

# International trade buffers the impact of future irrigation shortfalls

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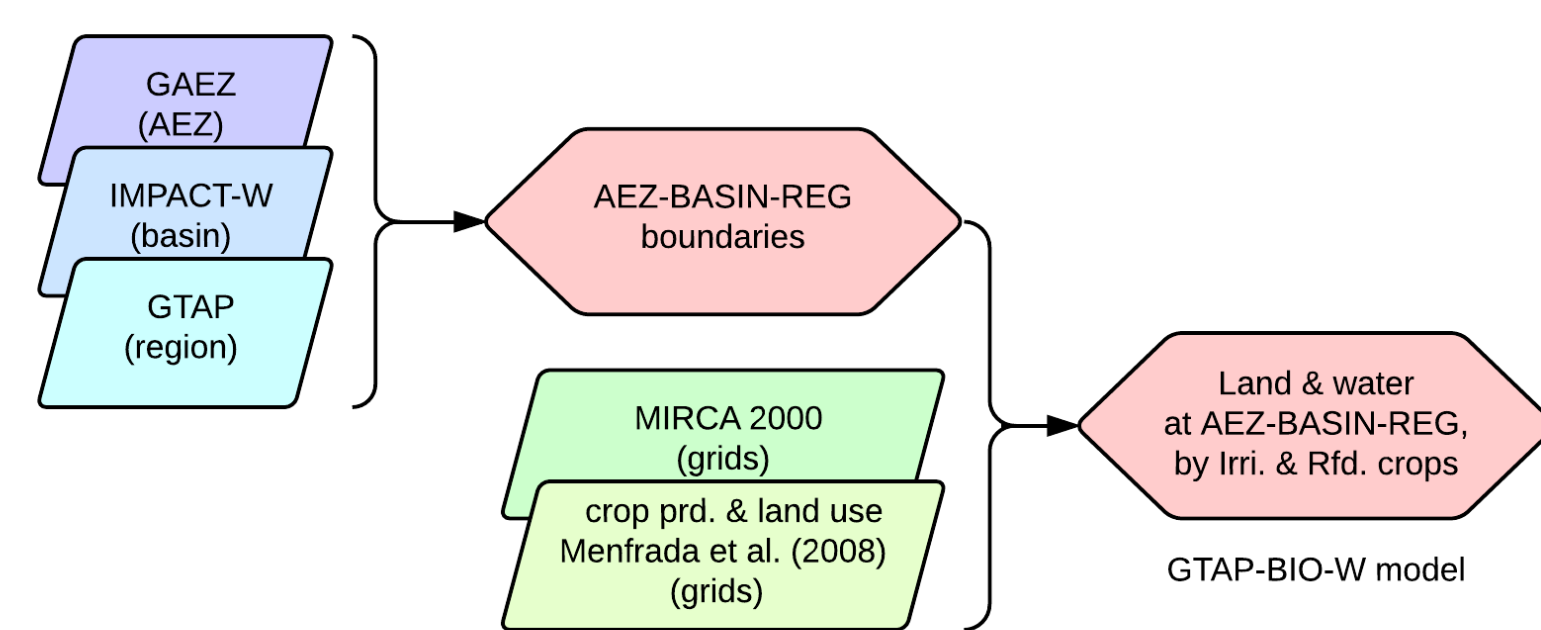


## Introduction

- Water scarcity restricts food production in irrigation stress hotspots, but little is known about the larger-scale implications for the economy.
- We integrated hydrological and economic analysis to study the impacts of future irrigation shortfalls on trade and economic welfare.
- Connecting GTAP with GEOSHARE can be valuable where subnational, geospatial detail is needed.

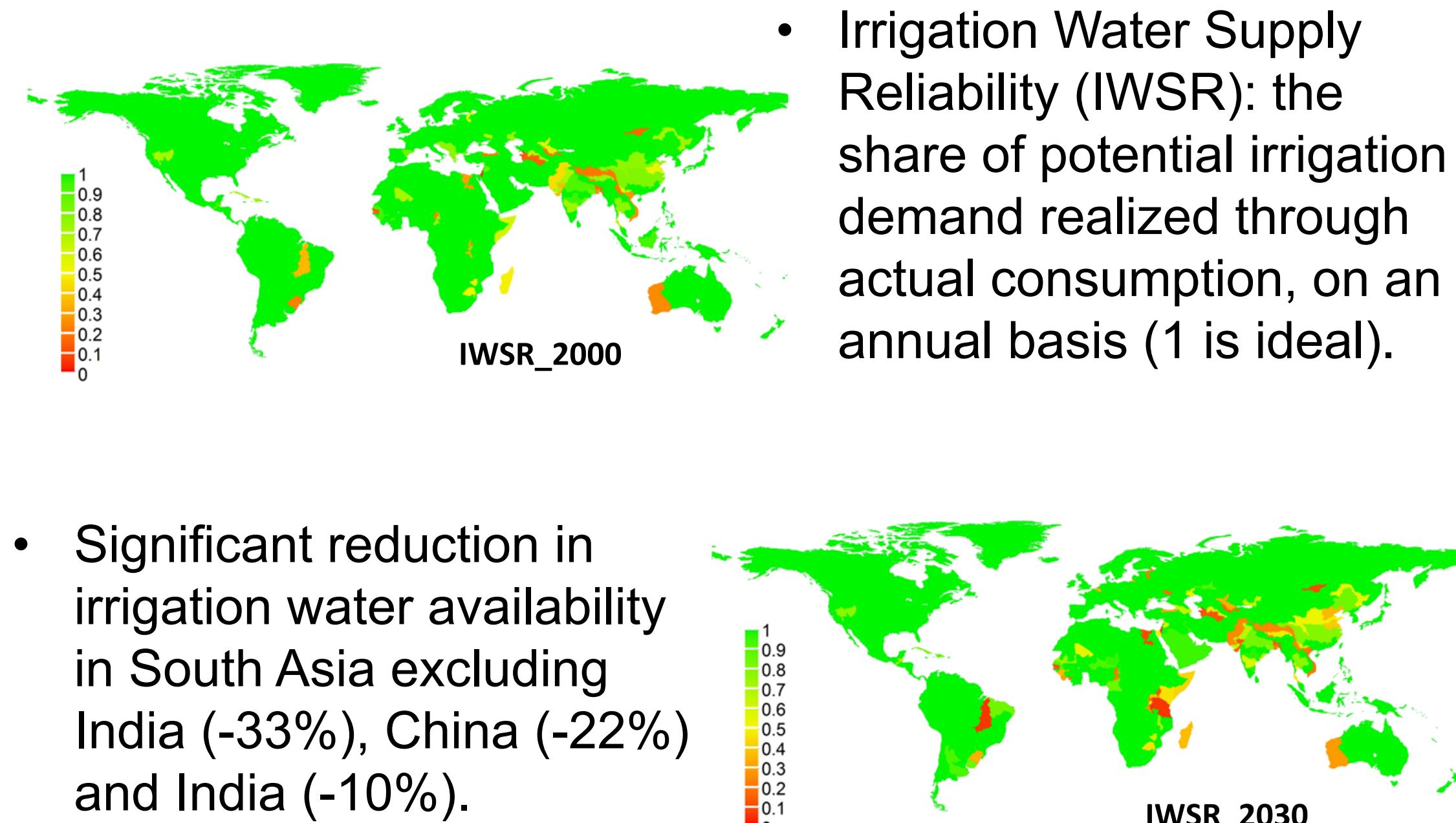
## Data

- Geospatial details are potentially important. However, data from diverse sources are provided with different resolutions, and often in conflict.
- Economic activities and physical regimes are subject to different boundaries (basins, AEZs & regions) – how to exchange data efficiently between modules?

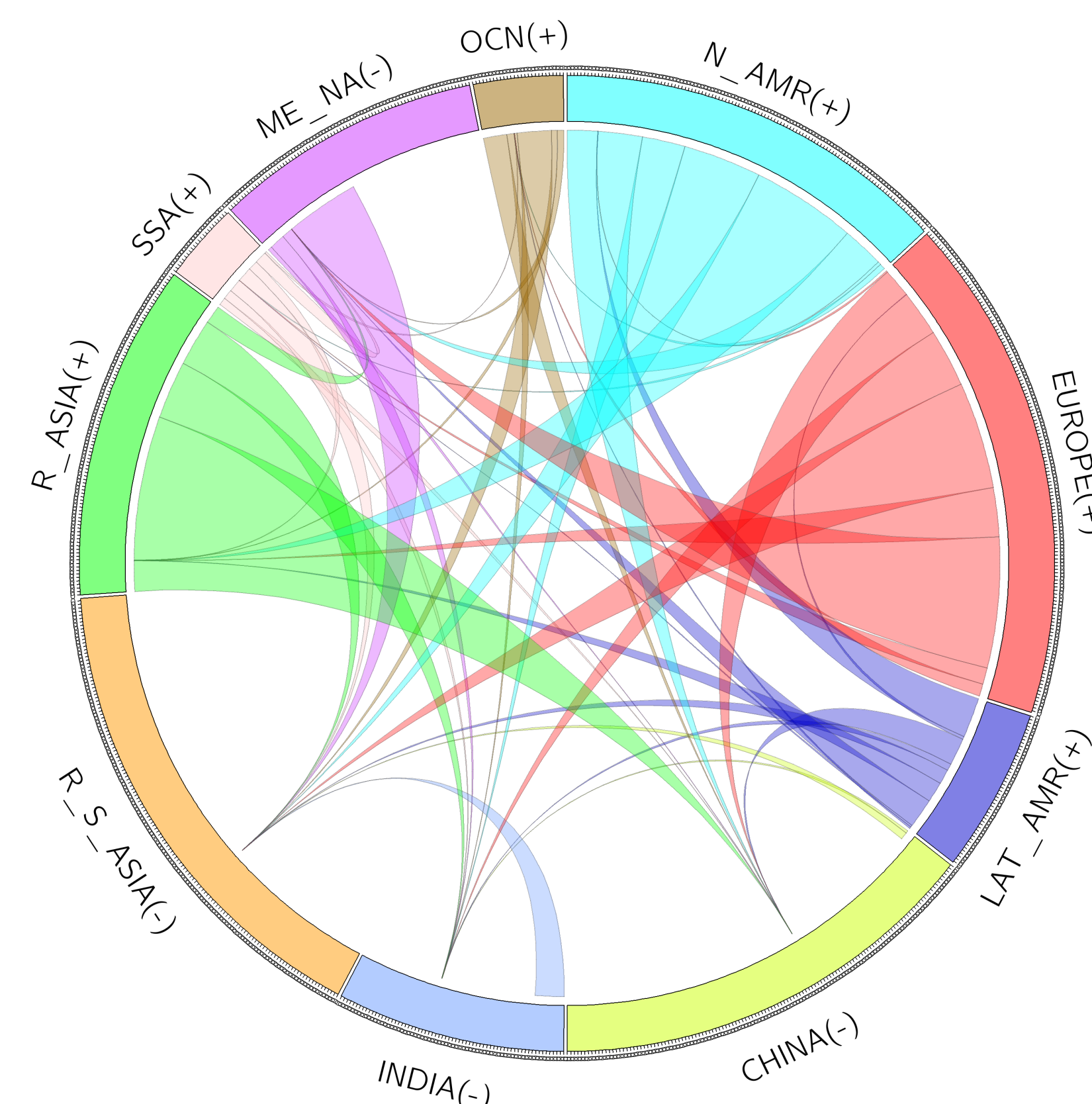


- Aggregate and transfer data output from a hydrological model (IMPACT-Water) to an economic model (GTAP-BIO-W)

## Results



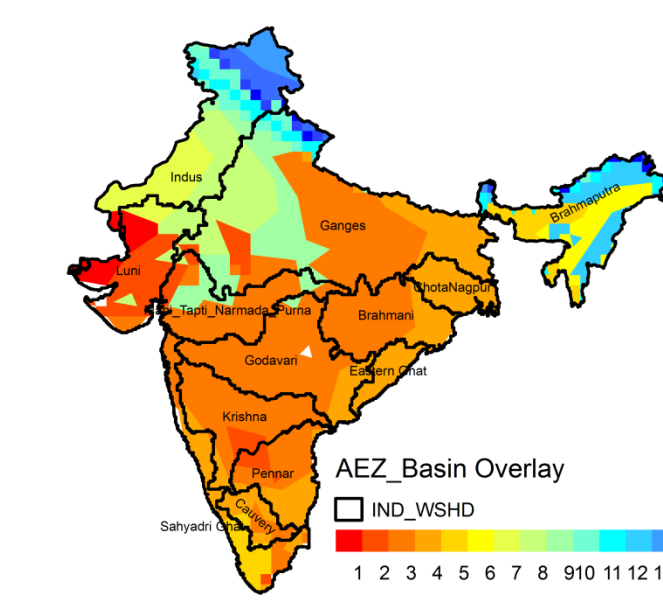
- Irrigation Water Supply Reliability (IWSR): the share of potential irrigation demand realized through actual consumption, on an annual basis (1 is ideal).
- Significant reduction in irrigation water availability in South Asia excluding India (-33%), China (-22%) and India (-10%).



Bilateral net trade flow of food. "+", net exporting increases; "-", net importing increases.

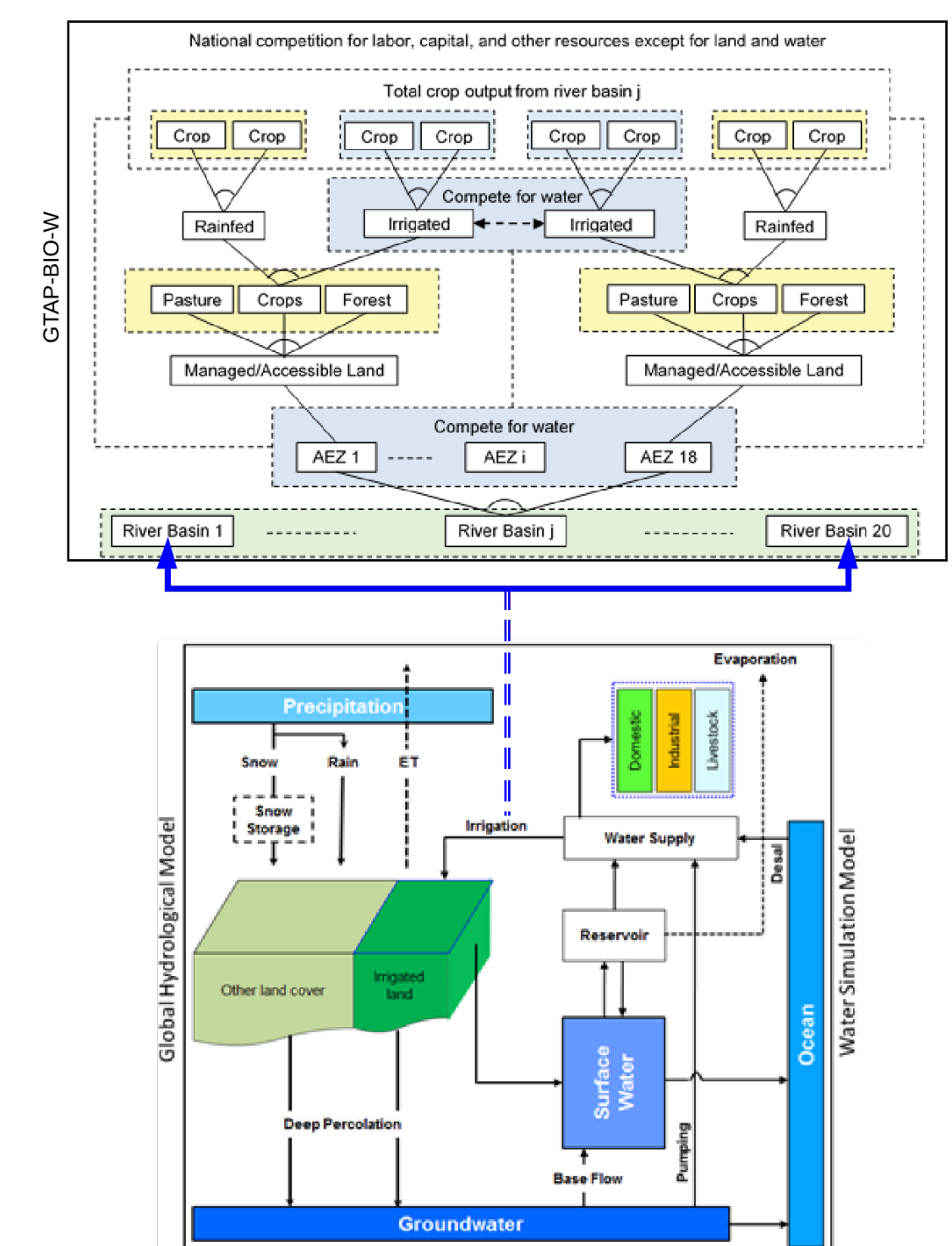
- Irrigation shortfall alters the geography of food trade. Regions facing severe irrigation scarcity increase net food import. Inter-regional trade is strengthened.

## Application



AEZ-Basin intersection: the India example

- One region contains up to 20 river basins and 18 AEZs
- Intersecting AEZs with river basins allows water and land to be competed for at different levels
- Project changes in irrigation availability during 2000-2030 based on a water balance model IMPACT-W
- Use these changes to shock irrigation supply in a global CGE model, GTAP-BIO-W
- Do a comparative static analysis



## Summary

- Future irrigation shortfalls significantly reduce crop output in South Asia and China.
- However, the induced welfare impact is relatively modest as a result of the buffering capacity of global markets.
- Geospatial details improves the flexibility of economic modeling and potentially precision.