Adaptation in ISIMIP3a/b

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Socio-economic forcing data for ISIMIP3b, group III

- **SOC forcing for no adaptation runs**

 accounts for socioeconomic changes (e.g. population from SSPs) & mitigation policies

 is blind to climate impacts, i.e. does not incorporate any responses to climate impacts

- **SOC forcing for adaptation runs**

 accounts for socioeconomic changes (e.g. population from SSPs) & mitigation policies

 accounts for impacts of climate change (includes endogenous/indirect responses e.g. trade changes to buffer climate change-induced crop yields and also direct reponses such as raising dikes)

Ⓟ We need two alternative future extensions of the SOC datasets we already provide for the historical period (no-adaptation; adaptation)

Ⓟ in theory different levels of adaptation for given RCP-SSP combination but we only aim for one "business as usual" SOC forcing for the adaptation runs and one for the no-adaptation setting (SOC forcings are SSP5-RCP8.5 und SSP3 RCP7.0 specific)

Ⓟ specific adaptation measures can be tested in optional (sectoral) runs

Impact model simulations in ISIMIP3b, group III
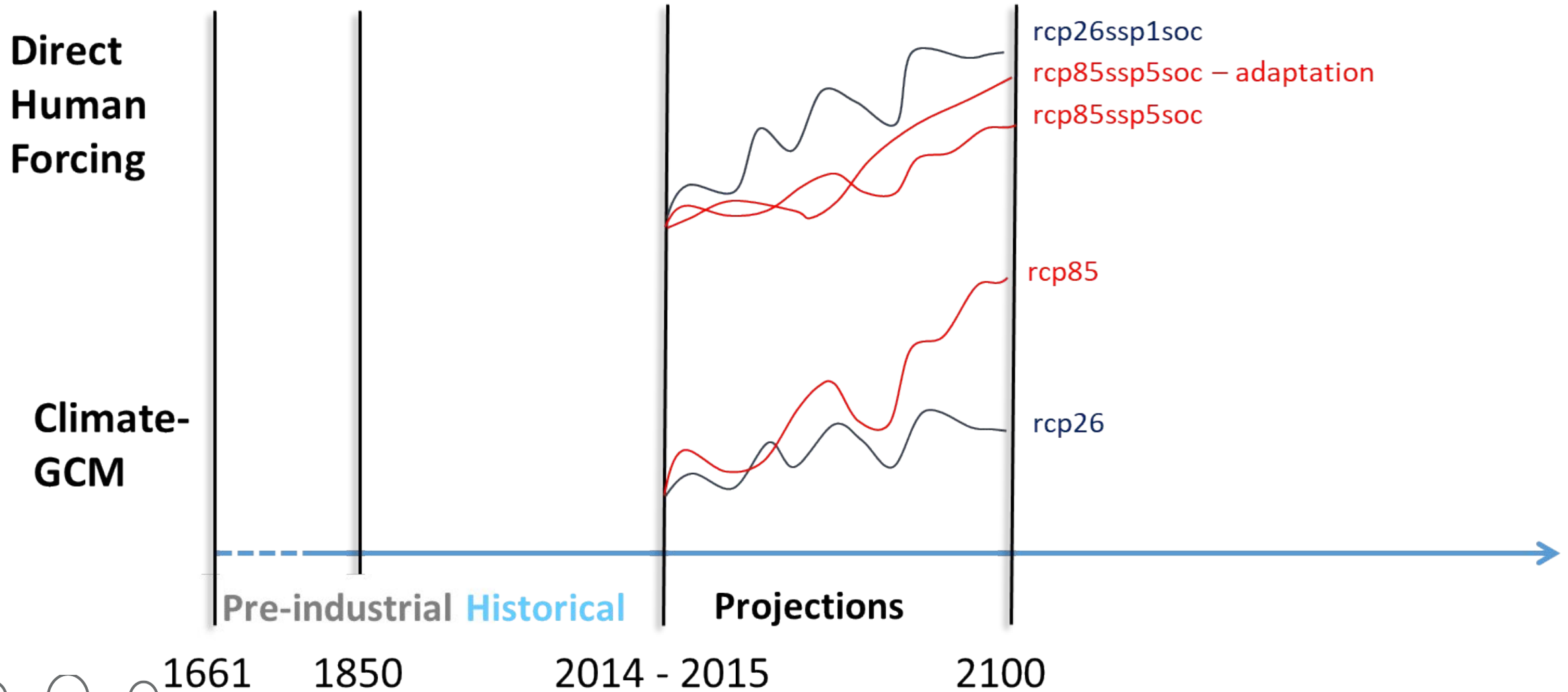
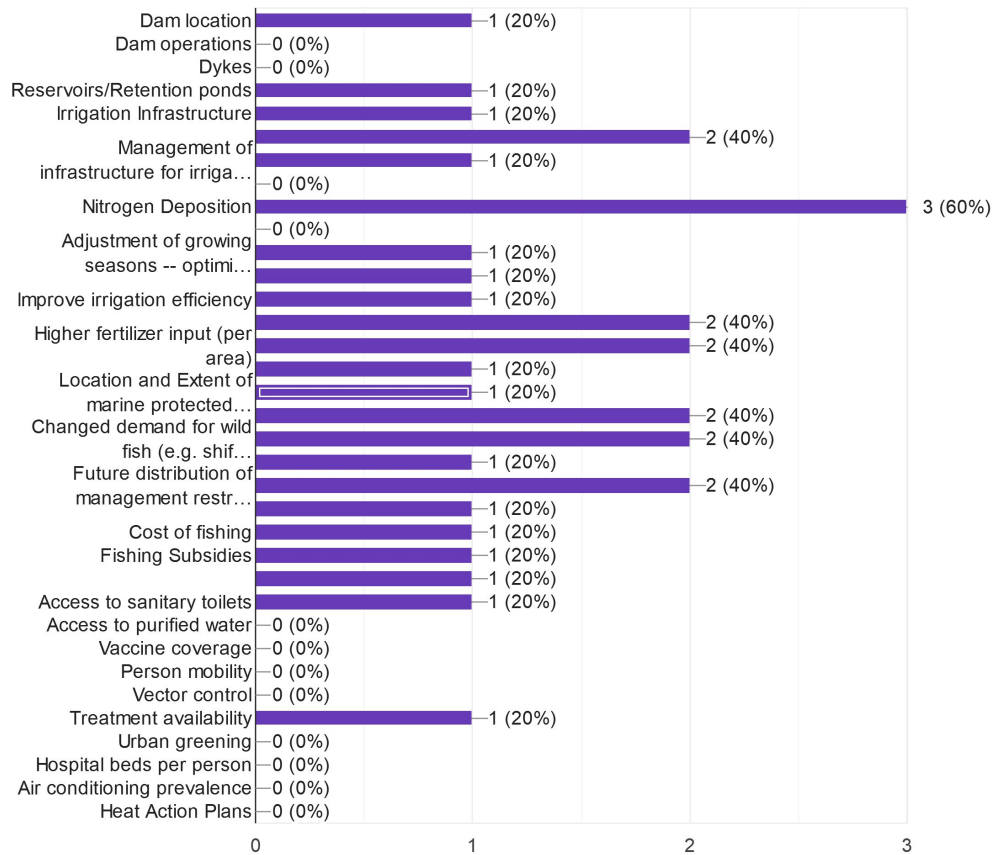# Adaptation in ISIMIP3a/b (full picture)
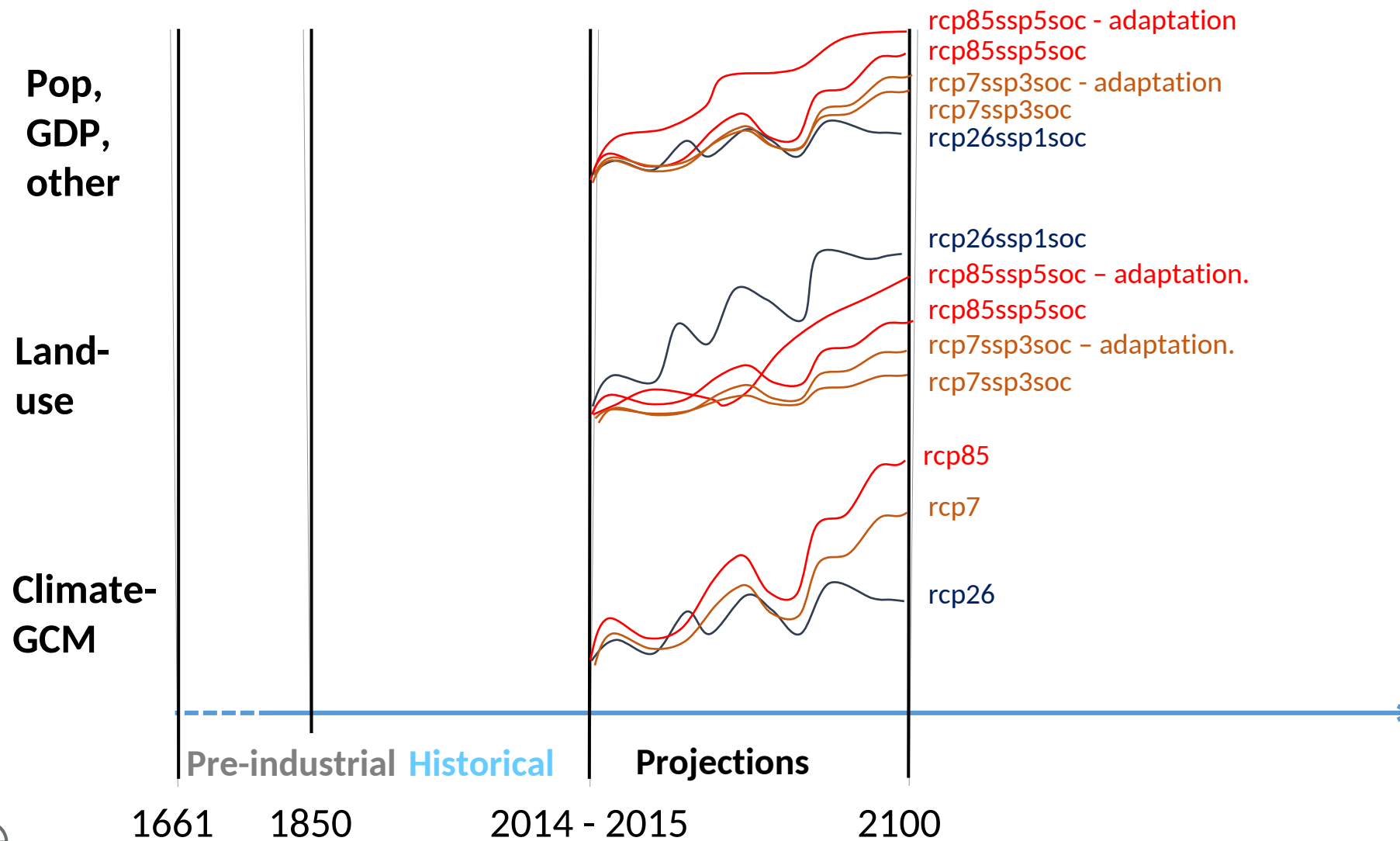
Narrowing down adaptation measures

Paris 2019

Can you include the following measures through external forcing (e.g. "my model can be constrained by external input to prescribe the cultivar to be planted") in your model?

5 responses

Virtual 2020

Water management –
- sea water desalination,
- inter-basin water Transfers
- dam locations,
- dam operations
- Non-agricultural water withdrawals & Uses

Land use models
- land use
- irrigation,
- fertilizer input

Agricultural management
- growing seasons length

Health
- labor sector breakdown,
- heat-related adaptation

Future fishing efforts and its drivers

Land use pattern

No adapation:

LU patterns respond to

- SSP-based increases in food demand due to population and diet changes

- SSP-based changes in agricultural management

- RCP-based mitigation demands (increasing demand for bioenergy...)

Adaptation

LU patterns additionally respond to

- climate impacts on crop yields

- climate impacts on natural carbon sinks

Dam locations

No adapation:

Hydropower dam locations account for

- SSP-based increases in energy demands

- RCP-based mitigation demands (increasing demand for hydropower…)

- *SSP-based changes in food demand and associated increases in irrigation?*

Adaptation

Hydropower dam locations additionally account for

- Climate impacts on discharge

- *Climate induced changes in irrigation demands?*

Fishing intensities

No adapation:

Intensities account for

- SSP-based increases in food demands driven by population and diet changes
- SSP-based marine protection strategies (SSP1 versus SSP3, SSP5)

Adaptation

Intensities additionally account for

- climate impacts on fish distributions

Operationalization for every adaptation dataset
(https://www.isimip.org/outcomes/cross-sectoral-isimip-online-workshop-2020/)

1. Specification of the socio-economic forcing that is required (name of the variable, unit, temporal resolution, spatial resolution)

2. No-Adaptation: variable depends on the SSP storyline or same across SSPs (SSP1, SSP3, SSP5)?

3. Adaptation scenario: How to include a response of the variable to climate change, to generate the adaptation scenario (SSP5-RCP8.5, SSP3-RCP7.0)?

4. Who could help to develop the data sets? Where could the ISIMIP team help?

General Discussion

- Jacob Schewe: thus far ISIMIP considers impact of cc as if climate has impact on world today Ⓟnow with adaptation we also check impacts of world that has changed in face of climate change
- Christopher Müller: How stylised are scenarios meant to be? how realistic could Scenarios be? Ⓟwhat mitigation is included that is tied to adaptation?
- Carl Schleussner: Ⓟresponse to impacts active or inactive? Storylines linked to SSPs Ⓟ much adaptation already in baseline
- Hermann Lotze Campen: Adaptation levels depending on SSPS assunptions Ⓟas much as possible in terms of overall SSP-baseline Ⓟreference scenario with "best available adaptation options" according to storylineⓅendogenous adaptations are "best possible adaptations" under SSPs Ⓟallows for additional analysis by switching on and off addtitional measures, Ⓟ could be called "SSP-specific levels of adaptations".
- Simon Gosling: extra modelling Ⓟ optimum level of adaptation vs. No adaptation case but what about the space in between the two? Iintermediate level of adaptation?Ⓟ more models runs, more postprocessing but makes a lot of sense in some sectors Ⓟe.g. Rerunning same Scenarios with different dike heights Ⓟpotential benefits of differential levels of adaptation? ⓅDifferent Levels of adaptation, Ⓟwhen you have to make decisions about adaptation: ==>what is adaptation intensity? low , middle , high?
- Marina Andrijevic: space between best adaptation and untamed impacts Ⓟwhat is potential for improvement? Ⓟdifferent adaptation options tested Ⓟ adaptation gap Ⓟthings are not "best –adaptated" Ⓟcan be linked to SSPs, complimentary approach between incorporating Ⓟrelocation of patterns only one option
- Marina Andrijevic: In sectoral discussion: can we deploy more datasets and test them? ⓅSSPS provides information we can already use Ⓟ adaptation depends on countries etc...
- Marina Andrijevic: SSP-specific storylines should be described in SSP baseline ⓅTypicall combination of SSPs and RCP makes sense and explore in between levels by eachs ector
- Juan-Carlos Ciscar / PESETA: what are elements of cross-secoral adaptation? Reply.: You can definitely combine various adaptation settings with the different SSPs, but we wanted to keep it simple and with few runs by distinguishing only no adaptation vs optimal adaptation given the SSP scenario.
- Check Adaptation for every historical dataset Ⓟis adaptation included?
- Maybe additional new forcings needed Ⓟinnovative measures that did not exist thusfar?
- Are OSPs only extending SSPs or also specifying adaptation?

Discussion how to implement adaptation?

- Christopher Müller: Many forcing data come from IAMs ℗fertilizer, irrigation etc. ℗in no-adaptation case model doesn't know about impacts, ℗ Assuming that adaptation will be very case specific (not only location/scenario but also model-specific), would the IAMs then run with each crop model to compute sensible adaptation strategies for each modeling team? Or should all modeling teams use the same "adaptation" scenarios and thus come to very different outcomes on the effects of adaptation?
- Reply Katja Frieler : I think we will not be able to get crop model specific land use patterns for each crop model but will try to somehow reflect part of the range by not only using LPJmL-MAgPIE but also other pairs.
- Björn Sörgel: Christoph's question applies in a similar way also to other data sets, e.g. dam locations. (Are dam locations specific to each hydrological model or not? Likely this won't be possible, but more on this in the session tomorrow)
- Replying to Bjoern's point - we discussed this a lot at the Paris workshop. If dams 'appear' in response to crossing a runoff/discharge threshold (i.e. regular low flows) then where and when the dams 'appear' will vary by model (unless we use a multi-model mean estimate of runoff). If dams were placed in the same place, and at the same time, in every model (e.g. by using a multi-model mean or some other rationale for placing dams) then one would end up with the unrealistic situation of dams appearing in areas where dams are not needed, e.g. where water availability can satisfy demand 100% of the time with no needs for (additional) storage. Something to discuss in more detail tomorrow indeed.