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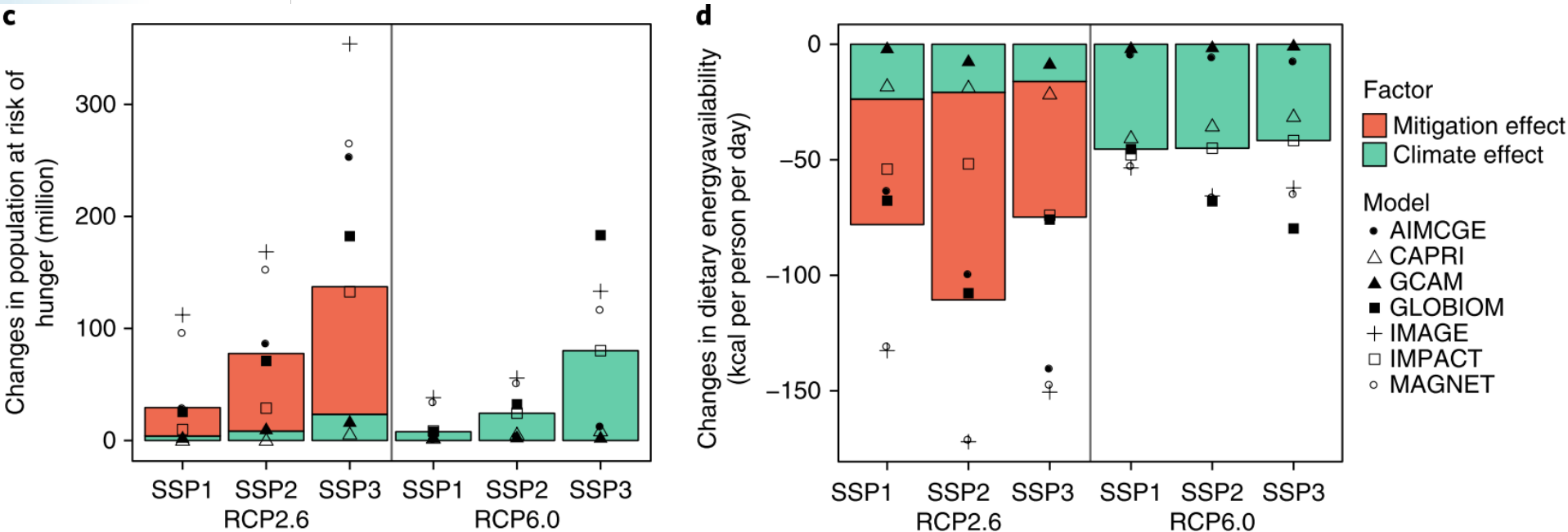
RTI
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# Land for mitigation, biodiversity, food, and fiber:
# How can we do/"model" it all?

## Justin Baker & Petr Havlík

# Food availability and carbon tax

‣ Carbon tax worse than climate change impacts



Source: Hasegawa et al. NCC 2018

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# Moderating trade-offs: Remunerating sinks

▸ Land based mitigation without considering soil organic carbon would lead to a rise in undernourishment of 40 to 170 million people in 2050

▸ While including the SOC into the mitigation portfolio would limit the additional number of undernourished to 10 - 40 million people
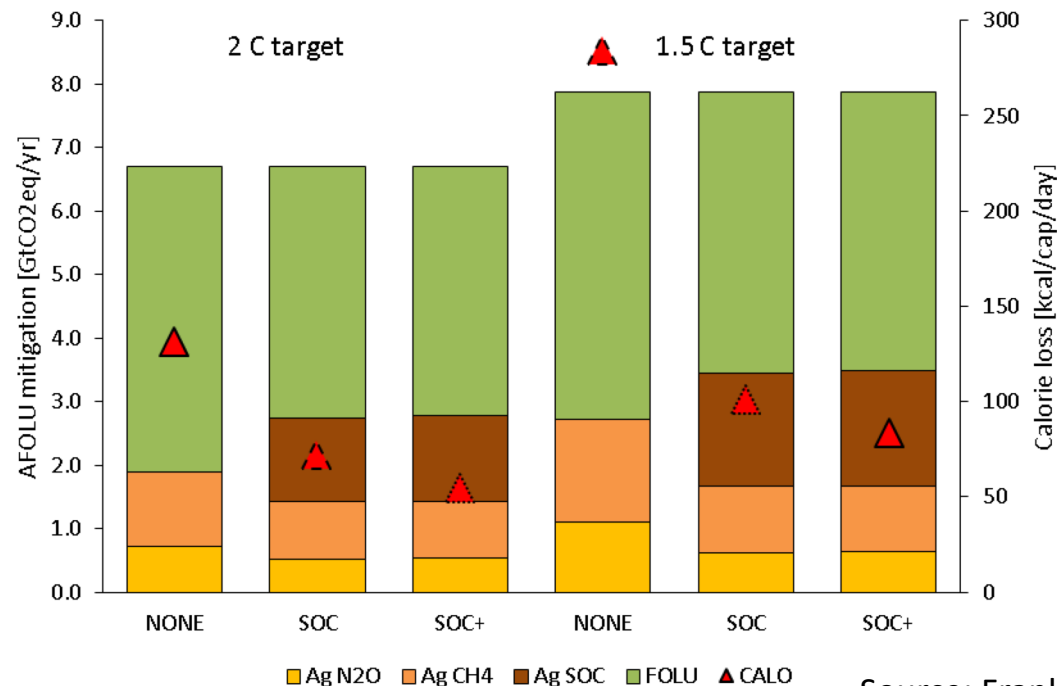


Source: Frank et al. ERL 2017

# Moderating trade-offs: Technological development

‣ Technological change leading to increased crop yields beneficial both for GHG mitigation and food availability
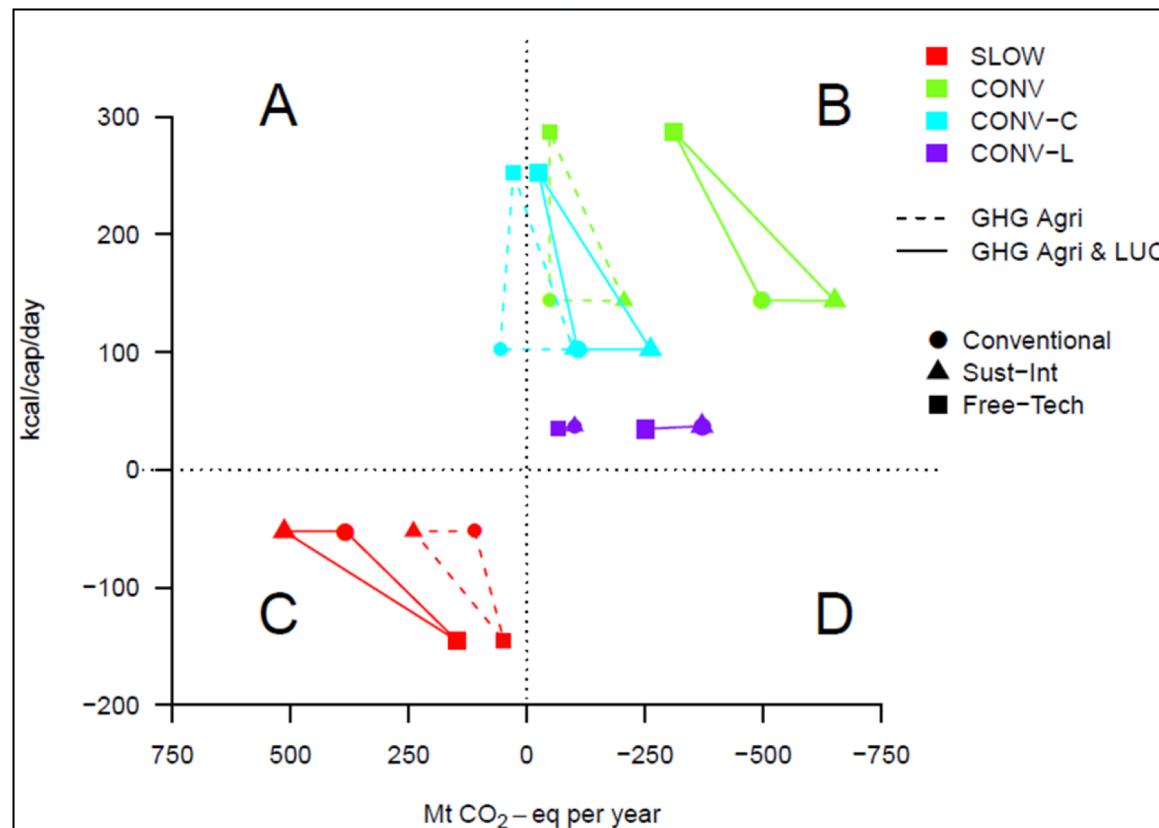


Source: Valin et al. ERL 2013

# SDG compatible land mitigation potential

- *Food security (SDG2)*
  - Developing countries reach minimum total that limit undernourishment below 1% by 2
- *Dietary preferences (SDG12)*
  - Based onon USDA recommendations for hea calorie intake decreased to 430 kcal/capita/day by 2030.
  - Halving current food waste by 2030
- *Sustainable water use (SDG6)*
  - Irrigation water consumption in agriculture does not conflict with ecosystem services and environmental flows
- *Biodiversity protection (SDG15)*
  - Achieving the AICHI Biodiversity target 11 and increase total surface of protected areas to 17% by 2030
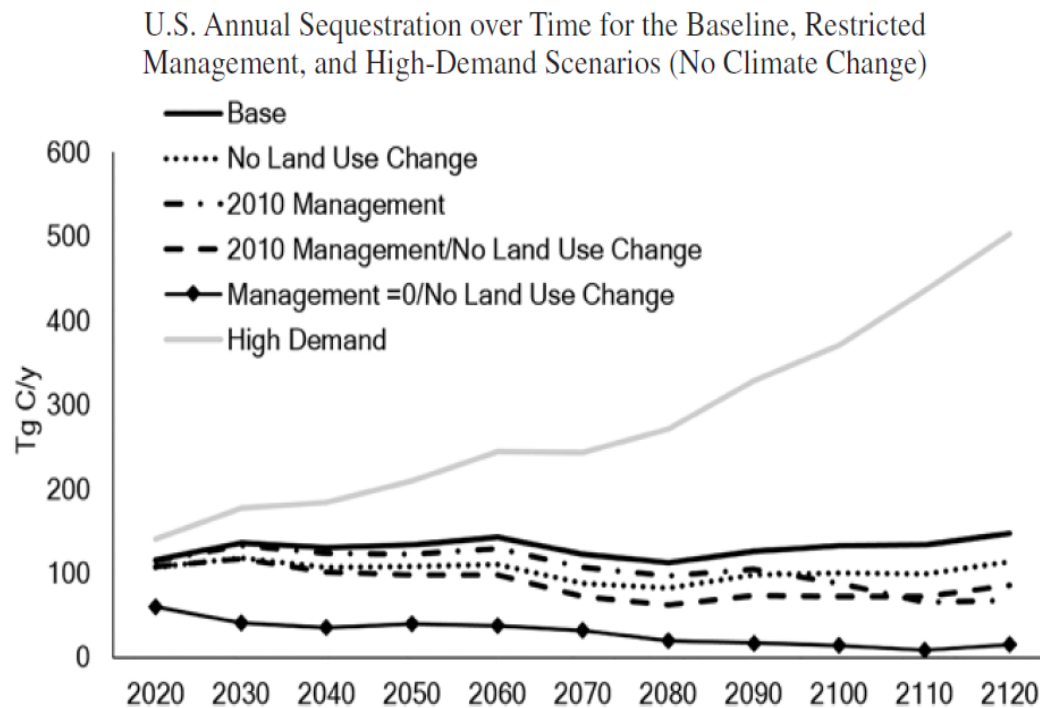  - No conversion of highly biodiverse areas

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# Global ag. and forest sector model
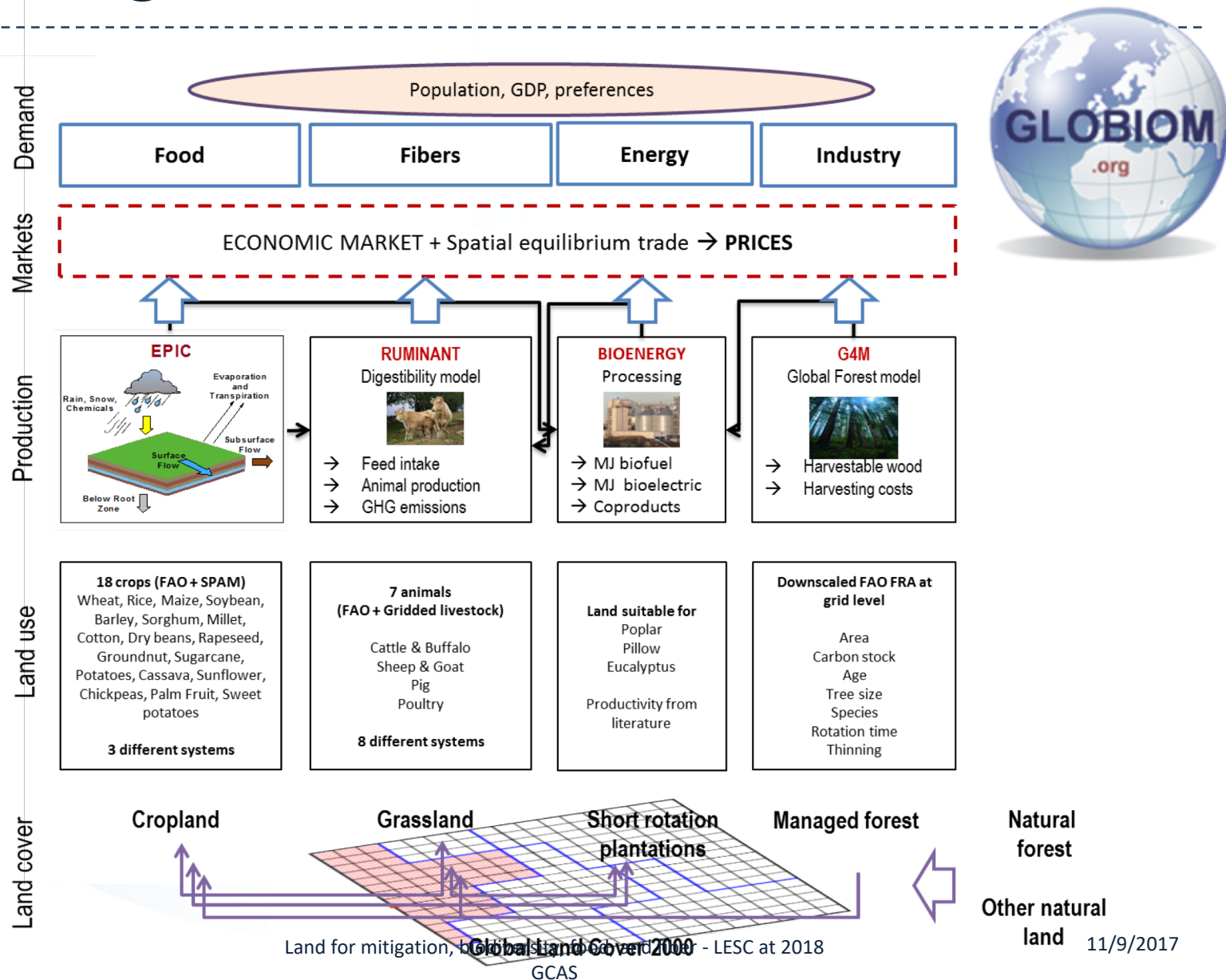
# Why partial equilibrium modeling?

‣ PE land use models are well suited for projections, policy,

and environmental change analysis

‣ Capture spatial and temporal dependencies between managed resource systems, markets, and policy drivers.

‣ Not accounting for endogenous land management considerations and market feedback can bias projections results

U.S. Annual Sequestration over Time for the Baseline, Restricted Management, and High-Demand Scenarios (No Climate Change)



Source: Tian, X., Sohngen, B., Baker, J. S., Ohrel, S. B., & Fawcett, A. (2018). Will U.S. forests continue to be a carbon sink? *Land Economics 94*(1), 97–113. DOI: 10.3368/le.94.1.97
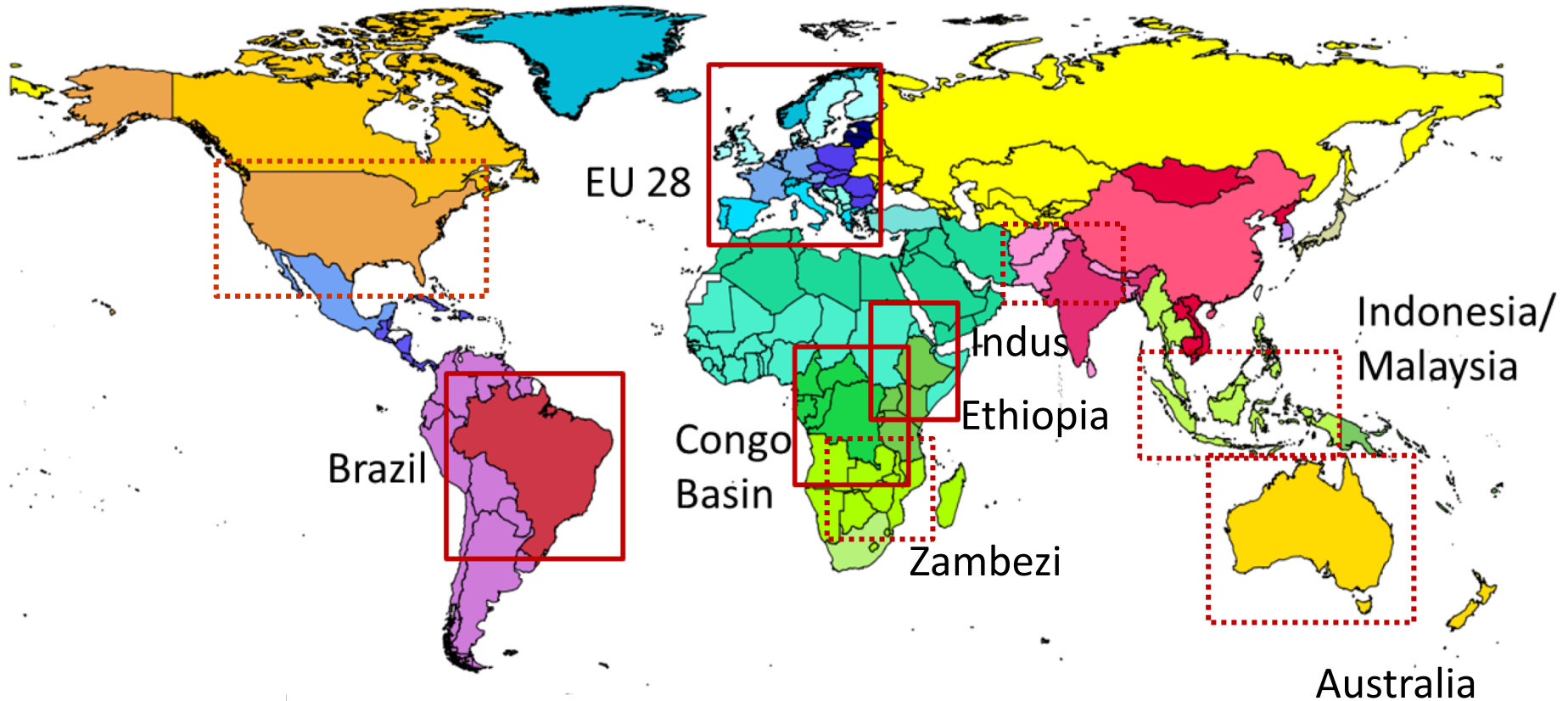
# Reflecting spatial heterogeneity in land use models

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‣ New tools are emerging that offer both spatial detail and advantages of structural modeling

  ‣ E.g., LURA modeling system (Latta, Baker, Ohrel, 2018) connects forest resource base to mills and ports through transportation nodes
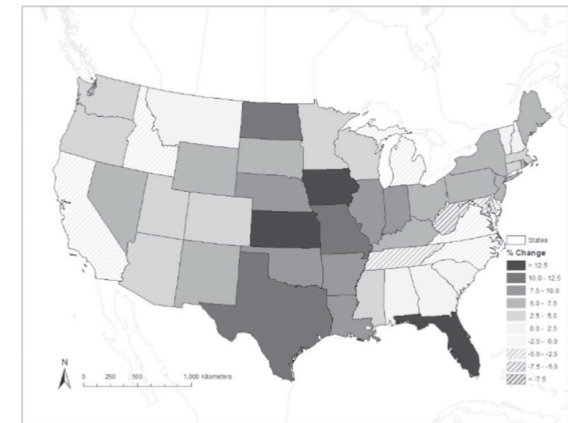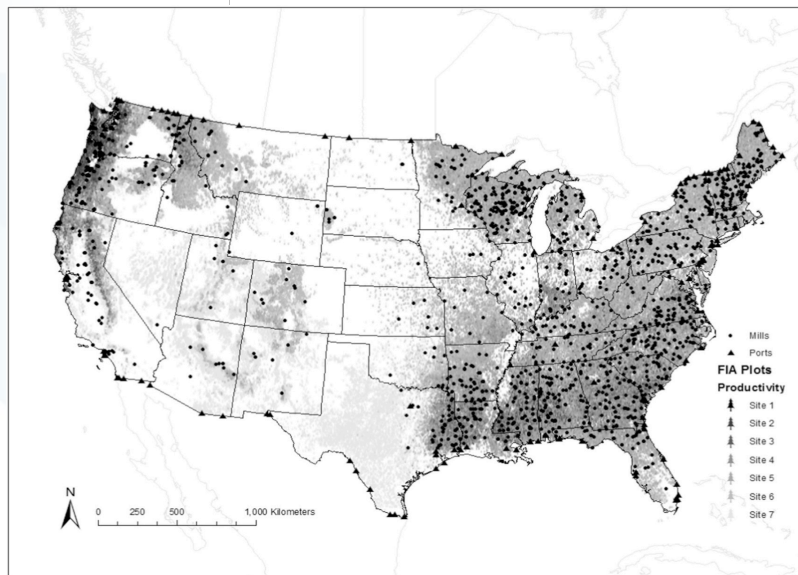




National modeling system but can inform state-level analyses
- *(figure shows state level carbon stock changes between 2025 and 2035)*

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# GLOBIOM: From global to local



EU 28

Indus

Ethiopia

Congo
Basin

Zambezi

Brazil

Indonesia/
Malaysia

Australia

# New Generation of Models

▸ Ability to assess trade-offs across multiple SDGs

▸ Spatial integration of models: From regional to global
  ▸ Improved reflection of spatial heterogeneity and temporal scale issues

▸ Spatial integration of models: From global to regional
  ▸ Connections between local resource management frameworks and global socioeconomic systems incl. market feedbacks

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# Thank you!

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