

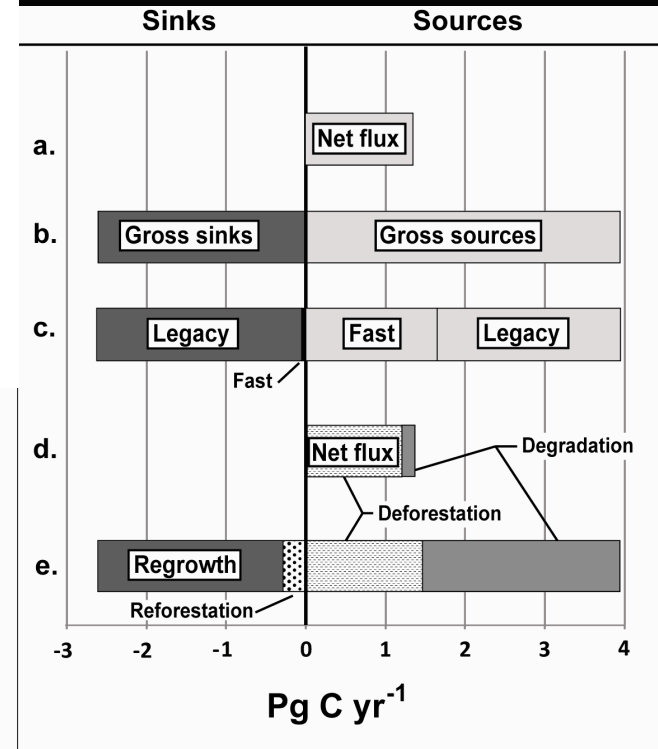
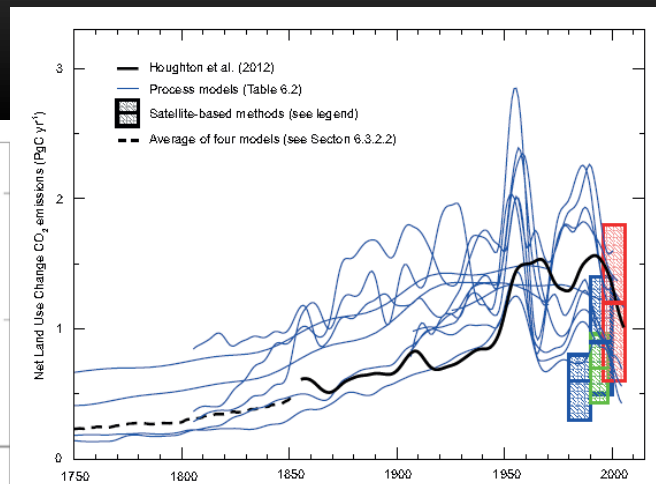
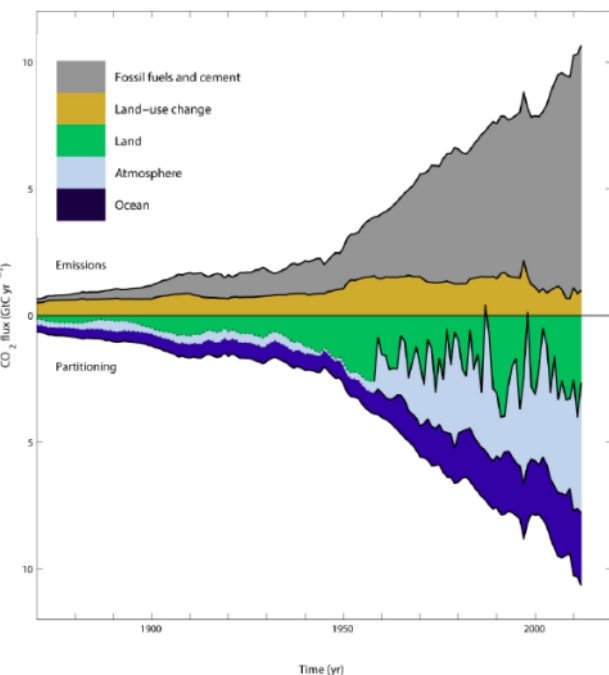
Land-use change: assessing the net climate *forcing*, and options *for* climate change mitigation and adaptation

- EU FP7 Integrated project
- 4 years, Nov. 2013 – Oct. 2017
- 15 Partners from 11 EU and 4 non-EU countries; total ca. 8 Mio €
- **Develops and supports a number of LUMIP/Scenario MIP-relevant activities (EU partners)**

Activities relevant for/contributing to LUMIP:

1) Contribute to **Trendy** (lead: U. Exeter), land-component of the historical terr. CO₂ balance.

→ Model development and improved assessment of LUC effects -- ongoing

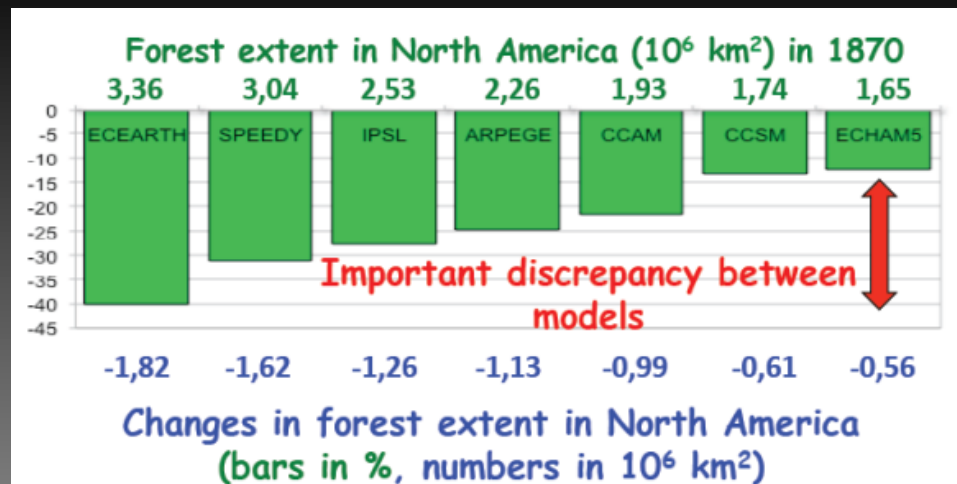
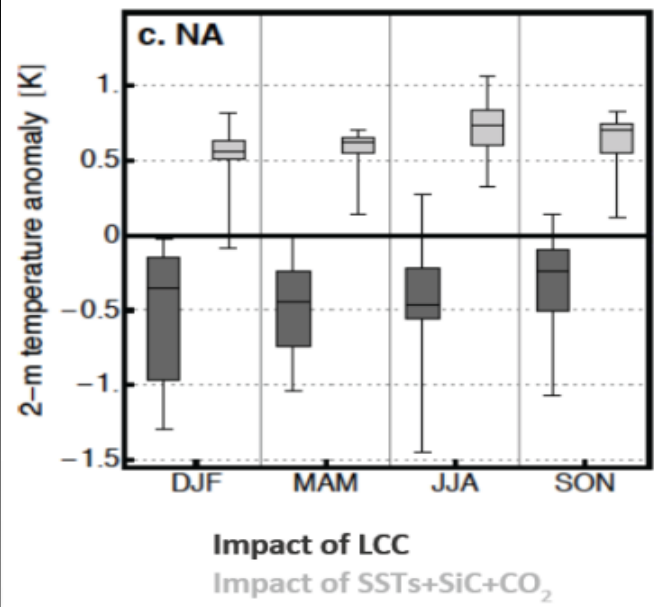


Activities relevant for/contributing to LUMIP:

2) Contribute to **LUCID** (co-lead: LSCE & U. Syd.); biophysical climate effects of LUC

→ Improved representation of LUC maps; development/test of idealised afforestation/deforestation scenarios; – ongoing

Mean REGIONAL Seasonal Change



Activities relevant for/contributing to LUMIP:

3) **ISI-MIP**/"forest sector" & **PLUME-MIP** („Trendy into the future“)

- *Assess terrestrial carbon cycle and vegetation responses to CMIP5 climate and CO2 projections*
- *Analysis designed to identify those processes that cause discrepancies between models*

Two Tiers;

1. Transient simulations forced by an ensemble of CMIP5 GCMs and RCPs + 1 historical WATCH simulation. All forcing daily (ISI-MIP phase 2 climate data)
2. Application of the Traceability Framework on a subset of the ensemble in 1.

$$\frac{dX(t)}{dt} = \text{INPUT} - \text{OUTPUT}$$

$$\frac{dX(t)}{dt} = BU(t) - \xi ACX(t)$$

X(t)=Carbon pool size

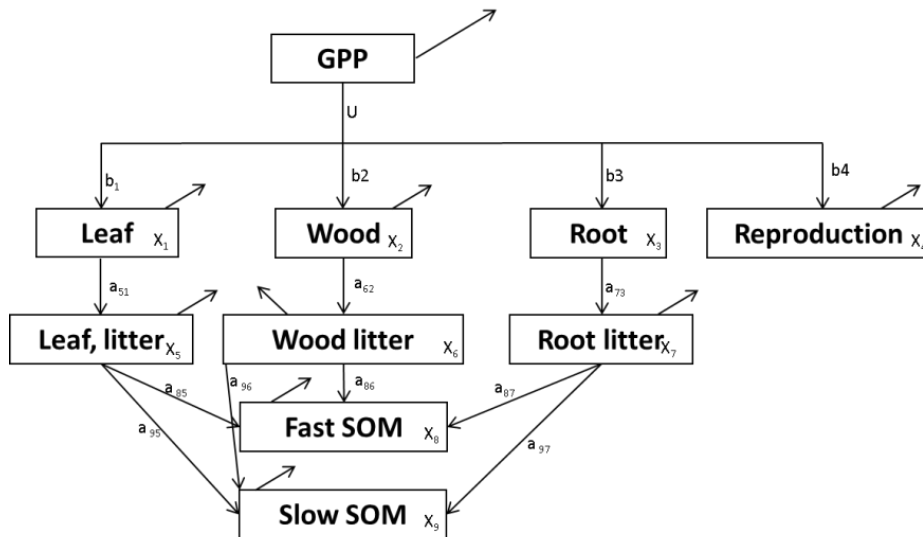
$\xi=(\xi_i)$ Environmental scalar, here soil C decay scalar.

A=transfer fractions, i.e. how much of litter is transferred to fast soil pool each year.

C=Turnover of Carbon pool, e.g. 1/2.85 for litter in LPJ-GUESS

B=Partitioning of NPP to plant compartments, should sum to 1!

U(t)=NPP.



$$\frac{dX(t)}{dt} = \xi ACX(t) + BU(t) = 0 \quad \Rightarrow \quad X_{ss} = (\bar{\xi}AC)^{-1} BU_{ss}$$

X(t)=Carbon pool size

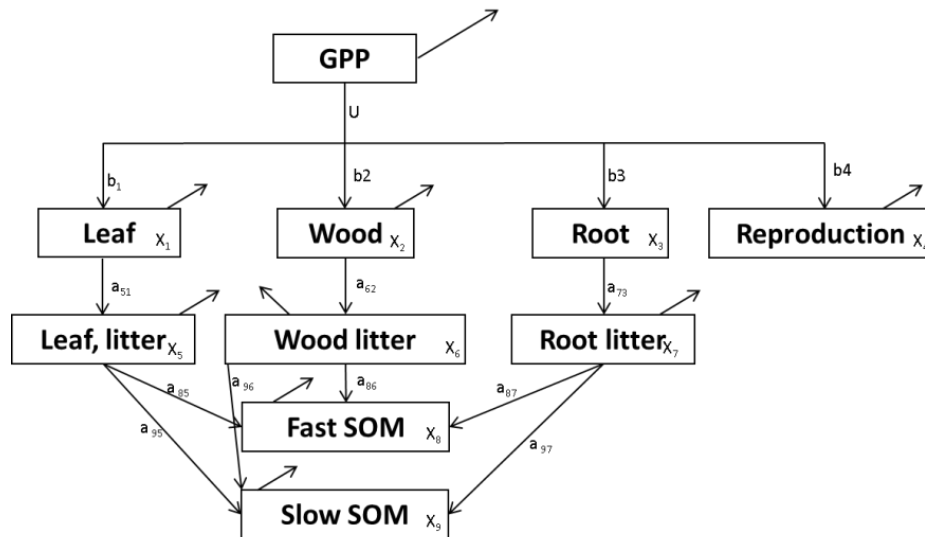
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U(t)=NPP.

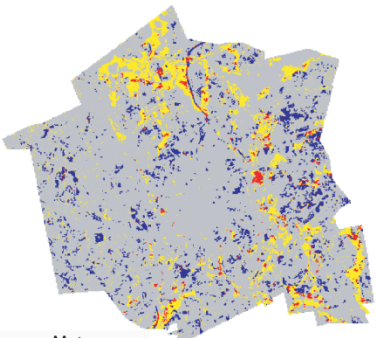
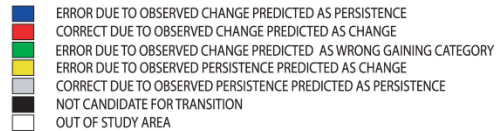


Activities relevant for/contributing to LUMIP:

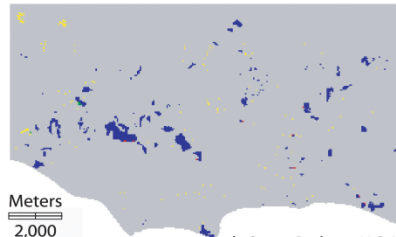
- 4) **LUC model MIP**: new (co-lead: Edinburgh, Amsterdam, KIT) – invitation out
 - Uncertainties in C-cycle and climate models not only due to the „natural“ system models, but also due to uncertainties in LUC projections
 - This so far not yet systematically assessed on continental/global scale

The problem: LUC model evaluation is mostly for small regions only indicating high uncertainty

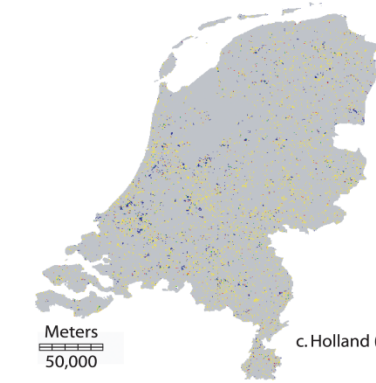
Legend for a-k



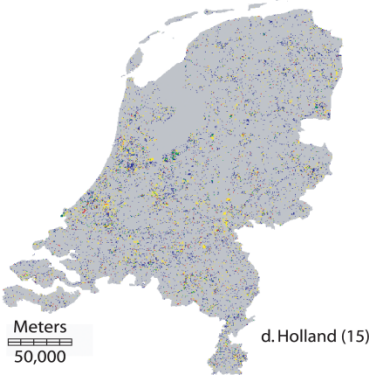
a. Worcester, U.S.A.



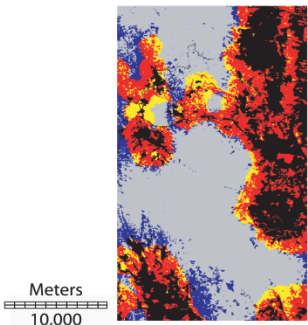
b. Santa Barbara, U.S.A.



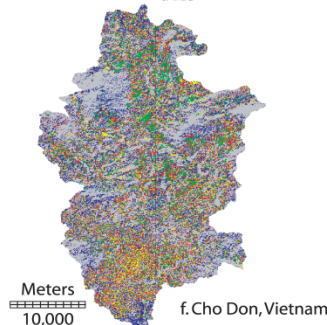
c. Holland (8)



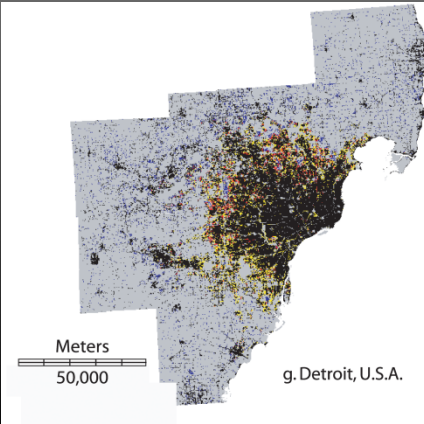
d. Holland (15)



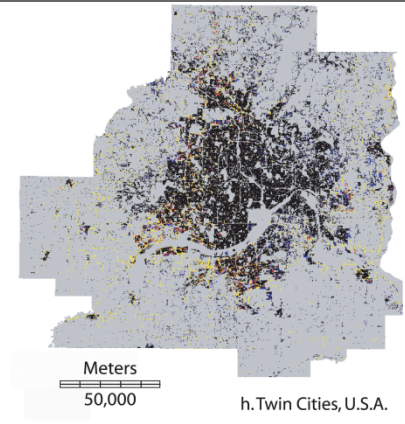
e. Perinet, Madagascar



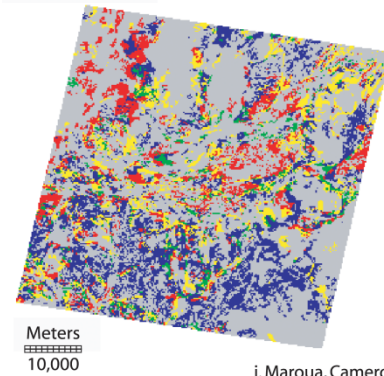
f. Cho Don, Vietnam



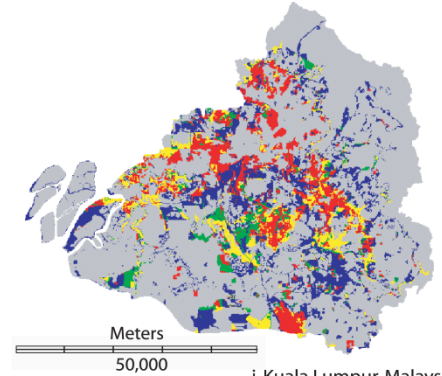
g. Detroit, U.S.A.



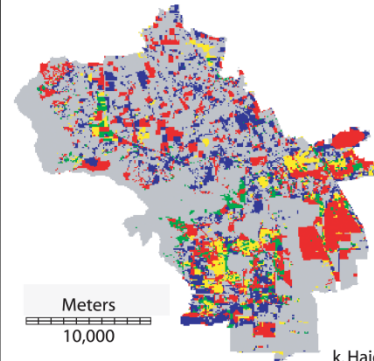
h. Twin Cities, U.S.A.



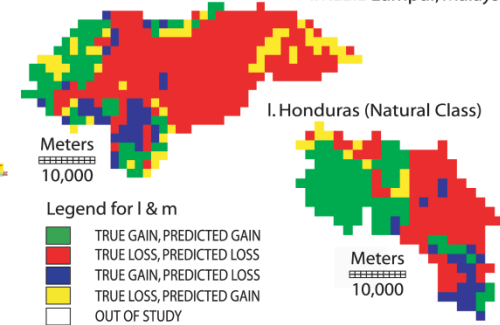
i. Maroua, Cameroon



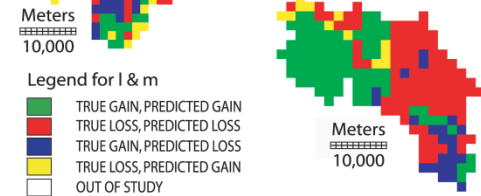
j. Kuala Lumpur, Malaysia



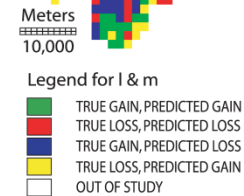
k. Haidian, China



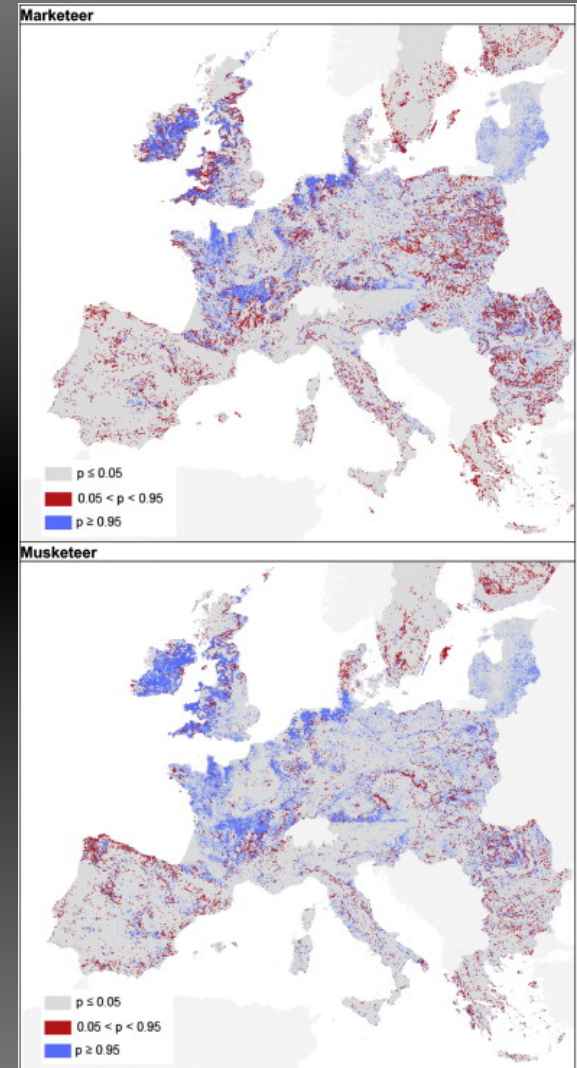
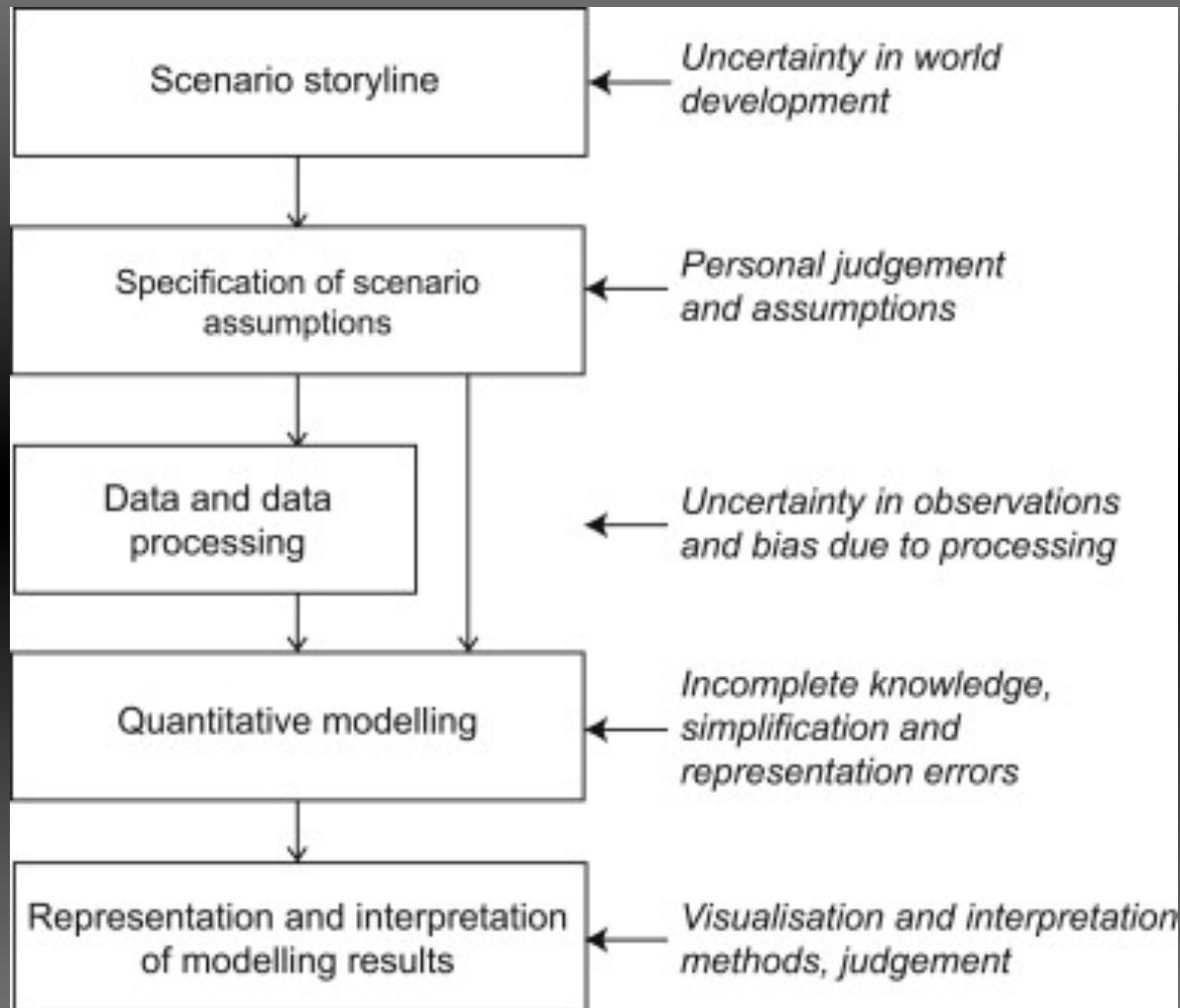
l. Honduras (Natural Class)



m. Costa Rica (Natural Class)



The problem: high sensitivity to model structure, parameter settings and scenario assumptions



The objective

- Assess differences in outcomes of continental/global scale LUC models
- Assess role of structural differences in land use models on land use projections

The Approach

- A 2 step approach:
 - An initial comparison of existing simulations, e.g. historical and SRES-based future projections;
 - The development of a more targeted set of inter-comparisons with (common) constraints imposed on model inputs, based on the lessons learned from Step 1 (RCP/SSP based)

The Approach, cont ...

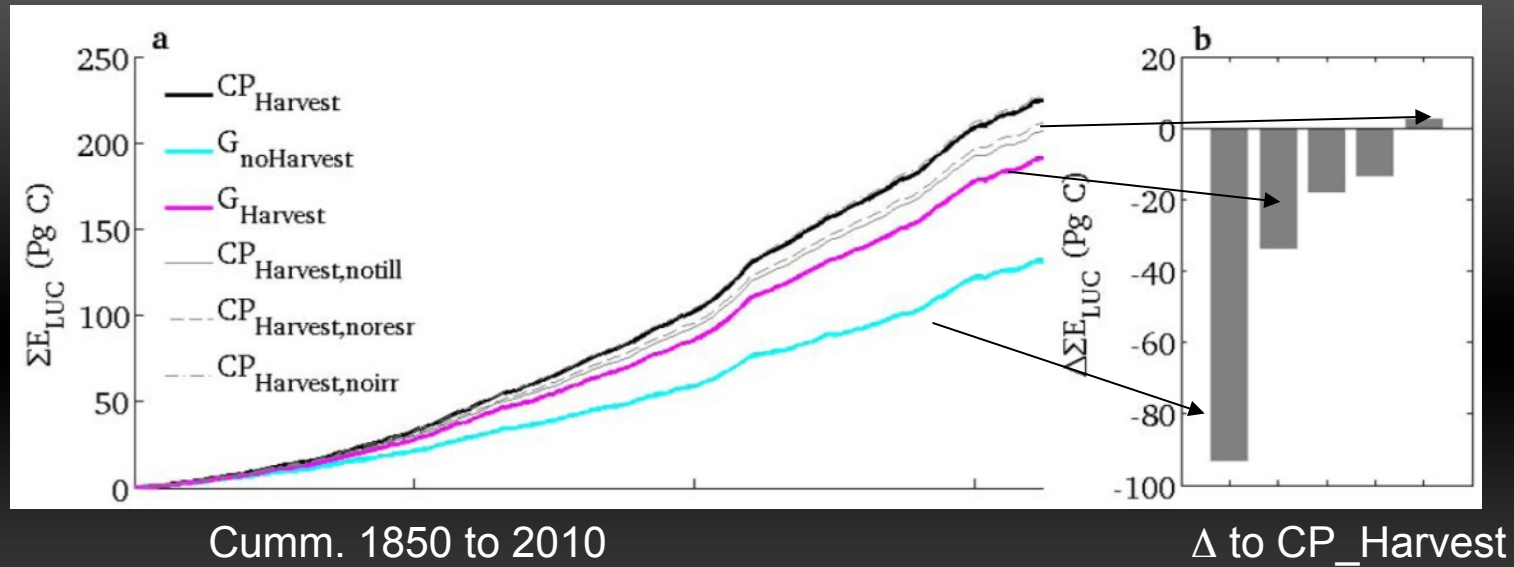
- Compare model outputs at both the Global and European scale levels, including the LUC realisations of IAMs, as well as targeted land use change models
- An expert workshop to go from step 1 to step 2
- Timetable of ca. 12 + 12 months

The models

MODEL NAME	INSTITUTION	CONTACT
<u>Global models</u>		
MagPie	PIK	Hermann Lotze-Campen
IMAGE	PBL	Elke Stehfest
CluMondo	VU-IVM	Peter Verburg
PLUM	UEDIN/Lund/KIT	Peter Alexander, Mark Rounsevell
iPETS	NCAR	Brian O'Neill
IIASA-IAM/GLOBIOM	IIASA	Michael Obersteiner
	CSIRO	John Finnegan
Magnet	LEI	Hans Van Meijl
AIM	NIES, Japan	Kiyoshi Takahashi
GTAP	Purdue	Tom Hertel
LandShift	Uni Kassel	Ruediger Schaldach
ISAM	Uni Illinois	P. Meiyappa/Atul Jain
ENVISAGE	FAO/World Bank	Dominique van der Mensbrugghe (dvandermensbrugg@worldbank.org)
EPPA	MIT	Sergey Paltsev (paltsev@mit.edu)
GCAM	PNNL	Allison Thompson or Marshall A. Wise (Marshall.Wise@pnnl.gov)
FARM	USDA	R. D. Sands (rsands@ers.usda.gov)
IMPACT	IFPRI	Mark Rosegrant (m.rosegrant@cgiar.org)
	University of Exeter	Tim Lenton (T.M.Lenton@exeter.ac.uk)
<u>European models</u>		
Dyna-CLUE	VU-IVM	Peter Verburg
ATEAM/ALARM	UEDIN	Mark Rounsevell
CRAFTY	UEDIN	Calum Brown
LUMP (CLUE 'clone')	JRC	Carlo Lavalle
CLIMSAVE-IAP	UCranfield, UOxford, UEDIN	Mark Rounsevell

5) From LCC to LUC – accounting for management is crucial

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5) From LCC to LUC – accounting for management is crucial – and it's mostly in the soil

