Jordan River Basin

Preliminary results of the GCI II survey

River Basins and the Water-Energy-Food Security Nexus

Report by Sina Marx (GWSP IPO)
GLOWA

- the GLOWA “Global Change and the Hydrological Cycle” was launched in 2000 by the German Ministry of Education and Research
- aim: to develop simulation-tools which will help to realize a sustainable water management under global change conditions

GLOWA Jordan

- international interdisciplinary project addressing the vulnerability of water resources in the Jordan River Basin under global change
transboundary: Lower Jordan marks the international border between Israel and the West Bank on the west and the Kingdom of Jordan on the east.

Catchment Area: total of ca.18,500 km²
- Jordan 40%
- Israel 37%
- Syria 10%
- West Bank 9%
- Lebanon 4%
Headwater streams: Dan, Banias, Hasbani
Mouth: Dead Sea
Length: 330 km
Main tributary: Yarmouk River

Semiarid area - groundwater is central to the water supply esp. of Israel, Jordan and Palestine
• Aquifers:
  - 56 % of the water resources
  - Main aquifers west of the river
Background

- extreme **variability** in the hydrological regime: in summer and autumn months, when water is most needed, river carries only 3–4 percent of its annual discharge → capturing the winter floodwaters is one of the most critical aspects of water resources management
- accordingly extreme **diverse ecosystems**: ranging from sub-humid Mediterranean environments to arid climates across very small distances)
- agriculture is a very high priority for all riparians
- long history of political **conflicts** both **water- and nonwater-related**
- no equitable access to WR and decision-making about WRM
1951  Jordan plans to divert part of the Yarmouk River
1953  In response, Israel begins the construction of its NWC (water transfer project, capacity of 1.7 million m3 daily)
1964  NWC begins to divert water from the Jordan River Valley

Arab Summit: plan to divert the headwater of the river to Syria and Jordan

1967  Six Day War: Israel destroys the Syrian diversion project and takes control of the Golan Heights, the West Bank, and the Gaza Strip
     → Israel in control of the Jordan River’s headwater and of significant groundwater resources.
• 60% natural forests & open areas, 20% wheat, 5% olives, 8% orchards
• Agriculture as the main water consumer has a very strong adverse impact on water quality and quantity
• More than 80% of GDP in the basin from agriculture: net exporter of food, about 40% of food are exported
• Irrigated areas are mostly fertilized with chemical fertilizers
• Existence and implementation of guidelines for fertilization varies
• In Jordan due to water scarcity over the past two decades more vegetables and less fruit trees are being produced and both in Jordan and the Westbank green houses have spread widely
Land use – water and agriculture

- **short term risks:** water shortage (esp. in the Jordan Valley) and rainfall variability including severe droughts as well as global fluctuations of food prices
- **longer term risks:** increased amount of treated wastewater on the expenses of fresh water resources and shrinkage of agricultural lands due to urbanization
- **coping strategies:** water is managed by increased water use efficiency and water prices, as well as by rationing water use. In Israel during chronic drought the water deficit can be filled by enforced reduction of demand and/or eventually by more pumping from aquifers.
• **scarcity**: one of the lowest per capita water resources worldwide and sinking groundwater tables

• **water demand** continues to increase rapidly due to high population growth rates and economic development

Which direct and indirect anthropogenic factors have the strongest impacts on flow regime and water availability?
Water quality: 
• *salinity* of the Lower Jordan River has risen significantly due to diversion of upstream water and direct dumping of saline and waste water

Which direct and indirect anthropogenic factors have the strongest impacts on the water quality in the basin?
short term changes
• both changes in water availability and biodiversity as well as biomass productivity of (semi-)natural landscapes rather depend on anthropogenic changes like changes in land management than on climate change
→ anthropogenic and esp. political impact might be far reaching and could easily spill outside the boundary of the region

BUT: long term changes
• GLOWA simulations show a reduction in crop yields like wheat due to climate change for the end of this century.
Global changes: climate change and anthropogenic changes

Figure 1: Simulated spatial distribution of mean water availability over the project region.

Figure 2: Aggregated results of the IPCC A1B scenario. The graph depicts relative changes of the major water balance components and of irrigation water demand for the scenario period 2021–2050 in comparison to the reference period 1961–1990.
Alternative energy – hydropower and biofuels

- exploitation of alternative energies is still at a very early stage, including hydropower and biofuels
- Since there is almost no infrastructure for hydropower production, the impacts on ecosystems are accordingly low
- no food crops for bioenergy produced
• although a significant reduction in biodiversity was noted over the past 30 years, preservation of ecosystems and biodiversity is to a very low extent priority in Israel; only relatively small areas for wildlife and waterfowl refuges, wetlands and park

• In Jordan preservation of ecosystems and biodiversity have medium to high priority. In order to preserve biodiversity two nature reserves are established in the Jordan Valley: Yarmouk and Mujib. A comprehensive plan of land use around the two reserves is currently planned

• Water flow is regulated by the governments

• NGOs pressure to release more water to nature
Solutions – „new water“

Shift from fresh water to improved recycling

Based on VALUE model (similar results for WAM model in Jordan)
Summary and Way Forward

• technical solutions (“new water”) can help to mitigate water stress
• BUT: cooperation between riparians needed esp. for food security in the entire basin
• Problem:
  transboundary WRM highly dependent upon political situation and vice versa
  ➔ WRM can also be an opportunity of cooperation and trustbuilding