **renewable energy**
- **Comp. 3:** Schemes for **desalination**
- **Comp. 4:Sustainable food** production
- **Comp. 5: Sustainable tourism**
- **Comp. 6: New urban environments** for jobs and living.

39.1. Creating a Knowledge Infrastructure for Functional Cooperation in the Gulf of Aqaba

- **Initial Countries**: Jordan (Aqaba), Egypt (Taba), Israel (Elat)
- **Partners**: Saudi Arabia and Palestinian Authority
- **Sponsors**: EU, USA & Japan, WB, IMF, EIB; **Facilitator**: UN
- **1st Step: Problem Recognition & Creation of Awareness**: UNU Centre on Regional Impact of Global Envíronmental Change to Mitigate Environmental & Human Security Risks
- **2nd Step: Creating the Knowledge Basis for Mitigation**: International Technical University of the Gulf of Aqaba with international departments and faculty in Taba, Elat, Aqaba
- **3rd Step: Setting up a tri-national integrated infrastructure**
  - **Taba**: Centre and Laboratory on Renewable Energy: solar & wind (EU)
  - **Elat**: Centre on Agriculture in Arid Regions in cooperation with with DRI (Egypt) & Blaustein Institute on Desert Research (Israel) (US)
  - **Aqaba**: Centre for Hydrology and Desalination (Japan)

39.2. Coping with Water & Food Scarcity: Framework Instruments for Long-term Conflict Avoidance

- **4th Step: Supplying Fossil & Renewable Energy**
  - **Fossil Energy: Natural gas from Egypt and oil from Saudi Arabia**
  - **Renewables: Exploit solar thermal and photovoltaic energy, wind power**
  - **Long-term: Create a joint infrastructure for a local hydrogen economy**
- **5th Step: Cooperative Mitigation of Water Scarcity**
  - **Joint training institution for water experts on water efficiency**
  - **Build joint water desalination plants to serve all three countries**
- **6th Step: Creating New Jobs & Supplying Food**
  - **Joint research and training institution for agriculture, irrigation, and desertification specialists for arid regions (e.g. in cooperation ICARDA)**
  - **Centres for IT, computer, software industry**
- **7th Step: Build New Sustainable Cities & Tourist Centres**
  - **Develop sustainable tourist centres based on renewable desalination**
  - **Develop sustainable cities with a low emission transport system. solar cooling and energy generation, waste based electricity generation**
  - **8th Step: Create a Pride in Joint Achievements & a Culture of Tolerance**

40. Peacebuilding by Functional Environmental Cooperation - Addressing Regional Impacts of Global Environmental Change

- Multilateral frameworks for post-conflict environmental reconstruction
- Functionalist credo: form follows function: start with functional coope-ration in areas population supports: water, environment, health, food
- Shift focus from narrow military to a wider human security concept
- Recognise the mutual challenges to survival (Awareness creation)
- Start with collaborative research that address these joint challenges.
- Establish joint scientific and technological capacities in the region
- Use energy potential of deserts for its greening & change of climate
- Develop scientific, environm. & econ. partnership building measures
- Potential spill-over from functional cooperation to conflict resolution.
- Develop confidence-building measures for political and military realm.

40.2. Conclusions: Window of Opportunity

Preconditions for Consideration of these Conceptual Ideas

- Implementation of the Roadmap for the Middle East of the Quartet
- Return to the Multilateral Peace Process with the Working Groups: Regional Economic WG: EU; Water WG: USA; Environmental WG: Japan or to a new structure.
- Plans should be developed within the Quartet with clear division of labour.

Conditionalised Support by the Donor Community

- The Marshall Plan aid was conditional on the cooperation among recipients!
- Strong unified strategy of all donors and equal treatment of all recipients.
- Grant and credits would be conditional on the development of multilateral regional functional infrastructures with a premium for cooperation and sanctions for violation that would hurt the violator with the suspension of assistance.

Preparation during Conflict: Step-by-Step Implementation

- The conceptual ideas for multilateral functional projects should be developed by joint functional teams of scientists from the three countries & Palestine
- The multinational NGO planning process should be supported by the EU in the Framework of the Euro-Mediterranean partnership or its new foundation.
- Other functional projects may be developed with the support of foundations in North America (e.g. Carnegie, Ford), and in Japan (Sasakawa or Nippon Fd.).

Thank you

for inviting me and giving me an opportunity to share with you these conceptual ideas.

Thank you

for your attention and patience.

Send your comments to:

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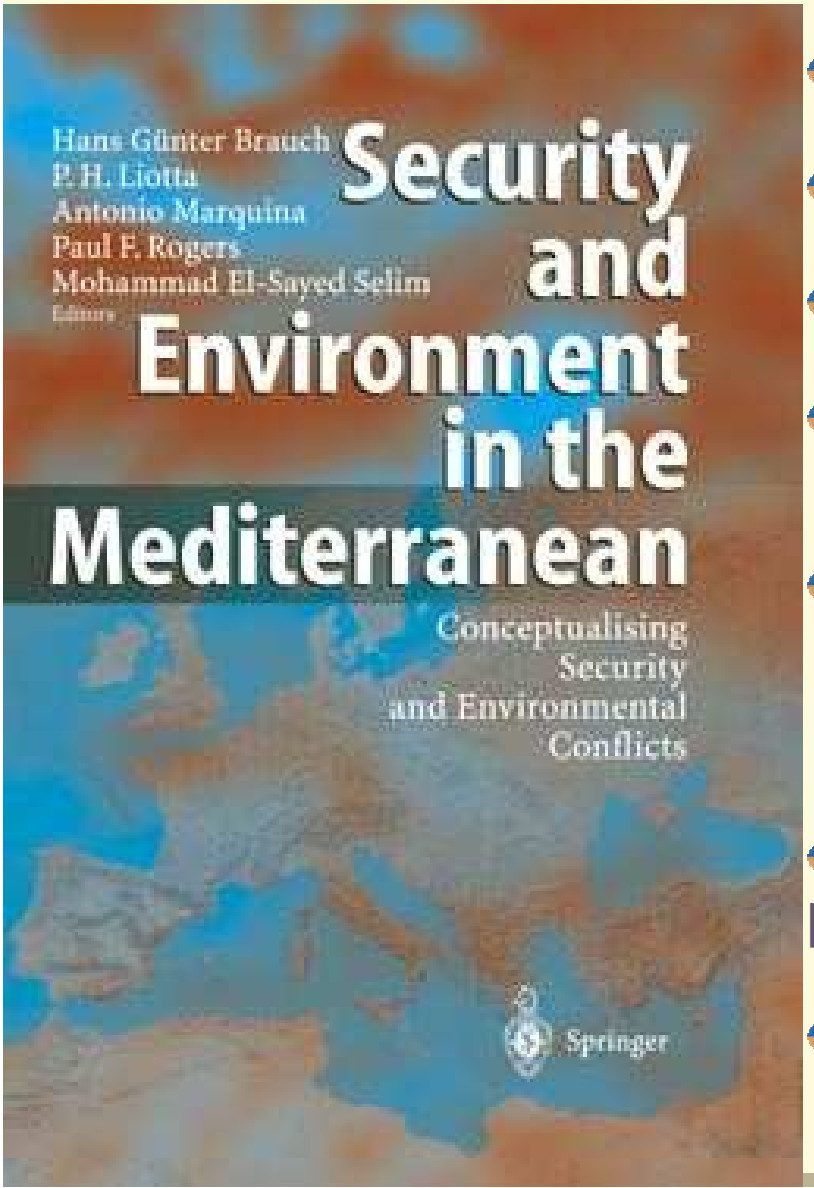
Major Sources



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