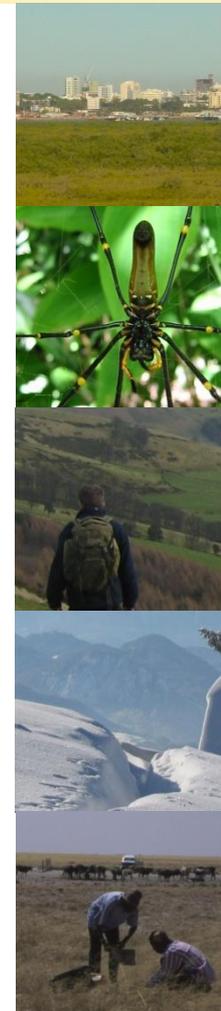


NASA- LUCC-Panel: Future Directions for Land Cover and Land Use Research

Anette Reenberg,
GLP chair
Professor, Department of Geography and Geology,
University of Copenhagen



My key points

- Where has the land change science shown significant progress
- What do we – as a community - have to offer in relation to the current ICSU visioning process for GEC research
- A couple of thoughts about needs for conceptual advancements

Recent advancements examples from GLP-OSM



- Refinement of global data sets - monitoring
- Advancement in modeling land use
- Emerging, interesting work on synthesis of case-studies
- Effectively linking the land system and ecological communities

What has been less well covered

- Exploration of tradeoffs and conflicts among different land uses across space and time
- Land use/cover impacts of the accelerating interconnectedness of human activities over the globe (have created systems prone to failure?)
- The role of land use intensification for sustainable pathways
- Integrated approach to assess land requirements for various societal and ecosystem needs.

ICSU visioning for GEC science

The LUCC community has a relevant focus



Themes from the GLP Science Plan

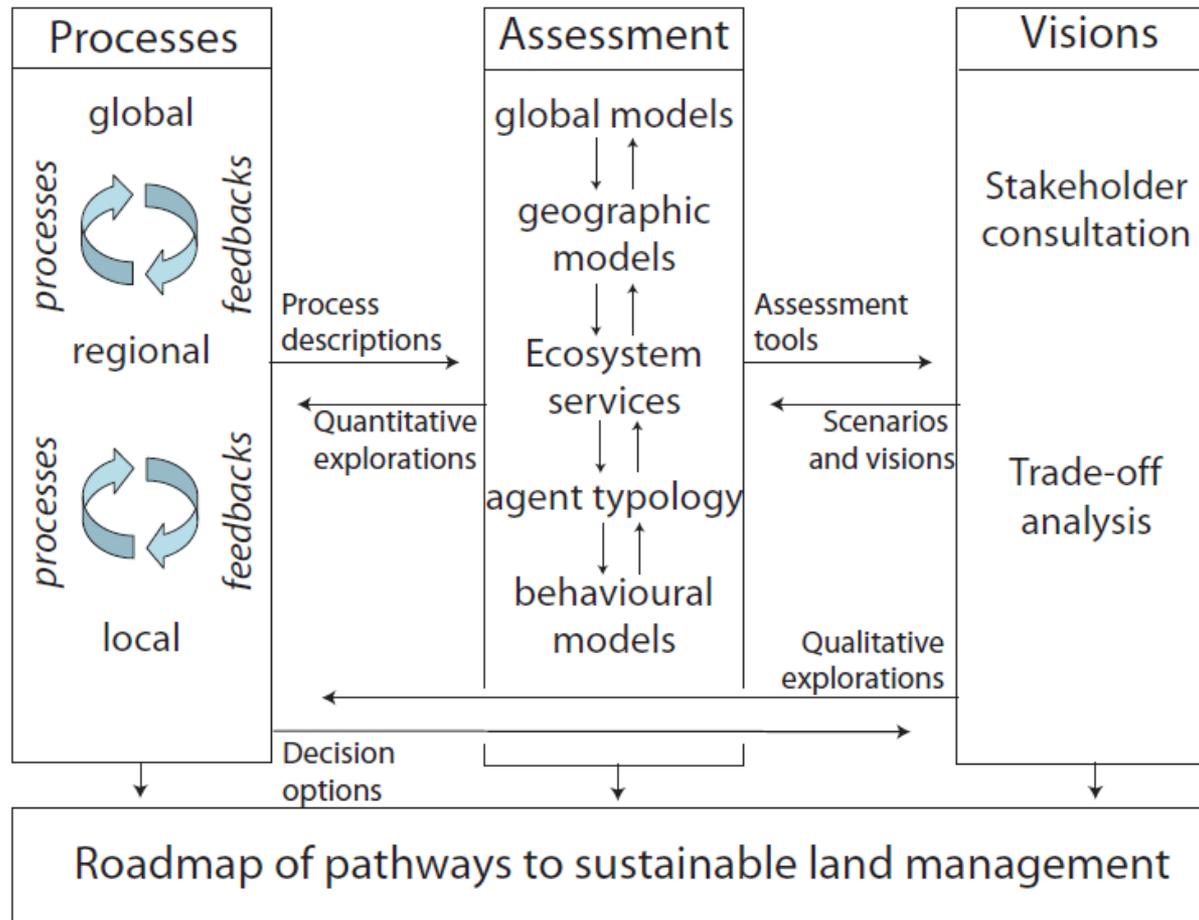
- **Dynamics of land-systems** (including e.g. globalisation effects, management effects on biogeochemistry)
- **Consequences of land-system changes** (including e.g. critical feedbacks to earth system from ecosystem change, ecosystem services and links to human wellbeing and responses)
- **Integrating analysis and modelling for land sustainability** (including e.g. critical pathways of change, dynamics of vulnerability and resilience, institutions and governance for sustainability)

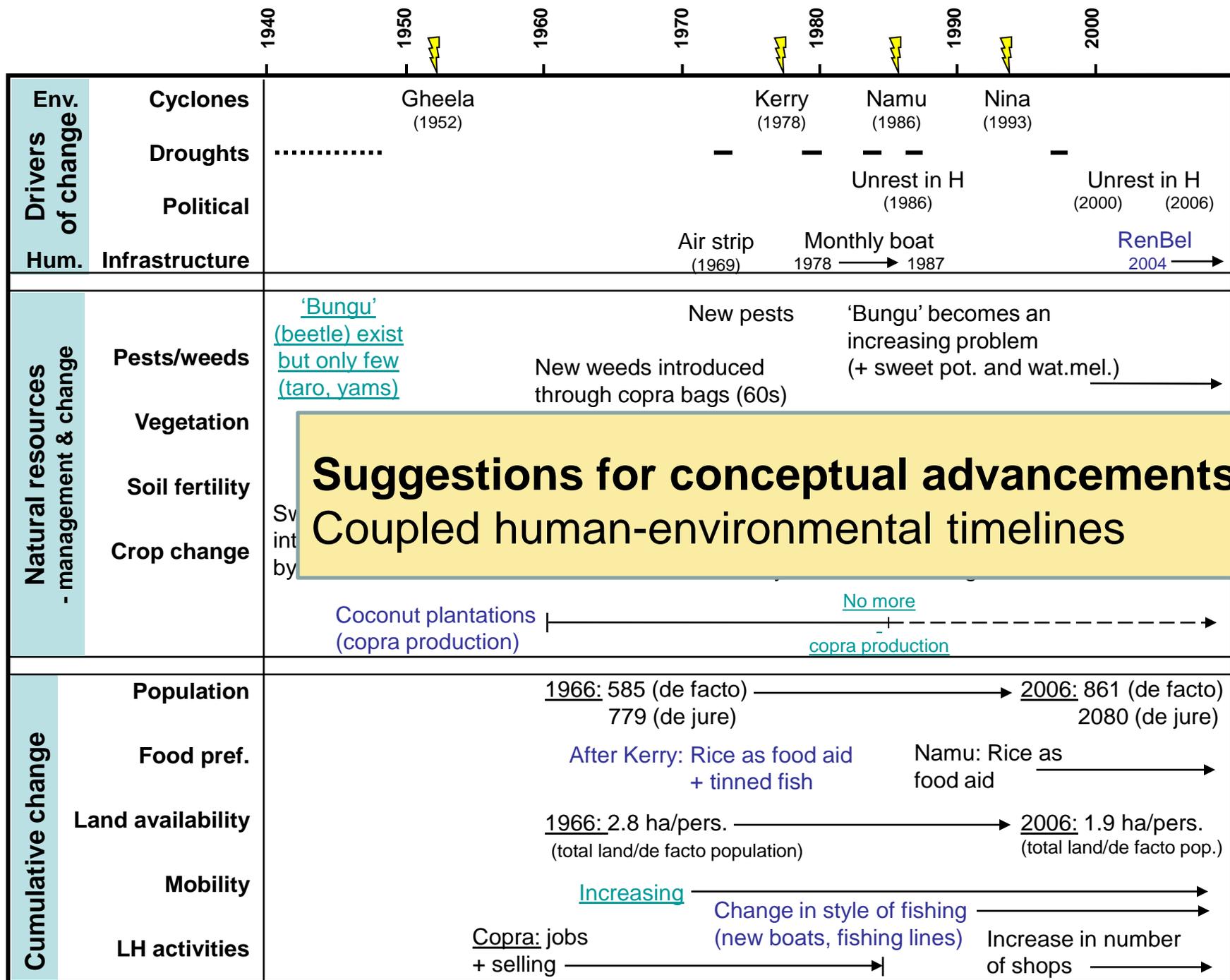
Some priority questions from ICSU Grand Challenges in Global Sustainability Research:

- 1.1. What significant **environmental changes** are likely to result from human actions, how would those changes **affect human wellbeing, and how are people likely to respond?**
- 1.2. What threats does global environmental change pose for vulnerable communities and groups and what responses could be most effective in reducing harm to those communities?
- 2.1. **What do we need to observe in coupled social-environmental systems**, and at what scales, in order to respond to, adapt to, and influence global change?
- 3.2. How can we **identify, analyze and track our proximity to thresholds and discontinuities** in coupled social -environmental systems? When can thresholds not be determined?
- 4.1. What **institutional structures** are effective in balancing the trade-offs inherent in social environmental systems?



Suggestions for conceptual advancements I: linking process, assessment and policy

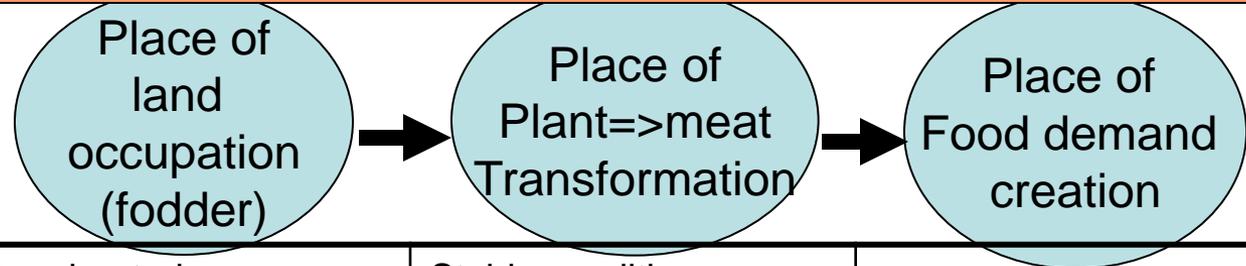




Suggestions for conceptual advancements III: land transformation chains - teleconnections

Food production systems (and decision making) are increasingly spatially disconnected from their natural resource base as well as from the demand side of the production chain (i.e. the socio-economic drivers)

e.g. soy => pigs => porkchops!



Land use	Accelerated pressure Decoupling from local capacity/demand	Stable conditions Linked to local regulation rather than demand	
Ecosystem	Under pressure, e.g. Biodiversity, habitat, water,	Under pressure, e.g. Ground water pollution, Lack of incentives to extensivisation	Possible relief of pressure on local environment
Socioeconomic system – drivers	Economy, technology, institutions	Economy, institutions, Technology (transport/production)	Culture, taste, economy, population

Suggestions for conceptual advancements IV: Spatial structures, human drivers, ecosystem services

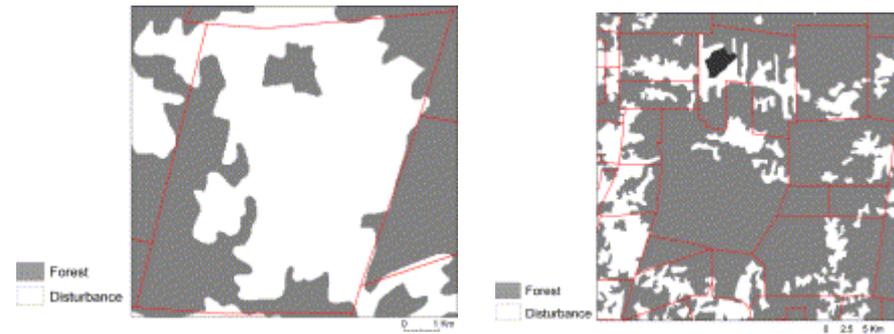
Turner defines 'land architecture' as

- **Kind**
- **Magnitude, and**
- **Spatial pattern**

of land uses and land covers in a bounded area

socio-cultural forces affect land access and resource use => hence shape the LA => implication for ecosystem services

Turner (2009). Land Use Policy



These attributes largely determines the capacity of the land system to deliver environmental (or ecosystem) services that are expected by society from the land use

- **Provisioning**
 - **Regulating**
 - **Supporting**
 - **Preserving**
 - **Cultural**
- (MEA, 2005)



IHDP

International Human Dimensions Programme
on Global Environmental Change



Hosted by Copenhagen University



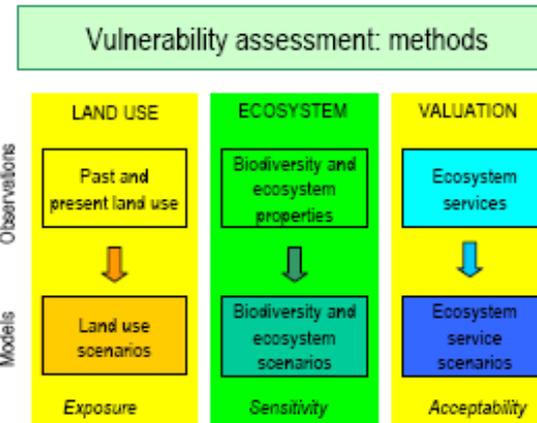
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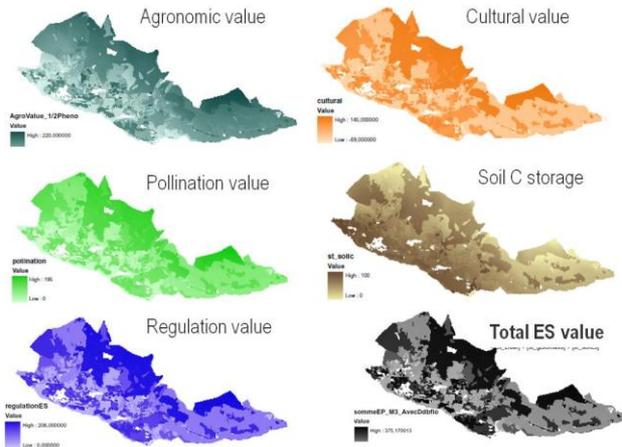
Ecosystem services: a way to integrate social and natural sciences



Step 4: Scenario outcomes projected by ecological models or through social surveys

Modelling evaluation: projection	Scenarios			
	A1	A2	B1	B2
Acceptability Outcome	-	-	+	+
post-card	-	0	0	+
agro-rural	-	0	0	+
heritage	0	0	0	0

Direct evaluation: interviews	Scenarios			
	A1	A2	B1	B2
Scenario Preferences	-	-	+	+
Post-Card	-	-	+	+
Agro-Rural	-	-	-	+/-
Heritage	-	-	+/-	+
Other socio-economic considerations	-	+	-	+
Overall	-	+/-	+/-	+



- Links between decision-making, ecosystem services and global environmental change define important feedbacks for human activities at the local and regional scale, and to and from the global scale.
- However, land system research has to cope with substantial multi- and interdisciplinary challenges to bridge the nature-society divide, including:
 - the behaviour of people and society,
 - the multi-level character of both decision makers and land units
 - the ways in which people and land units are connected to the broader world within which they exist
 - the aspect of time, both past and future