La modélisation Économie – Climat – Carbone pour le prochain rapport du GIEC
Séminaire de la Belle Gabrielle/GIS-DECLIC

Les trajectoires socio-économiques : illustrations avec le modèle IMACLIM-R

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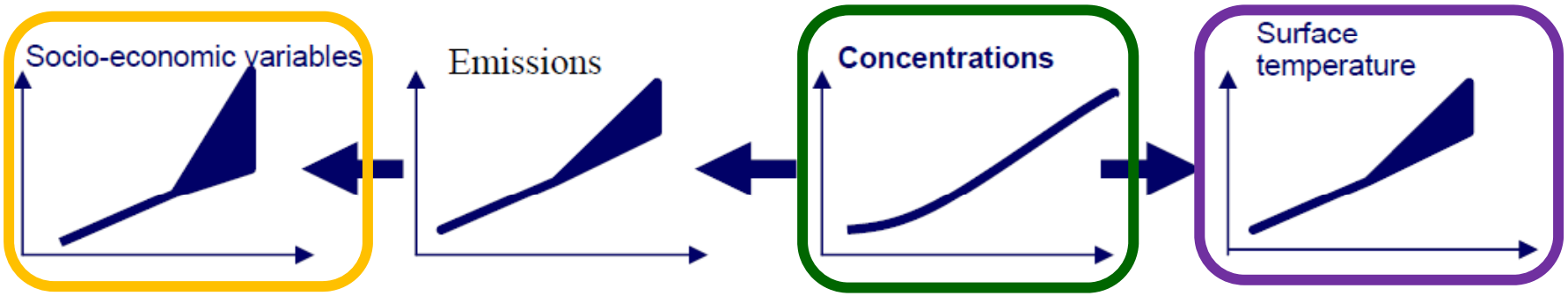
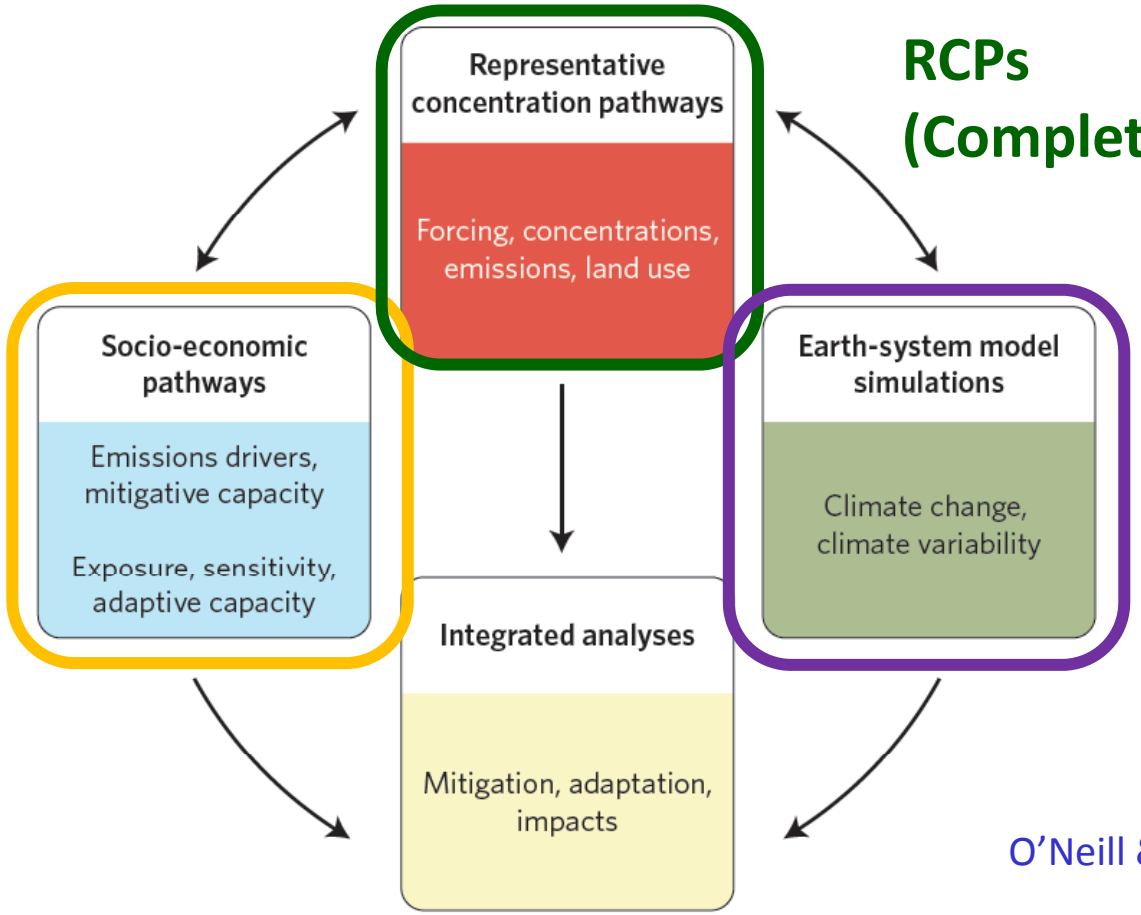
CIRED

CLIMAT ENVIRONNEMENT SOCIÉTÉ
Groupement d'Intérêt Scientifique

Chaire Modélisation prospective au service du développement durable

The new IPCC scenarios use a parallel approach





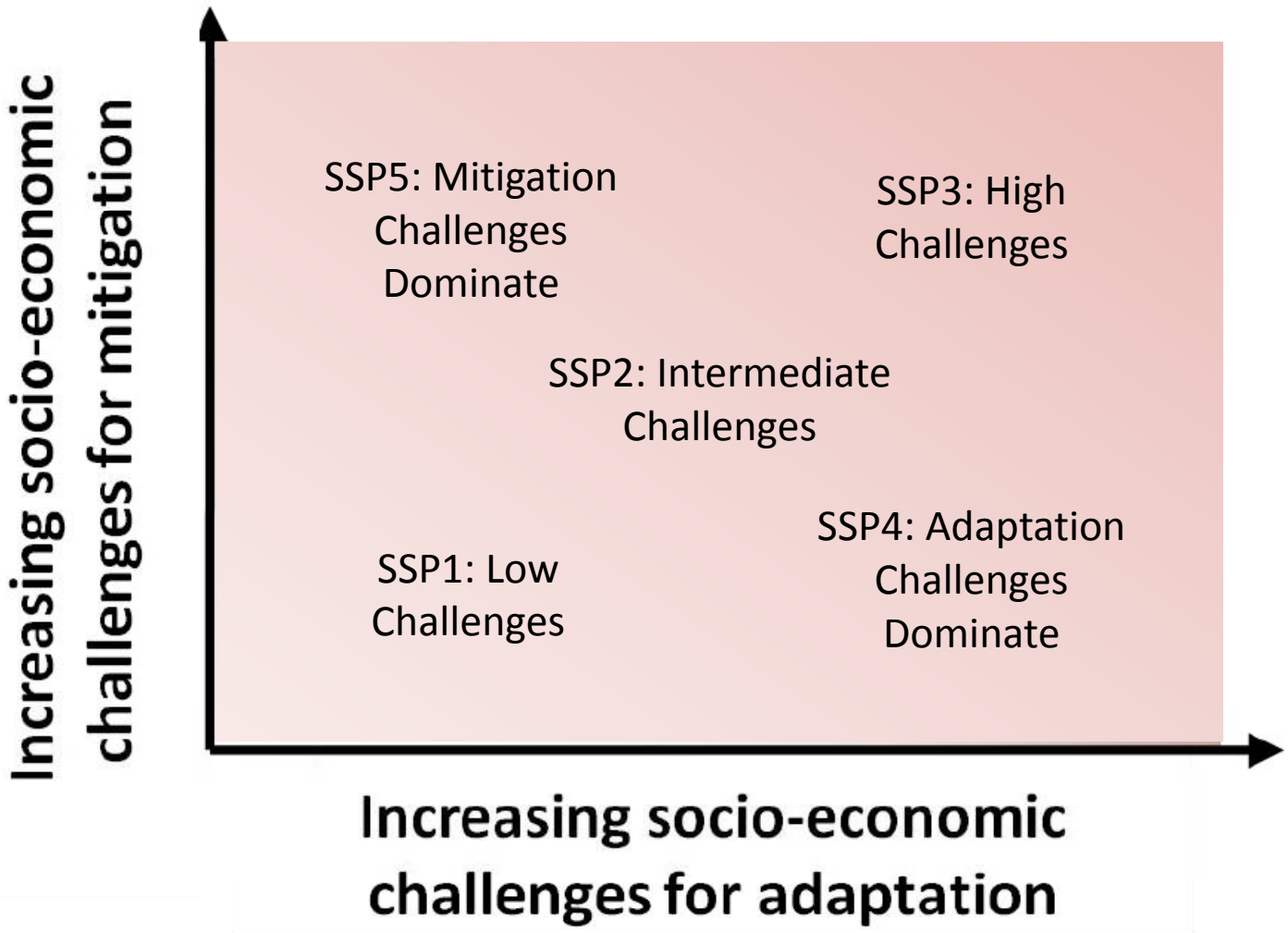
RCPs (Complete)

In progress

Ongoing

O'Neill &Schweizer, 2011.

Shared Socioeconomic Pathway (SSP) Logic



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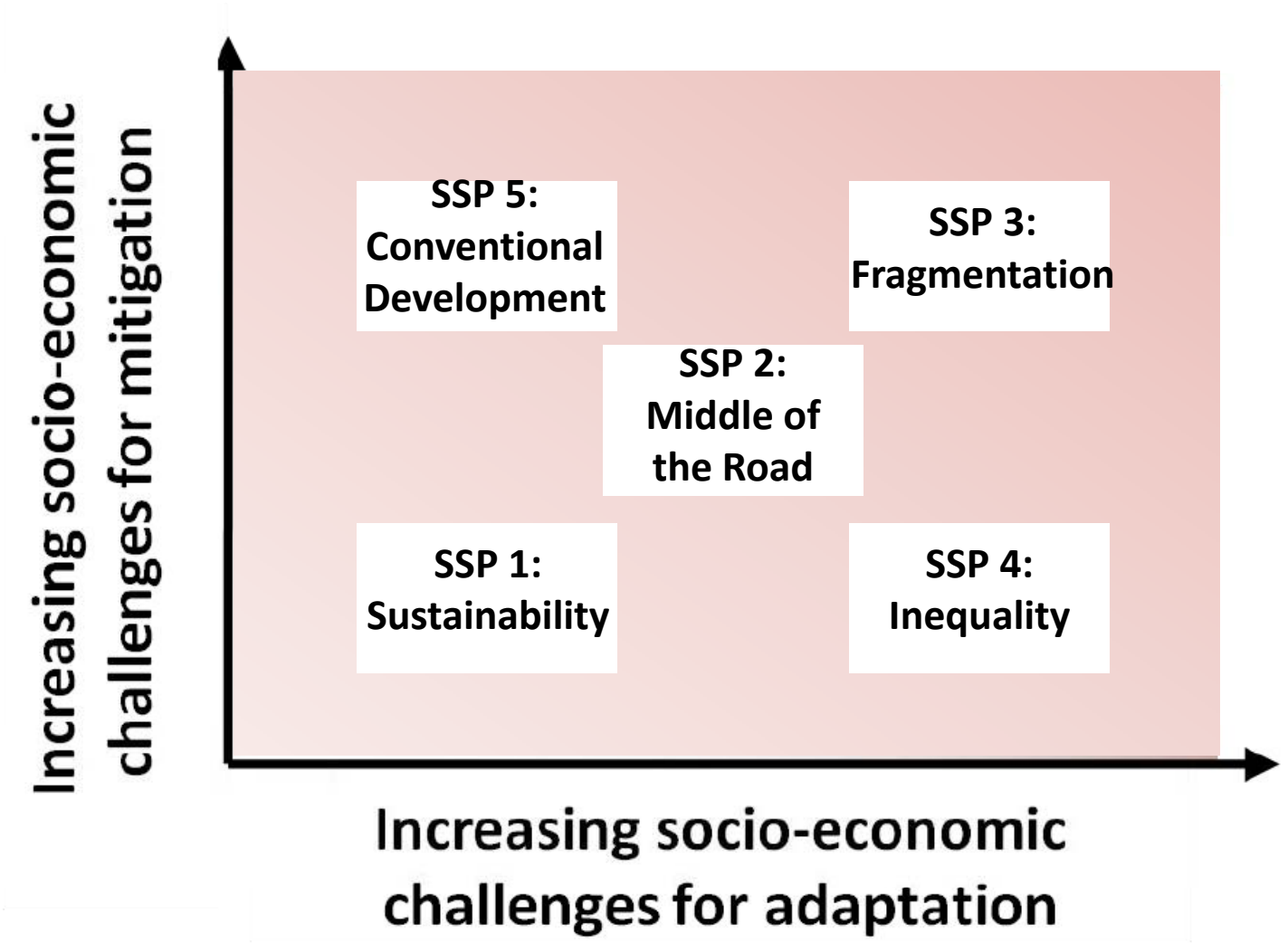
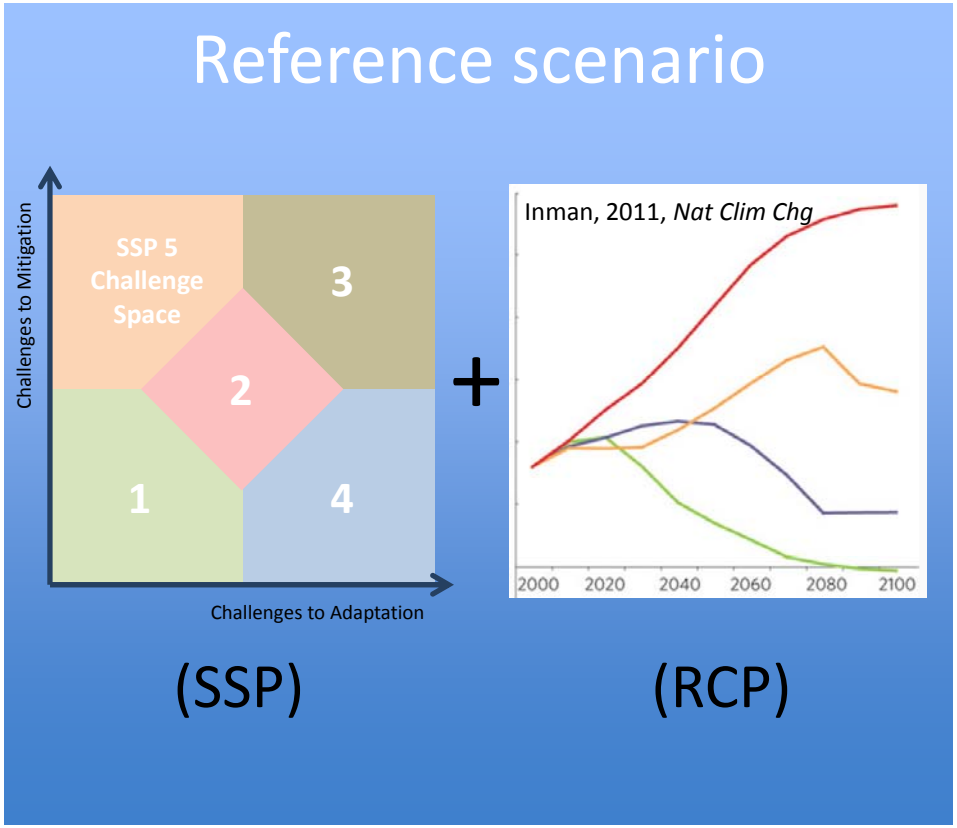


O'Neill et al. 2012,
Meeting Report: http://www.isp.ucar.edu/socio-economic-pathways

How are new scenarios to be used?

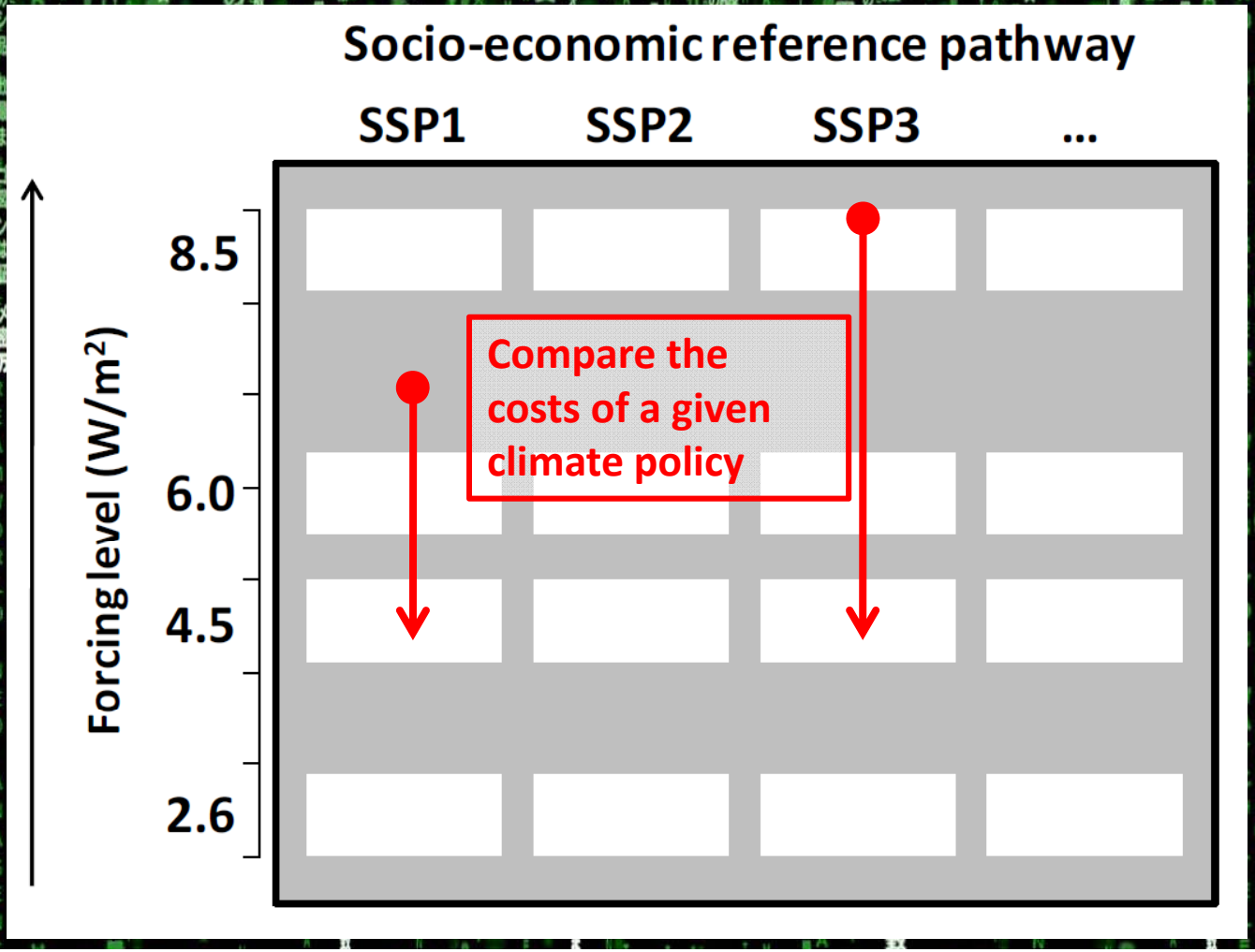
- Foundation for climate change research
- Scientific assessment (e.g. IPCC, governmental or non-governmental organization reports)

Use 1: Climate change research



+ Policy assumption(s) ⇨ Integrated benefit-cost analysis, risk analysis, etc.

Use 2:
A tool for integrated analysis: the scenario matrix



Source: Brian O'Neill

Framework paper posted on NCAR website: http://www.isp.ucar.edu/socio-economic-pathways

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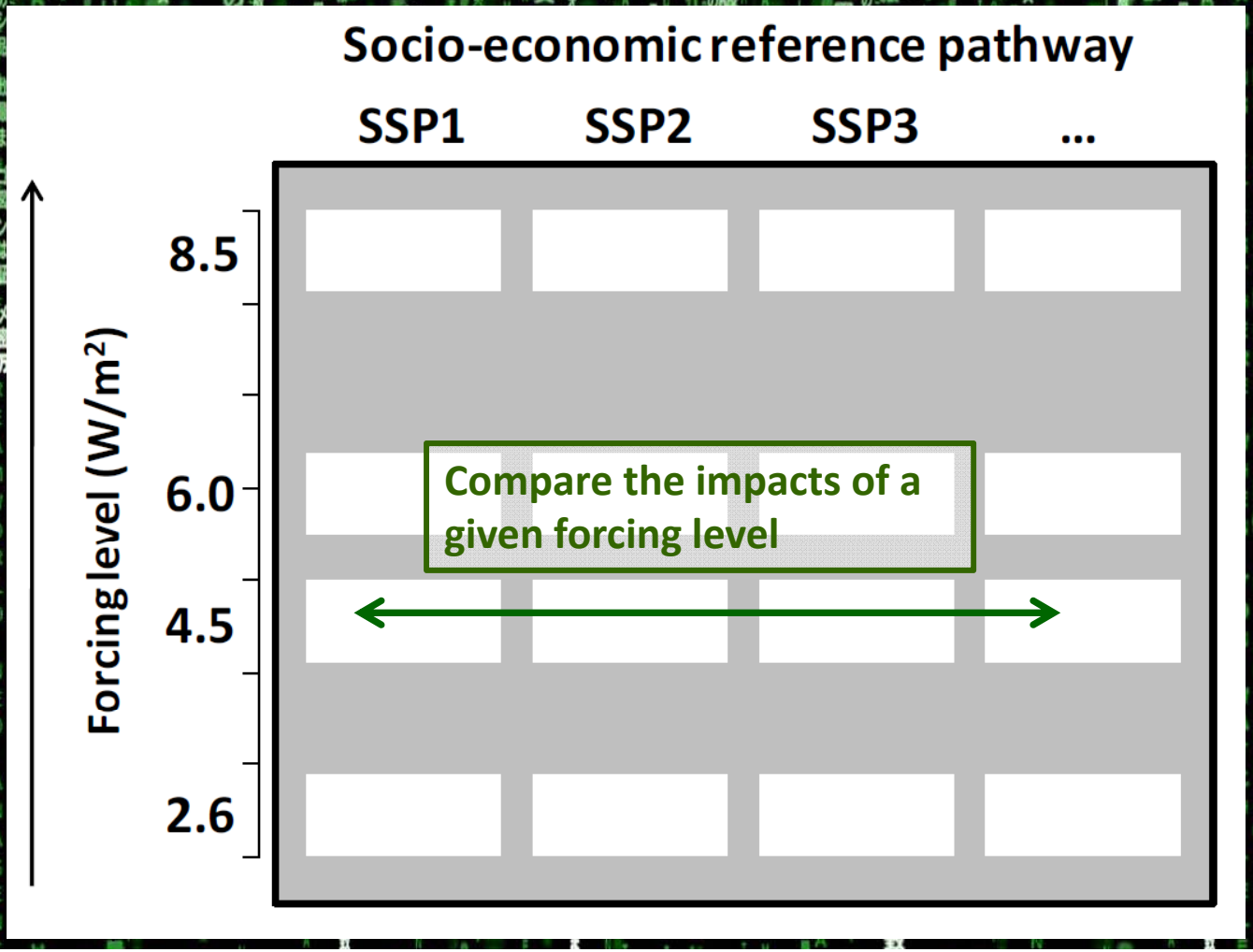

Source: Brian O'Neill

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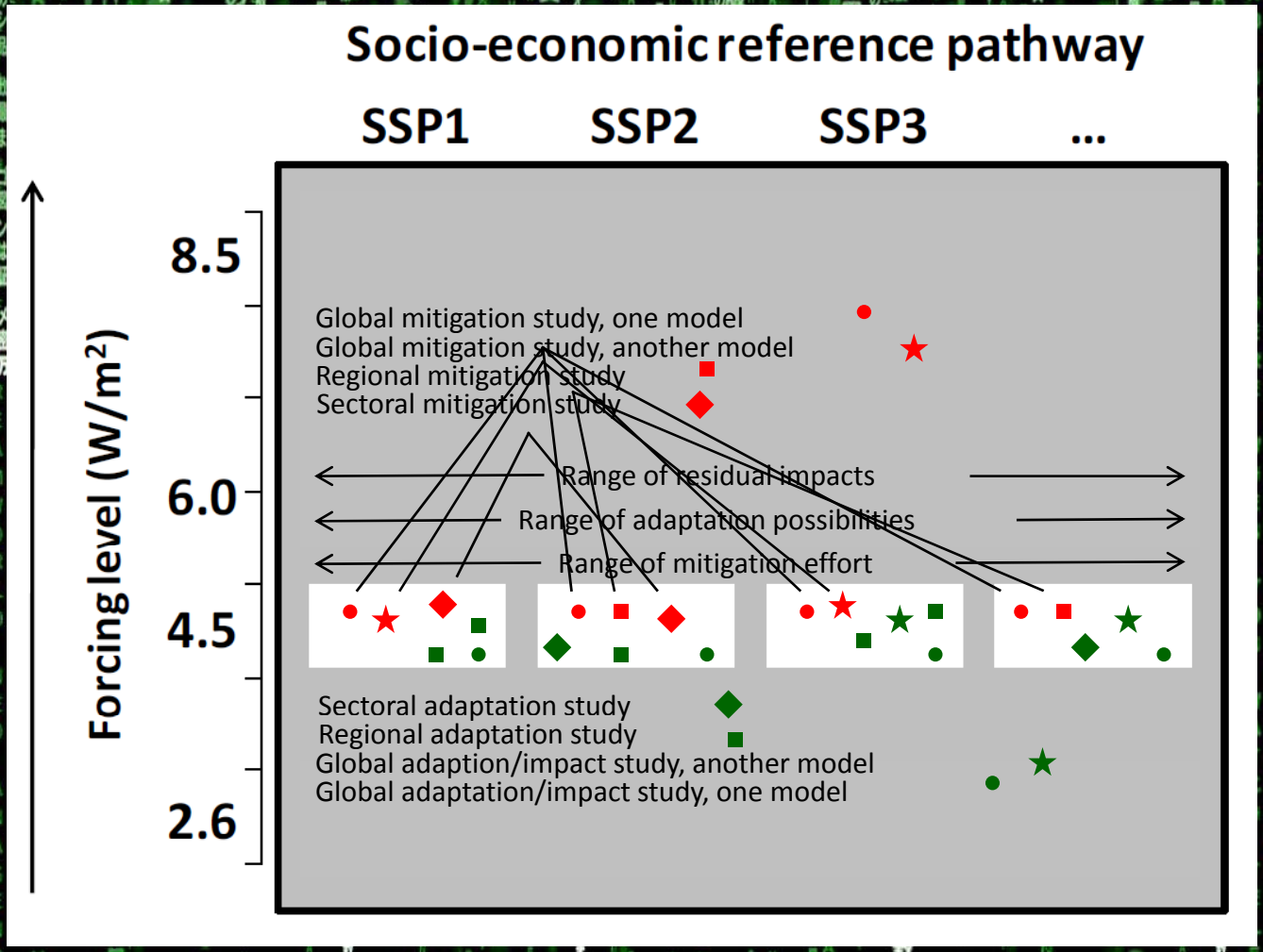
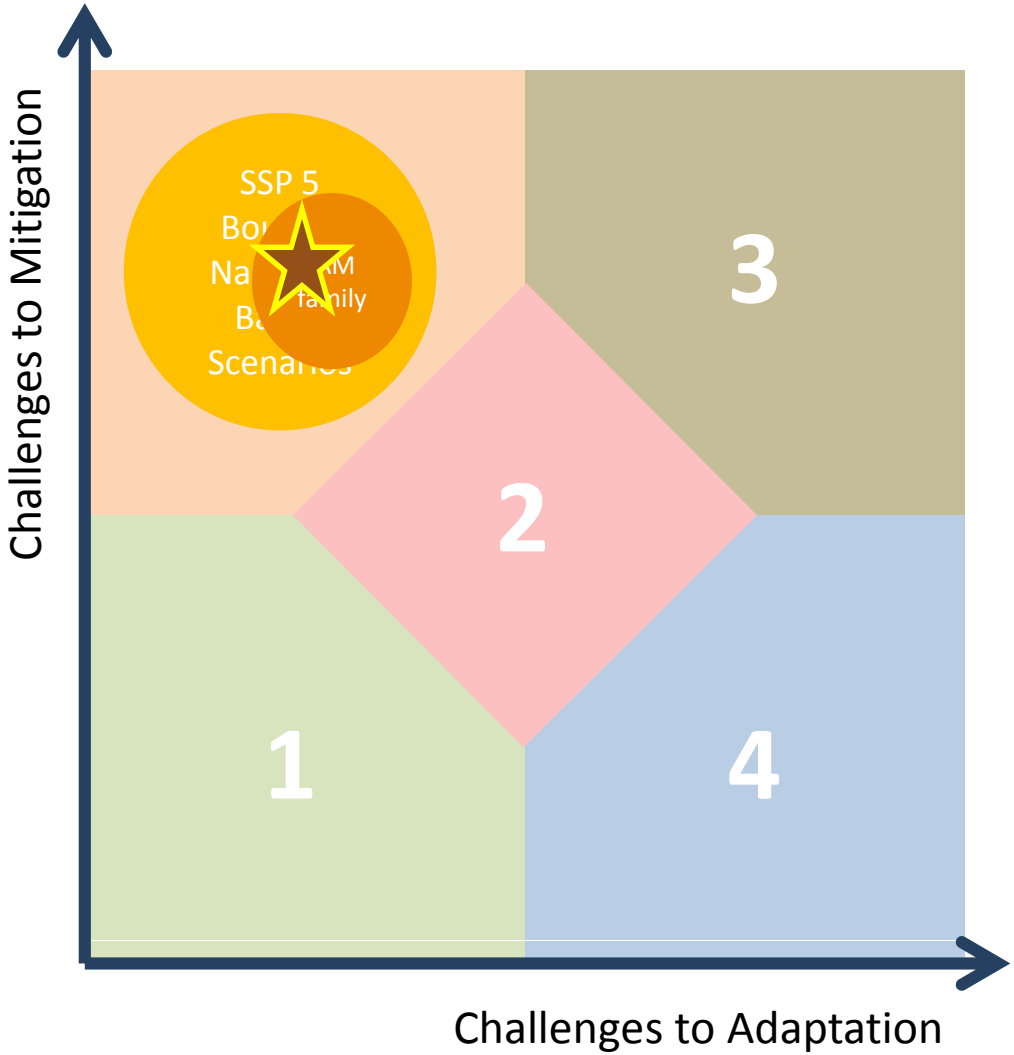


Source: Brian O'Neill

Different tracks of research activity



Modelling projects : EMF27, Ampere

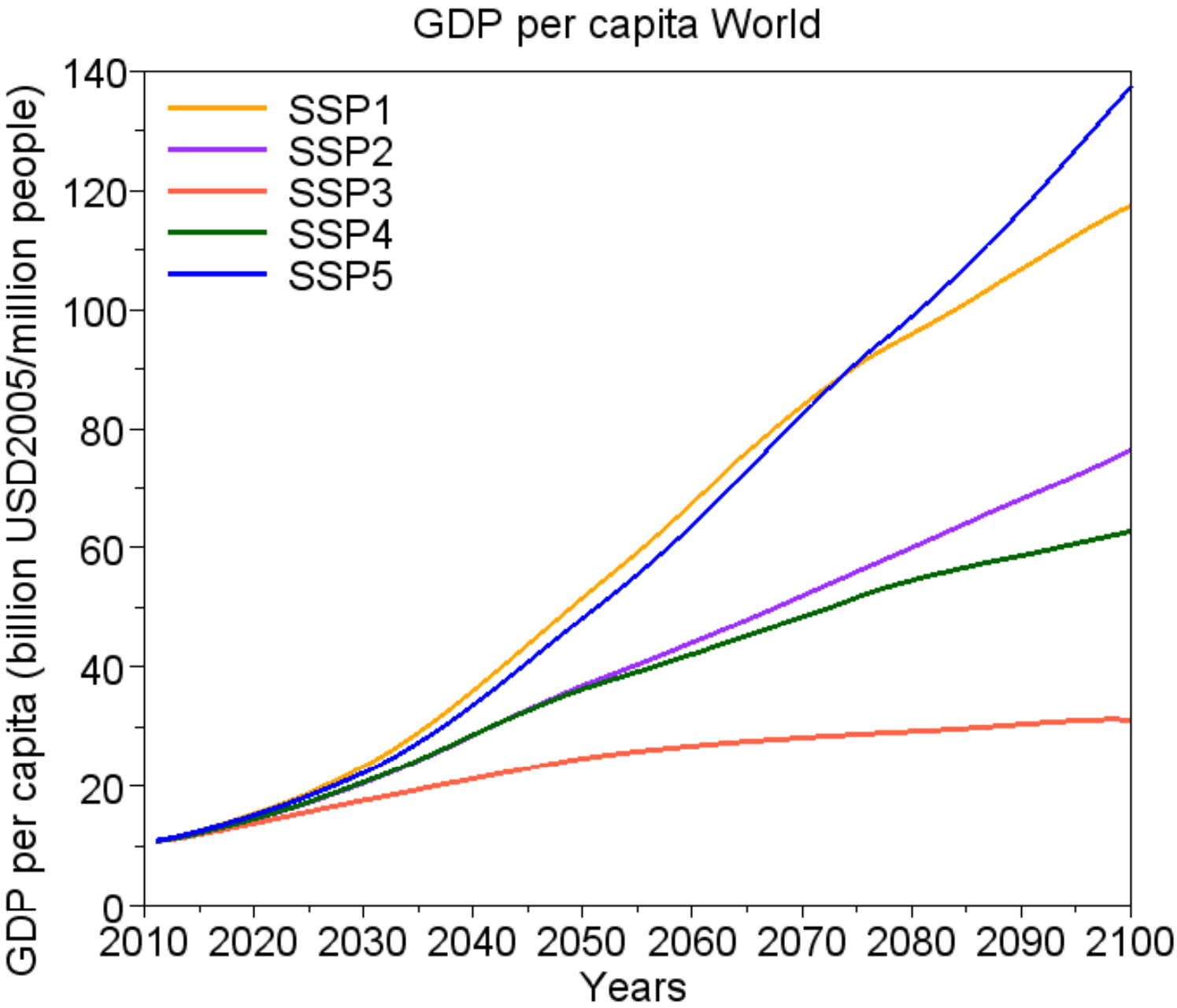
Marker scenarios for AR5

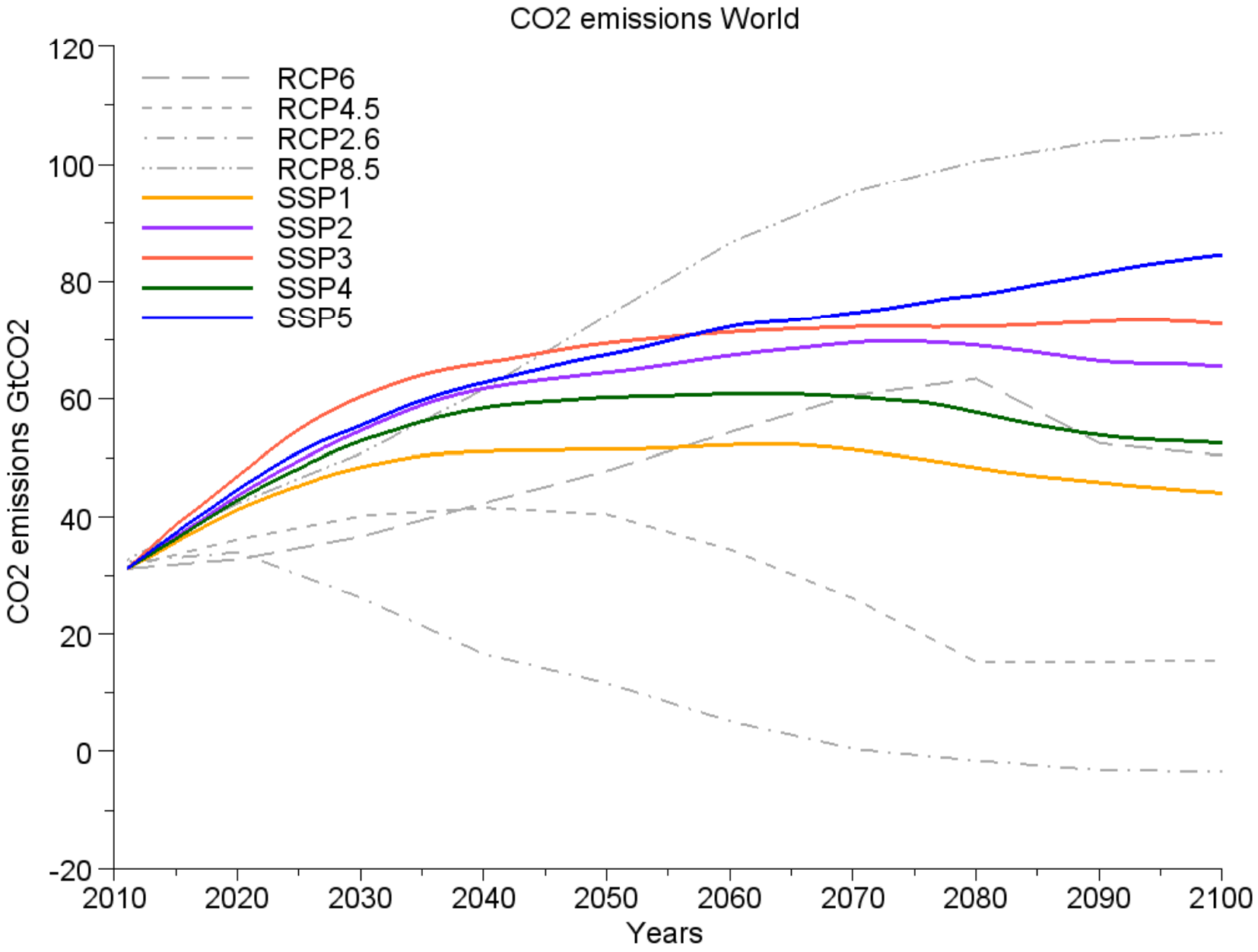
→ GDP + population trajectories for 5 marker scenarios

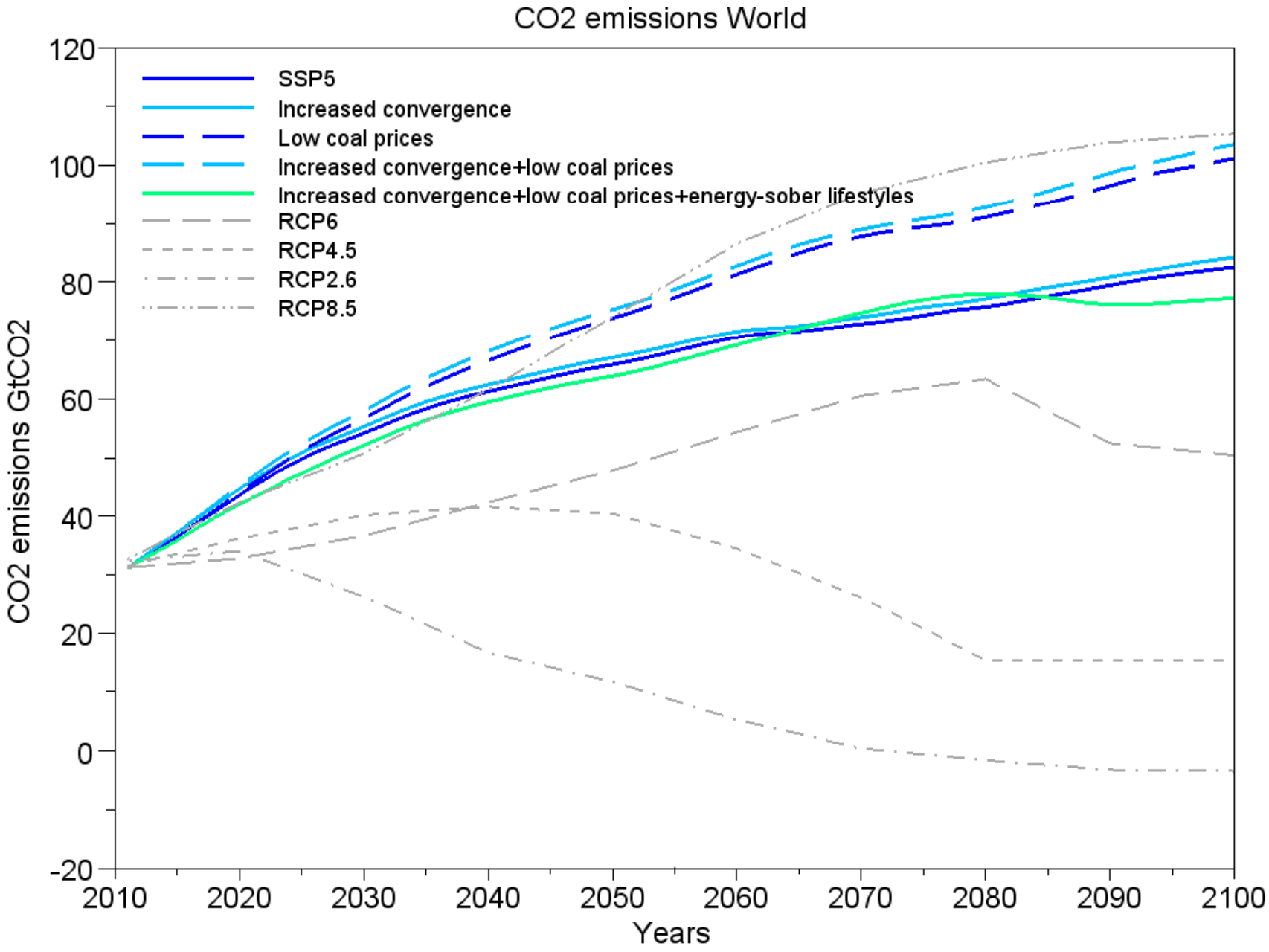
→ will be used as inputs by IAMs to compute markers for AR5

Insights from the IMACLIM-R hybrid framework

Endogenous growth, emissions, and energy efficiency: interaction in **both ways** between GDP trends and energy systems (and emissions) dynamics


GDP per capita World
GDP per capita (billion USD2005/million people)
140
120
100
80
60
40
20
0
SSP1
SSP2
SSP3
SSP4
SSP5
2010
2020
2030
2040
2050
2060
2070
2080
2090
2100
Years

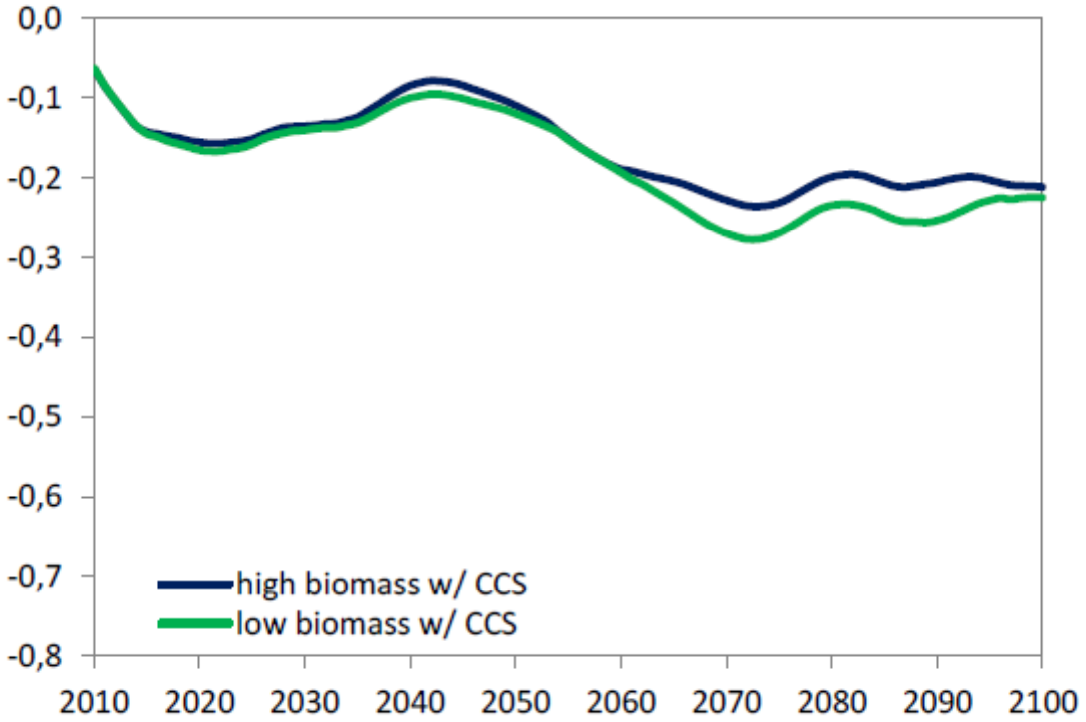

CO2 emissions World
RCP6
RCP4.5
RCP2.6
RCP8.5
SSP1
SSP2
SSP3
SSP4
SSP5
CO2 emissions GtCO2
120
100
80
60
40
20
0
-20
2010
2020
2030
2040
2050
2060
2070
2080
2090
2100
Years


CO2 emissions World
SSP5
Increased convergence
Low coal prices
Increased convergence+low coal prices
Increased convergence+low coal prices+energy-sober lifestyles
RCP6
RCP4.5
RCP2.6
RCP8.5
CO2 emissions GtCO2
120
100
80
60
40
20
0
-20
2010
2020
2030
2040
2050
2060
2070
2080
2090
2100
Years

Scenarios with climate policies: 550ppm and 450ppm

Scenario 550ppm : cost of the low biomass scenario

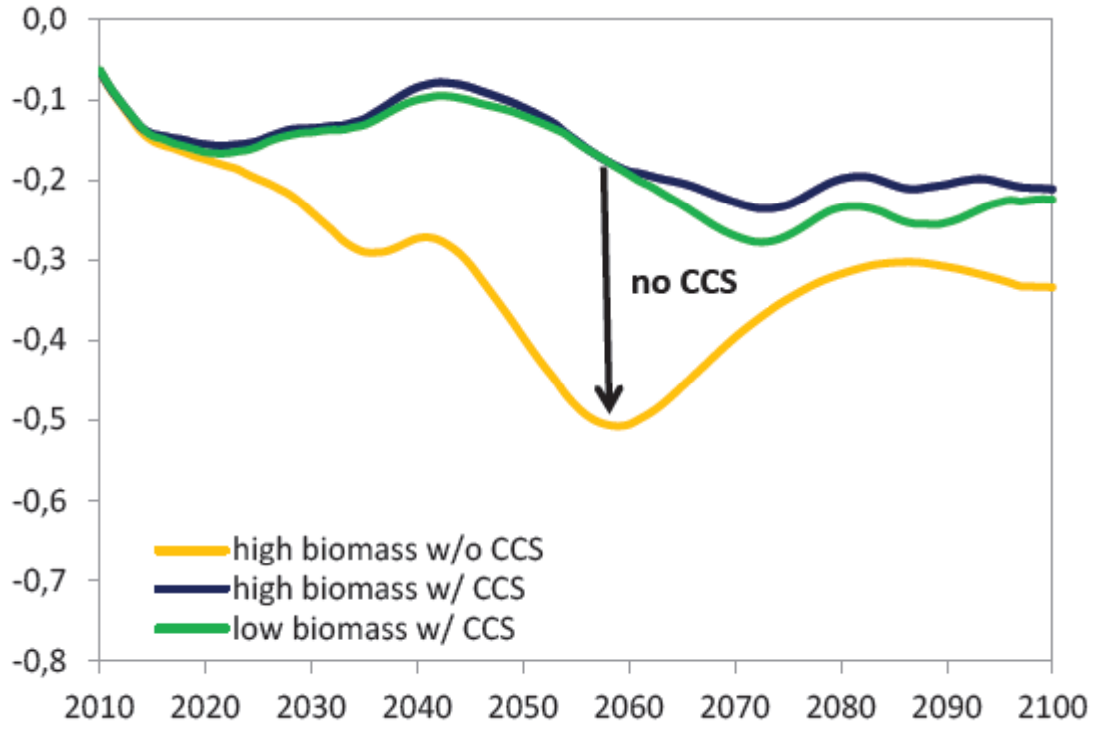
Difference in average GDP growth rate compared to baseline (%)



Small impact of biomass availability when CCS is available

Scenario 550ppm : cost of the no CCS scenario

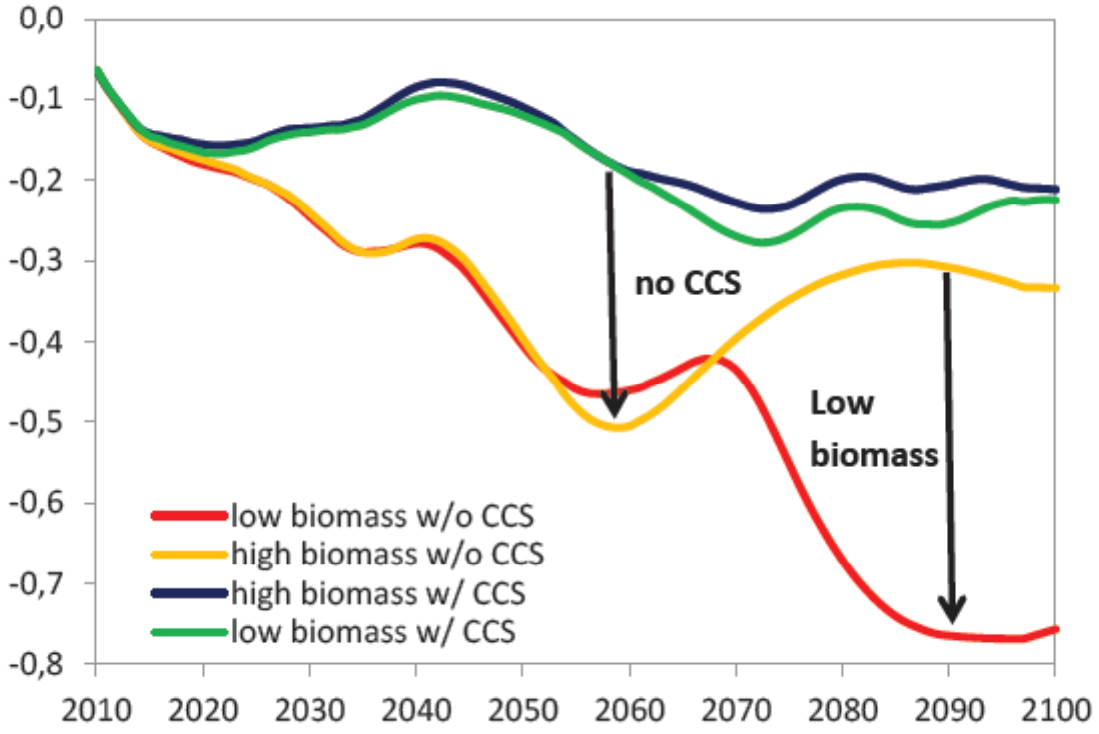
Difference in average GDP growth rate compared to baseline (%)



High medium term cost of the unavailability of CCS

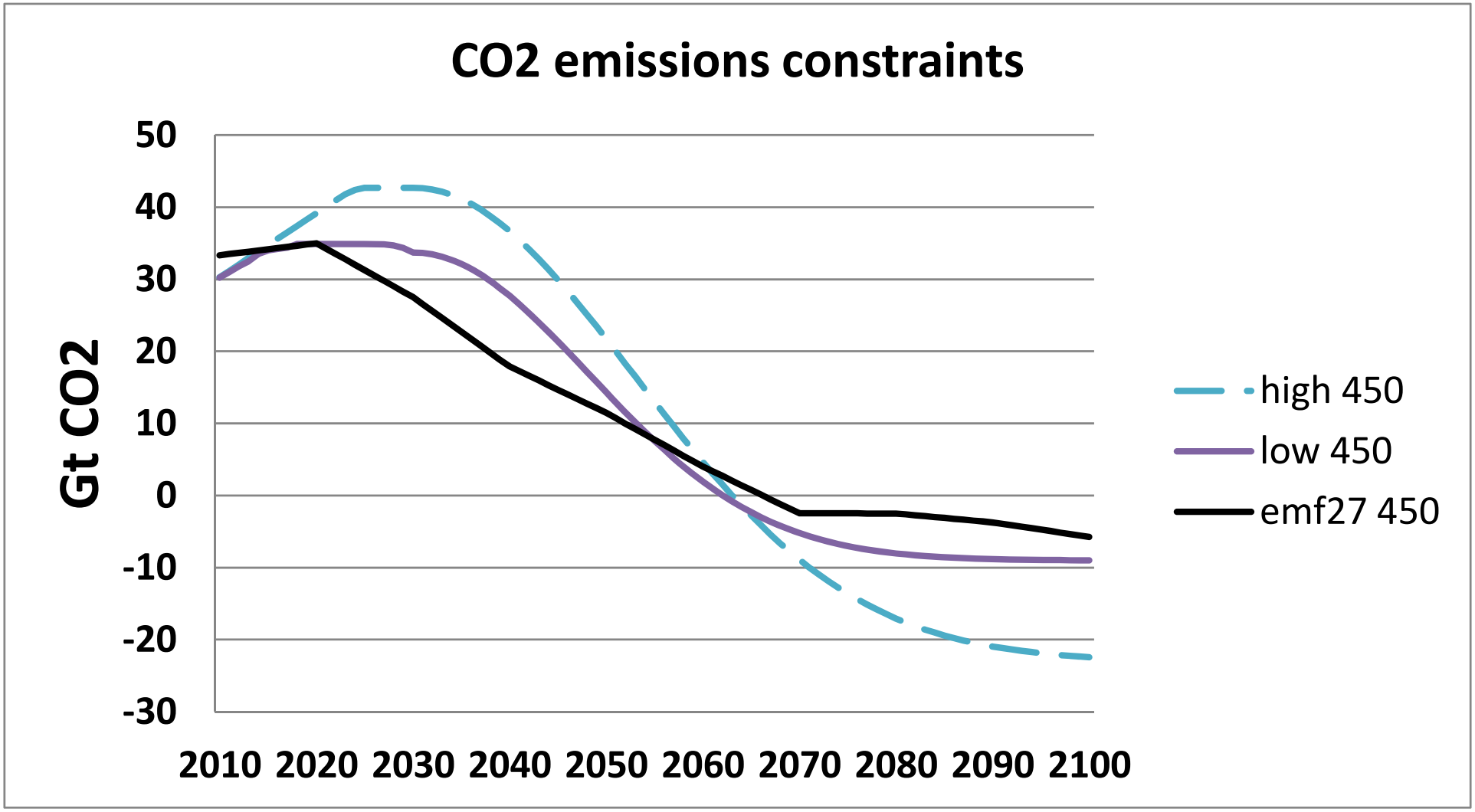
Scenario 550ppm: value of biomass when CCS is not an option

Difference in average GDP growth rate compared to baseline (%)

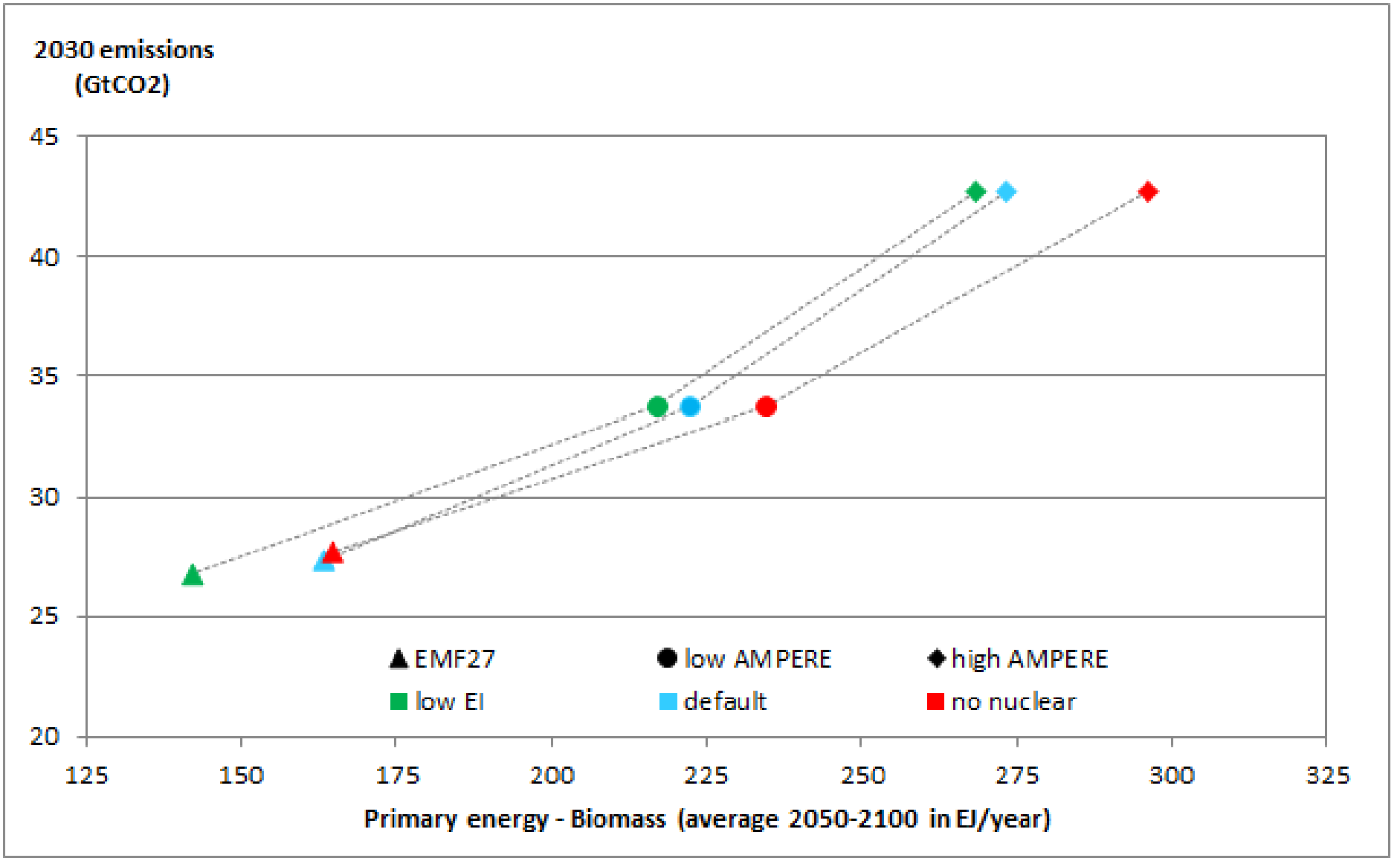


Critical role of biomass in the absence of CCS

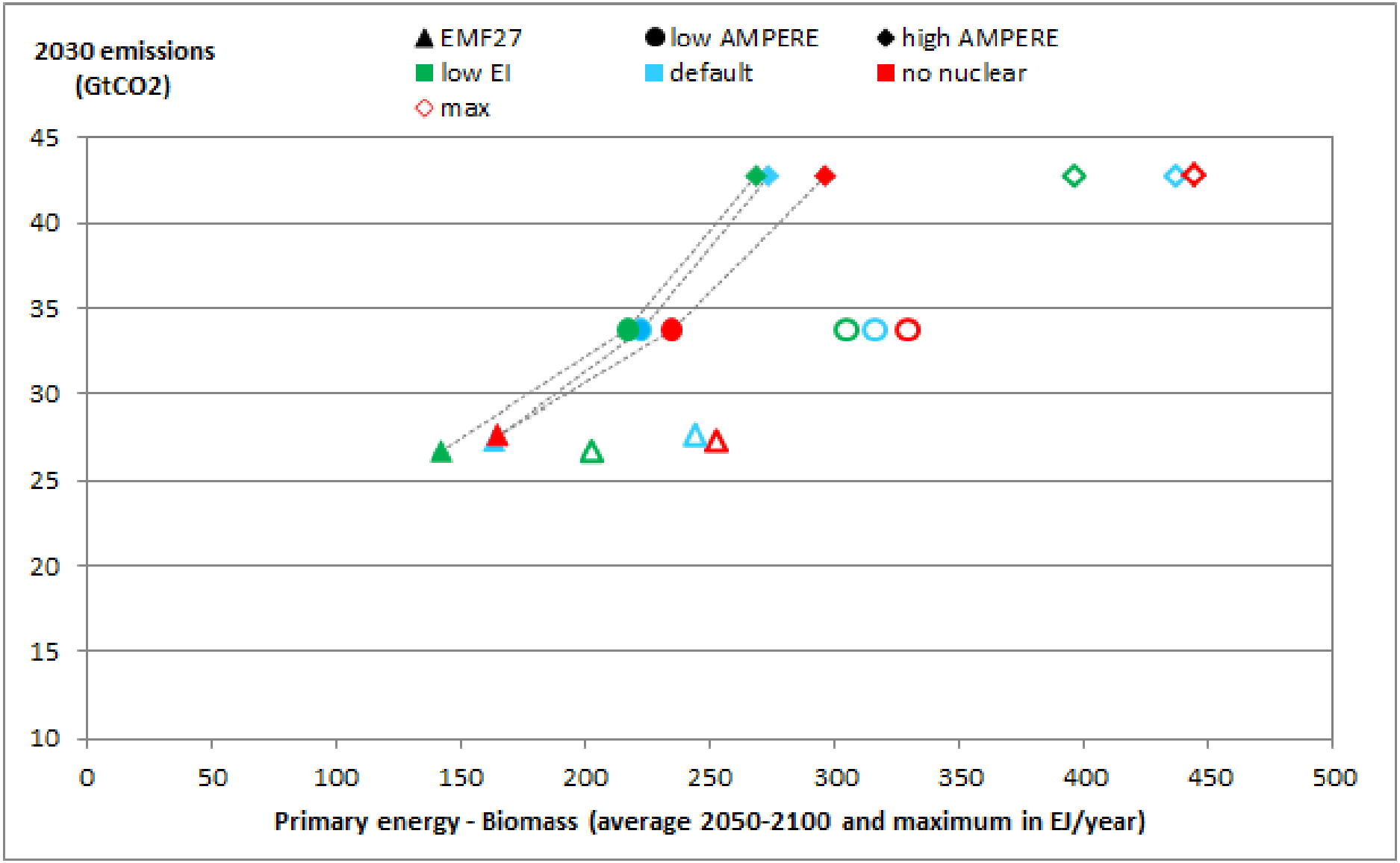
450ppm: short-term constraints vs. long term technical potentials



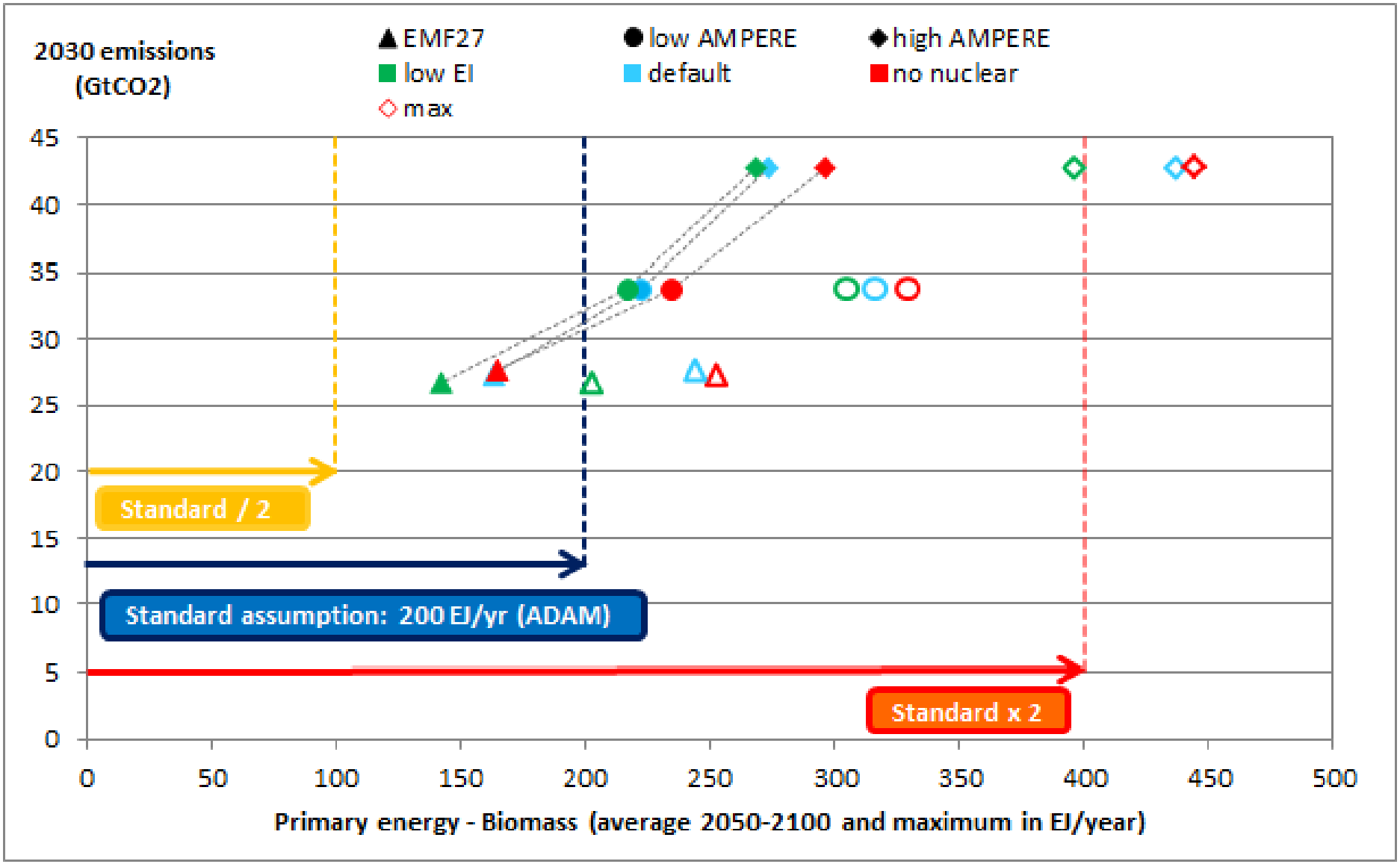
Short-term emissions and long term primary biomass energy



What's the maximum biomass requirement?



Biomass use vs. potential



Conclusions

- SSPs : nouveau cadre permettant d'organiser la recherche dans le domaine du changement climatique
- Rôle critique de la biomasse séquestrée pour atteindre des objectifs d'émissions contraignants sur le long-terme