



PURDUE UNIVERSITY

GLASS

Global to Local Analysis of Systems Sustainability



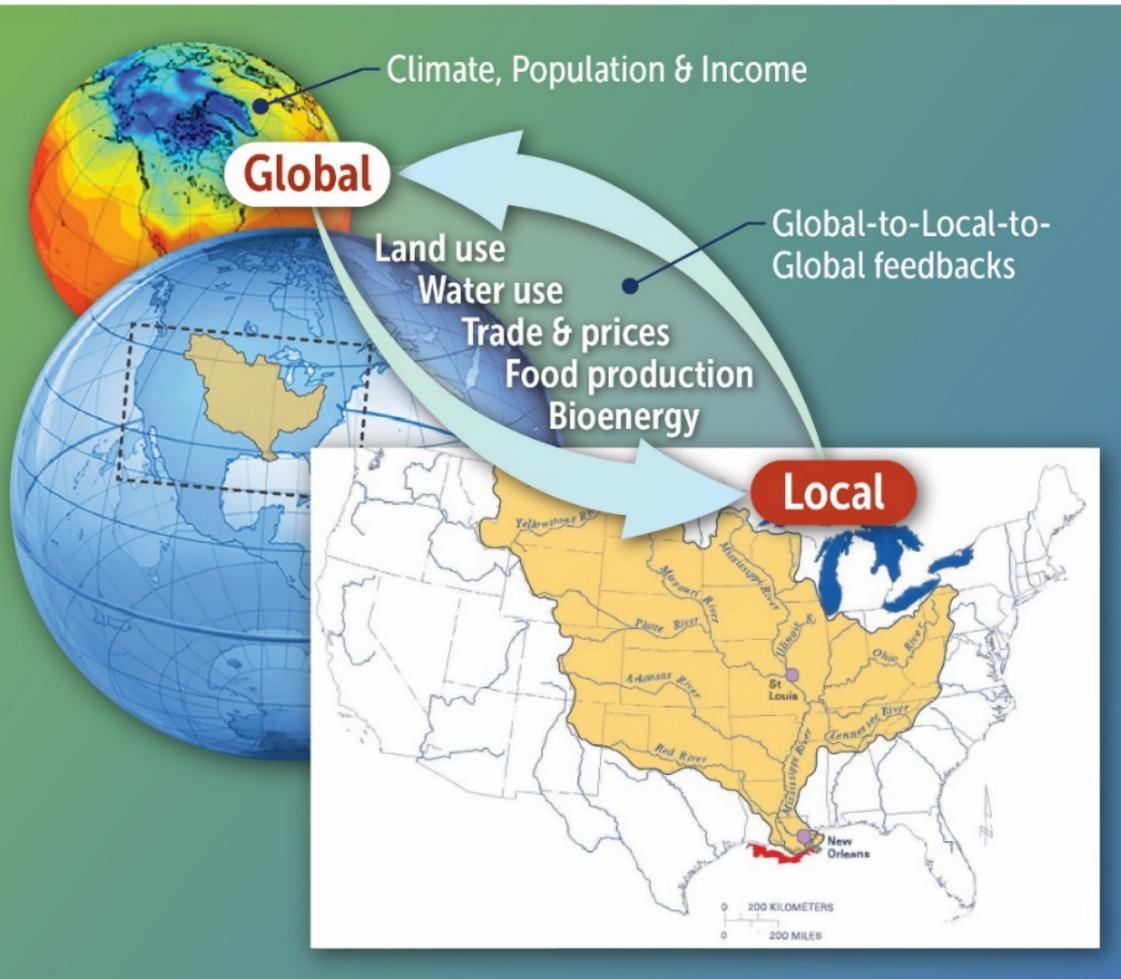
Global-Local-Global Analysis of Agricultural Sustainability

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Lightning Talk for GeoEDF Workshop
October 8, 2019

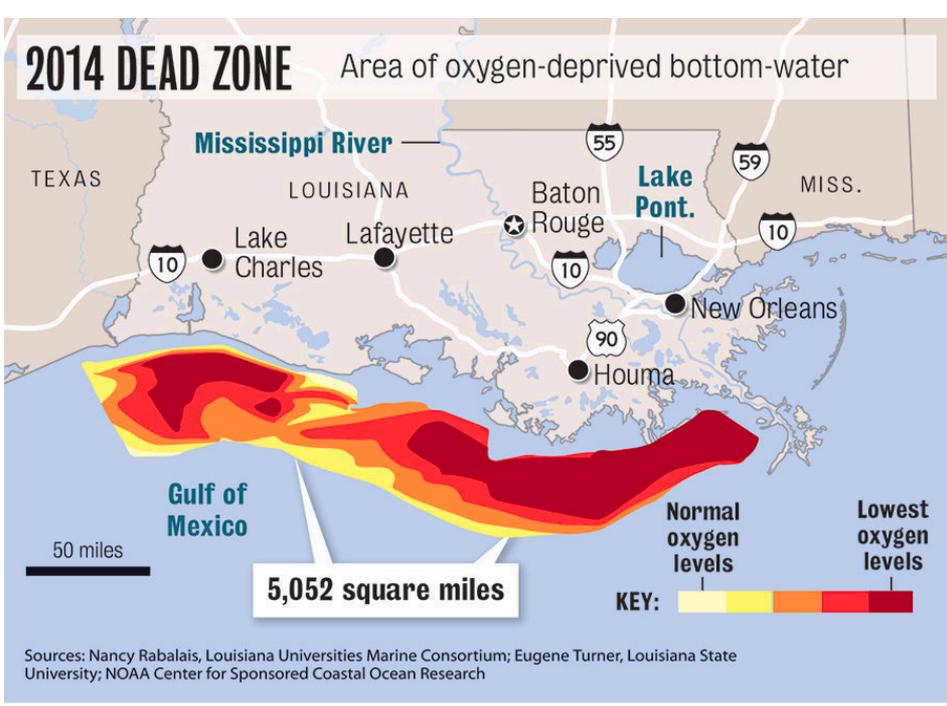
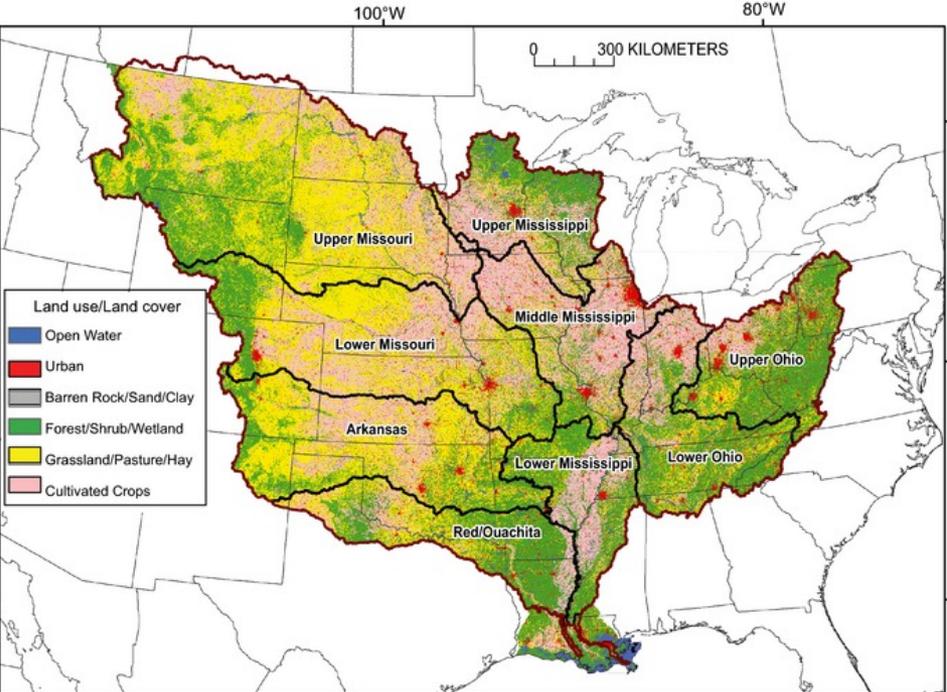


New Approaches Are Required

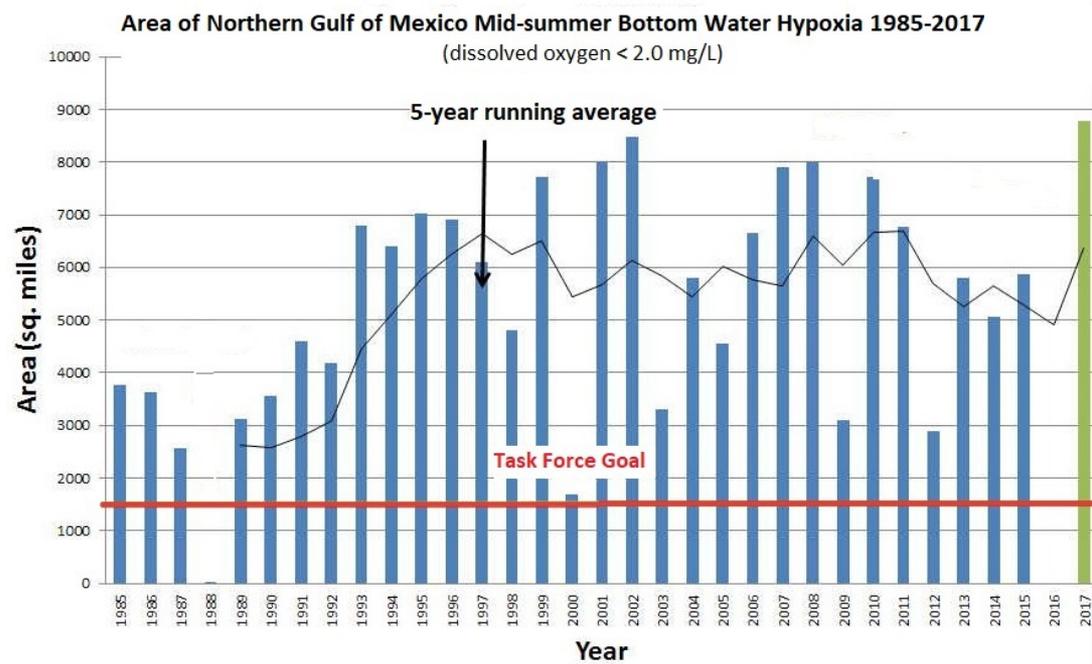
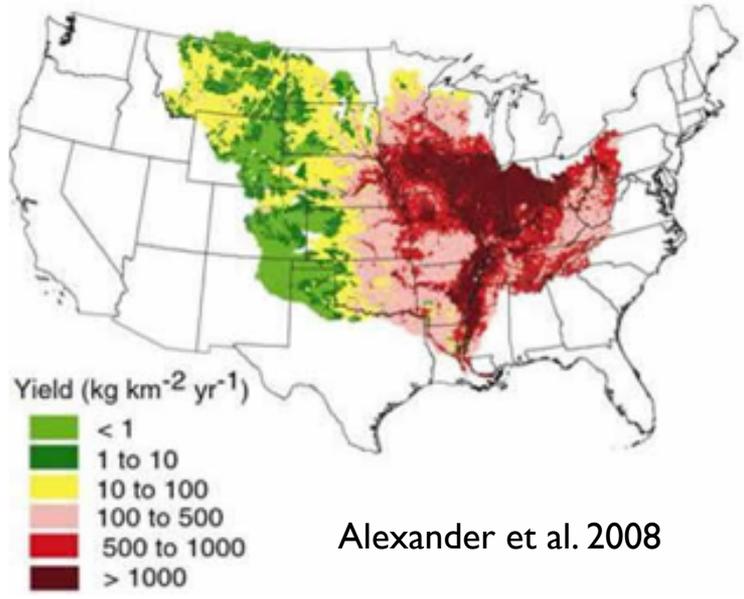
GLASS: Global-to-Local Analysis of Systems Sustainability



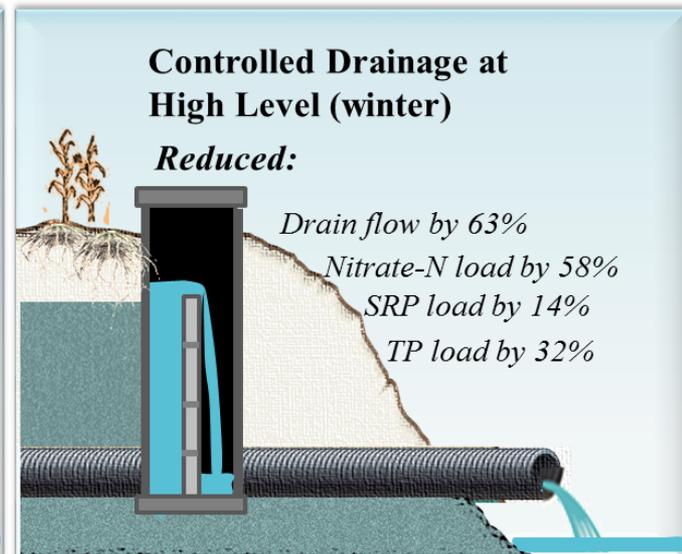
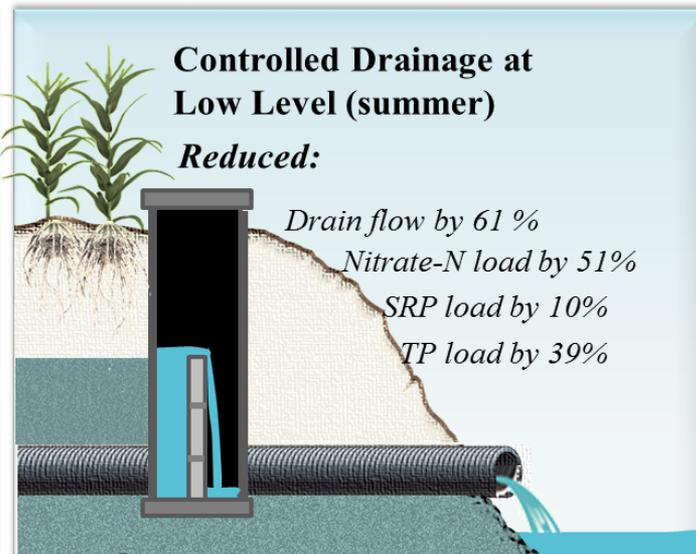
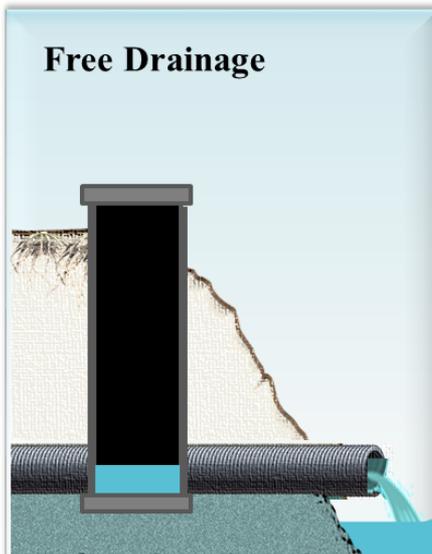
- Recognizes that **global forces are driving local sustainability stresses**
- Yet the character of these **stresses & solutions vary by locality**
- Furthermore, **local responses can have global consequences**
- **Cross-disciplinary collaboration is critical**



Total Nitrogen

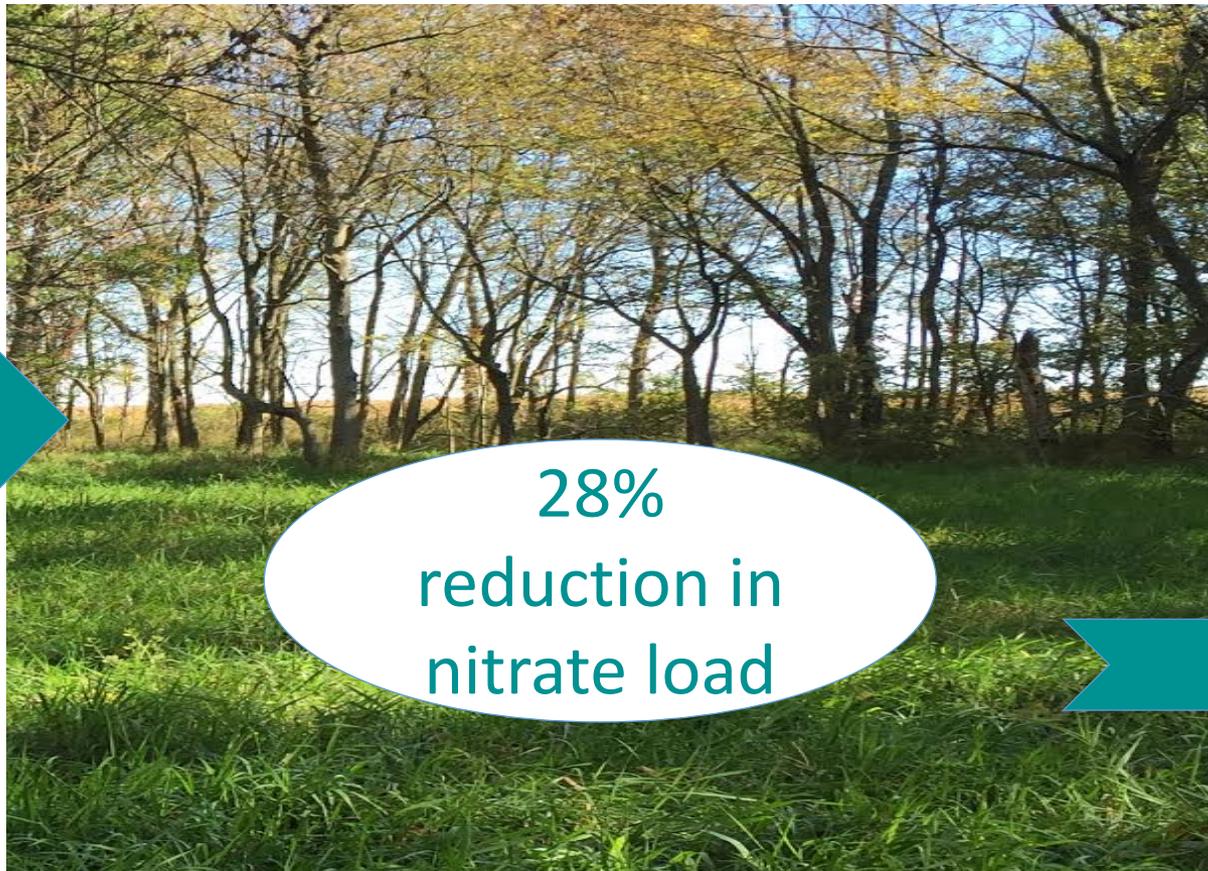


Potential Sustainability Solution: Controlled Drainage



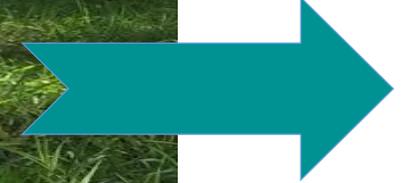
Potential Sustainability Solution: Managed Wetlands (at ACRE)

subsurface
drainage
in

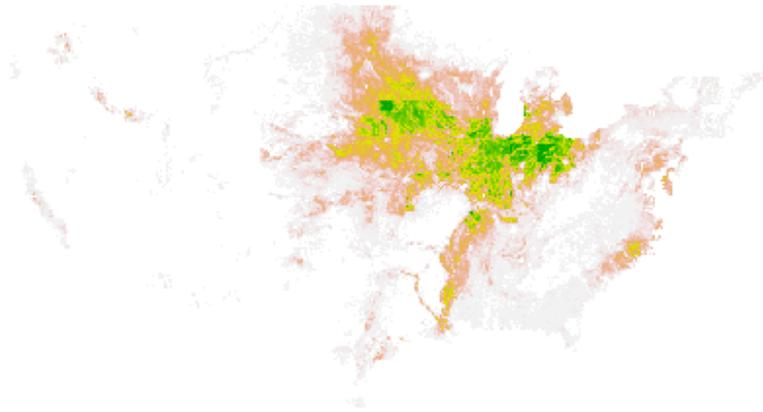


28%
reduction in
nitrate load

streamflow
out

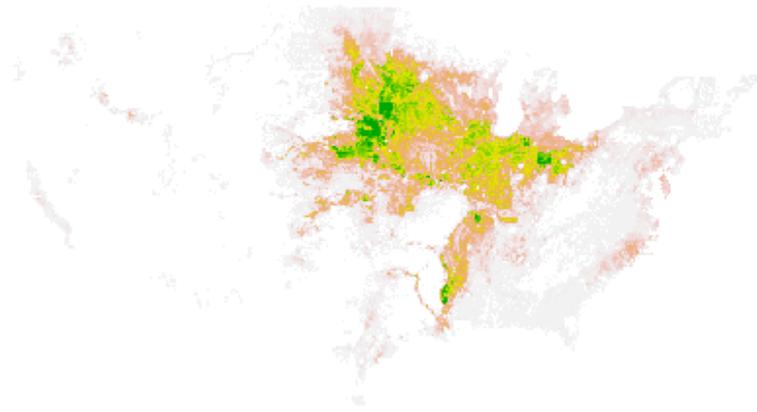


Controlled Drainage

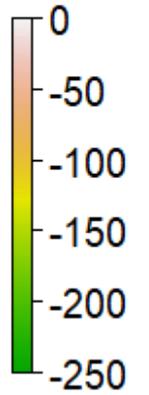


More effective for Illinois, Indiana, and Ohio

Wetland Restoration

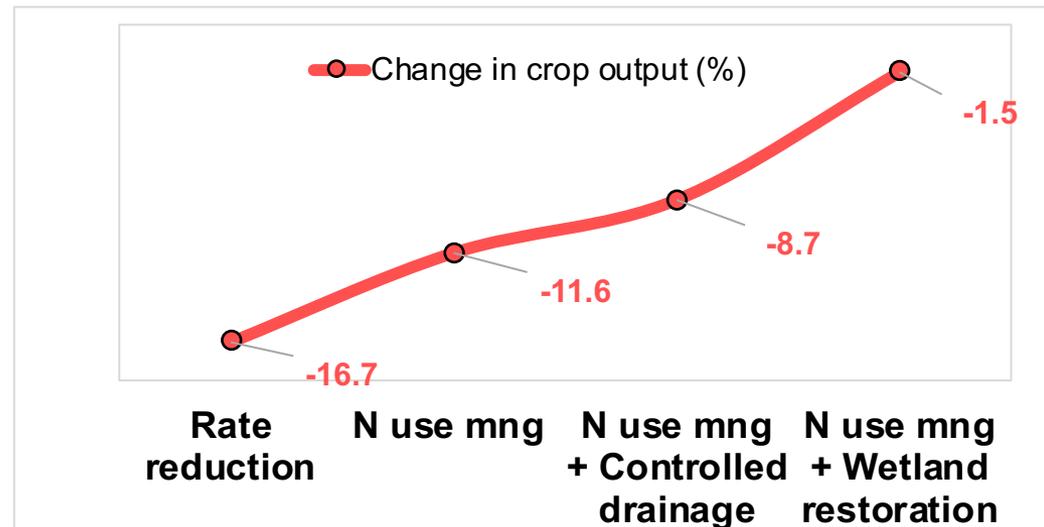


More effective for Nebraska, Iowa and Minnesota

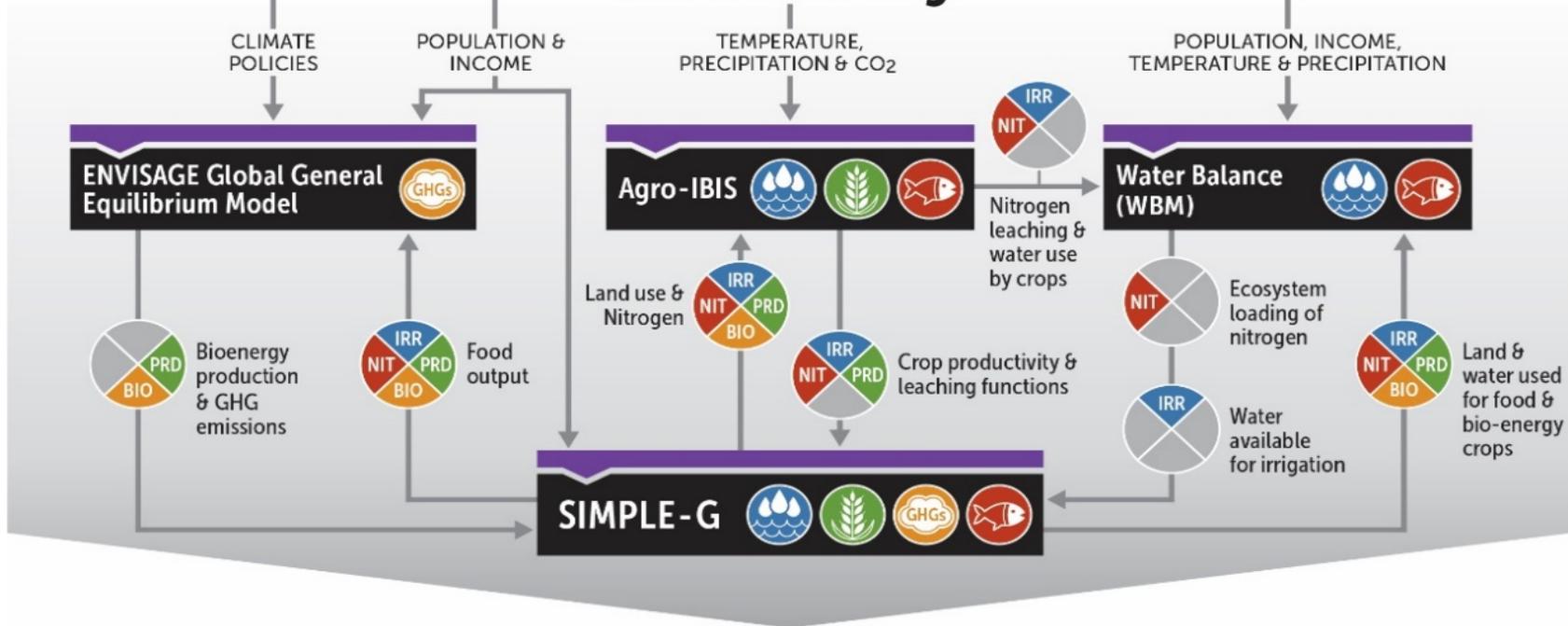


Tons N/grid

The **spatial patterns of mitigation** are quite different ... as are the consequences for corn Production and price



External Forcings



OUTCOMES

- Nitrogen (or nutrient) loading to freshwater, fertilizer use
- Terrestrial C fluxes
- Water supply, use & stress
- Rainfed & irrigated cropland, production
- Food Security
- Economic welfare, trade & energy source

KEY:

Sources of FEWS Challenge Metrics



Lever Domains



Solution Assessment Outcomes

Analytical Framework for NSF-INFIEWS

Challenges and Potential for GeoEDF Contributions

- Each of the four modeling teams have source data sets at different scales; these need to be merged/made consistent
- Output data (results) from one model become inputs (boundary conditions) to another, e.g. crop production or nitrate leaching
- *Can the GeoHub act as the glue between these different models?*
- *SIMPLE-G* is the organizing framework and it is *running on the GeoHub* – what about having each group upload the relevant input files to the GeoHub? How should these inputs be archived? How about the ensuing *SIMPLE-G* model outputs?
- This use case could provide a template for other sustainability analyses (e.g., collaboration with the Natural Capital Project (InVEST models))

GLASS-NET

A response to the NSF call for accelerating science by linking networks of networks

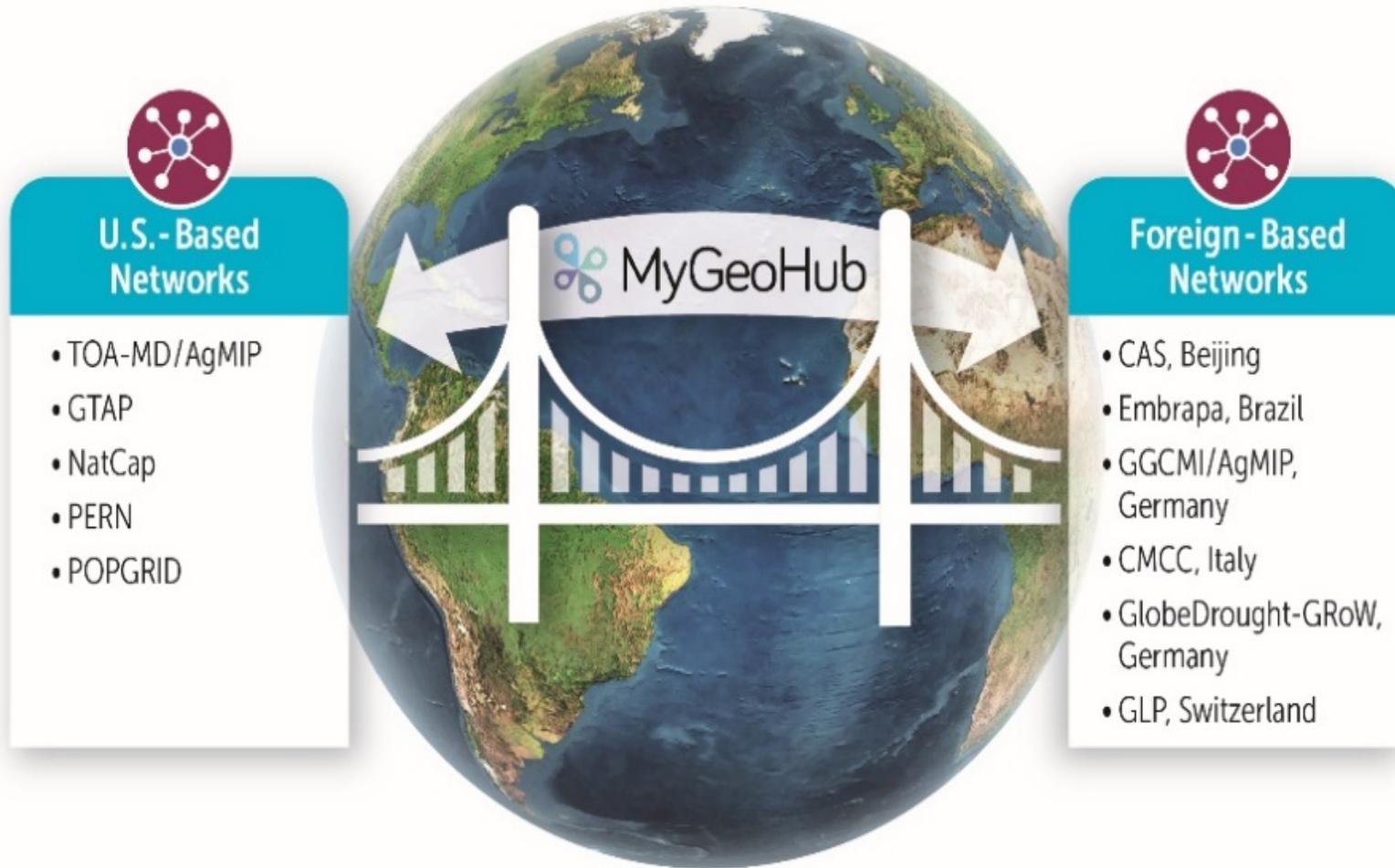


Figure 1. AccelNet bridging to create the GLASSNET network of networks for converging on best practices for research integration and sustainable development.