

**IIASA Seminar:
Exploring the Future Collaboration
with the Japanese Research
Community**

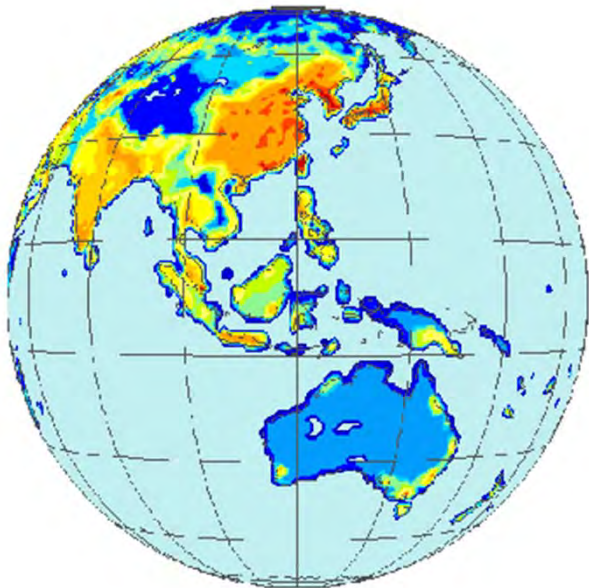
Collaboration with IIASA (3): Research Collaboration through AIM Model

Mikiko Kainuma,
Fellow, Center for Social and
Environmental Systems Research, NIES

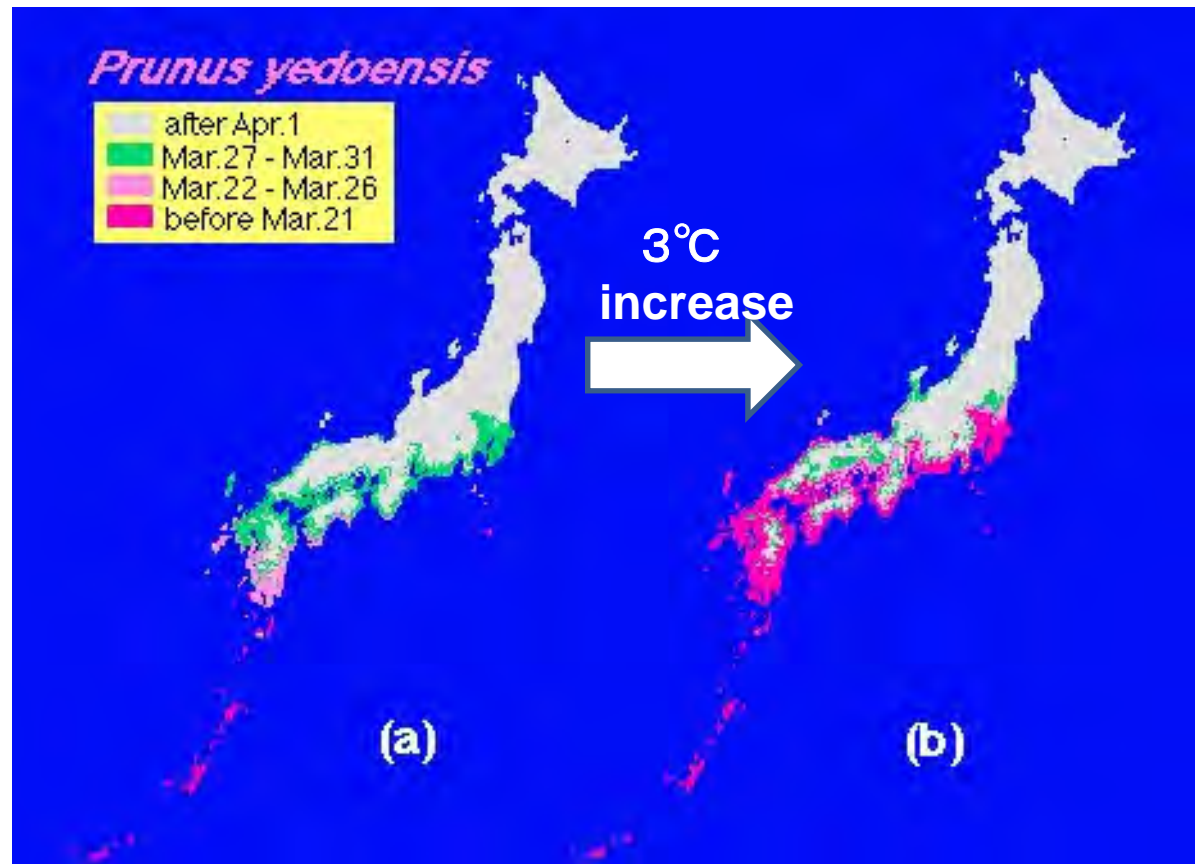
Monday, 13 October 2014
United Nations University



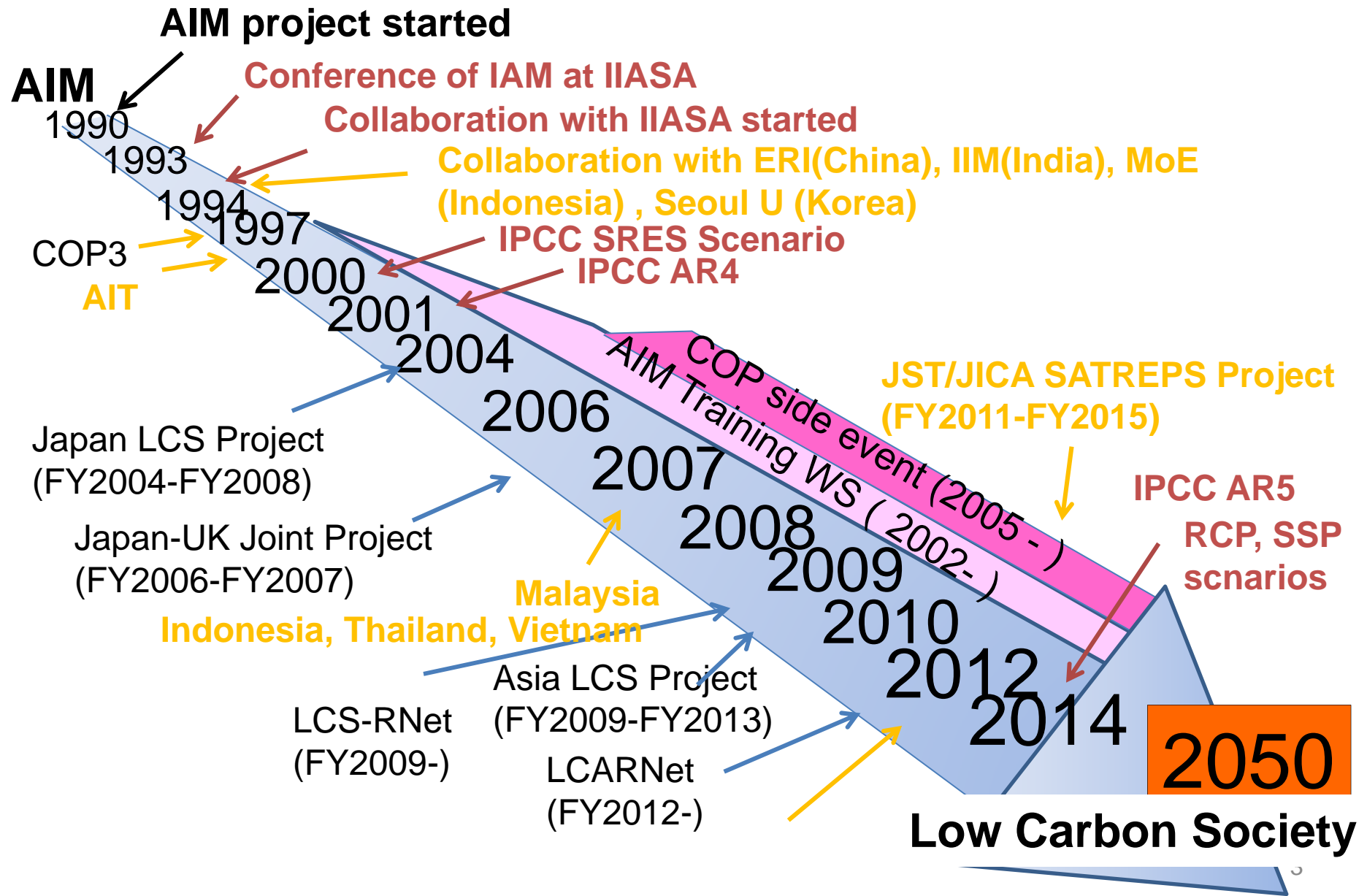
AIM model building started in 1990 when the Center for Global Environmental Research (CGER) was opened at NIES. These are the slides that we prepared for the opening ceremony. Major concerns were how much would CO2 emissions increase, how they will affect the natural environment and how to decrease CO2 emissions.



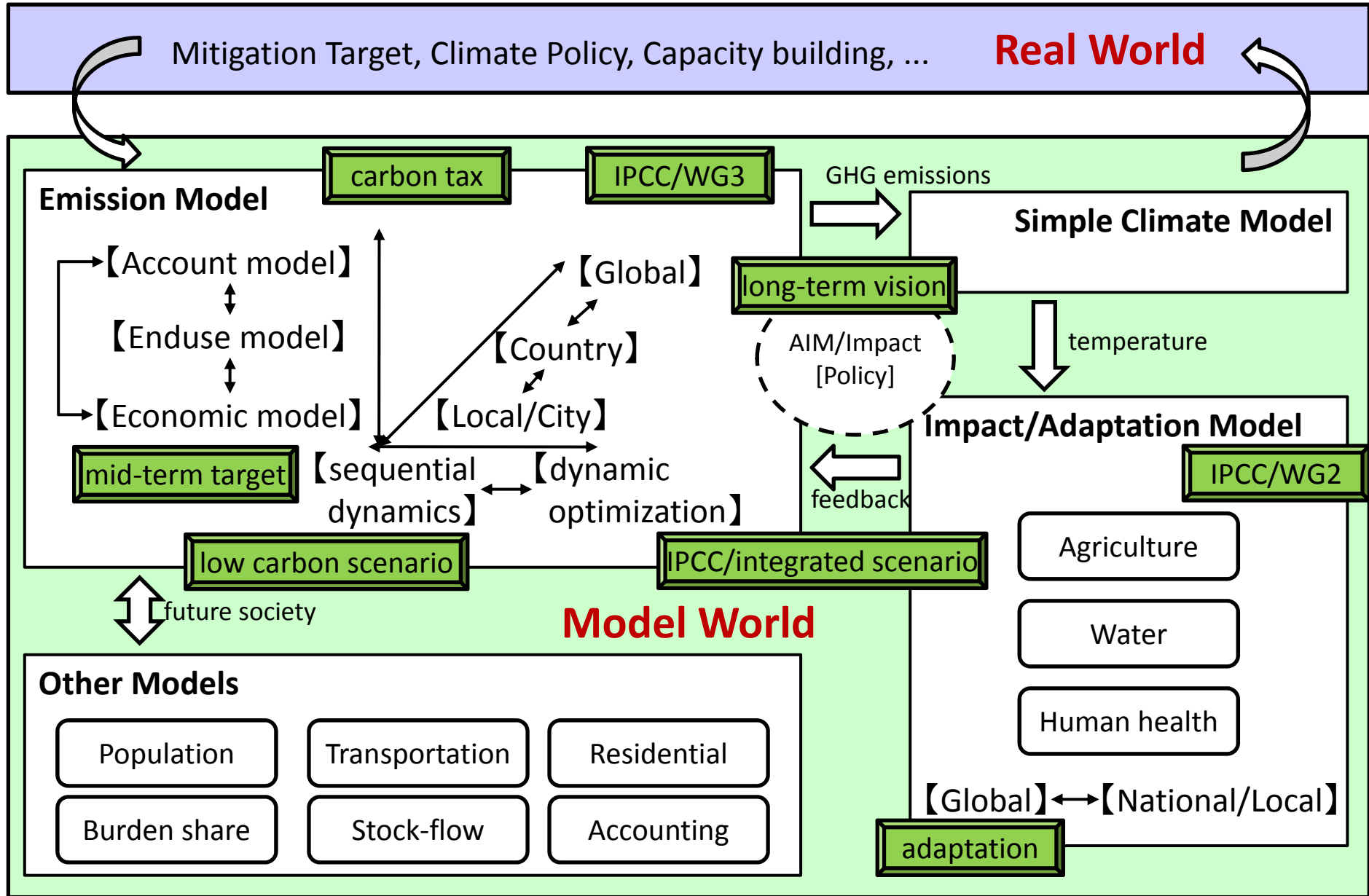
CO2 emissions in 2100



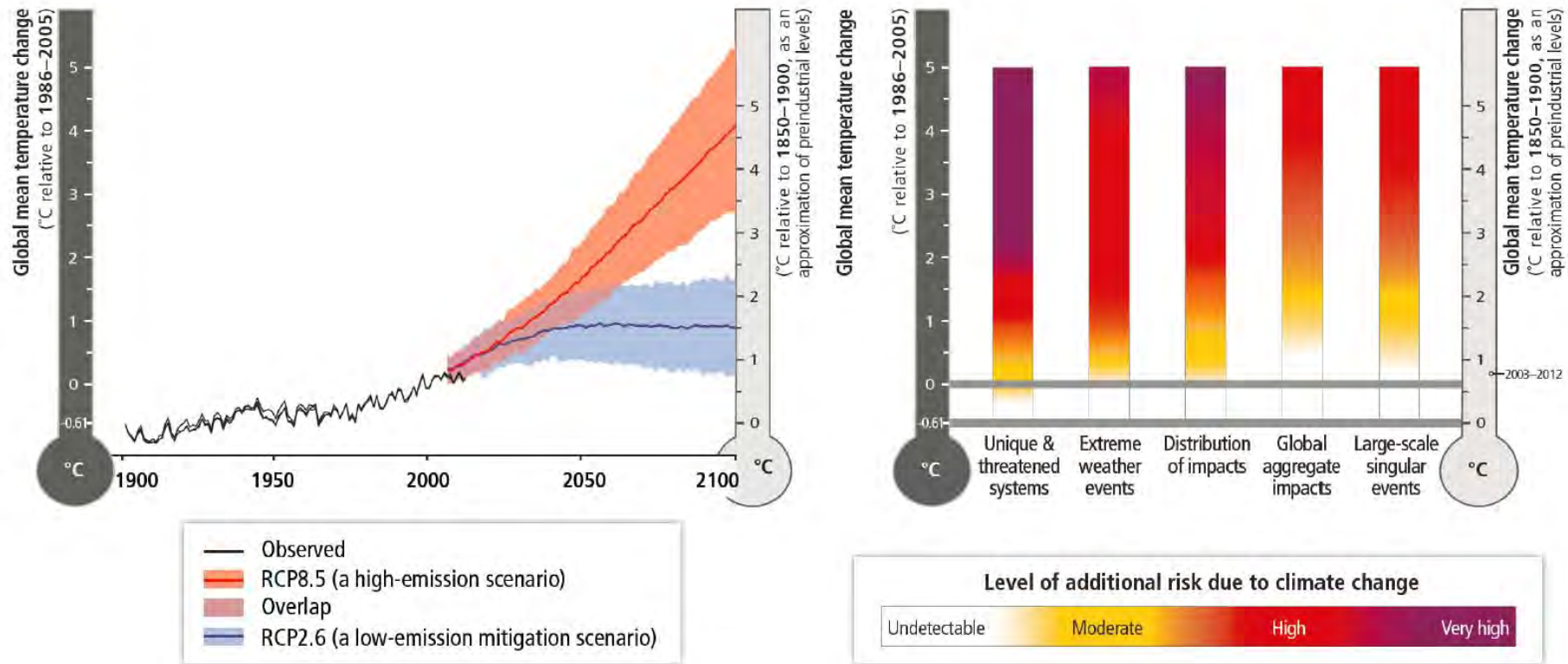
Asia-Pacific Integrated Model (AIM)



AIM Model Structure



A global perspective on climate-related risks.



Risks associated with reasons for concern are shown at right for increasing levels of climate change. The color shading indicates the additional risk due to climate change when a temperature level is reached and then sustained or exceeded.

Overview of representative concentration pathways (RCPs)

RCP	Description ^a	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
RCP2.6	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

^aApproximate radiative forcing levels were defined as $\pm 5\%$ of the stated level in W/m₂ relative to pre-industrial levels. Radiative forcing values include the net effect of all anthropogenic GHGs and other forcing agents

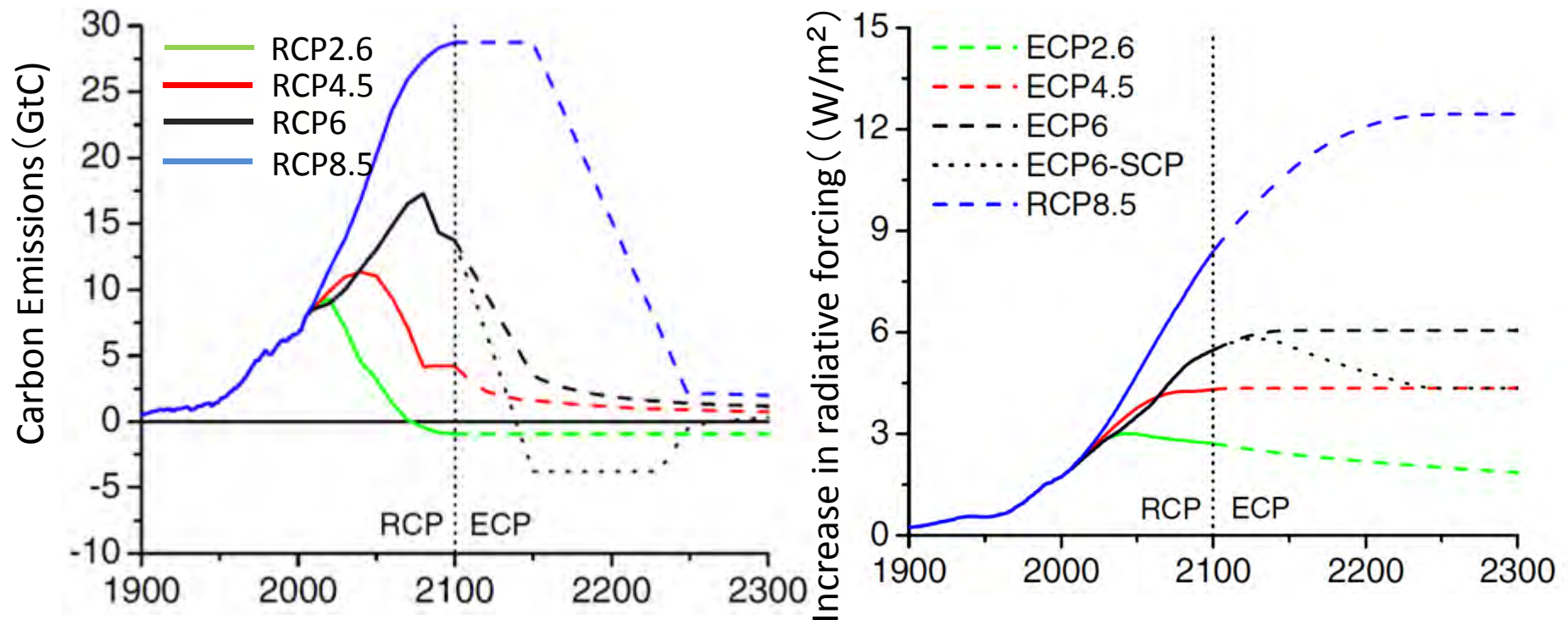
(Van Vuuren et al. 2011)

Basic rules for deriving extended concentration pathways (ECP)

Parameter	ECP	Generic rule
CO ₂ and other well-mixed GHGs	ECP8.5 ECP6 ECP4.5 ECP3PD SCP6to4.5	Follow stylized emission trajectory that leads to stabilization at 12 W/m ² Stabilize concentrations in 2150 (around 6.0 W/m ²) Stabilize concentrations in 2150 (around 4.5 W/m ²) Keep emissions constant at 2100 level Return radiative forcing of all gases from RCP6.0 to RCP4.5 levels by 2250
Reactive gases	All ECPs SCP6to4.5	Keep constant at 2100 level Scale forcing of reactive gases with GHG forcing
Land use	All ECPs	Keep constant at 2100 level

(Van Vuuren et al. 2011)

Extension of the RCPs (radiative forcing and associated CO₂ emissions). ECP is extended concentration pathway. The SCP6to4.5 (supplementary concentration pathway) shows an alternative extension for RCP6

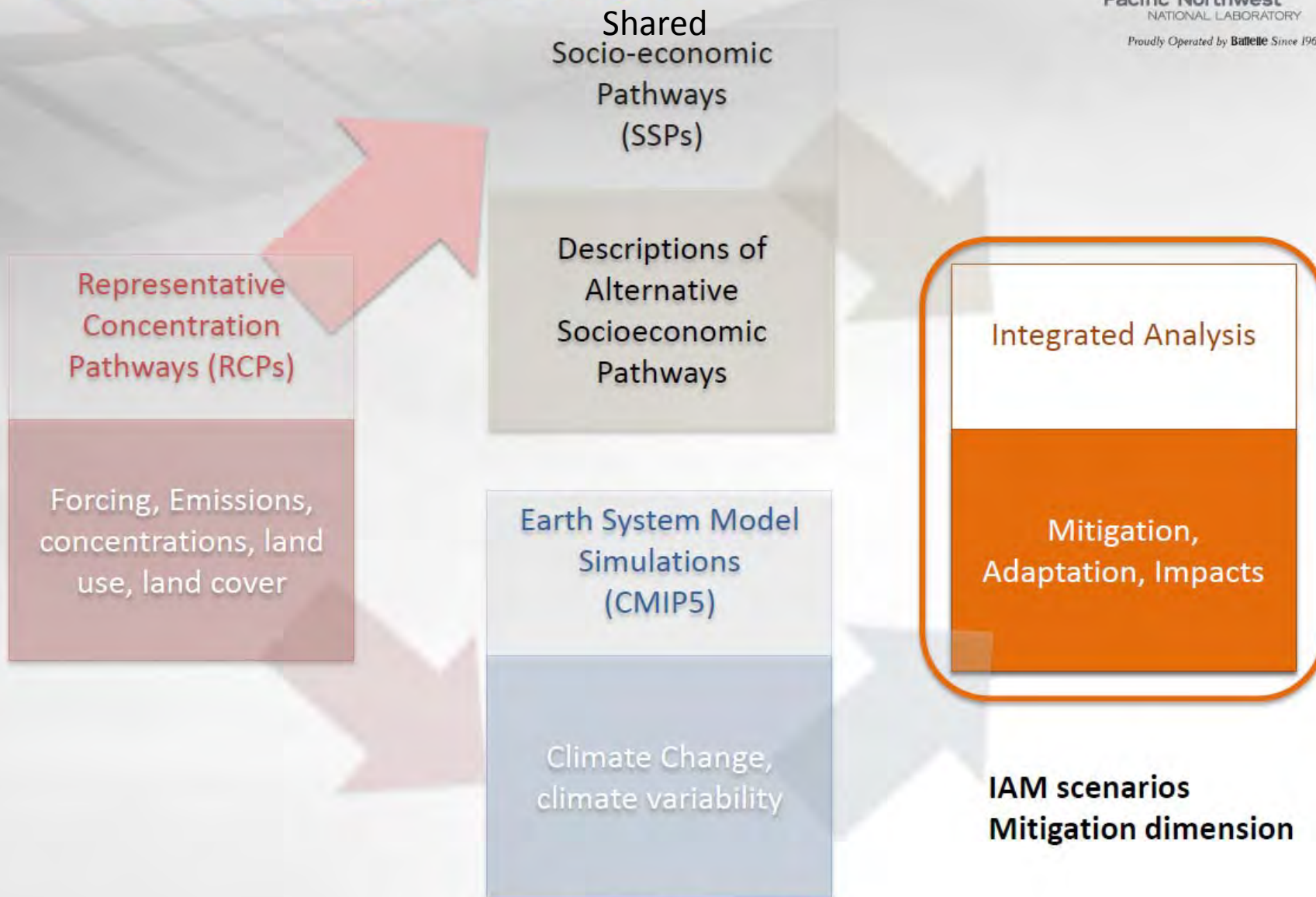


CO₂ emissions pathways in four Representative Concentration Pathways (RCPs) used for IPCC 5th Assessment Report (left) and corresponding increase in radiative forcing (right).

(Source: Detlef P. van Vuuren et al., 2011)

(Meinshausen et al. 2011)

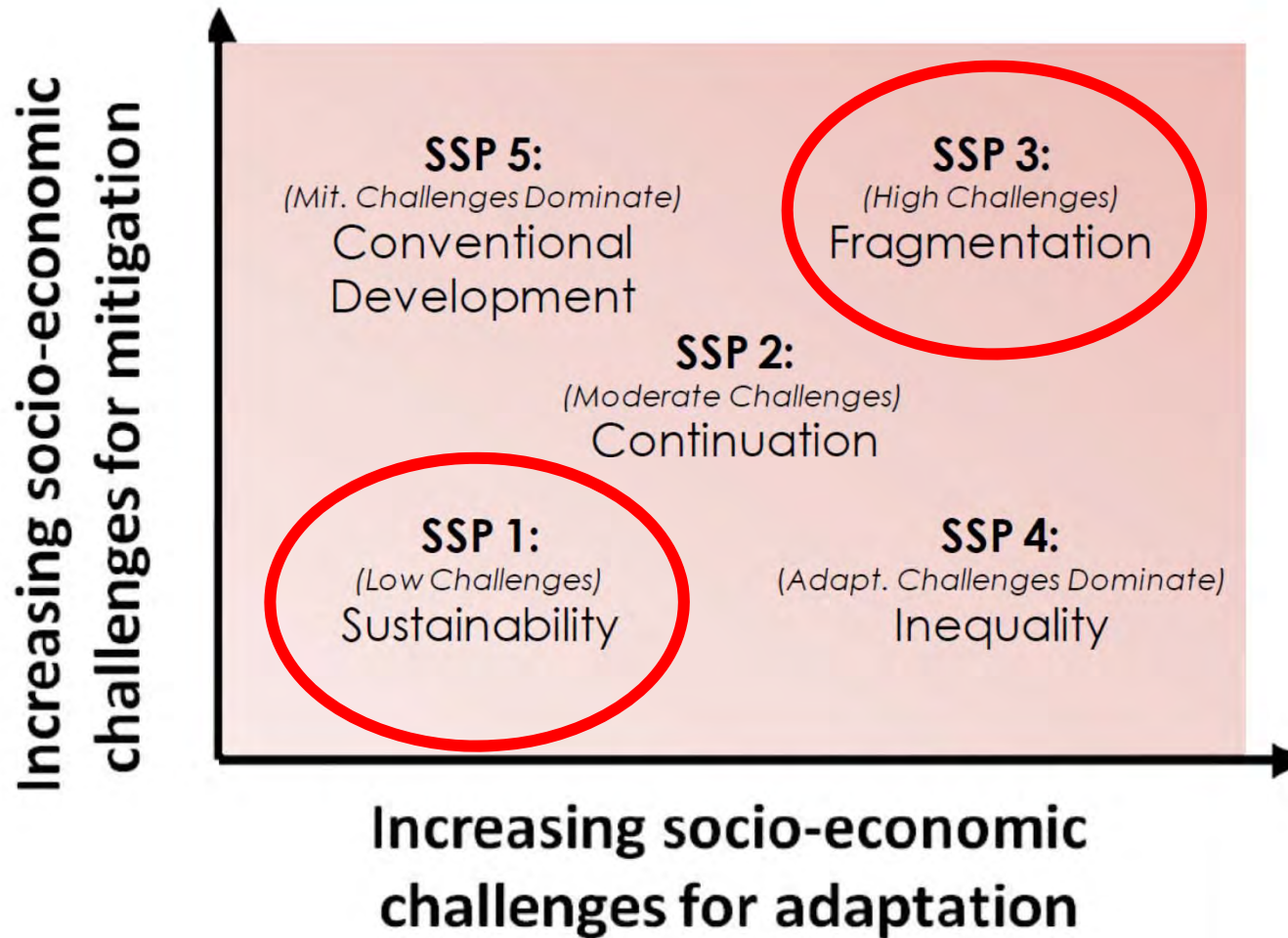
SSPs and Integrated Analysis



IAM scenarios
Mitigation dimension

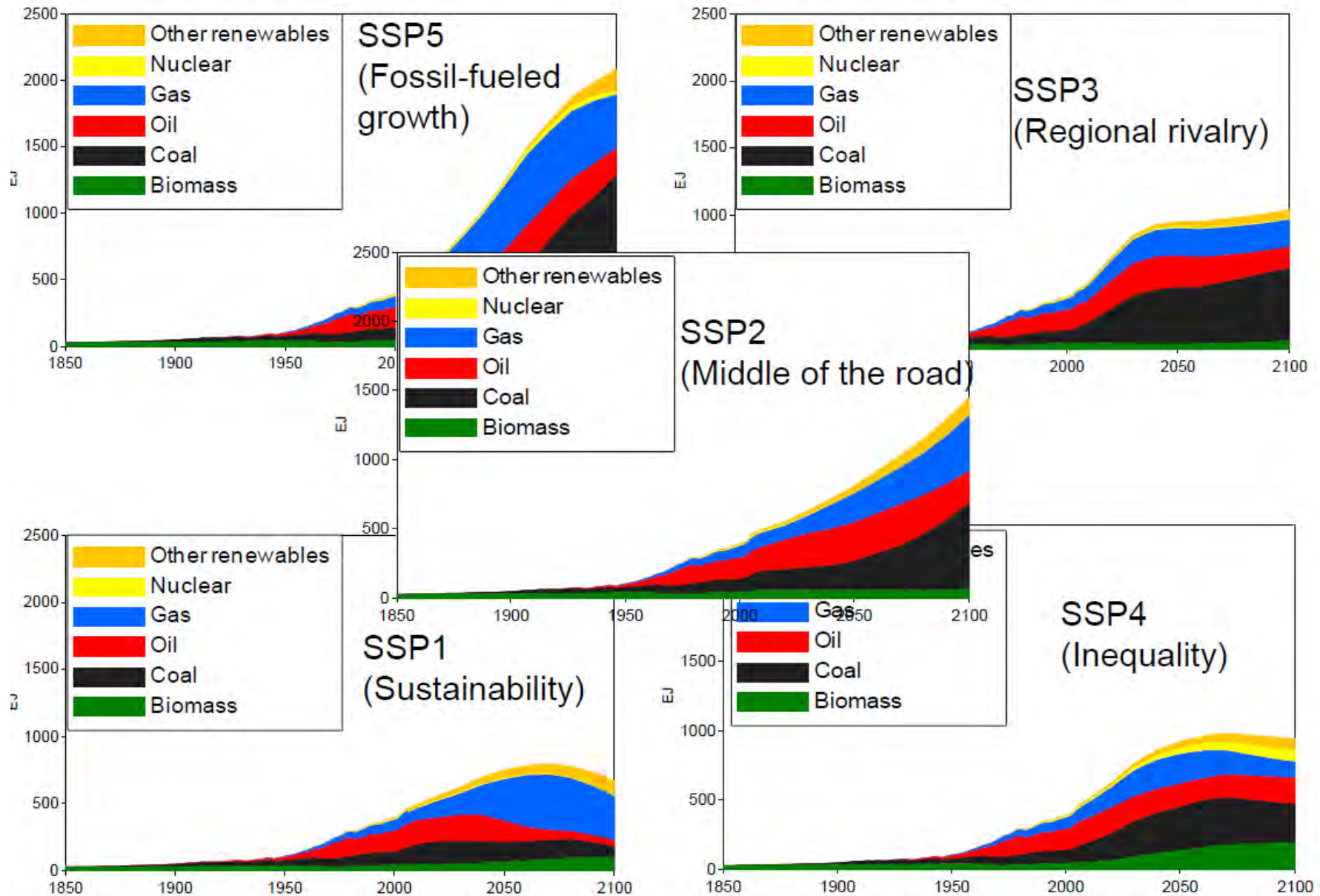
Moss, Edmonds, et al. (2010)

Scenario concept



(O'Neill, 2012)

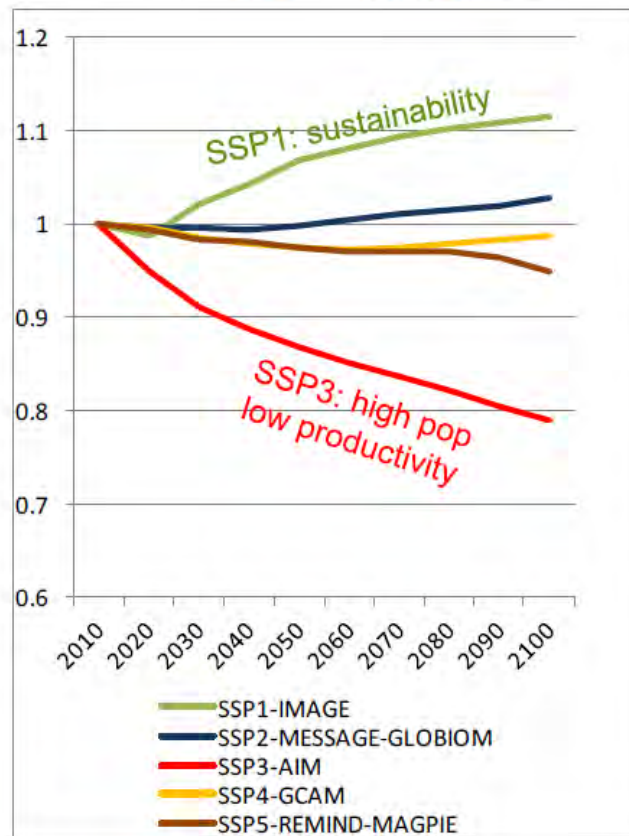
Energy – SSP Reference Cases



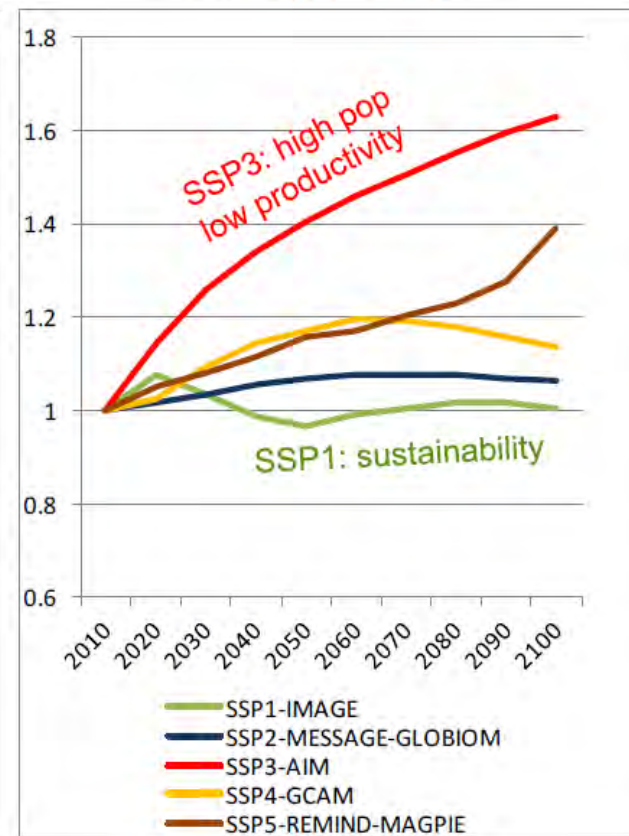
Land-use Change

(index 1=2010)

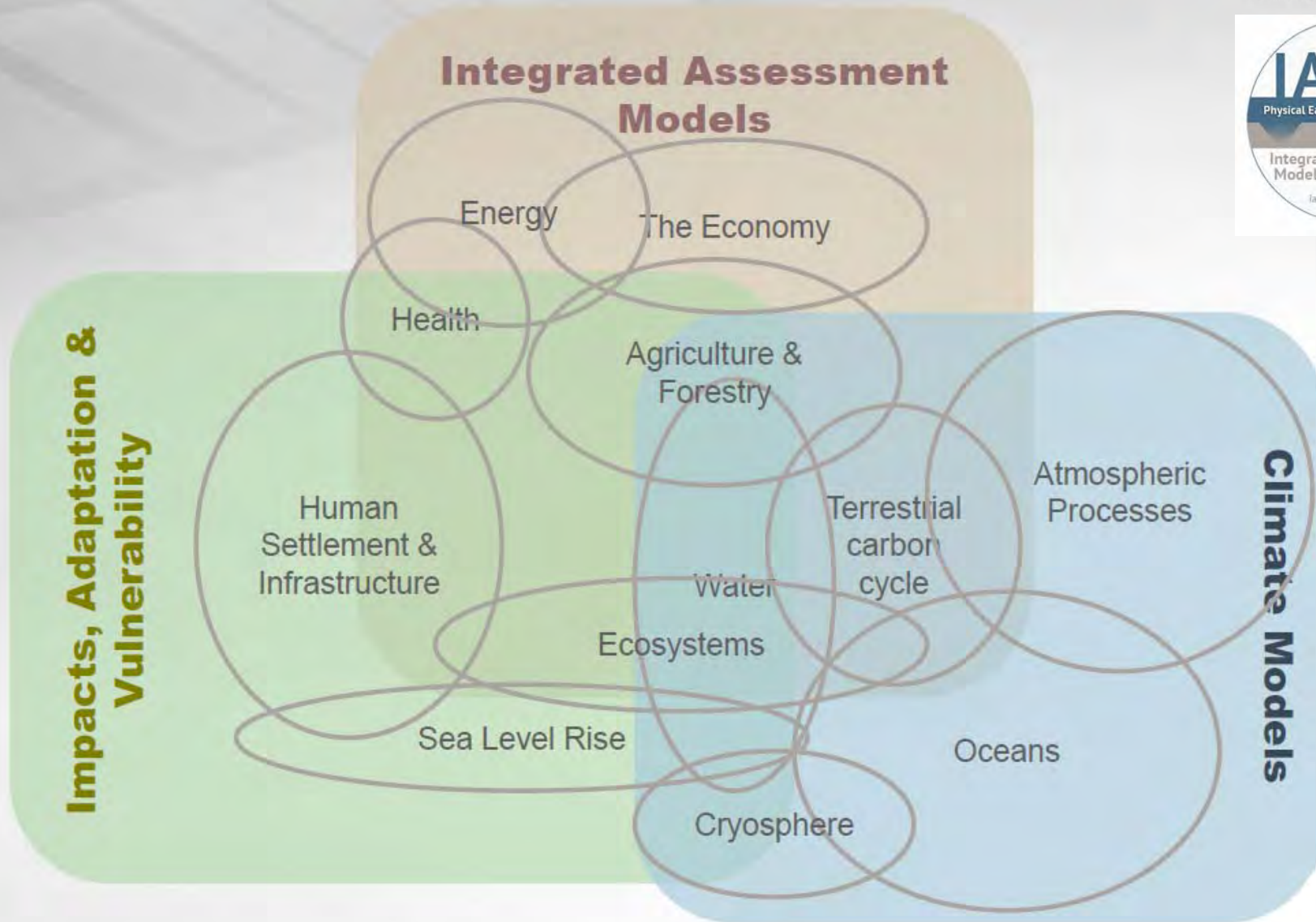
Forest land



Cropland



Where IAMs Are Headed



(James Edmonds, 31 July 2014)

How to deliver transformation to sustainable world is a question.

- RCPs provide different paths ranging from a very low carbon world (RCP2.6) to a very high carbon world (RCP8.5) without specifying climate policies.
- SSPs share different socio-economic assumptions and analyze climate policies that lead to a low carbon world.
- These consider challenges to mitigation and adaptation by using Integrated Assessment Model (IAM).

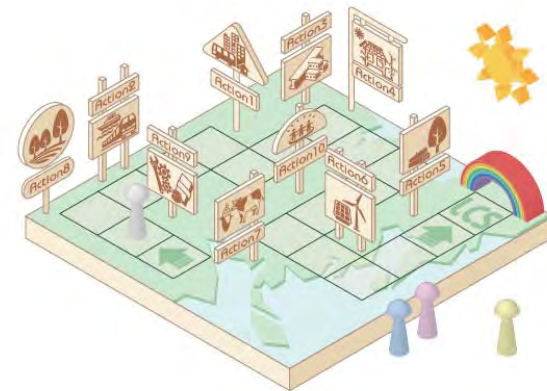
Thank you for your attention!



AIM Workshop at NIES

Realizing Low Carbon Asia

- Contribution of Ten Actions -



 Low-Carbon Asia Research Project
<http://2050.nies.go.jp>

AIM publication available at:
http://2050.nies.go.jp/file/ten_actions_2013.pdf