



The Story- and Simulation approach

Scenario development as a method to integrate qualitative and quantitative knowledge for long-term water planning

Background

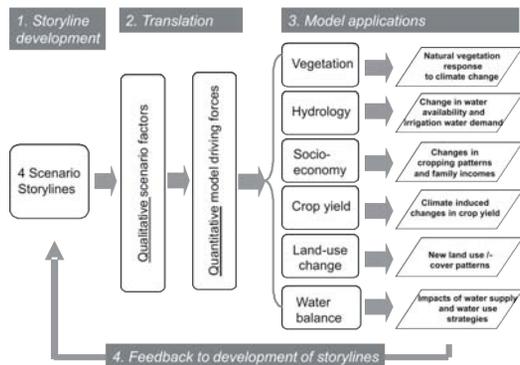
We used the so-called "Story and Simulation" (SAS) approach to carry out a scenario exercise dealing with the future water and land situation in the Jordan River region up to the year 2050. The objective of the scenario process was (1) to elaborate on possible futures of water resources in the region under climate change by using the scenario technique and (2) to provide scientific insights of GLOWA JR to stakeholders in a form useful for them. Six Scenario Panel Meetings were held, each with about 20 experts from water related institutions from Israel, Jordan and the Palestinian Authority.

Procedure and results

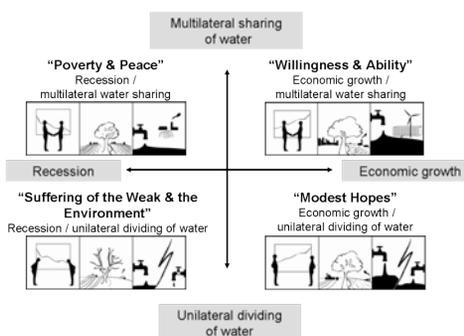
The SAS approach can be characterized as follows:

- I. It includes qualitative knowledge in the form of narratives mainly provided by stakeholders and other experts from the region.
- II. Qualitative information is quantified (if possible) by performing simulation studies.
- III. Scenario development is organized as an iterative procedure including feedback in two directions: Feedback via modeling studies is used to check the consistency of storylines. Stakeholders can give feedback to modeling groups in order to increase the relevance of simulation studies for themselves as potential users of the scenarios.
- IV. SAS is designed as an open process that motivates comments on the scenarios from persons or institutions that were interested but not directly involved in the scenario process.

Integration of storylines and simulation studies - overview



Step 1: Development of storylines



"Willingness & Ability" - the region flourishes due to lasting peace and world-wide economic growth

"Modest Hopes" - outside donors invest heavily in the region to prevent deterioration of the political situation

"Suffering of the Weak & Environment" - the economic and political situation in the region stagnates or worsens

"Poverty & Peace" - the political situation improves but economic growth does not

Step 2: Translating storylines to model input

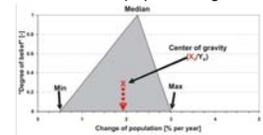
A critical step in qualitative-quantitative scenario development is the harmonization of storylines and model input. Stakeholders were (1) asked to make linguistic statements on e.g. future population growth e.g. "medium growth." (2) they were asked to give a range of what they believe is a medium growth. The latter information was used to build fuzzy sets representing the opinion of the whole group what medium population growth could mean in numbers. Defuzzyfication finally provides the single number which can be used as model input.



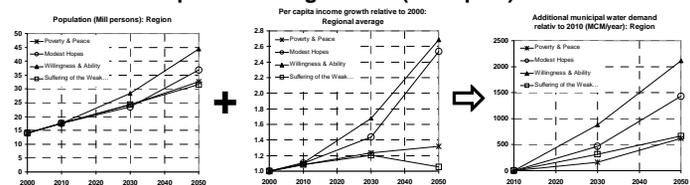
(2) Stakeholders assigned ranges of percentage change to linguistic statement for population growth

Member of decision panel	Large increase		Medium increase		Small increase		No change		Small decrease		Medium decrease		Large decrease	
	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
1	-0.20	0.20	-0.10	0.10	-0.05	0.05	0.00	0.00	0.05	0.05	0.10	0.10	0.20	0.20
2	-0.20	0.20	-0.10	0.10	-0.05	0.05	0.00	0.00	0.05	0.05	0.10	0.10	0.20	0.20
3	-0.20	0.20	-0.10	0.10	-0.05	0.05	0.00	0.00	0.05	0.05	0.10	0.10	0.20	0.20
4	-0.20	0.20	-0.10	0.10	-0.05	0.05	0.00	0.00	0.05	0.05	0.10	0.10	0.20	0.20
5	-0.20	0.20	-0.10	0.10	-0.05	0.05	0.00	0.00	0.05	0.05	0.10	0.10	0.20	0.20
6	-0.20	0.20	-0.10	0.10	-0.05	0.05	0.00	0.00	0.05	0.05	0.10	0.10	0.20	0.20
7	-0.20	0.20	-0.10	0.10	-0.05	0.05	0.00	0.00	0.05	0.05	0.10	0.10	0.20	0.20
8	-0.20	0.20	-0.10	0.10	-0.05	0.05	0.00	0.00	0.05	0.05	0.10	0.10	0.20	0.20
9	-0.20	0.20	-0.10	0.10	-0.05	0.05	0.00	0.00	0.05	0.05	0.10	0.10	0.20	0.20
10	-0.20	0.20	-0.10	0.10	-0.05	0.05	0.00	0.00	0.05	0.05	0.10	0.10	0.20	0.20

(3) Fuzzy set construction and defuzzyfication for the case of medium population growth



Step 3: Modeling results (examples)



Conclusions

A quantification of the scenarios and drivers of change increases the usefulness of a scenario process for planning and decision making. The SAS approach includes a quantification procedure requiring a substantial contribution of stakeholders in the scenario process so that the quantified outcome is transparent. It turned out, however, to be important to also consider existing planning scenarios of the participating countries to increase the credibility of the scenarios.