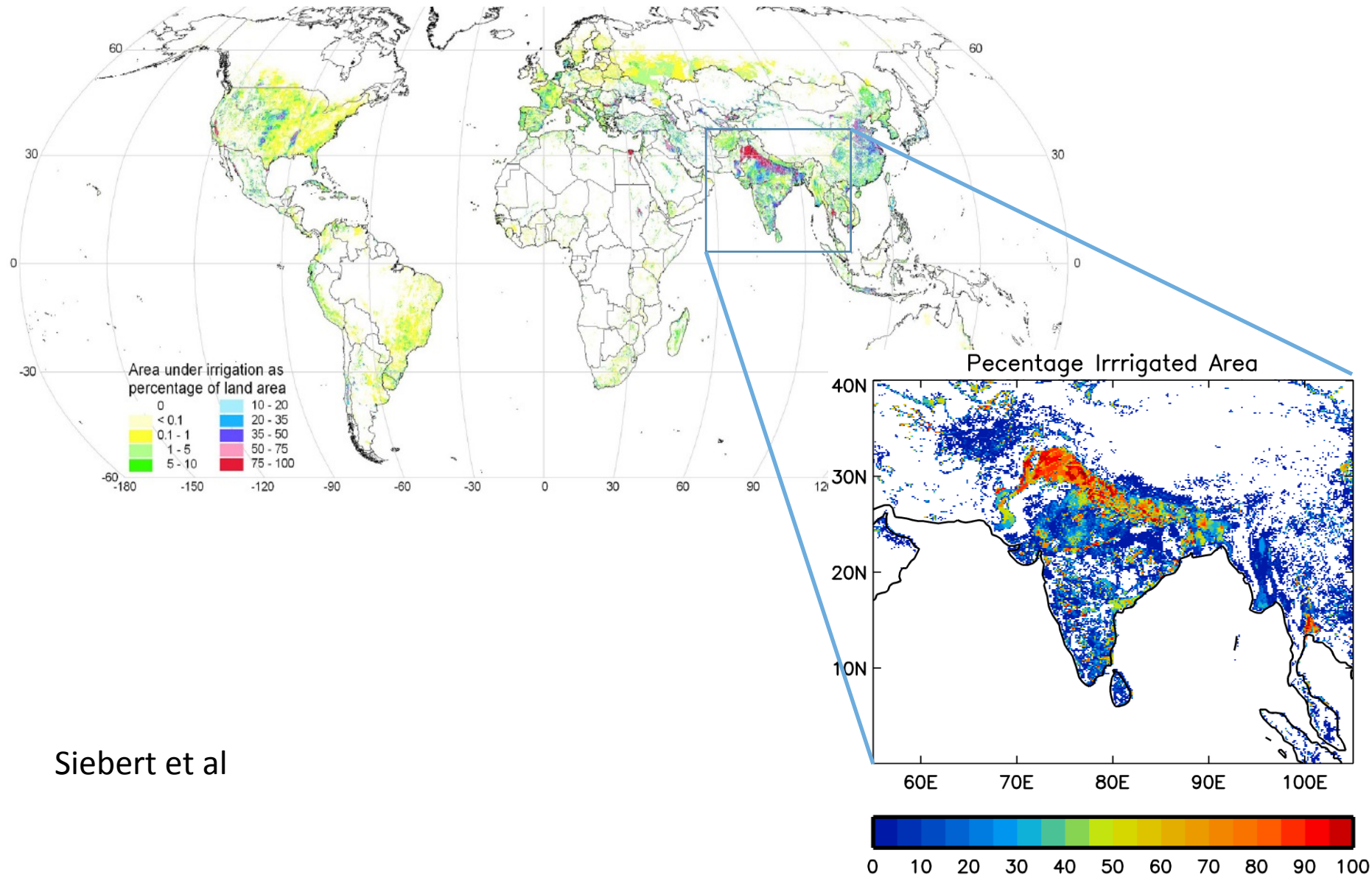# Managed water resource systems

Richard Harding, Jan Polcher, Taikan Oki, Martina Flocke, Pere Quintana Sequ, Aaron Boon, Mike Ek, Howard Wheater ….

A Joint GHP/GLASS Crosscut

Water for Food Baskets

Percentage Irrigated area

Area under irrigation as percentage of land area

Siebert et al

Including Water Management in Large Scale Models
Gif-sur-Yvette, France | 28-30 September 2016

- Joint GHP/GLASS initiative

- 30 presentations

- 40+ participants

- 48% of World's rivers are moderately or severely affected by dams

- 45000 reservoirs worldwide – an estimated 8000 km^3 of storage

- >90% of water extractions goes to irrigation

- 450 km^3 per year is extracted unsustainably from ground water

Impacts of Water Management

Coupled

- reduction of temperature extremes
- reduction of evaporative demand
- changing rainfall and cloud patterns
- Improvement of skill of climate/WP models
- ocean circulations?

Uncoupled

- Changing seasonal and total river flows
- Ground water decreases (can also increase due to leakage and return flows)
- water quality
- sea level rise (reservoirs and groundwater)
- food production

Models

1. Global Hydrology Models (GHMs)
   WaterGAP
   MESH-MODSIM-DSS

2. Biogeochemical models
   LPJ-mL

3. Land Surface Models (LSMs)
   CABLE
   HO8
   SiBuc
   H-Tessel
   NOAH-MP
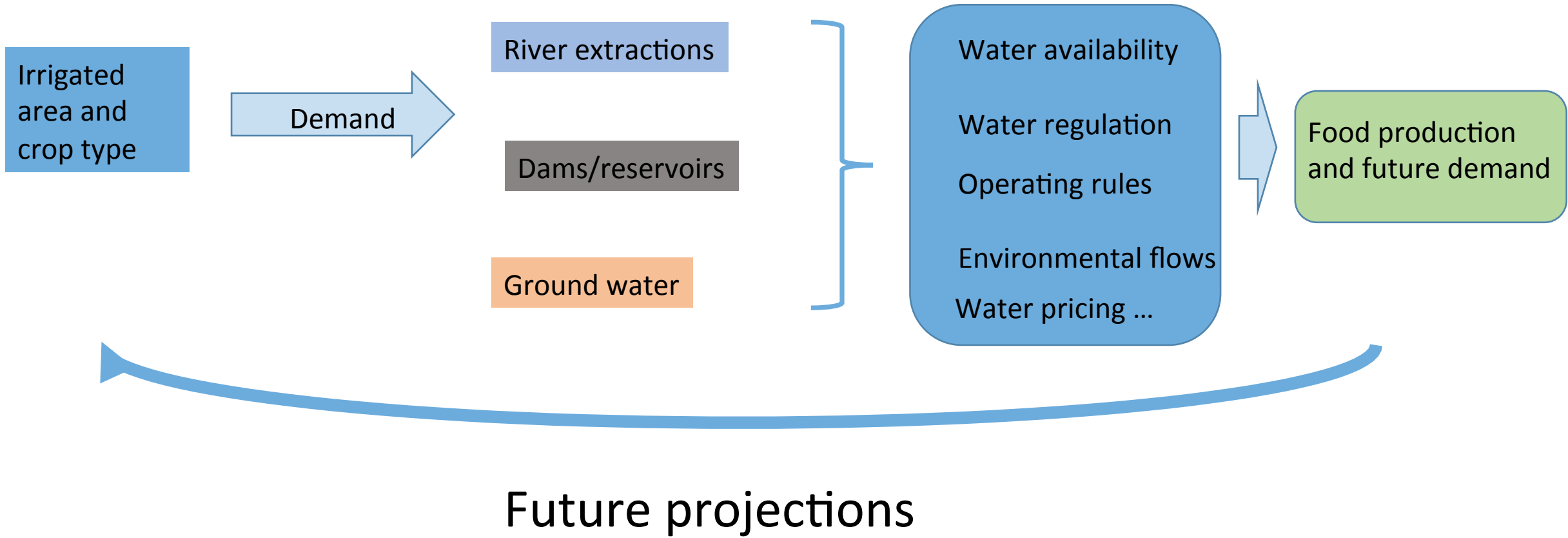   ORCHIDEE
   VIC
   ISBA
   CLM

Data issues

- Potential irrigated areas – well known, but how to estimate for future
- Actual irrigated area
- Irrigation technique (flooding, sprinkler, drip)
- Dams/reservoirs – size /position
- Dam operating rules
- Diversions – irrigation channels, trans basin transfers
- Ground water – levels, extractions
- Satellite data (soil moisture, evaporation …)
- Water pricing etc

Priorities for Model development

Irrigated area and crop type

Demand

River extractions

Dams/reservoirs

Ground water

Water availability

Water regulation

Operating rules

Environmental flows

Water pricing …

Food production and future demand

Future projections

Future Actions

1. To MIP or not to MIP? – probably not now.

2. Benchmarking -   Tower flux data
   Managed catchment data and models
   Aquifer data
   Protocols

3. Can the RHPs help? – data, process models, management rules etc etc

4. Science exchange between groups – summer school, visits, workshops etc

5. Links to other communities – AgMIP, economists, IAMs, satellite communities, conference session?

6. Crosscut project steering group, Workshop report for GEWEX News