Workshop: Linking Earth System Dynamics and Social System Modeling, 23-25 May 2016, Boulder, Colorado

***** Draft Agenda *****

Aim. To bring together a diverse group of researchers from multiple disciplinary backgrounds to push forward the boundaries of global-scale, coupled social and biogeophysical modeling. The workshop will be used to develop a strong research plan and timetable for the integration of human systems models with Earth system models. This will be based on establishing a distributed network of researchers with the cross-and trans-disciplinary skills to implement this ambitious project. The workshop will begin the process of developing a joint modeling effort that represents the effects of human activities on environmental change in better ways than is done currently.

Purpose: To assess the intellectual, informatics, and material resources needed to develop global models of human systems dynamics and couple them with models of Earth system dynamics in order to further understanding of the interactions and feedbacks within the integrated human-environmental system that dominates the globe today. Coupled human and Earth system models will help us better understand and anticipate consequences of changes in both social and natural drivers of coupled social/natural systems (e.g., climate, policy changes, etc.). This workshop will establish an interdisciplinary scientific network with the expertise needed to build integrated Human-Earth System Models (HESMs) to carry this initiative forward.

Outcomes: A three year research plan and timetable to identify the most tractable components for modeling of the coupled human-Earth system that can be scaled up from the local to the global. In addition, further development of a US national center for advanced social informatics and analytics.

Output: Recommendations for modeling priorities and resource needs, and a new community of modelers of global-scale coupled human and Earth system models.

Monday 23 May (9h-17h30)

Session 1 (Kathy Galvin): Welcome and introductions (9h-10h30)

Welcome and about the workshop + Q&A, Kathy Galvin & Mark Rounsevell (20 min + 10)

Introduction to the participants: tour de table (10 mins)

Community Surface Dynamics Modelling System (CSDMS), Focal Research Groups (FRGs), funders, white paper, James Syvitski (5 mins)

The Human Dimensions FRG, Kathy Galvin (5 mins)

Scene setting talk 1 (15 min + 5): Perspectives from Future Earth (either Mark Stafford Smith via Skype or Josh Tewksbury)

Scene setting talk 2 (15 min + 5): The Network for Computational Modeling for SocioEcological Science (CoMSES Net), Michael Barton

Scribe; Rapporteur

Coffee break (10h30-11h)

Session 2 (Michael Barton): where are we now? An overview of current major global modelling types (11h-12h30)

An overview of current global human dimension methods: Land use and land cover change models, Peter Verburg, GLP (15 min + 5)

An overview of current global human dimension methods: integrated assessment models, Brian O'Neill, NCAR (15 min + 5)

Recent developments in Digital Global Vegetation Models (DGVMs): C/N dynamics and crops yields, Almut Arneth, KIT (15 mins + 5)

The spectrum of Earth system dynamics models, James Syvitski (15 min + 5)

General discussion: what we do well now and what could we do better? (10 mins)

Scribe; Rapporteur

Lunch (12h30-14h)

Session 3 (Mark Rounsevell): where are we now? Examples of specific modelling approaches (14h-15h30)

Agent-Based Modelling of rural and urban land systems at the landscape scale, Dan Brown (15 min + 5)

The human dimensions of reconstructing past land use and land cover change, Jed Kaplan (15 min + 5)

Global scale agricultural systems: the role of diet, trade and food waste, Peter Alexander (15 min + 5)

General discussion: what do we do well now and what could we do better? (30 mins).

Scribe; Rapporteur

Coffee break (15h30-16h)

Session 4 (Marco Janssen): where are we heading? (16h-17h30)

How can social science methods be scaled to the global level? A.N. Other (15 min + 5)

Extending ABM approaches to national and continental scales, Mark Rounsevell (15 mins + 5)

Massive Agent-Based Models, Rob Axtel (15 mins + 5)

General discussion: what can we learn from these and other approaches? (30 mins)

Scribe; Rapporteur

Tuesday 24 May (9h-17h30)

Session 1 (Mark) Identifying key issues/questions (9h-10h30)

Recap and introduction to the day (15 mins), Kathy, Mark

Facilitated session on emerging issues/questions for discussion: collecting ideas, clustering and prioritizing these and planning the subsequent breakout sessions (75 mins)

Some possible issues/questions include:

1. Coarse-graining/scaling social processes to tractable scales for global modelling. What ARE tractable scales? Maybe they are not so coarse.
2. What aspects of human systems give the most ROI to start with? What are the low hanging fruit? Possibilities include landuse and its impact on land cover, GHG emissions, energy use, water use, health and epidemiology. What about economic markets? These are generally treated at national or supranational scales. Is there a benefit to downscaling this to 1 degree or less? Not sure.
3. To what extent do we want to model human systems components as emergent properties that respond to ESMs vs. researcher-specified parameters to set up and run experiments of different socio-ecological scenarios?
4. What modelling frameworks/"formalisms" are most useful for integrating with ESMs? My guess is CA of some kind. Are there other candidates? Should mobile agents be considered, at least for some things? Stick with a single global framework or integrated different ones for different aspects of human systems (e.g., like atmosphere, land, ocean models)?
5. How can human systems models be coupled with earth systems models? Currently, there are some human systems components embedded into the land models of ESMs. But these are generally static. Should they be pulled out and moved to a HSM? Can we have couplers (or APIs) that allow a community human systems model (CHSM) be coupled to different ESMs like CESM, ACME, Hadley, etc?
6. How best can we represent social processes in models that emerge from individual behaviour and choices?

Coffee break (10h30-11h)

Session 2 Discussion of key issues/questions (11h-12h30)

Break out groups on 3-4 key issues/questions (chairs to be nominated in Session 1)

Lunch (12h30-14h)

Session 3 Discussion of key issues/questions (14h-15h30)

Break out groups on a further 3-4 key issues/questions (chairs to be nominated in Session 1)

Coffee break (15h30-16h)

Session 4 (Kathy) Outcomes of discussions on key issues/questions

Brief report back from each breakout group (45 mins: ca. 5 mins each)

General discussion on outcomes and setting research priorities (45 mins)

Weds 25 May (9h-12h30)

Session 1 (Michael) Developing a research plan, the distributed network and the timetable (9h-10h30)

What we need, e.g. resources, person power, infrastructure, meetings. What kind of social/technical infrastructure is needed to develop and maintain a CHSM? Some things might include: versioning server(s), software engineering, organization to vet code and decide what does and does not get into CHSM, organization to oversee integration with ESMs and decide which experiments are run

Financing: what do we have now? What do we need in the future? What are the funding sources?

Establishing a network of researchers (communication and interaction)

Scribe; Rapporteur

Coffee break (10h30-11h)

Session 2 (Kathy/Mark) Planning continued with wrap-up and actions (11h-12h30)

Discussion on BC21 and CSDMS 3

The research plan and timetable

Actions: who does what and when?

Close of workshop

Scribe; Rapporteur

Lunch and depart (from 12h30)