The Scenario Analysis of the GLOWA Jordan Project

Second Scenario Analysis Meeting
Hofgeismar by Kassel
5-7 February, 2007

Joseph Alcamo, Janina Onigkeit, Barbara Lübkert
Center for Environmental Systems Research, University of Kassel

Why a Scenario Exercise?

- To provide new knowledge about **consequences of global and regional change** on **water resources** in the region;
- To explore new ideas on how society can **adapt to expected changes** and increase the well-being of people living in the region through sustainable water management;
- To **integrate information** from the **scientific sub- projects** of the Glowa-Jordan River Project in a form useful to stakeholders in the region.

What is the SAS (*Storyline and Simulation*) Approach?

A type of scenario exercise that …

… includes both **qualitative** information (storylines) and **quantitative** information (model calculations) and combines their advantages;

… is an **iterative process** engaging both stakeholders and environmental modelers;

… is a useful tool for **synthesizing information/findings** from the Glowa-Jordan River sub-projects in a form relevant to policymakers.

Where has the SAS *Approach been used?*

In many different international scenario exercises, e.g.

- Intergovernmental Panel on Climate Change
- Millennium Ecosystem Assessment
- UNEP Global Environmental Outlook
- World Water Commission

The SAS approach is under development

Major scientific methodological challenges –

e.g. How to convert from qualitative (stakeholder-relevant) information to quantitative information (model inputs) and back again?

Who is involved?
SAS integrates activities

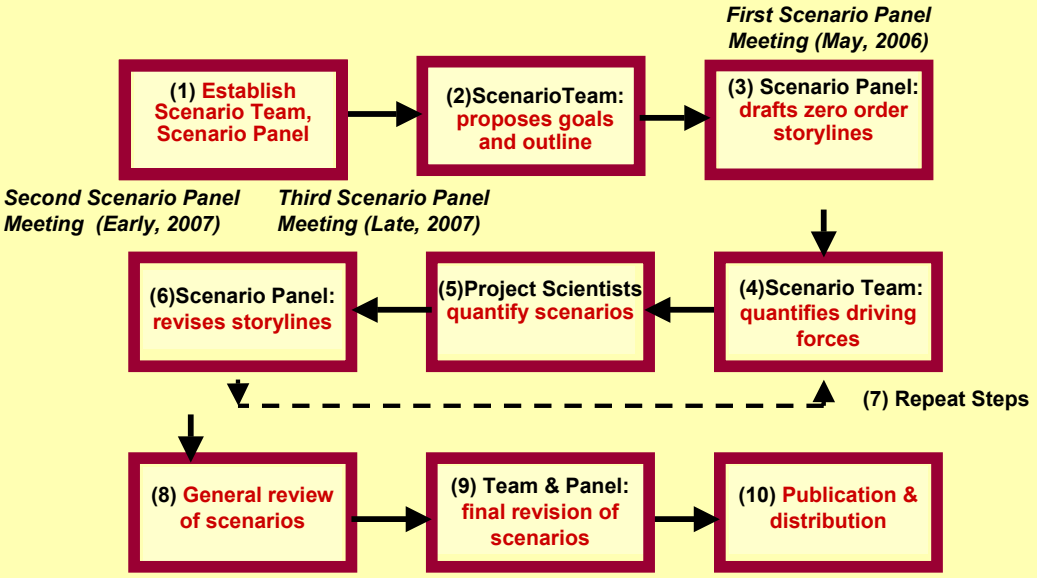
Scenario Panel: Stakeholders -- Representatives from water & agriculture ministries of Israel, Jordan, and Palestinian Authority; NGOs; scientific advisors. → *Develop qualitative scenarios ("storylines").*

***Scenario Team*:** Glowa-Jordan scientists (Univ. Kassel & Tübingen).
→ *Coordinate scenario exercise.*

***Project Scientists*:** Partners from scientific sub-projects of the Glowa-Jordan project. Support storyline development with modeling analyses.
→*"Quantify" scenarios (with modeling and other analysis)*

Moderator Team ("Prospex").
→ *Facilitate Scenario Panel meetings.*

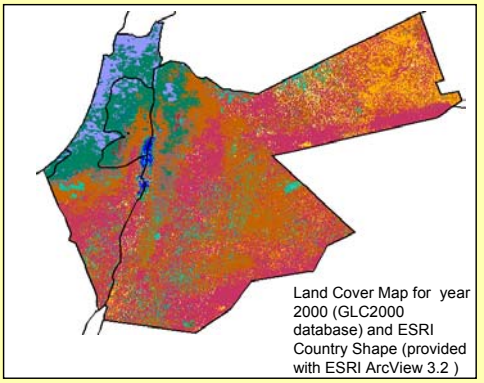
SAS Procedure in Glowa-JR Project



Results of First Scenario Panel Meeting

Study region

Territory of Israel, Jordan and the Palestinian Authority related to water resources of Jordan River.



Land Cover Map for year 2000 (GLC2000 database) and ESRI Country Shape (provided with ESRI ArcView 3.2)

Time scale of scenarios

Up to 2050 to evaluate impacts of climate change, long-term changes in vegetation cover.

Beginning (2008-2010) and middle (2025-2030) to evaluate steps towards sustainable development

CESR
Center for Environmental Systems Research

Results of First Scenario Panel Meeting

Identified factors influencing future water situation

1. Global climate change	8. Access to and allocation of water
2. Trade	9. Nature conservation
3. Water pollution and treatment	10. Finance & Pricing
4. Energy	11. Demographics
5. Competing water needs between sectors	12. Water supply
6. Values and attitudes	13. Peace / war regional strategies
7. Education	14. Agriculture

Results of First Scenario Panel Meeting

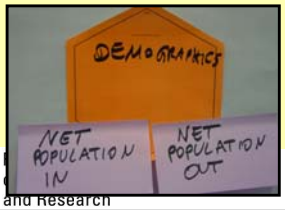
Identified main uncertainties

e.g. Demographics

Known
Population increase
Need for more resources

Not known
Influx / outflux

Opposites
Net in-migration or net out-migration??



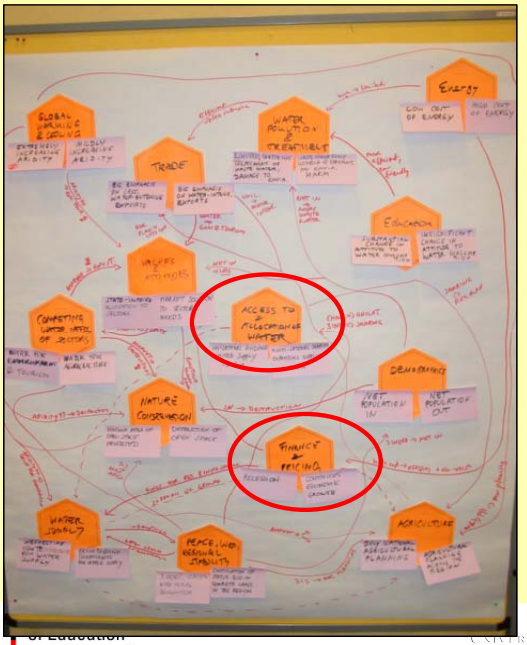
e.g. Trade

Known
--

Not known
- Extent of liberalization
- Existence of market for agricultural production
- Extent of environmental protection

Opposites
Big emphasis on water-intensive exports, or not??

Results of First Scenario Panel Meeting



First draft scenario storylines

Define influences between factors

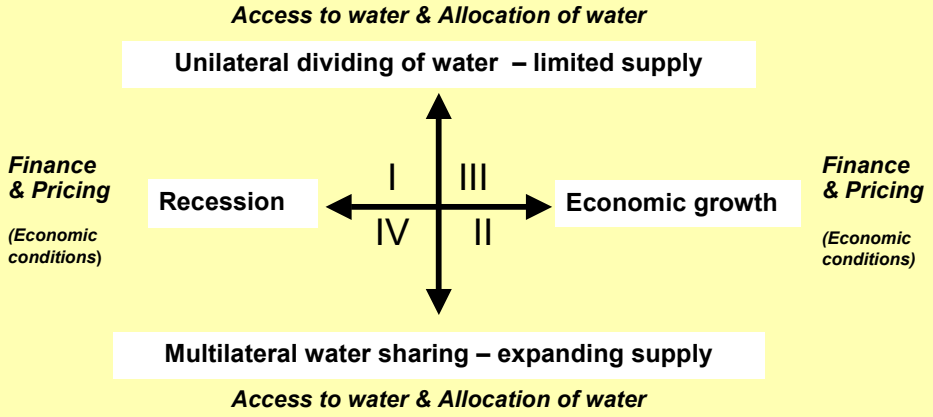
↓

Identify **key factors** that have **many interlinkages** with other factors

↙ ↘

Access to water & allocation of water

Finance & pricing (Economic conditions)



Scenario I: Recession / unilateral dividing of water *"Suffering of the weak & environment"*
Scenario II: Economic growth / multi-lateral water sharing *"Willingness & ability"*
Scenario III: Economic growth / unilateral dividing of water *"Modest hopes"*
Scenario IV: Recession / multi-lateral water sharing *"Poverty & peace"*

GLOWA

First Draft Scenario Storylines

"Scenario Sketches"

Example: Scenario II "Willingness & Ability"
Economic growth /multi-lateral water sharing

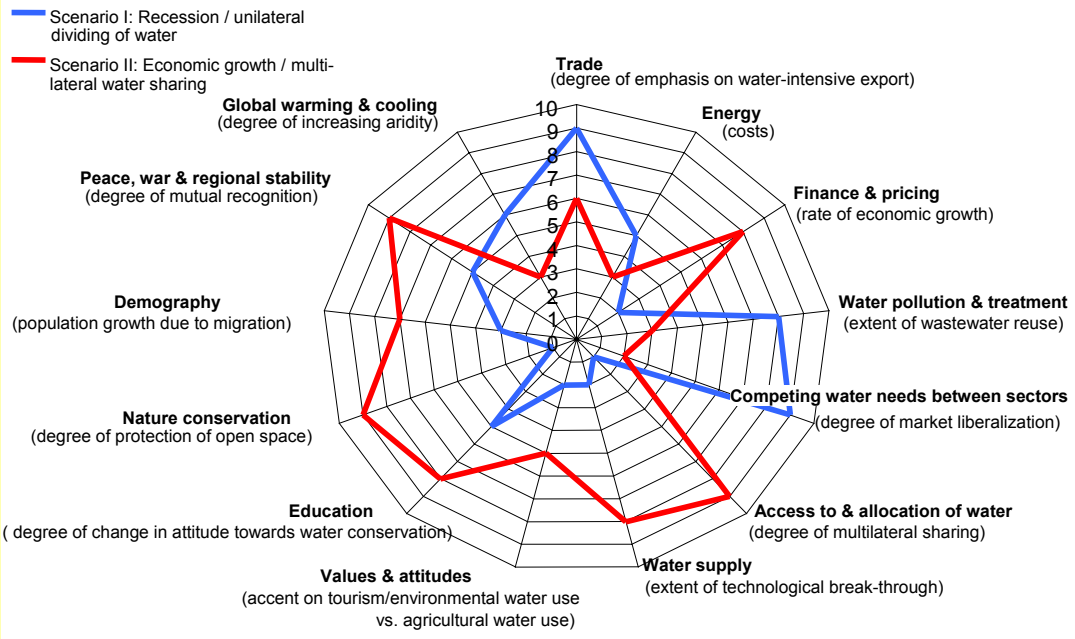
2008-2010	2025-2030	2050
Increase in waste water use, improved efficiency of irrigation systems, transfer of know-how …	Implement regional and national water plans, more water for tourism and environment, new irrigation techniques, new water supply (desalination, treated waste water , …)	Fulfilled water demand, expanded water supply & resources, reduced conflict between water sectors, …

First Quantification of Scenarios

Integration of Modeling Results and Other Inputs

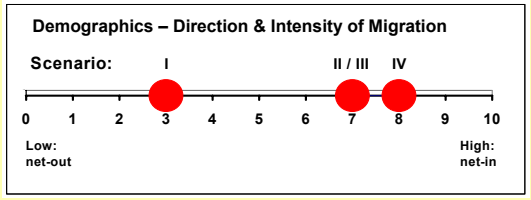
- Regional climate scenarios
- Regional agricultural and land use scenarios
- Future water requirements for agriculture
- Future water availability
- Future wastewater management and water quality
- Future changes in natural vegetation and ecosystems

From storylines to models

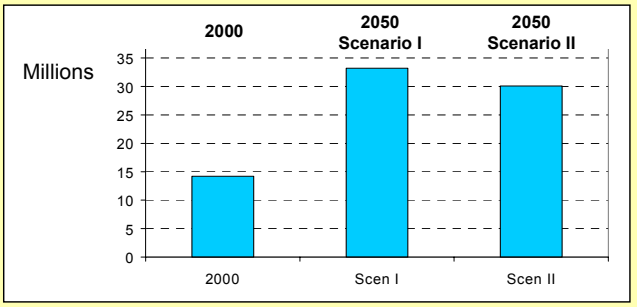


From storylines to models

From semi-quantitative factors...

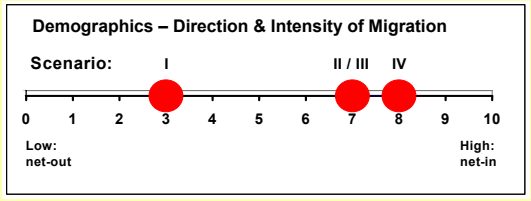


...to quantitative model drivers



From storylines to models

From semi-quantitative factors...



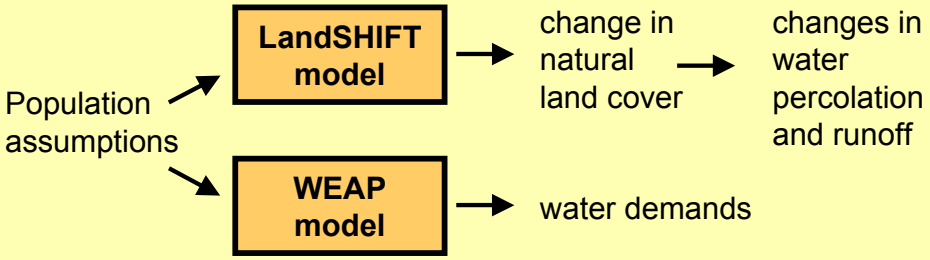
...to quantitative model drivers

Change in population growth rates [%] until 2050 (Scenario I)

- Israel: 2.3 to 0.6
- Jordan: 3.3 to 0.6
- PA: 4.5 to 1.6
- Region: 3.2 to 0.9

From storylines to models

Use of Model Inputs Assumptions, e.g.



From storylines to models

"Population growth is *medium*"

What does "medium" mean?

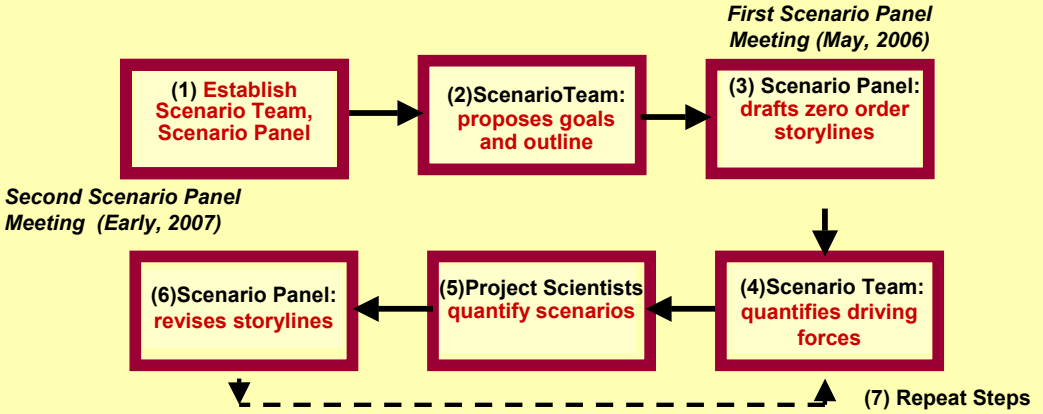
"Fuzzy Sets"

Population growth = 3 % per year

- Produces numerical data needed for models.
- Do not have to agree on boundaries of "small", "medium", etc. (fuzzy boundaries).
- Can represent many different views in definitions of "small", etc
- Translation from words to numbers is transparent.

Federal Ministry of Education and Research
Universität Tübingen
CESR Center for Environmental Systems Research

Next steps



Why Combine Models and Storylines?

1. Check *consistency* & *feasibility* of storylines:

e.g Scenario 1 asserts that climate change brings increasing aridity, but also that export of water-intensive crops will increase. Consistent?

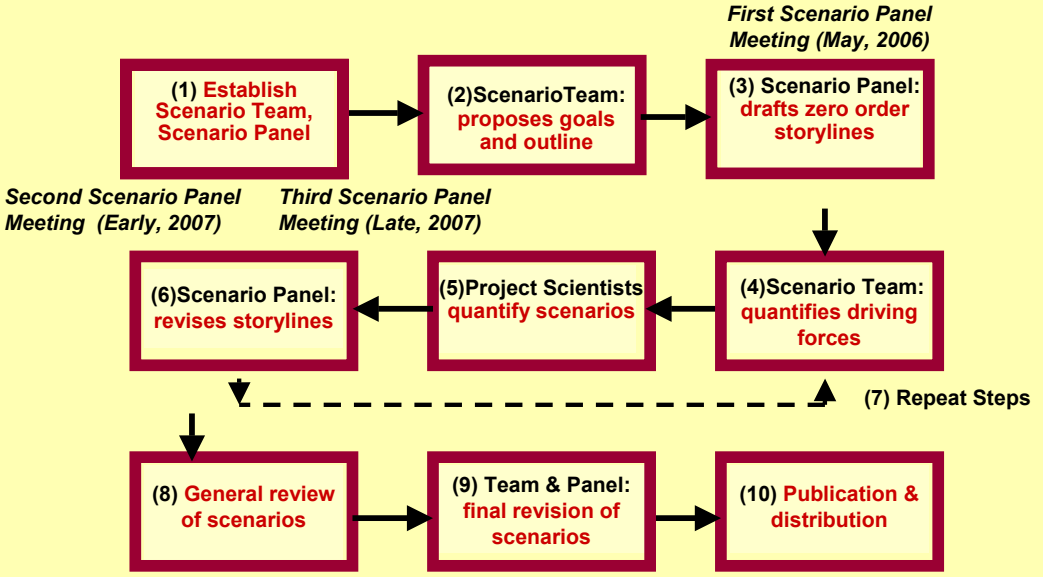
Models evaluate potential crop production and potential for expanding irrigated areas under climate change.

2. *Enrich* storylines:

e.g. Illustrate important environmental changes going on in different parts of the region for entire region –

Such as -- Maps of changing vegetation, diagrams showing changing regional water balance, graphs showing trends in water use in households, industry and agriculture

Next steps



Output of Scenario Exercise

***Set of qualitative* scenarios** (storylines) **+ *quantitative* scenarios** (model calculations)

- consistent, realistic, comprehensive, and rich
- new knowledge about consequences of global and regional change on water resources in the region
- new ideas on how society can adapt to expected changes
- synthesis of scientific information in form useful to stakeholders in the region. ♦

The Scenario Analysis of the GLOWA Jordan Project

Second Scenario Analysis Meeting
Hofgeismar by Kassel
5-7 February, 2007

Joseph Alcamo, Janina Onigkeit, Barbara Lübkert
Center for Environmental Systems Research, University of Kassel