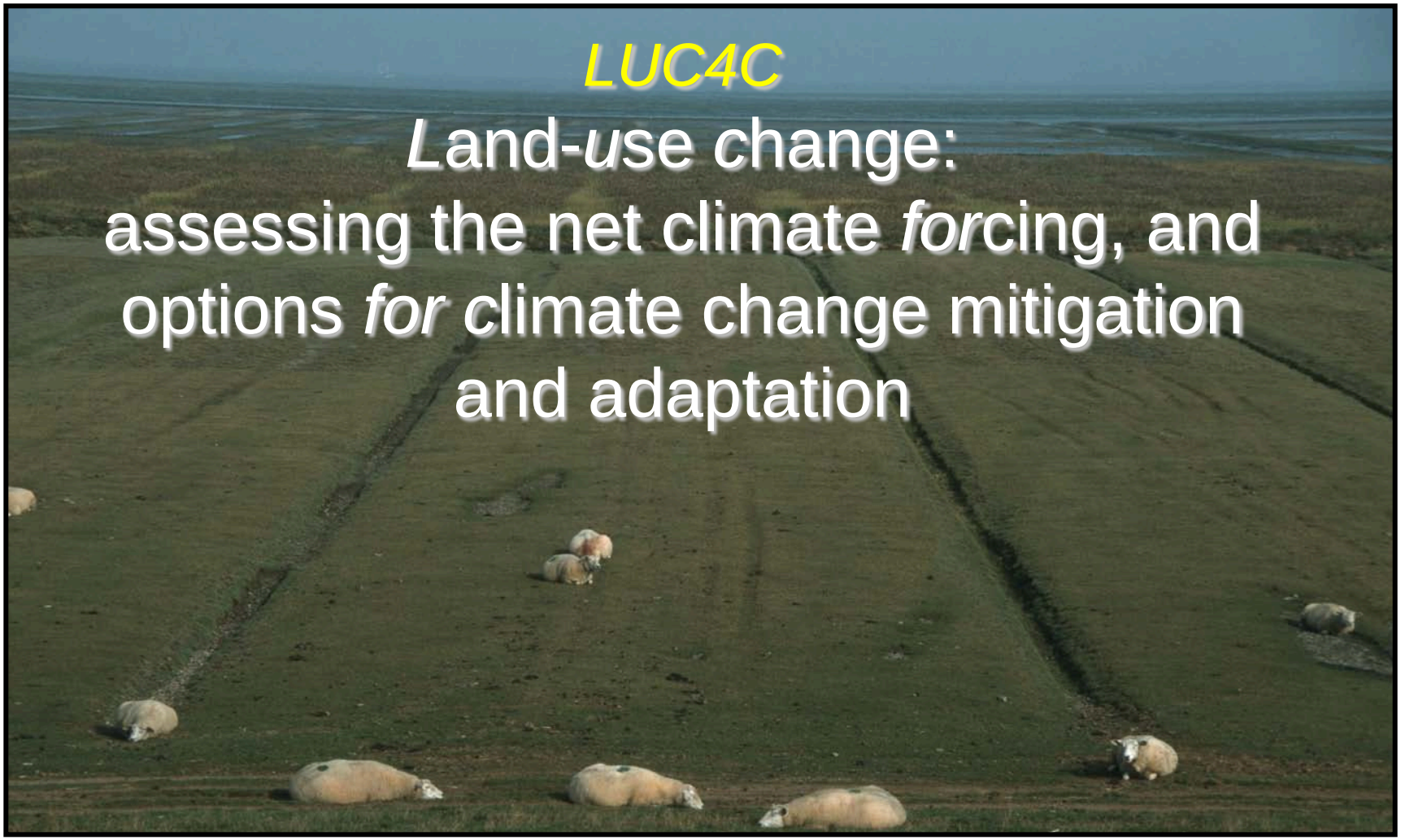

LUC4C
Land-use change:
assessing the net climate forcing, and
options for climate change mitigation
and adaptation

Project

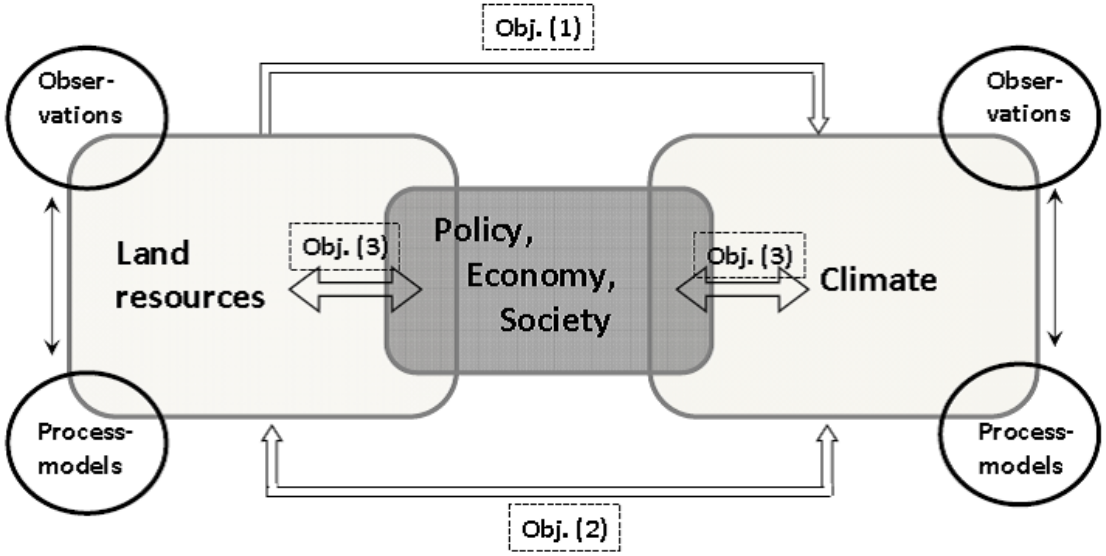
- EU FP7 Integrated project: 603542 – *LUC4C*
- Duration 4 years, 01/11/2013 – 31/10/2017
- 15 Partners from 11 EU and 4 non-EU countries; total ca. 8 Mio € (6 Mio € from EU)

Challenges

1. Key aspects of land use with the largest effect on climate, including their dependencies across time and space

2. Innovative methods to better quantify the dynamic interactions between land use and the climate system

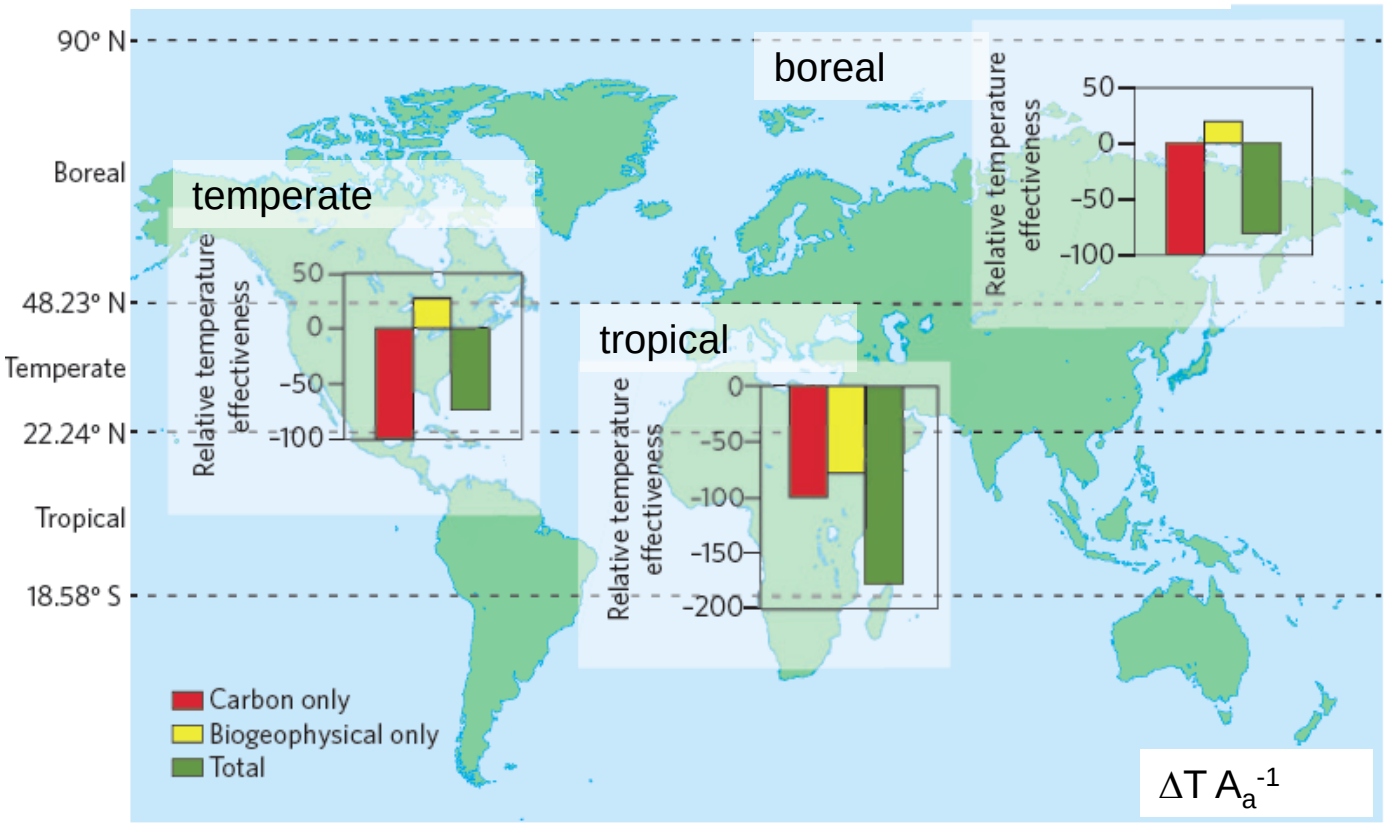
3. Synthesis products and best practice guidelines for identification of benefits or adverse effects of land-based mitigation options & adaptation strategies



Some of the issues to be addressed

Climate effects of land cover/use: biophysical vs. biogeochemical

Experiment: Afforesting 50% of the regional crop area until 2060

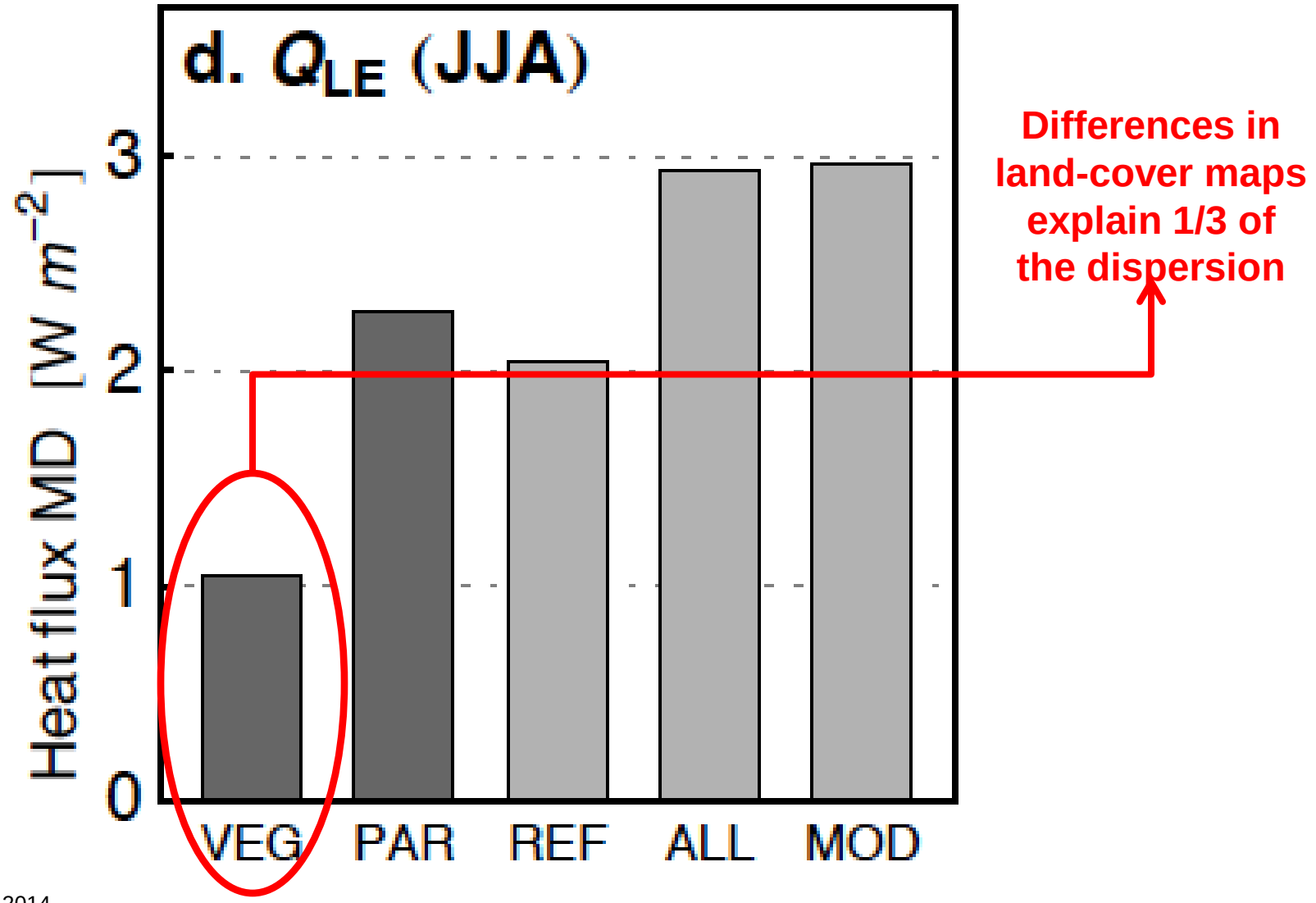


Biophysical and biogeochemcial climate effects of afforestation (and hence also deforestation) have regionally different magnitude and signs.

Arora & Montenegro, Nat. Geosc. 2011

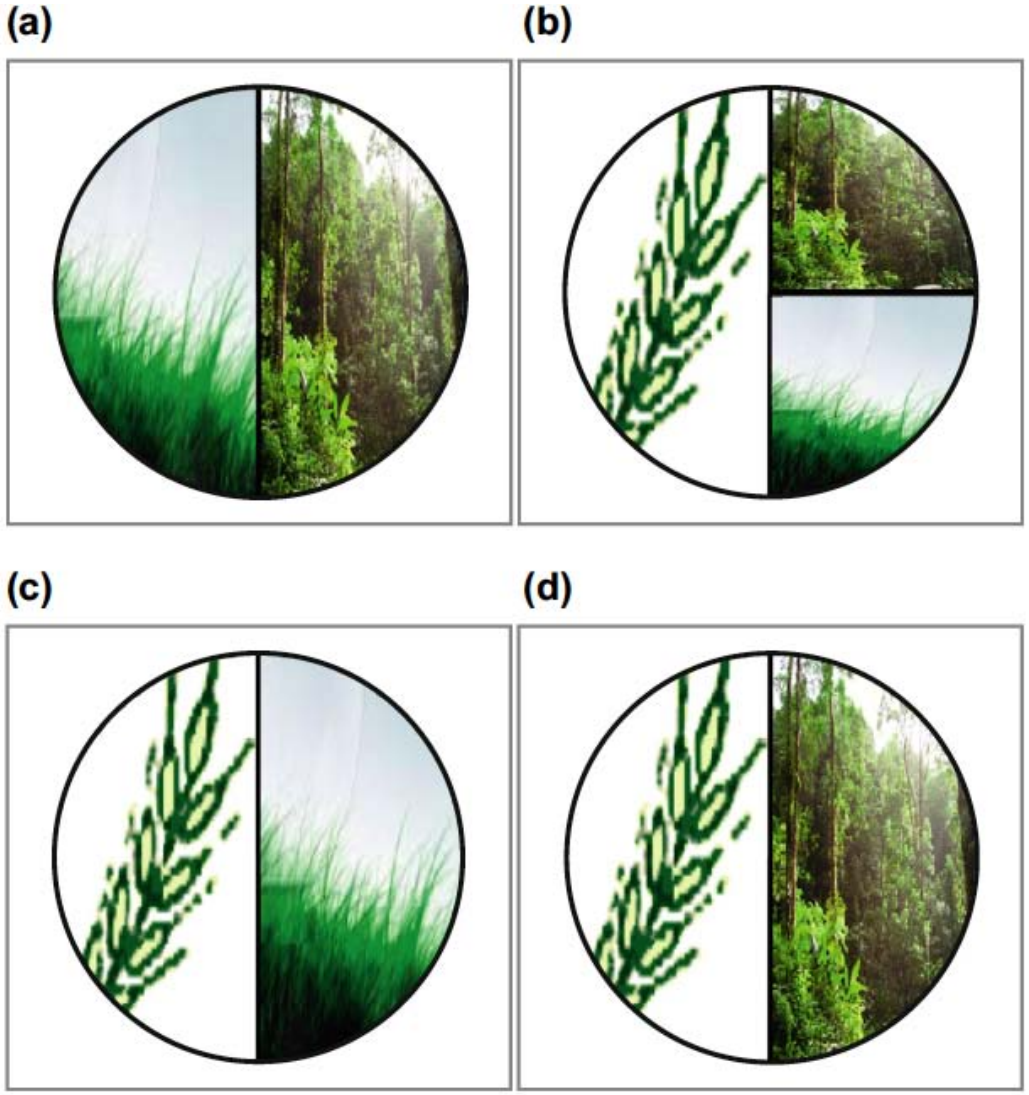
Uncertainties are large…e.g., attribution of the inter-model differences in Q_{LE} to:

VEG : Vegetation distribution. PAR : Land-Surface Parameters & parameterizations
REF : combines VEG & PAR. ALL & MOD = REF + remaining influences



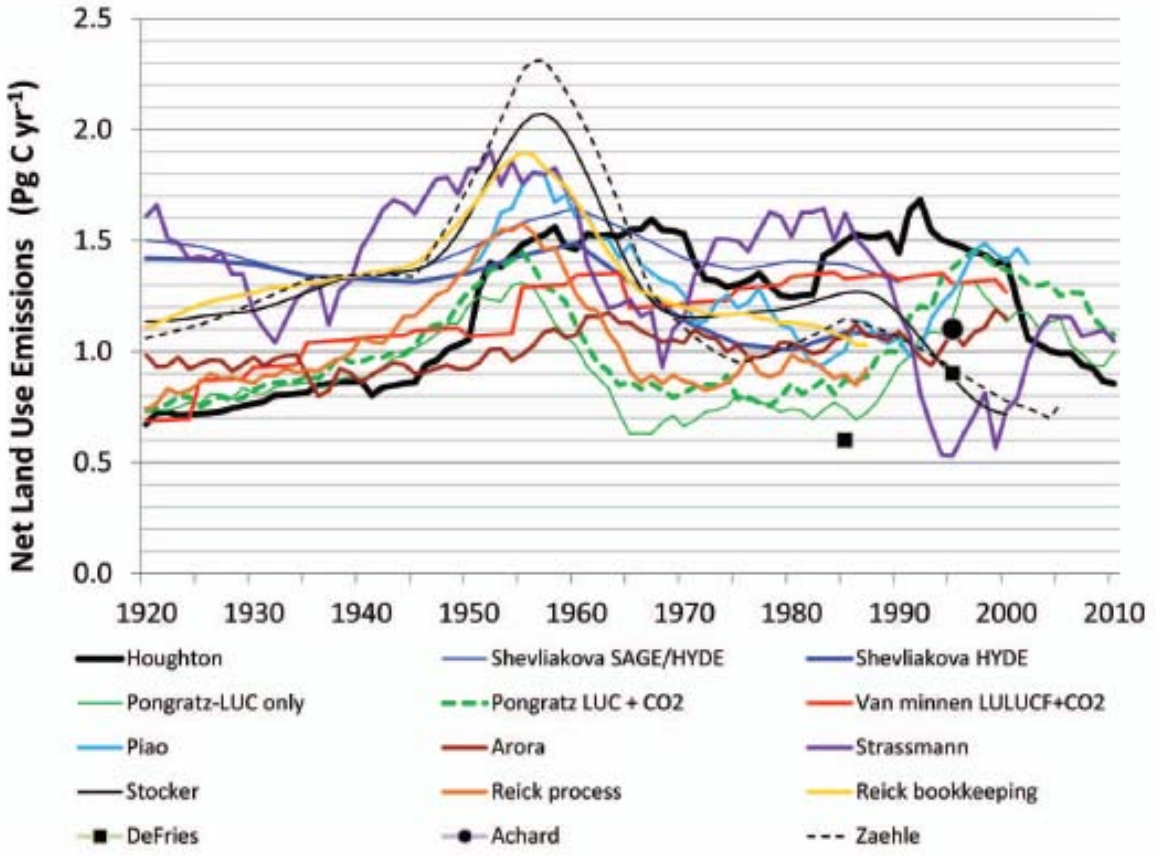
De Noblet et al., GAP 2014

Different decisions on land-transitions



De Noblet et al., GAP 2014

Different estimates on LUC-CO_2 emissions



Global C budget (2000-09: PgC a-1)

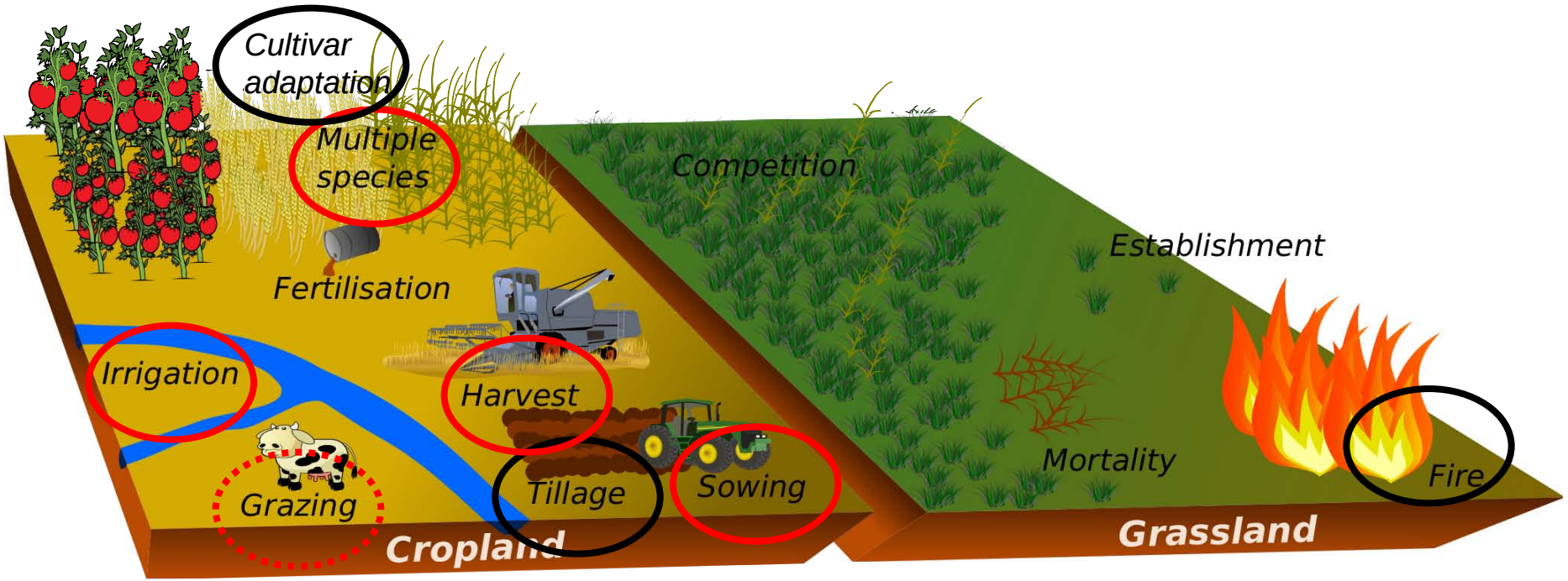
Emissions	
Fossil fuel combustion and cement production	7.8±0.4
Land-use change	1.0±0.5
Accumulations	
Atmospheric growth rate	4.0±0.1
Ocean sink	2.3±0.5
Residual terrestrial sink	2.5±0.8

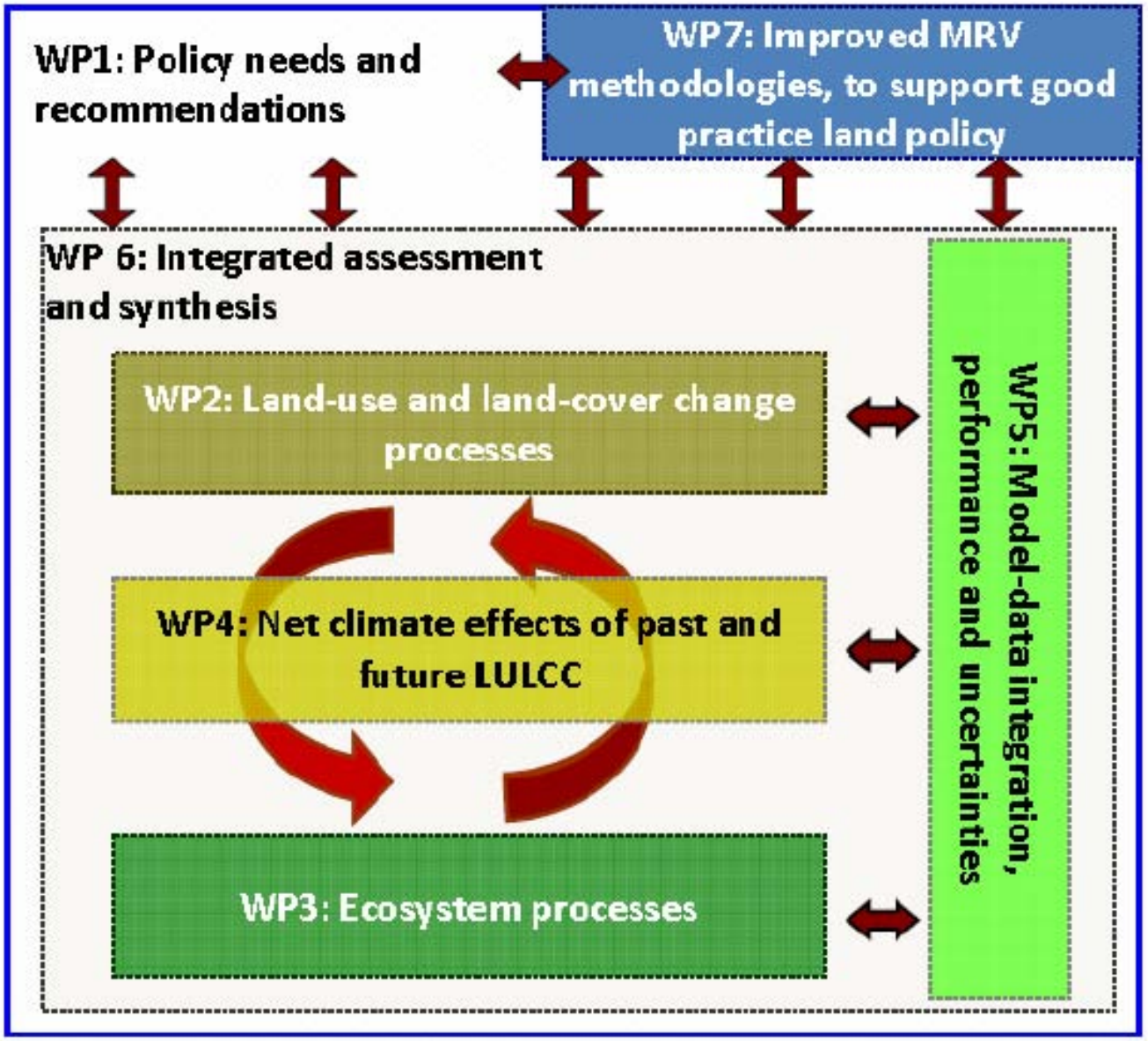
Houghton et al., 2013; Le quéré et al., 2009

From land cover to land use: Influence of crop representation on LUC-CO2 emissions

- AR5 ESMs represented croplands as grasslands….

- Does it make a difference when attempting to account for crop-specific processes?




WP1: Policy needs and recommendations
WP7: Improved MRV methodologies, to support good practice land policy
WP 6: Integrated assessment and synthesis
WP2: Land-use and land-cover change processes
WP4: Net climate effects of past and future LULCC
WP3: Ecosystem processes
WP5: Model-data integration, performance and uncertainties

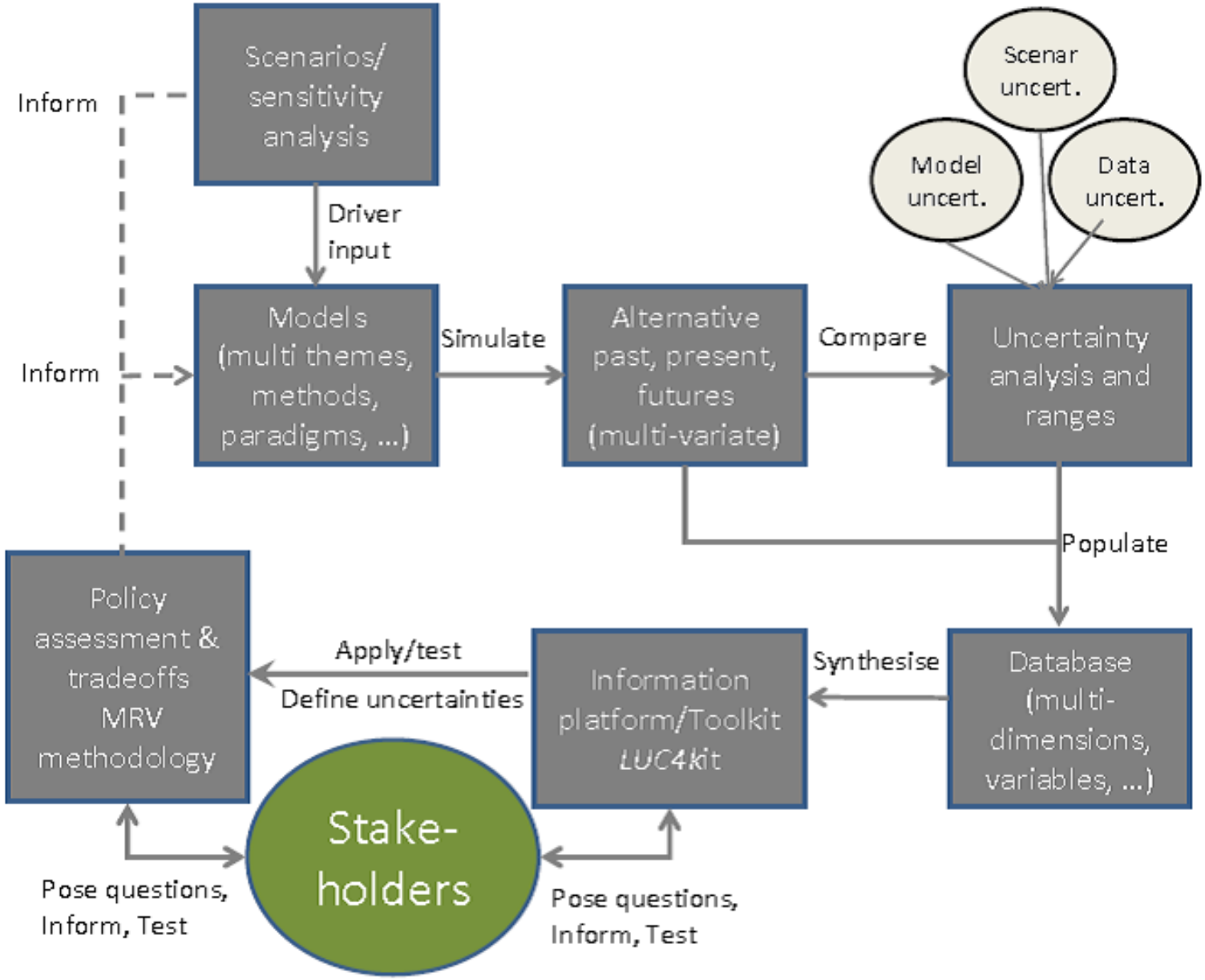
Focal regions

1. Globe

2.Continental Europe (EU and European Russia)

3.Sub-Saharan Africa

4.South/southeast Asia


Scenarios/ sensitivity analysis
Inform
Driver input
Scenar uncert.
Model uncert.
Data uncert.
Inform
Models (multi themes, methods, paradigms, ...)
Simulate
Alternative past, present, futures (multi-variate)
Compare
Uncertainty analysis and ranges
Populate
Policy assessment & tradeoffs MRV methodology
Apply/test
Define uncertainties
Information platform/Toolkit LUC4kit
Synthesise
Database (multi-dimensions, variables, ...)
Stake-holders
Pose questions, Inform, Test
Pose questions, Inform, Test

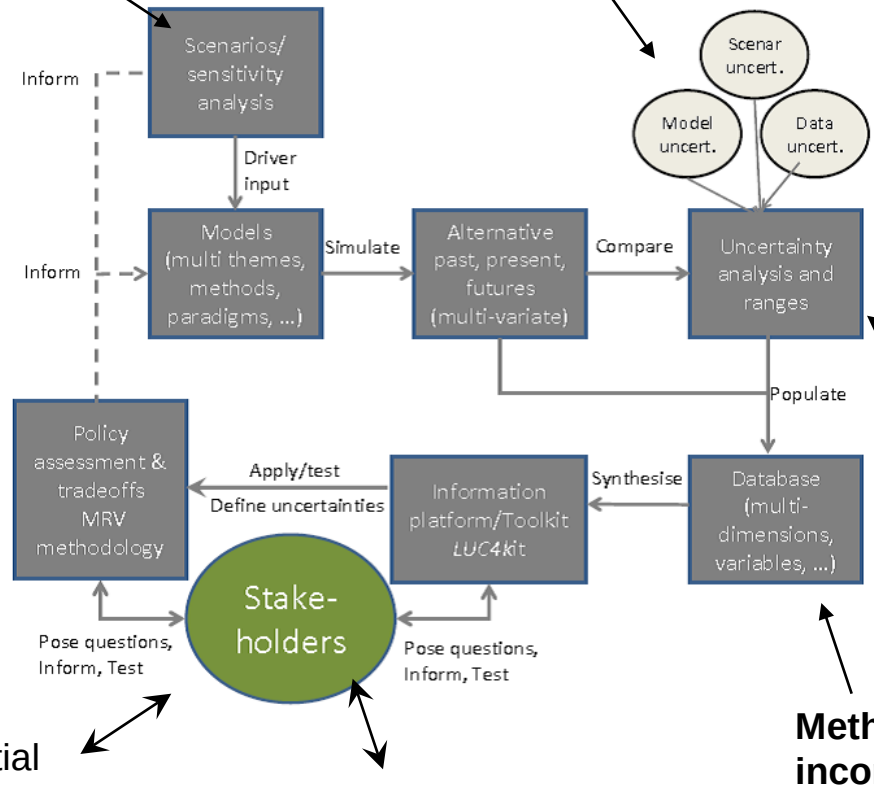
SEVENTH FRAMEWORK PROGRAMME

LUC4C Performance of DGVMs in assessing LUC-mediated climate impacts; assess ESM capacity in detecting observed changes in *bph* and *bgc* land properties

Scenarios for land-based climate change mitigation, based on SSPs

LUC-model intercomparison

Identify indirect effects and trade-offs of land-use-based mitigation options



Good practice guidance on MRV

Impact of changing methodology to incorporate LUC on the modelled carbon cycle and climate

Synthesis of the potential effects of current and anticipated future land-use and -mitigation policy on the climate system

An analytic and model-based exploration of land system change as a mitigation option, also including adaptation

Methodology to incorporate land-use changes provided by IAMs and/or land-use models into ESMs