

Linking scenario development and simulation to support water policies under climate change in the Jordan River basin

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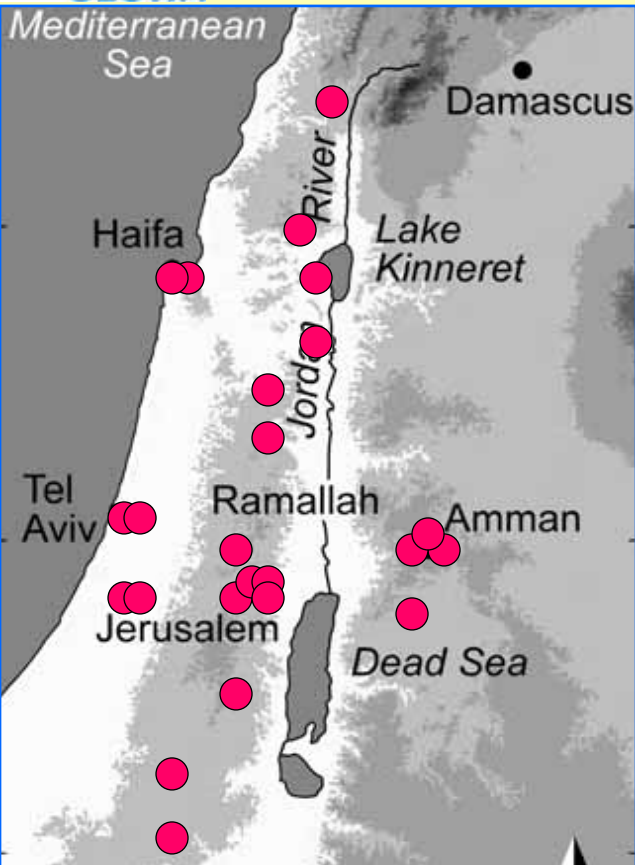


Federal Ministry
of Education
and Research



GLOWA

GLOWA Jordan River – the mandate



≈ 50 groups in D, IL, JO, PA

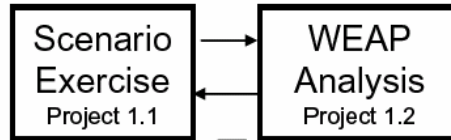
Under expected global change -- to what extent can blue and green water resources contribute to future water needs in the region?

- Provide scientific support for sustainable water management under global change conditions
- Provide simulation tools and instruments to develop strategies for sustainable water management

Project organization

Integration projects

Project 1



Overarching Question: *Under expected global change -- to what extent can conjunctive blue and green water resources contribute to future water needs in the region?*

Guiding Sub-Questions:

- 1) *New Water Question*
- 2) *Land Use Question*
- 3) *Climate Extremes Question*

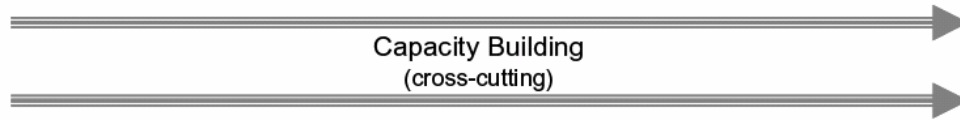


New Water Evaluation
Project 2, 4.2

Land Use & Ecosystem Analysis
Project 3

Climatic & Hydrologic Analysis
Project 4, 3.1.1

Supporting projects



Capacity Building
(cross-cutting)

Coordination & Dissemination Projects 0
& 1.3 (cross-cutting)

What are Scenarios?

Plausible description of how future may unfold based on 'if-then' propositions.

Typical scenario: representation of initial situation and sequence of events that lead to an image of the future.

What a scenario is *not*: Forecast, prediction, extrapolations

What is a Scenario Exercise?

A procedure including development of scenarios, a comparison of scenario results, and an evaluation of their consequences.

A key idea is to explore alternative future developments.

The GLOWA-JR Scenario Exercise



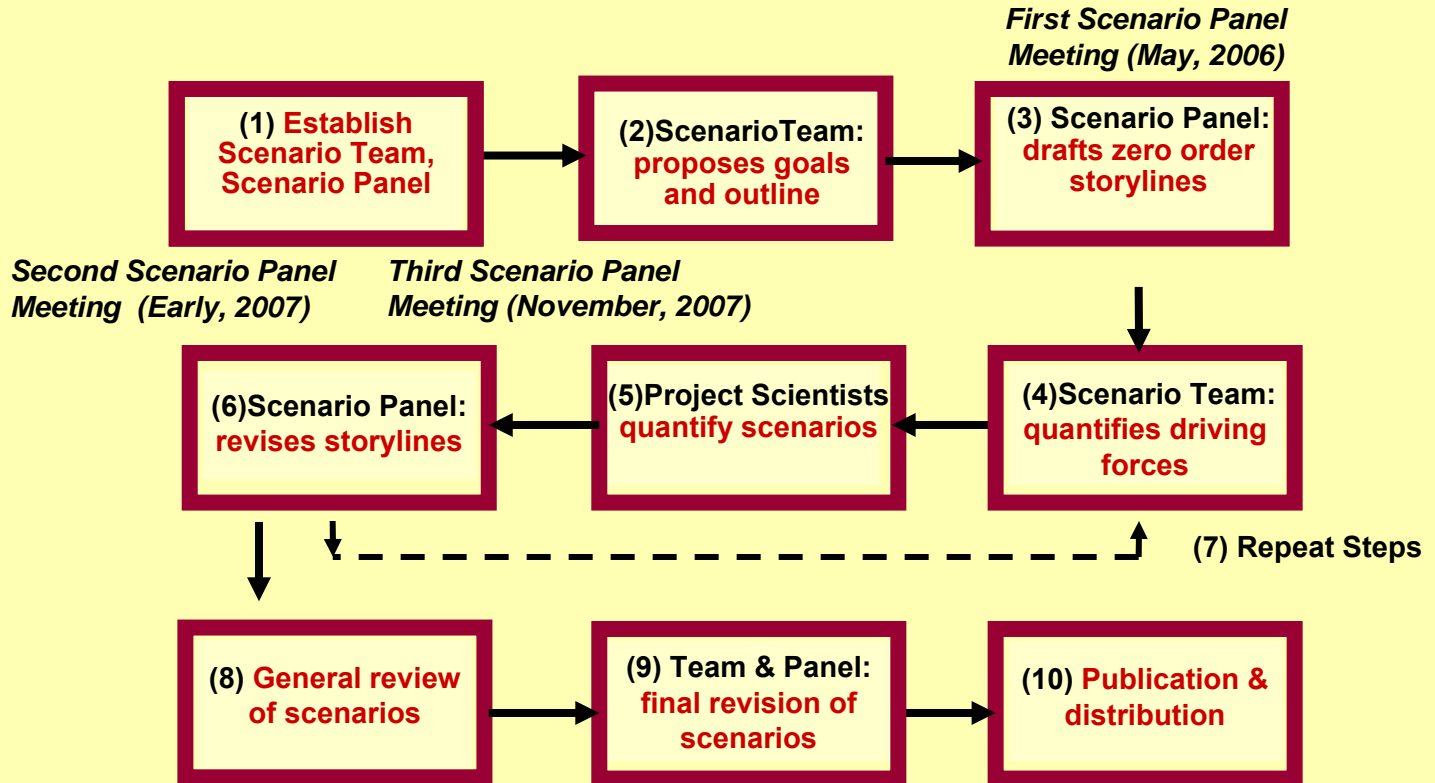
Goals

- Provide new knowledge about impacts of global & regional change on water resources in the region
- Integrate information from scientific sub-projects in a form useful to stakeholders
- Explore new ideas on adapting to changes through sustainable water management

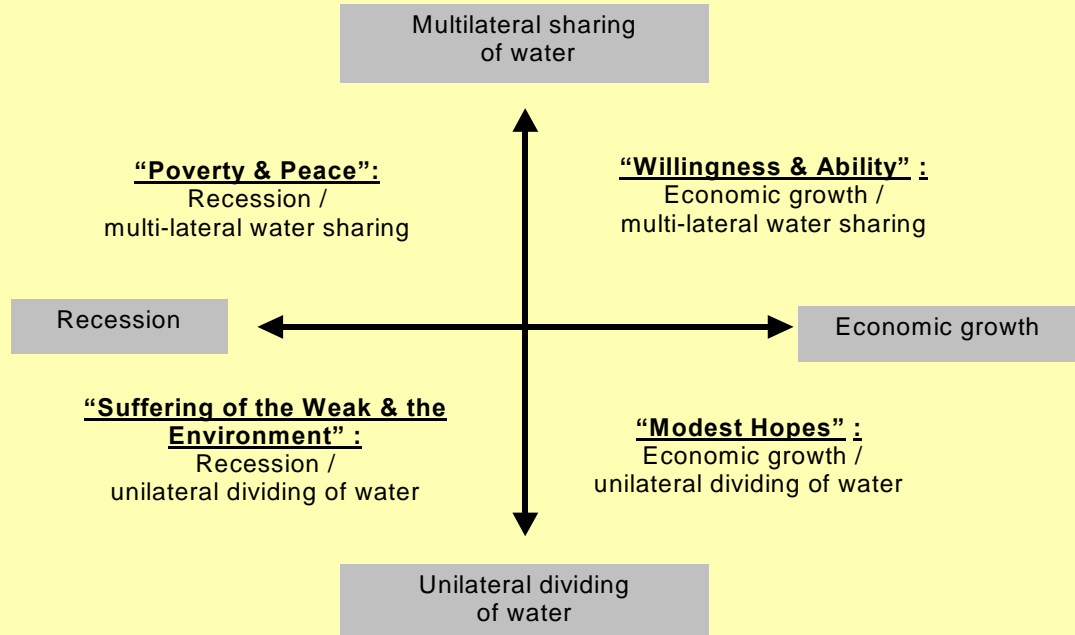
Approach: “Story and Simulation“ (SAS) approach

Similar to approach applied for IPCC-SRES-, MEA-, and GEO4-scenarios

SAS procedure in GLOWA-JR project (part I)



Results of Part I: Comprehensive storylines of regional development under global change

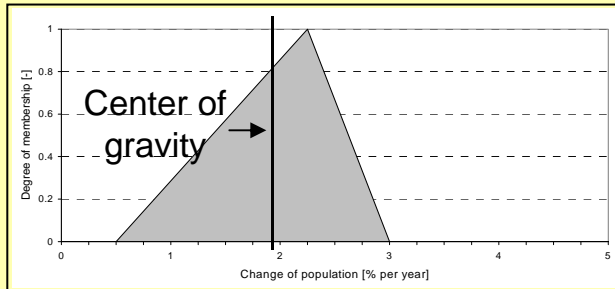


Abstract of Storyline – “Modest Hopes”

The **Modest Hopes** scenario assumes that no peace agreement can be reached but that economic prosperity prevails, kindled by international donors. This results in fairly stable conditions in the region. Education, training and capacity building make up for some of the lack of cooperation. In order to counter the effects of climate change, high-tech solutions, such as desalination plants and irrigation with properly treated wastewater, make up for the lack of a diminishing natural water availability. Agriculture becomes very profitable, but increases the pressure on open land. Because of continued lack of political cooperation, countries refuse to let more water flow into the Dead Sea so that its water table continues to drop sharply and puts the Dead Sea at great risk.

Results of Part I: New method for linking qualitative and quantitative knowledge in scenarios

Going from Storylines to Models



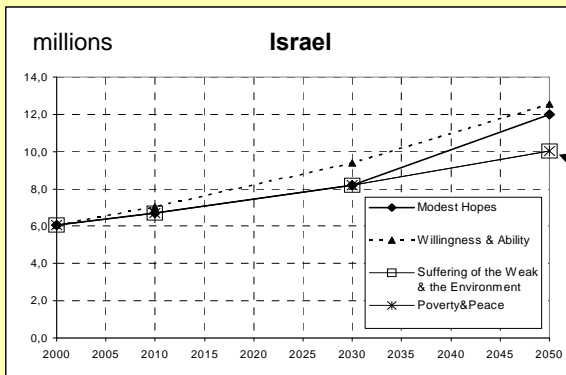
“Fuzzy membership function”

Objective translation:
linguistic statement “medium increase of population” → model input

Going from Storylines to Models

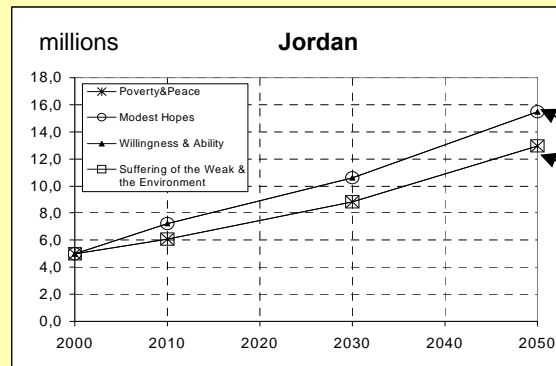
GLOWA Jordan River Scenarios of Regional Development
Population Growth – “Modest Hope” Scenario

		Rate of Change of Population	
Scenario period	State	Storyline	Model Input (% per yr)
2008-2010	Israel Jordan Palestine	Small increase High increase Medium increase	1 3.7 1.9
2025-2030	Israel Jordan Palestine	Small increase Medium increase Small increase	1 1.9 1
2050	Israel Jordan Palestine	Medium increase Medium increase Medium increase	1.9 1.9 1.9



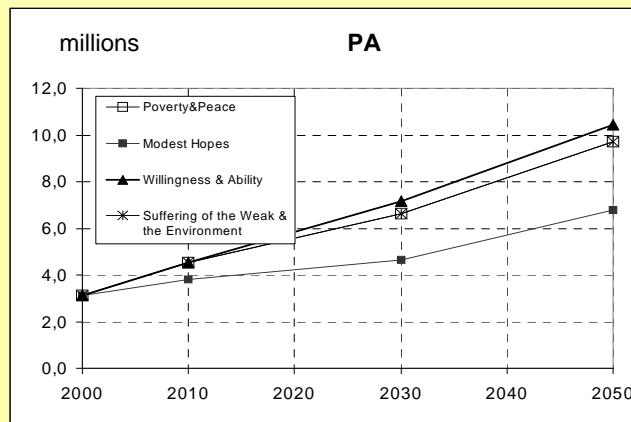
Modest Hopes

Poverty & Peace



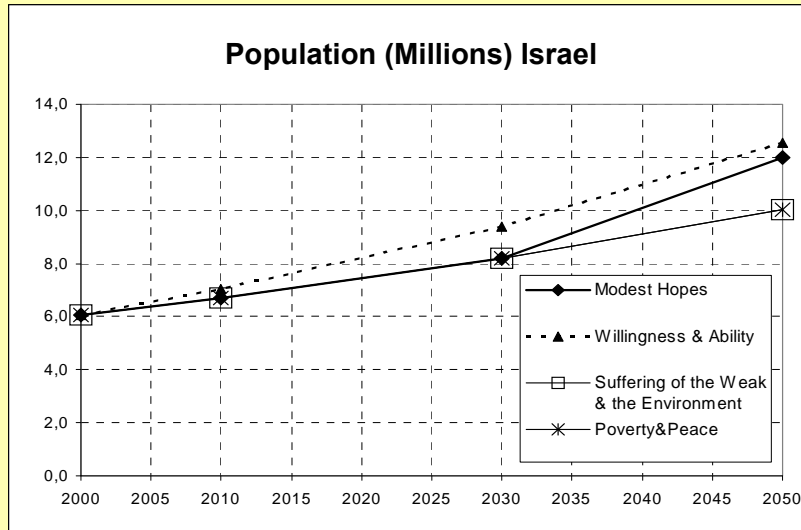
Modest Hopes

Poverty & Peace



Poverty & Peace

Modest Hopes



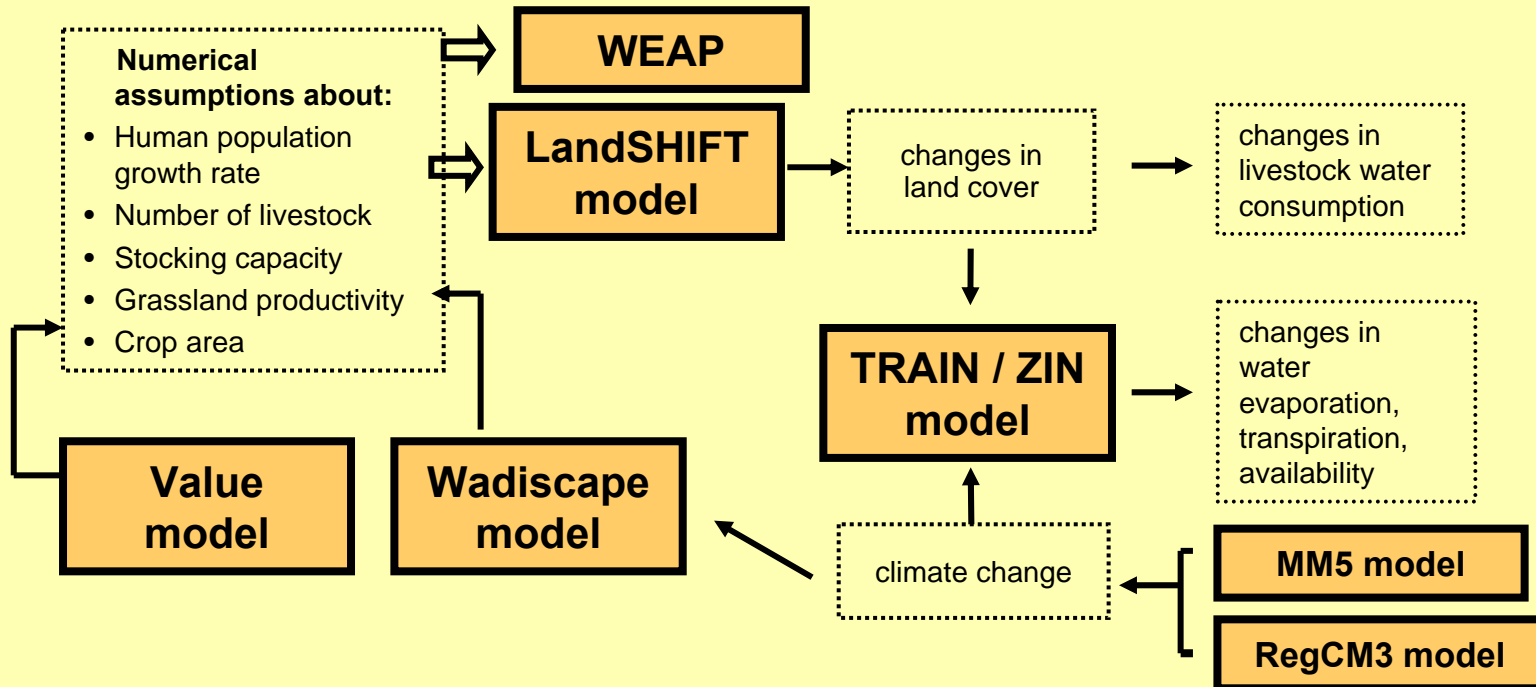
} Range of projections from literature

Glowa-JR Scenario Exercise

Storylines



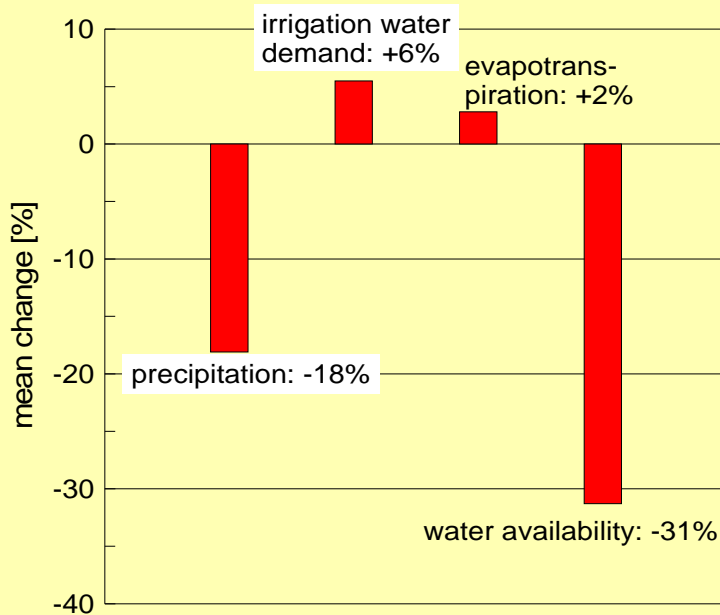
Results of Part I: Integration of sub-project results through coupled modeling



Climate Change: Change in Water Balance

period 2041-2050 vs. 1961-90

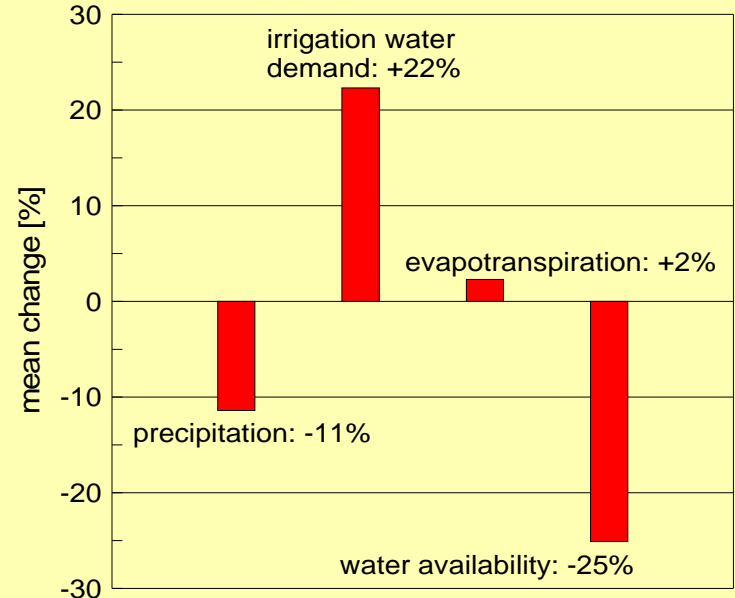
scenario **A1B**, region



Water balance: TRAIN model (Menzel)
Source: Menzel et al. 2009

period 2071-2100 vs. 1961-90

scenario **B2**, region



Climate calculations with ECHAM5 & RegCM3 models (Alpert, Krichak, Kunin)

Insights gained from scenarios

Quotes or paraphrased remarks of stakeholders in Scenario Panel

"Poverty and Peace":

"Peace not enough" - Lack of economic resources makes it difficult to deal with water resource problems

"Suffering of the Weak & the Environment":

- Linkage between peace and poverty;
- Negative effect on water resources of "world giving up on the Middle East".
- Policymakers should develop rainfed agriculture, rather than expanding irrigated areas.

"Willingness and Ability"

- Best chance to "invest in future generations".
- But could require large changes in region (e.g. shift to low water-using crops)
- But pollution problems arise because of intensive water and energy use

"Modest Hopes"

Combination of economic prosperity but no peace is surprising; "bypasses dichotomy of 'good and bad'"

Insights gained from scenarios

Quotes or paraphrased remarks of stakeholders in Scenario Panel

- "Climate change cannot be looked at alone"
- "We are currently not prepared for this!"
- "We have to prepare ourselves for the uncontrollable!"
- "Wise strategy: mix of national / regional approaches"

Advantages/Disadvantages of SAS Approach

Disadvantages of SAS

1. **Resource-intensive, time-consuming, expensive.**
2. **Requires good moderators, good models.**
3. **Linkage between qualitative and quantitative difficult / not transparent.**

Advantages of SAS

1. **An “open” approach → Stakeholders are involved in core activities, interested parties can comment on and contribute to the scenarios**
2. **An iterative process → Enhances involvement & interaction between writers, experts, modelers, & stakeholders**

Advantages of SAS (cont.)

- 3. Combines advantages of qualitative and quantitative scenarios.**
***Qualitative* -- understandable, express complex dimensions of problem.**
***Quantitative* -- consistency check of different assumptions of qualitative scenarios, provide quantitative data**

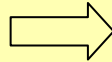
Current activity: Water Management Options

Part I Scenario Analysis (2006-2008)

Scenarios of Regional Development under Global Change

Departure point for planning

What are ranges of plausible futures in the region that can serve as background for testing water management strategies?



Part II Scenario Analysis (2009-2011)

Scenarios of Sustainable Water Management

Which strategies or combination of strategies can provide adequate water for the region?

Question 1: *The “New Water” Question*

Question 2: *The “Land Use” Question*

Question 3: *The “Climate Extreme” Question.*

1. The “New Water” Question

How can “new sources” of water be best exploited under uncertainty of future regional development?

2. The Land Use Question

How can better land use management be integrated into water management?
(Improving water productivity of crops, improving crop yield, saving water by retaining more open land for tourism and biodiversity).

3. The Climate Extreme Question

What will be impact of climate extremes on water resources? Where will major vulnerabilities arise?

What actions can reduce vulnerabilities (storage, modified water use patterns, changed crops).

Summary

Main Output of Scenario Exercise, Part I:

- Scenarios of regional development under global and regional change
- Linking science & policy in a contentious setting

Goal for Scenario Exercise, Part II

- Build on scenarios of regional development from Part I
- Develop policy-relevant and scientifically-sound scenarios of sustainable water management in the region
- Address three questions:
 1. The New Water Question
 2. The Land Use Question
 3. The Climate Extreme Question



Thank you !