

What we have learned from CMIP5?

Questions for CMIP6?

Proposal for a Land-Use Model Inter-comparison Project  
(LUMIP)

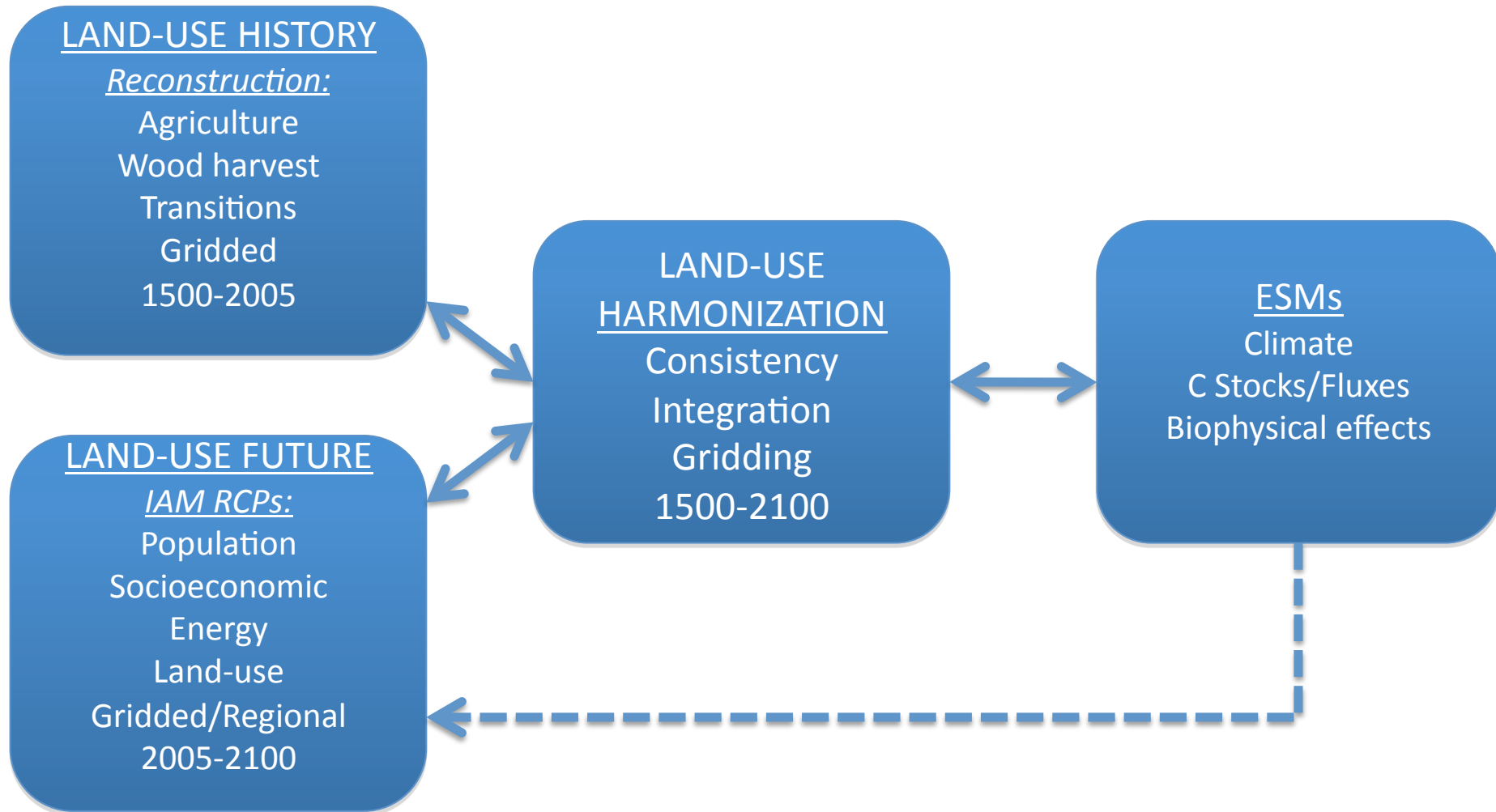
George C. Hurtt

Professor & Research Director  
Department of Geographical Sciences  
University of Maryland

# Questions (CMIP5)

- What are the combined biogeochemical and biogeophysical effects of land-use change on Earth System dynamics (past-future)?
- How can data from multiple time periods, sources, quantities etc. best be combined into a common coherent product to satisfy community modeling needs?

# Proposed Land-Use Scheme (CMIP5)



# What we learned (CMIP5)?

- Enabled first global model projections of both CO<sub>2</sub> and climate including land-use effects
- Land-use effects on global climate are generally modest relative to FF, but still important
- Land-use transitions are needed for accurately tracking land cover change resulting from land-use change
- Land-use effects are complex and challenging to diagnose
- Different models implemented standardized land-use data sets differently
- Potentially important impacts, management practices, biophysical effects, policy options, uncertainties, and feedbacks not adequately accounted for in current design
- Substantial opportunities exist to build on CMIP5 approach and improve data and models for CMIP6

# Priorities for CMIP6 (Land Use)

1. Repeat and mature the LUH process (more data, more terms, increased resolution, longer period, better communication)
2. Work to standardize products, and usage of products
3. Focus: links between LU change, LC change, C fluxes, Biophys.
4. New emphasis: LU management, policy relevance, uncertainty
5. New scenarios: Esp. with added normative considerations
6. Expand RCP-RF definition to include biophysical
7. Joint harmonization of LU emissions and LU changes
8. Diagnose ESMs, IAMs, and IAVs to quantify effective data requirements (resolution, precision, etc)
9. Prepare for fully coupled human-physical models
10. Consider LUMIP

# LUMIP Science Questions

- What are the effects of land use and land-use change on climate (past-future)?
- What are the effects of climate change on land-use and land-use change?

\*Additional detailed science questions to get at process level attribution, uncertainty, data requirements, etc.

\*Particular focus on uncertainty, and separating effects of: fossil fuel vs. land use, biogeochemical vs biophysical, land cover vs land management.

# LUMIP Major Activities

- **Model metrics and diagnostics:** A set of metrics will be developed to quantify model performance with respect to land use. A diagnostic protocol will also be developed to quantify related model sensitivities.
- **Data standardization:** LUMIP will coordinate an enhanced standardized land-use data set for CMIP6 model experiments, passing the maximum amount of common information between relevant communities (Historical, IAMs, ESMs).
- **Model experiments:** Central to LUMIP will be the development of an efficient model experiment designed to isolate and quantify land-use effects.

# Participation and Relationship to Other MIPS

- Participation in LUMIP will be open
- LUMIP will be coordinated by a small interdisciplinary and engaged working group, report to CMIP6 panel, and linked to other satellite MIPS
- LUMIP will have a unique focus on the role of land-use on climate
- LUMIP will work with other related MIPS and activities including: AGMIP, C4MIP, Trendy, GLP, iLeaps, etc.



# LUMIP Timeline

- 2013 Summer: Concept
- 2013 Fall: CMIP Proposal, WGCM Briefing
- 2014 Spring: GLP Meeting, Workshop 1
- 2014 Summer: Aspen Workshops
- 2014-2017: Diagnostics, new scenarios, new data sets, experimental design
- 2018-2019: Model results and synthesis
- 2020: WG1 AR6 Report published