



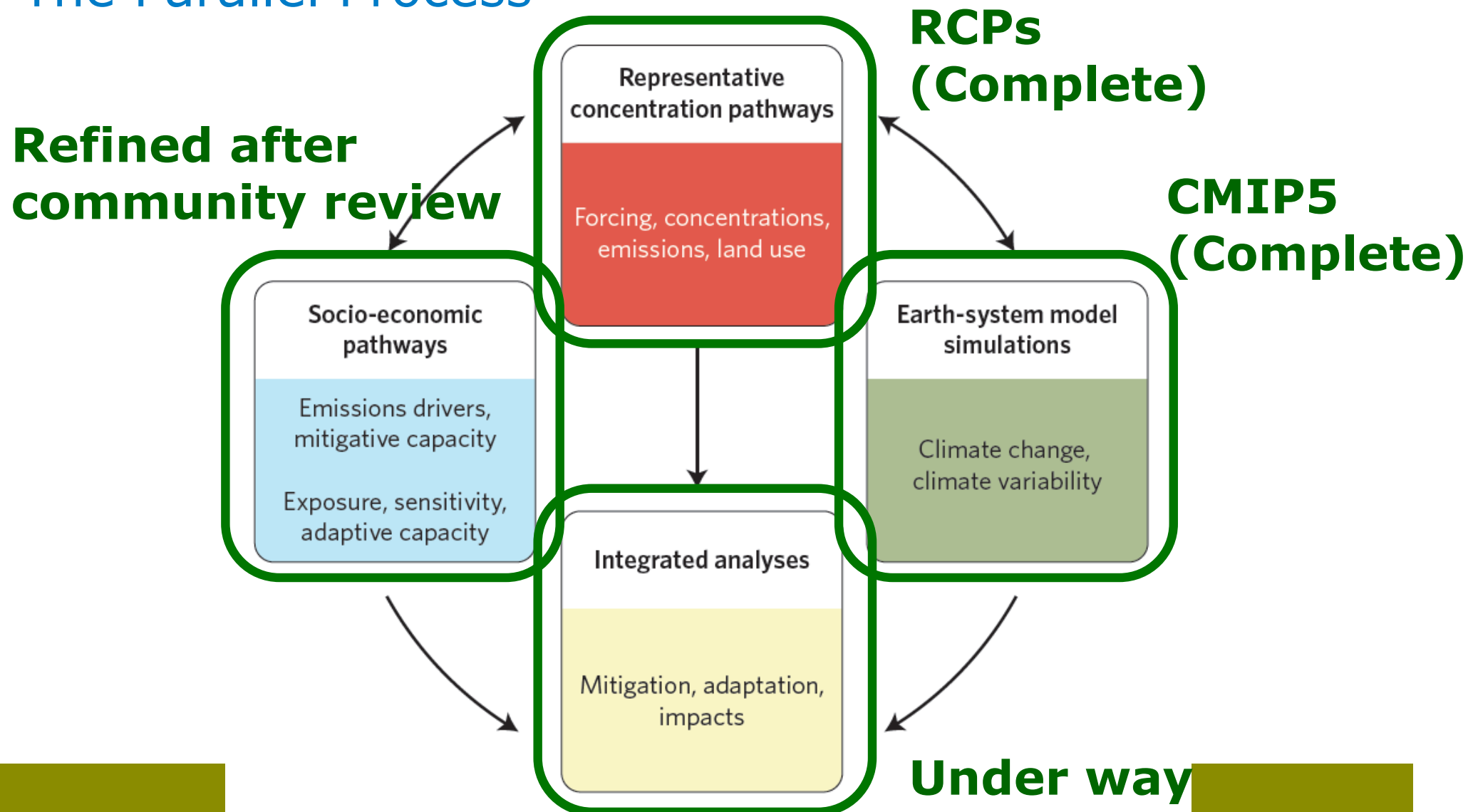
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SSP/RCP-based scenarios for CMIP6

Detlef van Vuuren, Jae
Edmonds, Brian O'Neill,
Richard Moss, John Weyant,
Keywan Riahi

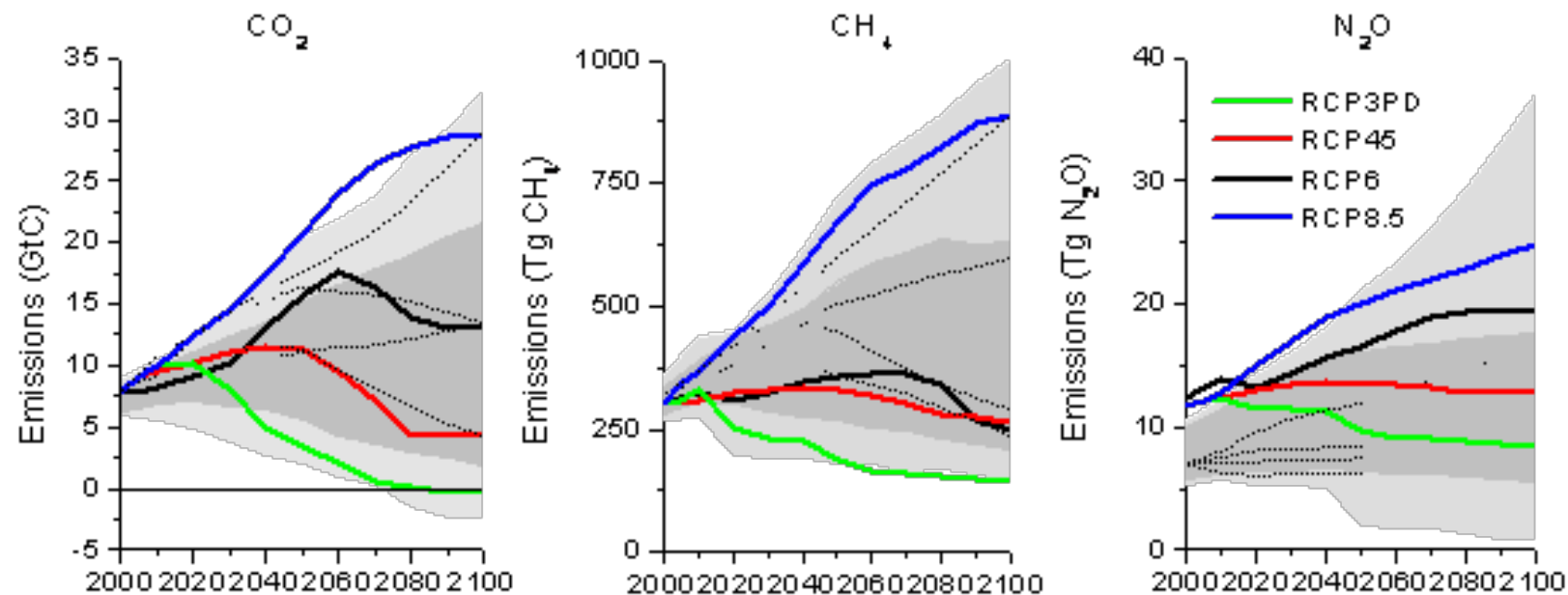


The Parallel Process



Representative concentration pathways

- Grey area = literature range; colour lines = RCPs

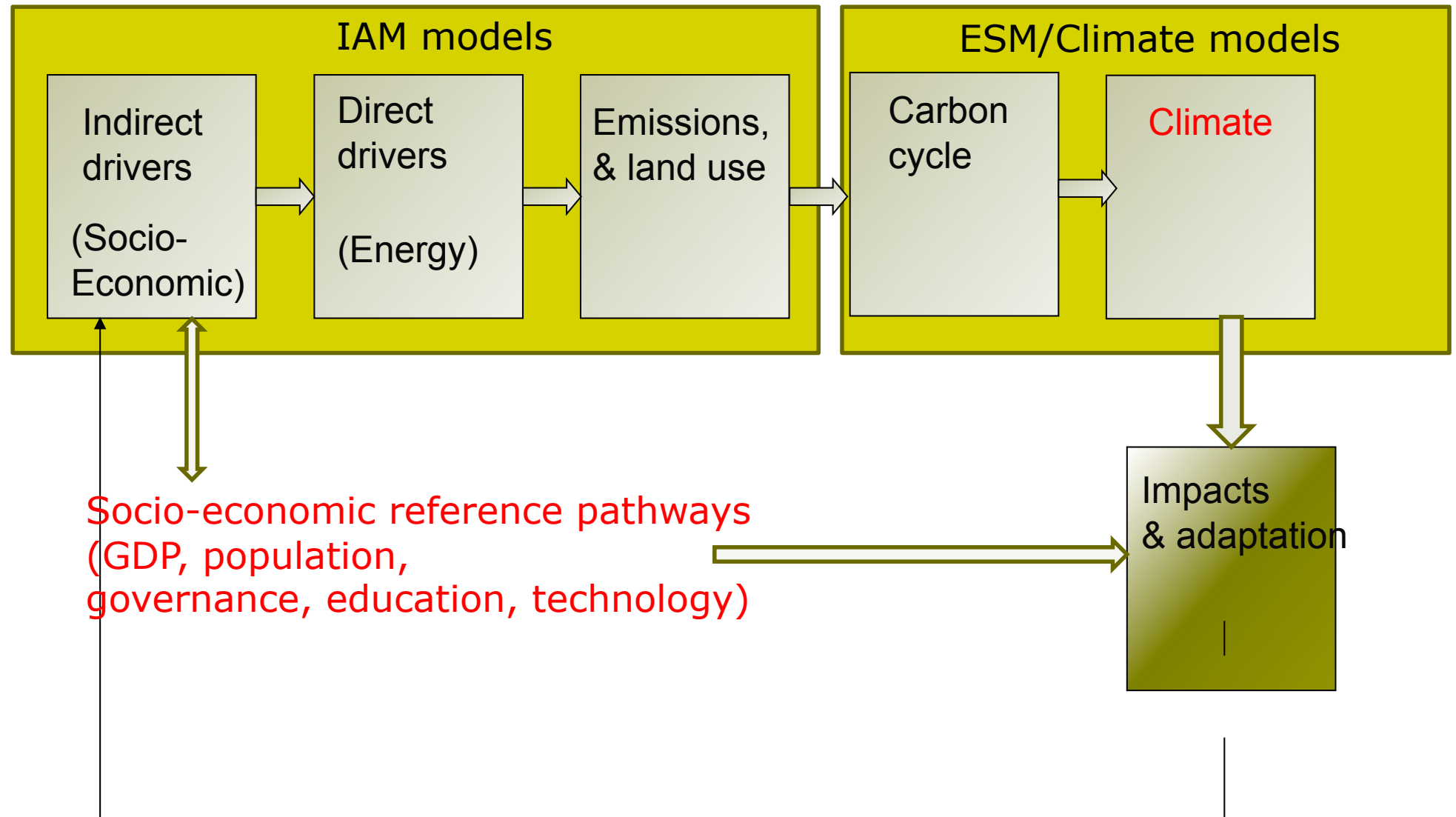


- RCPs cover the full range of GHG emissions ☺

Scenarios for impact analysis



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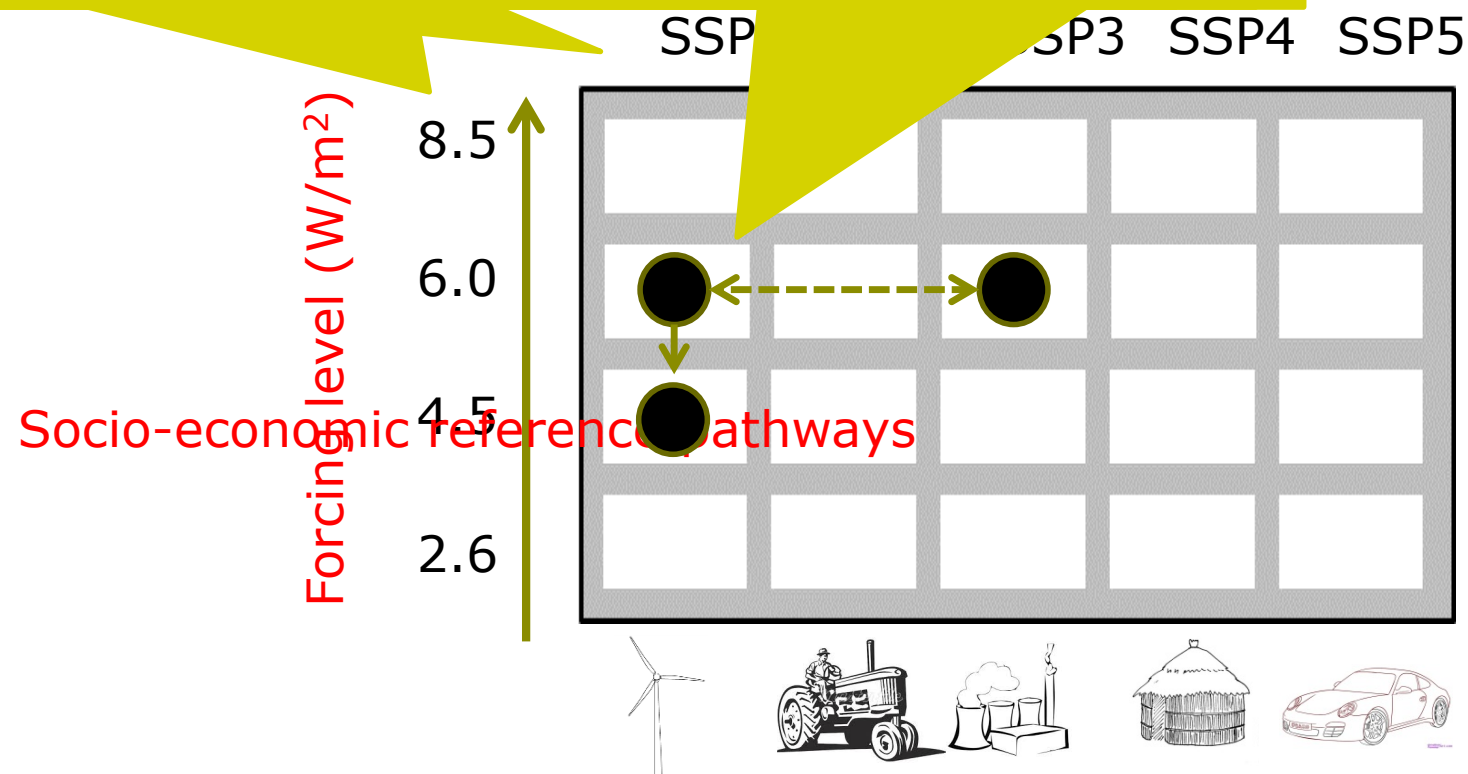
Scenarios for impact analysis



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SPA = description of mitigation (to move down a column) and adaptation policies (to deal with climate policy)

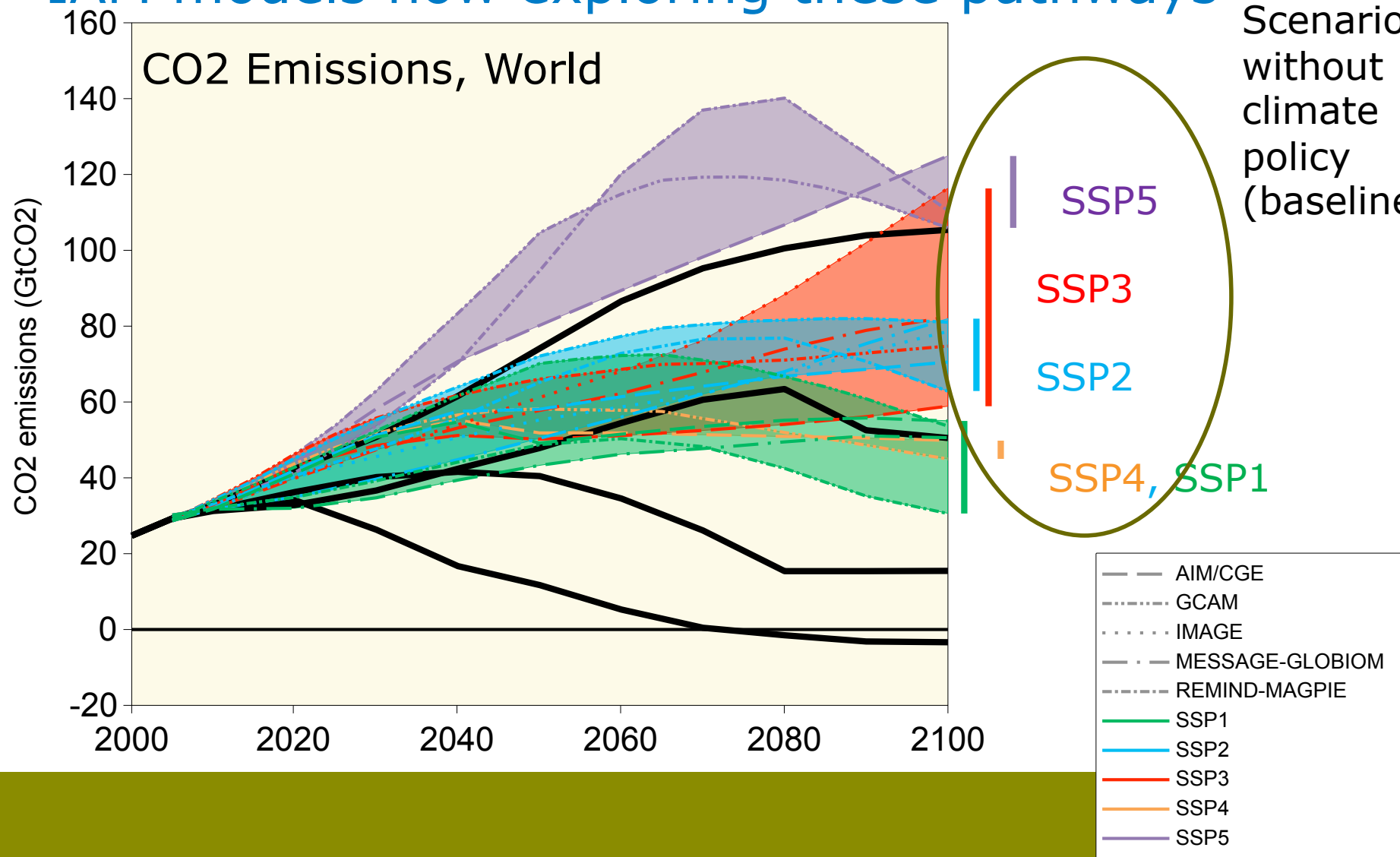
Climate





IAM models now exploring these pathways

Scenarios without climate policy (baselines)



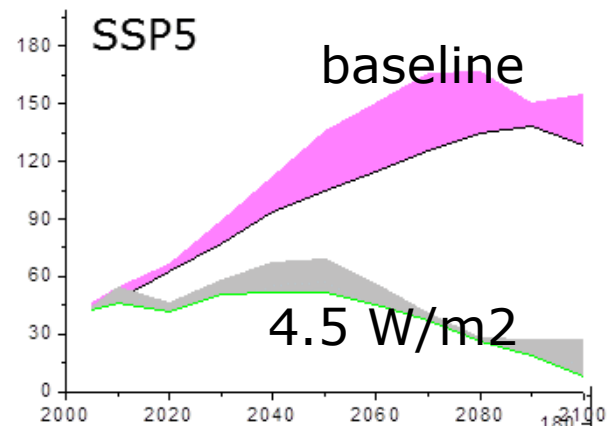


CO2 Emissions, World

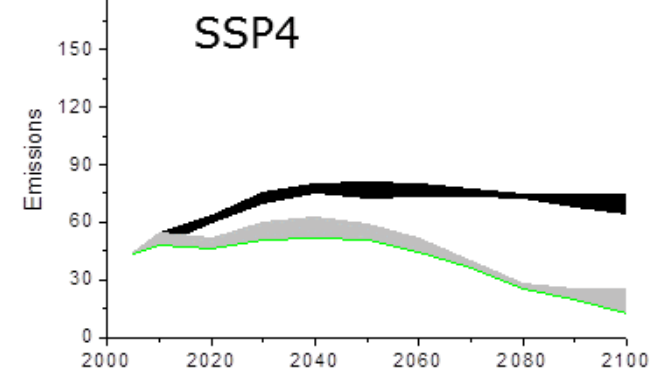
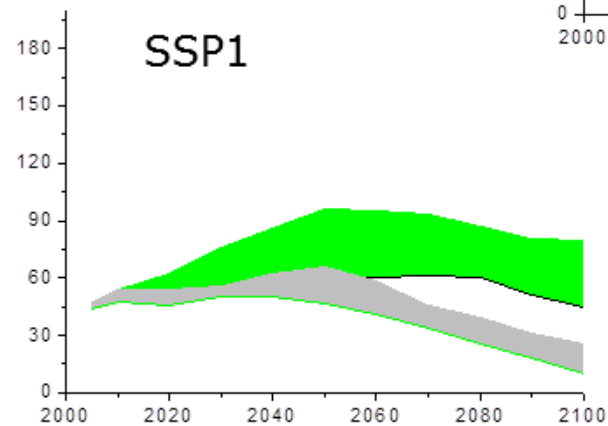
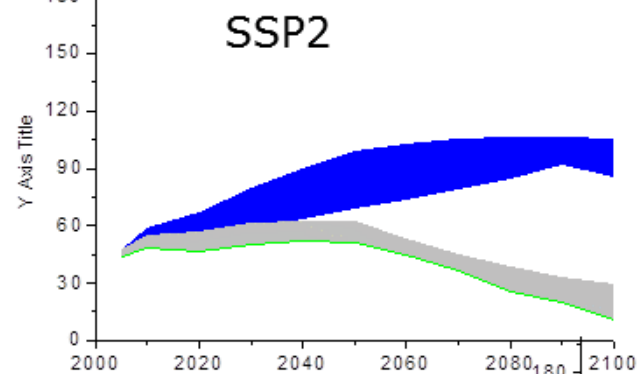
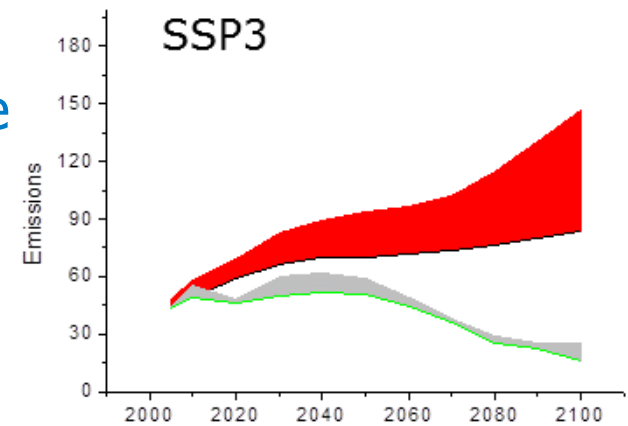
This line graph illustrates various projections for global CO2 emissions from the year 2000 to 2100. The vertical axis represents CO2 emissions in GtCO2, ranging from -20 to 160. The horizontal axis shows the years from 2000 to 2100 in 20-year increments. A solid black horizontal line is drawn at 0 GtCO2. The graph contains numerous lines of different colors and styles (solid, dashed, dotted, dash-dot) representing different scenarios. Most scenarios start at approximately 25 GtCO2 in 2000. A purple dashed line shows a significant increase, peaking at 140 GtCO2 around 2080 before declining. A red dotted line shows a steady, linear increase to about 115 GtCO2 by 2100. Other scenarios show more moderate growth or even a decline, with some reaching near-zero emissions by 2100.

Policies introduced to meet climate targets from SSP baselines

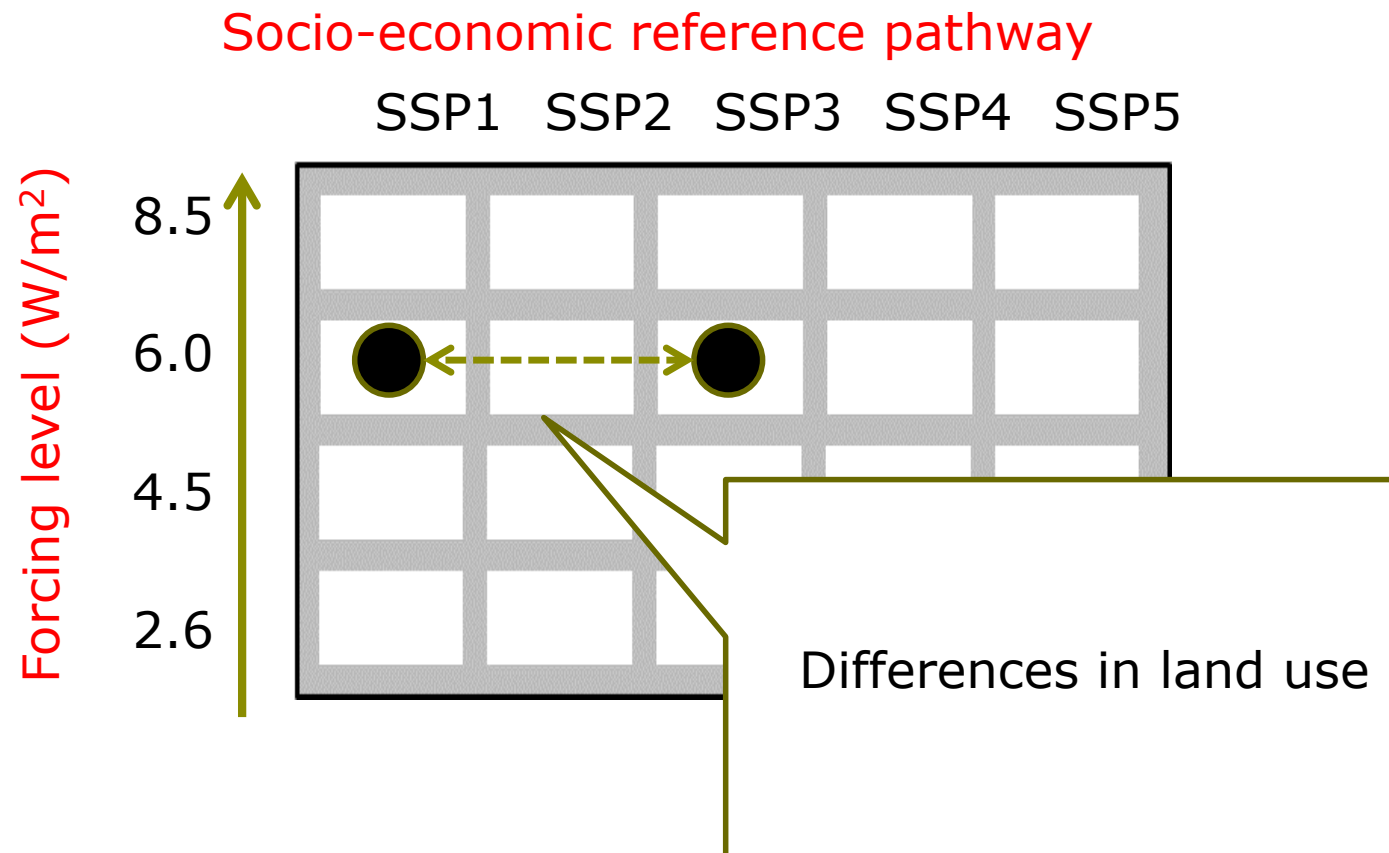
 2.6 W/m^2



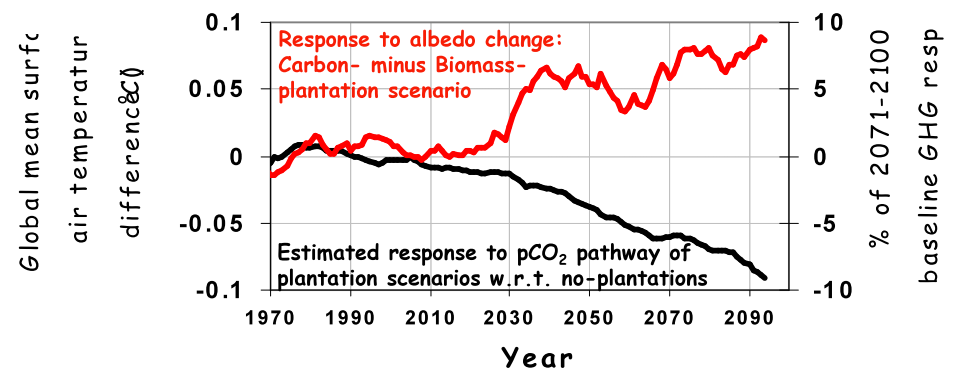
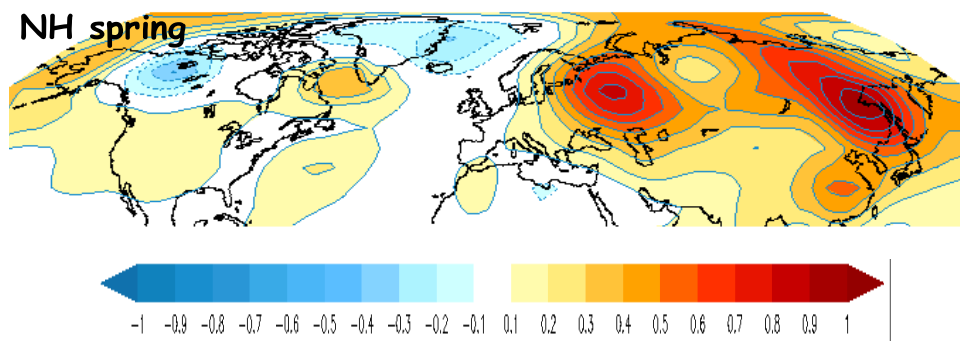
Greenhouse
Gas
emissions



Main architecture new scenarios

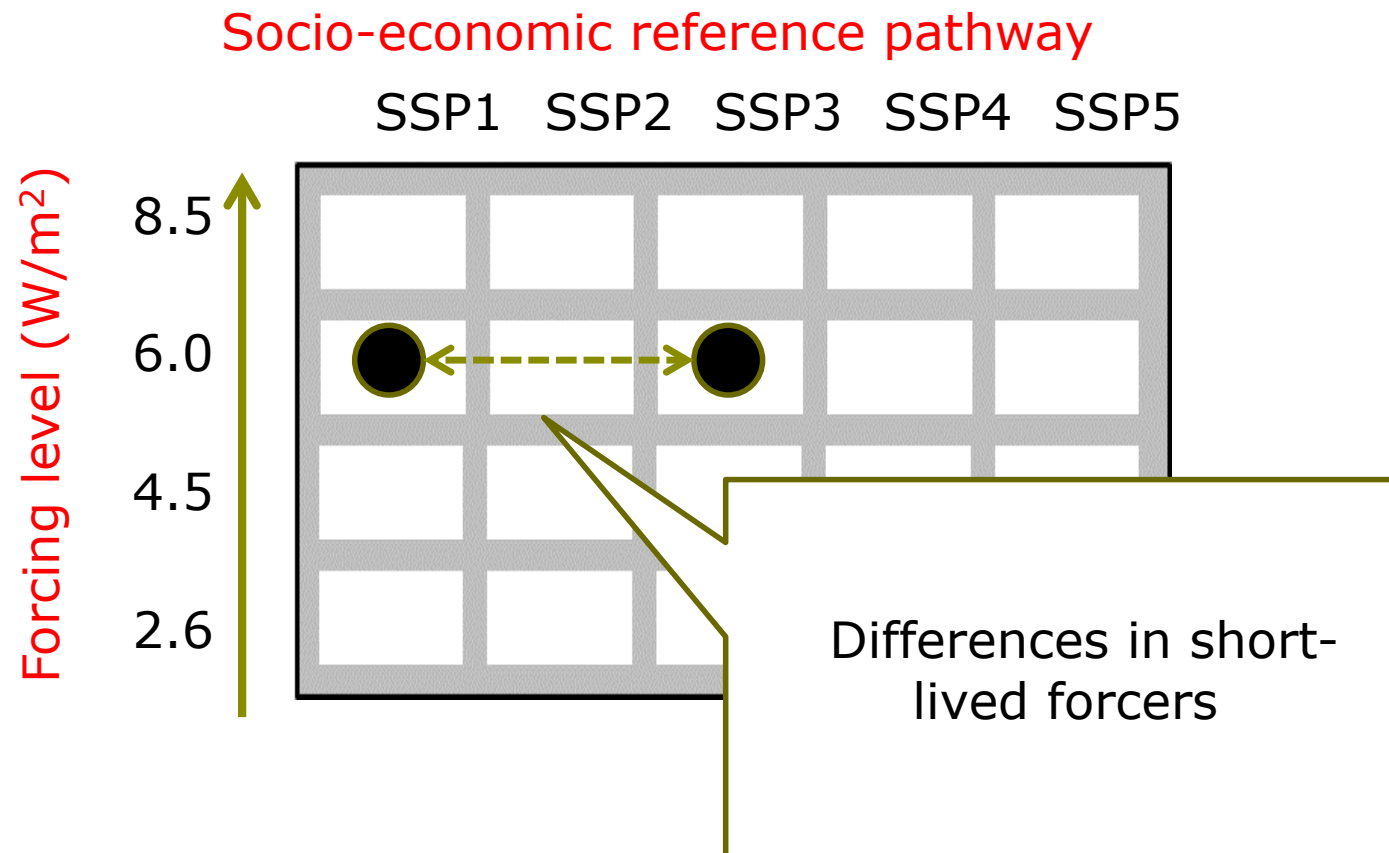


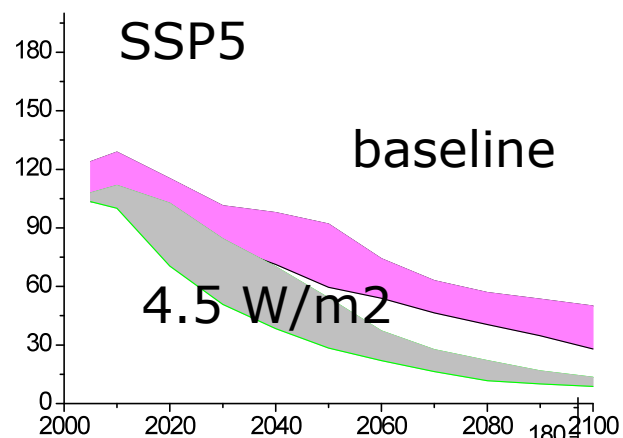
Research question #1: Can we explore together the influence of land use? (albedo, CO₂)



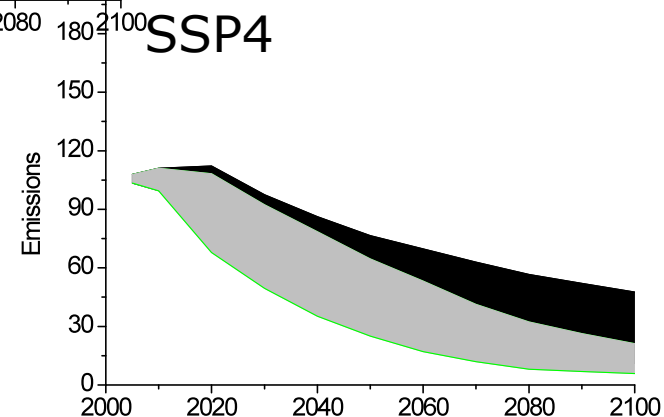
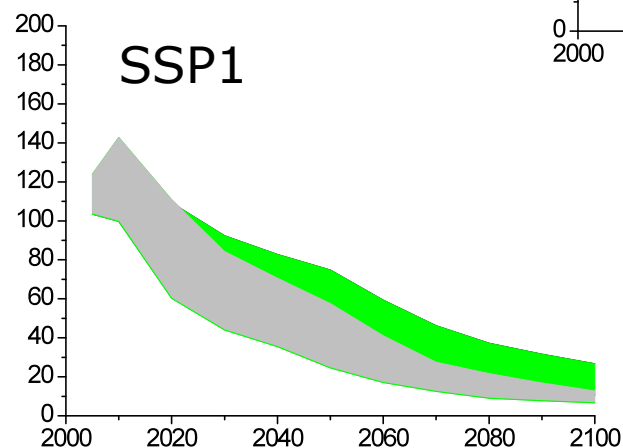
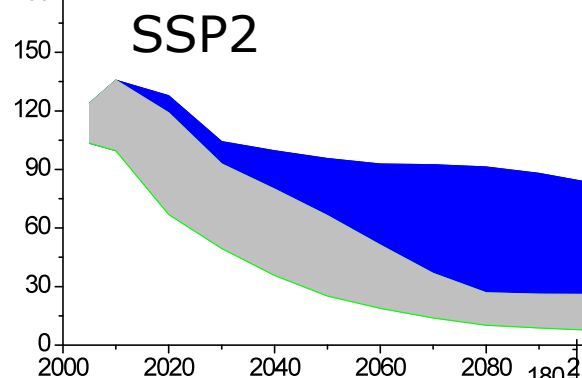
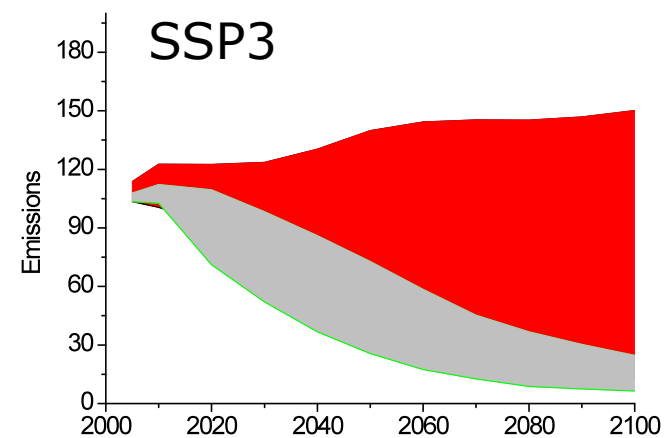
Schaeffer et al. (2006) CO₂ and albedo climate impacts of extratropical carbon and biomass plantations Glob. Biogeochem. Cycles 20 GB2020

Main architecture new scenarios

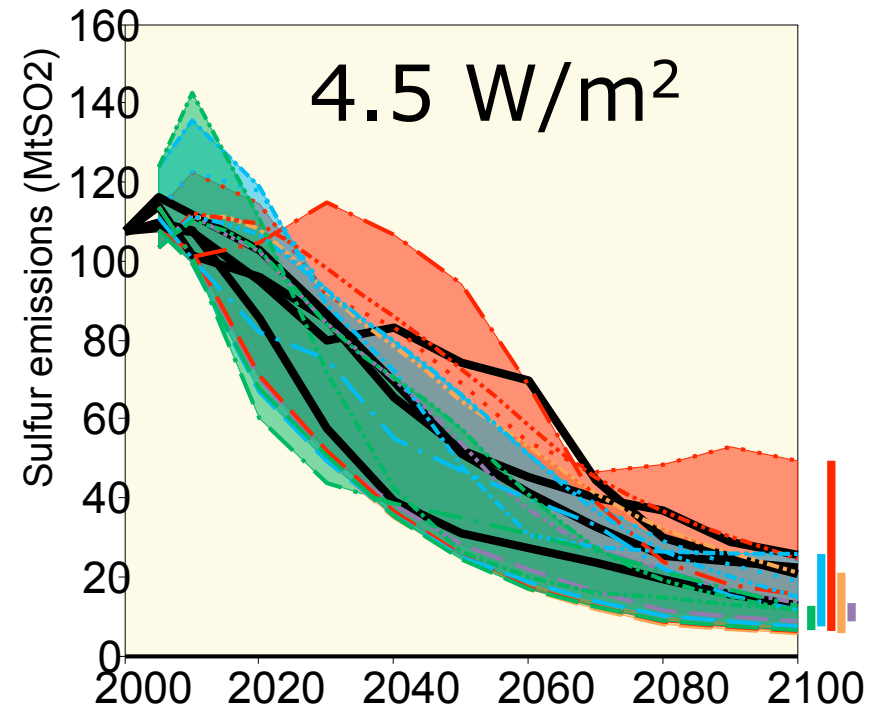
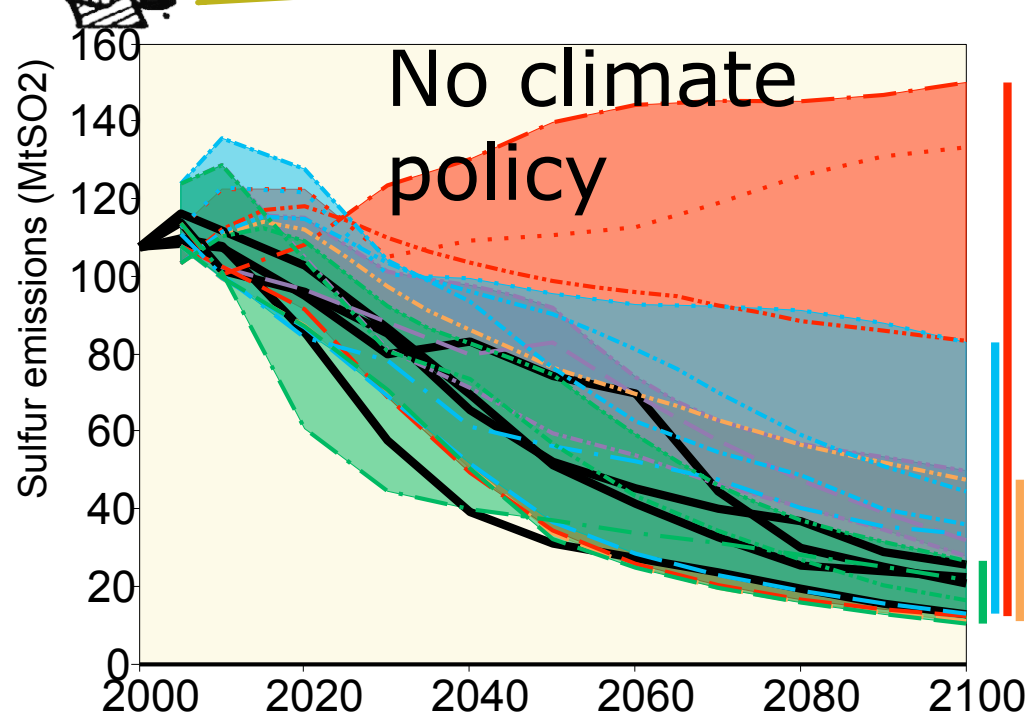




Sulphur emissions



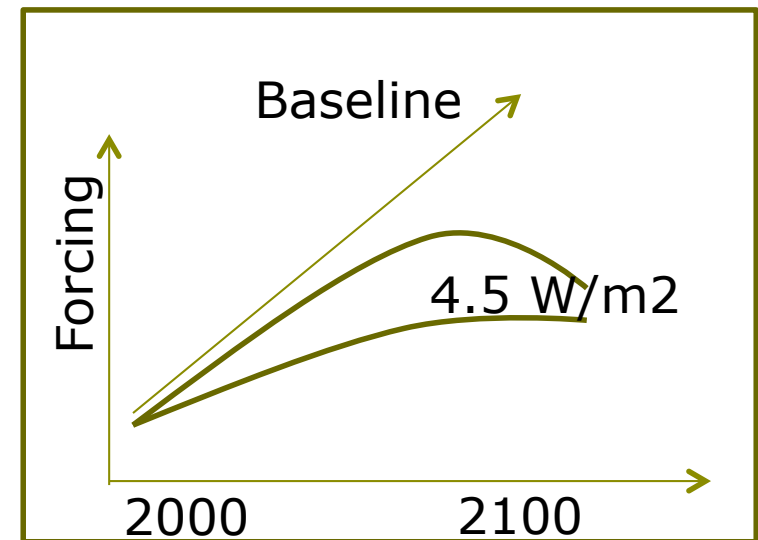
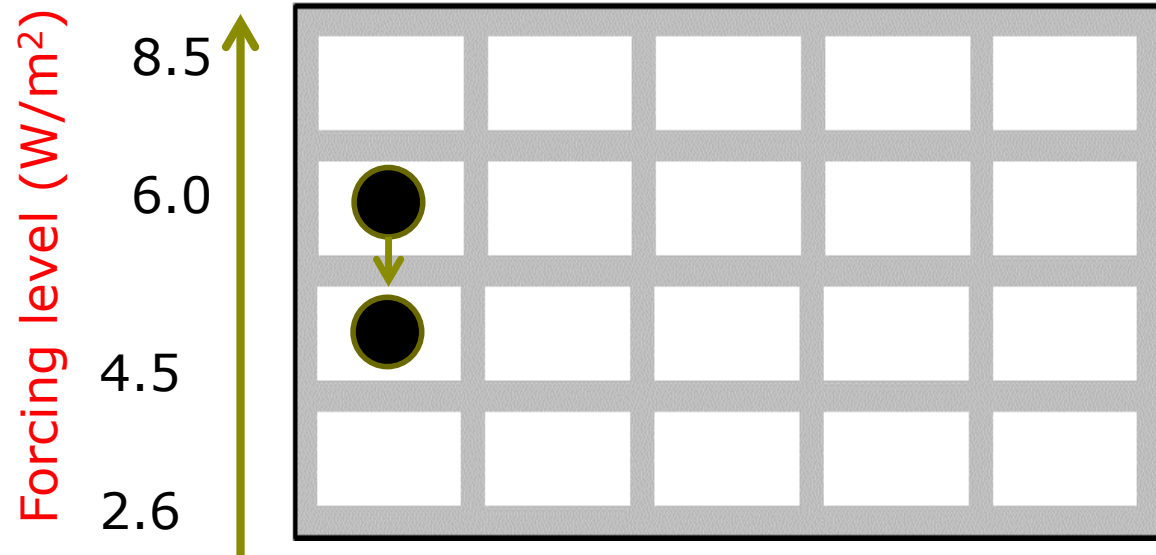
Research question #2: Can we explore together the influence of short-lived forcing agents? (aerosols)



Main architecture new scenarios

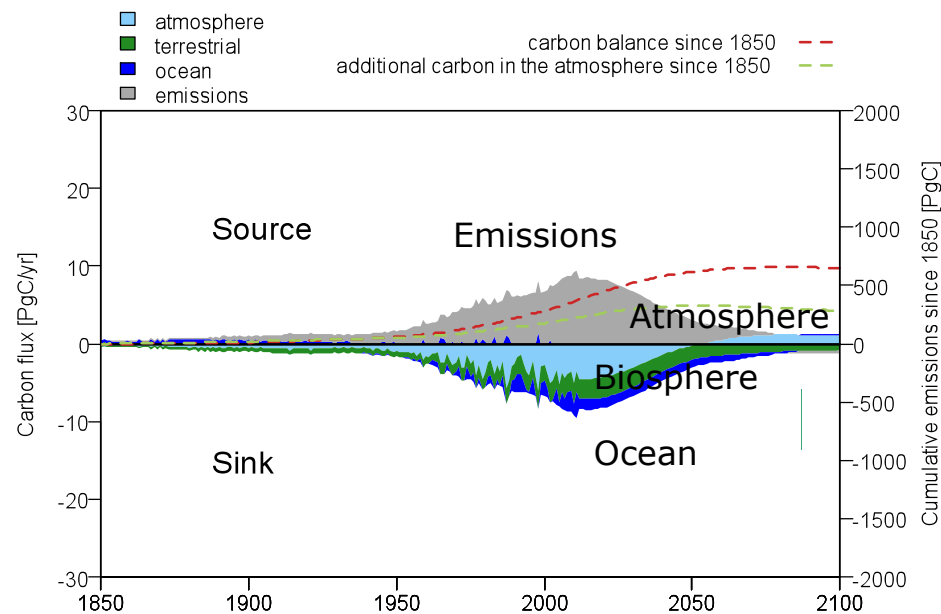
Socio-economic reference pathway

SSP1 SSP2 SSP3 SSP4 SSP5





Research question #3: We would like to explore together the influence of overshoot

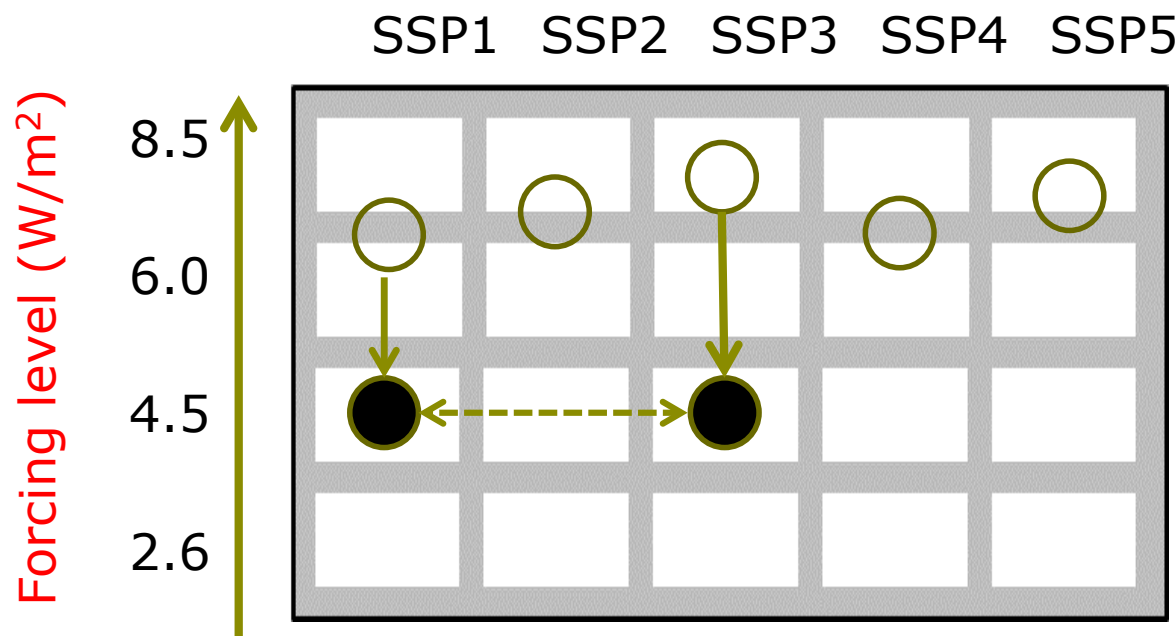


Analysis of CMIP5 RCP Data by Chris Jones, Jones et al., 2013; Historical Data: Global Carbon Project, 2010; Le Quere et al., 2012

Research question #4: We would like to explore together costs and benefits of mitigation and adaptation



Socio-economic reference pathway



Ideally, run all combinations – and look into climate, mitigation and (avoided) impacts for all cells and pairs

→ Select the most relevant
→ Look for ways to reduce runs (pattern scaling)



Process

- Interest in running set of scenarios to explore:
 - Land use effect (question #1)
 - Effect short-lived climate forcers / aerosols (question #2)
 - Overshoot (question #3)
 - Impacts of mitigation and adaptation policies on costs / benefits (also compared to baseline) (question #4).
- Selection of set of scenarios on the basis of the SSP architecture



Proposal

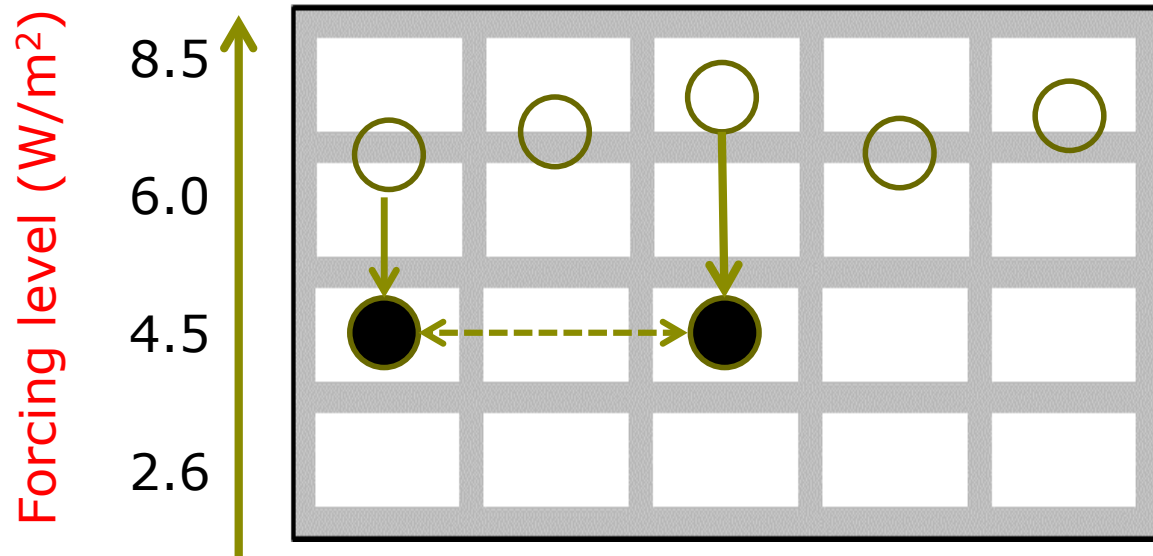
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 - Land use effect (question #1)
 - Effect short-lived climate forcers / aerosols (question #2)
 - Overshoot (question #3)
 - Impacts of mitigation and adaptation policies on costs / benefits (also compared to baseline) (question #4).
- First three questions could possibly be dealt with in specific MIPs (possibly via stylised scenarios or SSP/RCP combi's)
- In addition, scenario MIP: Selection of set of scenarios on the basis of the SSP architecture



Assume that we use different combinations of ESMs (selected in the right way)

Socio-economic reference pathway

SSP1 SSP2 SSP3 SSP4 SSP5



Decide which scenarios make most sense:

1. Enough along the x/y axis
2. Enough baseline/mitigation scenario pairs
3. An overshoot scenario
4. # scenarios?



Process

- Currently developing SSPs in IAM models (plan to be finished early next year) → First results already available
- We would like to discuss now (up to summer 2014?) how to best address these four questions by selecting scenarios from the framework:
 - Scenarios defined by combinations of SSP/RCP only?
 - Scenarios including deliberate different characteristics than standard SSP/RCP combination (extra S, overshoot)?
 - Choices also depend in progress in ESM models (need to run RCP ranges)
- Very strong interest in pattern scaling + questions related to “how different should scenarios be to make a difference”