

Land-use Change Scenarios for the Jordan River Region

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Abstract

In order to develop pathways to increase the benefits from regional water resources for humans and ecosystems, the GLOWA Jordan River project comprises the elaboration of regional development scenarios for Israel, Jordan and the Palestinian Authority. Since land-use change strongly affects water quantity and quality as well as biodiversity and ecosystem functioning, land-use change scenarios form an essential part of these regional development scenarios. We have applied the spatially explicit land-use change model LandSHIFT.R as integration tool within the scenario analysis of GLOWA Jordan River in order to develop land-use change scenarios for Israel, Jordan and the Palestinian Authority up to 2050. The objective of this paper is to present the four resulting spatially explicit land-use change scenarios. All four scenarios show an increase in urban and built-up area and agricultural area by 2050. Two of these scenarios stand out due to strong rangeland expansion. Reasons are a large increase in livestock numbers and the application of a sustainable rangeland management strategy, respectively. We discuss possible future environmental problems and potential subsequent applications of the land-use change scenarios in form of environmental impact studies. Furthermore, we highlight necessary enhancements of the land-use change scenarios.

Keywords: Middle East, Story and Simulation Approach, GLOWA Jordan River, land-use change, LandSHIFT.R

1. Introduction

With values for total renewable water resources ranging from 52 m³ to 535 m³ per capita and year [1], the per capita water availabilities in Israel, Jordan and the Palestinian Authority (PA) range among the lowest in the world. Current limitations of water availability are likely to aggravate in the future due to high population growth rates, economic development and climate change.

The interdisciplinary and international research project GLOWA Jordan River (GLOWA JR) addresses this problem. It aims at the development of sustainable strategies to increase the benefits from the scarce regional water resources for humans and ecosystems. In order to develop these strategies, a scenario analysis with intensive participation of experts from Israel, Jordan and PA was initiated.

In the context of the scenario analysis, a set of four regional development scenarios was elaborated [2]. They give a plausible description of future developments in Israel, Jordan

and PA, and thereby provide a formalized way to evaluate future environmental problems and to identify policies to take countermeasures.

Land-use activities have a strong impact on the environment by affecting water quantity and quality (e.g. [3], [4]) or by inducing degradation, fragmentation and destruction of natural habitats (e.g. [5]). Hence, land-use change scenarios that show possible future states of regional land-use systems are an essential part of the GLOWA JR scenario analysis and make an important contribution to the revelation of future environmental problems. In order to develop these land-use change scenarios for Israel, Jordan and PA up to 2050, we have applied the spatially explicit land-use change model LandSHIFT.R (**L**and **S**imulation to **H**armonize and **I**ntegrate **F**reshwater availability and the **T**errestrial environment – **R**egional version) [6].

The objective of this paper is to present these land-use change scenarios and to discuss environmental problems that were detected by means of the scenario calculations. Moreover, we address possible subsequent uses of the land-use change scenarios within the scope of environmental impact studies and

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DOI:10.5383/swes.03.02.005