Water Resources in Integrated Assessment Models: Modeling the Institutional Aspects

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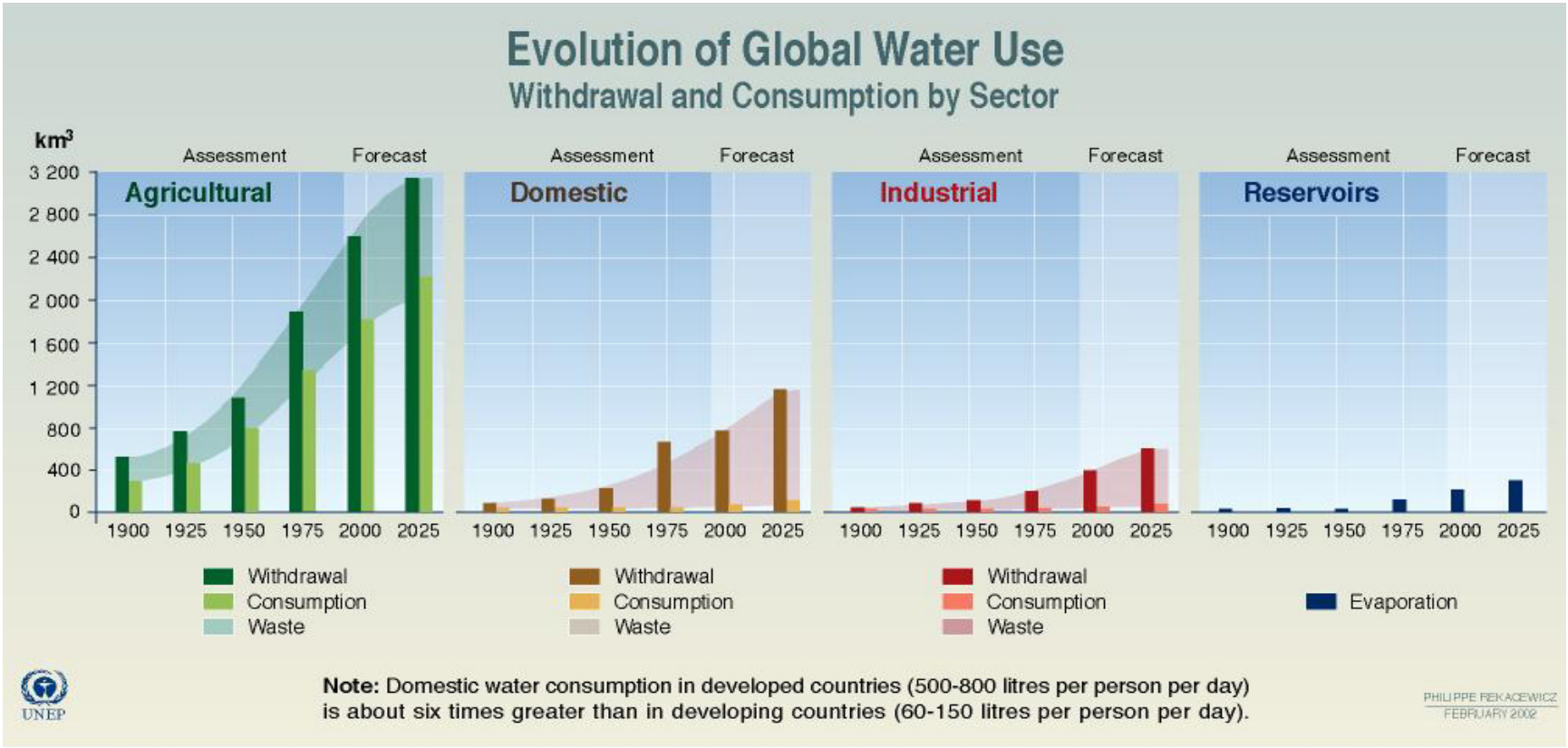
Session Outline

- Brief Overview – Stage Setting
- An African View
- A USA View
- Some methodological issues
- Adaptation Issues
- **Discussion**

Session Goals

- Share with IAM modelers the reality of Institutional Roles on Water Mgt, Investment and Adaptation to CC
- Discuss approaches to modeling these realities
- Share with Water Managers what they can “glean” from IAM to assist in planning.



Source: Igor A. Shiklomanov, State Hydrological Institute (SHI, St. Petersburg) and United Nations Educational,Scientific and Cultural Organisation (UNESCO, Paris), 1999.

Modeling Water Resources Impacts in IAMS

- **We know how to model key water related at the River Basin Level**

Hydrology, Crops, Energy, M&I, ….

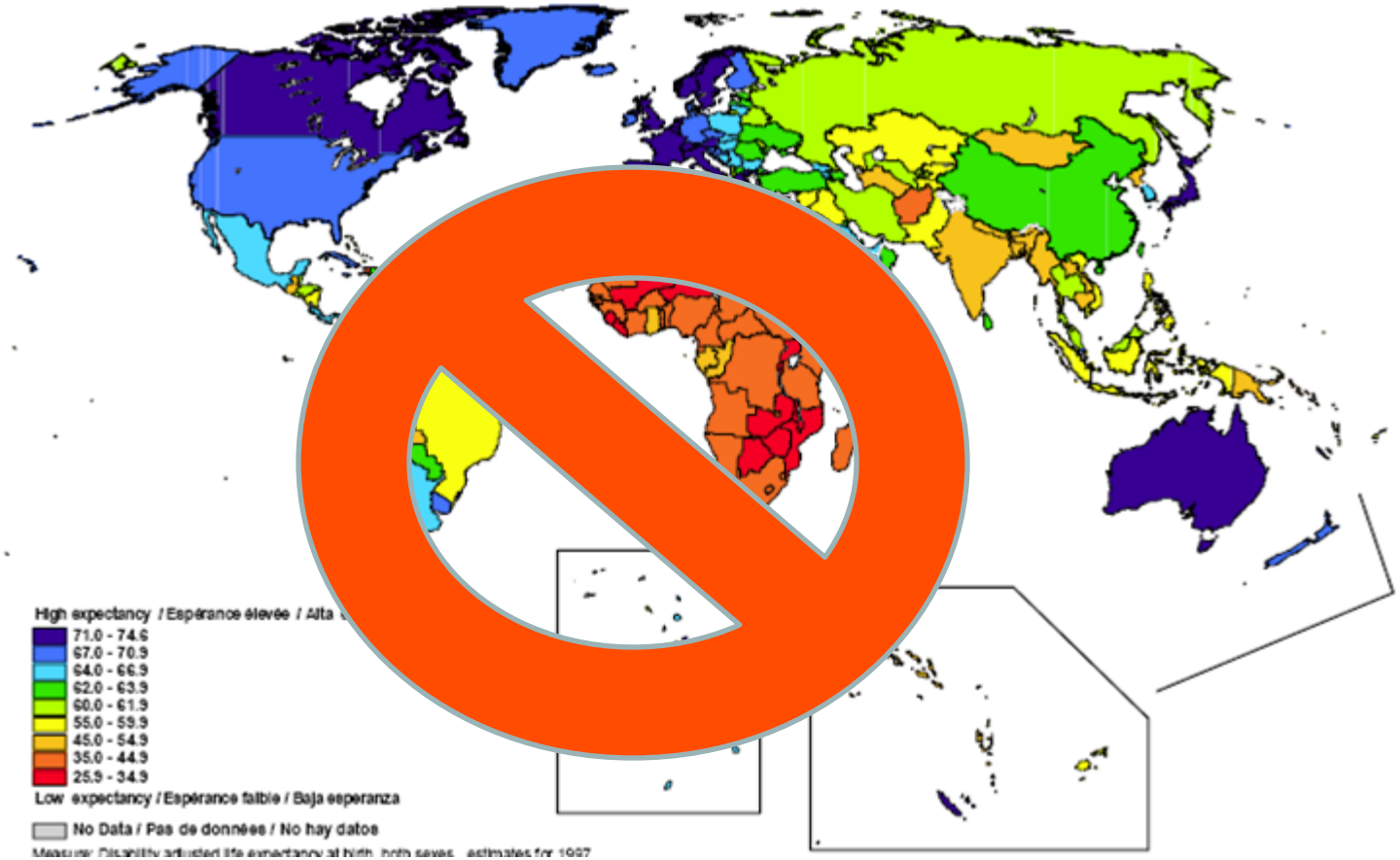
Combined Use of Optimization and Simulation Models in River Basin Planning
Henry D. Jacoby & D. P. Loucks *WATER RESOURCES RESEARCH, VOL. 8, NO. 6,, 1972*

- What is the appropriate Spatial and Temporal Scale to accurately model climate change impacts for the questions being asked by IAMs or sectoral level analysis at what scale.
- IAMs
  - Spatial Scale: 10 to 20 regions: National lowest Scale
  - Temporal Scale: 1 to 5 year time steps
- Global Crop and Hydrologic Modeling at 0.1 to 0.5 degree dail
- There are over 10,000 level 4 River Basin “~20,000 km2”
- Water Mgt Models : “River Basin Scale” and Monthly

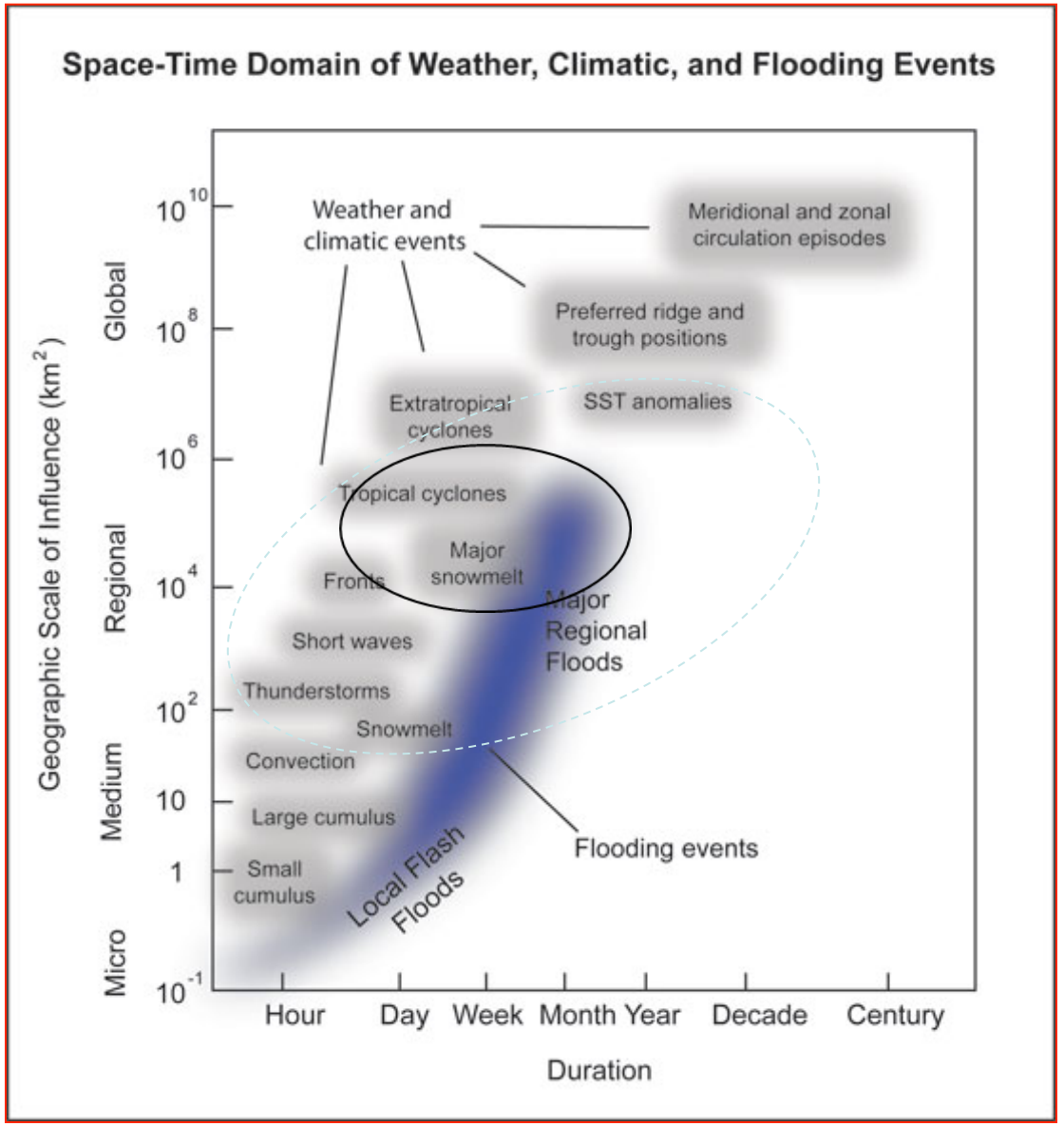
Spatial Scale Economic Components of Selected IAMs

- MiniCAM: 14 Regions
  - the United States, US, Canada, W. Europe, Australia & New Zealand, Japan, Eastern Europe, The Former Soviet Union, China, Mid-East, Africa, Latin America, Korea, Southeast Asia, and India. In addition, three others are under development: Mexico, Argentina, and Brazil.
- MERGE: 9 Regions
  - Canada, Australia and New Zealand (CANZ); China; eastern Europe and the former Soviet Union (EEFSU); India; Japan; Mexico, and OPEC (MOPEC); western Europe (WEUR); the United States of America (USA); and the rest of the world (ROW).
- IGSM/EPPA: 16 Regions
  - United States (USA) European Union (EUR) Eastern Europe (EET) Japan (JPN) Former Soviet Union (FSU) Australia & New Zealand (ANZ) Canada (CAN China (CHN) India (IND) Higher Income East Asiad(ASI) Middle East (MES) Indonesia (IDZ) Mexico (MEX) Central & South America (LAM) Africa (AFR) Rest of World (ROW)
- Fund : National Level

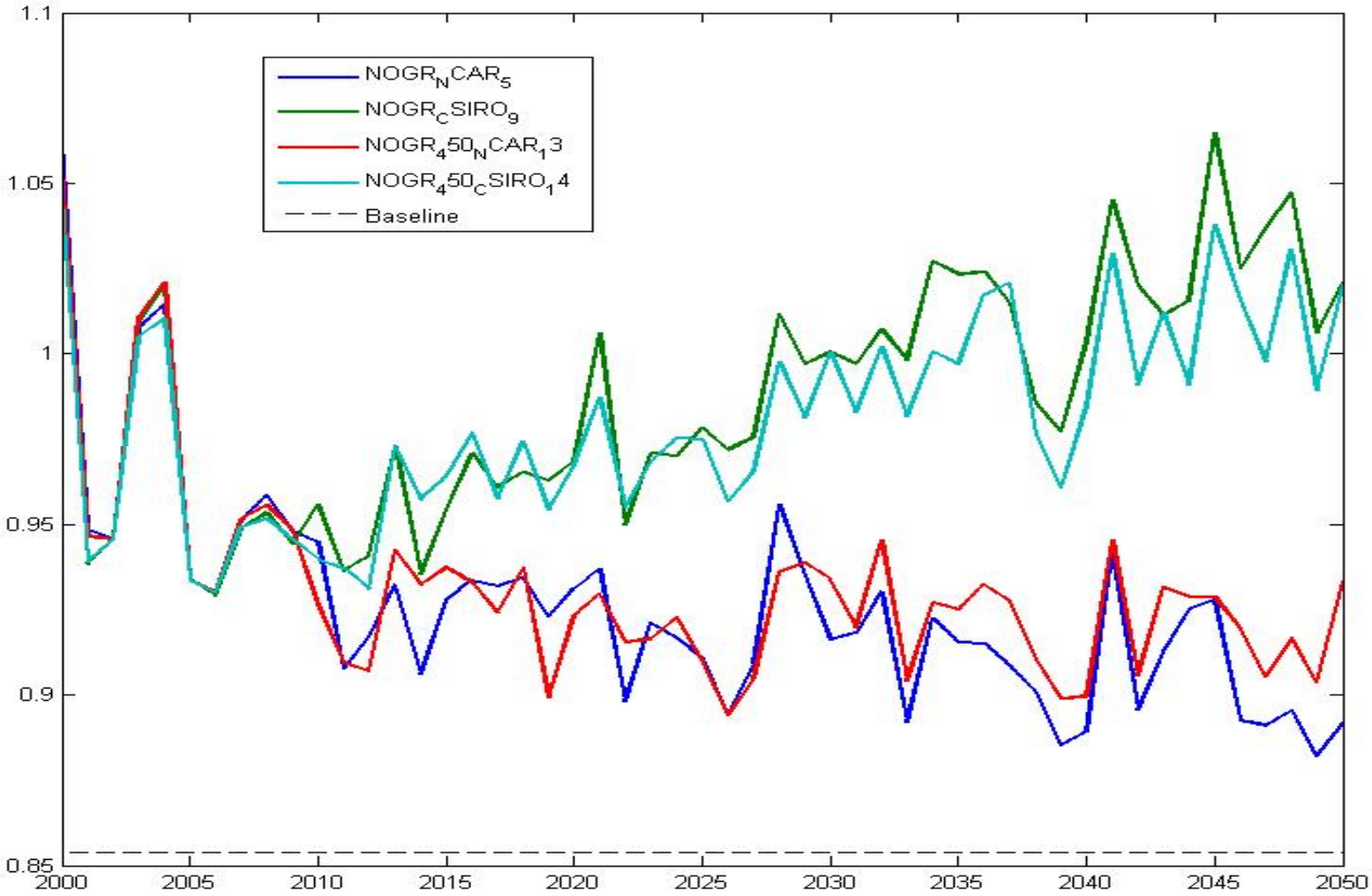
Global Water and Food Models
National Scale



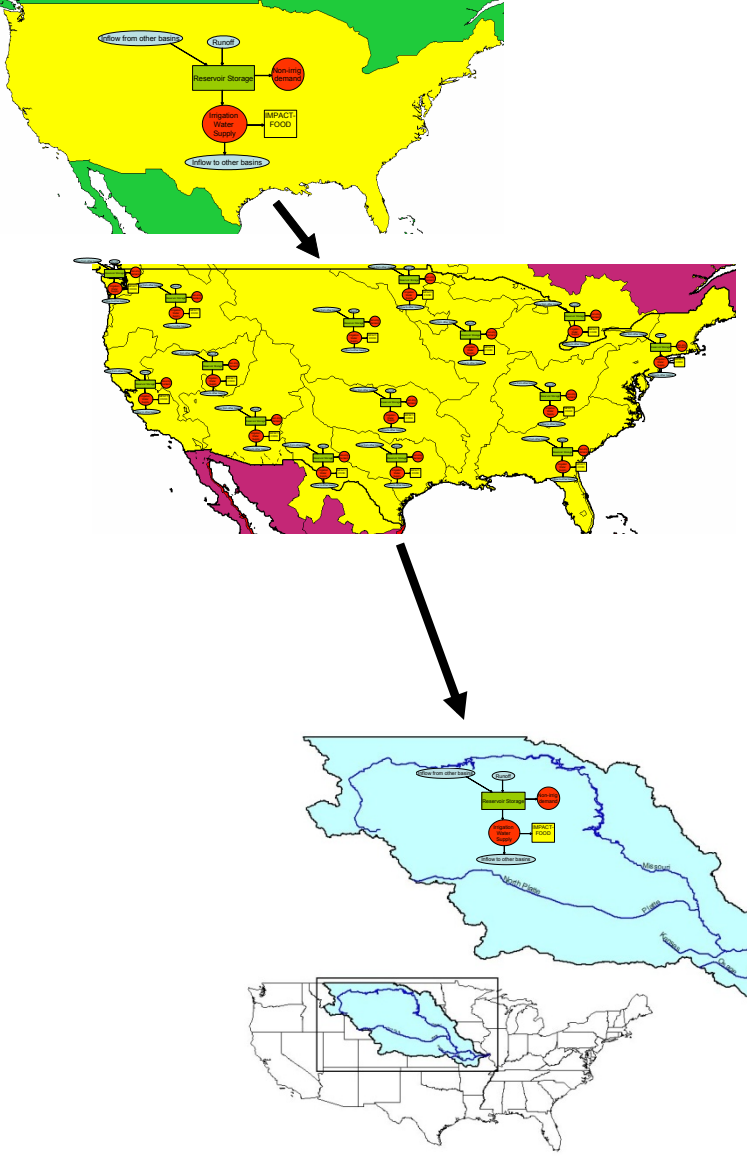
RUNOFF IN TIME AND SPACE

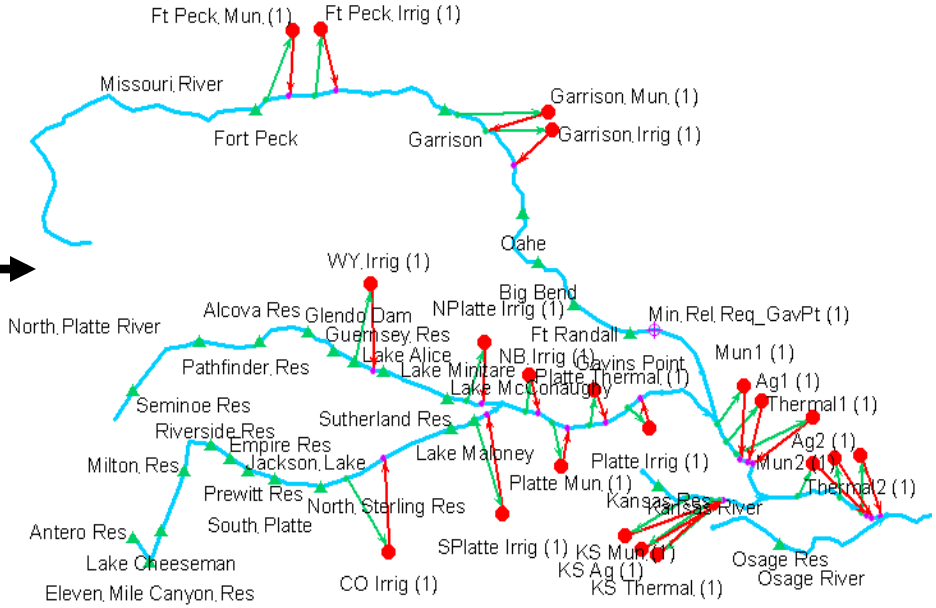


GCMs v. Scenario
Global Runoff

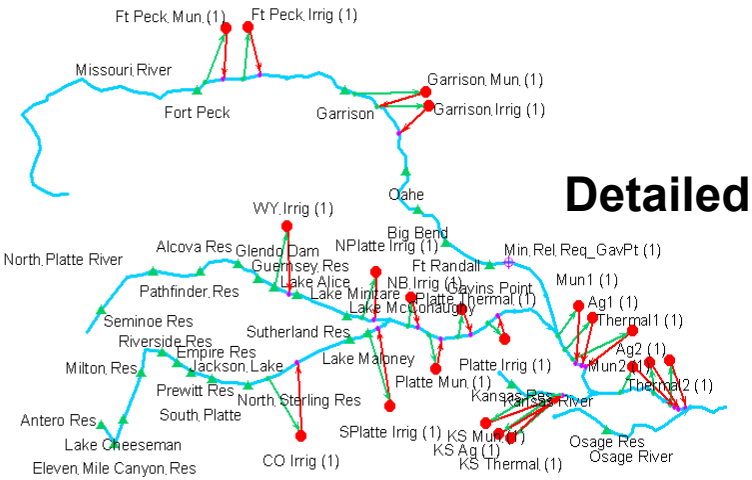


"What is the importance of spatial scale and management on river basin modeling for global food production?"



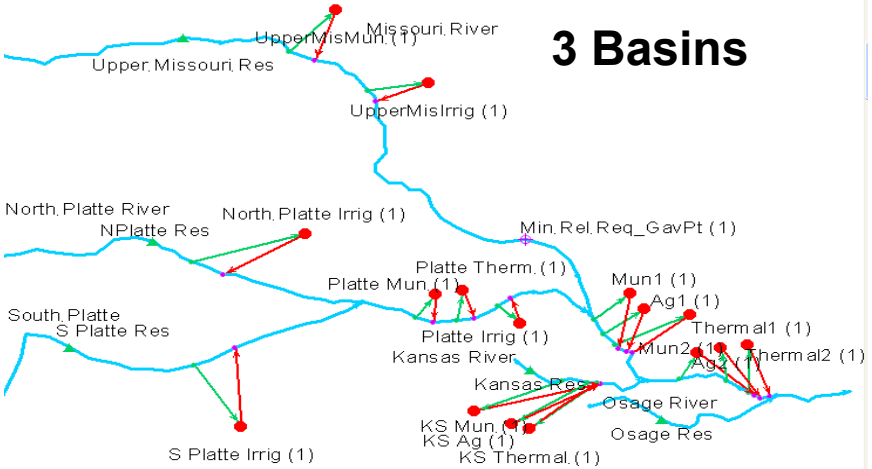


4 Spatial Scale Representations of Missouri River Basin

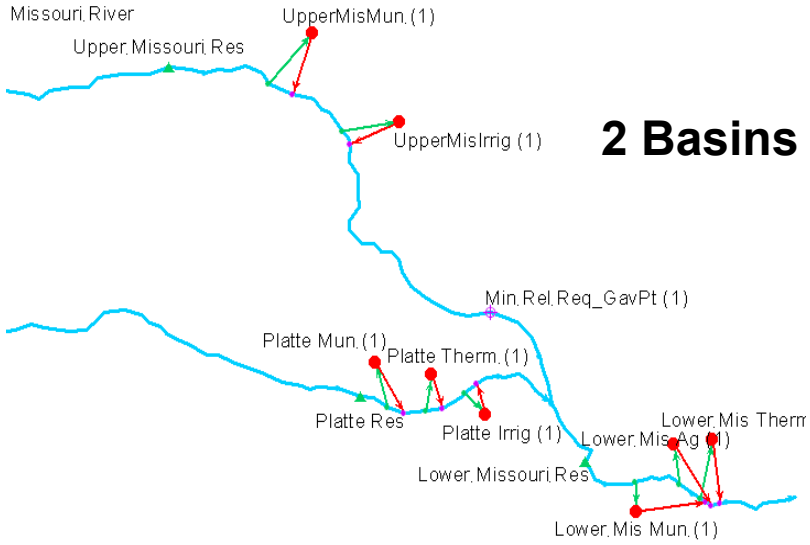


Detailed

1 Basin

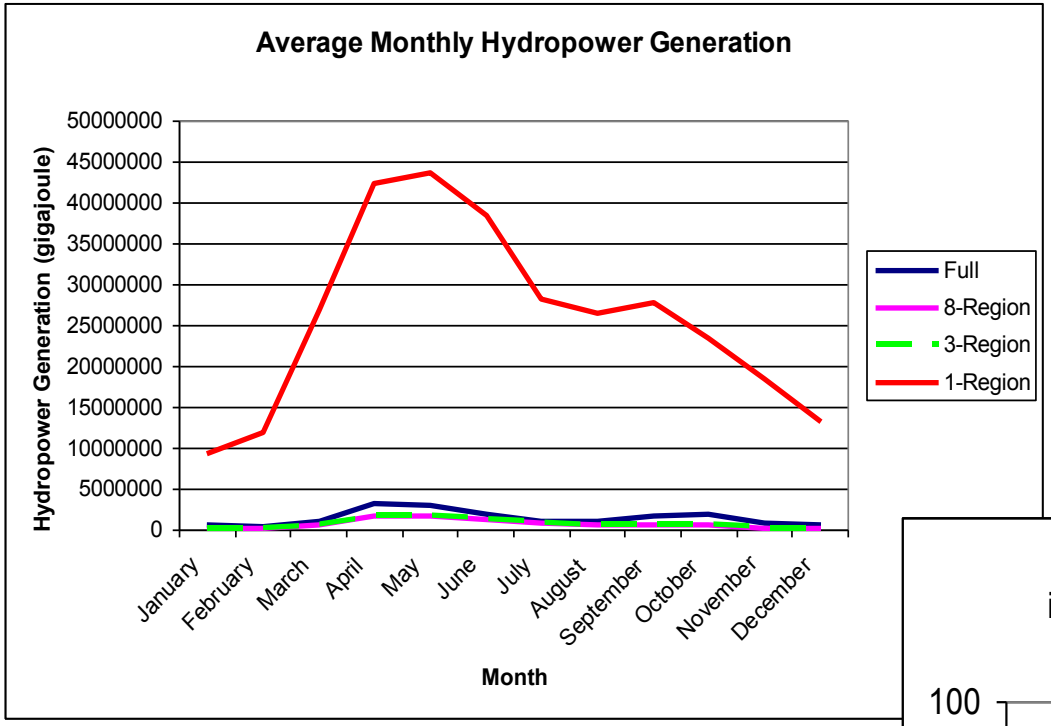


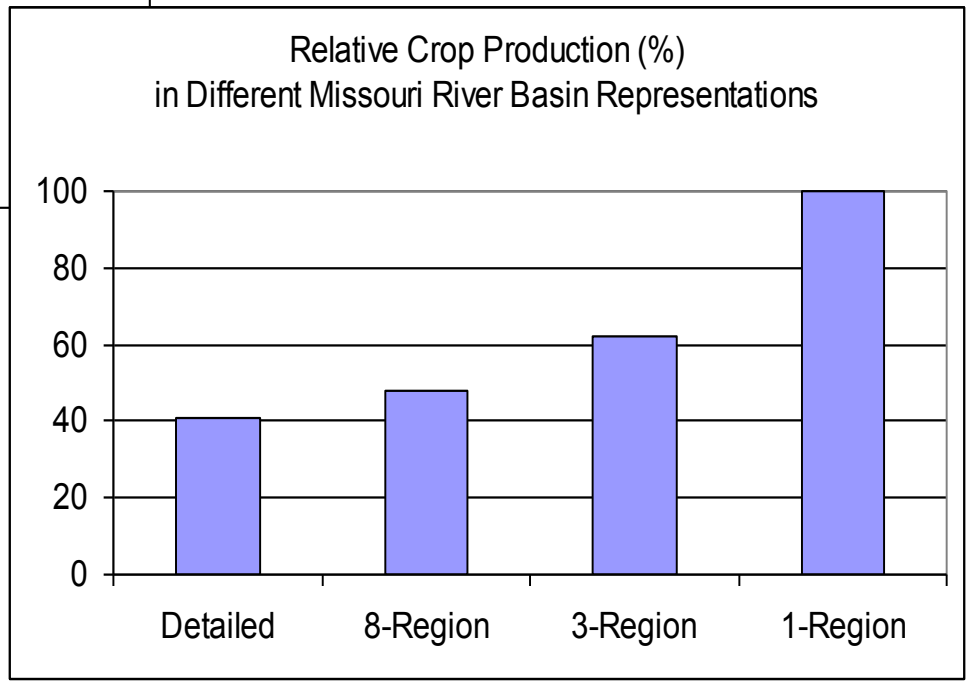
3 Basins



2 Basins

Average Monthly Hydropower Generation in each of the Missouri River Spatial Representations



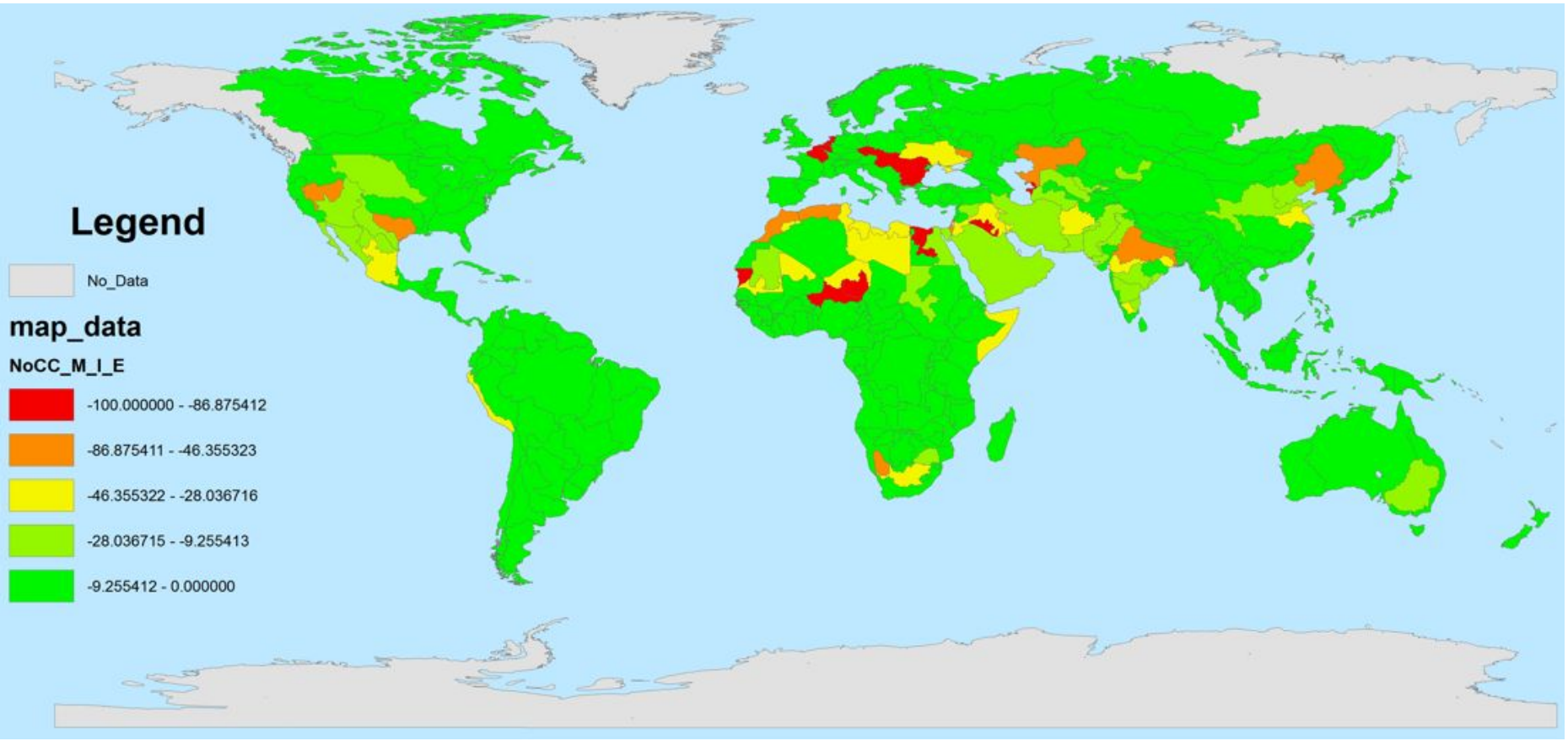


Water Available for Environment

- InStreamflows
- Water Quality – Temperature and pollutants
- Extreme Events for habitat
- Agro-Ecosystems
- Natural versus Adapted
- Deltas -- downstream

What are the indicators? Value?

Threats to Existing Ag Water



Threats to Existing Ag Water

Foresight Region	2000 Agricultural Withdrawals (billion m^3)	No Climate Change		
		2050 M&I	EFRs	2050 M&I and EFRs
World	**2,946**	**7.3%**	**9.4%**	**17.7%**
Europe	**263**	**2.5%**	**7.7%**	**14.4%**
European Union	95	0.7%	12.8%	18.7%
Northwestern Europe	16	4.5%	11.7%	8.2%
United Kingdom	0.6	0.0%	0.0%	0.0%
Former Soviet Union	186	3.2%	10.0%	19.7%
Africa	**246**	**9.8%**	**5.8%**	**15.8%**
Sub-Saharan Africa	50	11.9%	7.2%	16.4%
Nile River Basin	146	9.1%	0.2%	9.2%
North America	**255**	**-0.1%**	**15.2%**	**14.9%**
Asia	**2,060**	**8.8%**	**8.9%**	**18.6%**
China	558	2.7%	7.3%	10.1%
India	866	13.5%	12.1%	27.7%
Latin America and the Caribbean	**182**	**3.8%**	**12.3%**	**16.1%**
Brazil	21	0.0%	0.0%	0.0%
Oceania	**50**	**0.2%**	**14.3%**	**14.5%**

IT IS HAPPENING NOW !!!

- **Australian farmers are furious about a government concession to nature Australia's water war**
- AFTER a ten-year drought, farmers along the Murrumbidgee River now face ruin from a devastating flood. But it is the government that riles them as much as any caprice of nature. Last month officials called for a cut of nearly 40% in the volume of river water they take for irrigation. At a rowdy meeting in Narrandera, a river town, John Bonetti, a third-generation farmer, drew cheers from about 900 farmers when he told visiting bureaucrats and scientists, “If you think this is the end of the fight, I can assure you it’s only the bloody start.”

Summary

- SCALE MATTERS
- FLOODING VERY IMPORTANT
  - Need “additional” information from GCMs

- CLIMATE CHANGE IN THE CONTEXT OF GLOBAL CHANGE