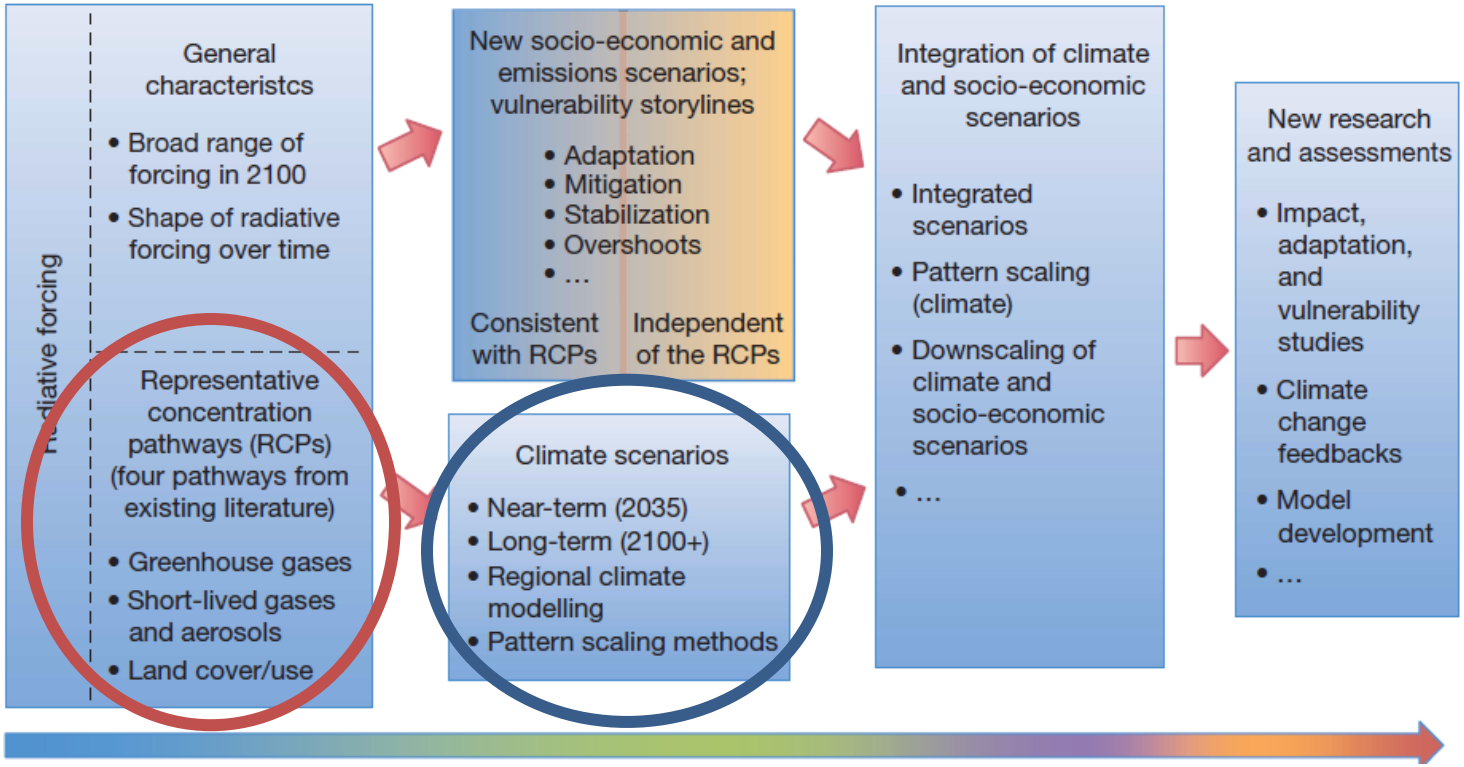
Representative Concentration Pathways Scenarios of greenhouse gas emissions and land-use for climate research

AM Thomson, JA Edmonds, KV Calvin, SJ Smith, LE Clarke
(and many collaborators)

21 September 2011
Climate and Earth System Modeling PI Meeting
Washington DC

New Scenarios Overview

- Community driven process to generate new scenarios for CMIP5 and climate research going forward
- 4 IA modeling groups selected to provide 4 pathways
- JGCRI group was one of the 4 and active throughout in the many activities



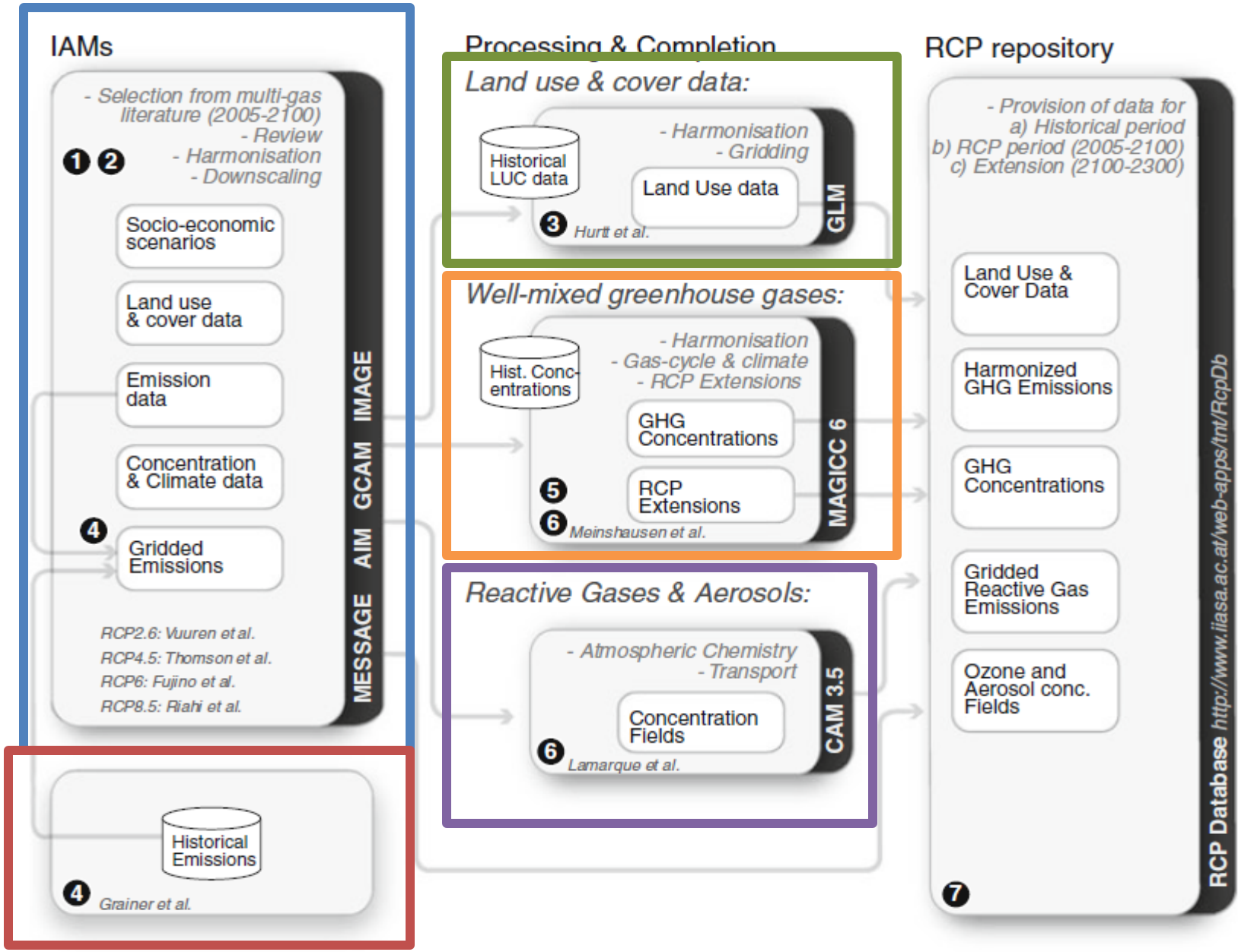
From Moss et al. 2010

The 4 selected pathways

- Designed to span the full forcing scenario space
- Based on already published literature
- Separated enough to be distinguishable in the climate models

	Description	*Publication – IA Model*
RCP8.5	Rising radiative forcing pathway leading to 8.5 W/m^2 (~1370 ppm CO_2 eq) by 2100.	(Riahi et al., 2007) **MESSAGE**
RCP6	Stabilization without overshoot pathway to 6 W/m^2 (~850 ppm CO_2 eq) at stabilization after 2100	(Fujino et al., 2006; Hijioka et al., 2008) **AIM**
RCP4.5	Stabilization without overshoot pathway to 4.5 W/m^2 (~650 ppm CO_2 eq) at stabilization after 2100	(Clarke et al., 2007; Smith and Wigley, 2006; Wise et al., 2009) **GCAM**
RCP3-PD[2]	Peak in radiative forcing at ~ 3 W/m^2 (~490 ppm CO_2 eq) before 2100 and then decline (the selected pathway declines to 2.6 W/m^2 by 2100).	(Van Vuuren et al., 2007a; van Vuuren et al., 2006) **IMAGE**

RCP Overview

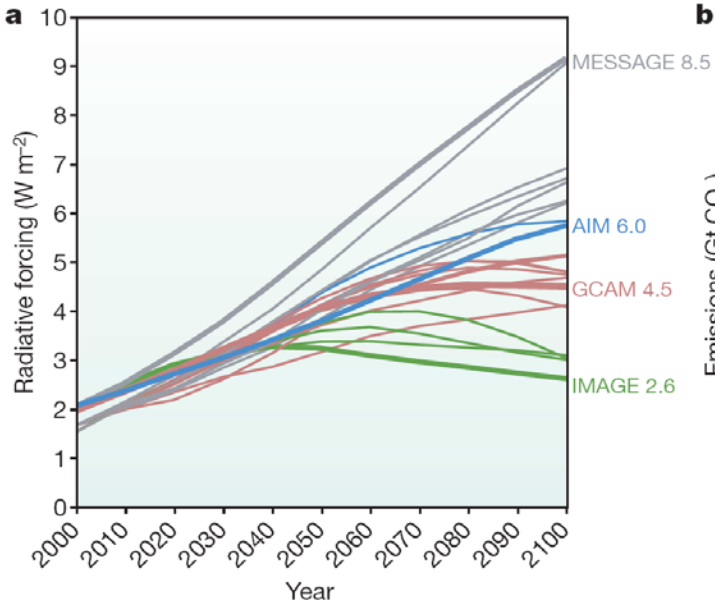


From van Vuuren et al. 2011

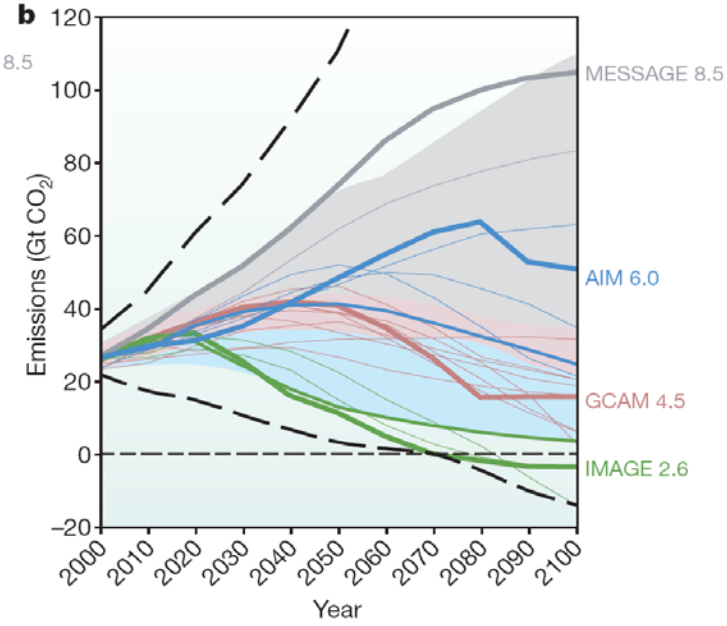
RCPs act as starting point for climate modelling

- They all have been peer reviewed (twice), and each provides an internally consistent description of socio-economics, emissions, radiative forcing and land use
- Selected from a broad range of available scenarios:

Radiative Forcing



Represent 10-90th emissions



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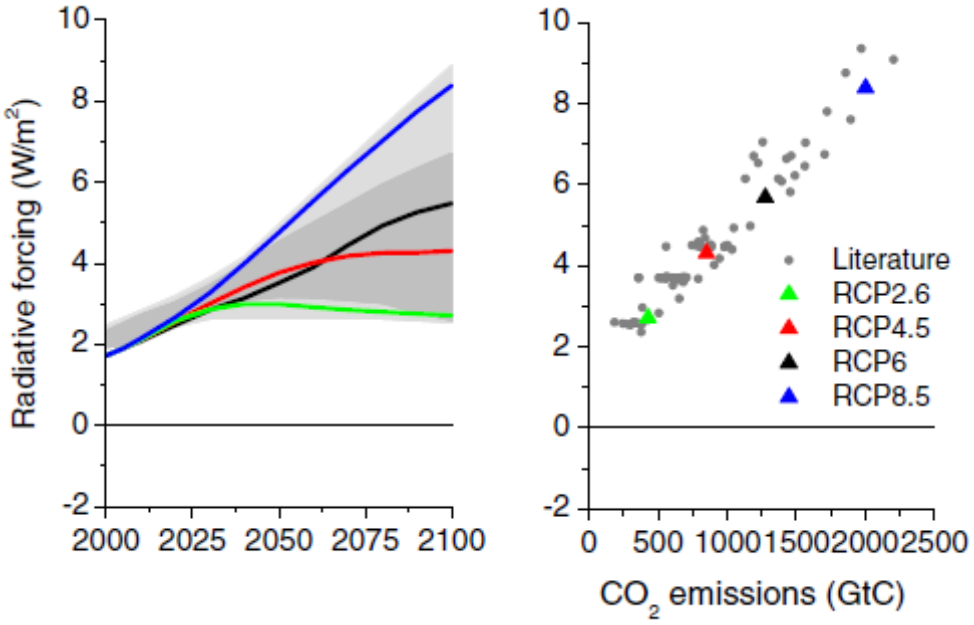
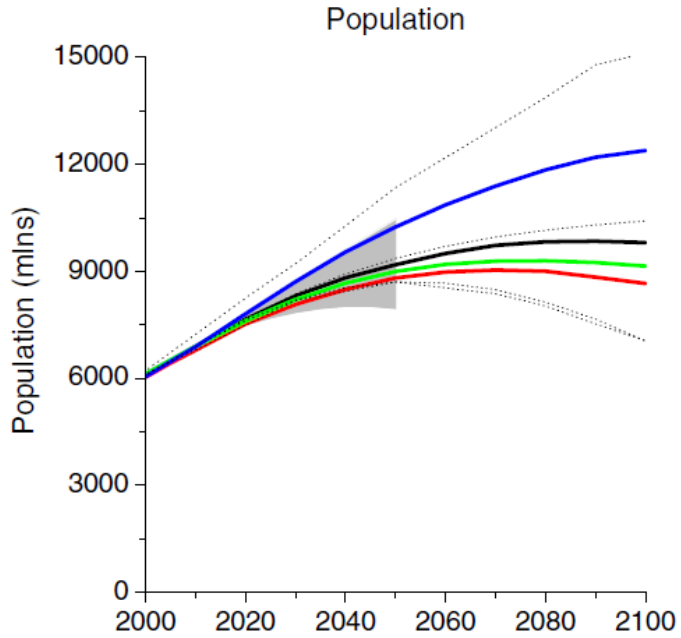
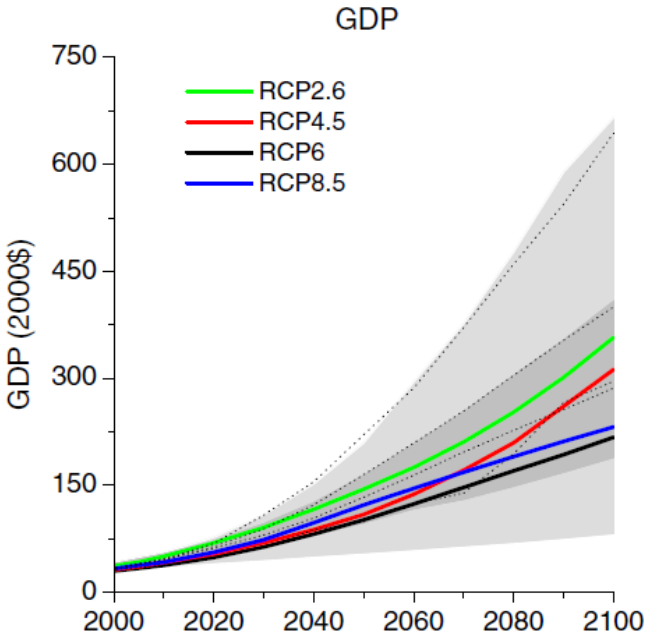
Selected scenarios in context of the literature

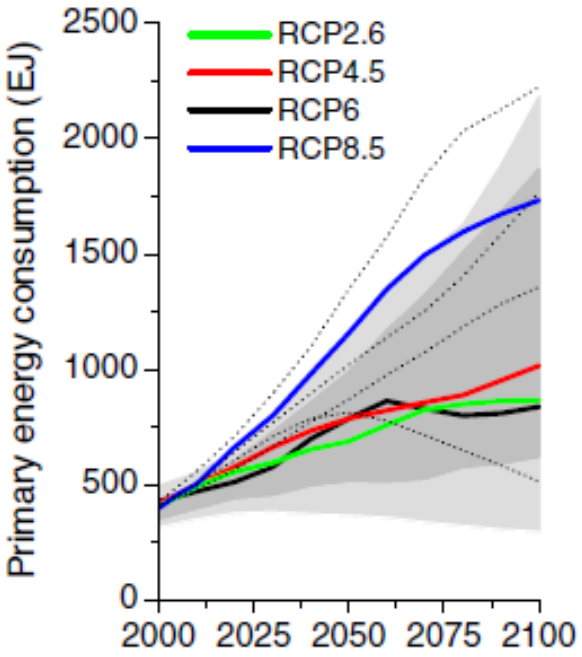


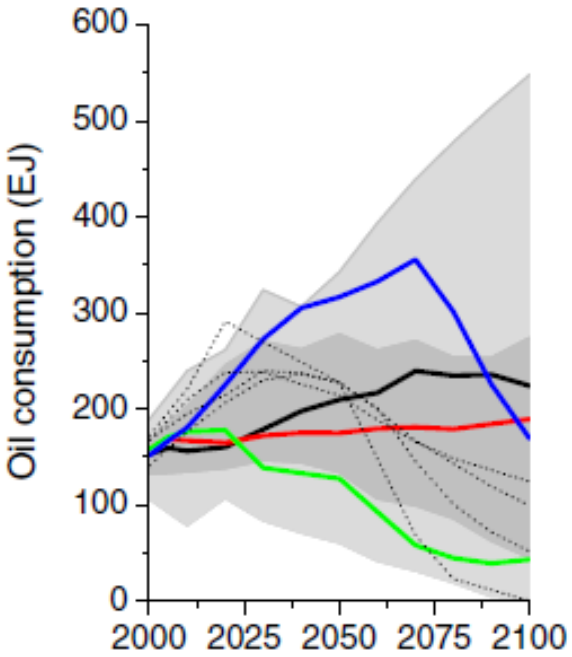
- The RCPs span the range of literature on future radiative forcing
- NOT designed to span range of socio-economic futures (or other dimensions of future scenarios)

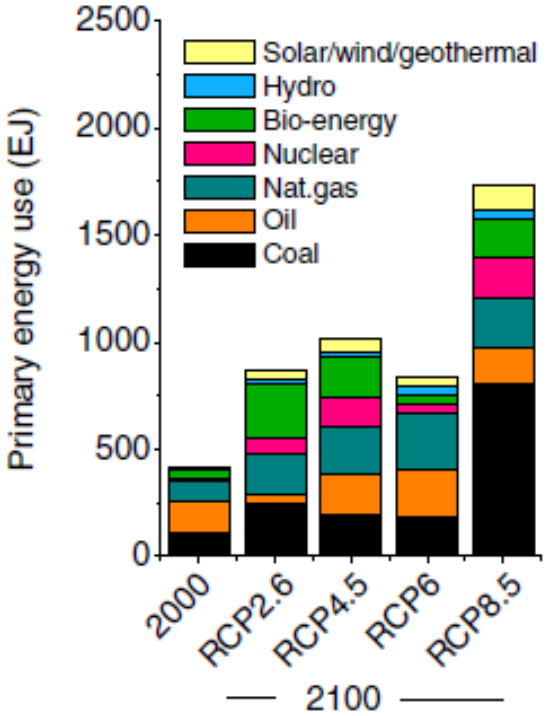




Energy Results from 4 RCPs



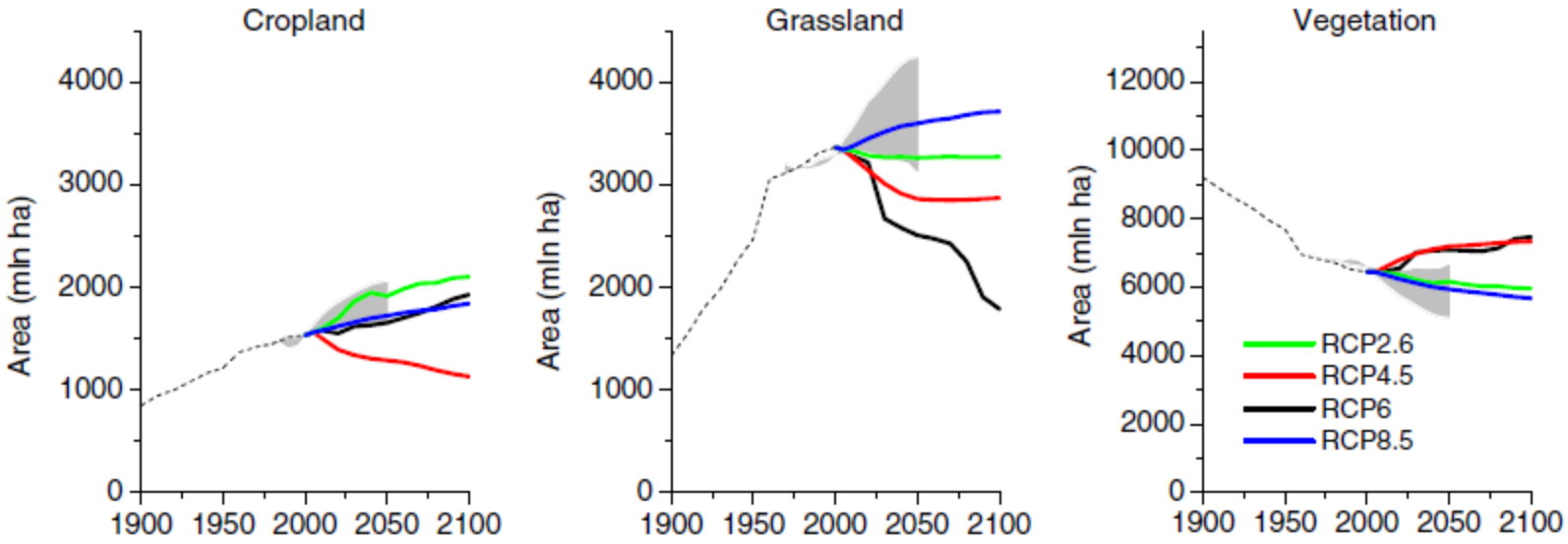




Energy consumption is closely correlated to RF target

Each model uses a mix of alternative energies, and all forms of energy increase over the century

Land Use Results from the 4 RCPs



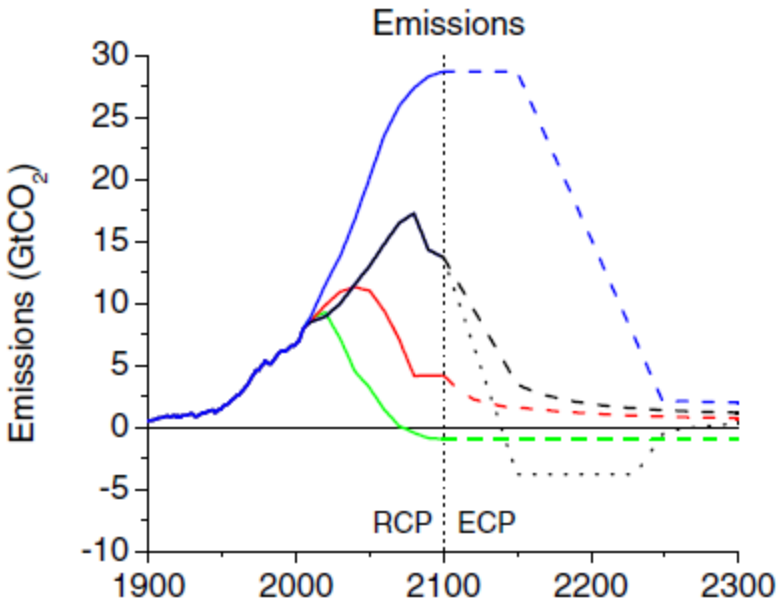
Land use change is NOT closely correlated with RF target

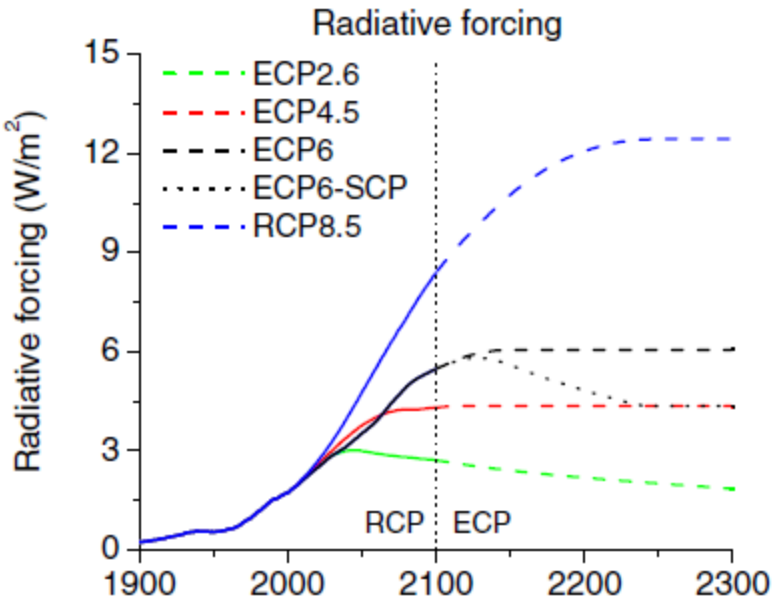
Land use projections are highly dependent on individual model assumptions and methods, which are more divergent than energy models

This is the first coordinated scenario exercise to attempt to pass land use from IAMs to climate models

For more information on this topic, see Louise Chini's presentation at 2:45 in this room.

Extensions past 2100 - ECPs

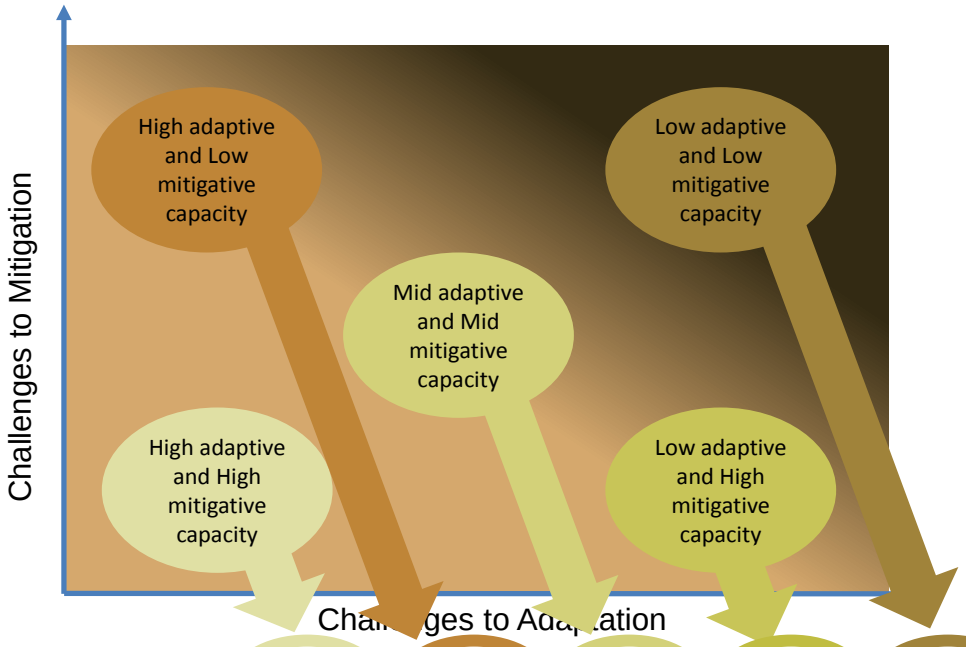




- For long-term CMIP experiments, an extension of each RCP was produced using a simple rules in the MAGICC model
- These are not IA model results and do not have underlying socio-economic assumptions
- These assume static land use post-2100
- They were designed in consultation CMIP and IAV representatives

Next Steps – Shared Socio-ecological Pathways

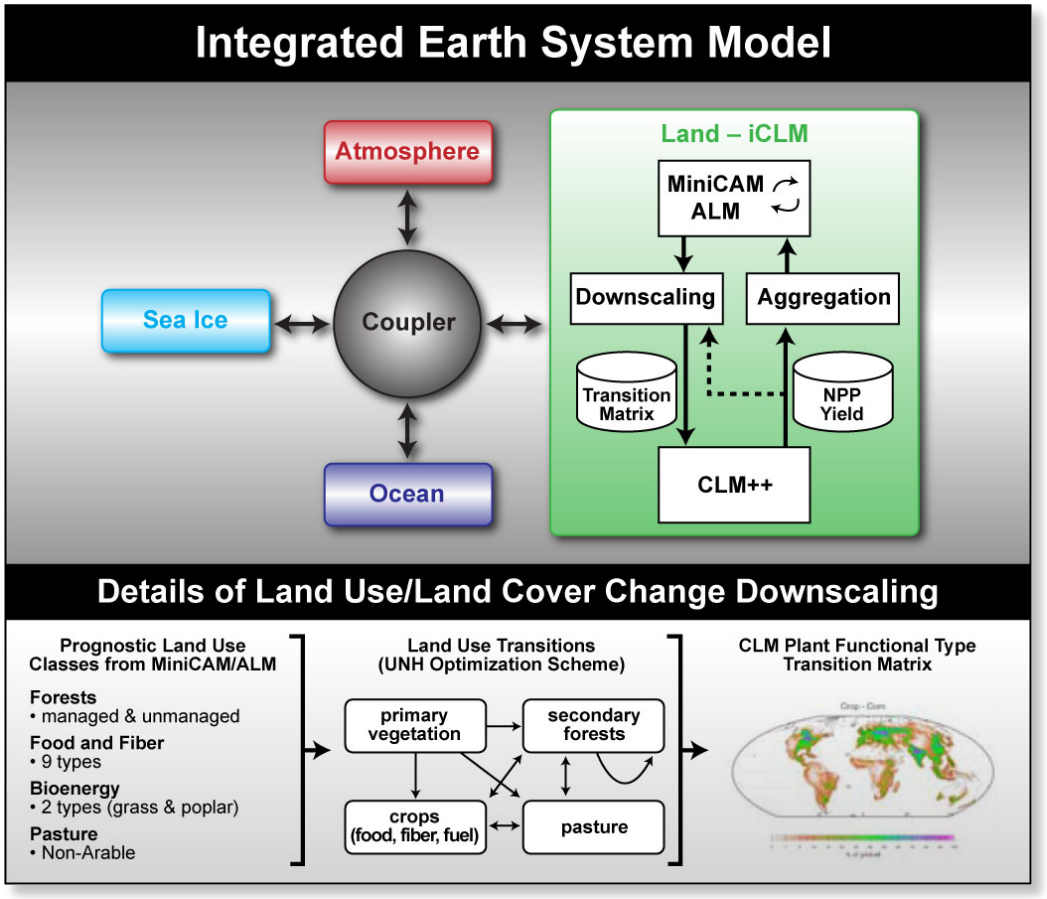
- RCPs provide guidance on human influence of those activities with direct impact on radiative forcing – emissions and land use
- Not designed as a consistent or coherent set of socio-economic scenarios
- *See Jae Edmonds presentation*



		SSP 1	SSP 2	SSP 3	SSP4	SSP5
	Reference	X	X	X	X	X
RCP Replication	8.5 Wm^{-2}				X	X
	6.0 Wm^{-2}		X	X	X	X
	4.5 Wm^{-2}	X	X	X	X	X
	2.6 Wm^{-2}	X	X	X		X

Next Steps – integrated Earth System Modeling

- Plenary talk by Edmonds, Thornton and Collins and numerous other talks and posters here.



References and further information

- Data are available from IIASA web site: **http://www.iiasa.ac.at/web-apps/tnt/RcpDb**
- RCP4.5 and supplemental GCAM data and model available from: **globalchange.umd.edu/gcamrcp**
- New Scenarios overview paper in Nature
  - Moss et al. 2010. The next generation of scenarios for climate change research and assessment *Nature*. 463:747-756.
- Special Issue of ***Climatic Change*** – now available online with open-access, to be in print in November:
  1. Overview (van Vuuren et al.)
  2. RCP8.5 paper (Riahi et al.)
  3. RCP6.0 paper (Matsui et al.)
  4. RCP4.5 paper (Thomson et al.)
  5. RCP2.6 paper (van Vuuren et al.)
  6. Land use harmonization paper (Hurtt et al.)
  7. Emission inventory documentation (Garnier et al.)
  8. Atmospheric Chemistry paper (Lamarque et al.)
  9. GHG concentrations and extension to 2300(Meinshausen et al)