

The coming water shortage in the Jordan River Basin -Finding objectivity in a subjective problem

by

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Introduction

Water shortage in the Jordan Valley region might become one of the major obstacles for peace in the future. The region which has semi arid to arid climate is densely populated and has limited water resources. High demands of water for agricultural irrigation, industry and domestic use have prompted different nations in the regions to act individually. Water management in the region will depend on how the nations involved can cooperate together. The distribution of water from the Jordan River has been a continuous matter in the Arab-Israeli conflict. It is important however to stress that the conflicts are still determined by deep political differences. Water is an important matter in the conflict situation but should be regarded mainly as a trigger.

Problem description

The issue in the Jordan Valley is regional water shortage. This is a fundamental problem that affects all the nations in the area. If water available per person is reduced below the minimum water barrier (MWB) at 125 m³/year per person, nations risk civil disorder. The carrying capacity of the region is determined by the minimum amount of water used per person that is renewable. Allocation of water in the region is not equal which poses a problem for the less developed nations in the region. Israel controls currently 60% (313 m³ per capita) of all the yearly renewable water resources, Jordan controls 33% (202 m³ per capita), and Palestine 7% (92 m³ per capita) (figure 1).

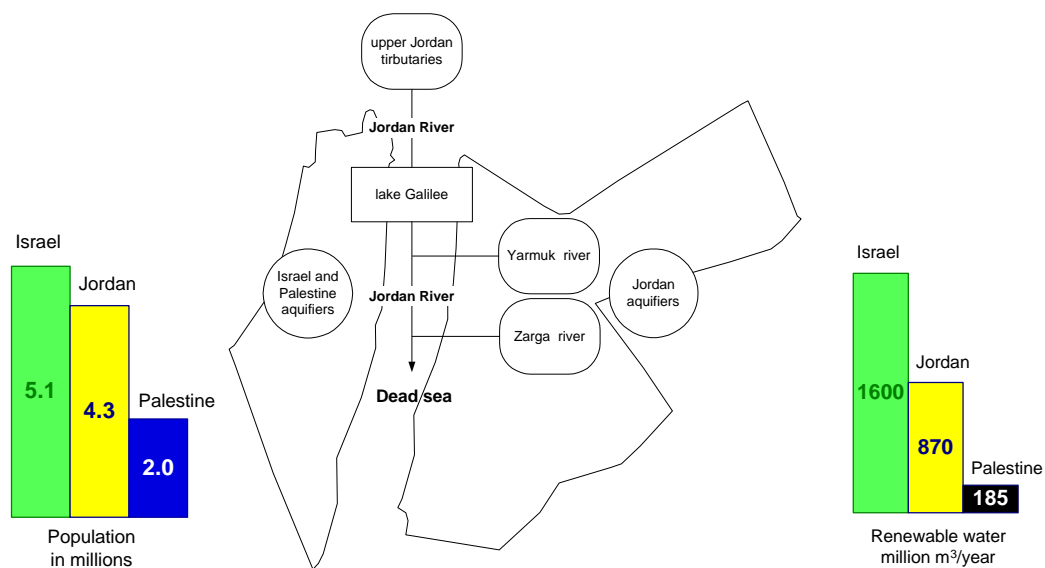


Figure 1: The population and water distribution and availability in the Jordan Valley region.

Objectives

The objectives of the study are to find the dynamic properties of the water issue and to understand the mechanisms and feedbacks in the system. Further, it is also important to be able to set the problems with water supply in the context of the whole geo-political situation in the Jordan River region. Of crucial importance is to understand the system of water usage, decision mechanisms and actions of different population groups. The ultimate expected outcome would be to find a stable, fair and equal supply of water, which would be sustainable in a long-term perspective.

Hypothesis

Due to the geo-political complexity of the situation in the Jordan Valley, this study will only consider mass balance of water i.e. how allocation is carried out and how extraction rates of different countries affects water availability in the future. Geo-political conflicts are not specifically modelled. Although severe overdraft of water aquifers and river water can be used as an indicator of possible conflicts.

Methods and research

A casual loop diagram (CLD) was elaborated step by step in order to understand the variables involved in the issue and their connections (figure 2). The CLD is divided into three sectors which represent the three nations involved, Israel, Palestine and Jordan. There are basically three factors that are important to observe, i.e. water availability, extraction effort and Water volume in aquifers and rivers. Water availability stands for the amount of water that is present within the system of each nation (water tanks, dams etc). Effort is the cost that is required to extract the water from the Jordan River and aquifers. Water volume in the Jordan River and aquifers is annual flow of rechargeable water.

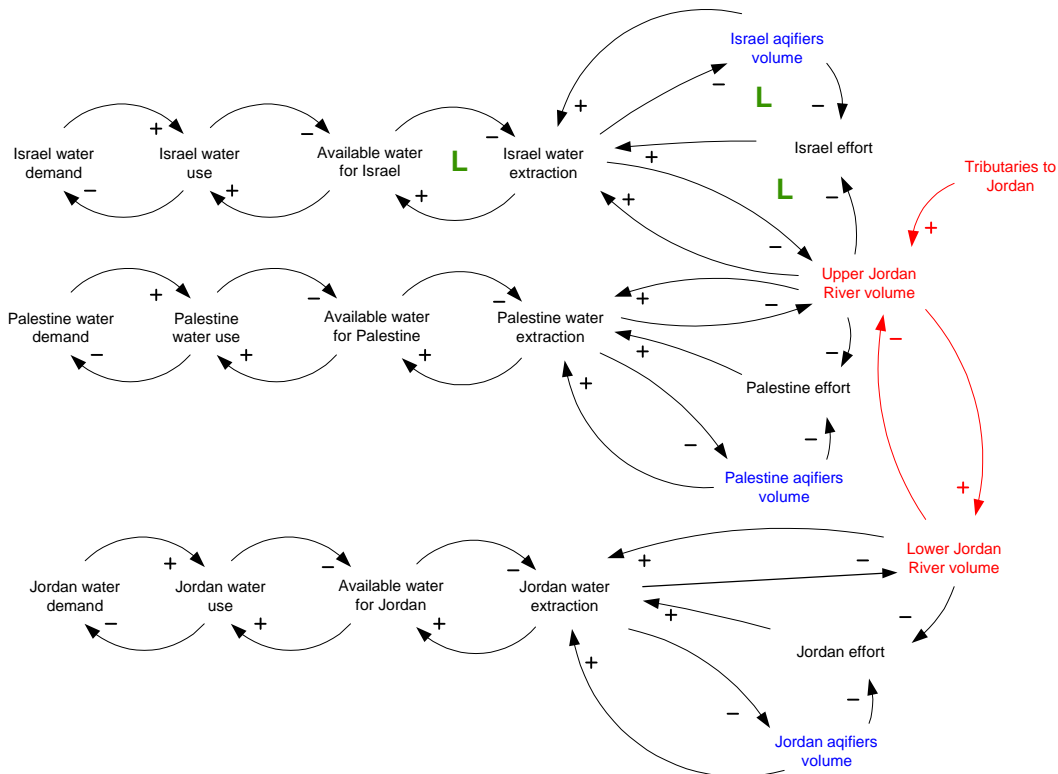


Figure 2: CLD of the water allocations in the Jordan Valley river basin.

The CLD has three dominance loops (L) that determine the flows of water through the system. Israel has control over the water resource. The Jordan River runs first through Israel con-

trolled areas and part of the river is diverted towards Israel. Afterwards Palestine is allocated a fixed amount of water. Jordan gets what is left over from Palestine and Israel.

There are three sectors in the society that require water for critical function, the domestic, industrial and agricultural sector (figure 3). The domestic sector utilises water for cooking, hygiene and residential purposes. The industrial sector uses water for material processing, food production and services. The agricultural sector uses water of crop production, mainly through irrigation. Adding all these water uses from each sectors amounts to certain water use per person in respective country. A minimum water barrier (MWB) for sustaining basic functional properties in society is $125 \text{ m}^3/\text{year}$ per person (Kirschbaum, 1997). Water use is closely linked to available water within the system, i.e. short-term water storages that functions as a buffer against oscillated water demand.

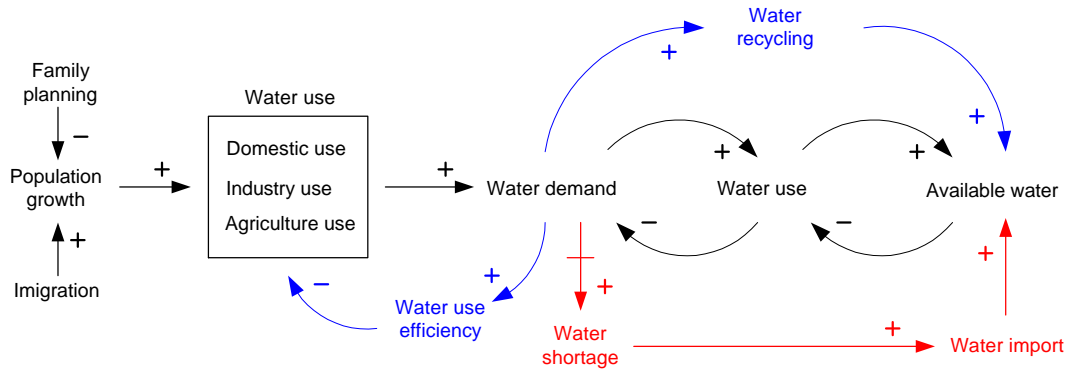


Figure 3: CLD of the relation ship between demand and supply of water.

Improving water use in the system can only occur in two ways, by increasing the efficiency of the water carrier infrastructure in order to reduce water losses while being delivered, or reduce the losses of water use by recycling it. Significant amount of water can be saved if simple measures are implemented such as stop leaks in the municipal delivery systems. In Jordan these water leaks amount to 7% of the total water use (PRIDE, 1992).

Preliminary results and discussions

Two scenarios are illustrate here, water use “business as usual” (BAU) and Recycling of domestic, industrial and agricultural water use.

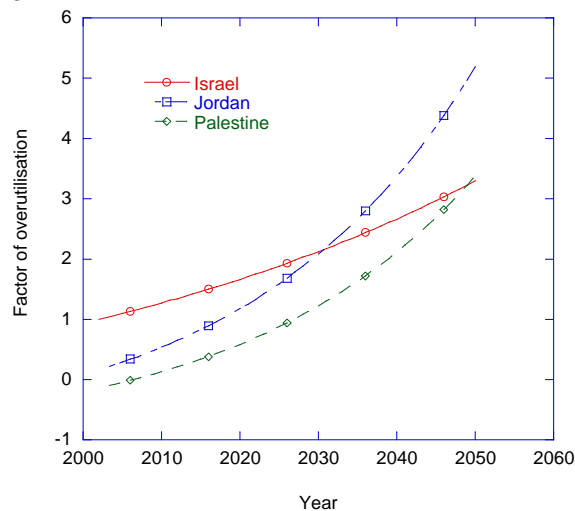


Figure 4: Factor of over utilisation for Israel, Palestine and Jordan compared with current water use.

Figure 4 illustrates that increase in water use will reduce the ability for each nation to be self sufficient on renewable water use only. As for the current water use, Israel uses factor 1 over

its normal water extraction, which is beyond the renewable water availability that currently exists for Israel. Figure 4 also shows that both Israel, Palestine and Jordan will not be sustainable in the future with current water policies. Figure 5 shows the total water use compared to available renewable water resources.

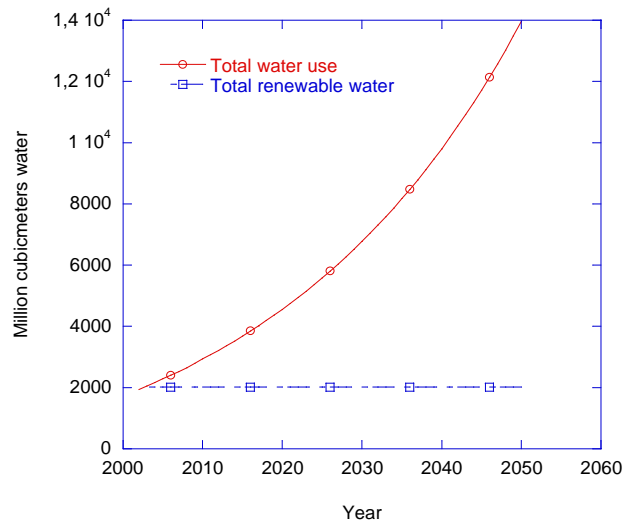


Figure 5: Total water use and renewable water in the Jordan River basin.

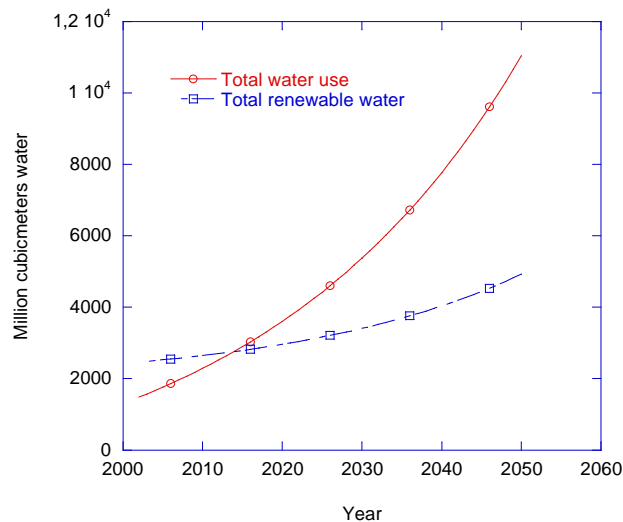


Figure 6: By recycling 1/2 of the used water in Israel, Palestine and Jordan it is possible to delay the overshooting of the renewable water resources.

It is important to notice that water recycling has a great potential in all the countries, especially in Palestine and Jordan. The agricultural sector makes up the bulk of the water use (73-85%). Different water saving techniques and alternative crop production that are less water demanding can drastically reduce the water use.

Refernces:

Kirschbaum, M.E., 1997: Water Resources: Security Impacts in the Jordan River Basin, research paper, the research department at the Air Command and Staff College. 45p.

PRIDE, 1992: A water management study of Jordan, PRIDE Technical report # 4, US Agency for International Development and Ministry of Water and Irrigation of Jordan.