



International Institute for
Applied Systems Analysis
www.iiasa.ac.at

science for global insight

Water Futures and Solutions: Developing a New Generation of Integrated World Water Scenarios

Worlds Within Reach, From Science to Policy

26 October, 2012, Laxenburg, Austria

David A. Wiberg

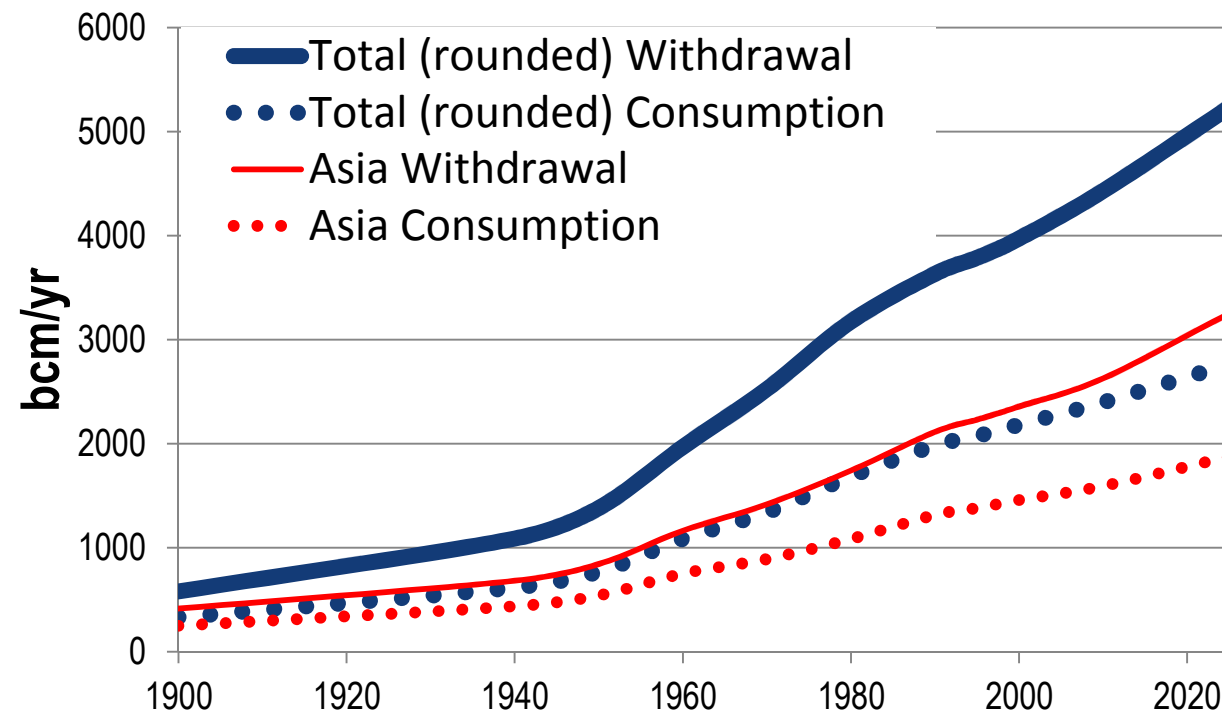


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Water: Global Challenges

Access and Use

- ~ 900 million people still have inadequate access to safe freshwater (WHO & UNICEF, 2010)
- Water use has been growing at more than twice the rate of population increase in the last century (FAO & UN-Water)

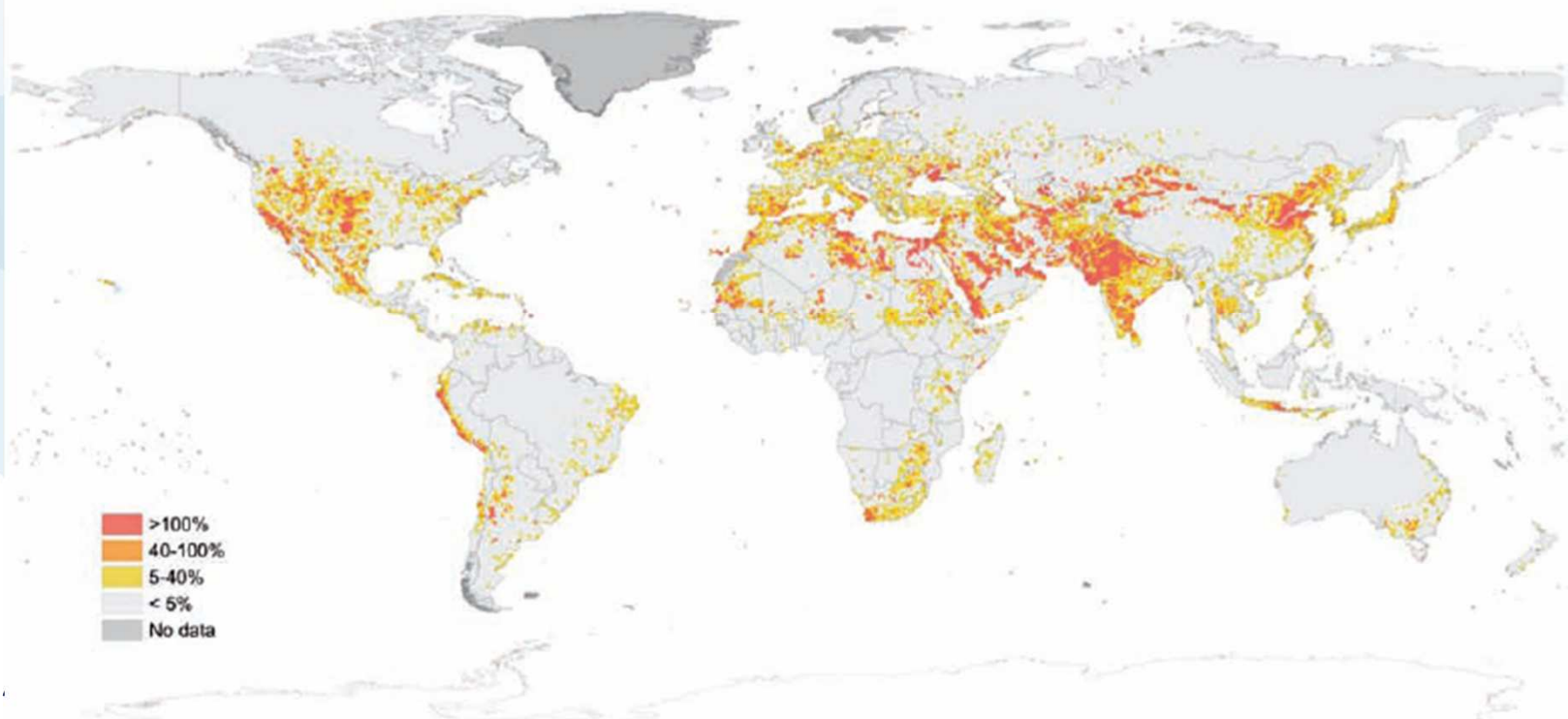


Water: Global Challenges

Water Scarcity

- 25% of population live in areas of physical water scarcity
- In many areas, withdrawals exceed local renewable water resources.

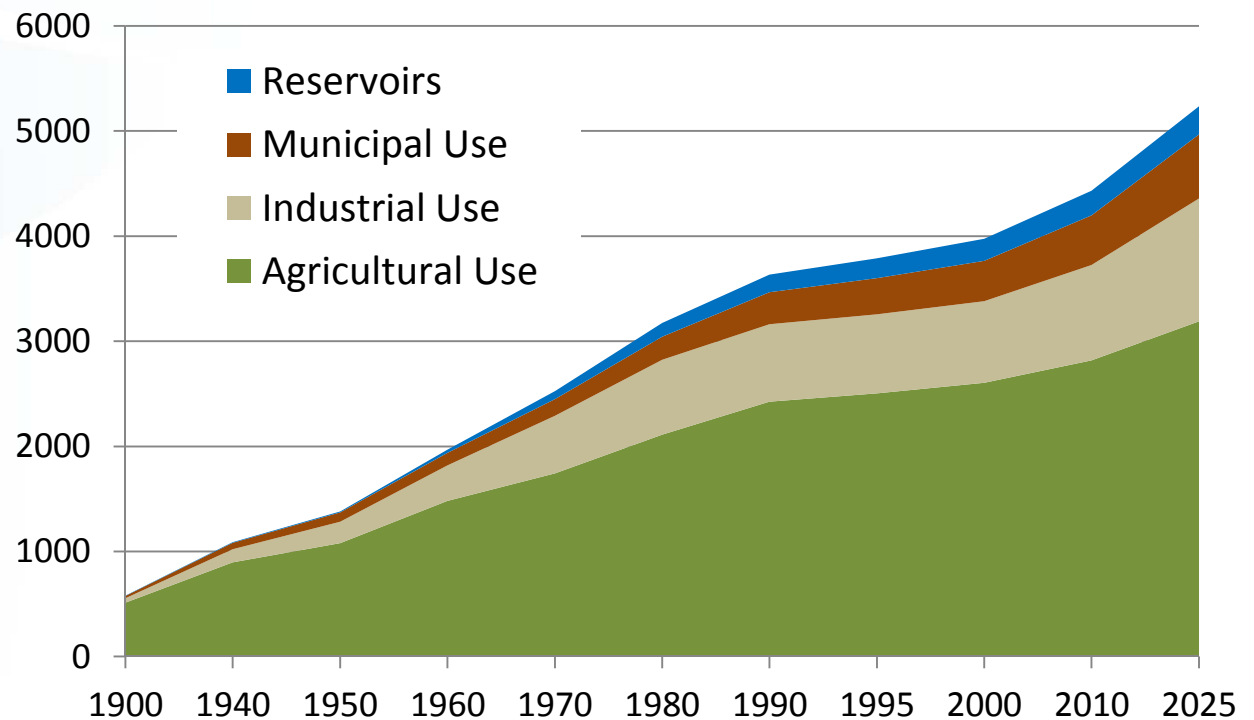
FIGURE 15: RATIO OF ANNUAL WATER WITHDRAWAL TO AVAILABLE RENEWABLE WATER RESOURCE



Water: Global Challenges

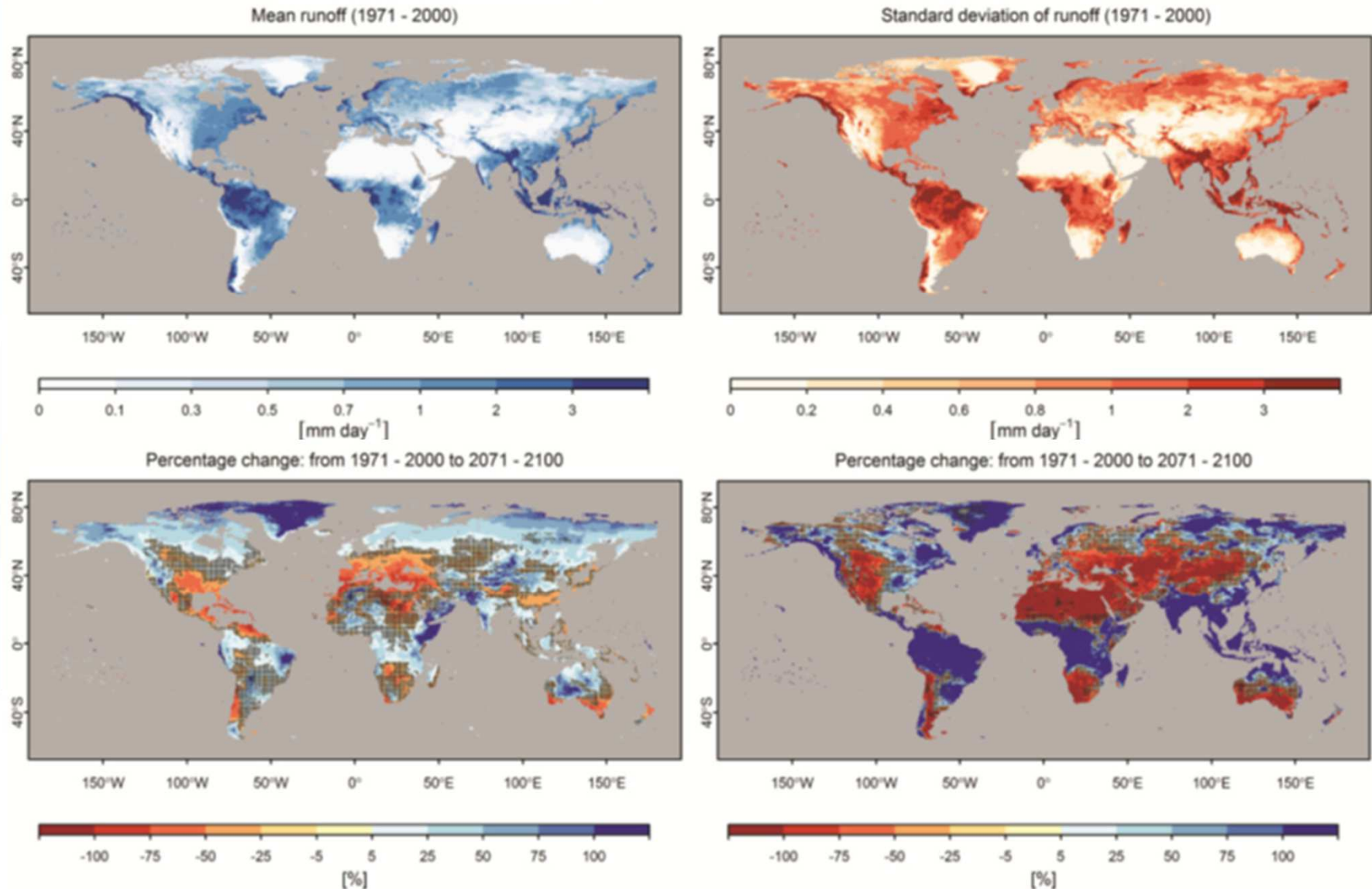
Increasing and Competing Demands

- Population still growing, adding 2 billion more by 2050
- Food production requirements potentially 70% greater by 2050
- 20% of the world's population has no access to electricity
 - Industrial and energy water uses exceed agriculture in high-income countries.
- Ecosystems?



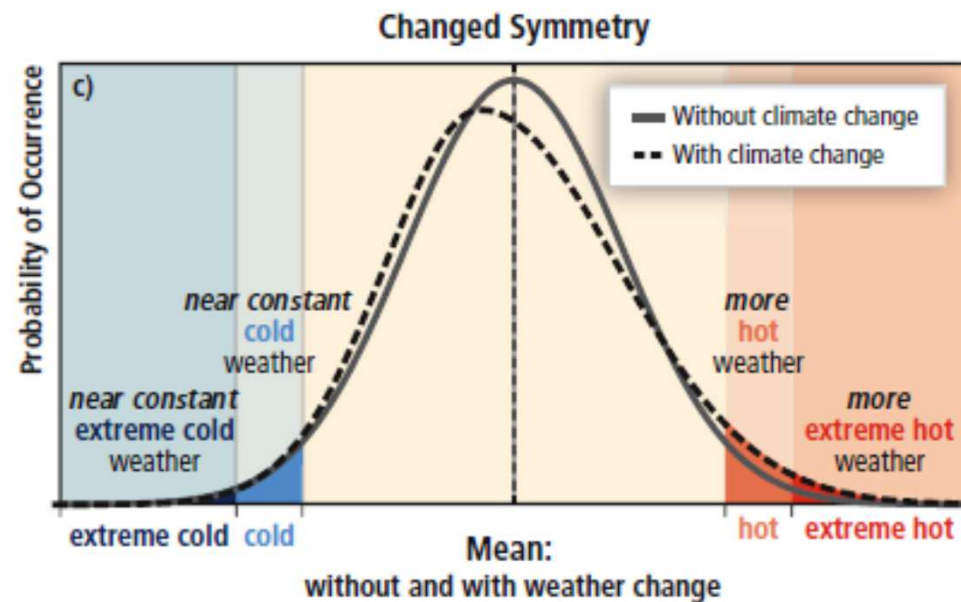
Water: Global Challenges

Climate Change and Variability



Water: Management Challenges

- Water management must intensify.
- Managing the water sector alone is no longer enough
 - Water integrates across scales and sectors, which all use and influence increasingly scarce water resources.
- Water management is risk based, but how does risk change?
 - Large uncertainties
 - Data
 - Scenarios
 - Models
 - No stationarity
 - More robust, flexible solutions required



Water: Management Challenges

Decisions under Uncertainty

- How do we make decisions now that will be effective and robust into the future under increasing risks?

Crystal Ball?

Perfect foresight?

No

Water Futures and Solutions

World Water Scenarios Approach

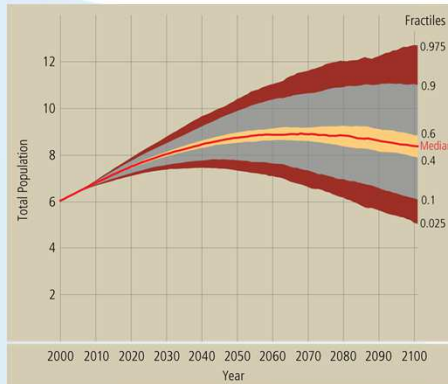
1. Conceptual model
2. Driver analysis
3. Narratives of future
4. Changes in drivers
5. Impacts
6. Management options
7. Identify sets of robust, flexible solutions
8. Communicate

All items are done iteratively with stakeholders

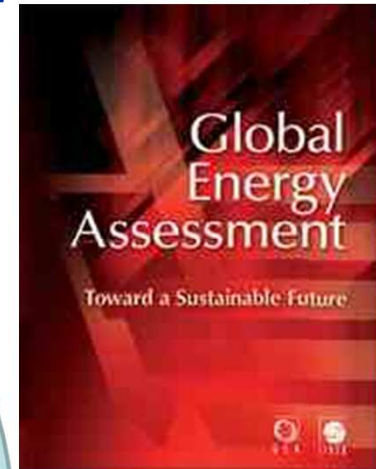
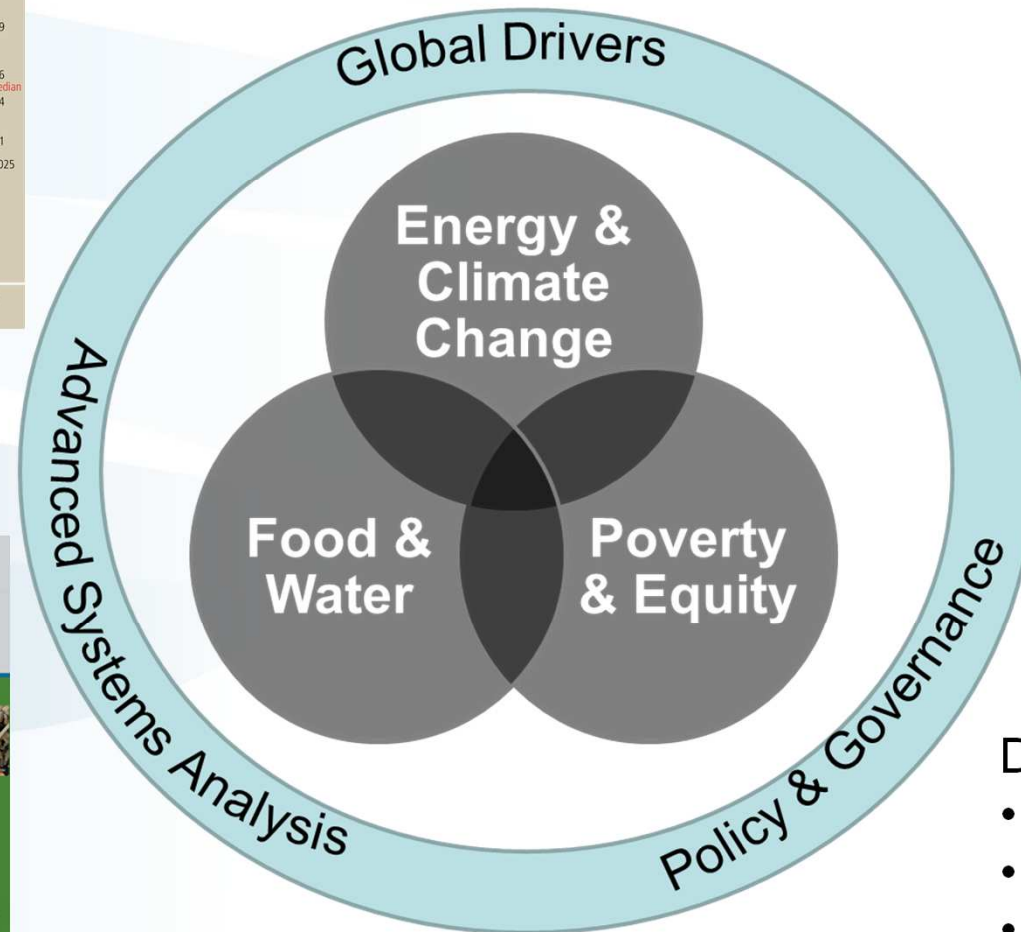


Water Futures and Solutions

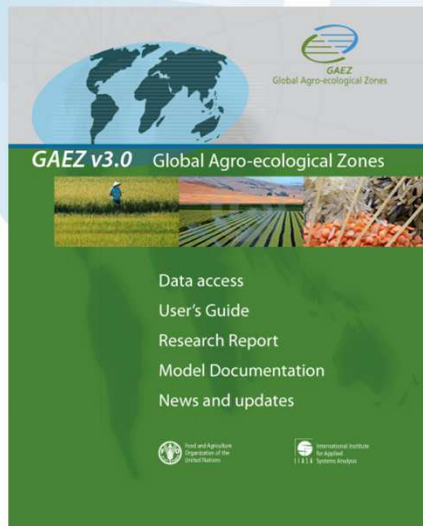
World Water Scenarios Approach: Applying Experience



<http://www.iiasa.ac.at/Research/POP/proj07/>



<http://www.iiasa.ac.at/Research/ENE/GEA/>



<http://www.gaez.iiasa.ac.at>

Data repository for:

- IPCC
- WATCH
- GEA
- GAEZ
- POP
- GAINS



David A. Wiberg

Water Futures and Solutions

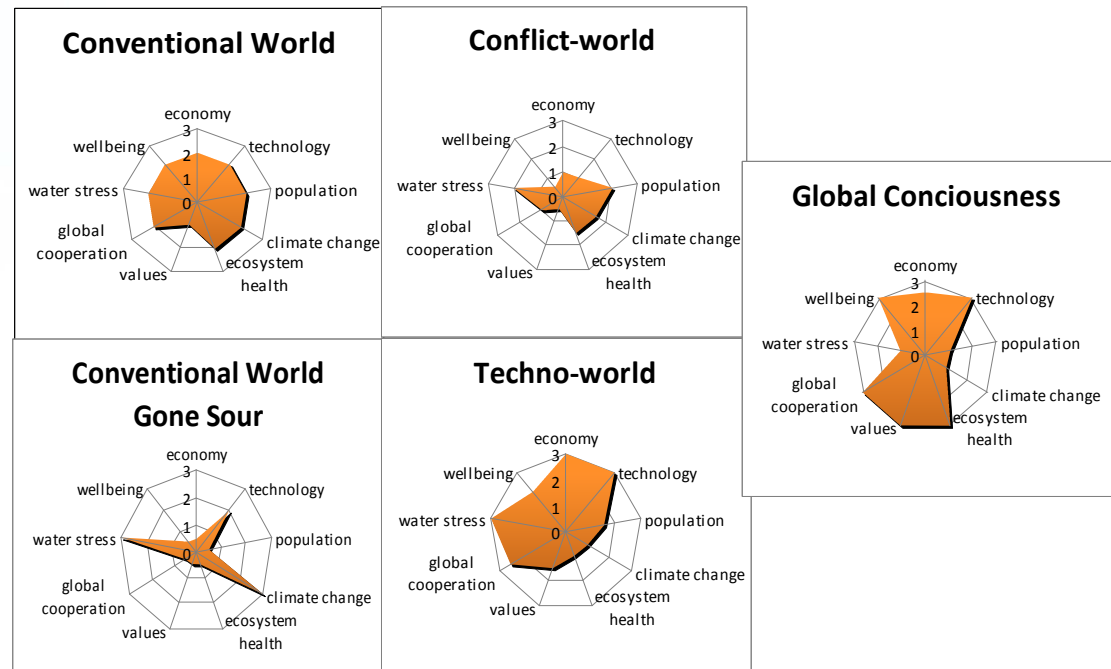
World Water Scenarios Approach: Initializing

Development Phase Reports – Drivers and Stylized Scenarios

Drivers

- Agriculture
- Climate change/variability
- Demography
- Economy/Security
- Ethics
- Governance
- Infrastructure
- Politics
- Technology
- Water Resources

Stylized Scenarios



Water Futures and Solutions

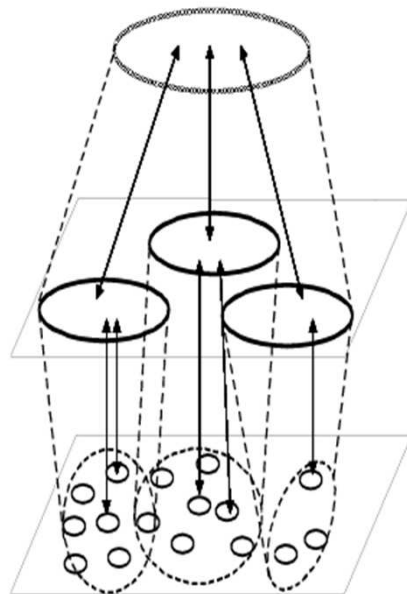
World Water Scenarios Approach: Applying Experience

SCENES: Multi-level Scenarios for Europe

Pan-European

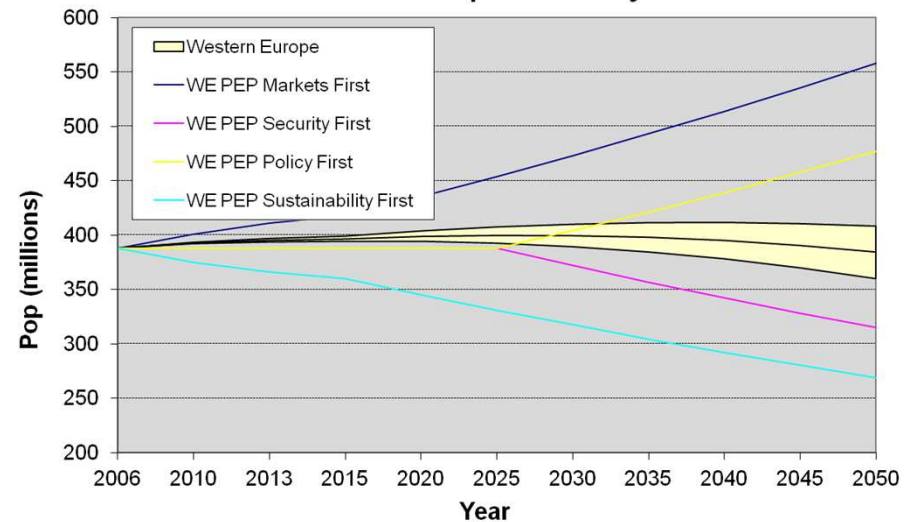
Regions

Pilot Areas



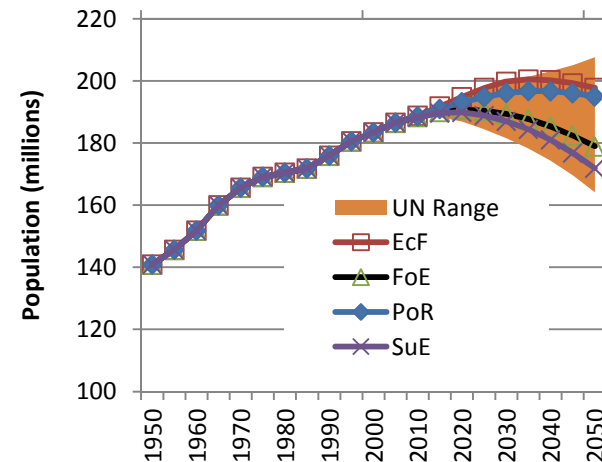
Early stakeholder growth estimates

Probabilistic Population Projections vs. PEP



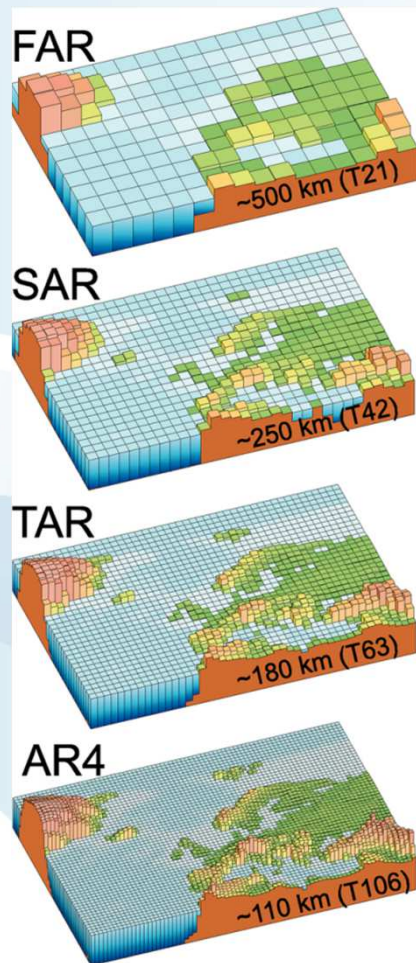
After two rounds of enrichment

Western Europe

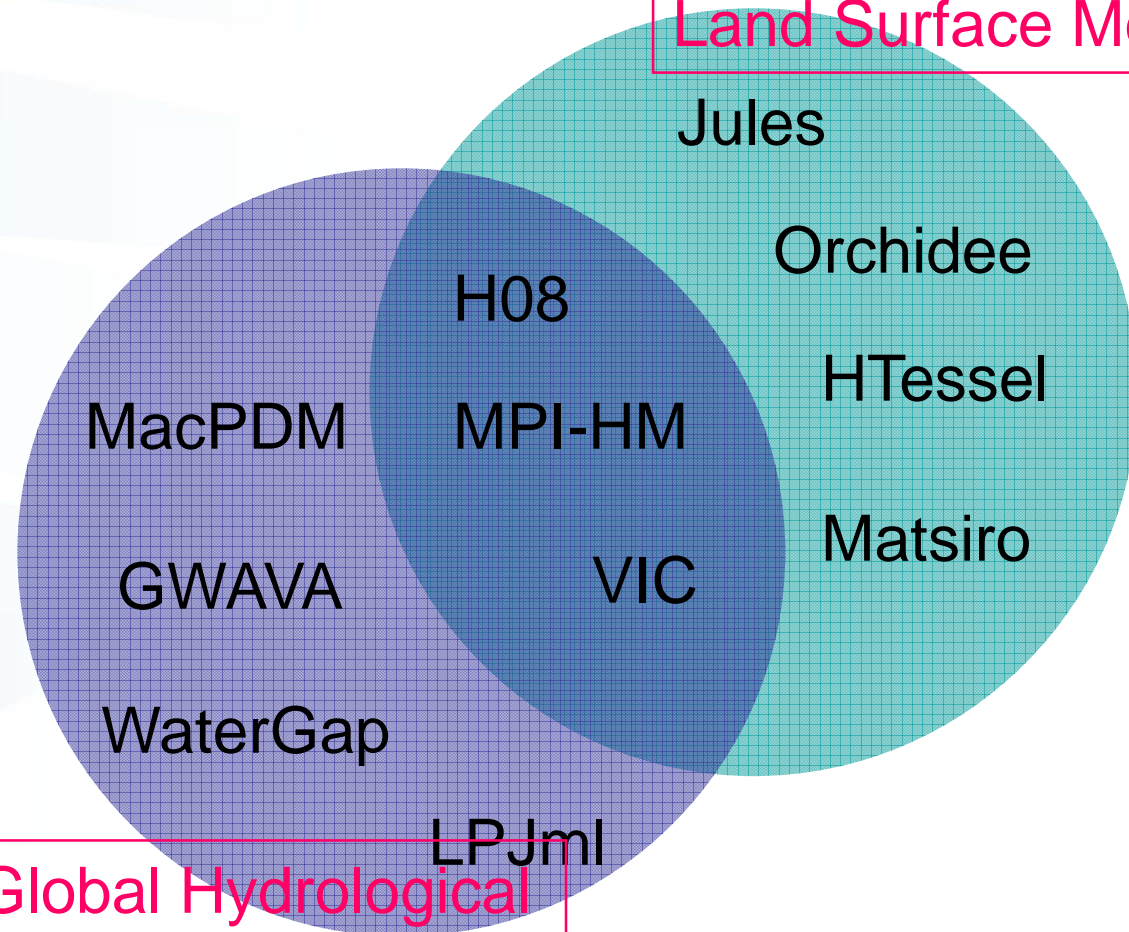


Water Futures and Solutions

World Water Scenarios Approach: Applying Experience



Land Surface Models



Global Hydrological Models

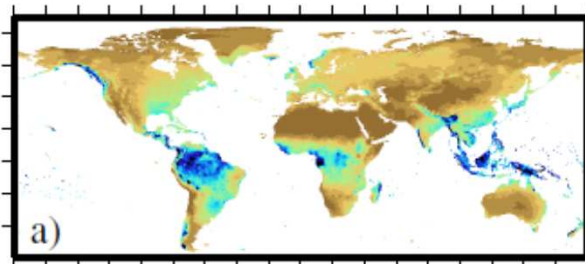
Modeling Advances and Multi-model Assessments



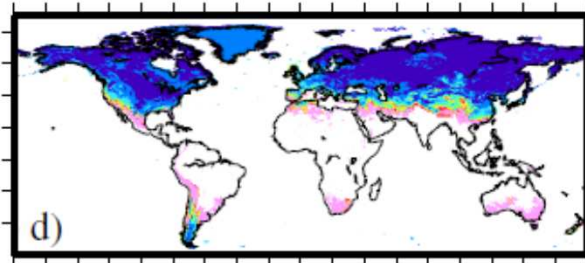
Multi-model Assessments

Summary of Watch Results – average of models 1985-1999

Precipitation

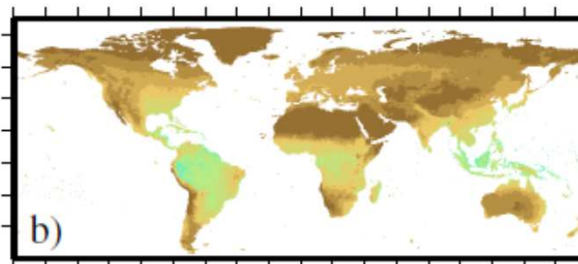


0 2 4 6 8 10 mm day⁻¹

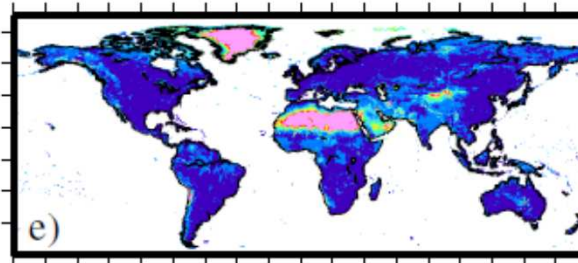


0.0 0.4 0.8 1.2 1.6 CV

Evaporation

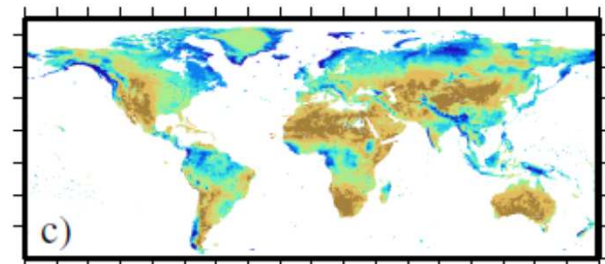


0 2 4 6 8 10 mm day⁻¹

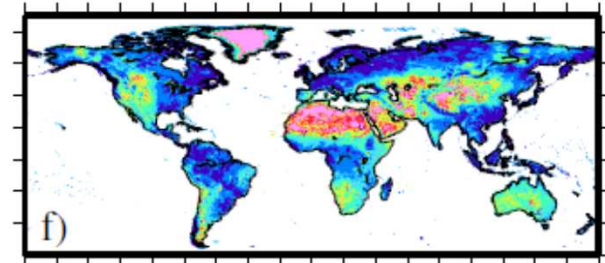


0.0 0.4 0.8 1.2 1.6 CV

Run-off Fraction



0.0 0.4 0.8 fraction



0.0 0.4 0.8 1.2 1.6 CV

Watermip: 872 mm

415-586 mm

0.33 - 0.52

GSWP2: 829 mm

272-442 mm

0.47 - 0.68

Haddeland et al, *in review* J Hydromet.



Water Futures and Solutions

World Water Scenarios Output

- New generation of integrated global water scenarios and vision that are consistent with other global scenarios.
- Solution options toolbox for scenario-based decision making
 - Methods
 - Data bases and information
 - Exploratory models, impact calculators, automated checklists
 - Solution options
 - Decision trees for mapping solutions to local conditions
- Information exchange network
 - Mutual learning through exchange of experience and solutions
- Training workshops

If we focus our attention on problems, we will find problems.

If we focus our attention on solutions, we will find solutions.

THANK YOU!

