



A Regional Water Evaluation and Planning (WEAP) application for the Jordan River basin

Key findings

The Regional WEAP is a basin-wide planning and scenario tool which:

- Includes hydrology, supplies, demand and water resources management
- Is a comprehensive consolidation and harmonization of water data for the entire Jordan River basin
- Engages stakeholders, scientists and decision makers in a discussion on water management options and policies
- Can combine stakeholder-driven assumptions with scientific scenarios to analyze quantitative scenarios

Findings from various Regional WEAP scenario applications :

- Political and physical constraints, namely limited water exchange between countries and poor water infrastructure in rural areas and the West Bank, inhibit the impact of large-scale solutions on regional water scarcity when compared to decentralized approaches
- The impact of climate change on available water resources is high (it could double unmet water demands), however the impact of socio-economic developments, mainly driven by population growth and per capita water demands, have a far greater potential to aggravate water scarcity in the region

resources will be available for future water needs in the region.

The system boundaries coincide with the Jordan River catchment. However, due to significant water diversions to locations outside the river catchment, water demands and resources outside of the basin that directly influence the water cycle within the basin are accounted for.

With this tool in place, we can address system-wide effects, spatial response patterns and tradeoffs between different unilateral or multilateral adaptation options, such as new transfer schemes, additional non-conventional water supplies, improved demand-side management and loss reduction, wastewater reuse or rainwater harvesting.

Supported by the hydro-climatological model simulations and participatory scenario exercises (SAS) in the GLOWA Jordan River project (see Briefing 1.1 and 1.2), the Regional WEAP allows for the testing of various adaptation options under climate and socio-economic change.

Overview and Objectives

The Regional WEAP tool incorporates global and regional change models to reveal a range of future supply and demand scenarios, allowing for the creation of a consistent framework for integrated water resources management (IWRM) planning. The tool provides an excellent basis for participatory and problem-oriented analyses and negotiations over reasonable and equitable use of transboundary water resources.

The GLOWA Jordan River research team has jointly developed a new consensus database and basin-wide WEAP tool with stakeholders and experts from the riparian countries: Israel, Jordan, and the Palestinian Territories (Briefing 2.1). This WEAP application serves as an integration tool within the GLOWA Jordan River project and is used to assess to what extent – under expected global change – blue (fresh surface and groundwater) or green (rain) water

Research Methods

Scientific models stemming from GLOWA Jordan River subprojects provided insight into the effects of climate and regional change on water availability and use throughout the Jordan River basin. The WEAP tool

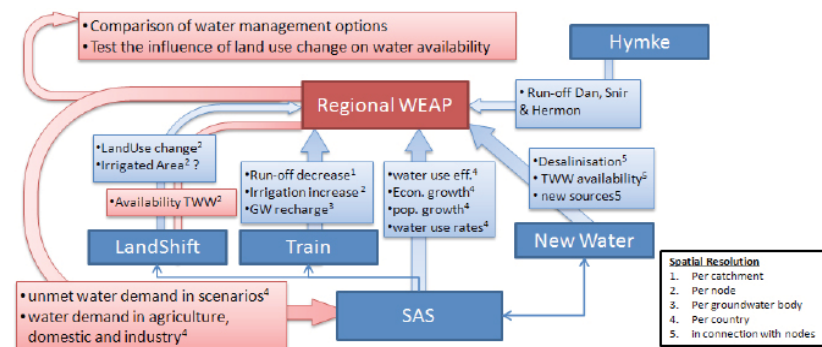


Figure 1: Flow chart illustrating data exchange between GLOWA JR sub-projects and the Regional WEAP.

integrates scientific results from these different subprojects and links them together into a consistent framework of supply and demand. Important inputs to WEAP modeled by other GLOWA Jordan River subprojects are e.g. projected population, land use and climate trends as well as planned interventions to mitigate increasing demand (Figure 1).

Using the WEAP scenario analysis, these results are made accessible to stakeholders and policy makers on a regional level in a manner that allows for the evaluation of different combinations of planning uncertainties and response strategies. Adjacent figures 2a) and 2b) show outputs of the Regional WEAP visualizing unmet demands on a regional level for:

a) Four different socio-economic futures based on the SAS scenarios (Briefing 1.1),

b) A comparison of the effects of a set of water management interventions (rainwater harvesting, desalination of brackish water, water imports and increased wastewater reuse) on one large scale, in this case the Red Sea - Dead Sea Canal, under current socio-economic conditions.

The model shows that political and physical constraints, namely limited water exchange between countries and poor water infrastructure in rural areas and the West Bank, inhibit the impact of large-scale solutions on regional water scarcity when compared to decentralized approaches.

Figure 2c) compares regional unmet demands from varying socio-economic scenarios (based on the GLOWA Jordan River SAS scenarios, Briefing 1.1 and 1.2) with climate change-driven scenarios (based on the eco-hydrological TRAIN model, Briefing 2.7). The results show that the impact of climate change is high (it could double unmet water demands), and yet the impact of socio-economic developments, mainly driven by population growth and per capita water demands, however have a far greater potential to aggravate water scarcity in the region.

Conclusions

The Regional WEAP is a comprehensive tool for Jordan River basin water data consolidation and harmonization. This is the first project to model the full Jordan River basin including hydrology (supplies), demand and water resources management.

The Regional WEAP is a transboundary water management tool that supports the engagement of stakeholders, scientists and decision makers in a transparent discussion on water management scenarios, options and policies. Thus, the Regional WEAP is an excellent framework for further transboundary initiatives on data consolidation and regional model integration or as a transboundary dialogue platform for scientists and stakeholders.

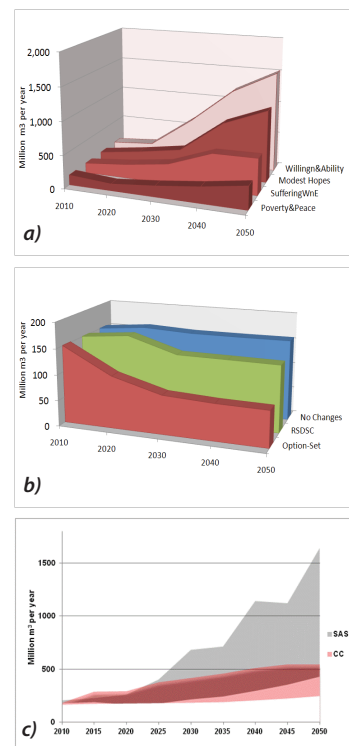


Figure 2: Simulated unmet water demand for a) the 4 SAS scenarios, b) scenario assuming no socio-economic change compared to a set of water management options and the implementation of the RSDS and c) the comparison of regional unmet demands of a "pure" socio-economic scenario (SAS, gray) with a scenario only regarding climate change (TRAIN, red).

References

Hoff, H., Bonzi, C., Joyce, B., Tielbörger, K. 2011: A Water Resources Planning Tool for the Jordan River Basin Water 2011, 3(3), 718-736
 Bonzi, C., Hoff, H., Stork, J., Subah, A., Wolf, L., Tielbörger, K. 2010: WEAP for IWRM in the Jordan River Region; Bridging between scientific complexity and application. IWRM, Conf. proceedings 24. - 25. Nov., Karlsruhe. 397-403.