Mitigating Anthropogenic CC
future of carbon cycle in “overshoot” worlds

Nebojša Nakićenović
Vienna University of Technology
International Institute for Applied Systems Analysis
naki@iiasa.ac.at

Energy Modeling Forum, Snowmass – 1 August 2013

A Proposal for a New Community Scenarios

Nebojša Nakićenović
Vienna University of Technology
International Institute for Applied Systems Analysis
naki@iiasa.ac.at

Energy Modeling Forum, Snowmass – 31 July 2007

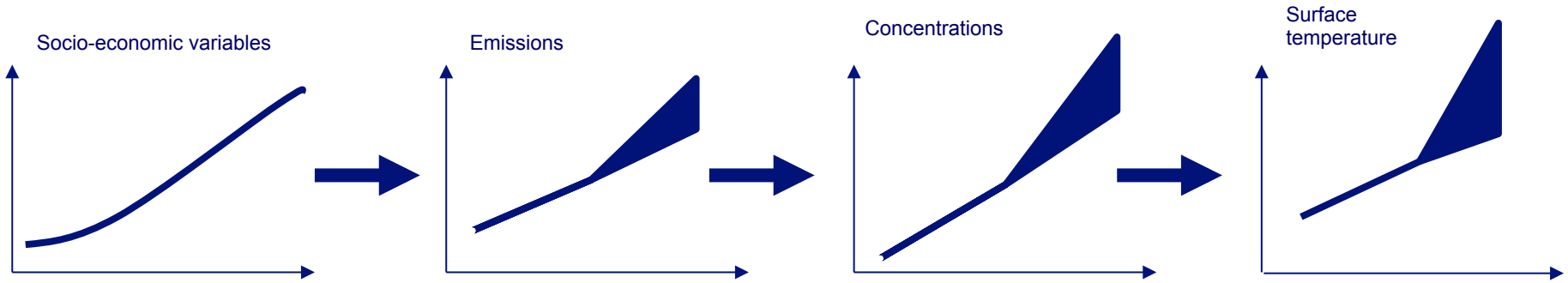
WCRP REPORT
World Climate Research Programme

WMO UNESCO IOC ICSU International Council for Science

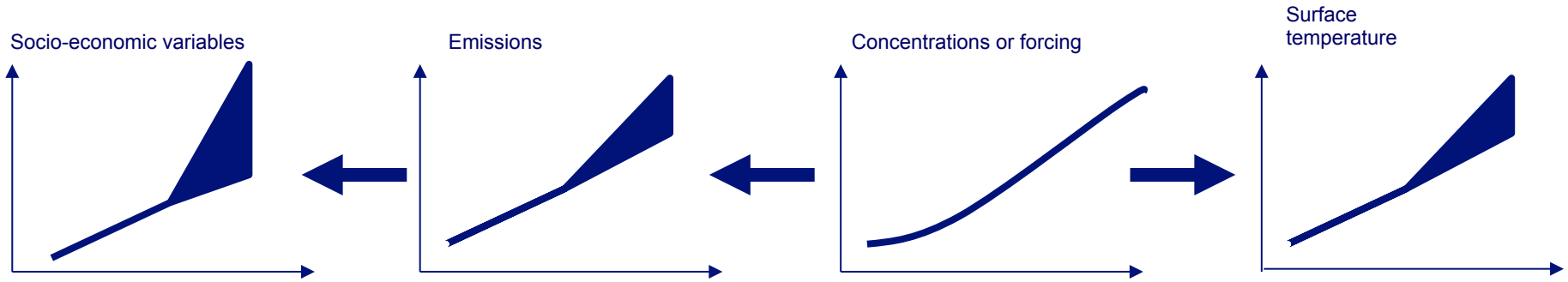
Aspen, 2006

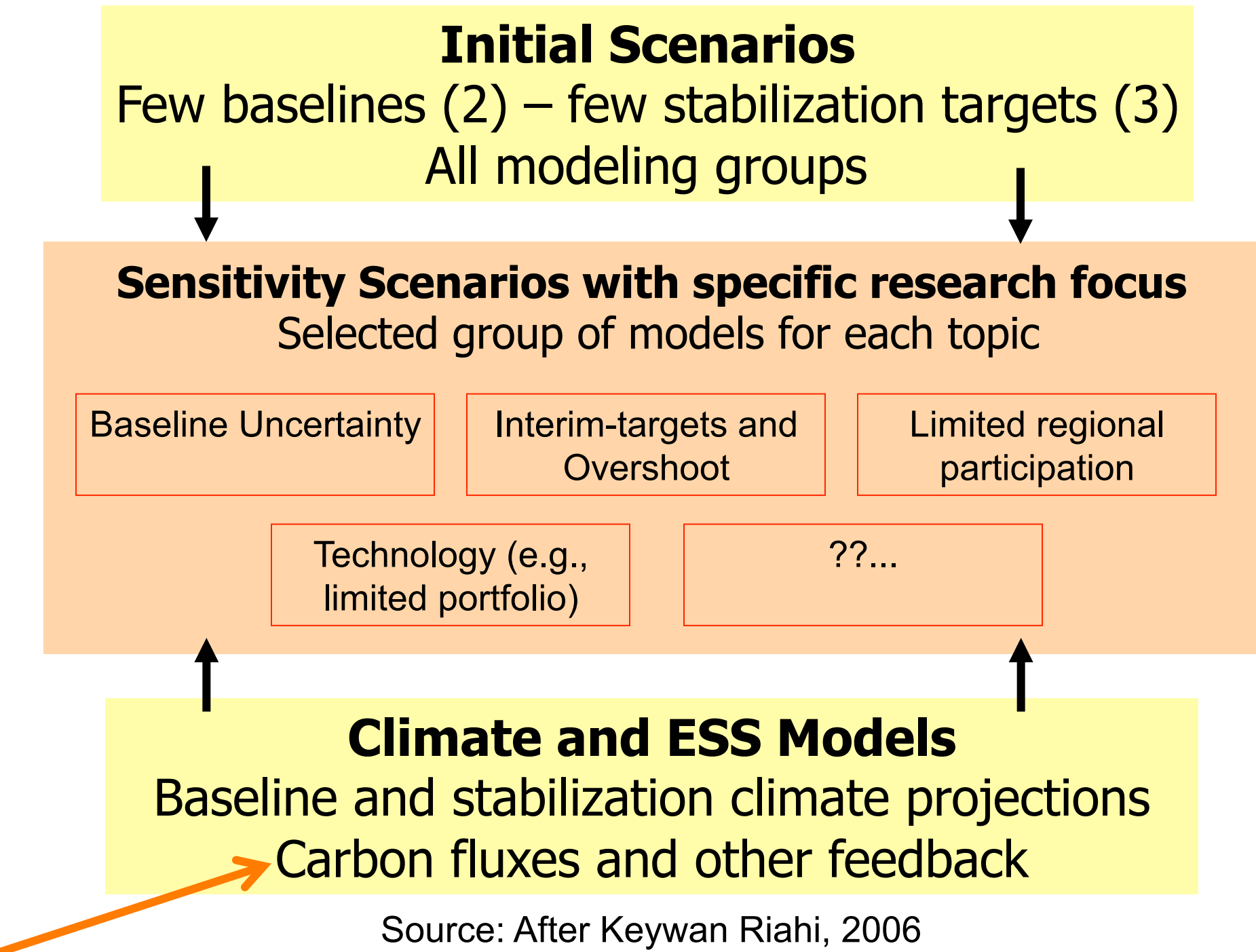
New Integrated Assessment Approach

Forward approach: start with socio-economic variables



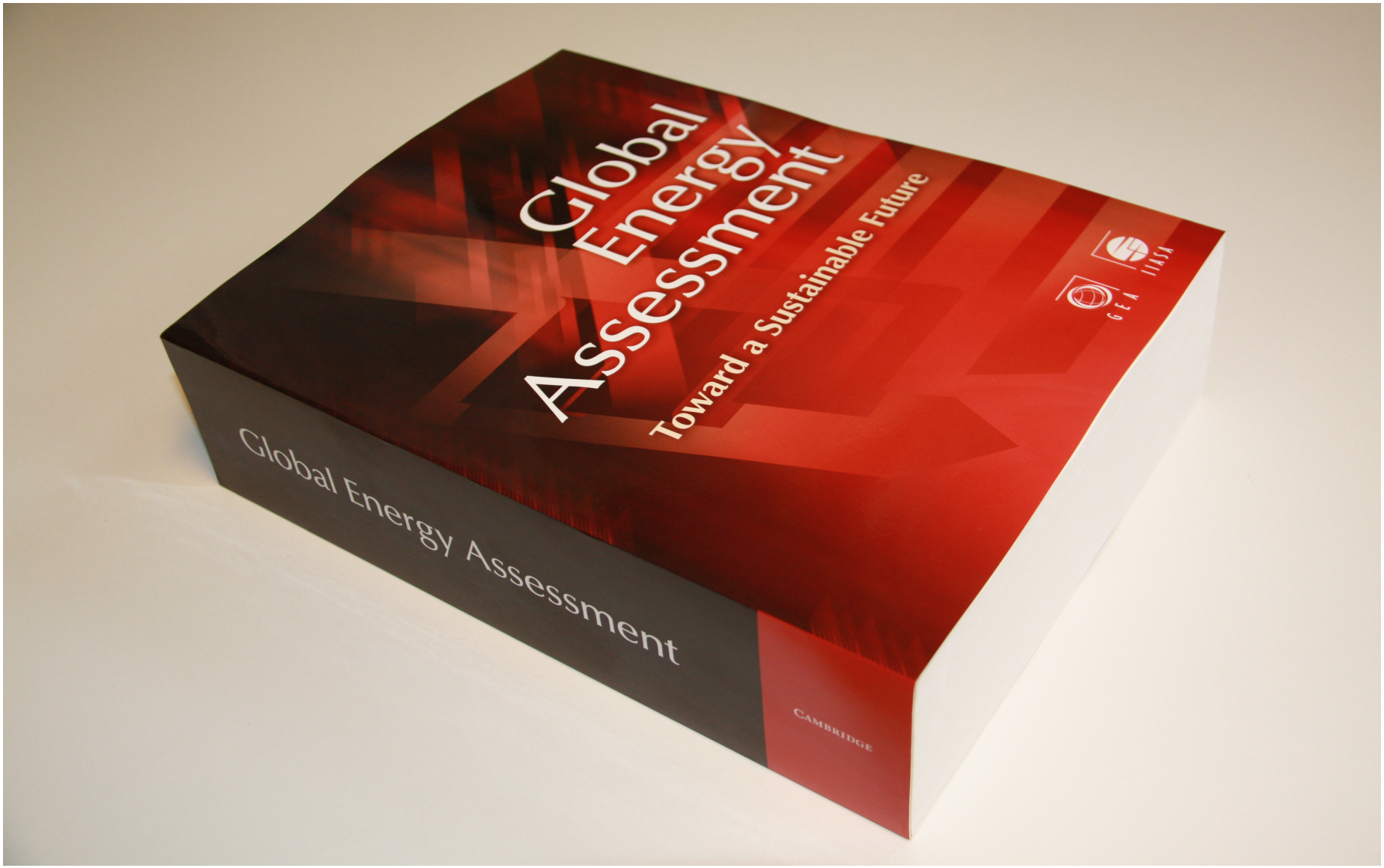
Reverse approach: start with stabilization scenario concentrations





Source: After Keywan Riahi, 2006

www.GlobalEnergyAssessment.org




Global Energy Assessment
Toward a Sustainable Future
Global Energy Assessment Summary Booklet
Global Energy Assessment
CLIMATE CHANGE 2007
MITIGATION OF CLIMATE CHANGE
CLIMATE CHANGE 2007
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CLIMATE CHANGE 2007
IMPACTS, ADAPTATION AND VULNERABILITY
CLIMATE CHANGE 200
THE PHYSICAL SCIEN
energy
and the challenge of sustainability
RENEWABLE ENERGY SOURCES
AND CLIMATE CHANGE MITIGATION
EMISSIONS SCENARIOS

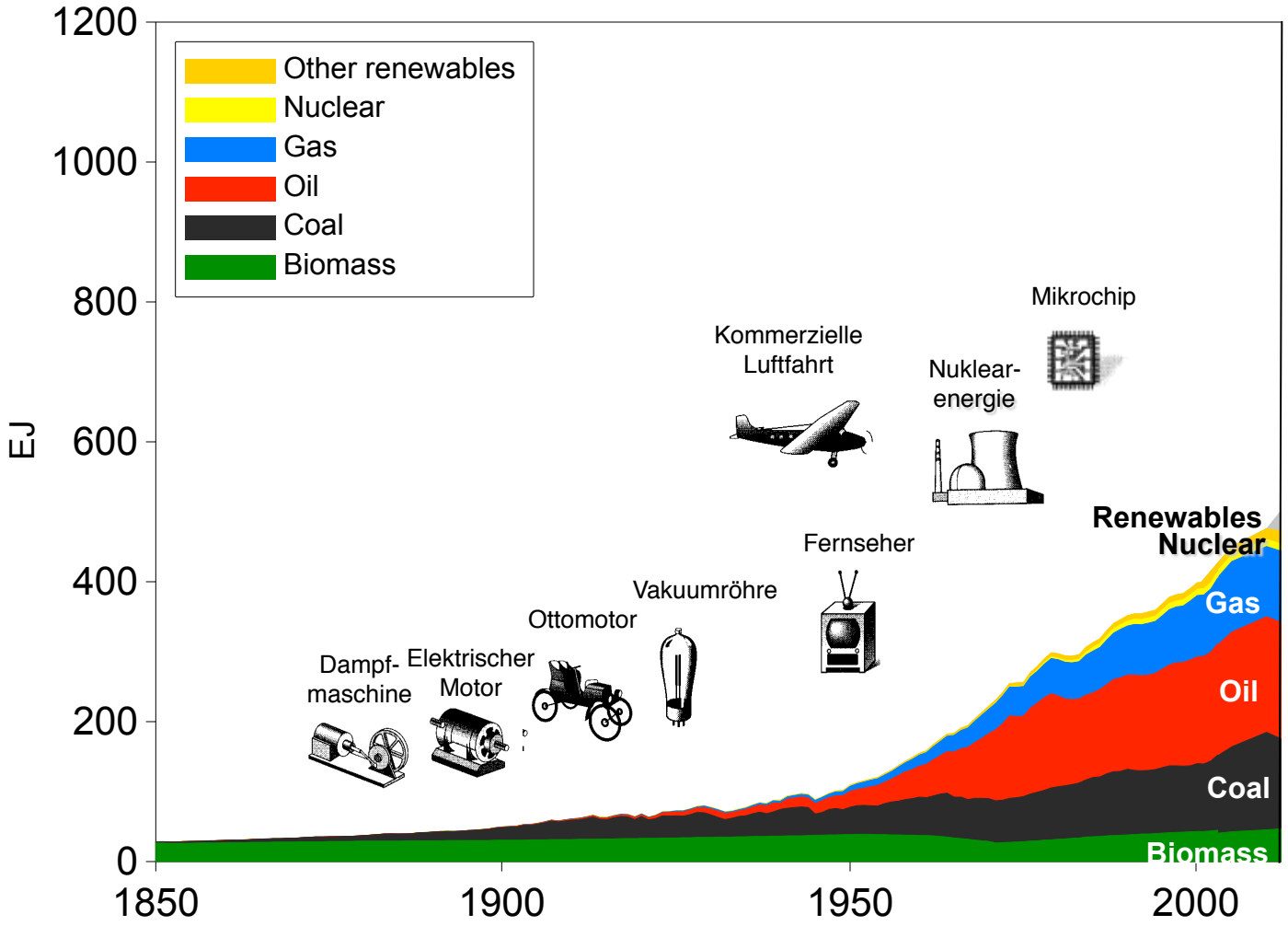
2012 INTERNATIONAL YEAR OF
SUSTAINABLE ENERGY
FOR ALL

2030 Energy Goal

- Universal Access to Modern Energy
- Double Energy Efficiency Improvement
- Double Renewable Share in Final Energy

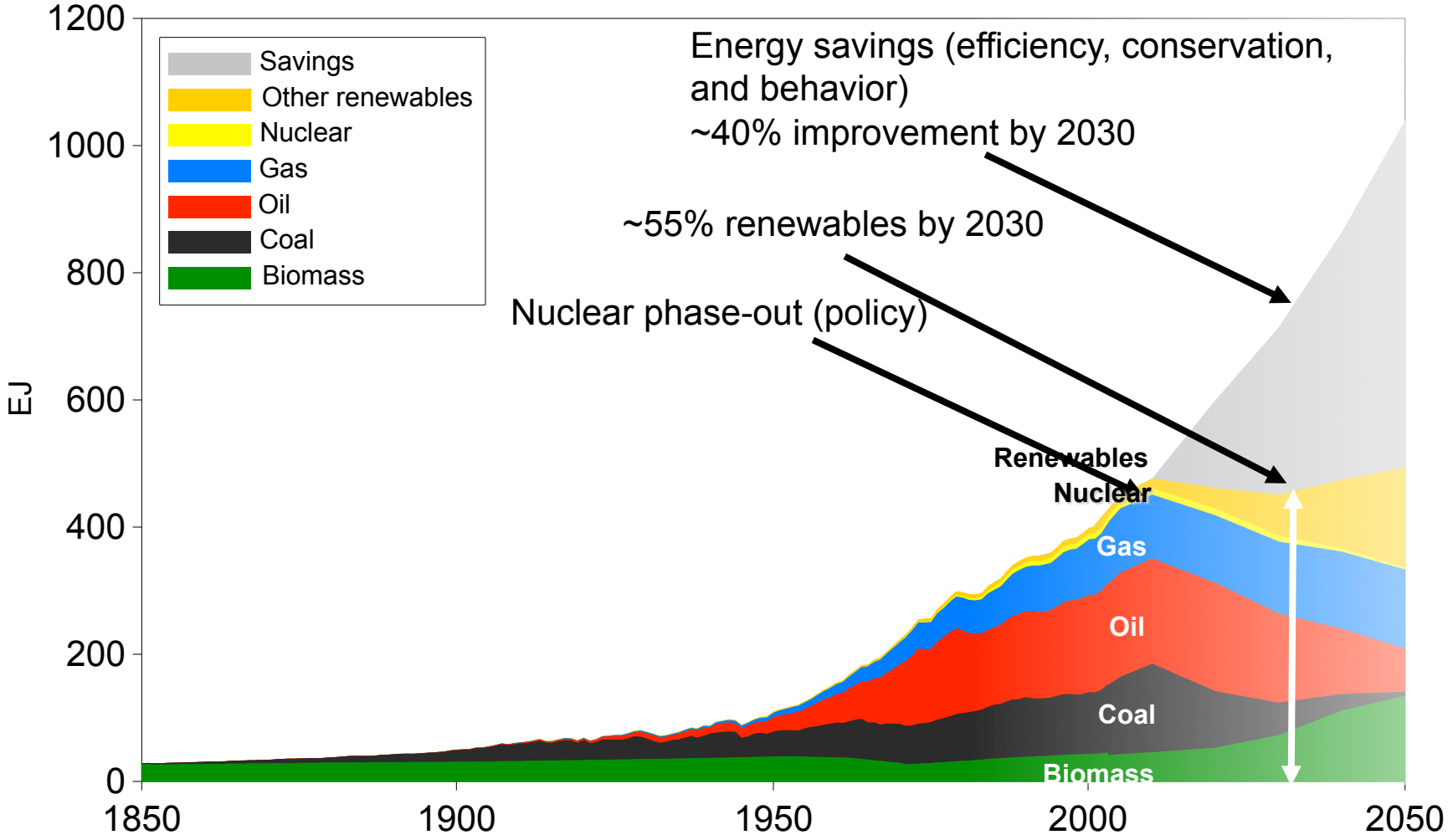
Aspirational & Ambitious but Achievable

Global Primary Energy



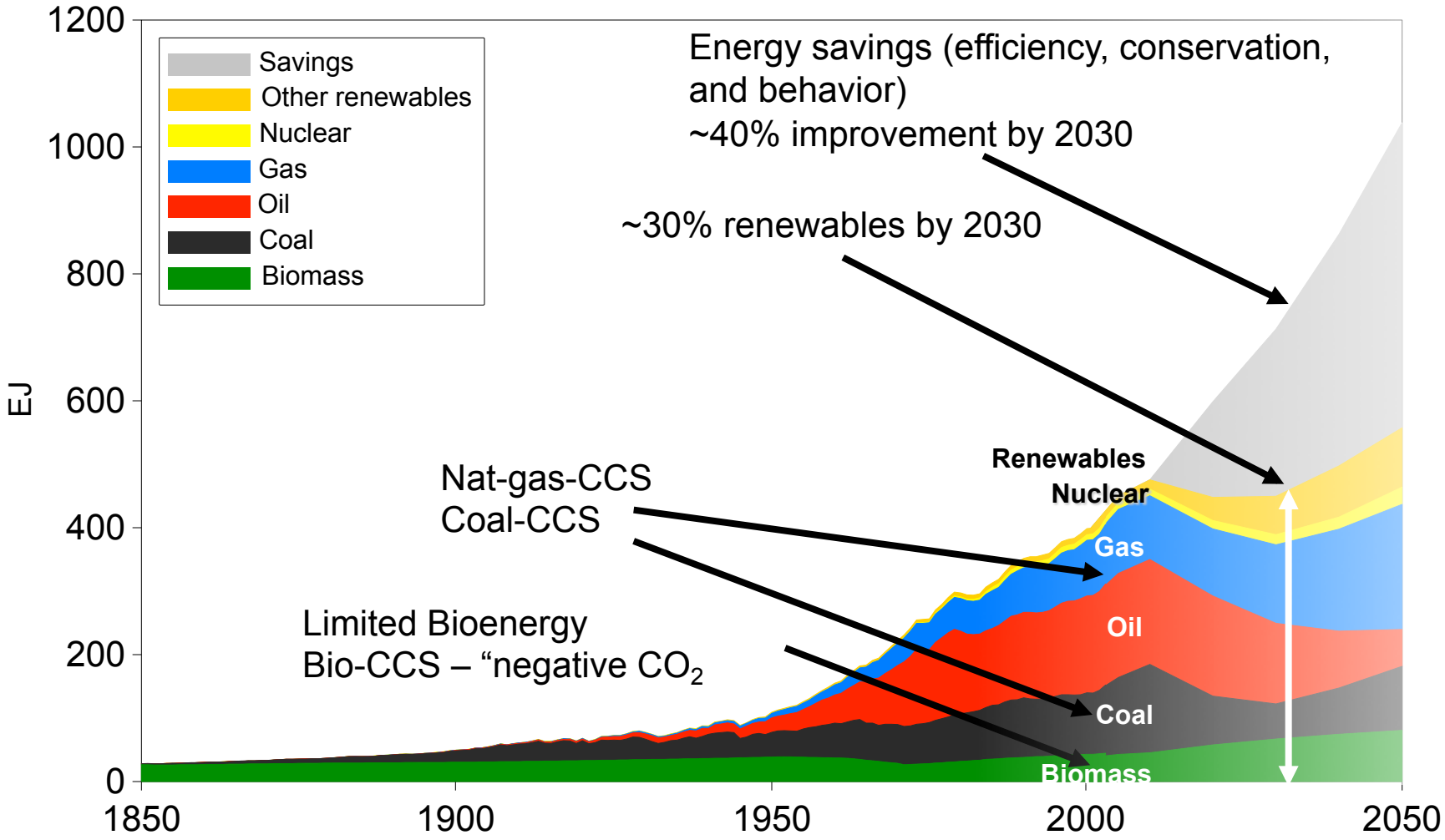
Global Primary Energy

no CCS, no Nuclear



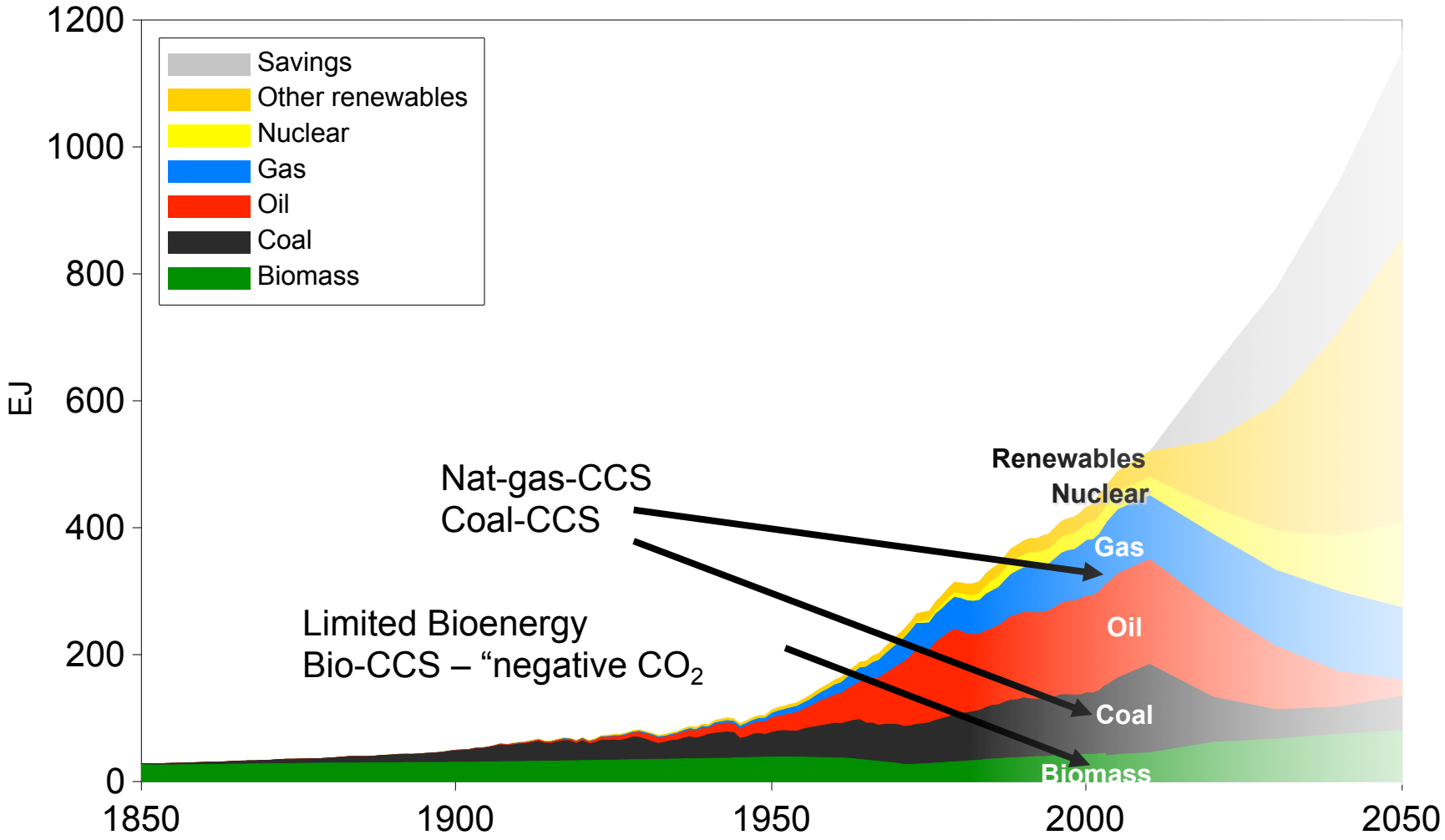
Global Primary Energy

lim. Bioenergy, lim. Intermittent REN

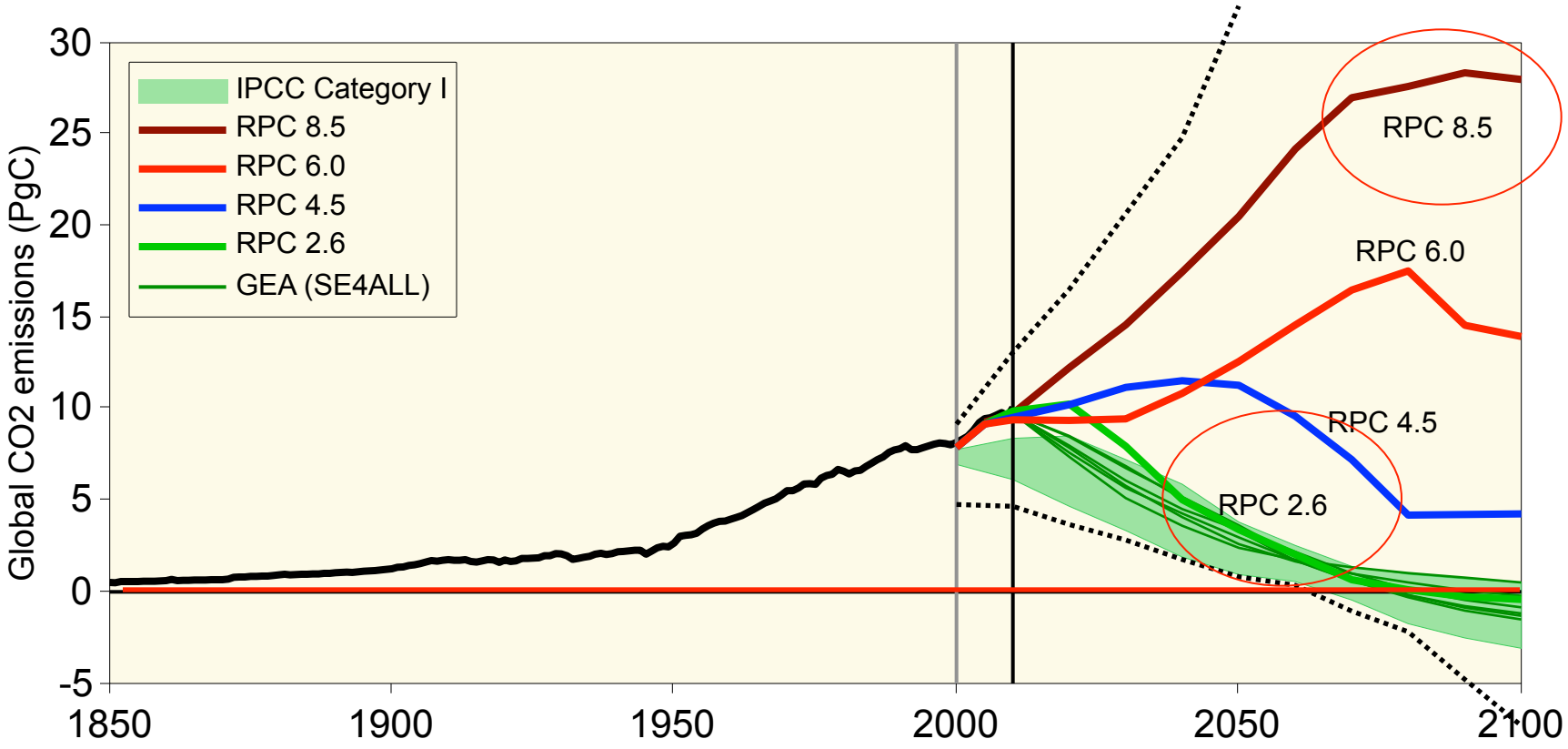


Global Primary Energy

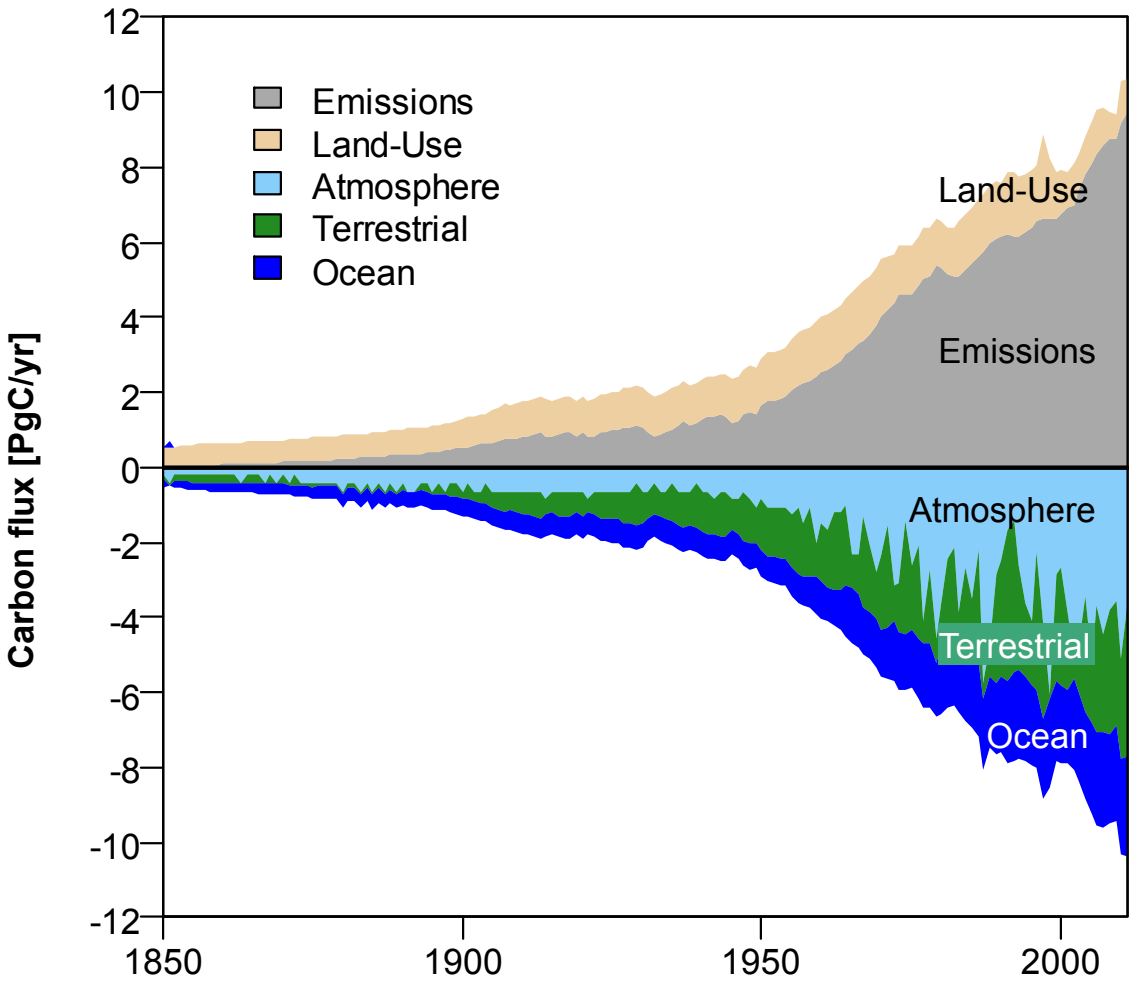
Supply



Global CO_2 Emissions



Human Perturbation of the Global Carbon Budget



2000-2010
(PgC /yr)

1.0±0.7

7.9±0.5

4.1±0.2

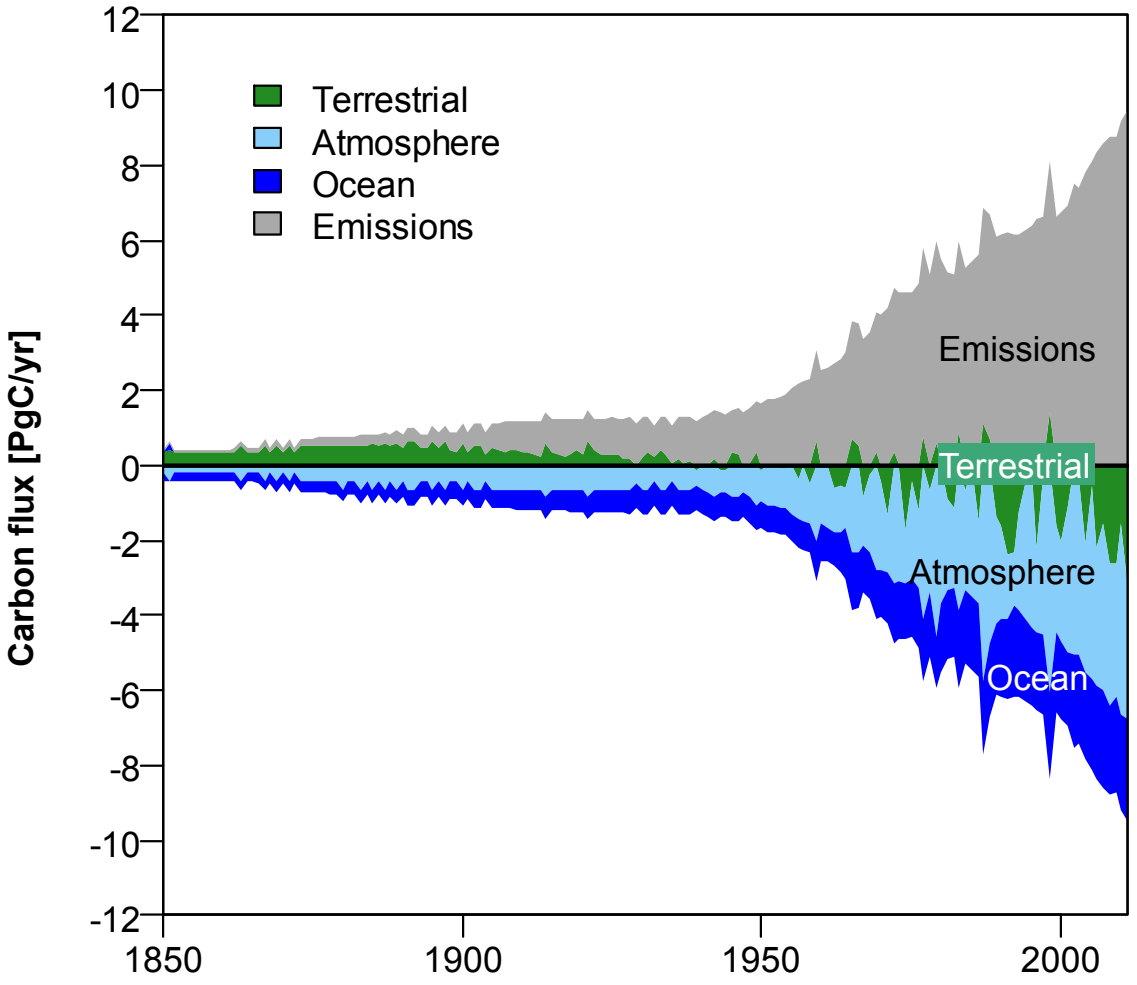
2.5±1.0
(Residual)

2.3±0.5
(5 models)

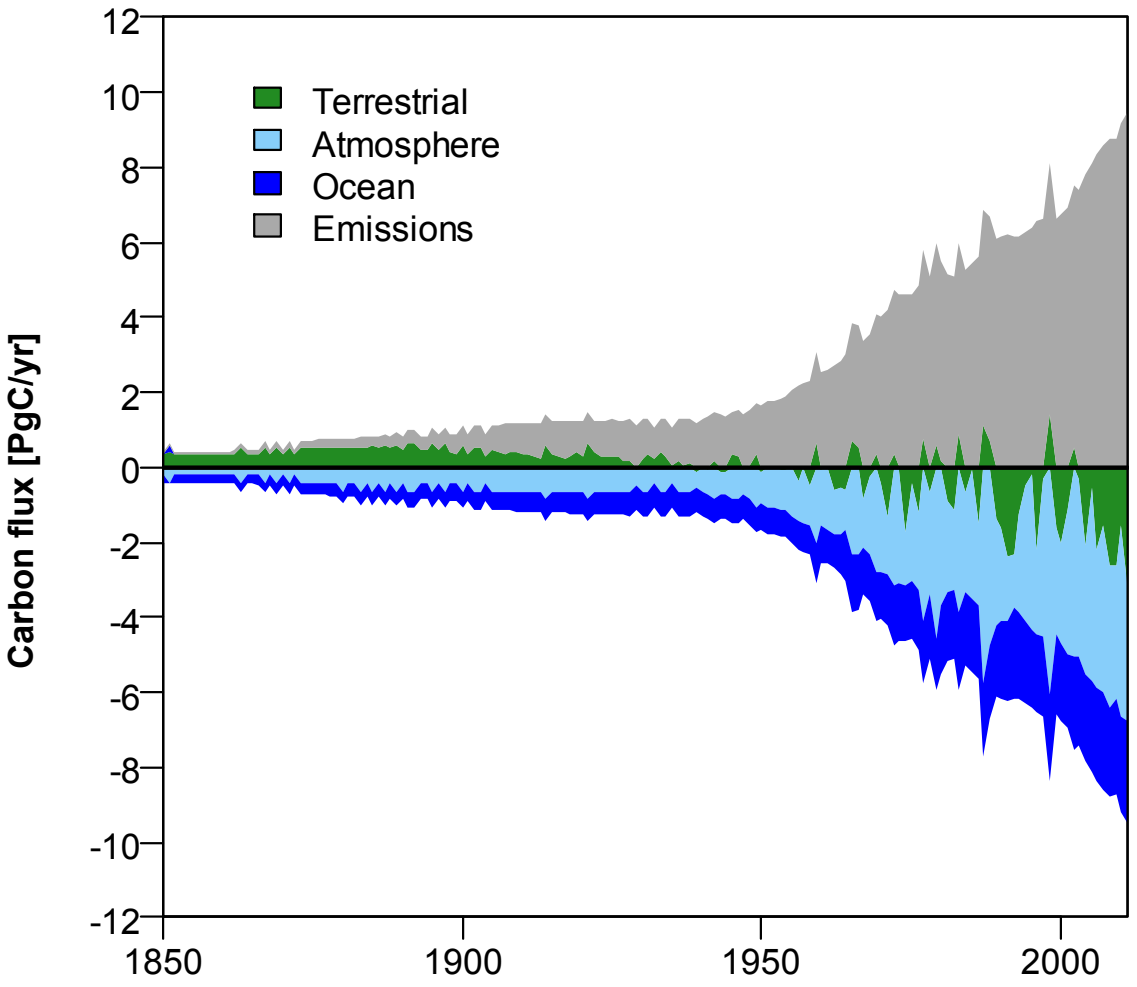
Global Carbon Project 2011; Le Quéré et al. 2009 & 2012, Nature G; Canadell et al. 2007, PNAS

Historical Carbon Fluxes

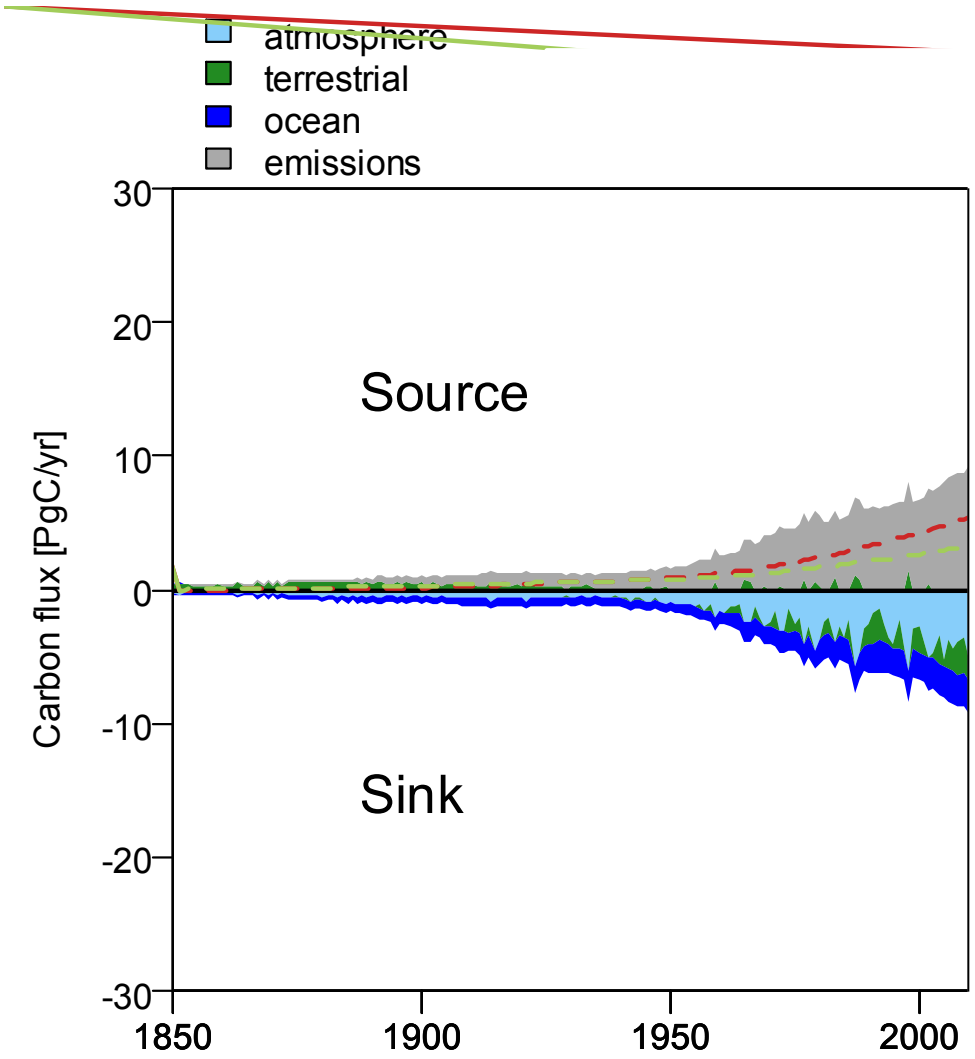
Land-Use Change incorporated into Terrestrial Pool



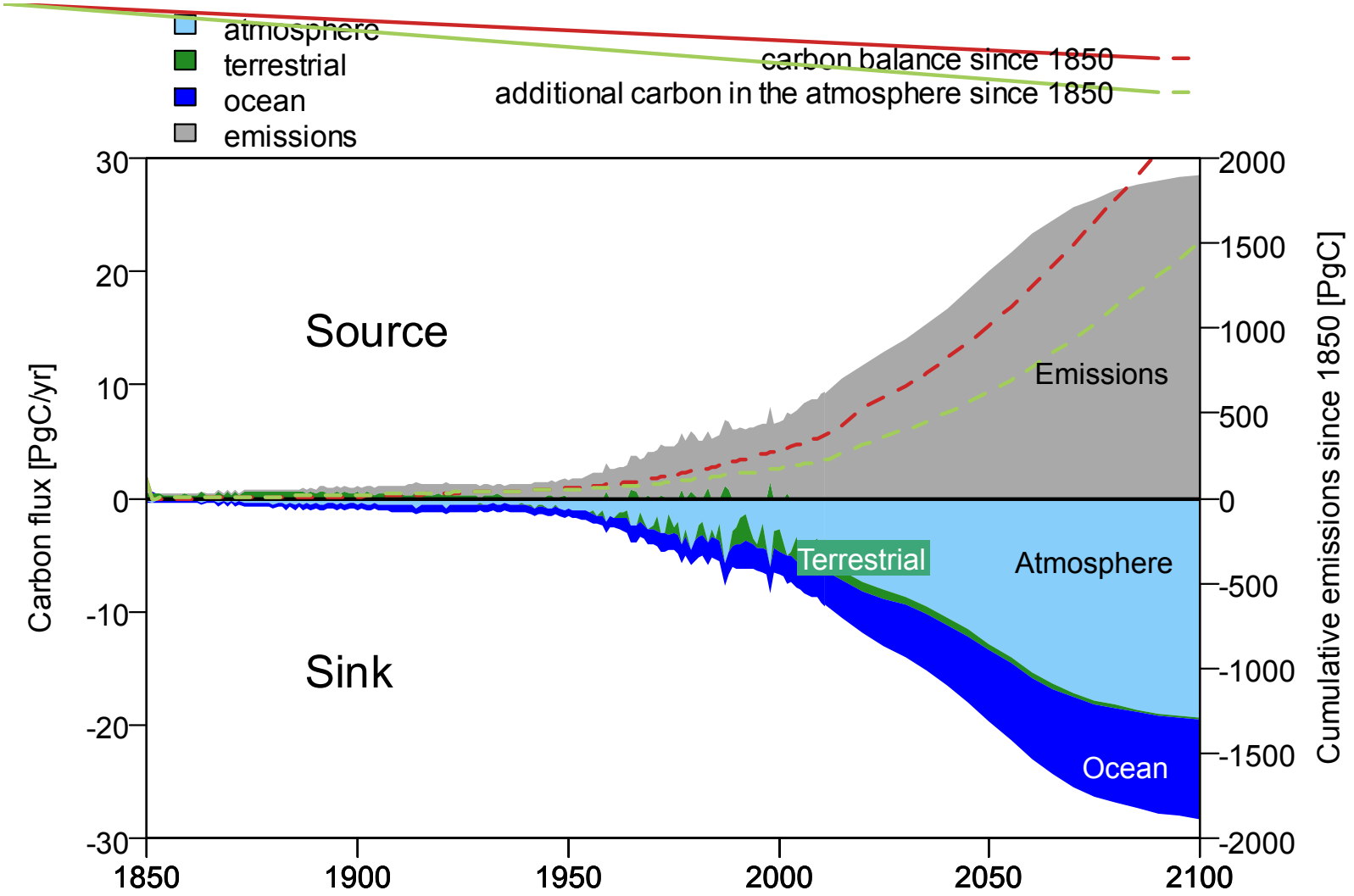
Historical Carbon Fluxes



Historical Carbon Fluxes

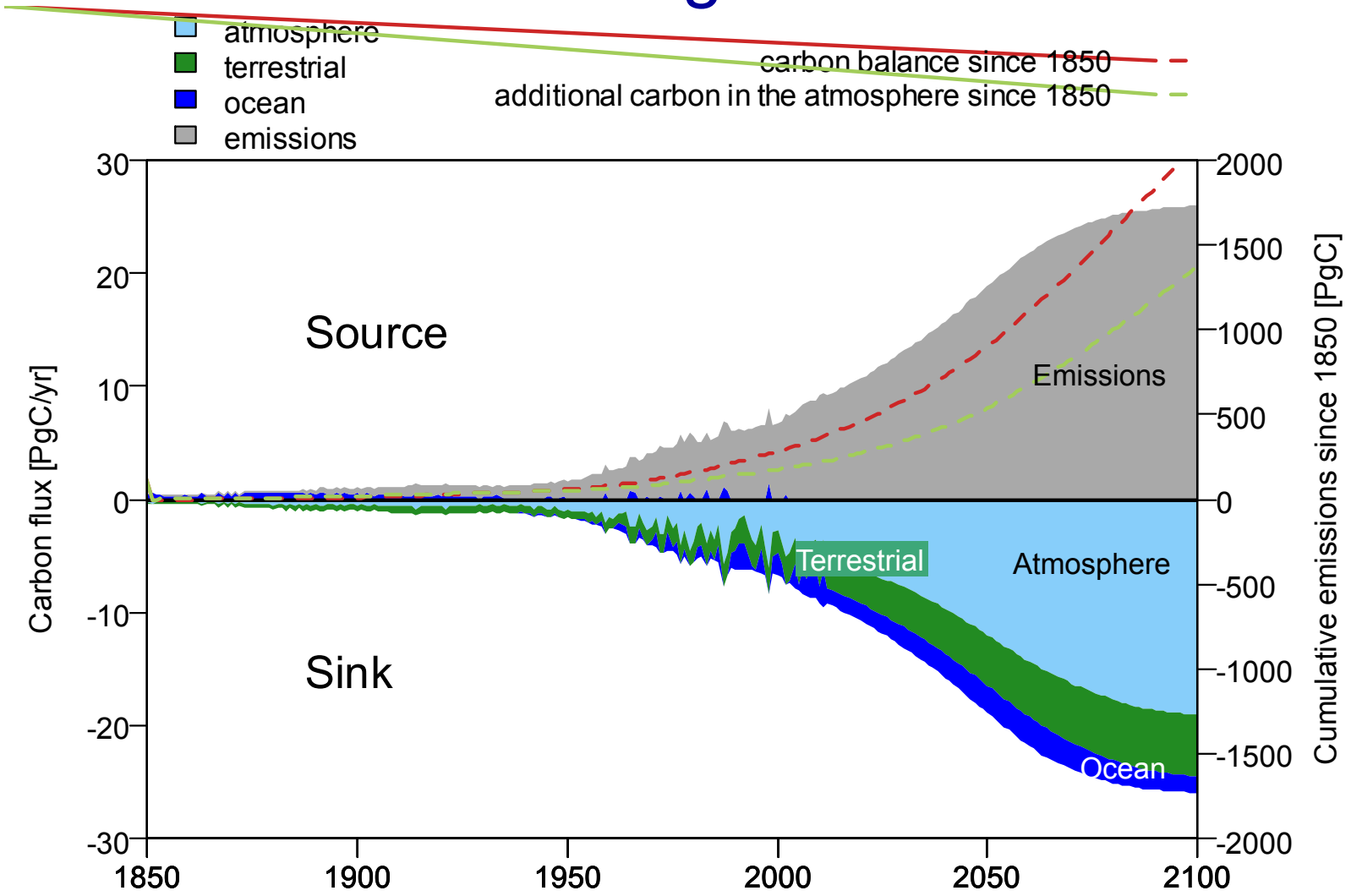


IIASA RCP8.5



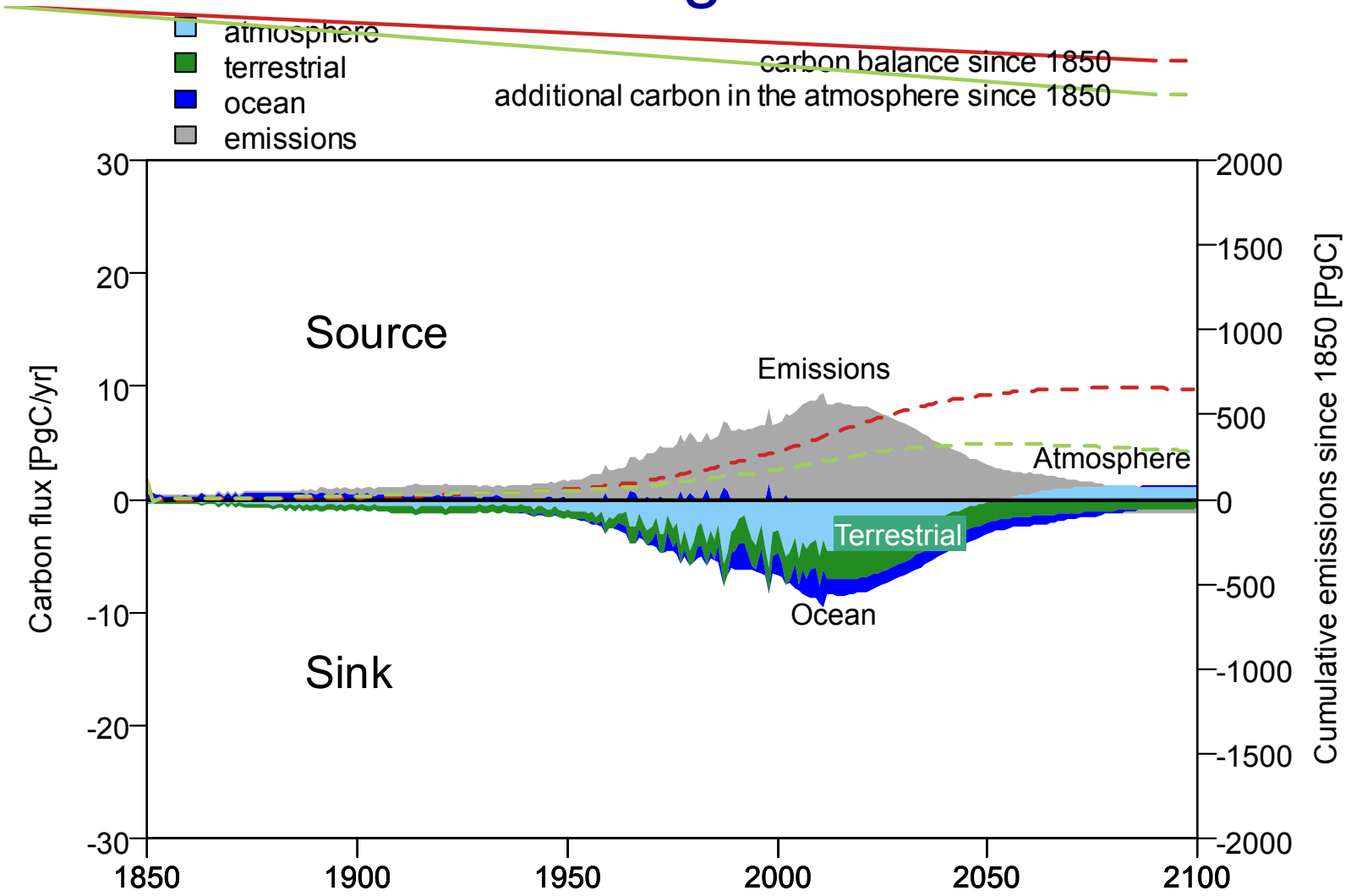
RCP Data: http://tntcat.iiasa.ac.at:8787/RcpDb/
Historical Data: Global Carbon Project, 2010; Le Quere et al., 2012

25-year moving average – RCP 8.5 – multi-model avg.



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

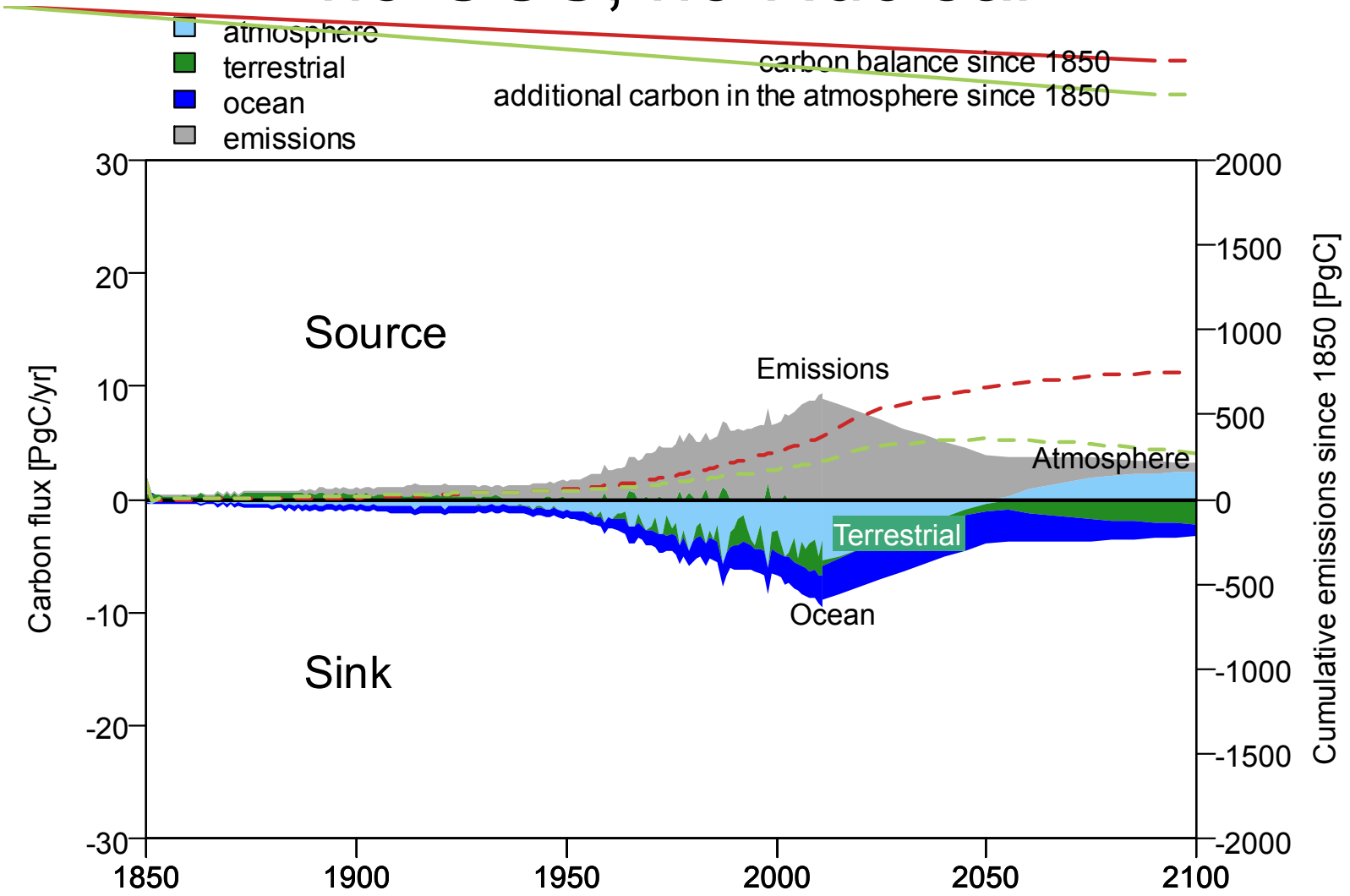
25-year moving averages – RCP 2.6 – multi-model avg.



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

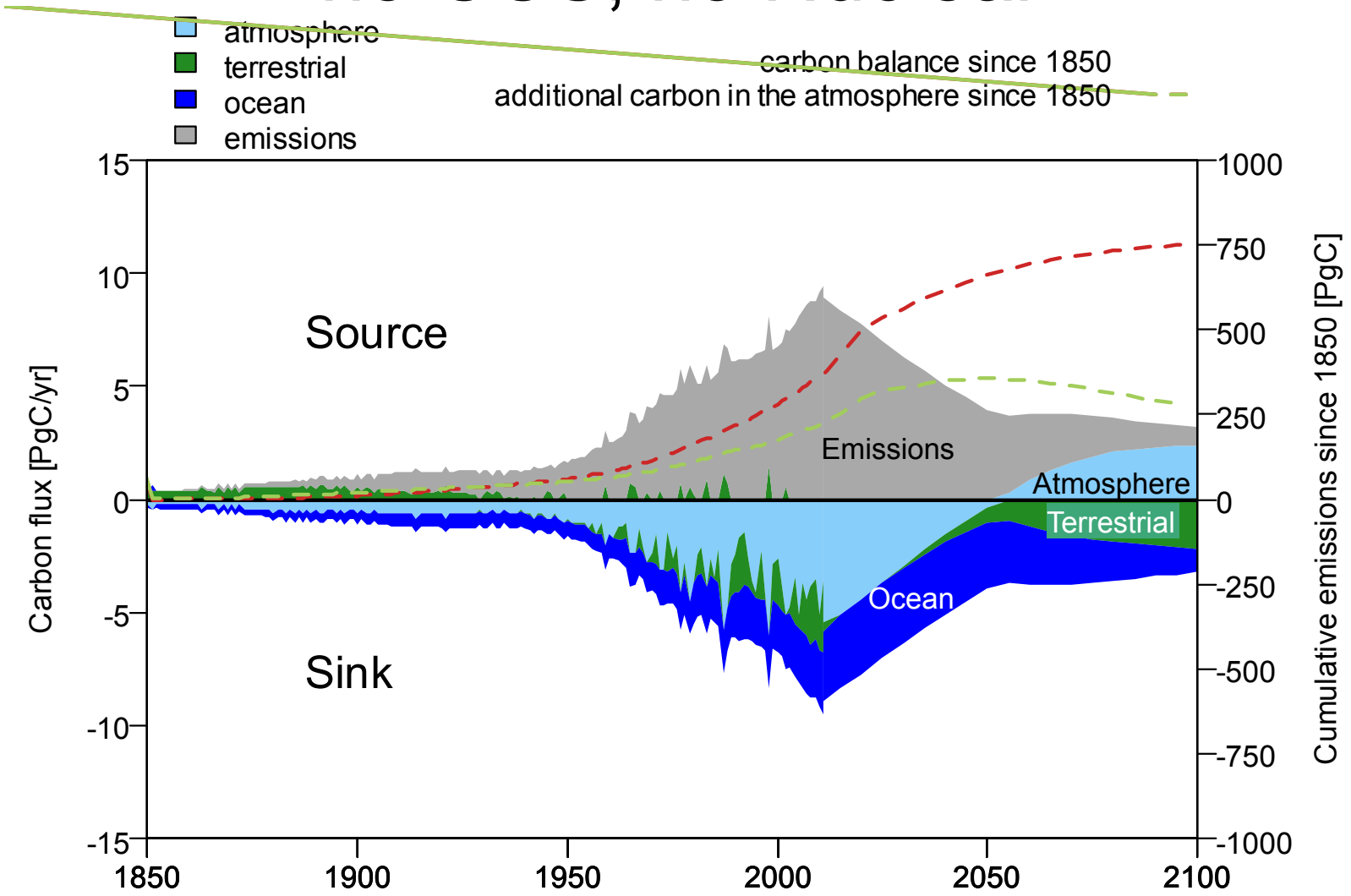
GEA Efficiency

no CCS, no Nuclear



Nakicenovic and Rogner, 2013, Global Energy Assessment, 2012
Historical Data: Global Carbon Project, 2010; Le Quere et al., 2012

no CCS, no Nuclear



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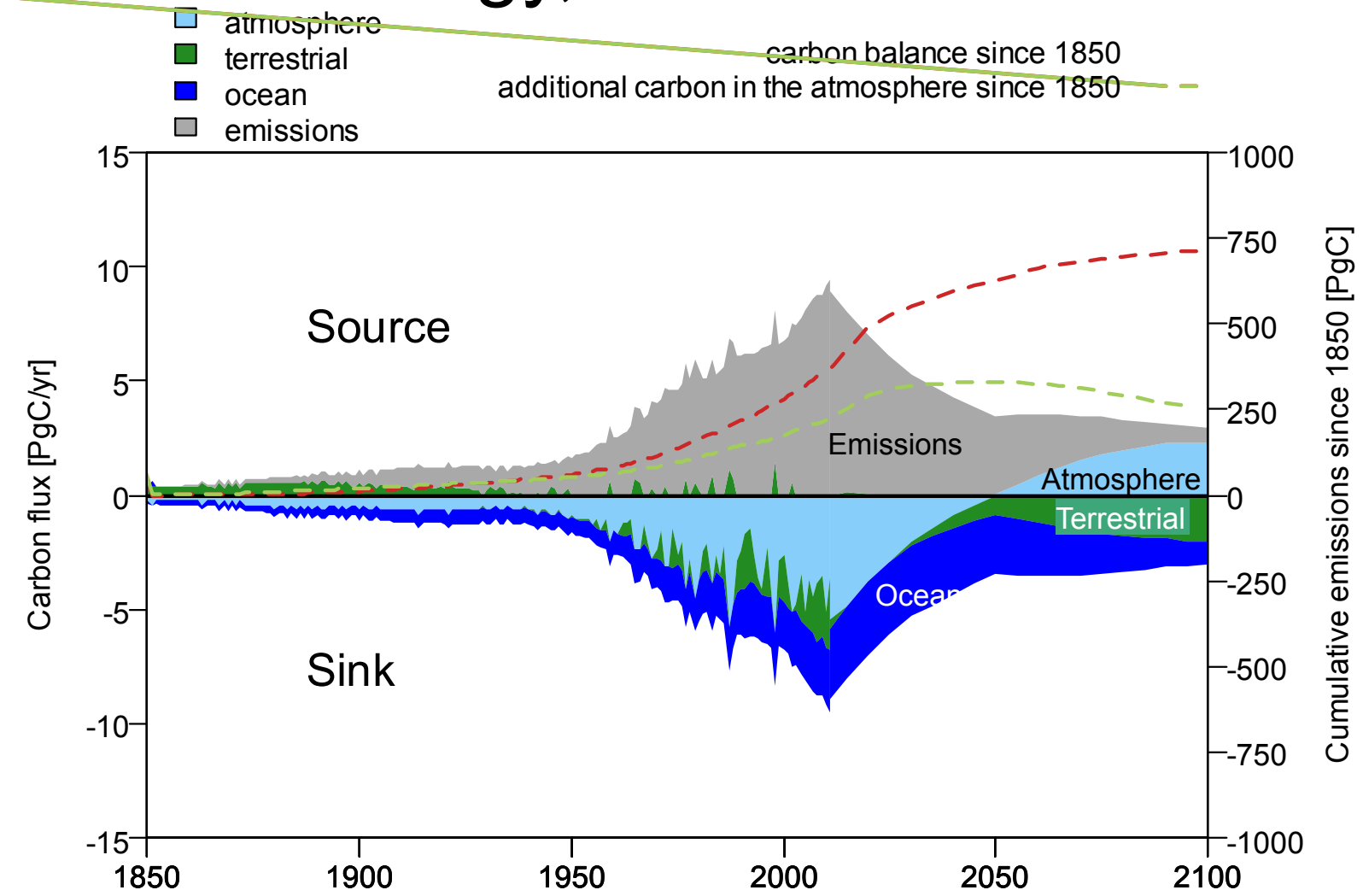
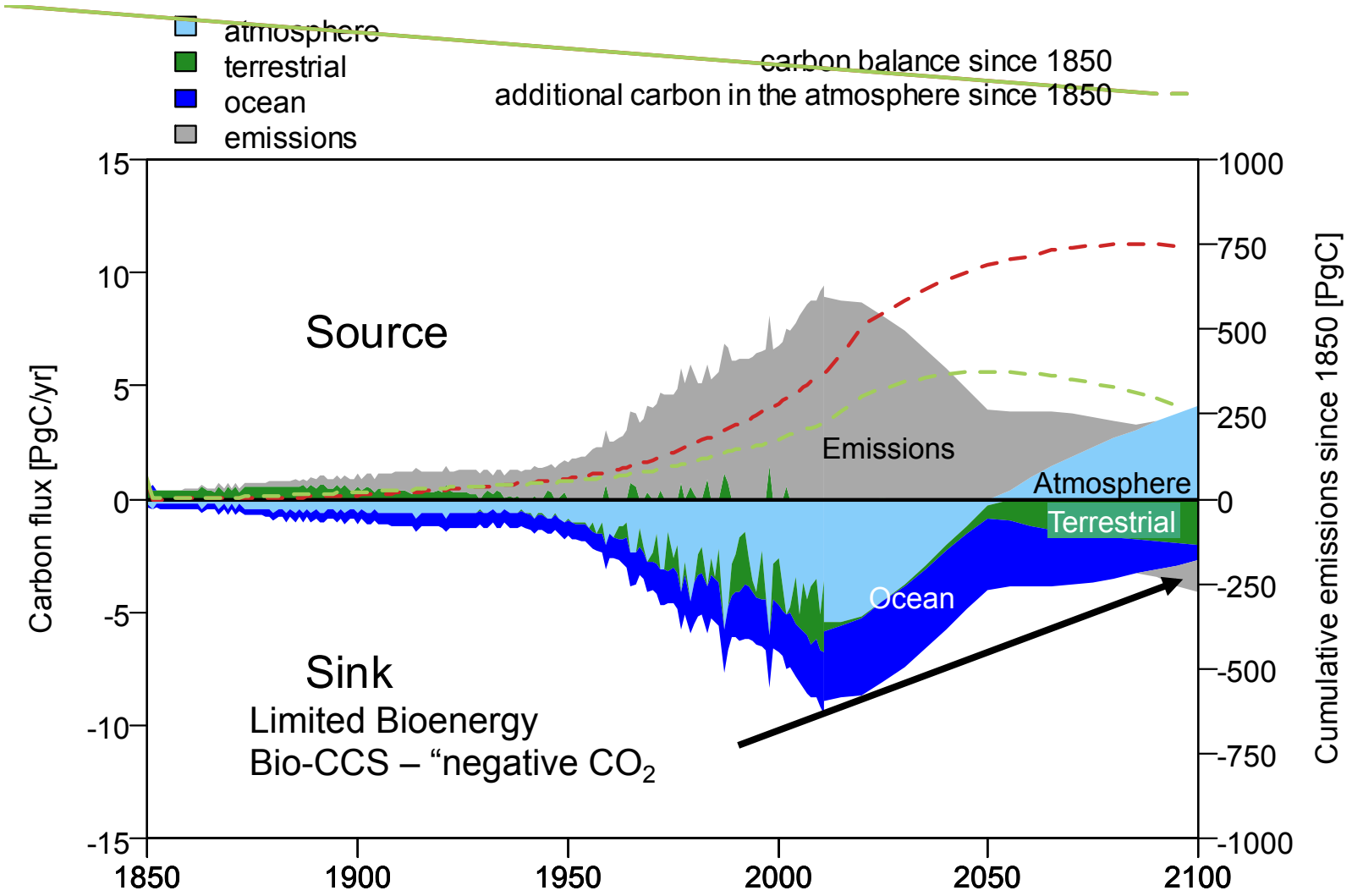
Lim. Bioenergy, lim. Intermittent REN



Nakicenovic and Rogner, 2013, Global Energy Assessment, 2012
Historical Data: Global Carbon Project, 2010; Le Quere et al., 2012

GEA Supply

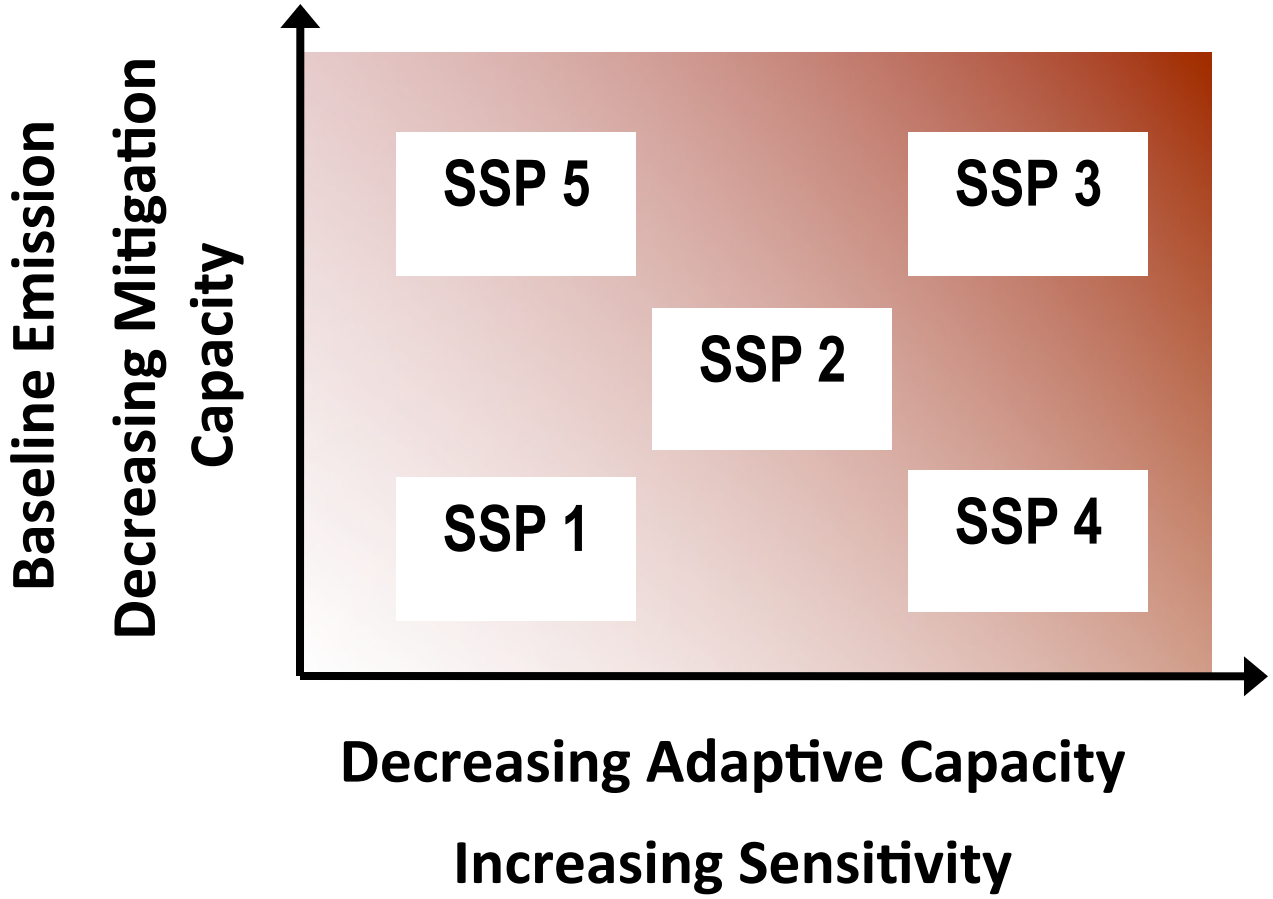


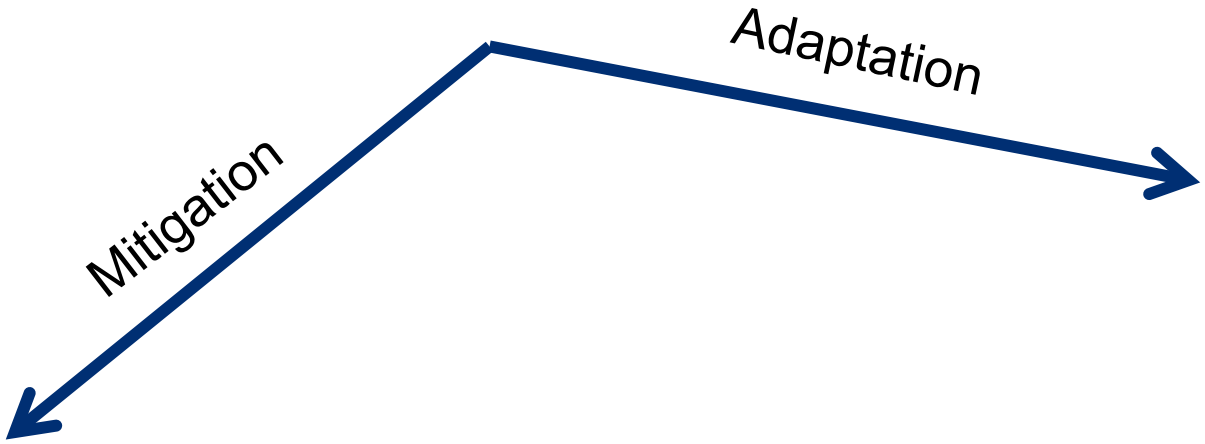
Nakicenovic and Rogner, 2013, Global Energy Assessment, 2012
Historical Data: Global Carbon Project, 2010; Le Quere et al., 2012

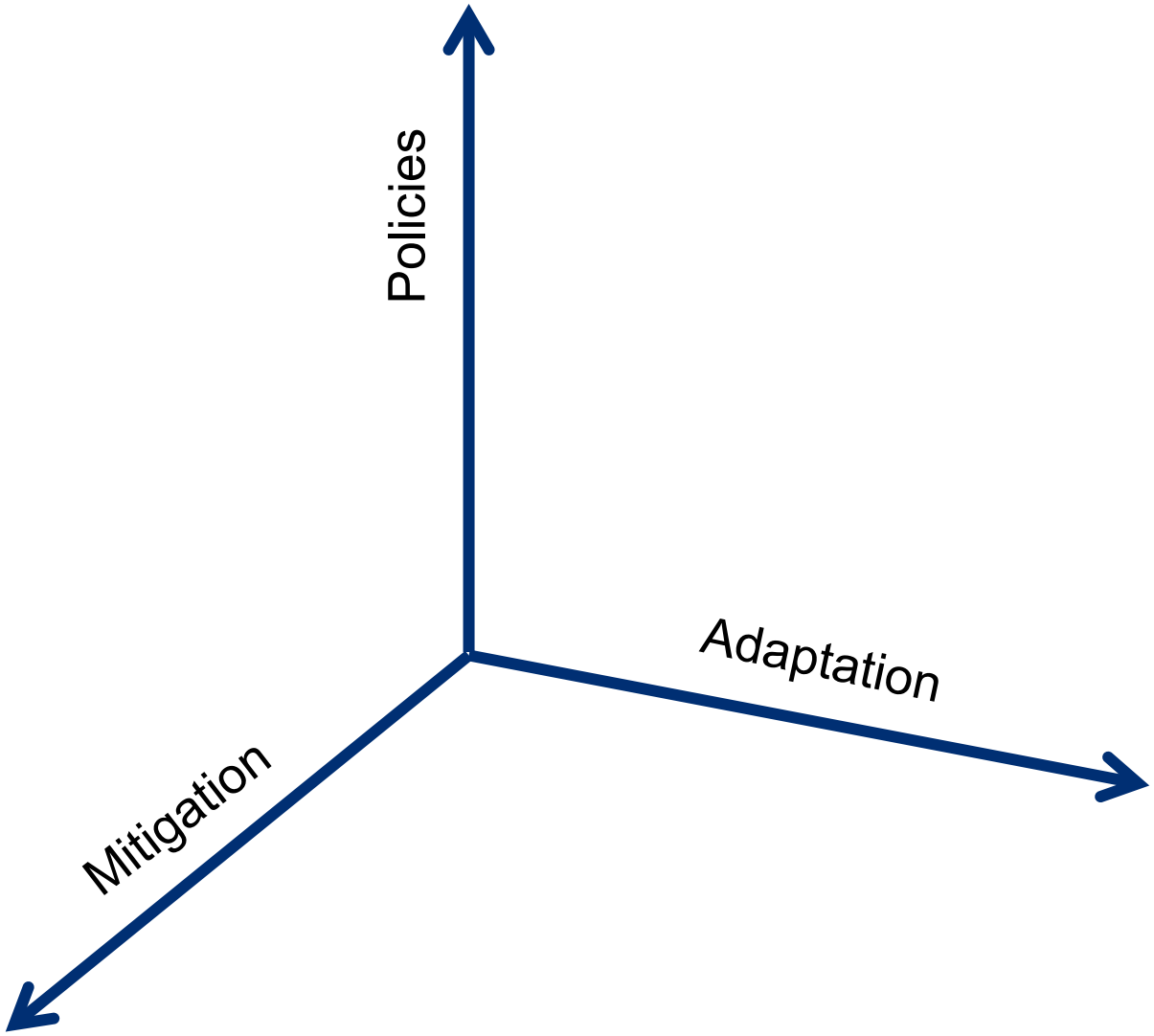
Source: www.IPCC.ch

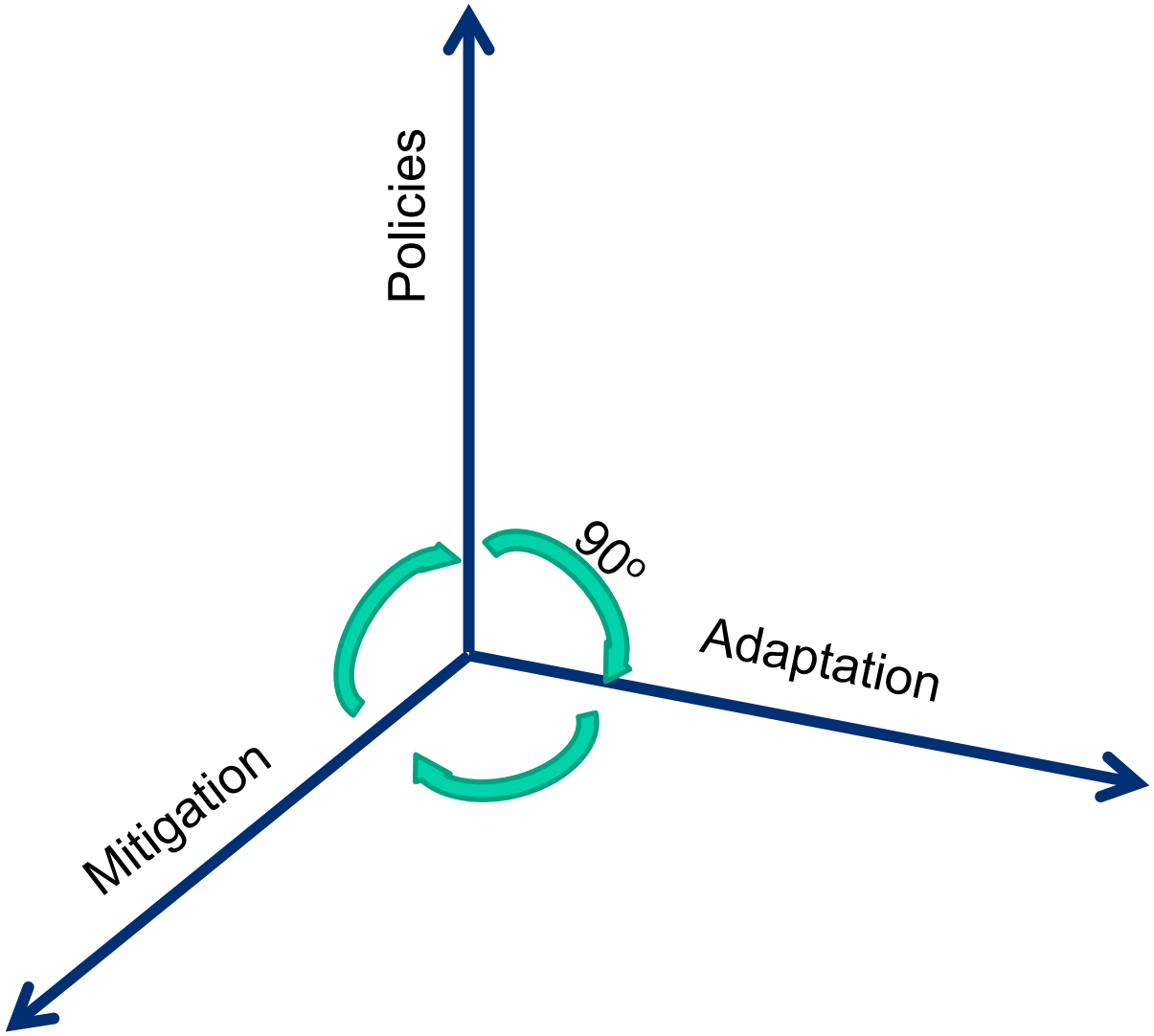
Unified (re-ordered) SSP scheme

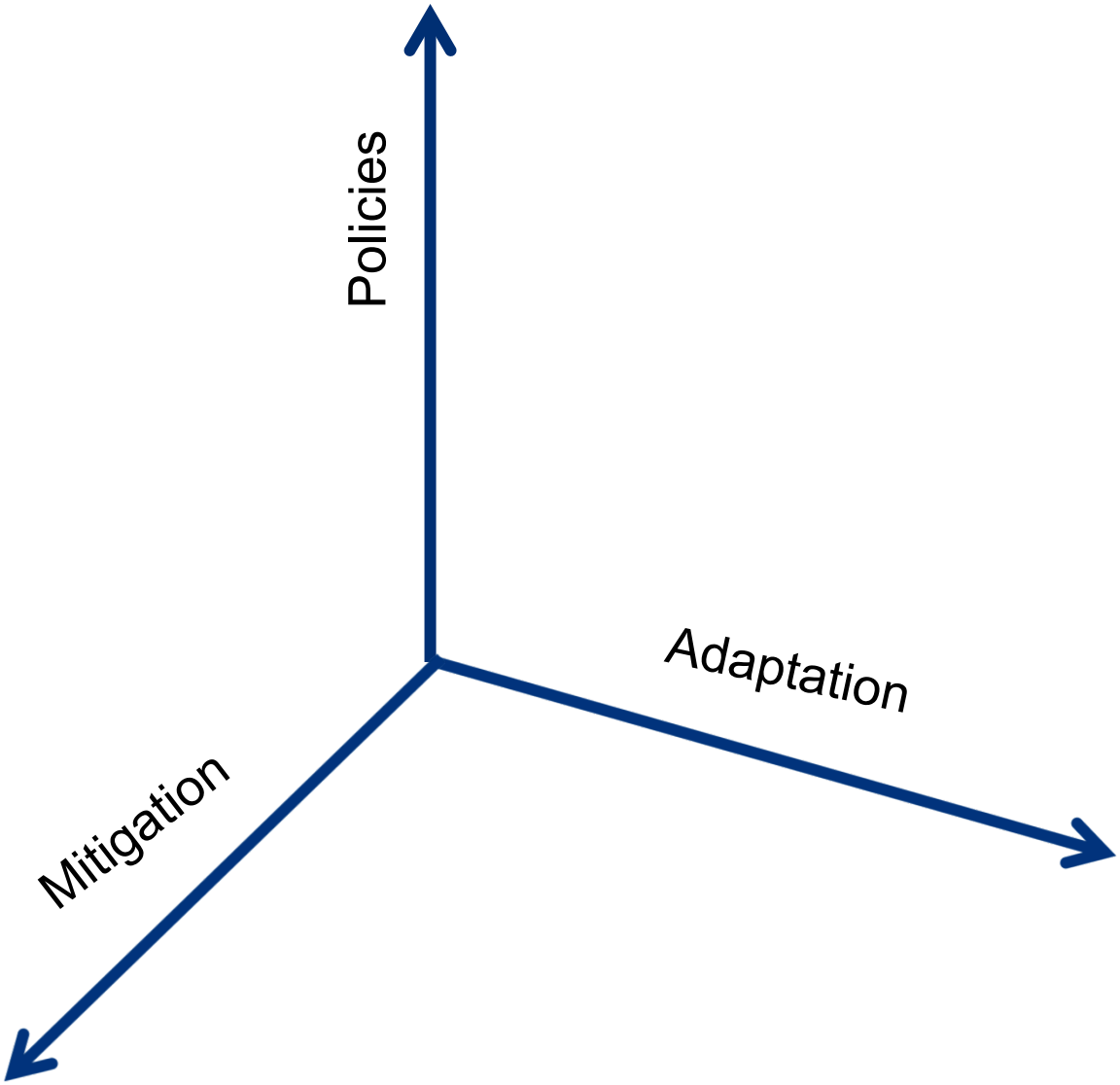
SSPs aim at covering the range of plausible combinations of mitigative and adaptive capacity (in the baseline)

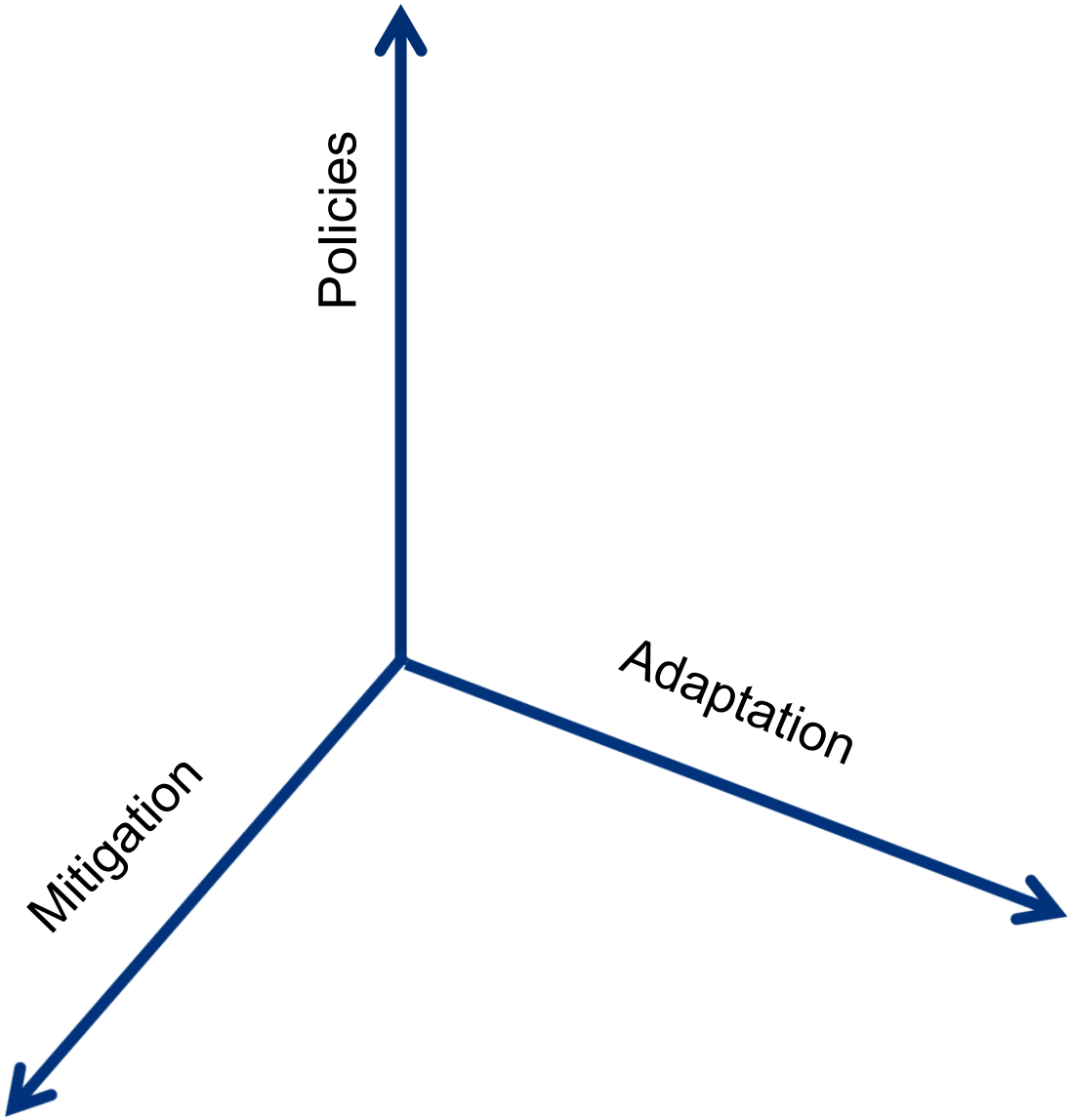



Adaptation
Mitigation


Policies
Adaptation
Mitigation


Policies
90°
Adaptation
Mitigation


Policies
Adaptation
Mitigation


Policies
Adaptation
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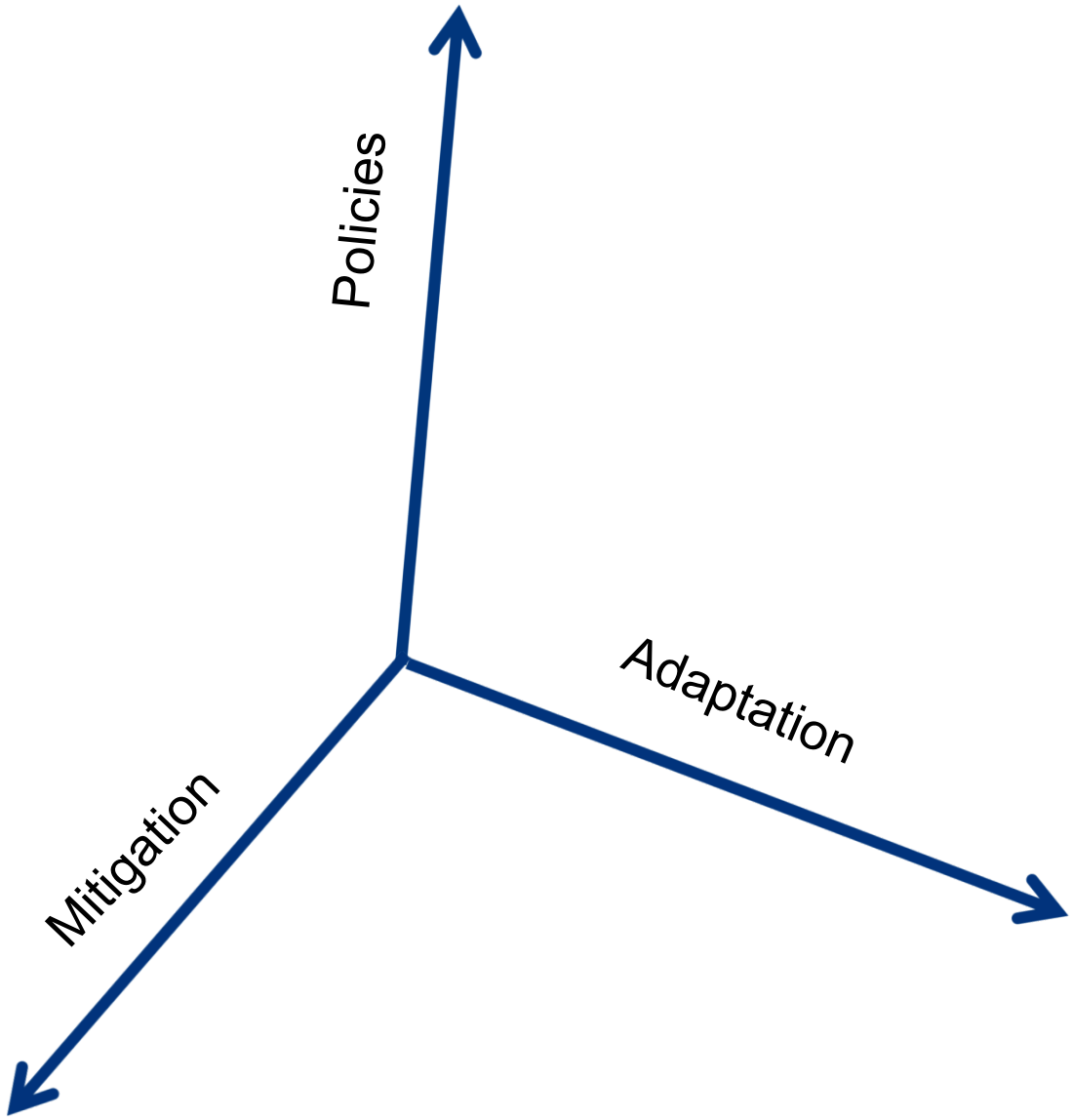
Policies
Adaptation
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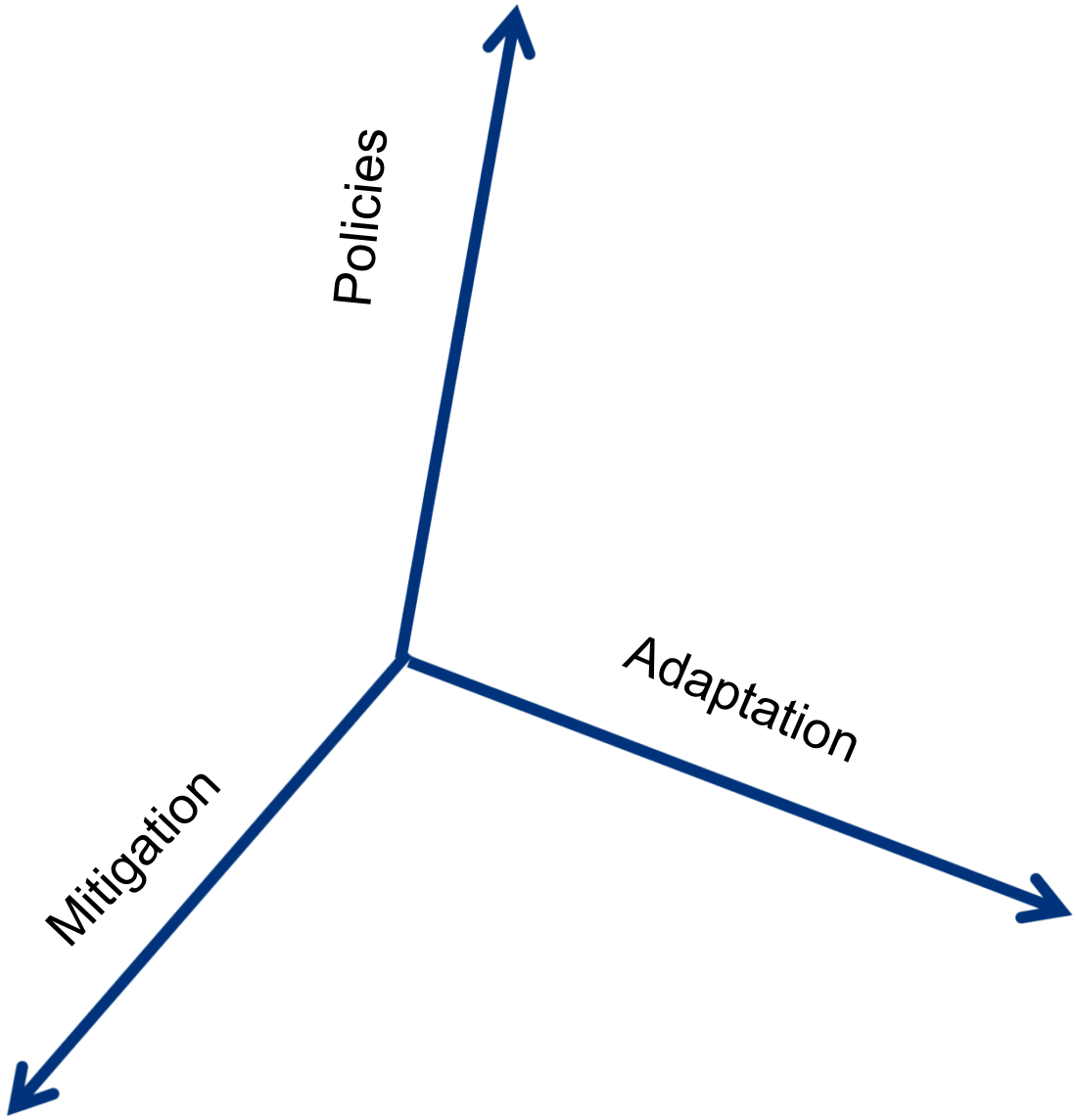
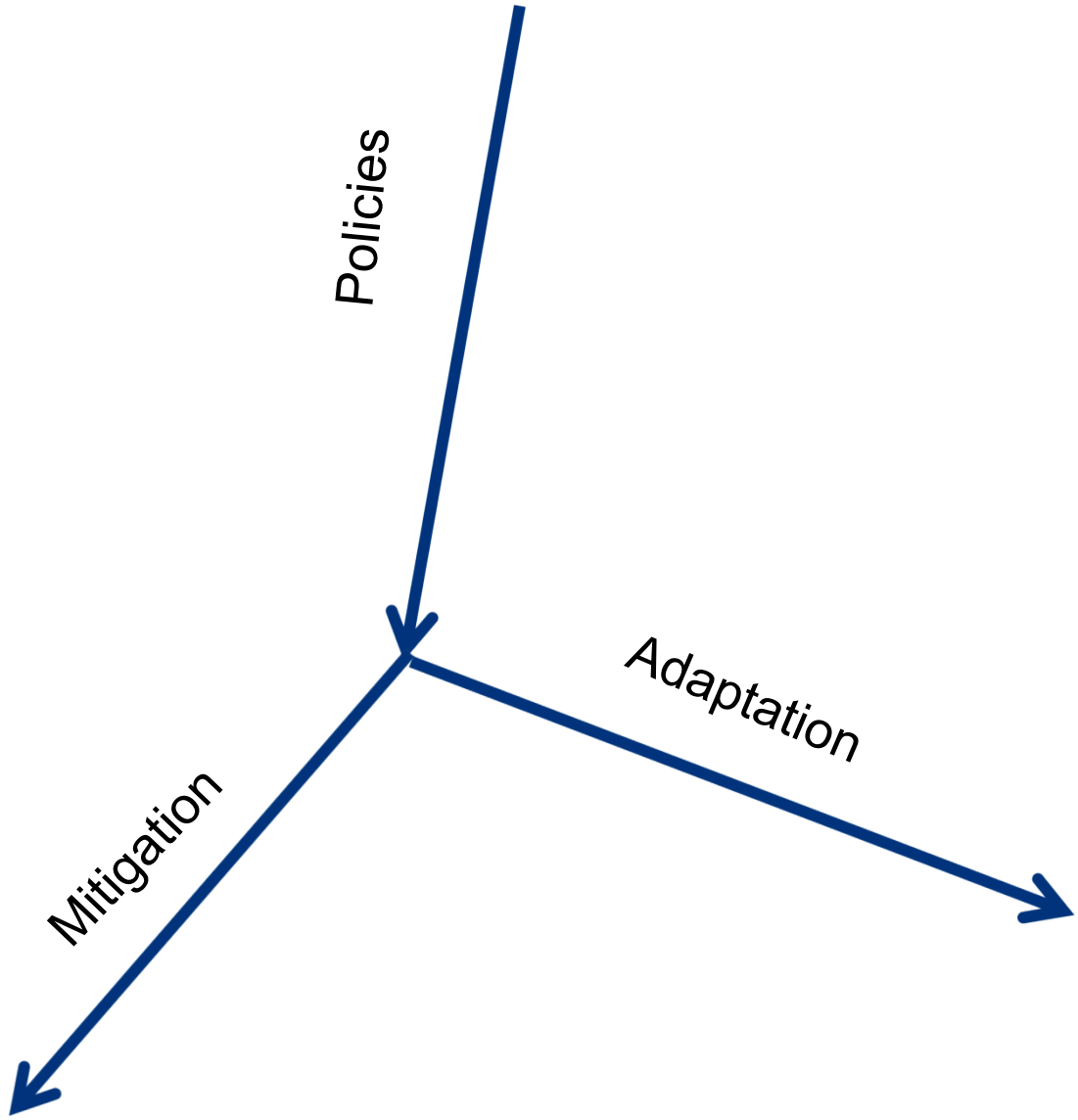

Policies
Adaptation
Mitigation


Policies
Adaptation
Mitigation

“Granger’s Problem”

Interpreting and Using RCPs & SSPs

- Greatest achievement is “community building”
- A small scenario set needed by most users
- High and low baseline and stabilization (4-6)
- Creative and simple meta-narrative and logic
- Pertinent and plausible description of the “library”
- How can communities use and select scenarios
- We offer to host a brainstorming meeting at IIASA to work on possible interpretative architectures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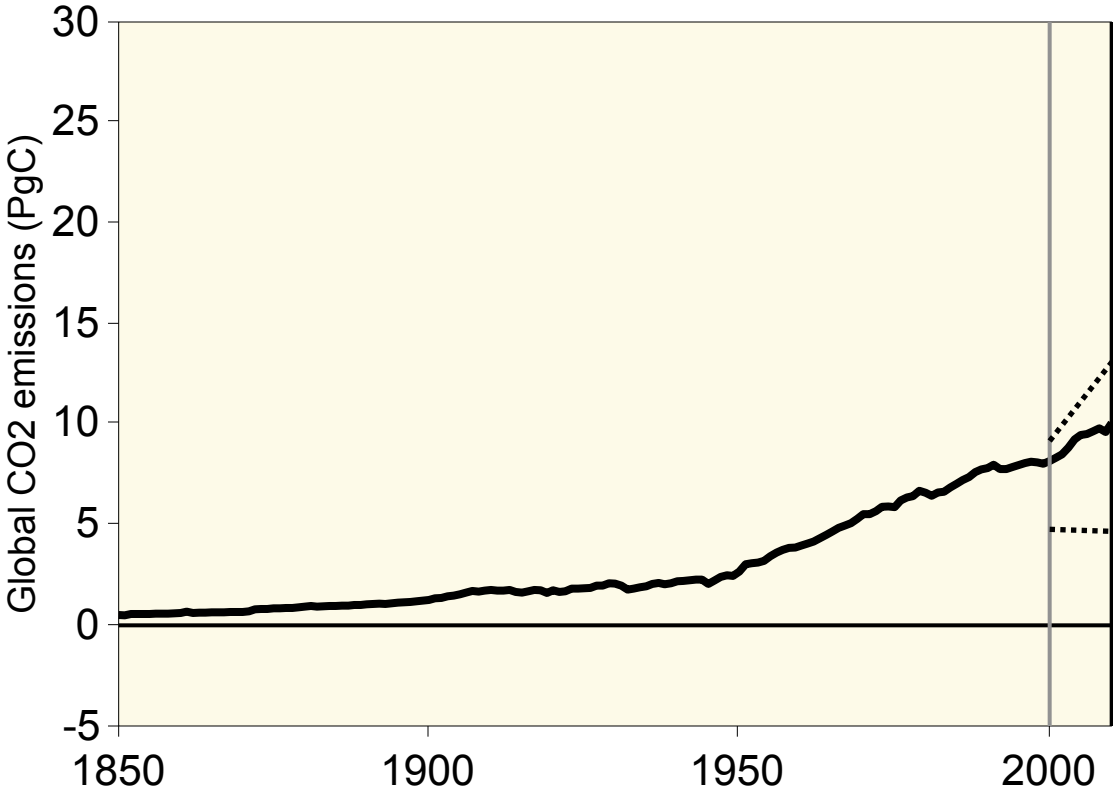
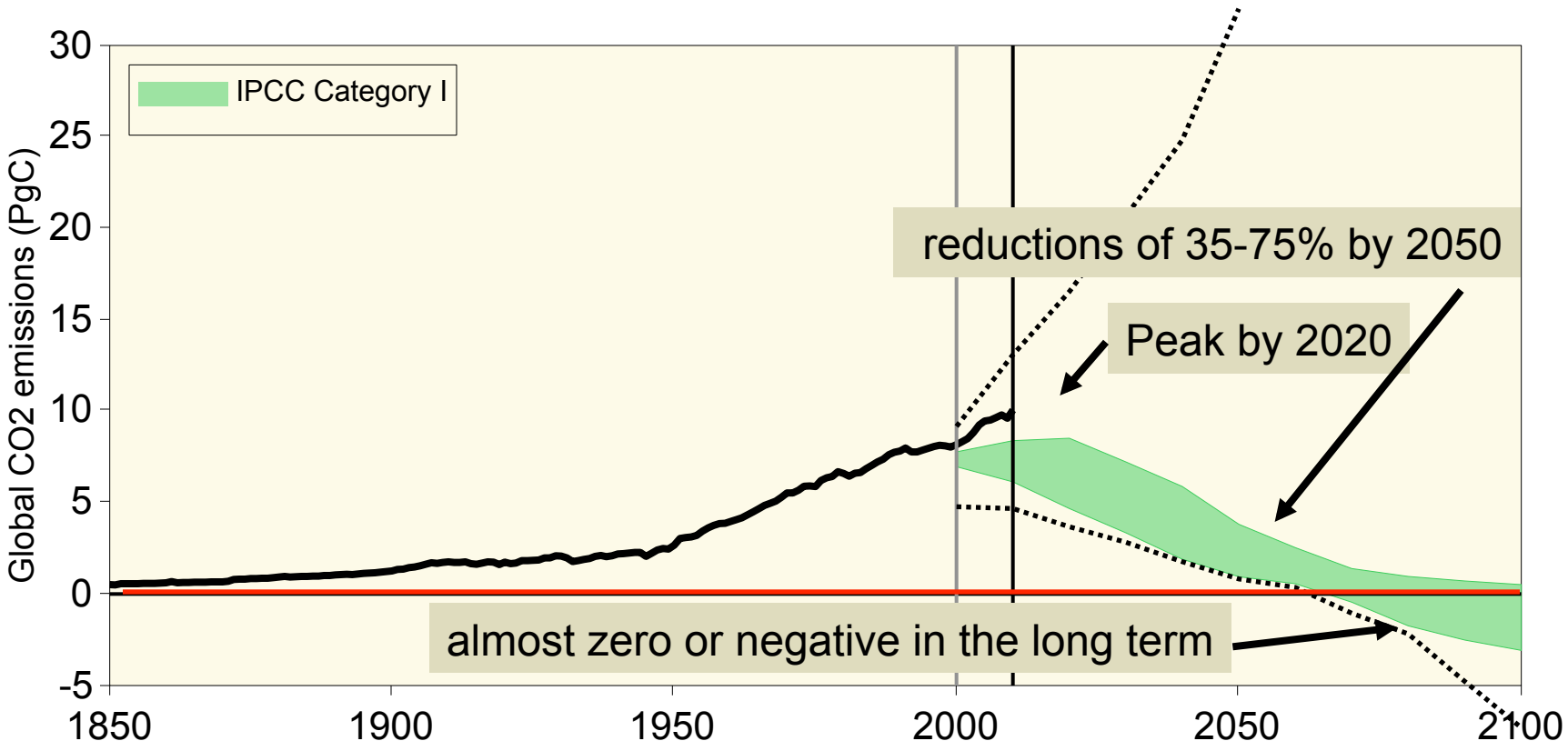
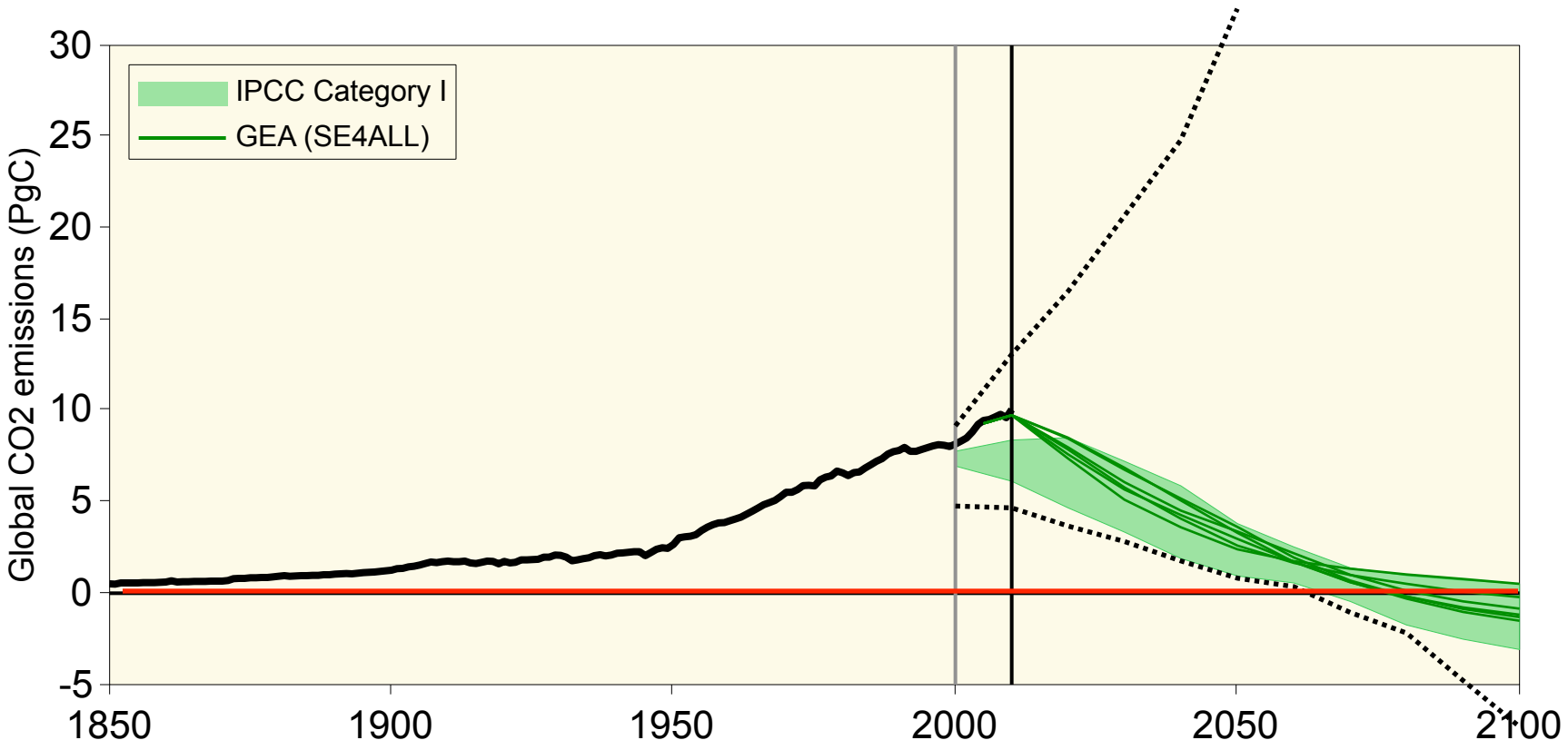
Global CO_2 Emissions



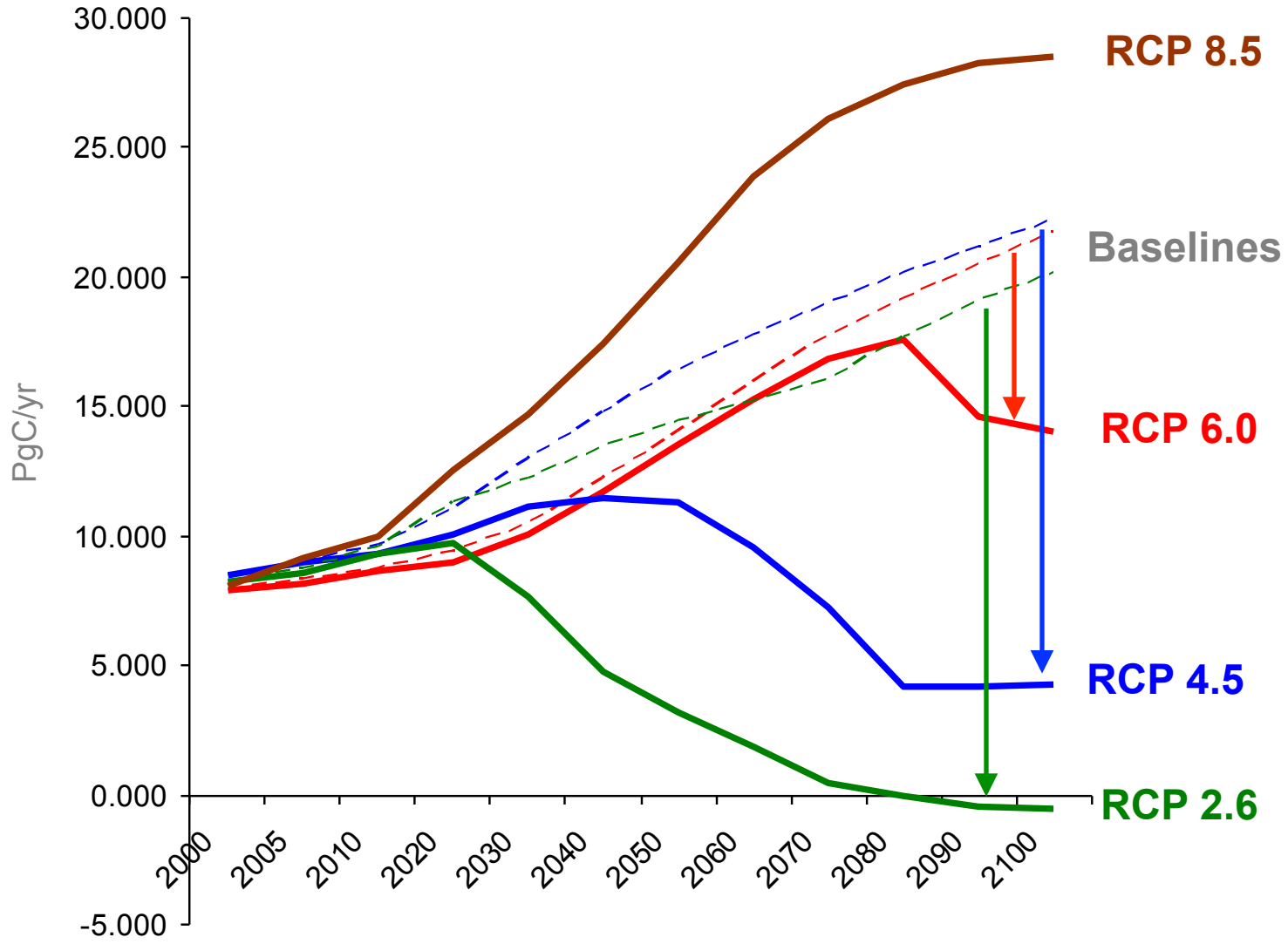
Global CO_2 Emissions



Global CO_2 Emissions

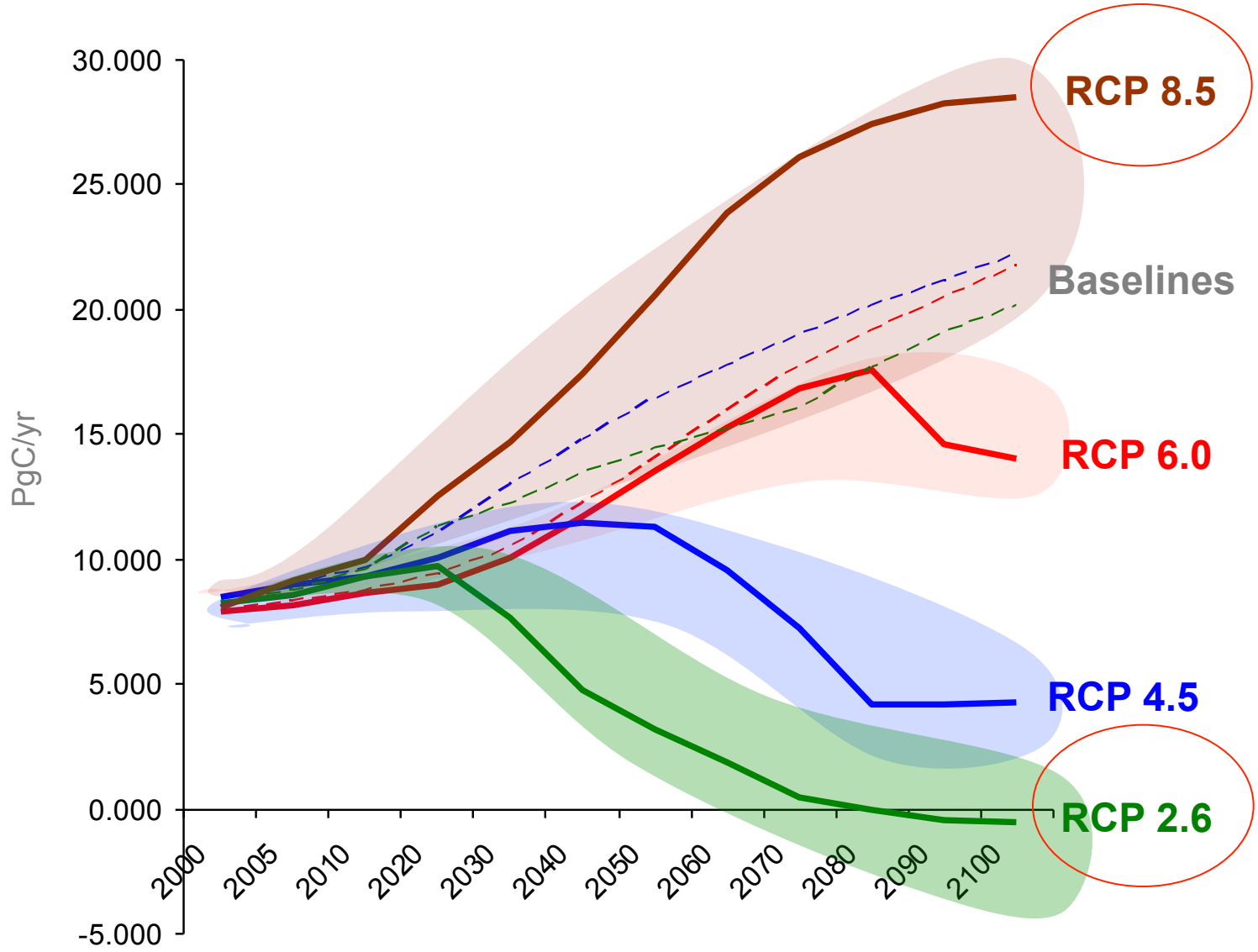


CO_2 Emissions (World)



Source: van Vuuren et al, 2009

CO_2 Emissions (World)



Previous IPCC Scenarios and Future Outlook