INTERNATIONAL FOOD
POLICY RESEARCH INSTITUTE
sustainable solutions for ending hunger and poverty

WP 5 -- Intervention Analysis

Identification and Implementation of High-Impact Interventions—Use of modeling tools

Outline

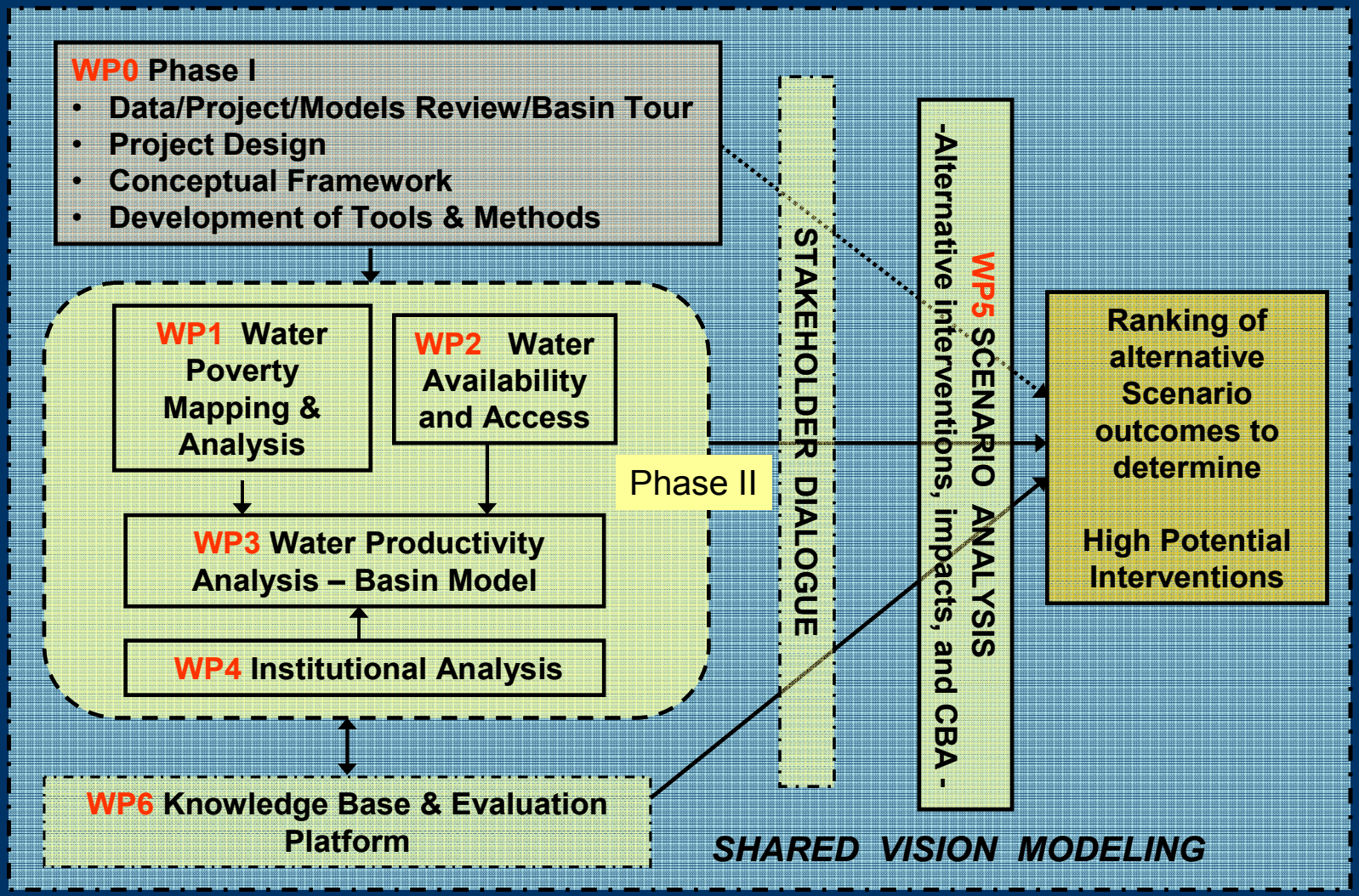
- WP5—Yellow River Basin
- Tools to support WP5 type analyses
  - Global water and food projection tools
  - Basin models

WORK PACKAGES

WP5: Intervention Analysis

- Research Activities:
  - Literature review on previous, current, and proposed interventions in the YRB
  - Identification and assessment of high potential interventions for increasing water productivity and alleviating poverty
  - Stakeholder insights from upper, middle, and lower basin
- **WP5 Leaders**: **Xue Yunpeng** and Claudia Ringler with support from everyone else

Yellow River Basin WP5 Implementation Process



What is a Shared Vision Model?

A “Shared Vision” model is a collective view of a water resources system jointly developed by modelers, managers and stakeholders. It is used to facilitate plan development, implementation and maintenance

Perceived Advantages of Shared Vision Models

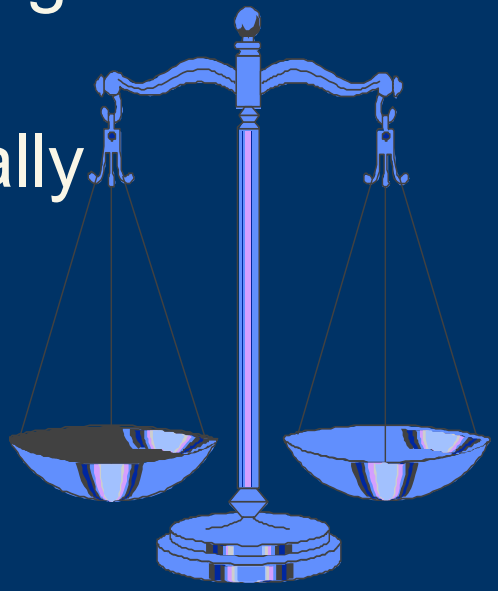
Shared Vision Models

- Improve analysis
- Are more flexible
- Communicate more effectively
- Cost less to develop than traditional approaches

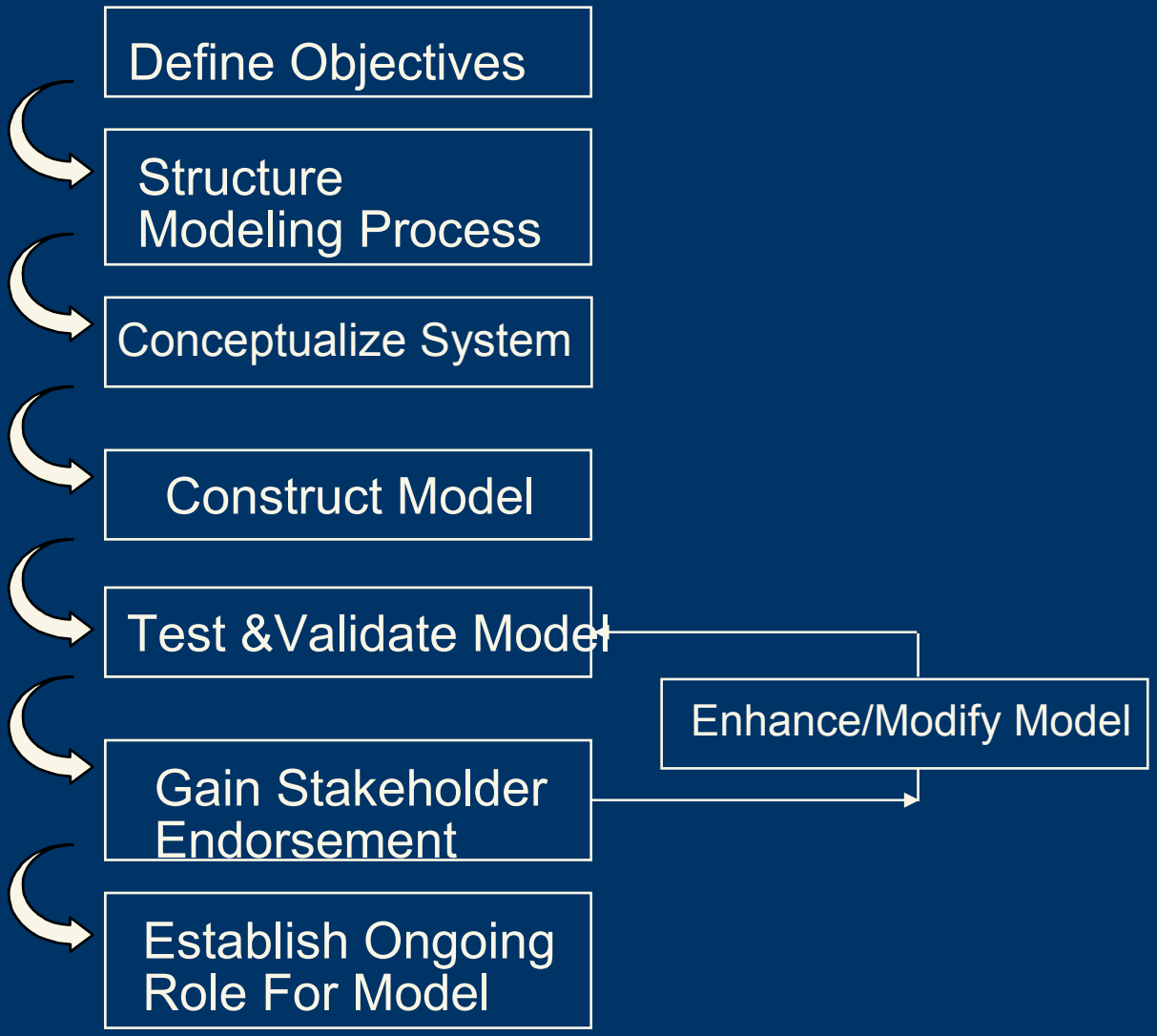
Modeling Philosophy

Shared Vision Models should

- Be developed with wide support
- Improve communication among managers and stakeholders
- Disseminate information equally
- Improve planning and management of water resources
- Serve as a basis for effective negotiation

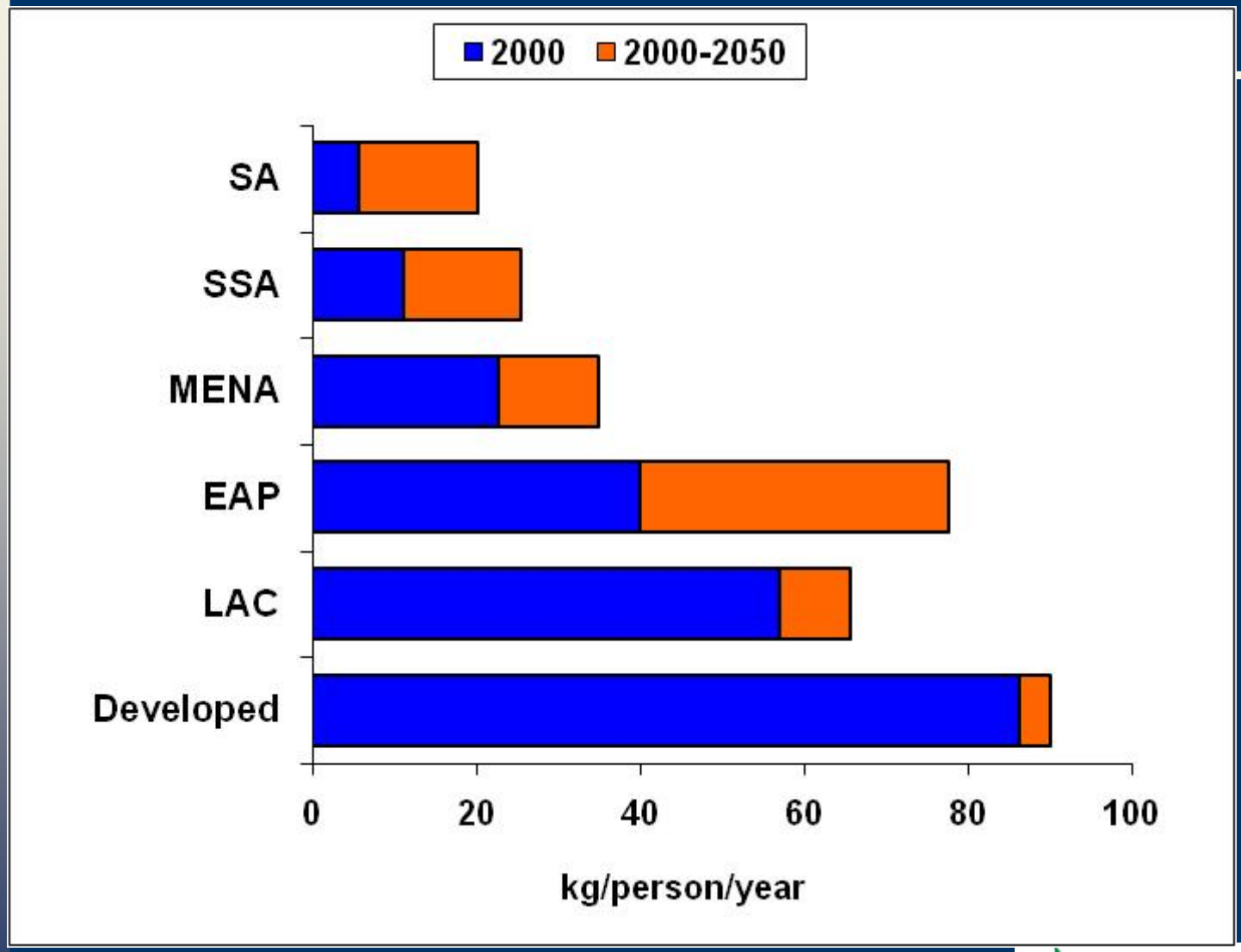


Overview of Model Development Process

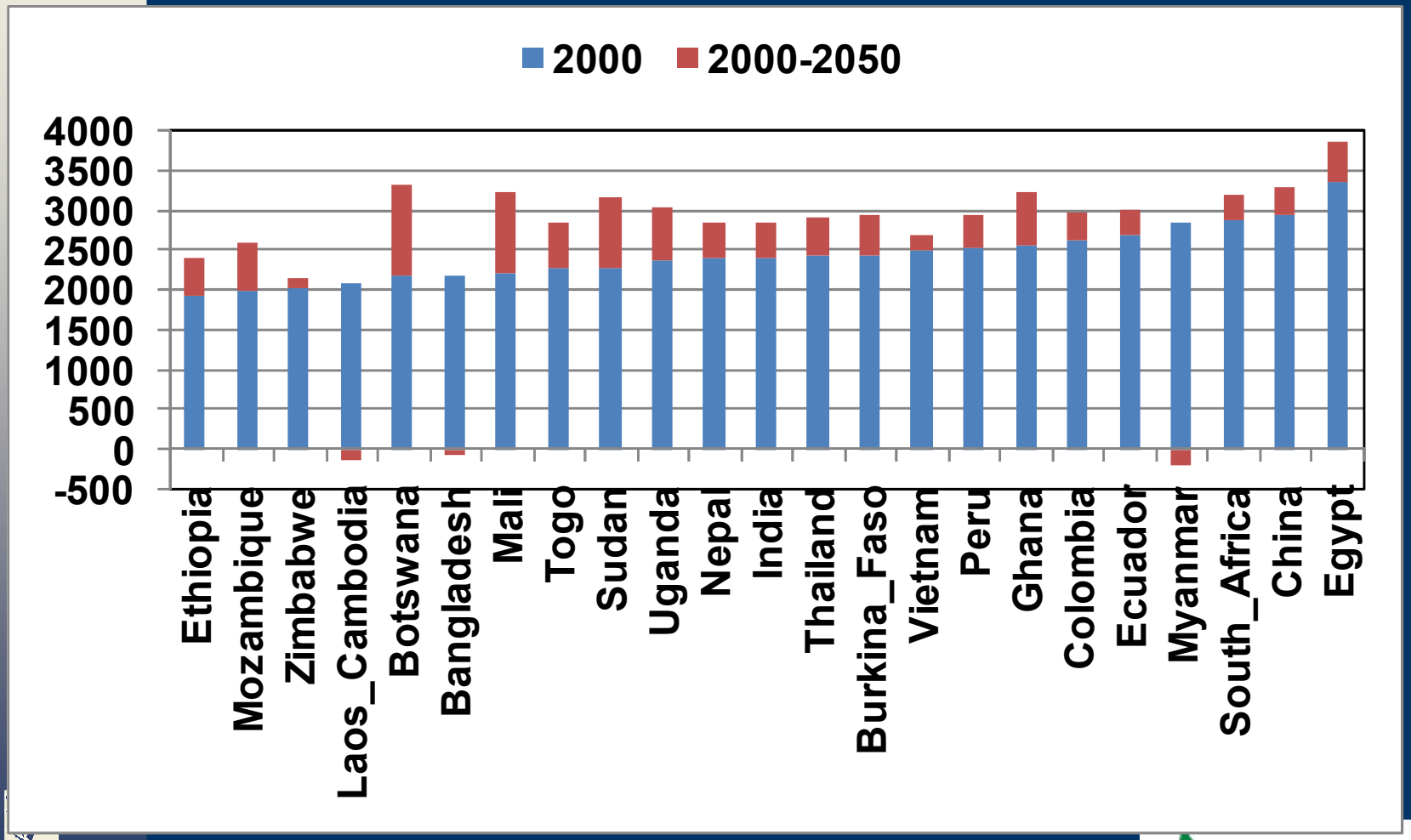


MODELING TOOLS IN SUPPORT OF INTERVENTION ANALYSIS

Per Capita Meat Consumption, 2000-2050

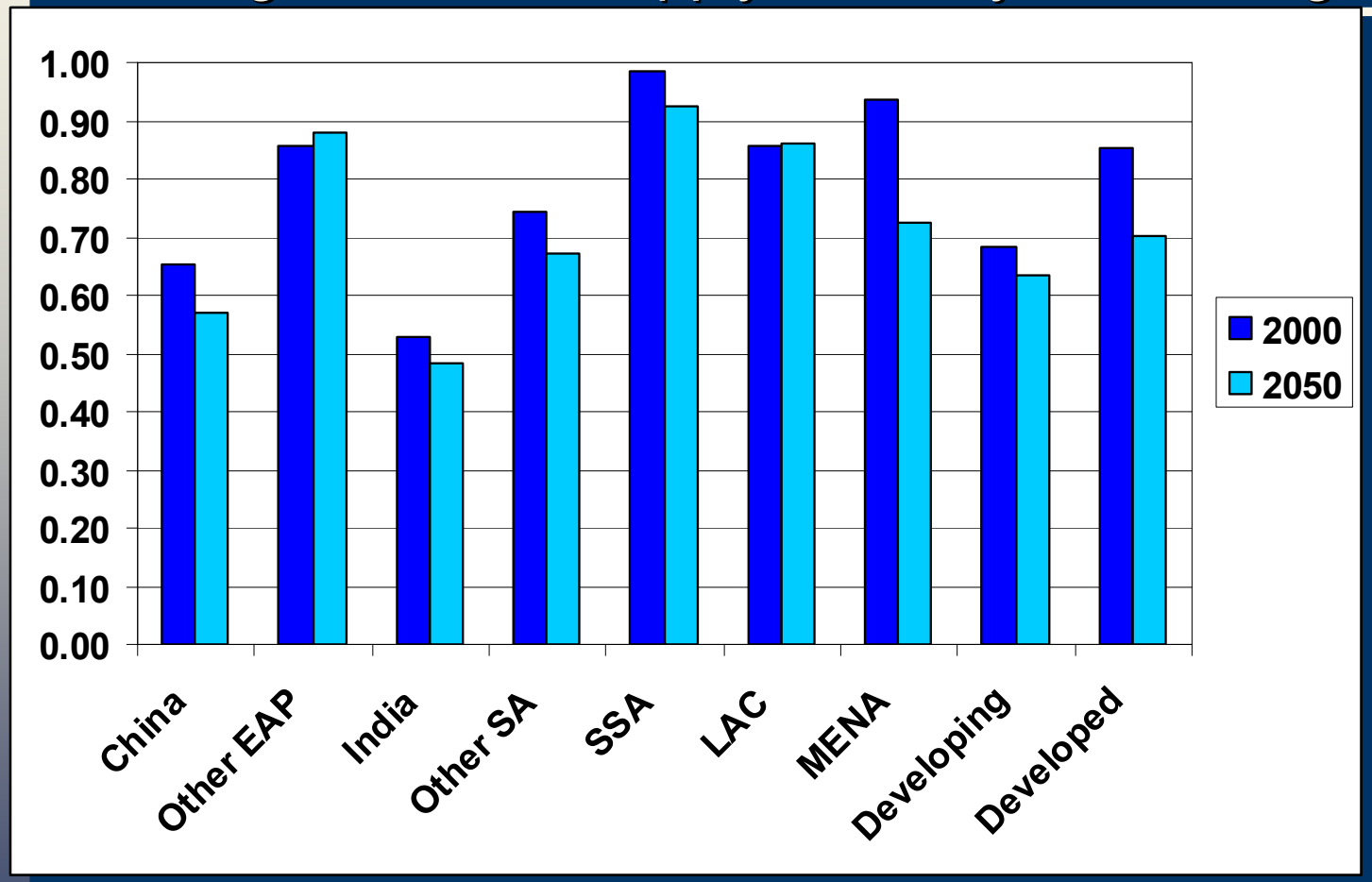


Calorie availability, key riparian countries (calories per capita per day)



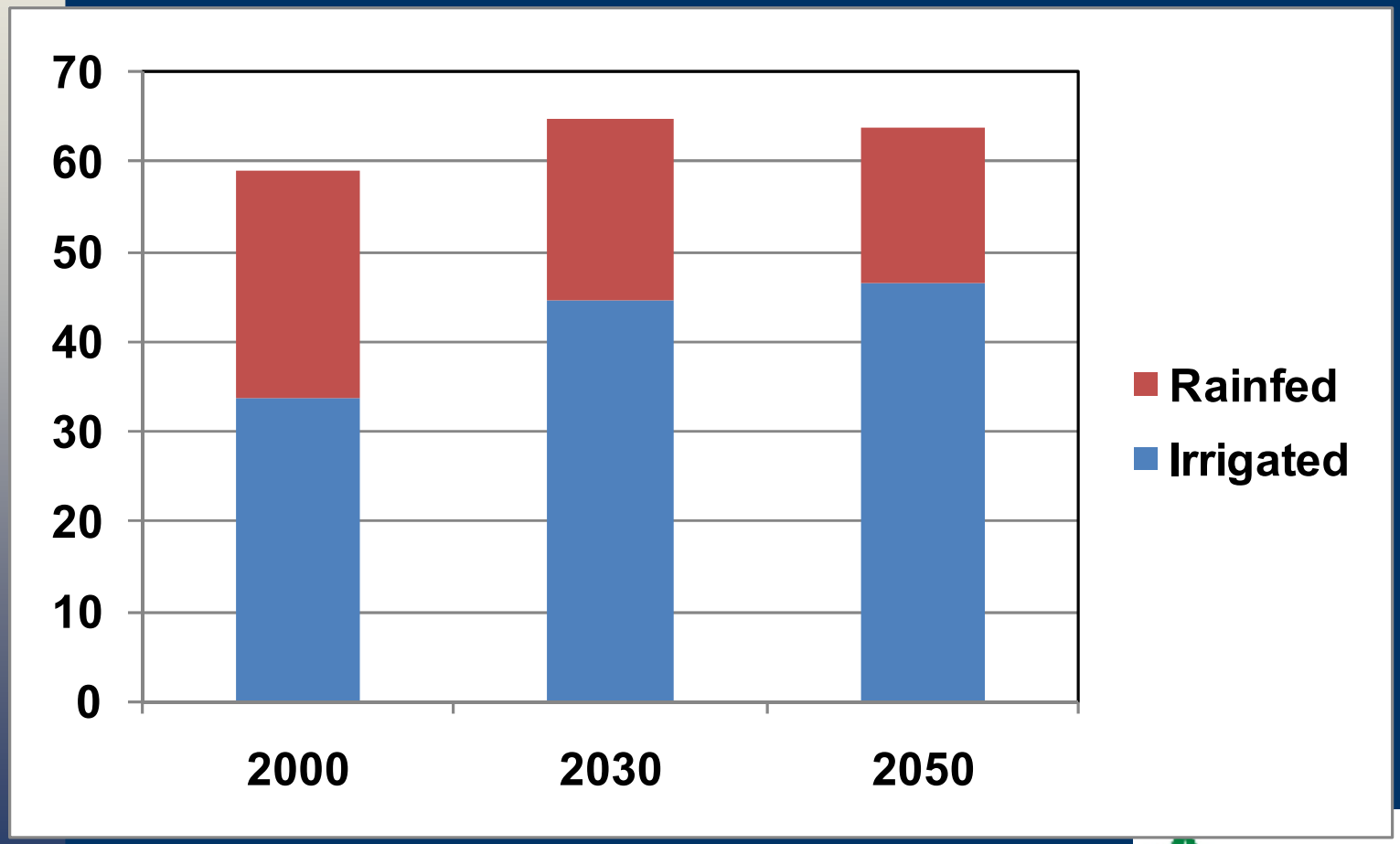
Increasing Irrigation Water Scarcity

Irrigation water supply reliability is declining

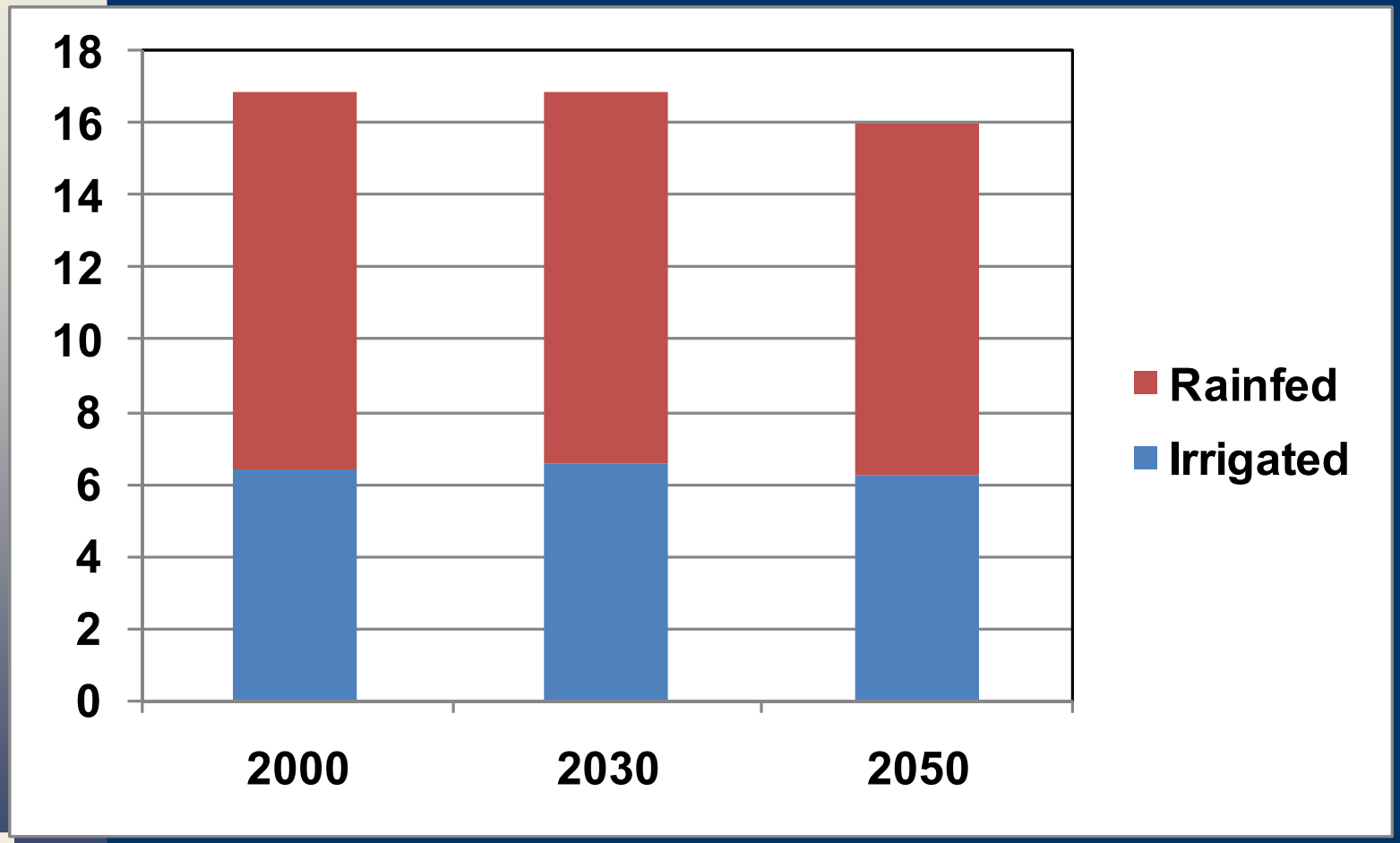


Note: Irrigation Water Supply Reliability is defined as the ratio of actual irrigation water consumption to potential irrigation water consumption.

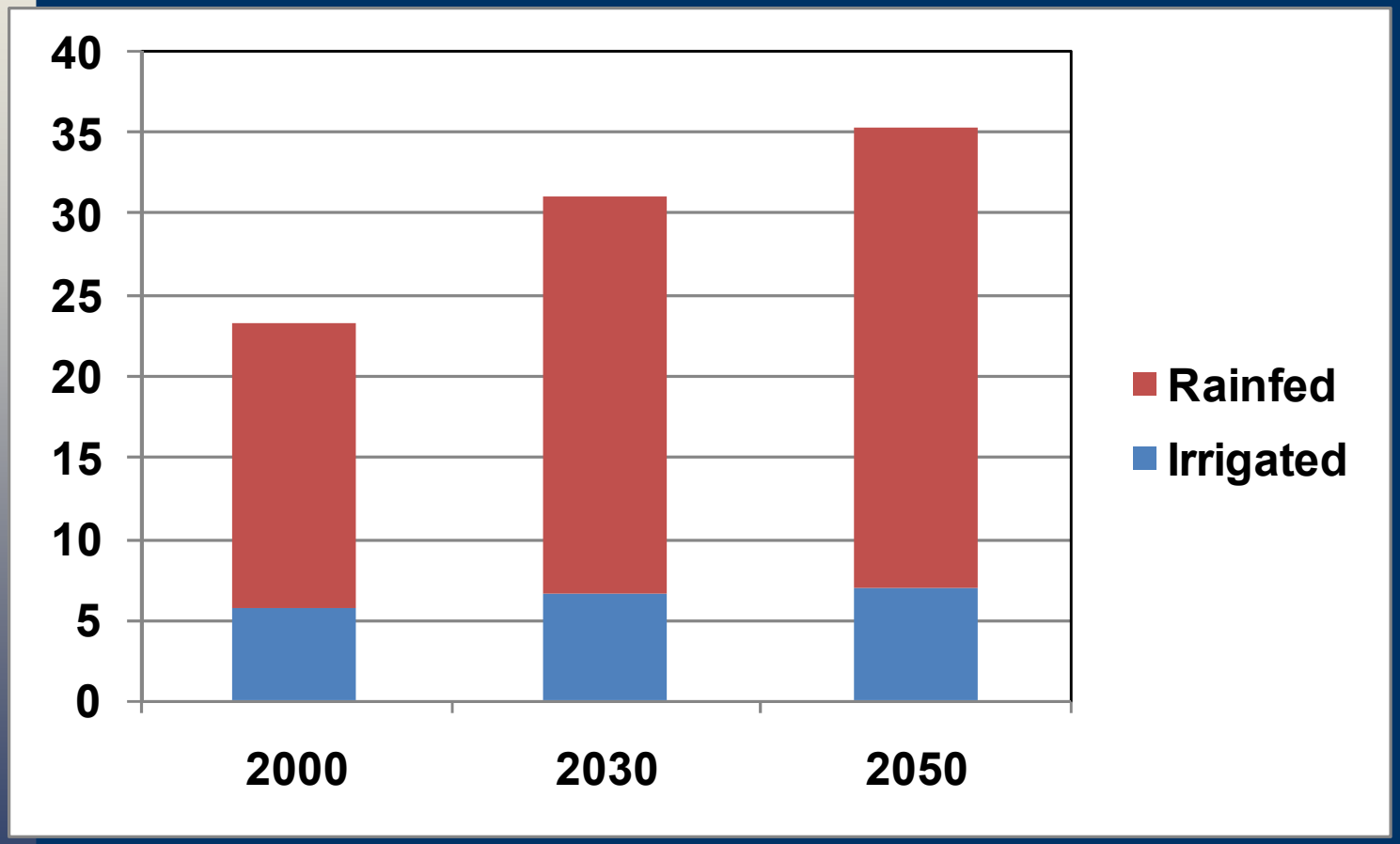
Irrigated and rainfed harvested area, Ganges basin (million hectares)



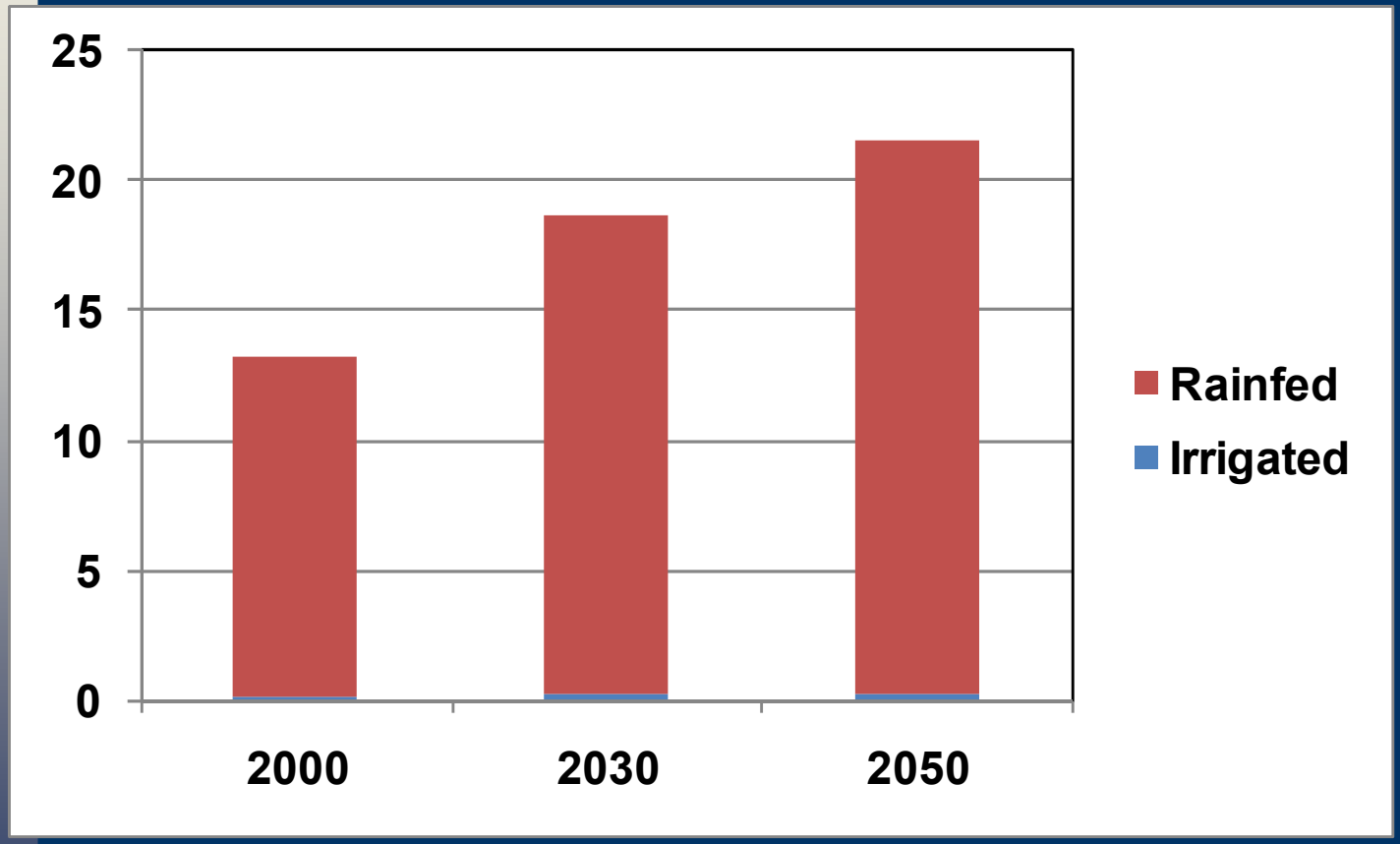
Irrigated and rainfed harvested area, Mekong basin (million hectares)



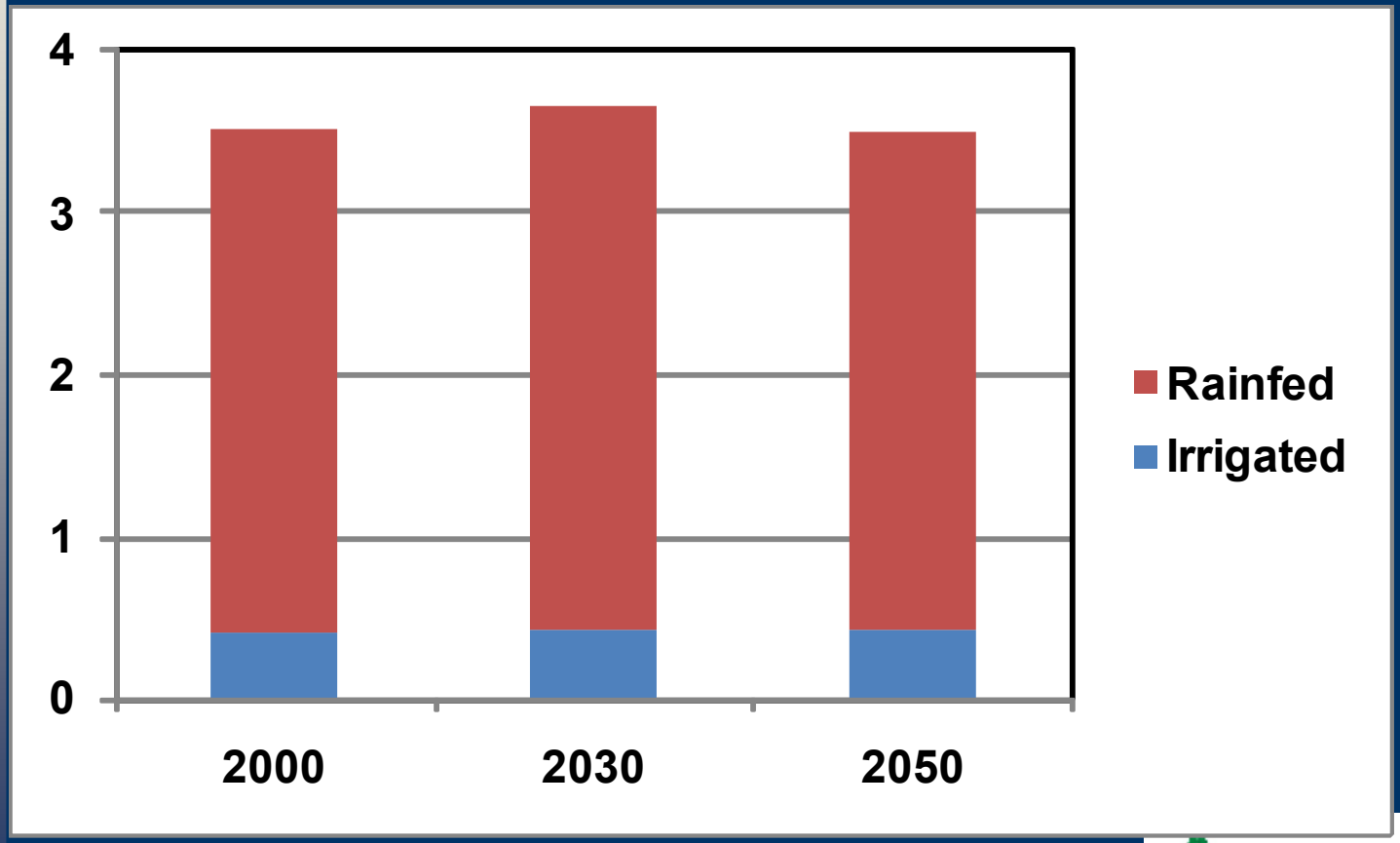
Irrigated and rainfed harvested area, Nile basin (million hectares)



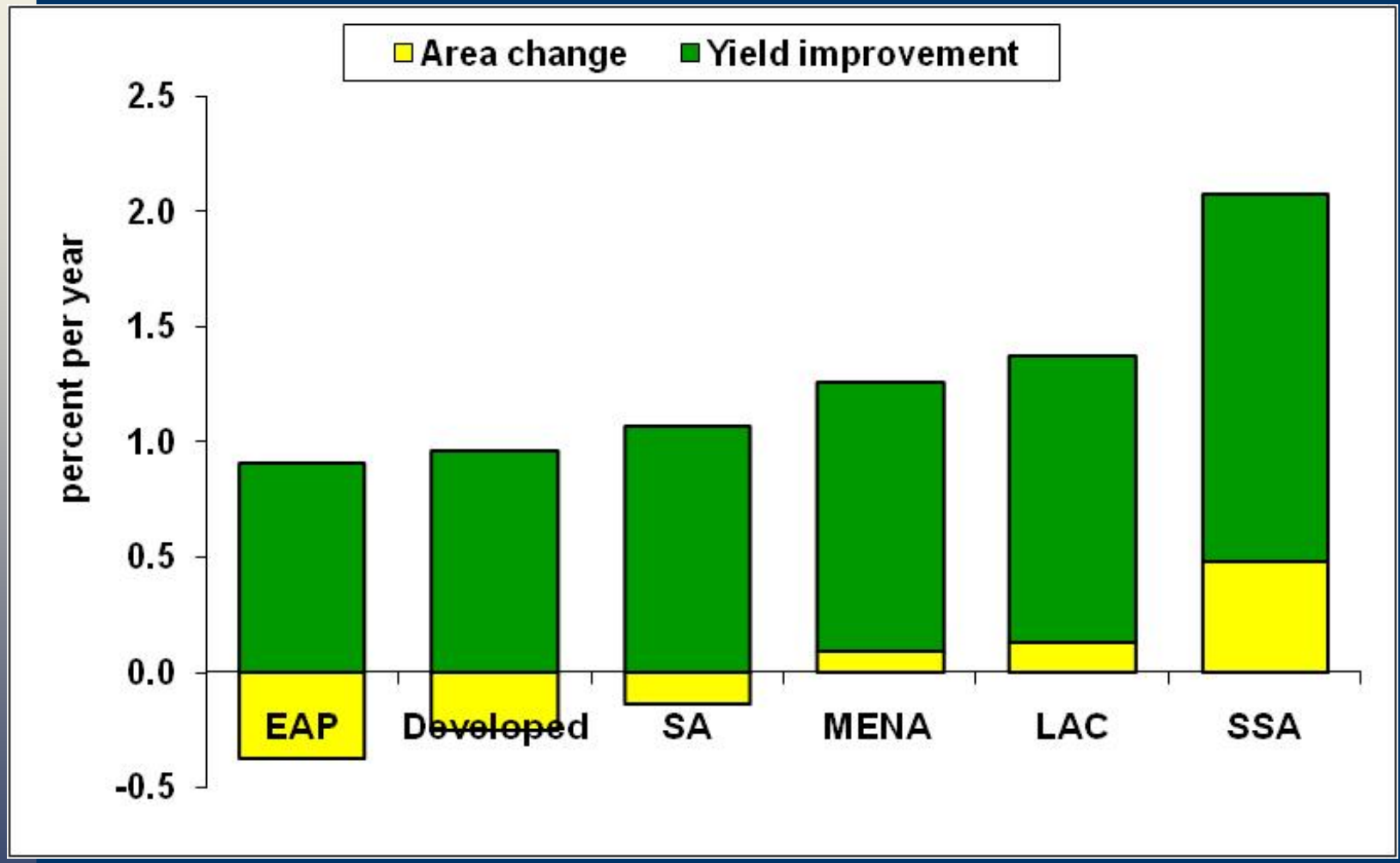
Irrigated and rainfed harvested area, Volta basin (million hectares)



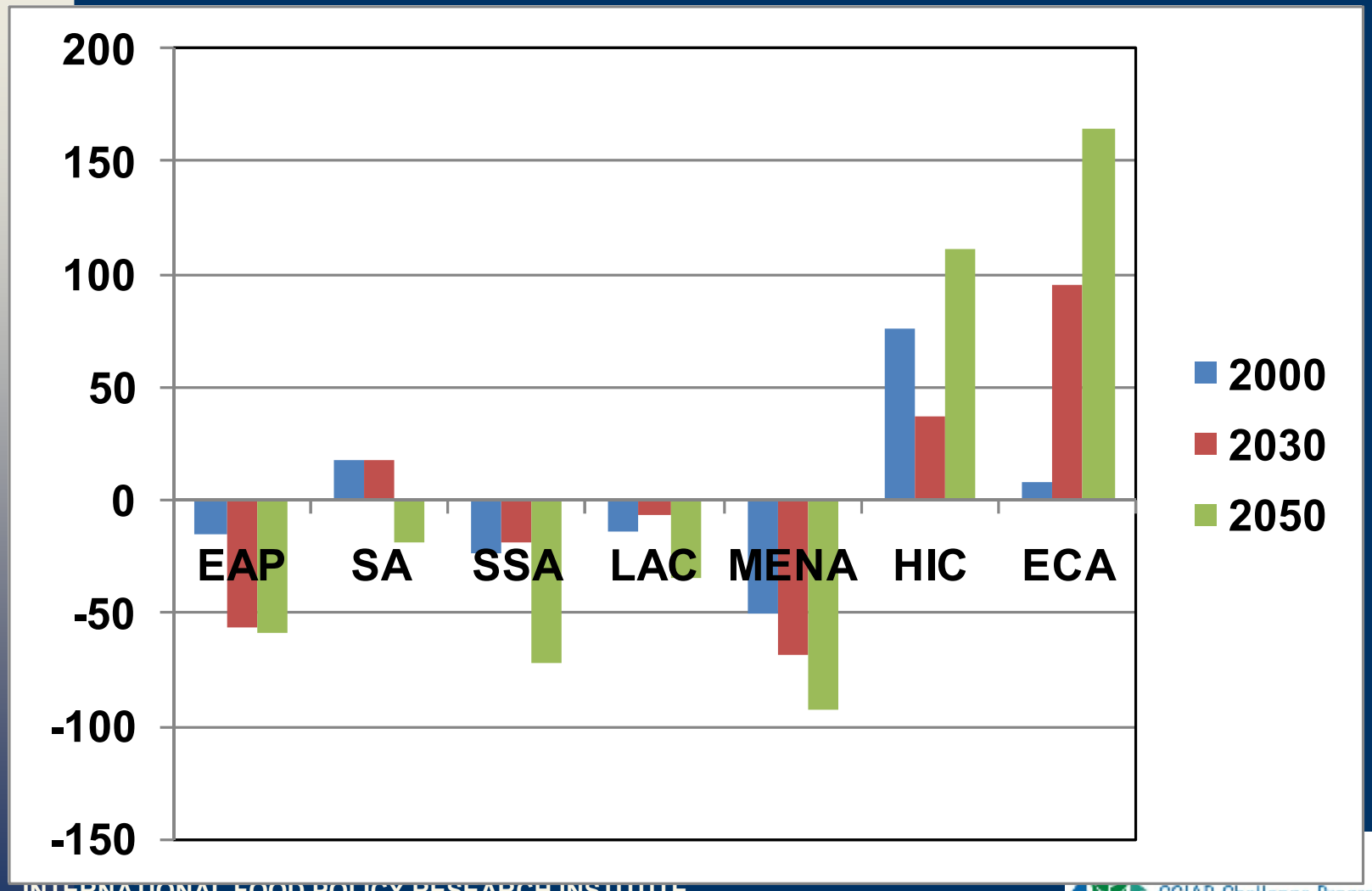
Irrigated and rainfed harvested area, Limpopo basin (million hectares)



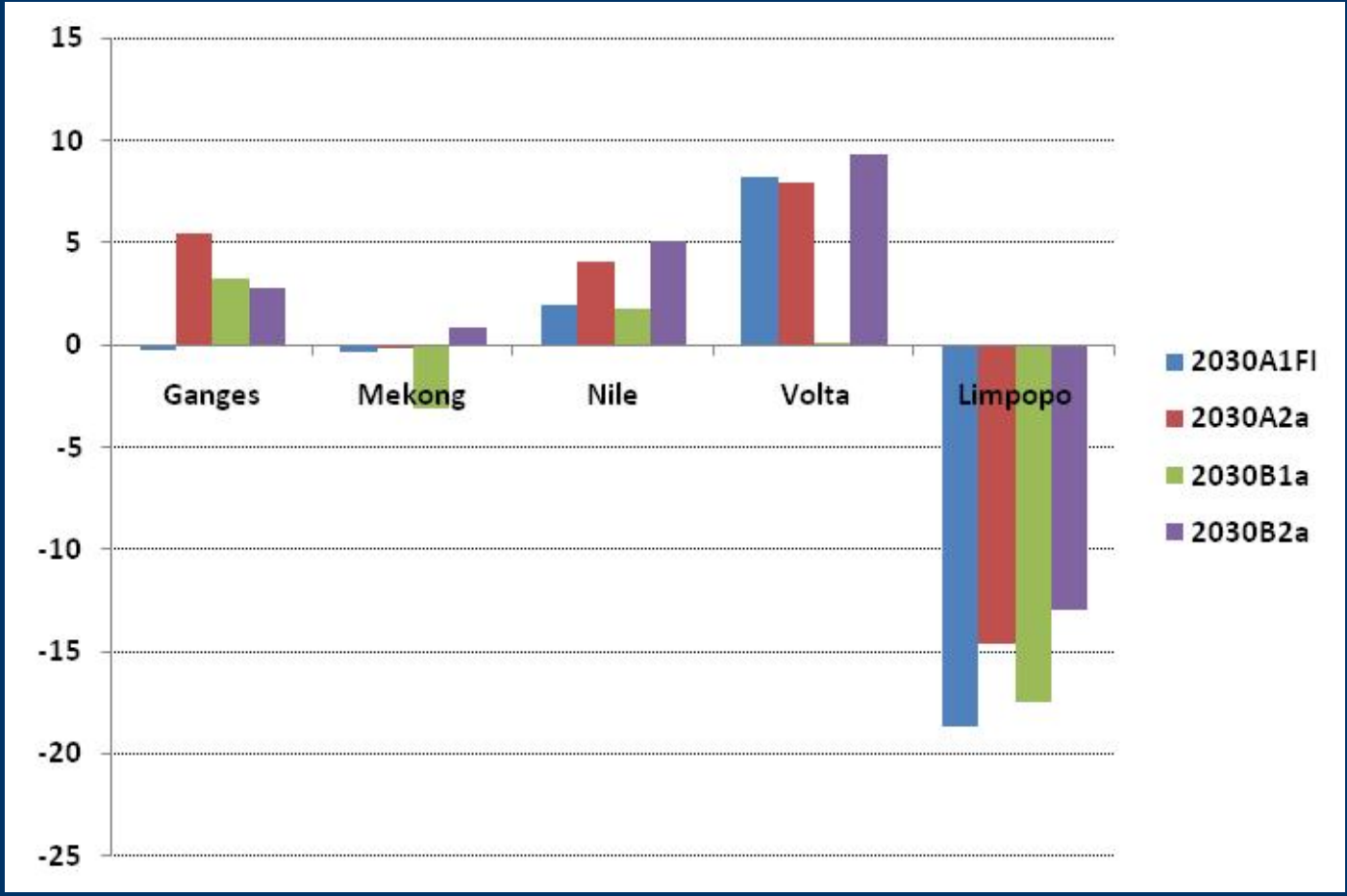
Sources of Cereal Production Growth, Baseline, 2000-2050



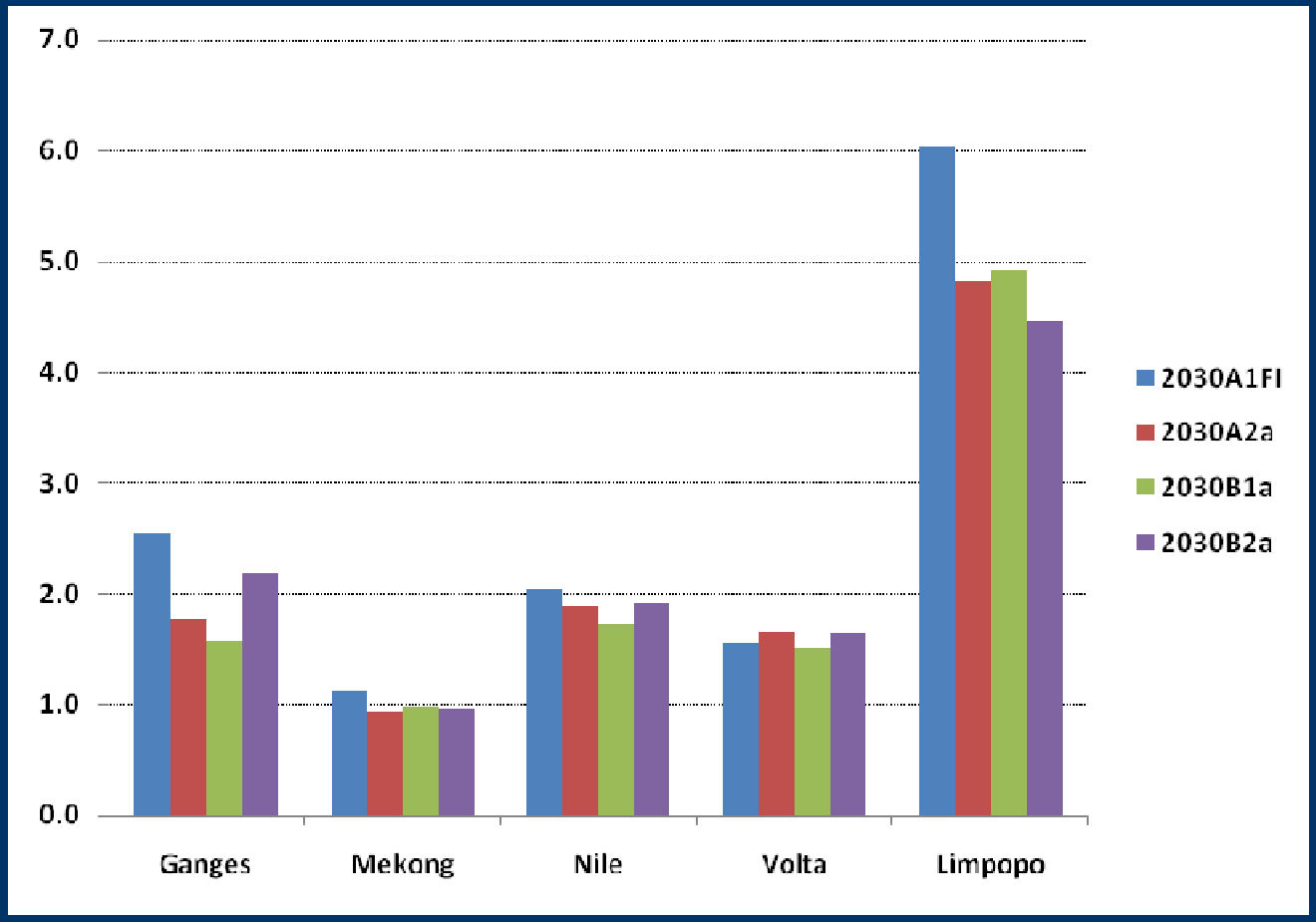
Net cereal trade (million mt)



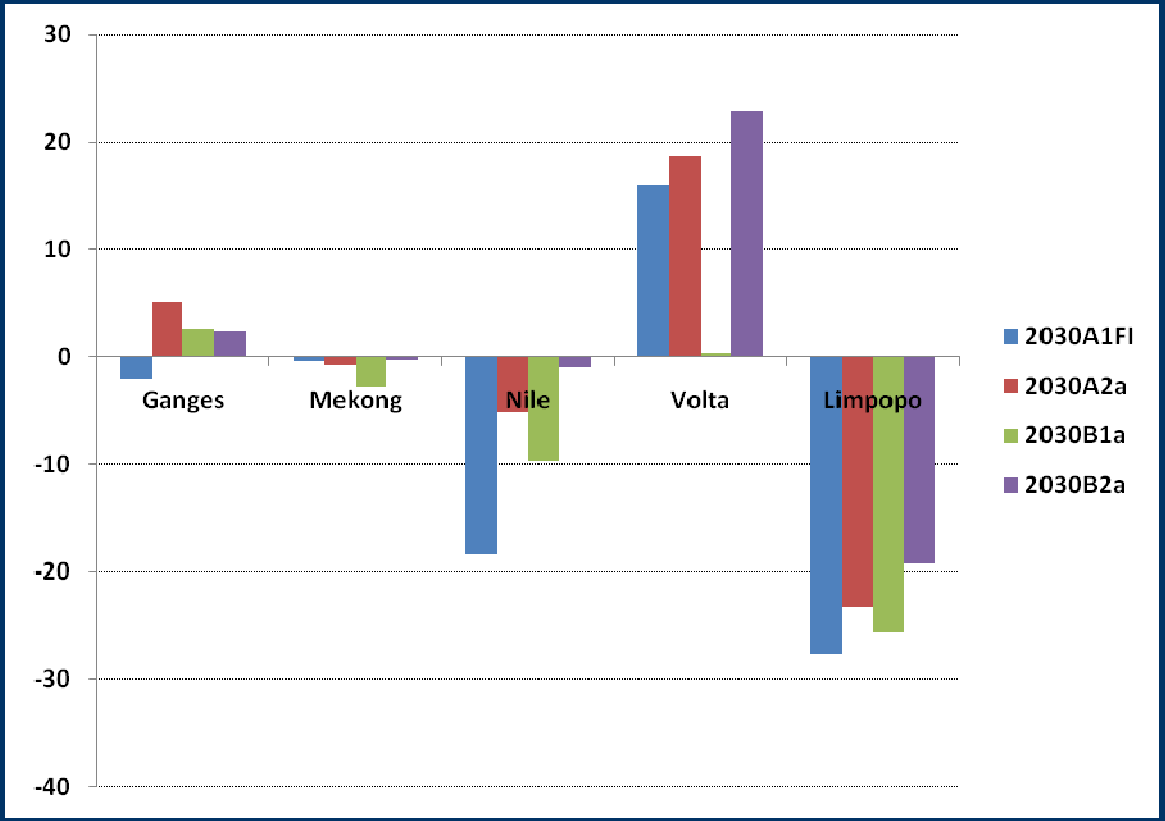
Changes of Annual Precipitation by 2030 (%) (HadCM3)



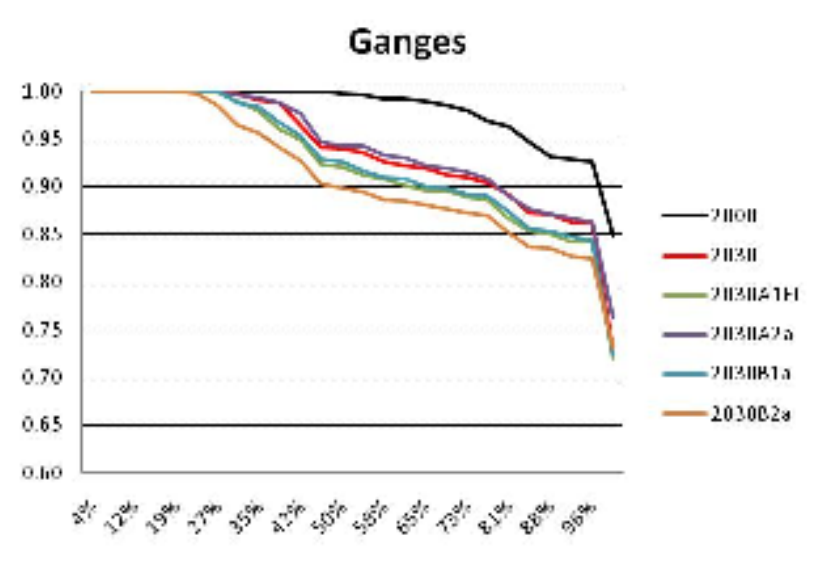
Changes of Annual Potential ET by 2030 (%) (HadCM3)

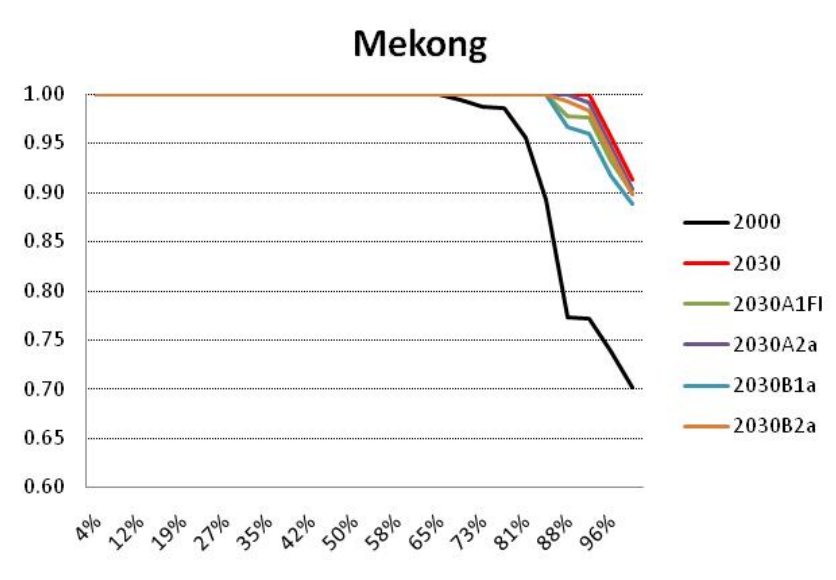


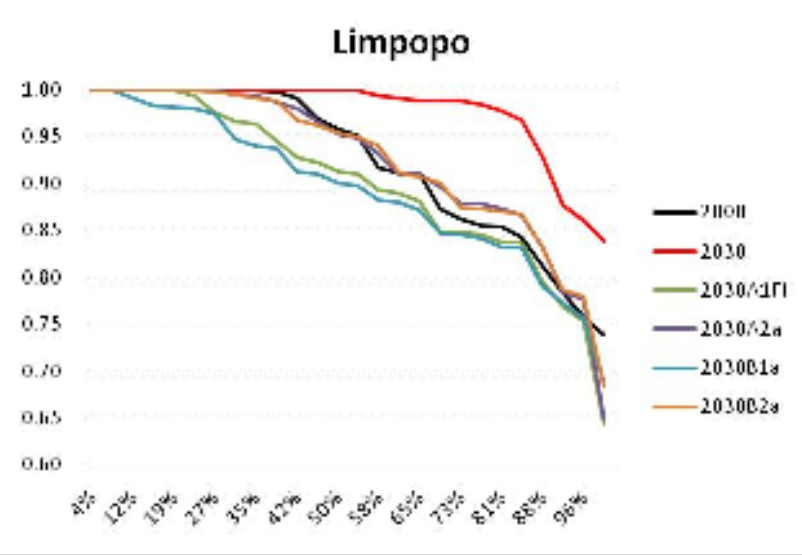
Changes of Annual Runoff by 2030 (%) (HadCM3)



Irrigation Water Supply Reliability
IMPACT Model Projections







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Selected Insights

- Basins span a good range for presented indicators, including average rainfall, water availability per capita, population density, and irrigation development
- Urbanization important for all basins, but in several basins urban centers are outside the basin area (Andean, Volta, Mekong, Limpopo)
- Climate change is a threat in all basins, but is expected to play out in different ways
- Maize is an important crop in all river basins
- Non-irrigation water demand increases faster than irrigation demand

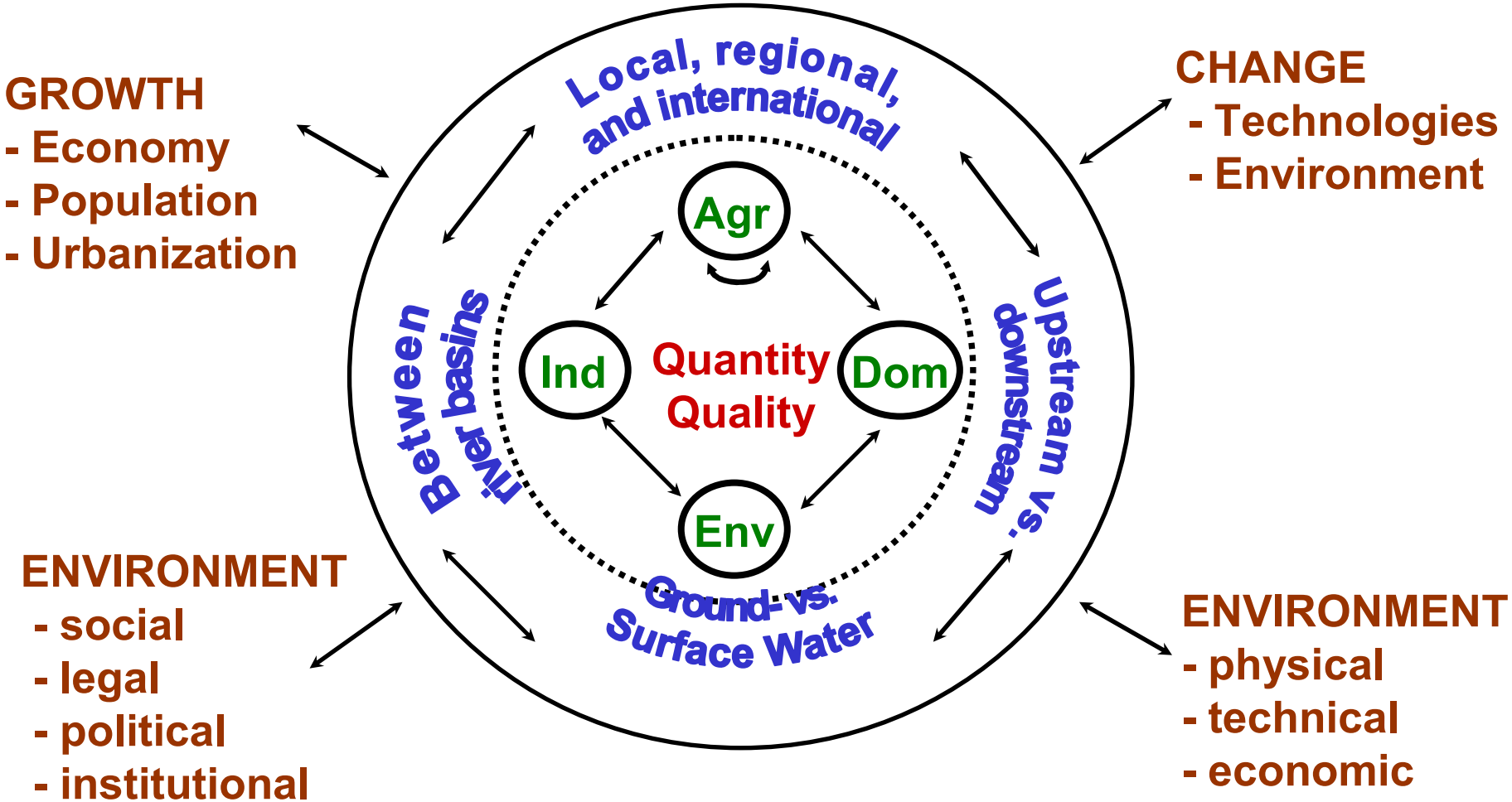
Selected Insights

- Under baseline, childhood malnutrition largest in the Ganges, generally declining in Asian basins, but increasing in African basins before declining
- Yield growth is expected to contribute most to future productivity growth in river basins; only in African basins will area expansion still play an important role as well; in Asian basins, area is expected to slightly contract
- Rainfed production dominates African basins—95% in the region, 99% in the Volta
- Rainfed crop yields in African basins generally lower compared to Asian basins (because of better rainfall and better access to other inputs); however, yields are also low in the Ganges

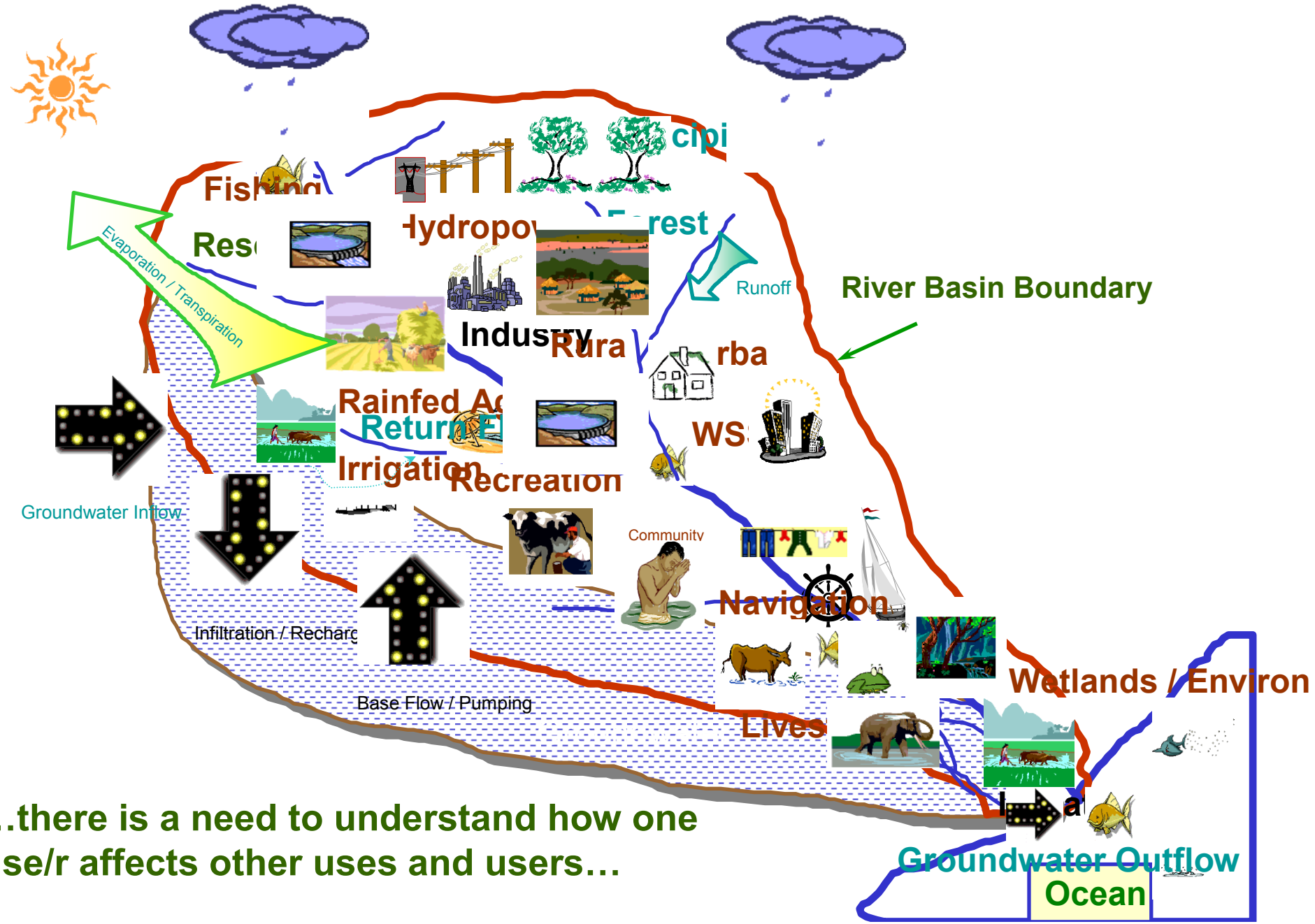
Selected Insights

- Developing countries account for almost all of future income growth and increase in food demand, including livestock demand
- Coupled with growing resource scarcity on the supply side [water, land, climate-related, energy], developing countries and basins will need to increasingly rely on net food imports
- Increasing food prices as a result of scarcity on the supply side and rapid growth on the demand side [food, & non-food] reduce access to food and increase childhood malnutrition among the poorest populations in many African and selected Asian countries [particularly those who spend > 50% of income on food]

MOTIVATION – Increased Competition for Water



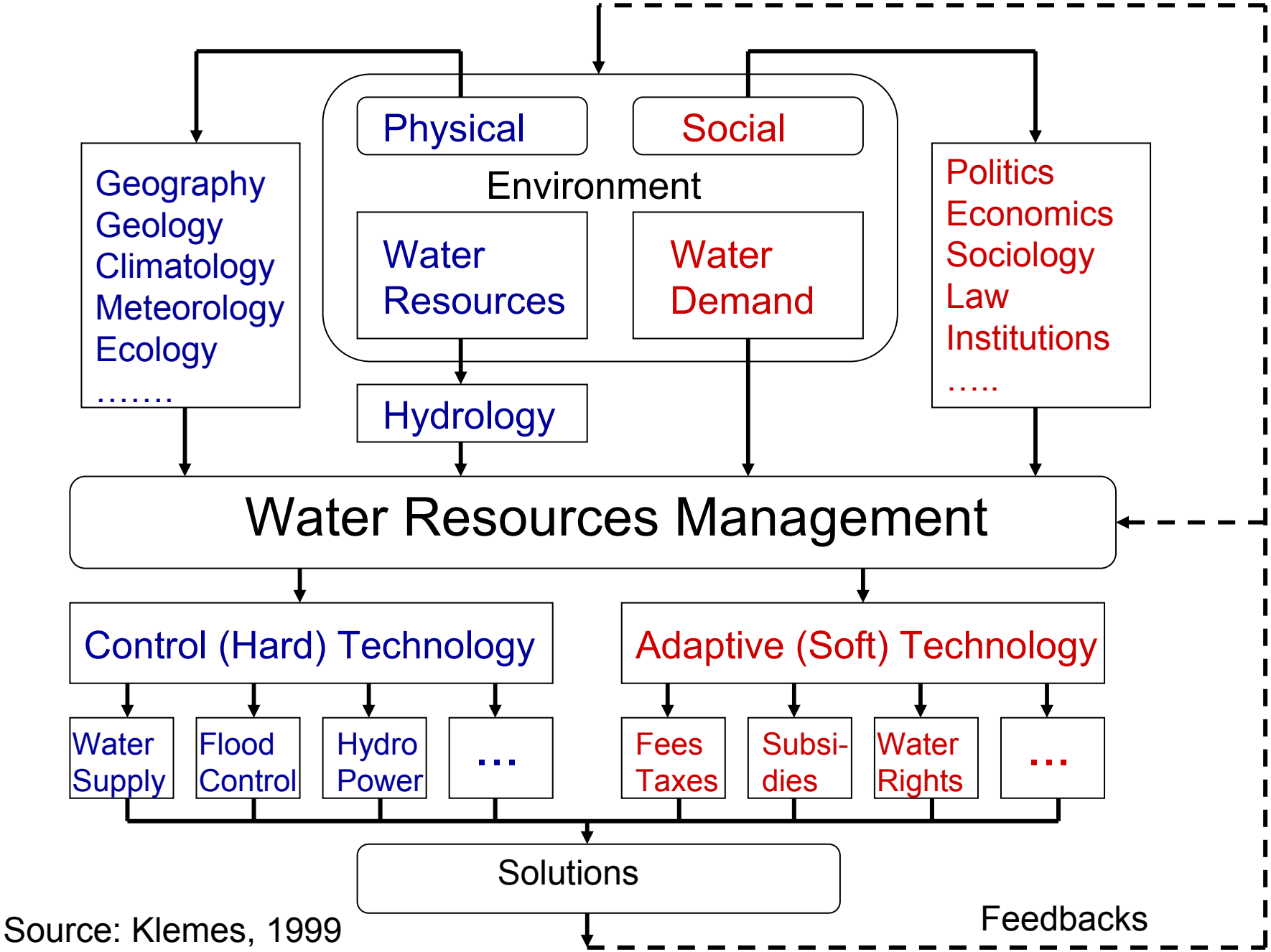
An Example of a Typical River Basin…



…there is a need to understand how one use/r affects other uses and users…

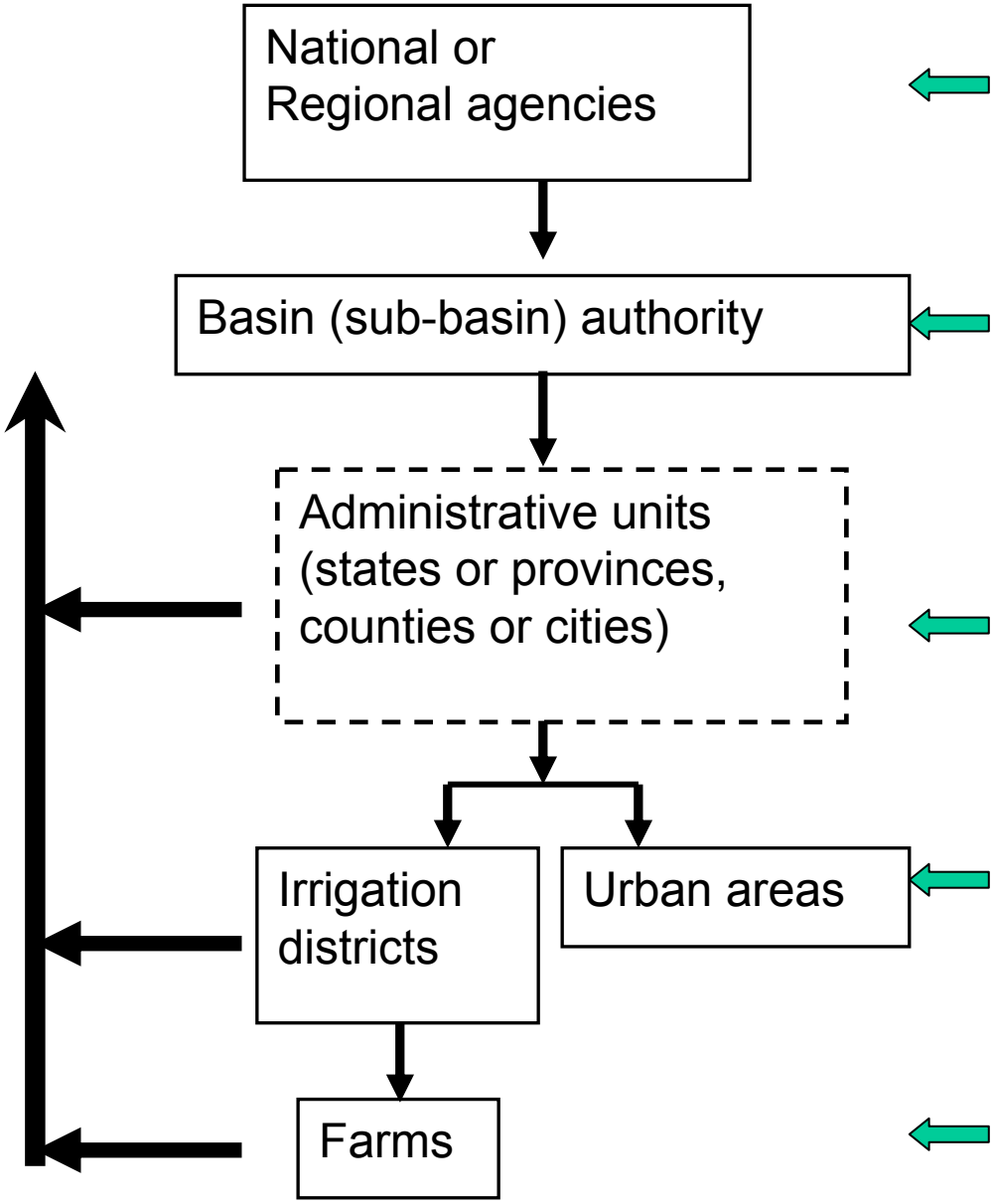
TYPES OF RIVER BASIN MODELS

- Hydrologic simulation models are important for real-time operation of dams & river systems
- Economic optimization models are important for investment calculations
- Optimization in simulation models is generally of limited use for water allocation based on economic efficiency purposes
- Economic models without sufficient hydrologic representation are also of limited use
- Joint hydrologic-economic models can be used for strategic decision-making in river basins



Source: Klemes, 1999

POLICY ANALYSIS AT THE BASIN LEVEL



National or regional policies on water and economic development

Basin policieson multiple purposes of water use, water supply, hydropower, environmental and ecological requirements, water quality, flooding control, capacity expansion and O&M

Inter-regional agreements on water allocation and water trade

Inter-sectoral water allocation, water right and markets, water prices and O&M cost, water use agreements,

On-farm water management

CONCLUSIONS

- Effects of policies and developments in one part of the basin for the entire basin can be analyzed
- Impacts of non-water and non-irrigation water policies on the basin can be examined

MODEL CHALLENGES

- Can be data-intensive to adequately model human behavior
- Difficult, but not impossible to link water uses to poverty outcomes
- Focus on productive water uses manipulated by humans, and less on rainfed water management [where a lot of poverty persists], but the latter can be represented if it rainfed agriculture results in changes in inflows
- Difficult but feasible to link to land cover models
- Stakeholder input is essential
- Long-term models needed to assess dynamics and cumulative environmental impacts