Global-to-local: Perspectives on global change drivers and implications for the southern forest sector

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Collaborating Institutions:

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Global Forces, Local Resource Management Decisions

- Global change drivers include *gradual* factors:
  - Environmental change
  - Socioeconomic developments
  - Emerging market growth
  - Paradigm-shifting technology developments

Global Forces, Local Resource Management Decisions

- How do local resources managers adapt to gradual global change drivers?

  – Adaptive management to new market/policy realities ***(recursive dynamic)***

  – Expectations ➔ management today is a function of where we *think* we'll be in the future ***(intertemporal)***

    - Markets, productivity change, etc.

Global Forces, Local Resource Management Decisions

- Could also include *instantaneous* exogenous or unanticipated factors:
  - Pandemics
  - Armed conflict
  - Trade disputes

Global Forces, Local Resource Management Decisions

- How do local resources managers adapt to **gradual** global change drivers?
  - Expectations => management today is a function of where we *think* we'll be in the future
    - Markets, productivity change, etc.
    - Subject to local resource constraints, institutions

Global Forces, Local Resource Management Decisions

- How do local resources managers adapt to **_instantaneous_** global change?
  - Adaptive management ➔ adjustments to unanticipated exogenous change
    - Management change subject to lag effects
    - Decisions post-event can have recourse

Local modeling perspective

- Local scale analyses (and some regional frameworks) are based on exogenous factors
  - Prices, input costs, land rents
    - Based on global market conditions
- We can use Monte Carlo to quantify ROI for a stand
  - But when we scale up… the cumulative effect of management changes affect markets, creating market feedback
  - Need to understand changing relative comparative advantages under global change

Global modeling perspective

- Modeling global systems can miss nuance of local factors
  - Resource conditions
  - Institutions
  - Infrastructure
  - Etc.

Global Modeling Perspective

- Recent advances by the global FSM community in modeling future "pathways"
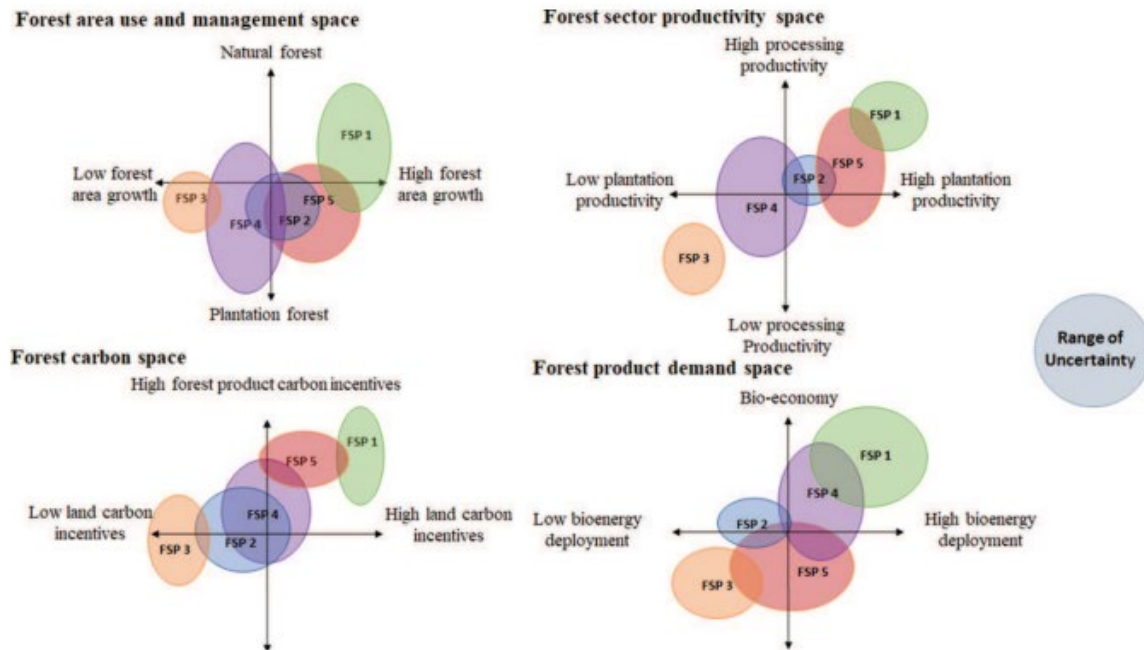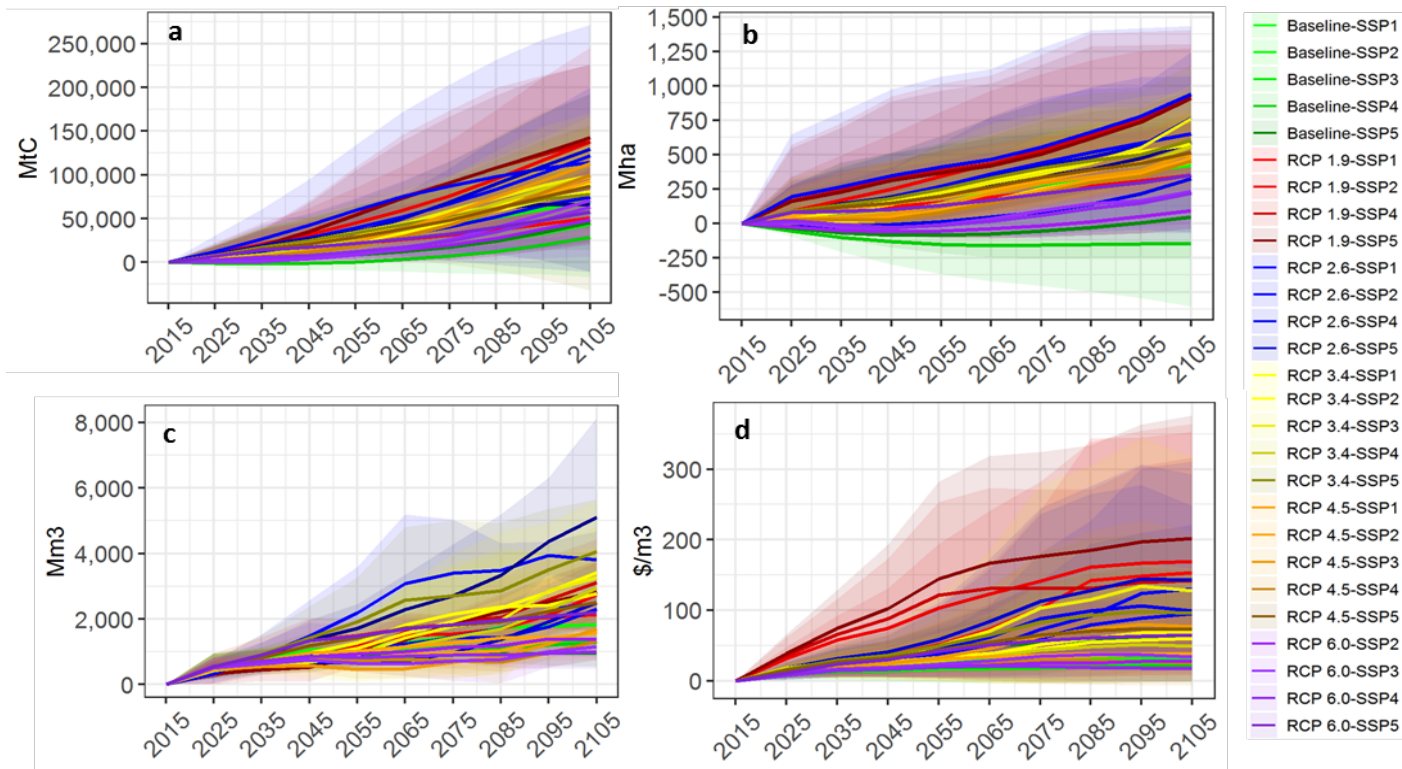

Figure 3: Relationship of key elements in Forest Sector Pathway (FSP) narratives.

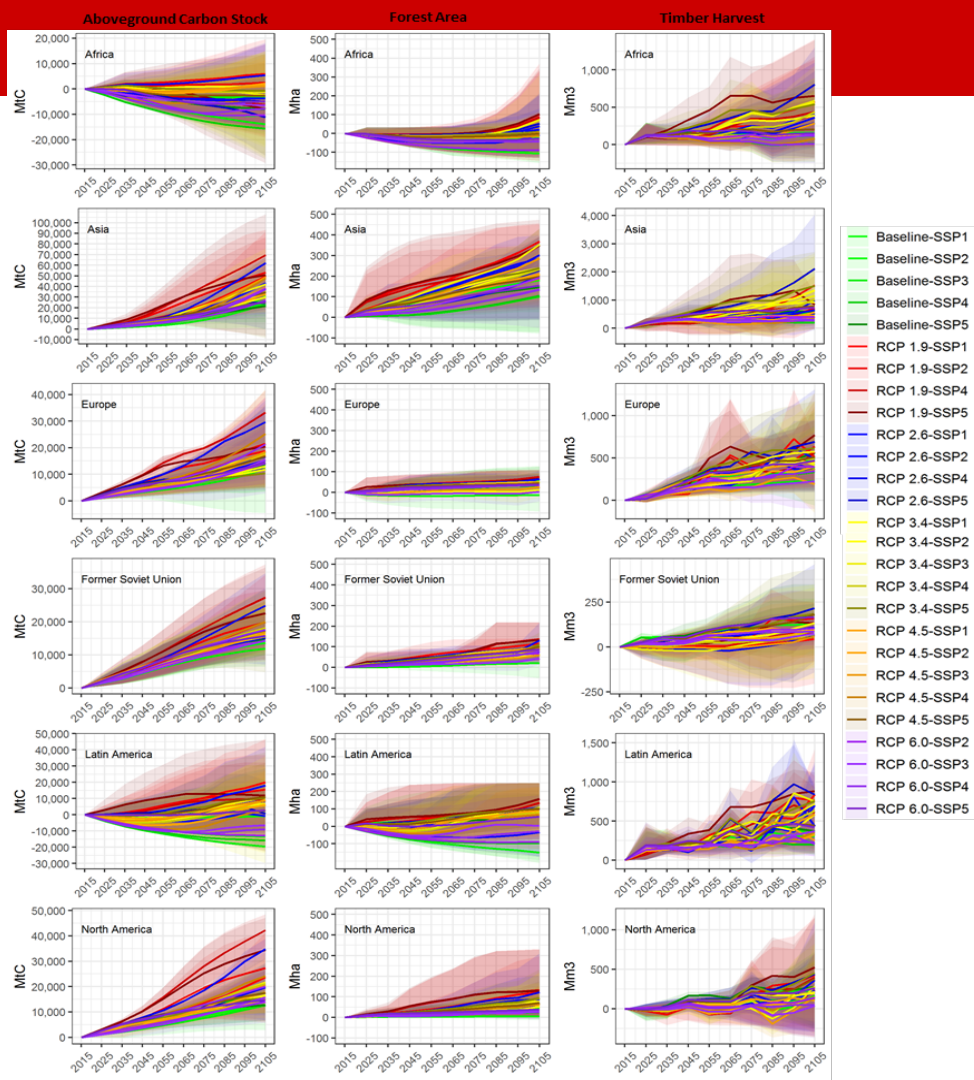Source: Daigneault et al. 2019

Global Modeling Perspective

Source: Daigneault et al. 2019

For-MIP Results

- We're seeing common themes in directionality of global results.
    - What about regional outputs?

Wider variation in regional outputs

Why the divergence at regional scale

- Global models have different criteria for optimizing spatiotemporal distribution of land use/harvests
- Global models may not capture nuance of local/regional systems
  - What is the solution?
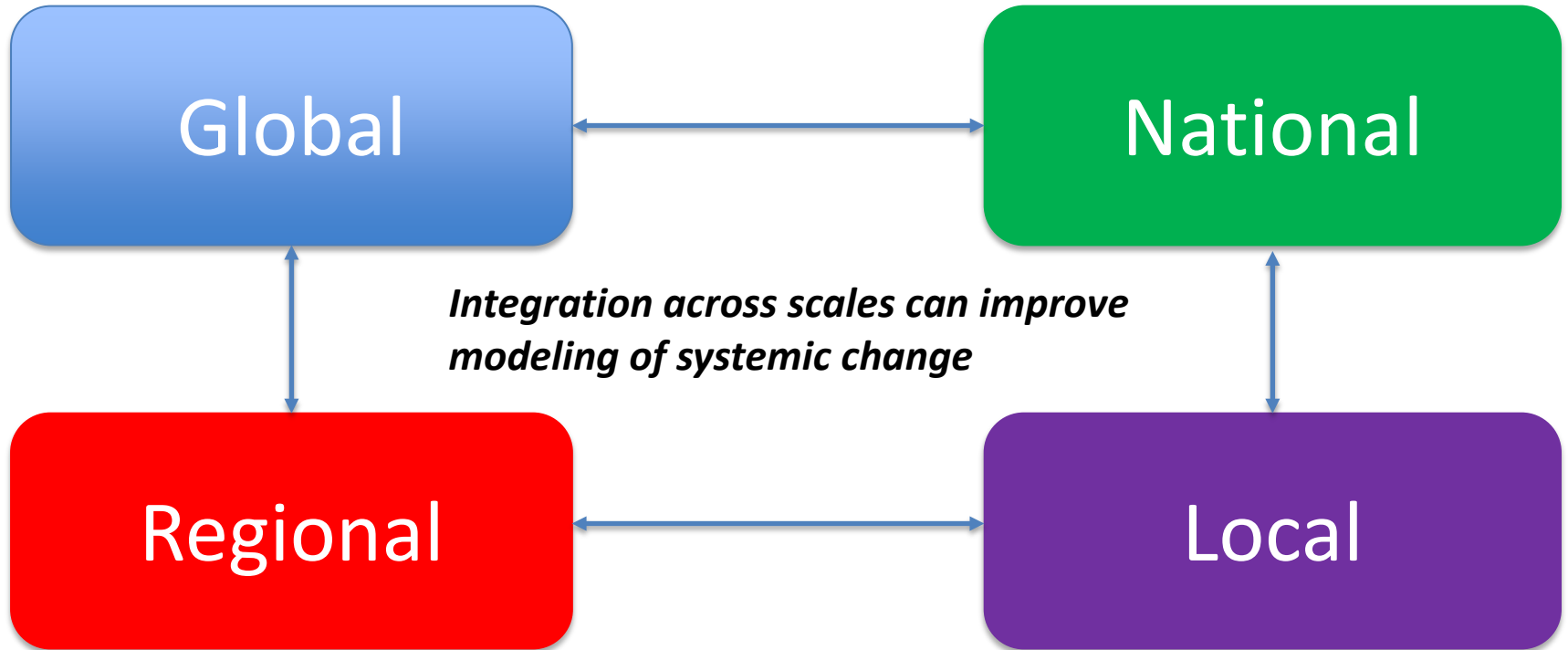
Multi-Scale Modeling

Global

National

Modeling at different spatiotemporal scales offers flexibility in analysis of policy and investment options
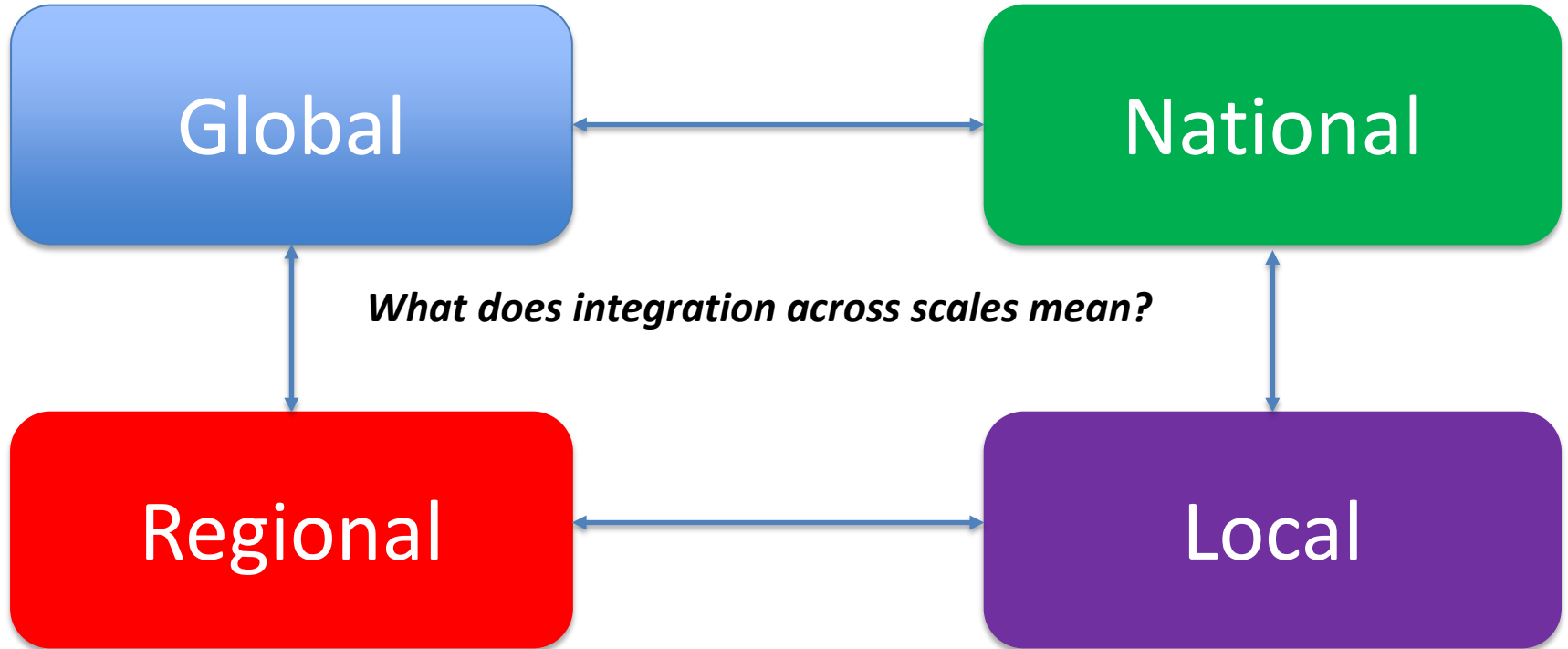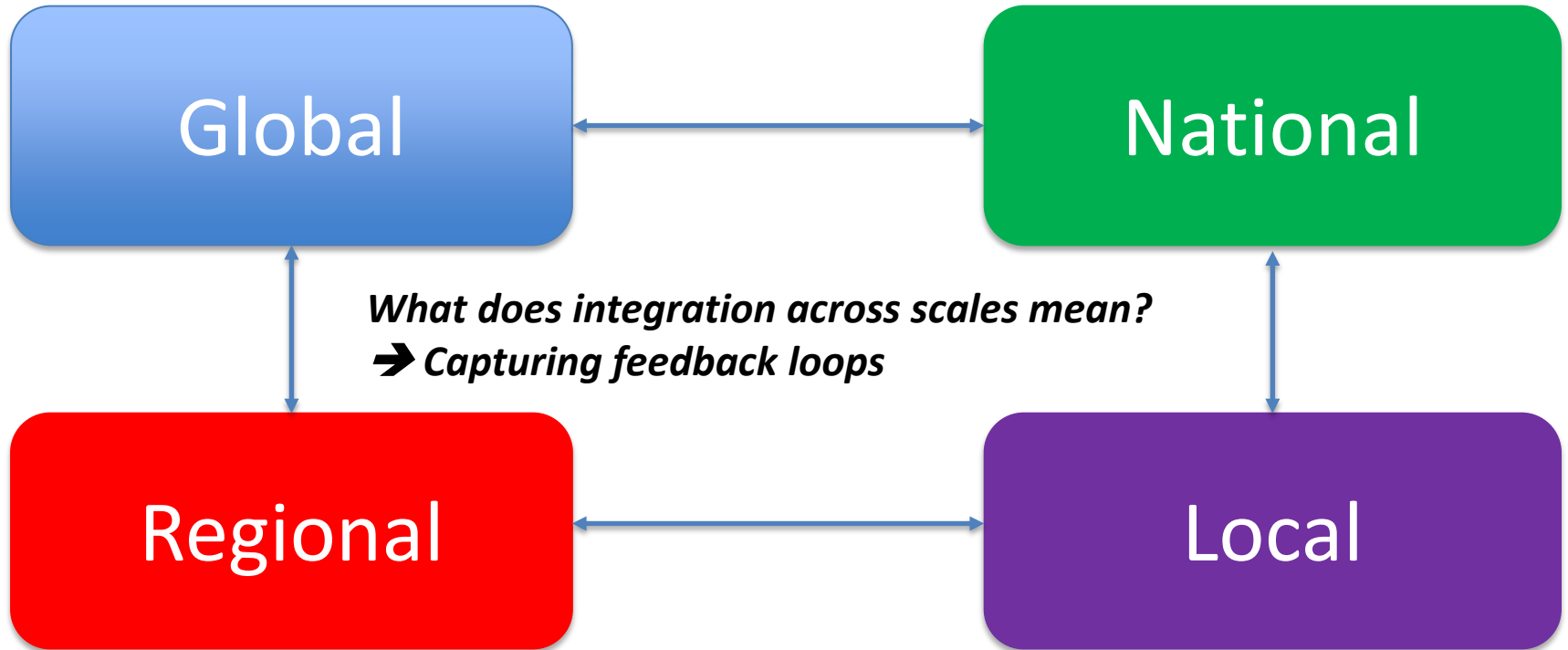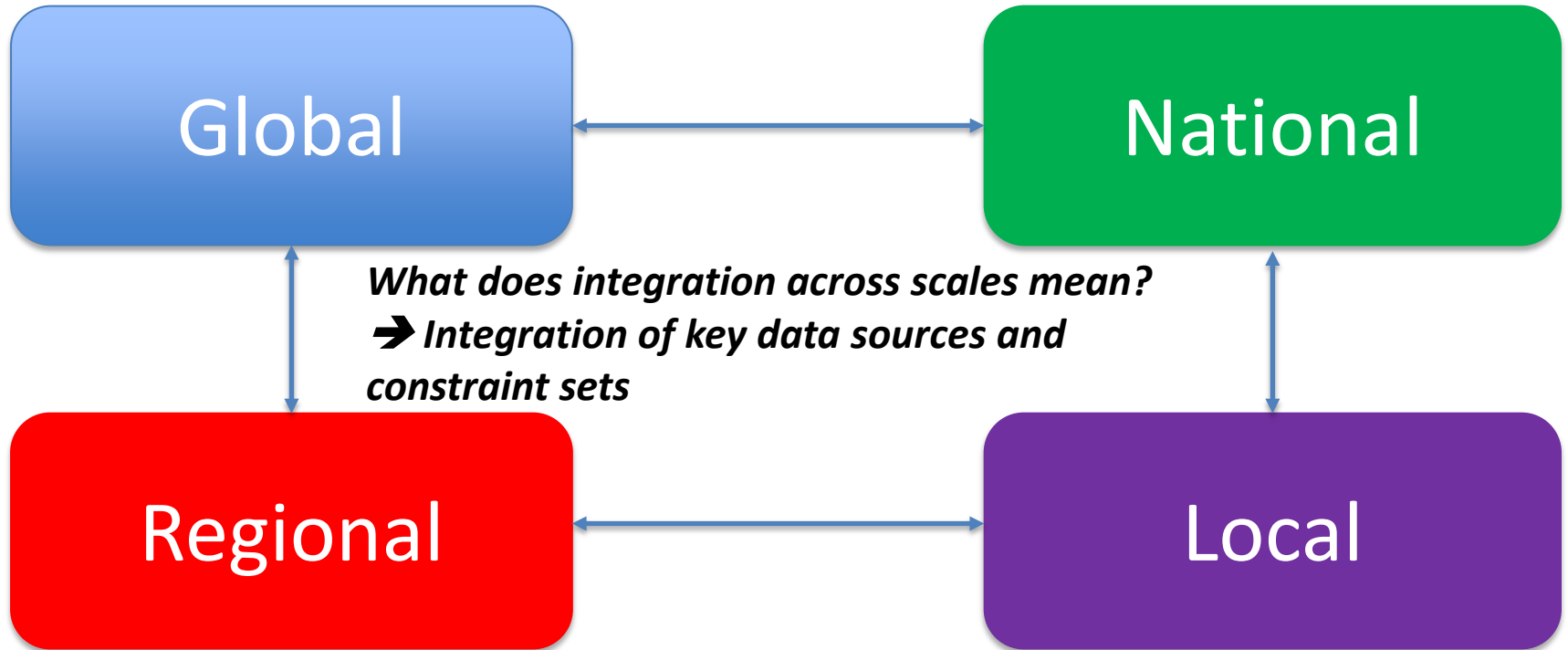
Regional

Local

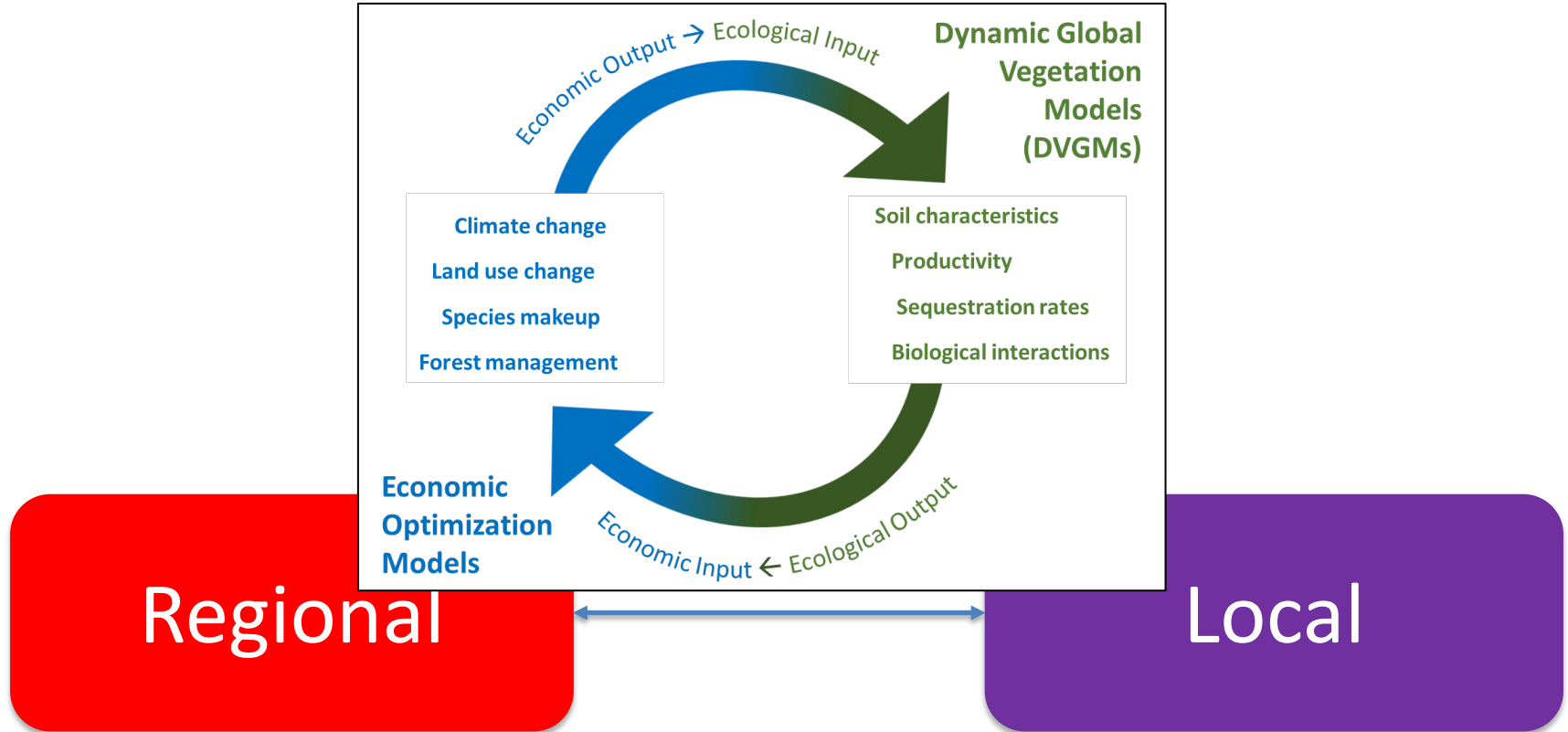# Multi-Scale Modeling

Multi-Scale Modeling

Integration across Scales

- What is SOFAC's role?
  - Continue improving representation of southern forestry
  - Participation in multi-model assessments
  - Model integration efforts
    - Iterative processes across scales to achieve "convergence" in market outputs

Integrating Spatially Explicit Process and Economic Modeling

(with Tom Gower, Madisen Fuller, Bob Abt, Maniswini Ganjam)

Economic Output → Ecological Input

Dynamic Global Vegetation Models (DVGMs)

Climate change

Land use change

Species makeup

Forest management

Soil characteristics

Productivity

Sequestration rates

Biological interactions

Economic Optimization Models

Economic Input ← Ecological Output

Regional

Local

Closing Remarks

- Markets and environmental change forces matter when modeling policy and market change

- Economic models reflect market opportunity costs of mitigation and facilitate tradeoff analysis

- Integration across scales and disciplines can improve modeled assessments

Global

National

Integration across scales can improve modeling of carbon policies

Regional

Local
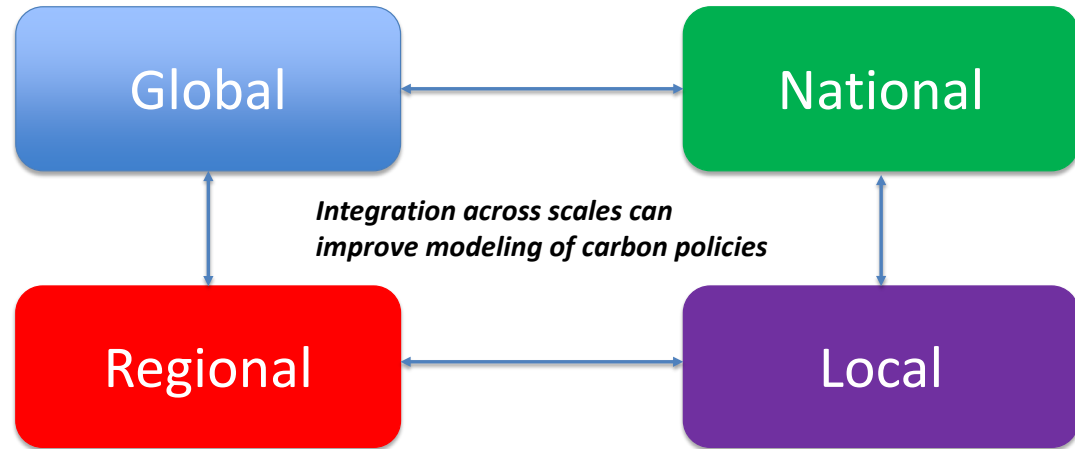
Thank You!

- Questions?
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