



# Land Management for Climate Mitigation and Adaptation

LAMA CLIMA project aims to investigate how changes in land cover and land management can aid the mitigation and adaptation objectives of the Paris Agreement, as well as the Sustainable Development Goals.

<https://climateanalytics.org/projects/lamaclima/>

## Partners:



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# Objectives of LAMACLIMA

- Advance the scientific and public understanding on the coupled effects between changes in Land-Cover-Land-Management (LCLM) and climate, and assist the elaboration of sustainable land-based adaptation and mitigation measures.
- Investigate the biogeophysical and biogeochemical effects of three key changes in LCLM (re/afforestation, irrigation and wood harvest) on climate using advanced Earth System Models (ESMs).
- Investigate the implications of LCLM changes on agriculture, water availability, biodiversity and economic productivity.
  - Assess the economic impacts of LCLM changes.

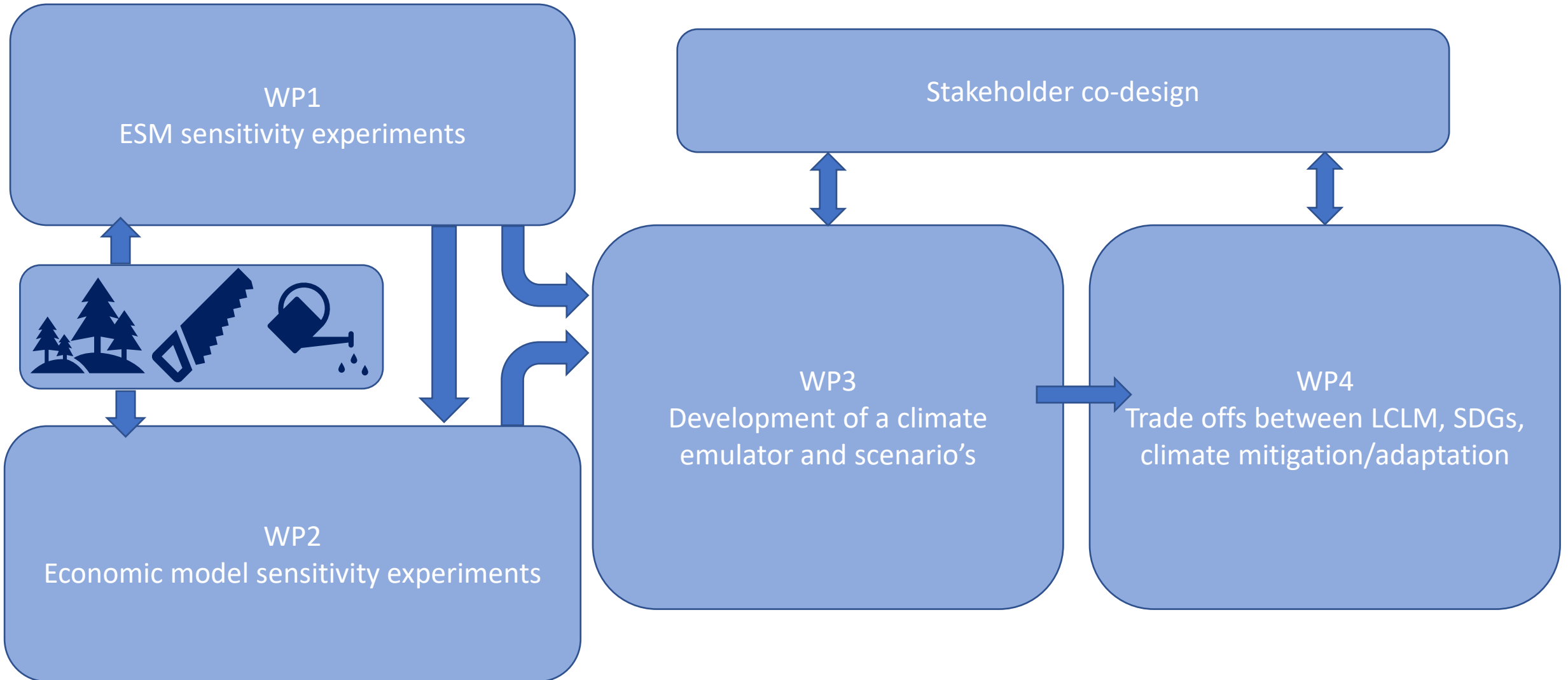


# Sensitivity Experiments with ESMs – 150 years

- a) Control run under fixed 2014 forcings and land cover.
- b) Global reforestation (simulate an 100% forested world).
- c) Global crop land (simulate an 100% crop land world).
  - d) Wood harvesting on 100% forested scenario.
  - e) Irrigation on crops on 100% crop land scenario.



# LAMACLIMA Structure



# Biogeochemical effects

**Land cover and land management change(LCLM)**

Biogeophysical effect



**climate (local, nonlocal)**

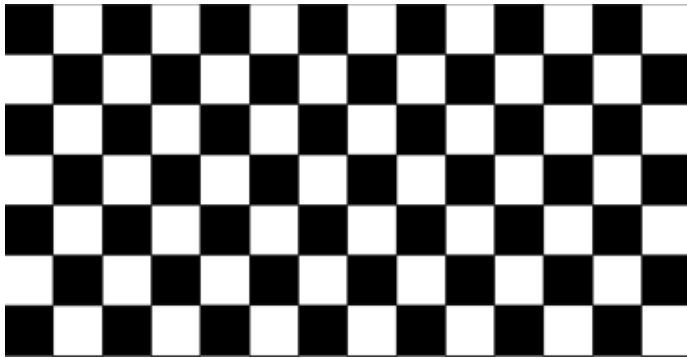


**Forest or cropland carbon cycle (carbon sequestration ability)**

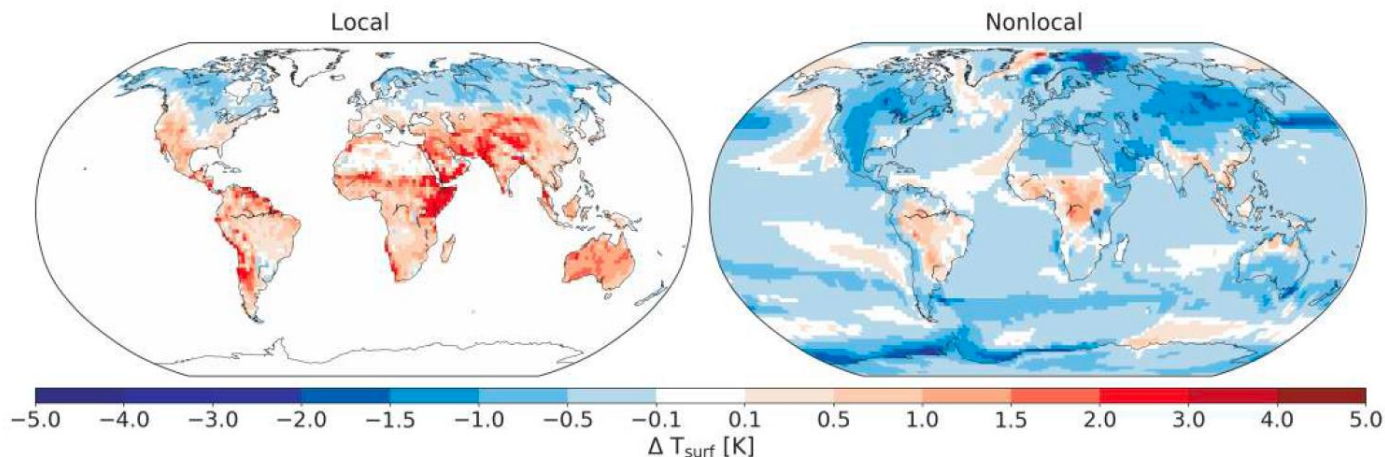
1. Carbon cycle under different LCLM.
2. Feedback between LCC and climate.  
(additional offline experiments needed)

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# Local VS Remote biogeophysical effects: The checkerboard approach



the LCLM changes will go through a sequence of unchanged grid boxes in a checkerboard approach similar to Winckler et al., 2017, in order to accurately separate the local from the non-local effects.



# Local biogeophysical effects

- Effect LCLM on climate extremes (heat wave duration, drought ...), as well as the role of soil moisture in modulating these effects.
- Effects on mean and extreme precipitation.
- Analysis of water and energy balance.

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# Remote biogeophysical effects

- The impact of soil moisture due to LCLM changes on large scale atmospheric dynamics and teleconnections.
- The feedbacks between atmospheric Rossby wave changes due to LCLM and geographically key regions such as the world's breadbaskets.

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Thank you for your attention!

<https://climateanalytics.org/projects/lamaclima/>

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# References

- Winckler, J., Reick, C.H., Pongratz, J., 2017. Robust identification of local biogeophysical effects of land-cover change in a global climate model, American Meteorological society, 30(2), DOI: 10.1175/JCLI-D-16-0067.1