Land-use pattern in ISIMIP3

What we want to achieve

- MAgPIE/GLOBIOM/IMAGE to generate LU projections as input for ISIMIP3b, group III
- Those projections should be separated into “No-adaptation” (= no response to climate impacts, that are simply not seen) and “Adaptation” (= response to climate impacts that are provided to the LU model) runs.

RCP-SSP combinations considered within ISIMIP3b

The following RCP-SSP combinations are needed for ISIMIP3b

- SSP1-RCP2.6
- SSP3-RCP7.0
- SSP5-RCP8.5

The priority of ISIMIP GCMs is the following:

1. GFDL-ESM4
2. UKESM1-0-LL
3. MPI-ESM1-2-HR
4. IPSL-CM6A-LR
5. MRI-ESM2-0

No-Adaptation

- The No-Adaptation run is essentially a no-climate change run i.e. does not incorporate any responses to climate impacts (close to “baseline” run)
- It accounts for socioeconomic changes according to SSP population and economic growth and storylines + mitigation policies
- This is a counterfactual run and not a realistic “no adaptation but climate impacts” run

Adaptation

- The adaptation runs account for the same SSP-based socioeconomic changes + mitigation policies as the no-adaptation runs
- In addition, they allow for socio-economic responses to climate impacts such as changes in crop yields. For example trade changes could buffer climate change-induced losses in crop yields.

Points that are already agreed

- MAgPIE/GLOBIOM/IMAGE will use their own biophysical impact models LPJmL/EPIC/LPJmL to represent crop yields and natural carbon sinks
- Adaptation runs will build on biophysical simulations forced by ISIMIP climate data (5 GCMs)
- The underlying IAM simulation describing SSP-RCP-based bioenergy and food demand will not account for climate impacts, i.e. bioenergy and food demand will be the same in the no-adaptation and no-adaption run.
- Before providing LU patterns to the ISIMIP community to force the ISIMIP3b, group III simulation they will be harmonized by the Hurtt approach.

Which information is needed to force the ISIMIP3b, group III simulations?

Minimum (information provided within ISIMIP2b, group III):

- Crop type specific land use (-> crop models, hydrological models)
- Specification of different types of grass land (-> biodiversity)
- Fertilizer input (-> crop models, hydrological models, lake models, representation of nutrient transport to the ocean, water quality)
- Irrigation fractions (-> crop models, hydrological models…)

Potential additional outputs nice to have:

- ….

Paper draft ongoing

- Rest of session in smaller group with Land-use modellers

Biophysical simulations
Which impacts will be accounted for?

Which impact of climate change will be considered in the adapation runs?

Is it only impacts on crop yields affecting food supply or also impacts on bioenergy plants or natural carbon sinks?

Biophysical simulations:
Which adapation measures will be accounted for in the biophysical simulations?

MAgPIE (and EPIC?) will use offline biophysical impact simulations such as the ‚pure crop runs' generated within ISIMIP3b while IMAGE will use online LPJmL simulations.

Which types of adapation measures will be considered in the biophysical impact model simulations?

For MAgPIE (and GLOBIOM?) that translates into the question: Will they use the ISIMIP3b, group II simulations (constant 2015 management) or group III simulations (adjustments of growing seasons, fertilizer inputs, other management choices…)

Which measures are considered within IMAGE?

IAM runs
How to prescribe food and bioenergy demand?

- Which IAMs will be used to describe food and bioenergy demand?
- Is it one IAM per LU-model similar to the biophysical pairing or one IAM for all LUM runs or one IAM per SSP-RCP scenario?

Last setting would not really allow for a comparison of the scenarios and does not seem to be appropriate.

- Is food demand externally generated as in MAgPIE or are there other approaches in the other IAMs? Could food demand be harmonized?

LUM runs
Which societal responses will be accounted for?

How will SSP storyline be implemented? E.g. protection areas in SSP1…

Do LUM agree on the representation of the following responses to climate change or ways to implement SSP storylines?

- Prices
- technological change (scaling factor?)
- agricultural management (fertilizer input, irrigation, livestock husbandry?, growing season adjustment (represnetaed in biophysical simulations?))
- trade
- consumption.