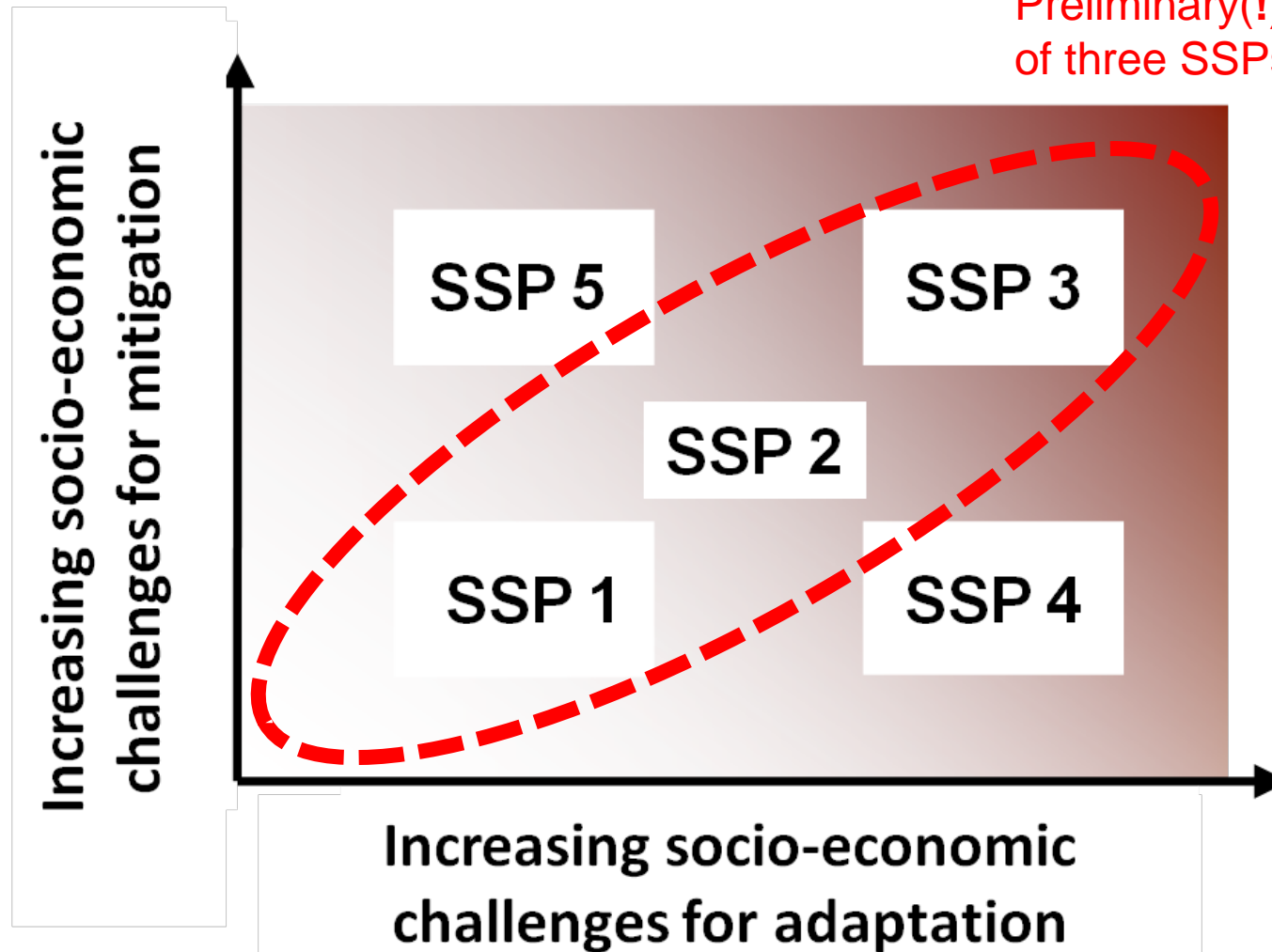


# Some Initial SSP Experiments IIASA-IAM Framework

Keywan Riahi, Peter Kolp,  
Volker Krey, David McCollum, Nebojsa  
Nakicenovic, Shonali Pachauri, Shilpa Rao,  
Oscar Van Vliet

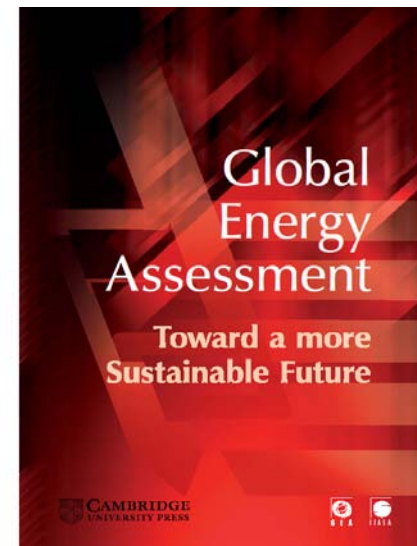
# SSP Framework

Preliminary(!) quantifications  
of three SSPs



# SSPs build upon earlier work

- IIASA Special Issue (2007):  
Integrated assessment of uncertainties of GHGs and their mitigation (SRES-based with major updates)
- Global Energy Assessment (2011)  
New scenarios with focus on the interaction of climate policies with other major local objectives (energy access, pollution, energy security)



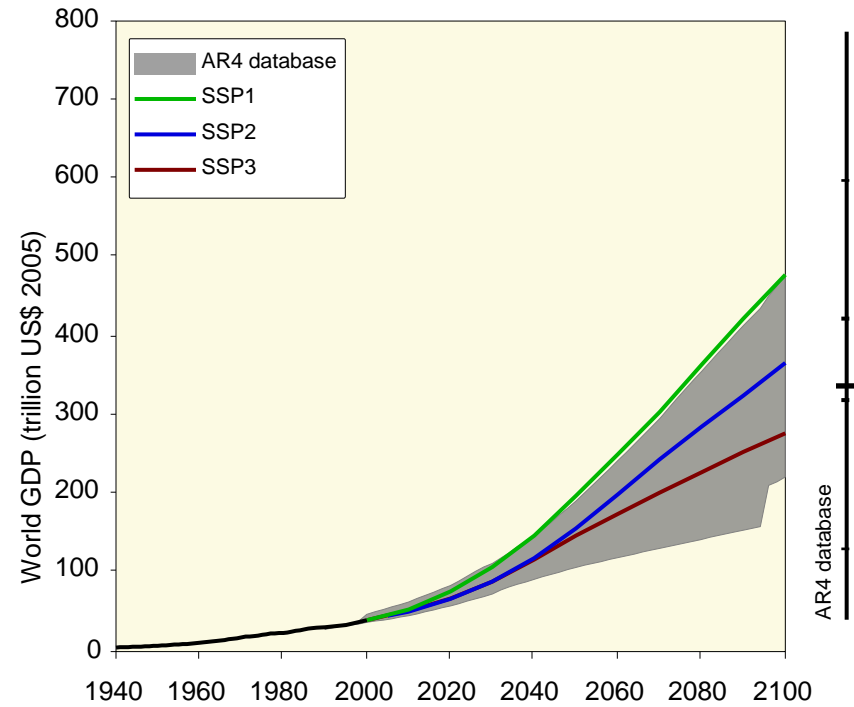
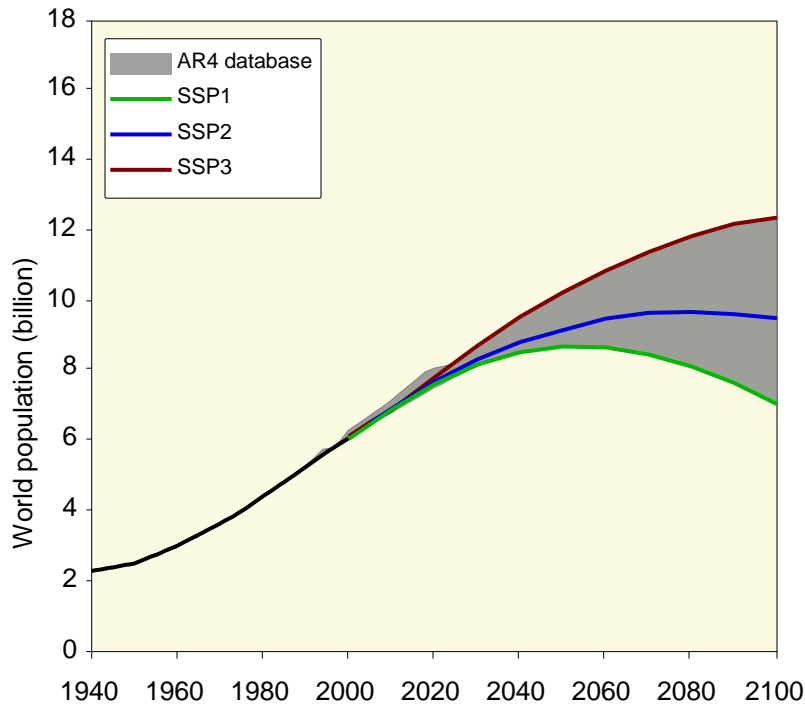
# Selected SSP Characteristics

Increasing socio-economic challenge  
to mitigation & adaptation



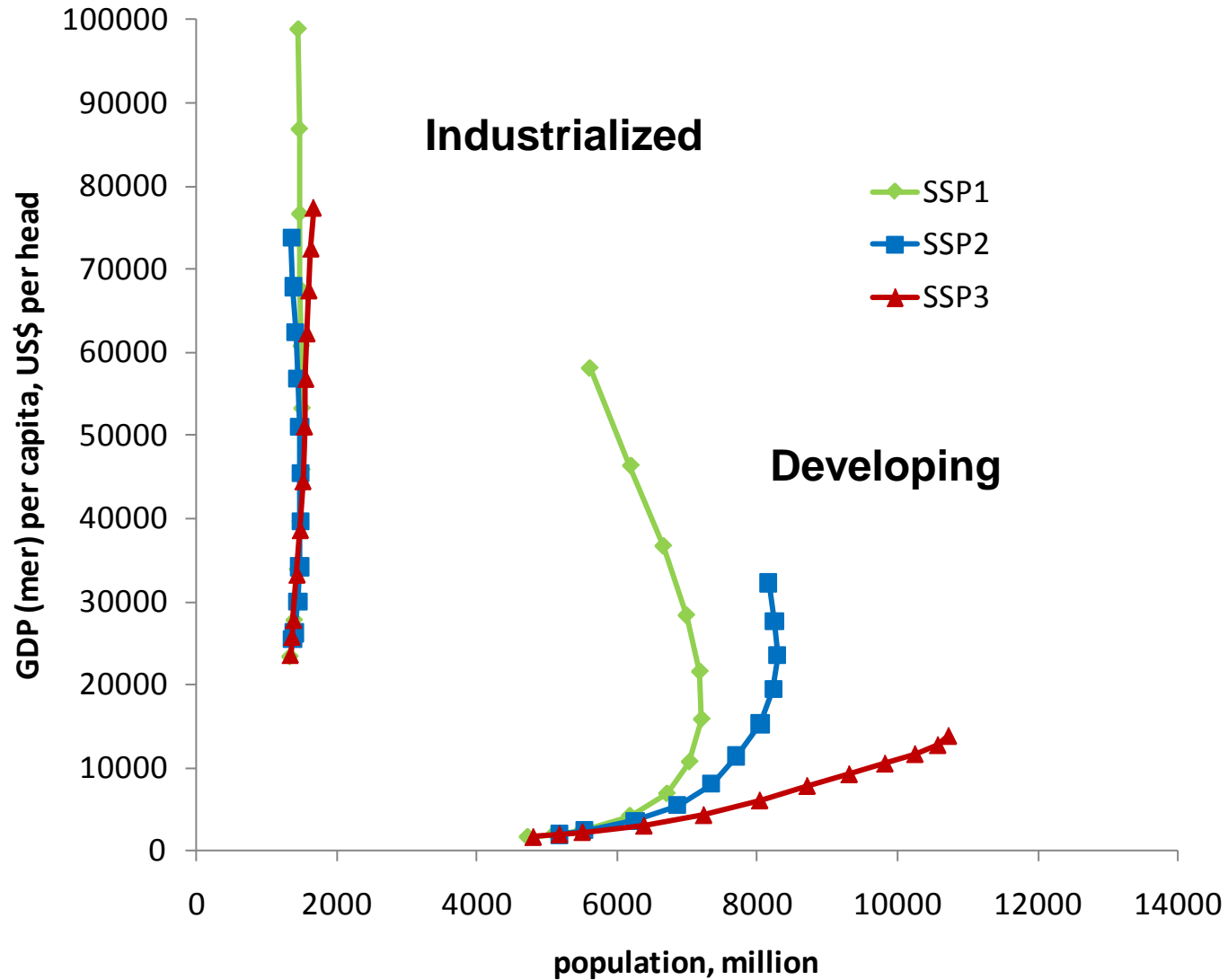
	SSP1	SSP2	SSP3
Population			
growth	L	M	H
urbanization	L	M	H
education	H	M	L
Economy			
GDP growth	H	M	L
convergence	H	M	L
Technical Change			
energy supply & demand	Rapid	Intermediate	Slow
Agricultural productivity	H	M	L
fossil resources	L	M	H
Governance and institutional effectiveness	H	M	L
Other non-climate policy priorities (MDGs, health/air pollution, energy access, etc...)	Rapidly improving	Improving	Slow or no progress

# World Population and GDP

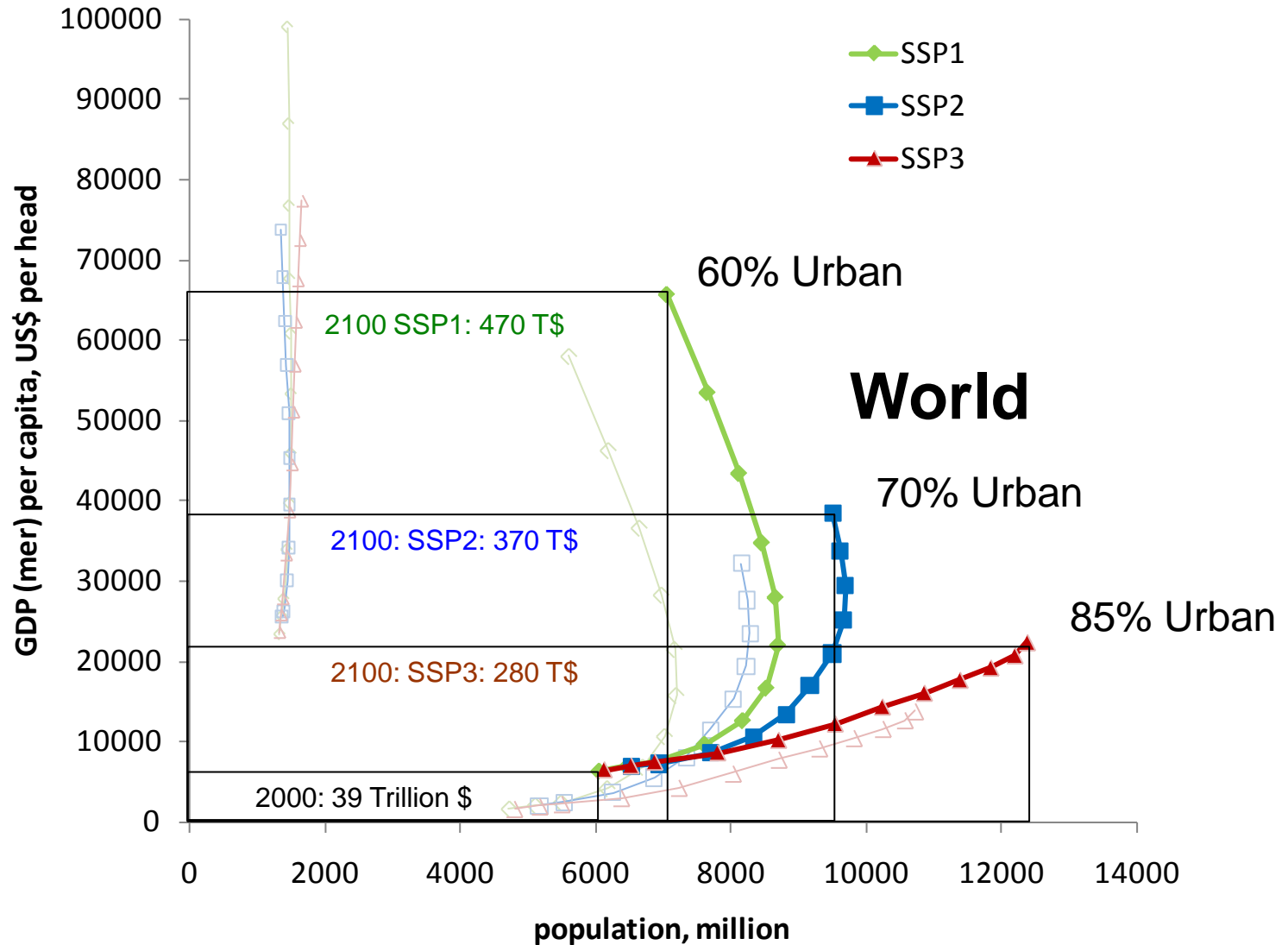


Grey range = 10<sup>th</sup> to 90<sup>th</sup> percentile of AR4 baseline

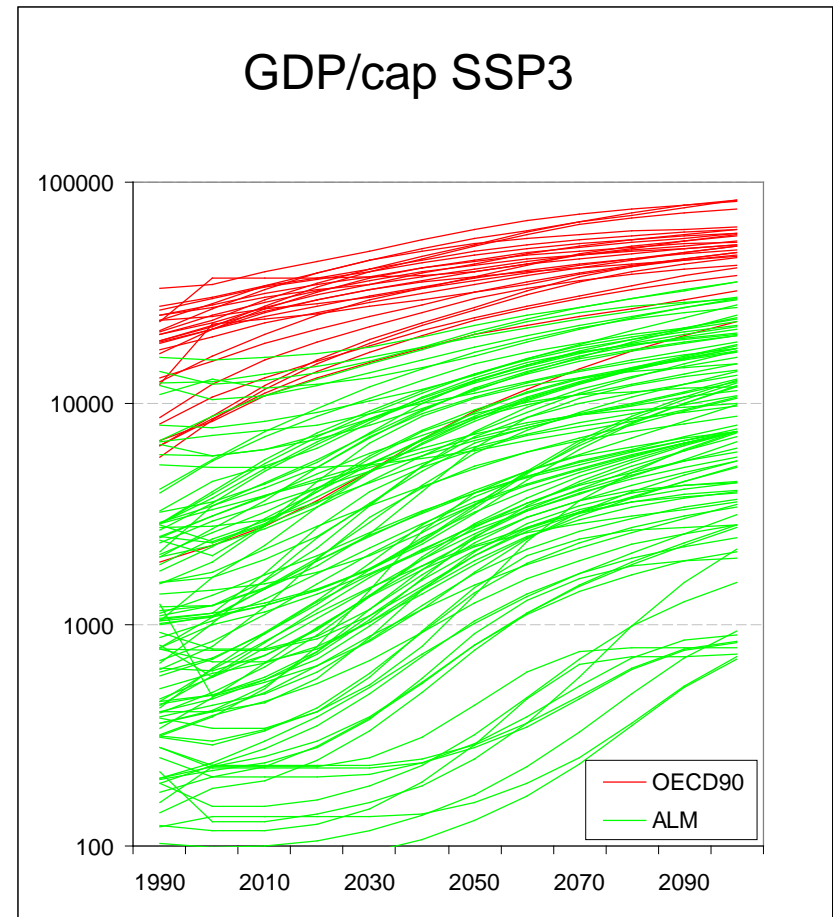
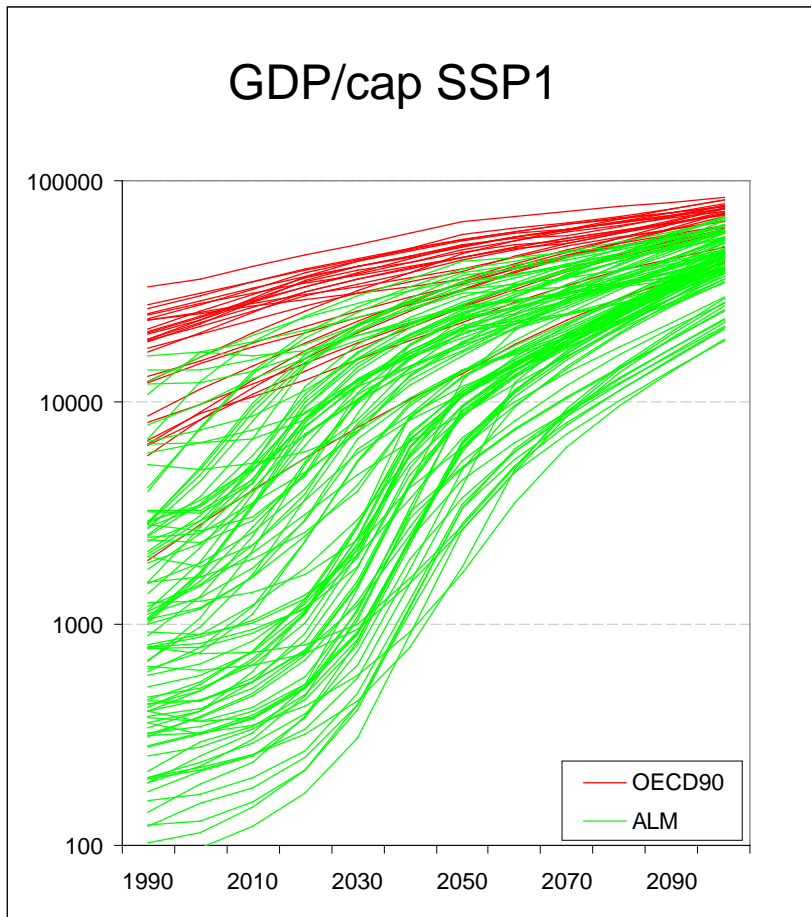
# Population & per Capita Income



# Population & per Capita Income



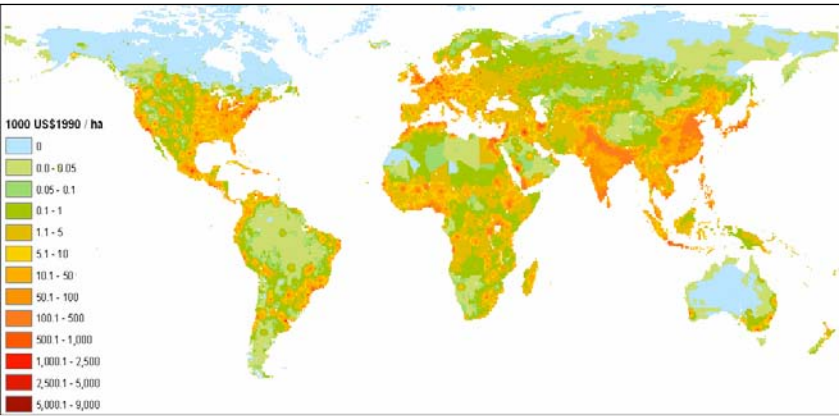
# National GDP Projections (Downscaling from regional level)



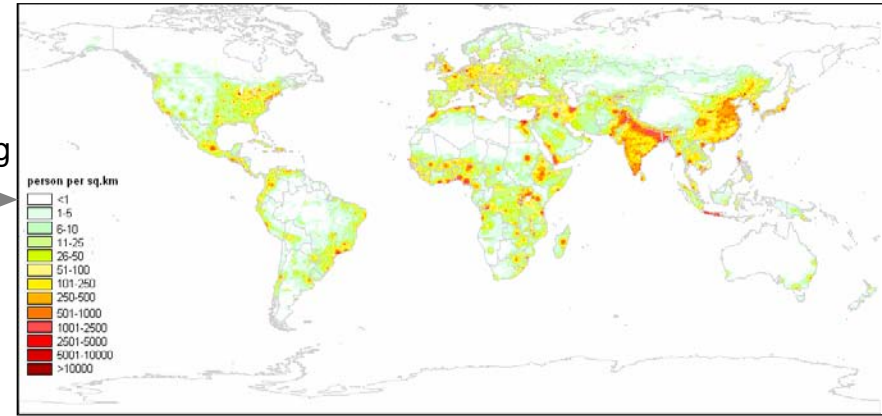


# Spatial Socio-economics (relevant for impacts & mitigation)

Dynamic GDP maps (to 2100)

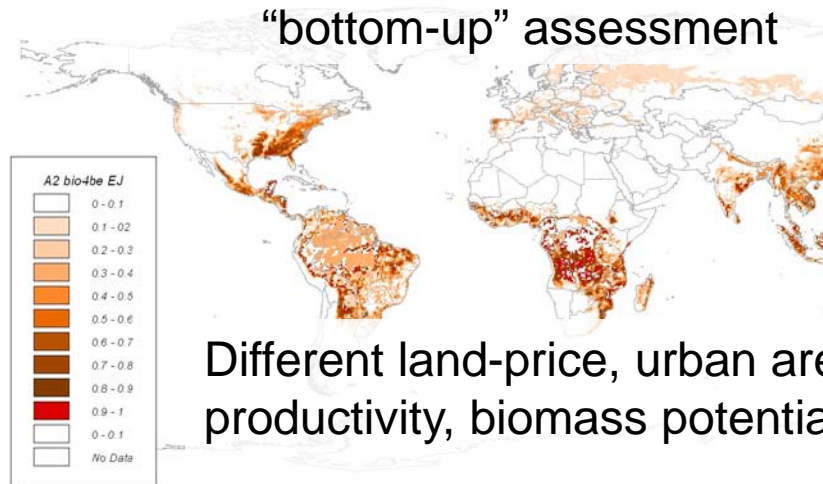


Dynamic population density (to 2100)



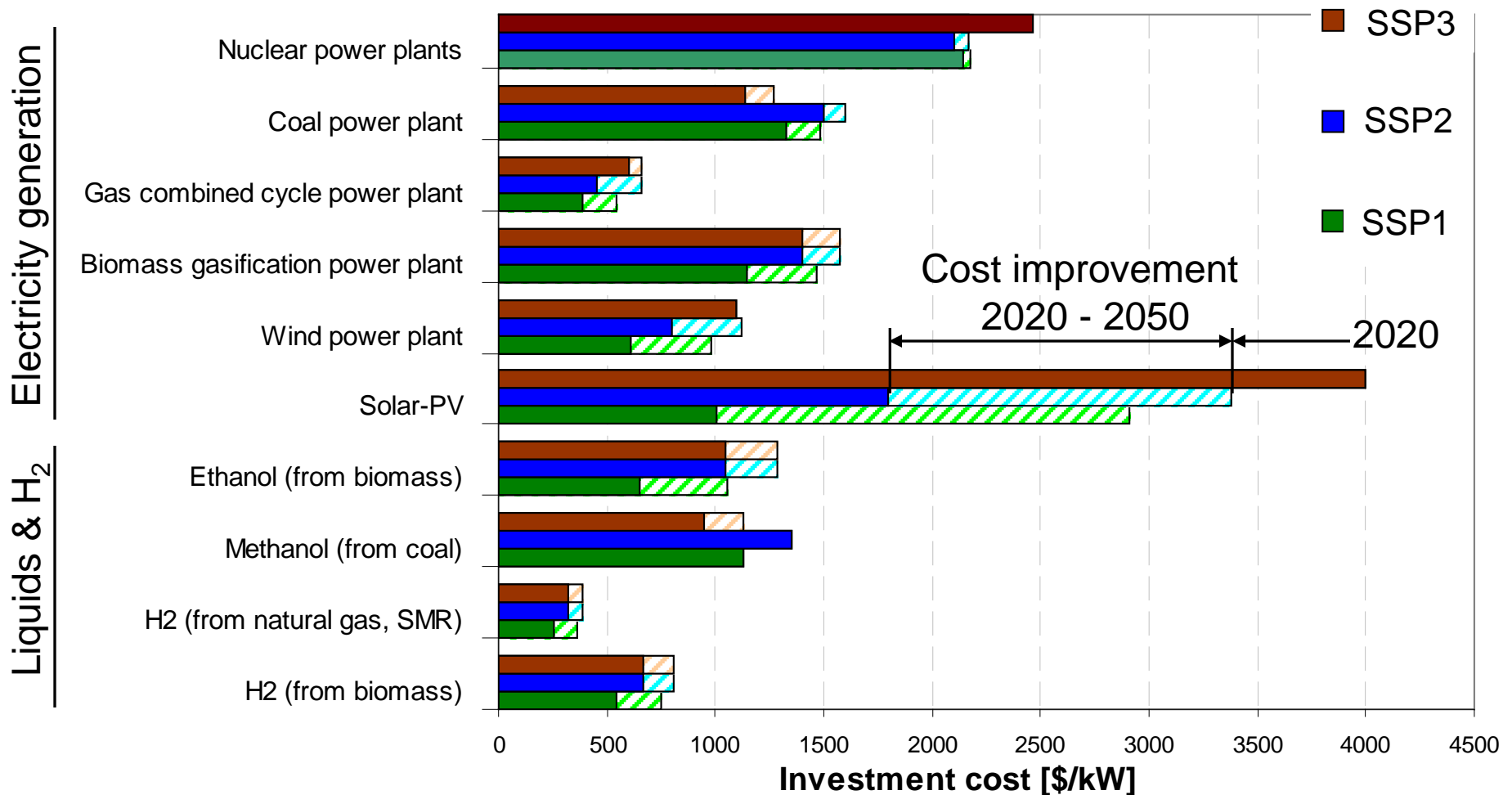
“Top-down”  
Downscaling

Development of bioenergy potentials  
“bottom-up” assessment



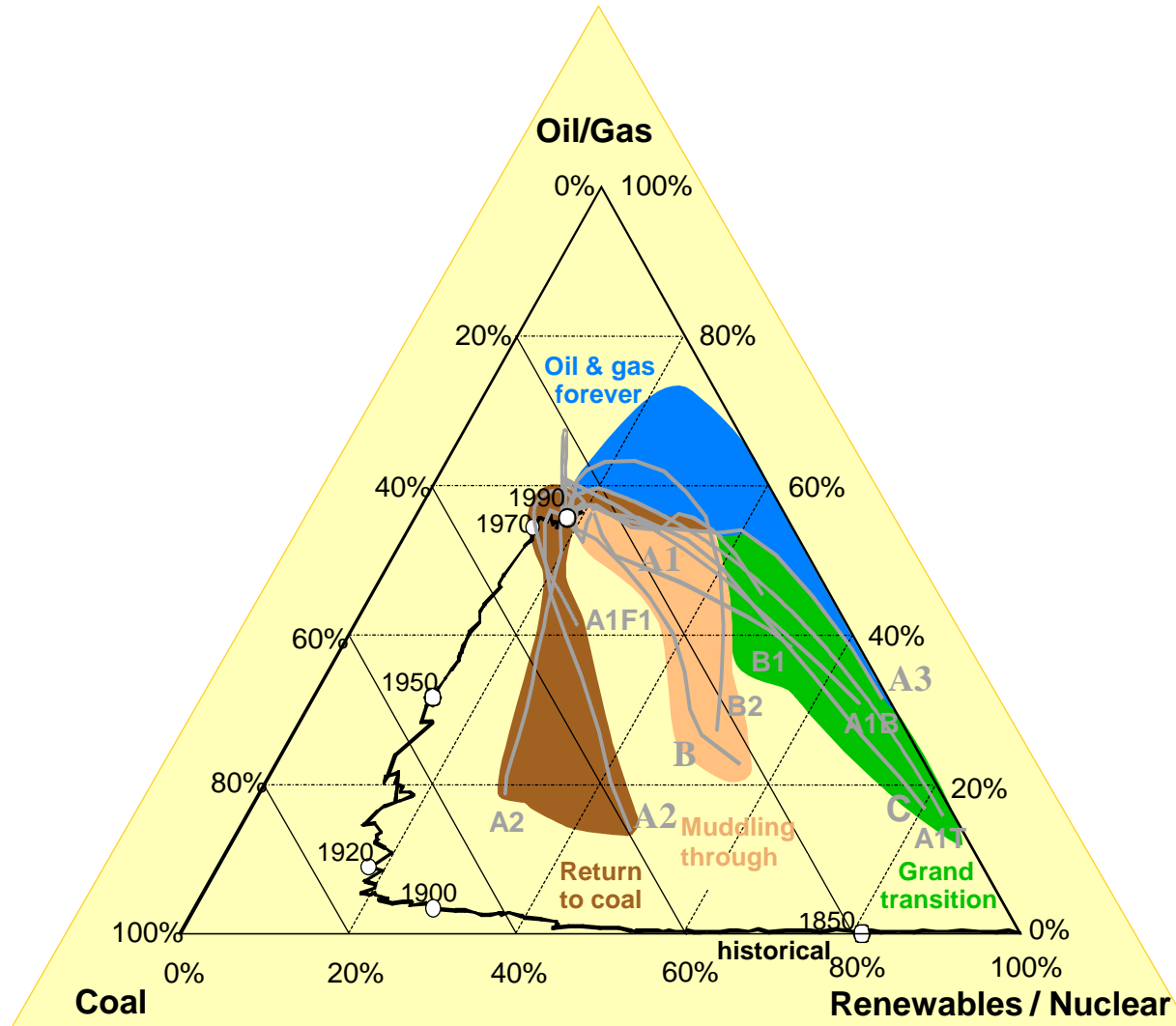
Different land-price, urban areas, net primary productivity, biomass potentials (spatially explicit)

# Technological Change selected technologies: 2020-2050

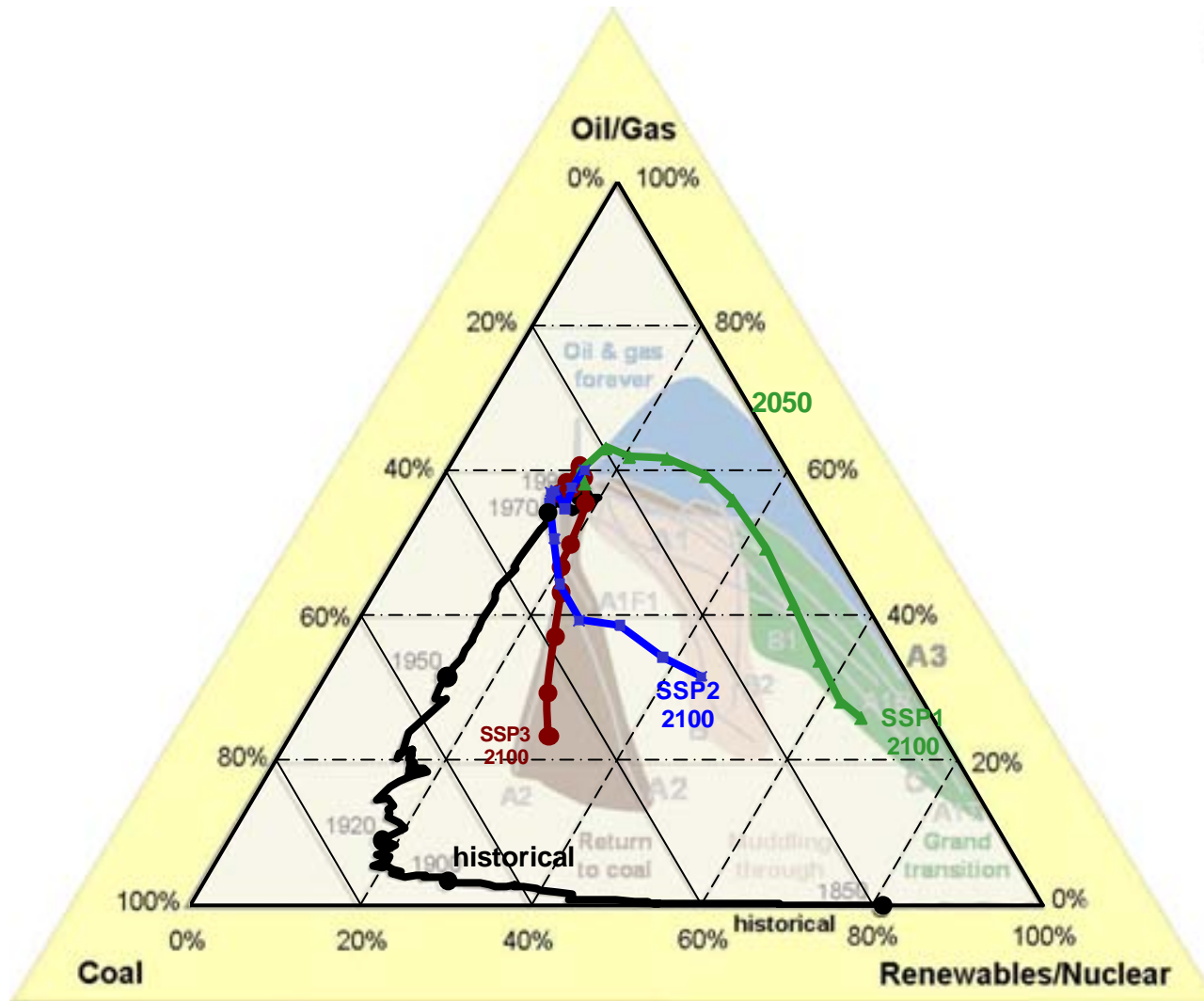


# Energy Transitions

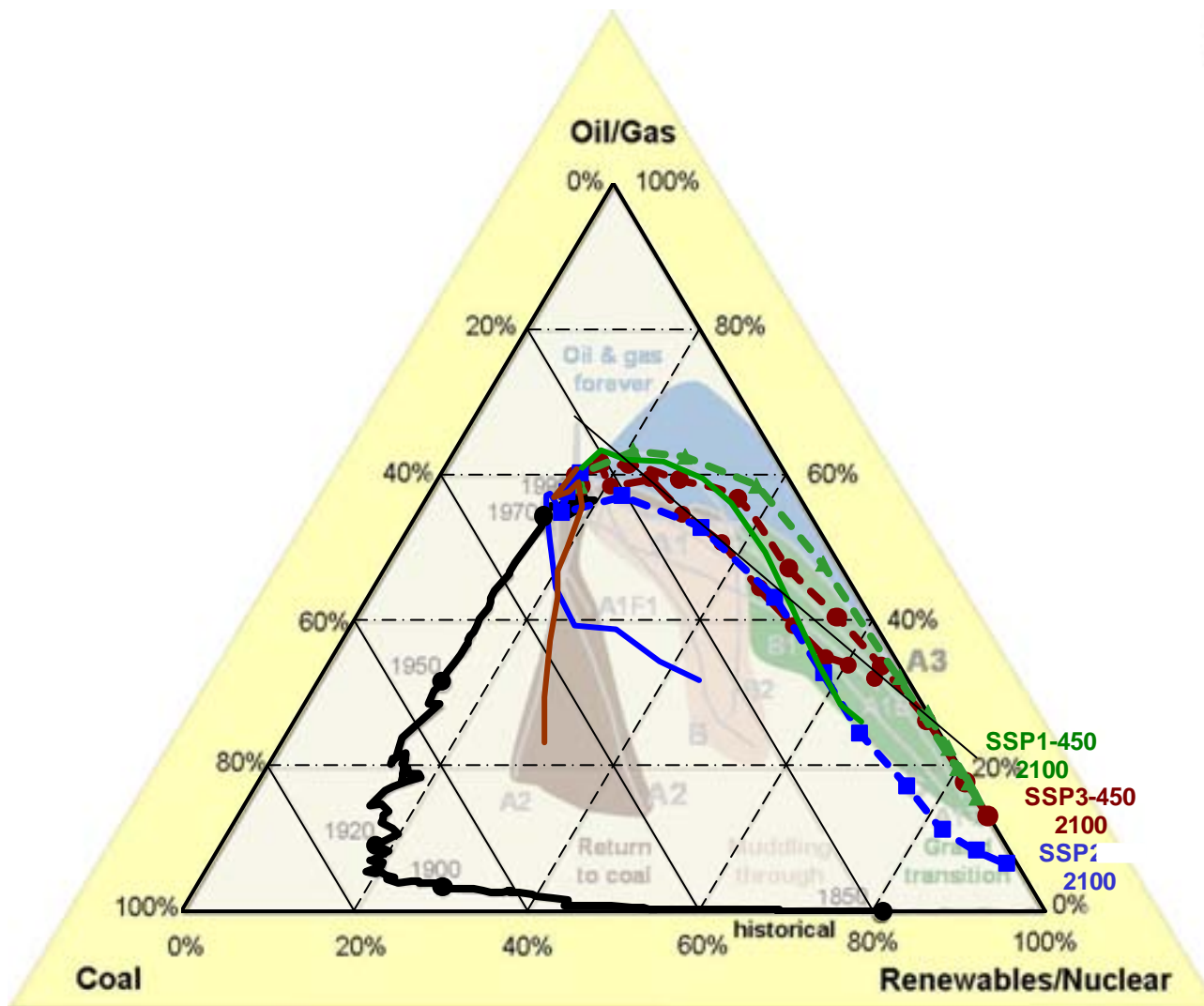
(IIASA-WEC and IPCC SRES Scenarios – Primary Energy Shares)



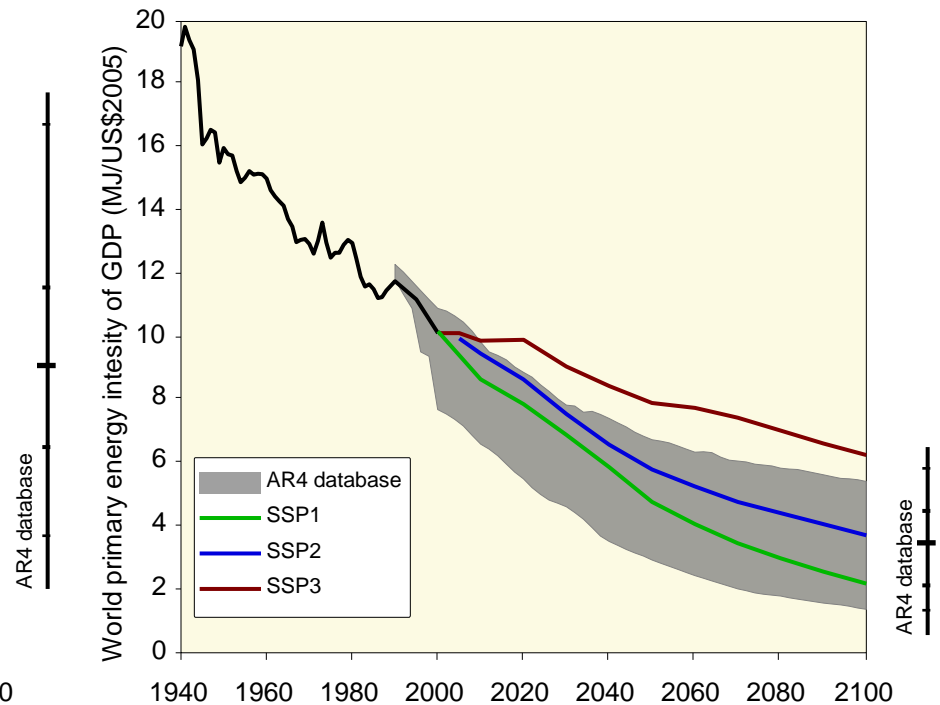
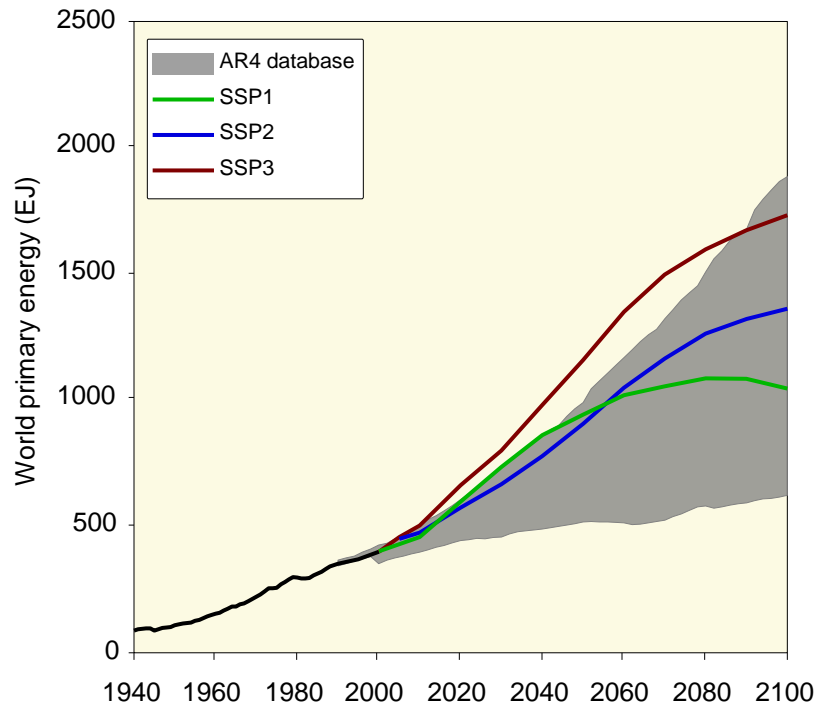
# Energy Transitions: Baselines



# Energy Transitions: SSPs + SPA2.6

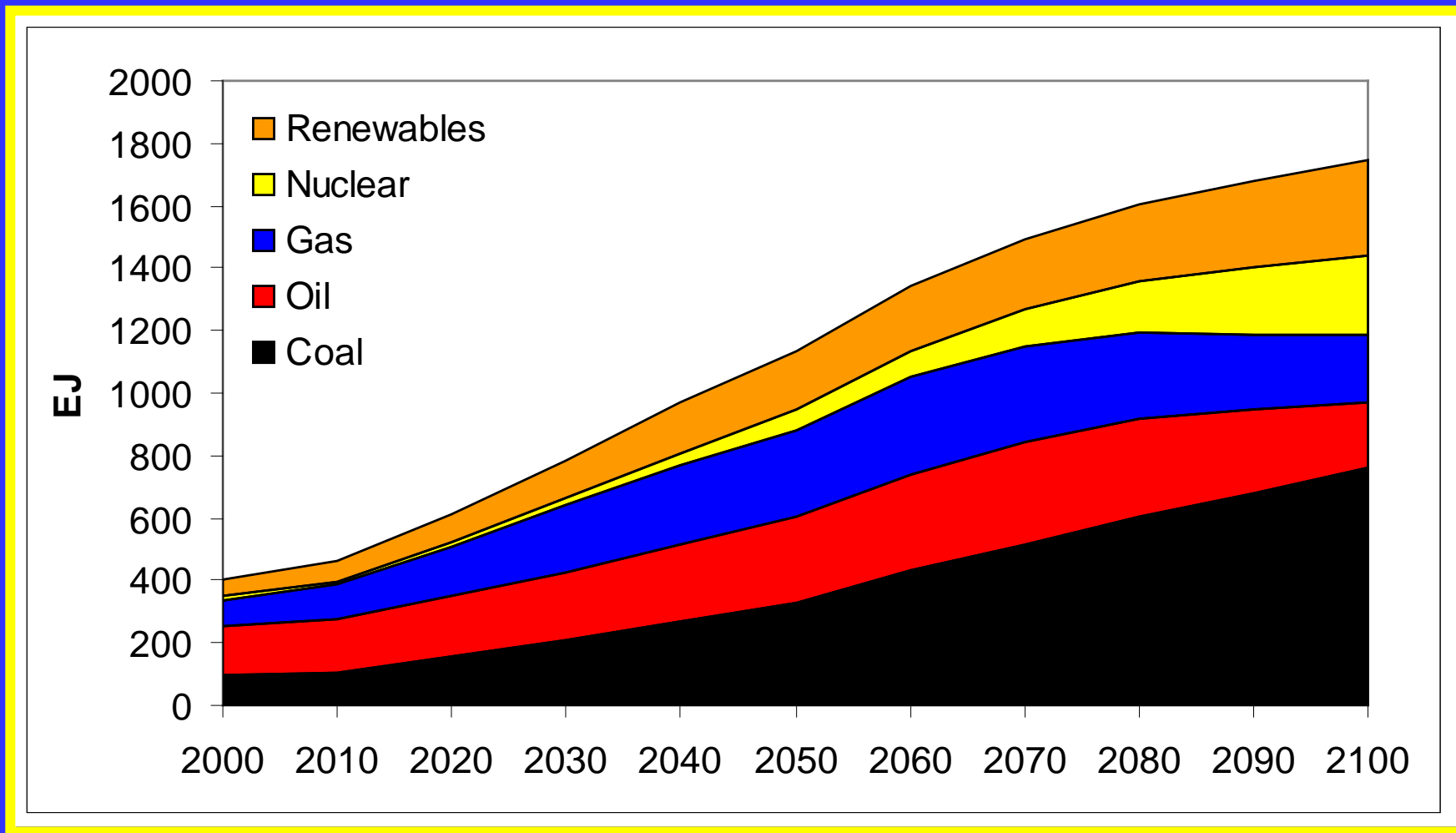


# Energy Intensity & Energy Demand

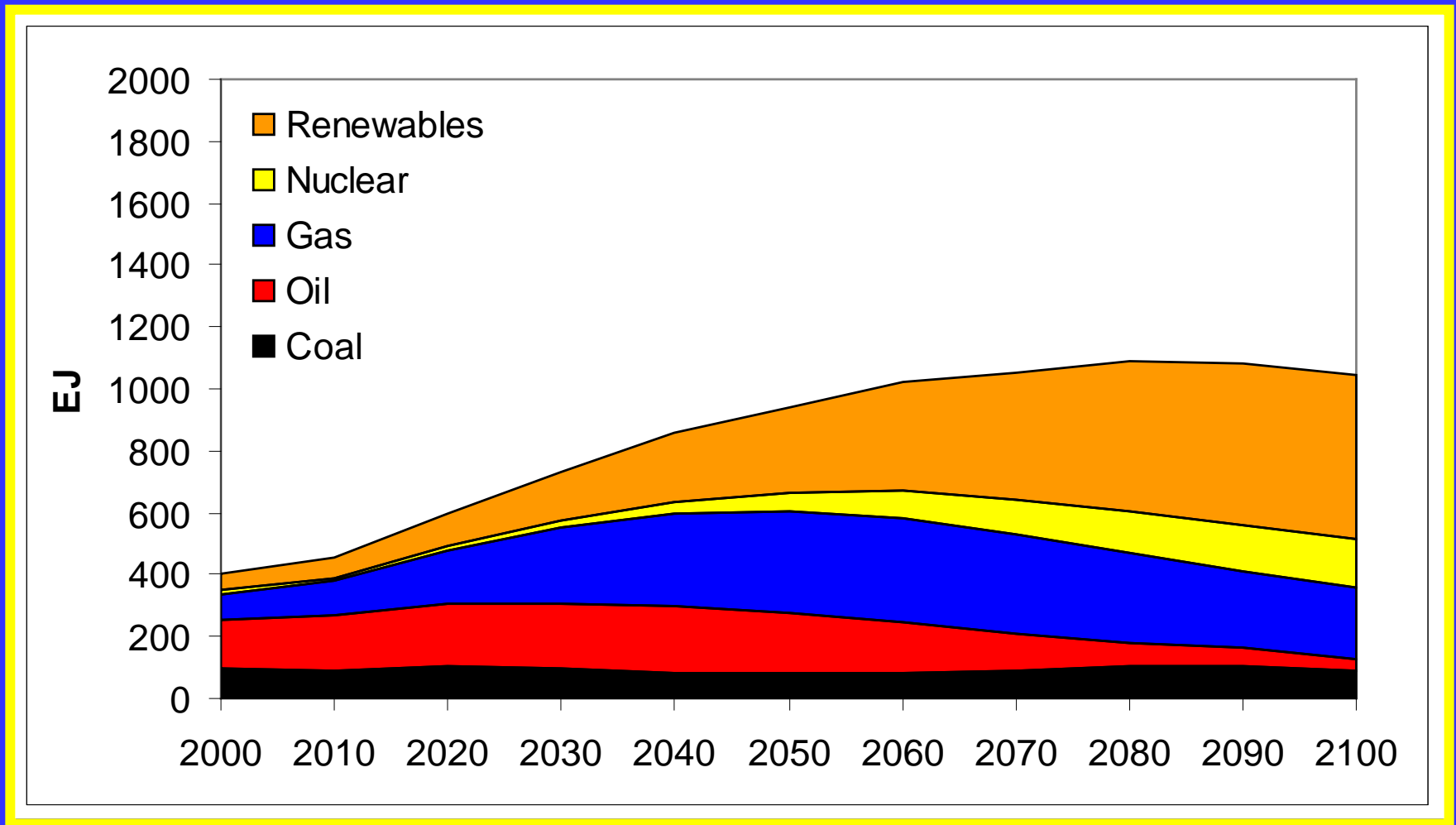


Grey range = 10<sup>th</sup> to 90<sup>th</sup> percentile of AR4 baseline

# Global Primary Energy – SSP3

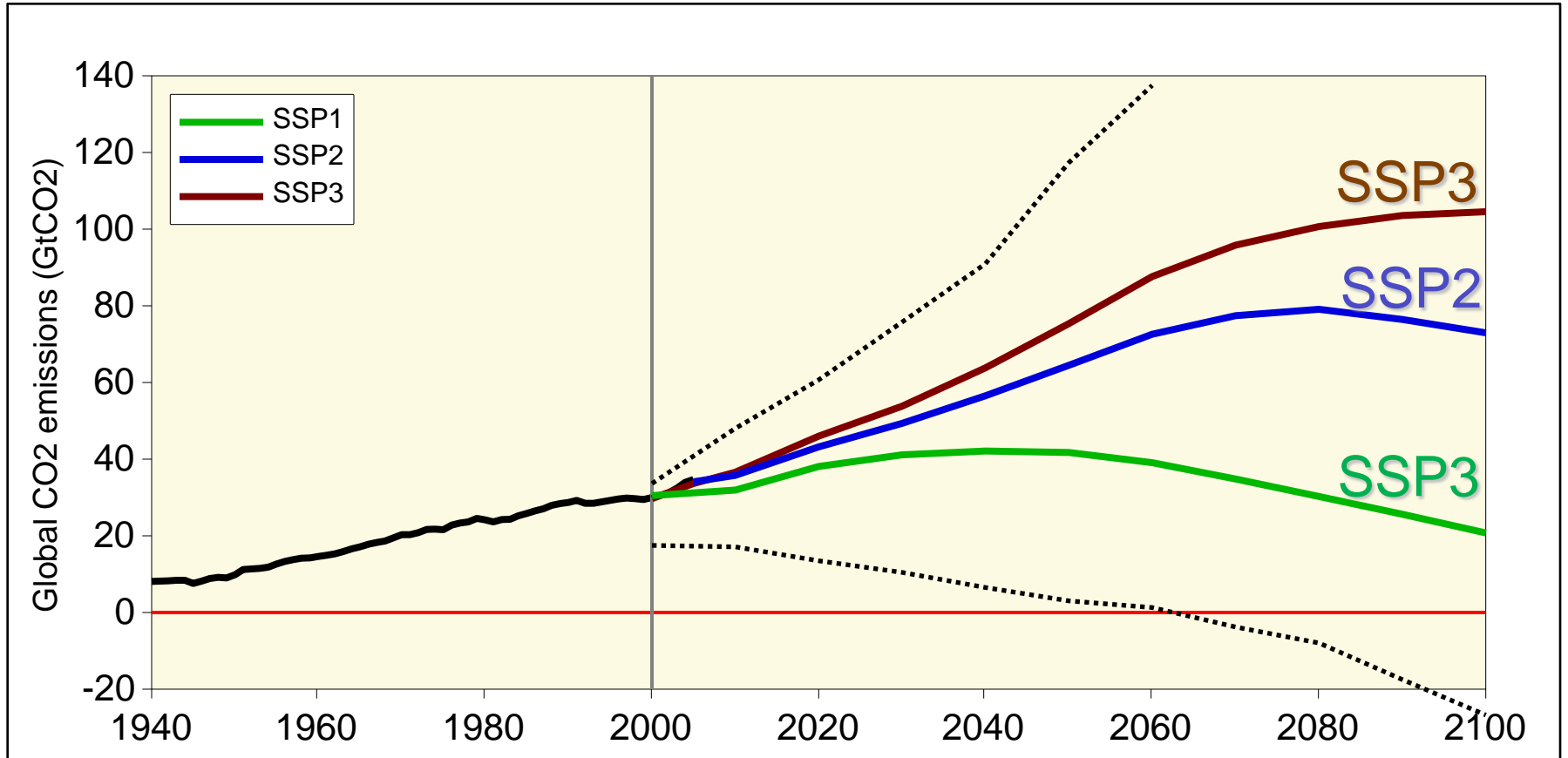


# Global Primary Energy – SSP1





# Global CO2 Emissions



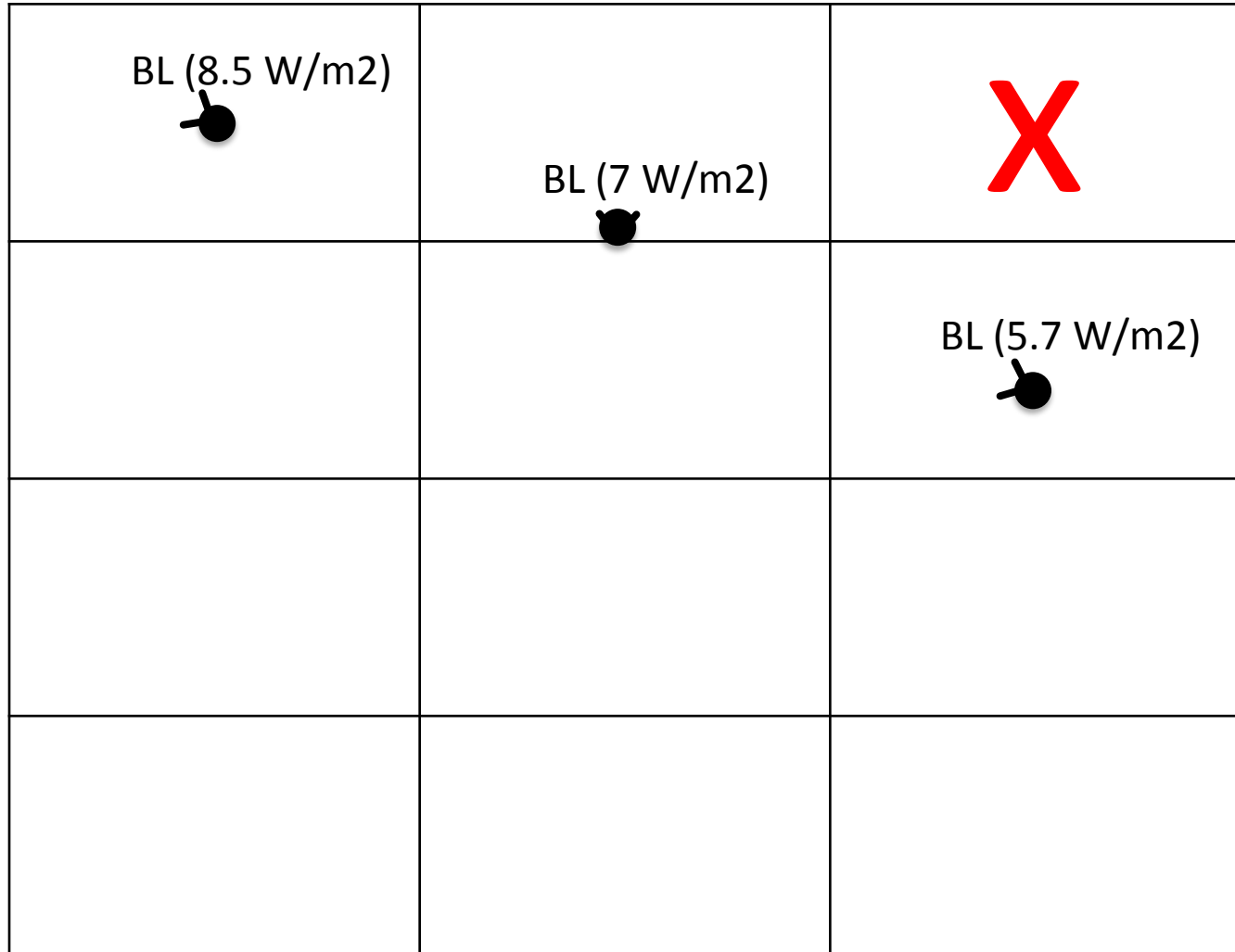
← Increasing socio-economic challenge  
to mitigation & adaptation →

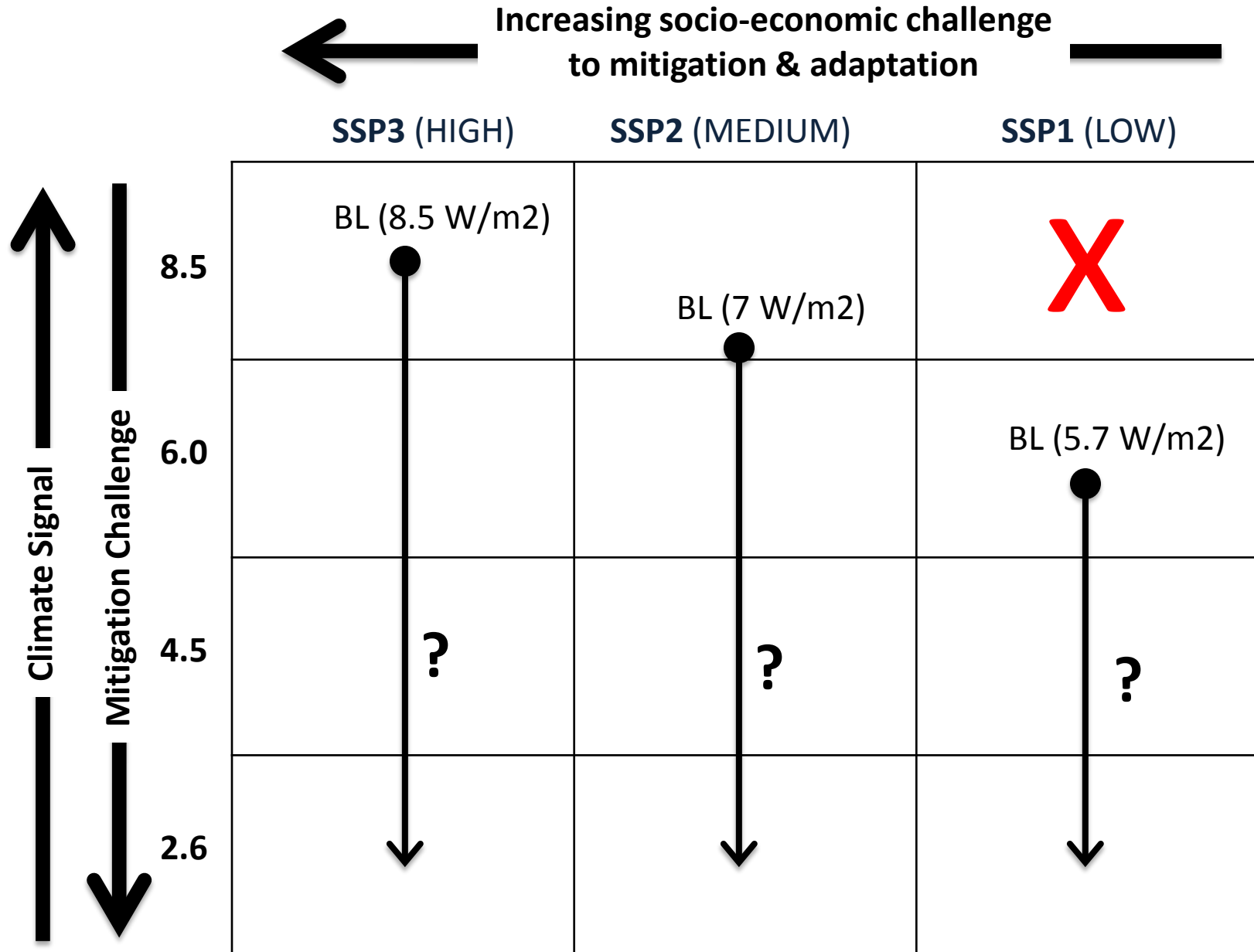
SSP3 (HIGH)

SSP2 (MEDIUM)

SSP1 (LOW)

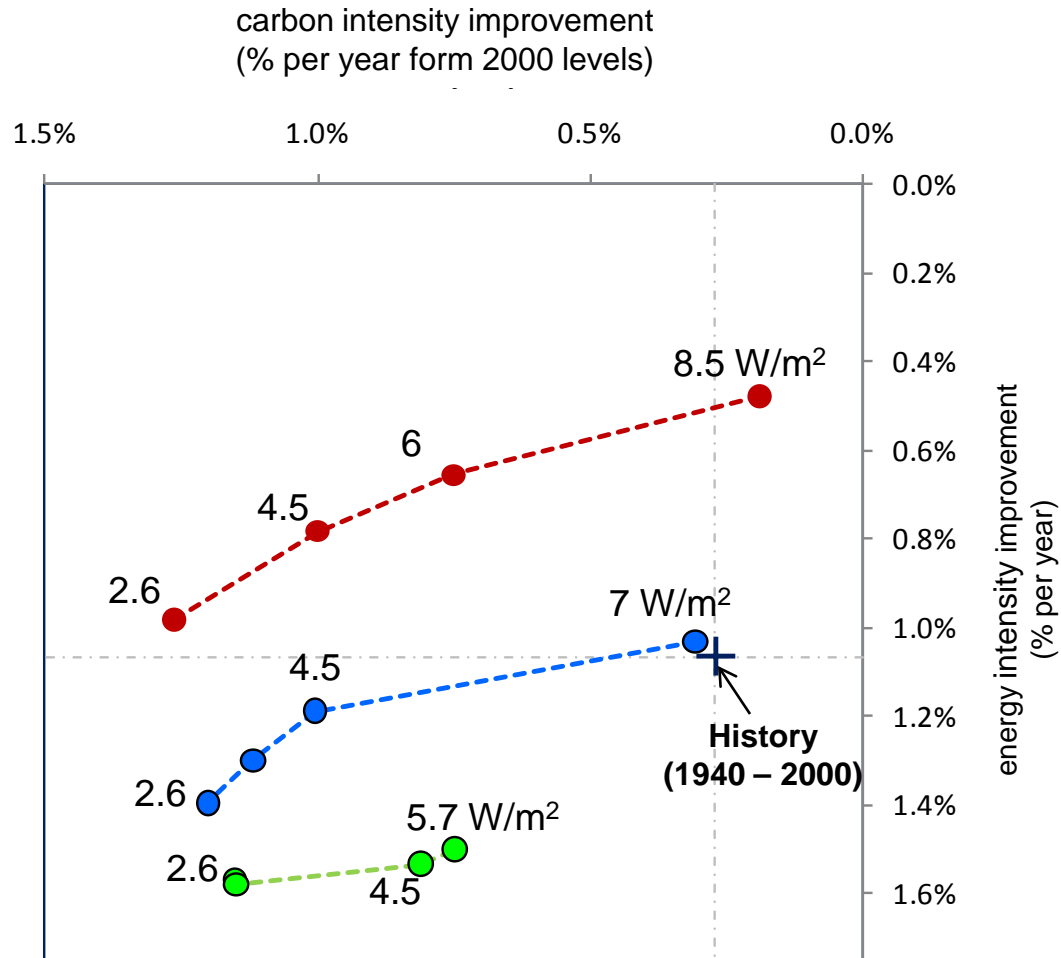
↑ Climate Signal  
Mitigation Challenge ↓





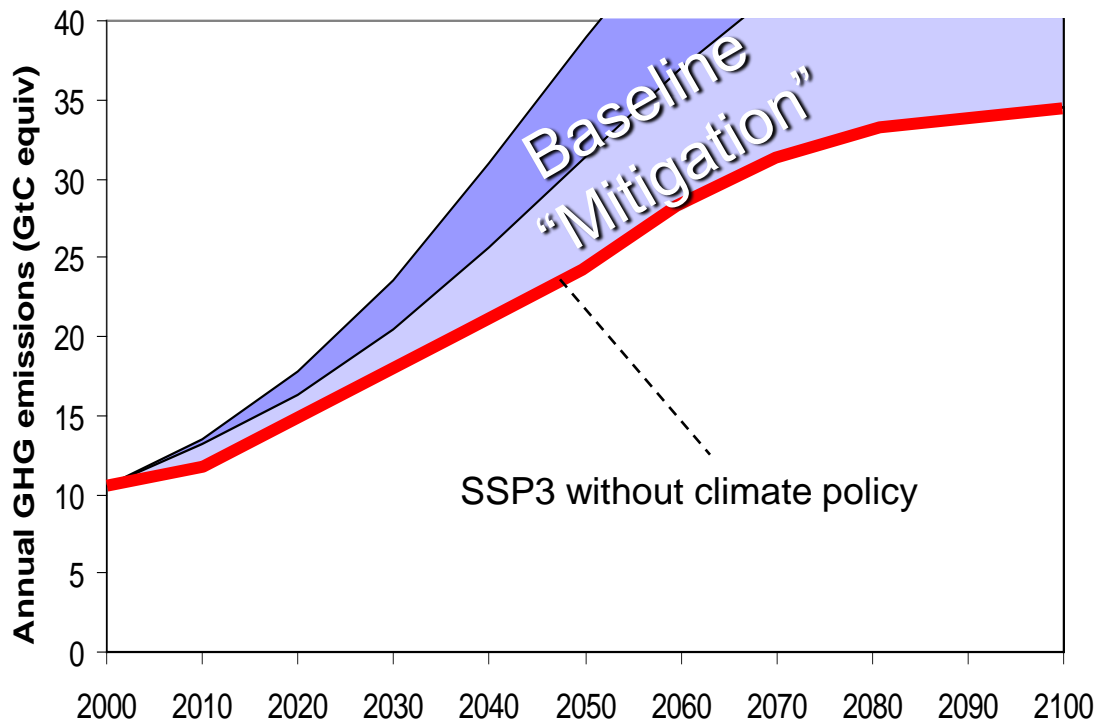
Implications of SSPs for Mitigation

# Supply and Demand-side Improvements



# World GHG Emissions

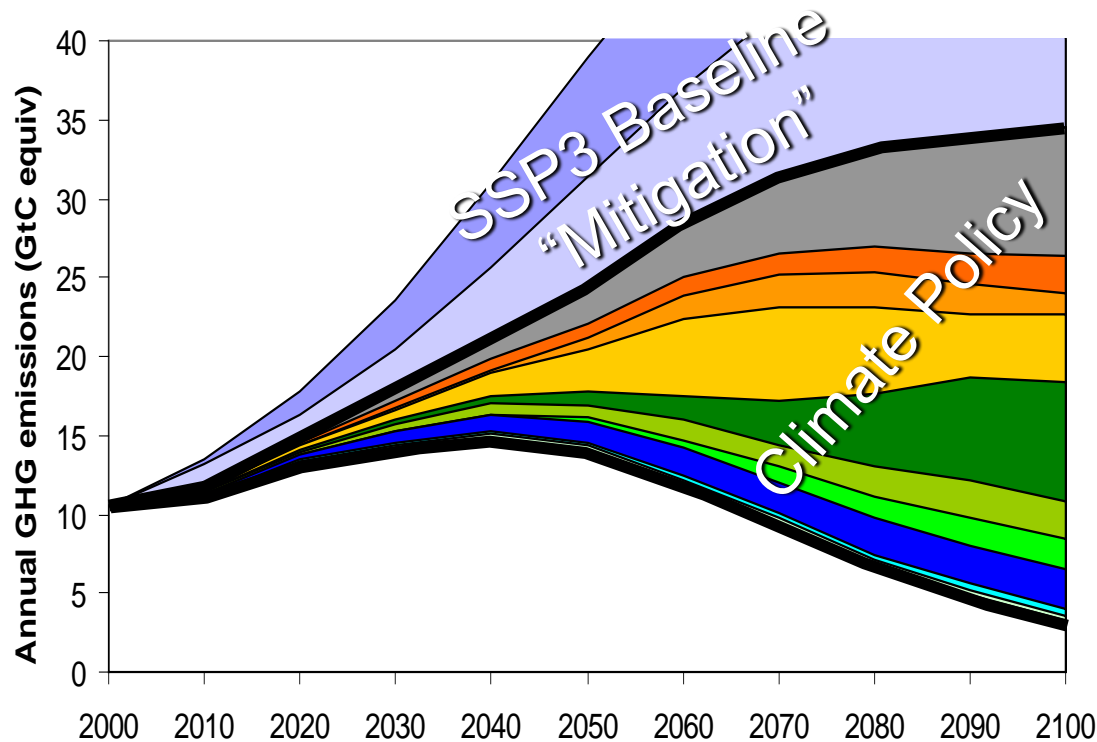
## SSP3: RCP8.5 $\rightarrow$ 4.5 W/m<sup>2</sup>



SSP3 without climate policy

# World GHG Emissions

## SSP3: RCP8.5 $\rightarrow$ 4.5 W/m<sup>2</sup>

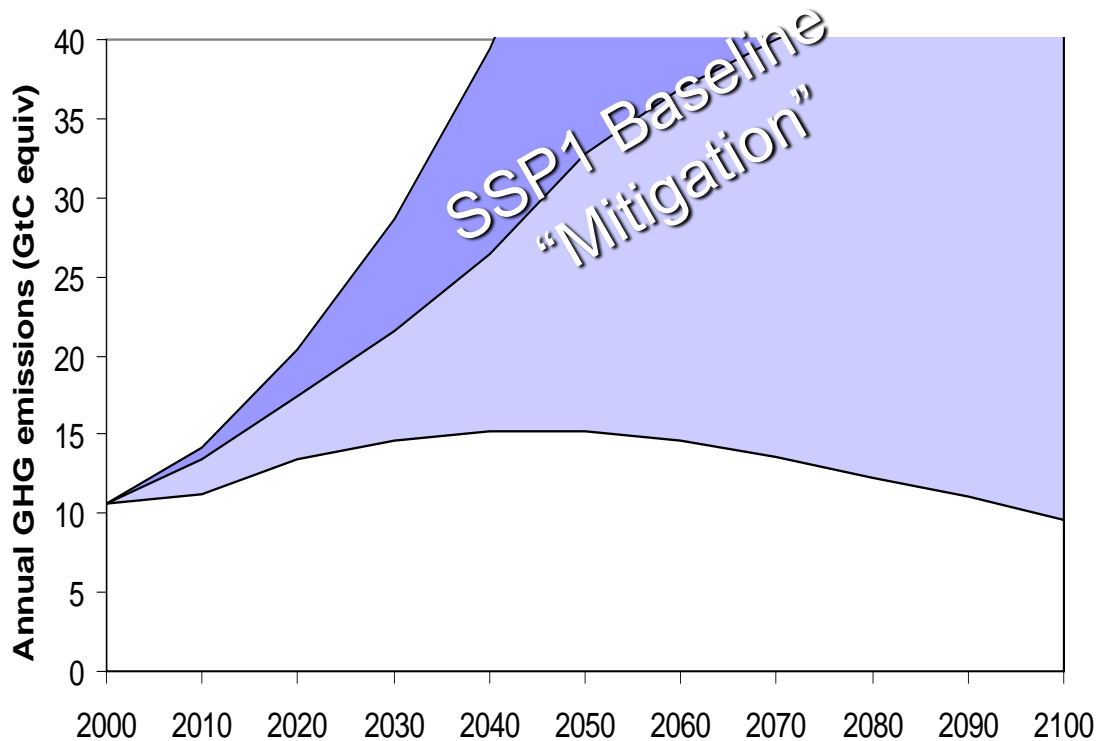


Climate Policy

Illustrative only: note attribution problems

# World GHG Emissions

## SSP1: 5.7 $\rightarrow$ 4.5 W/m<sup>2</sup>

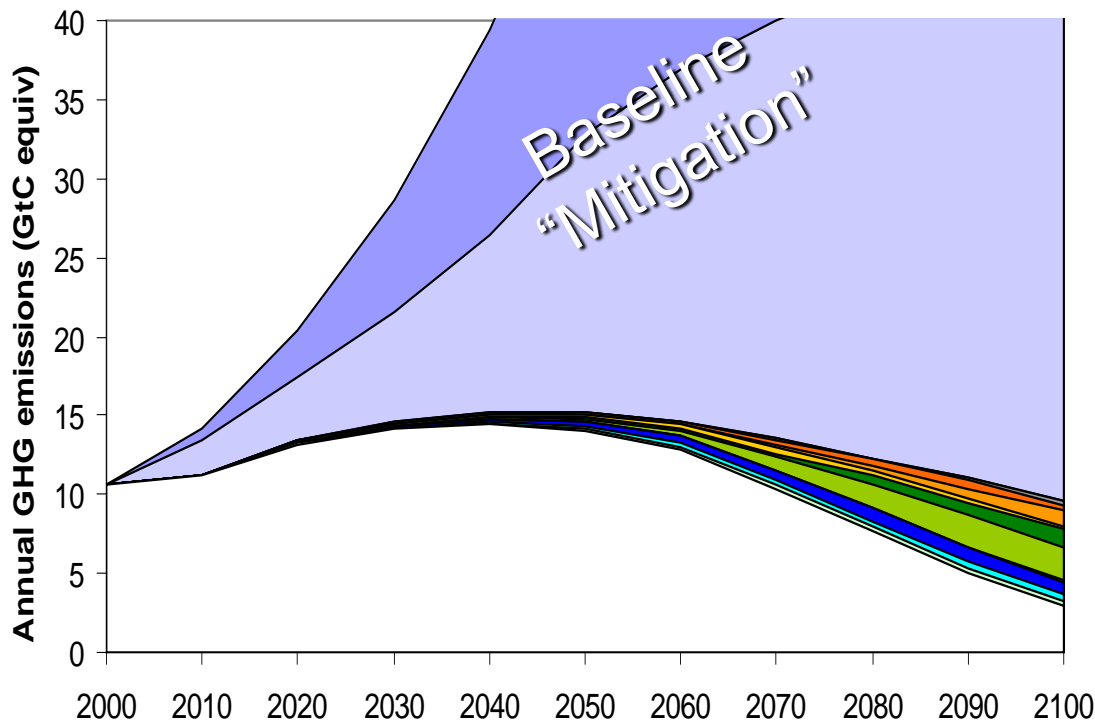


SSP1-Baseline  
"Mitigation"

Illustrative only: note attribution problems

# World GHG Emissions

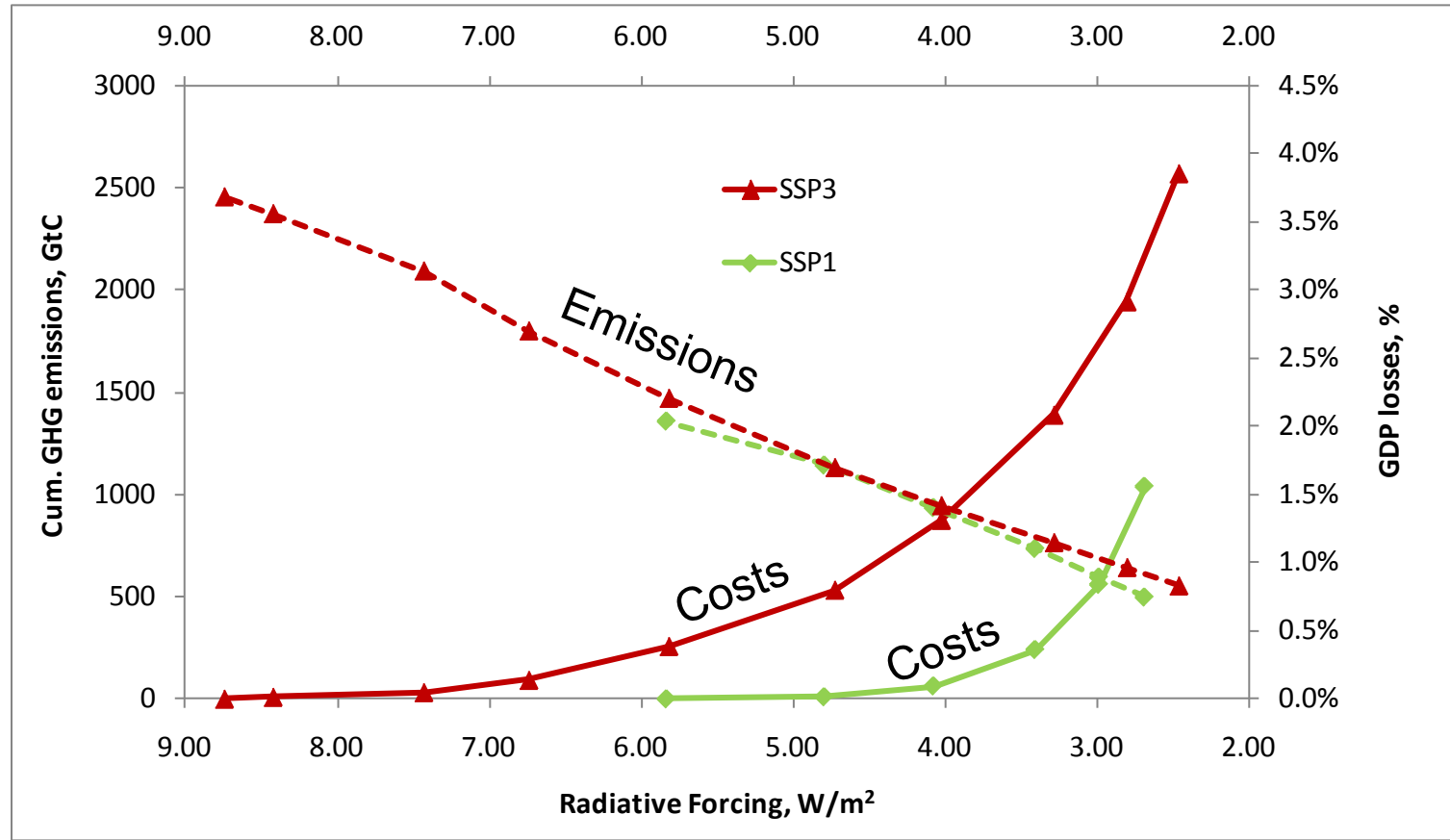
## SSP1: 5.7 → 4.5 W/m<sup>2</sup>



Illustrative only: note attribution problems



# Emissions and Costs 2000-2100



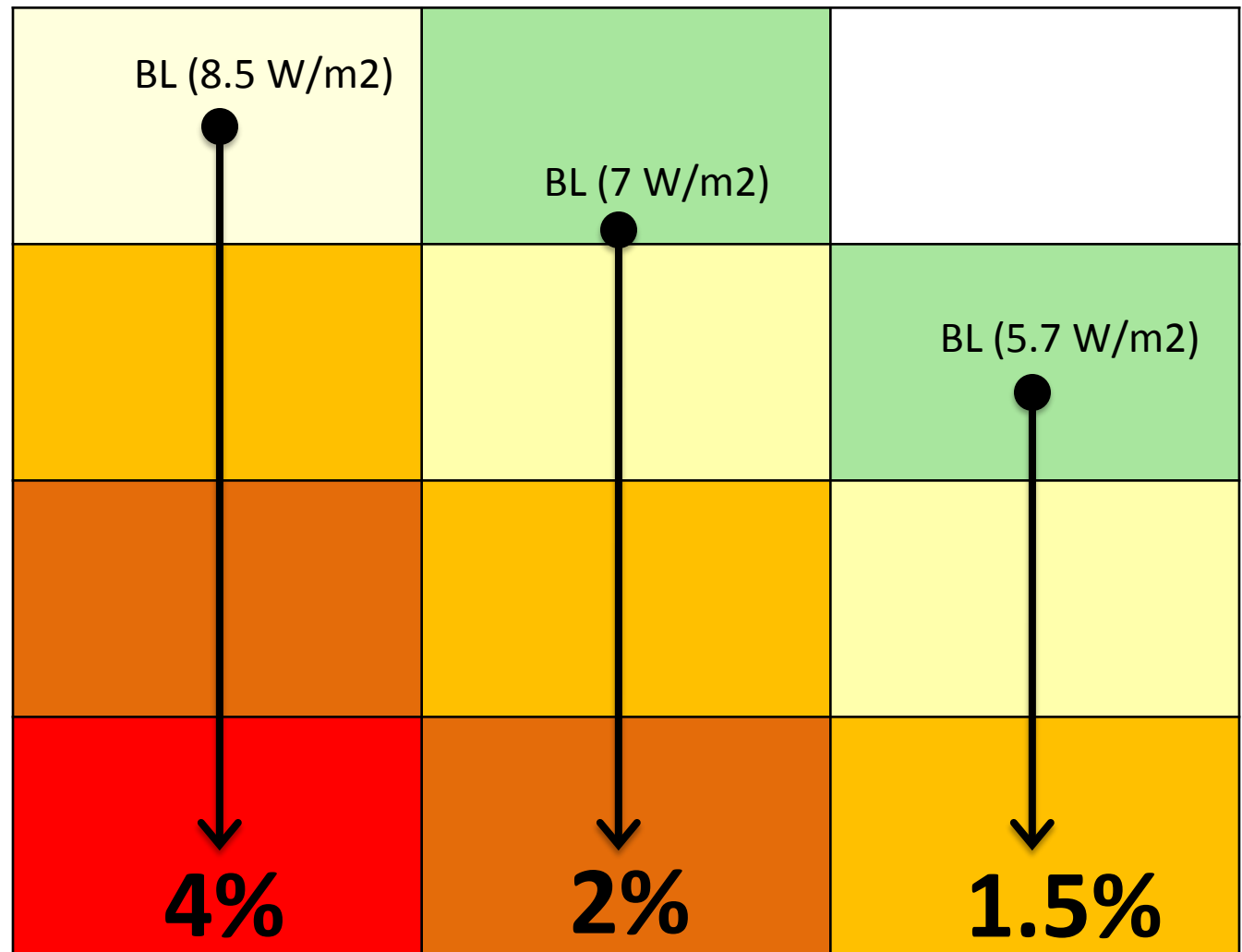
← Increasing socio-economic challenge to mitigation & adaptation →

SSP3 (HIGH)

SSP2 (MEDIUM)

SSP1 (LOW)

↑ Climate Signal  
↑ Mitigation Challenge  
↓ Mitigation Cost



Mitigation Cost (GDP losses)



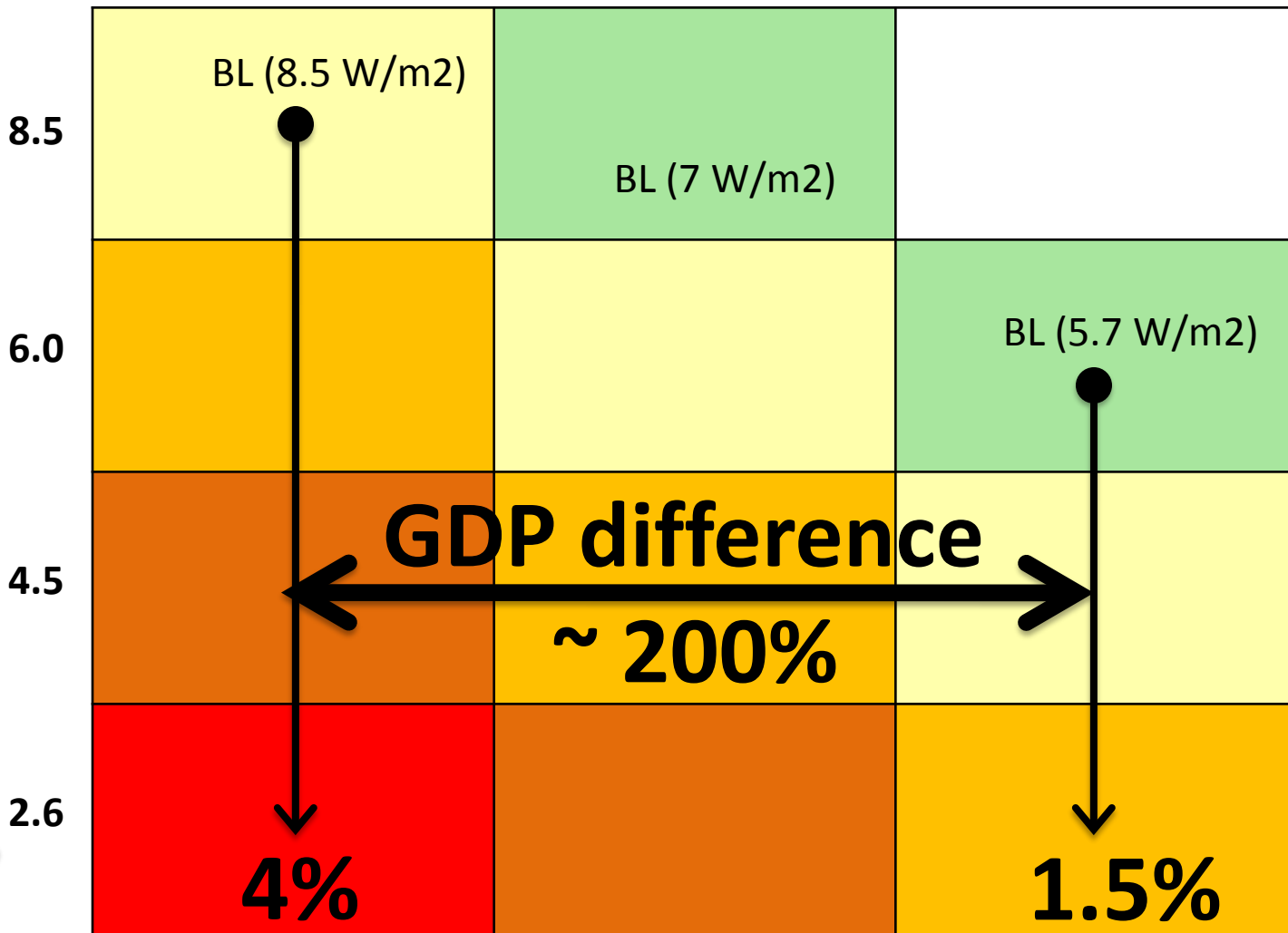
← Increasing socio-economic challenge to mitigation & adaptation →

SSP3 (HIGH)

SSP2 (MEDIUM)

SSP1 (LOW)

↑ Climate Signal  
↑ Mitigation Challenge



HIGH      LOW

Mitigation cost

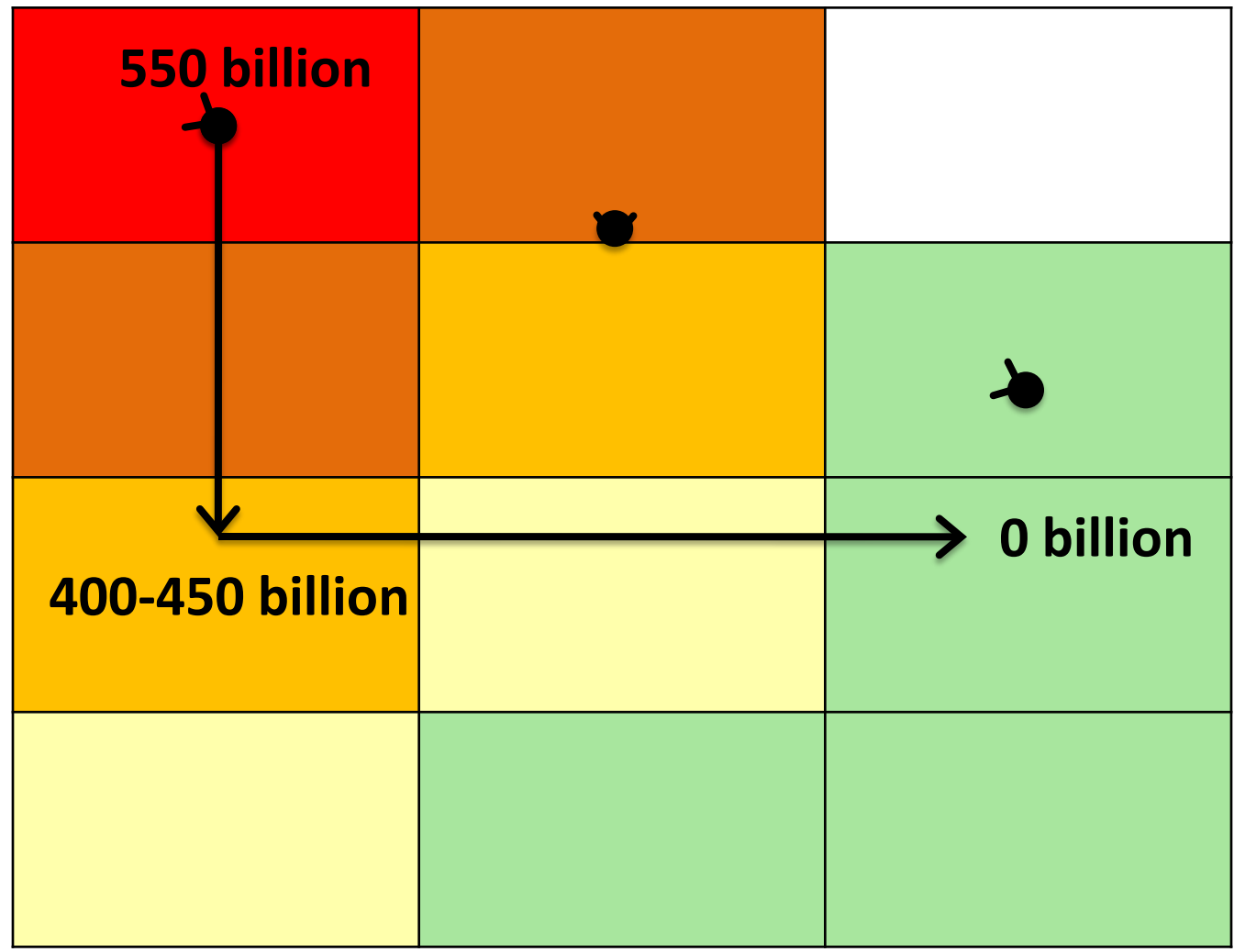
← Increasing socio-economic challenge to mitigation & adaptation →

SSP3 (HIGH)

SSP2 (MEDIUM)

SSP1 (LOW)

↑ Climate Signal  
↑ Adaptation Challenge



Population at risk of hunger



← Increasing socio-economic challenge to mitigation & adaptation →

SSP3 (HIGH)

SSP2 (MEDIUM)

SSP1 (LOW)

↑ Climate Signal  
↑ Adaptation Challenge

8.5  
6.0  
4.5  
2.6

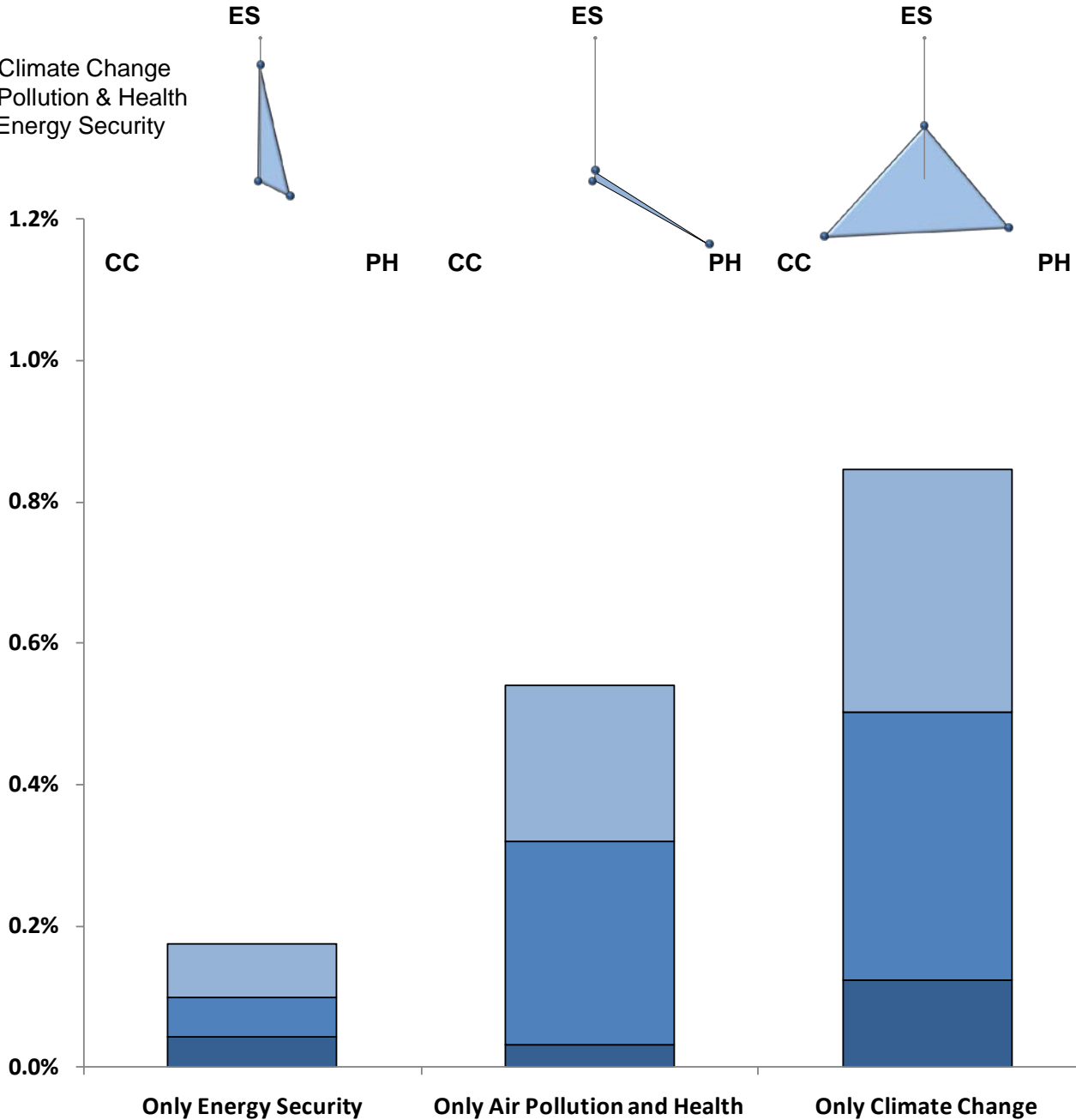
RCP 8.5 SRES-A2		
	RCP 6.0 SRES-B2	
	RCP 4.5	SRES-B1
	RCP 2.6	

SRES and RCPs



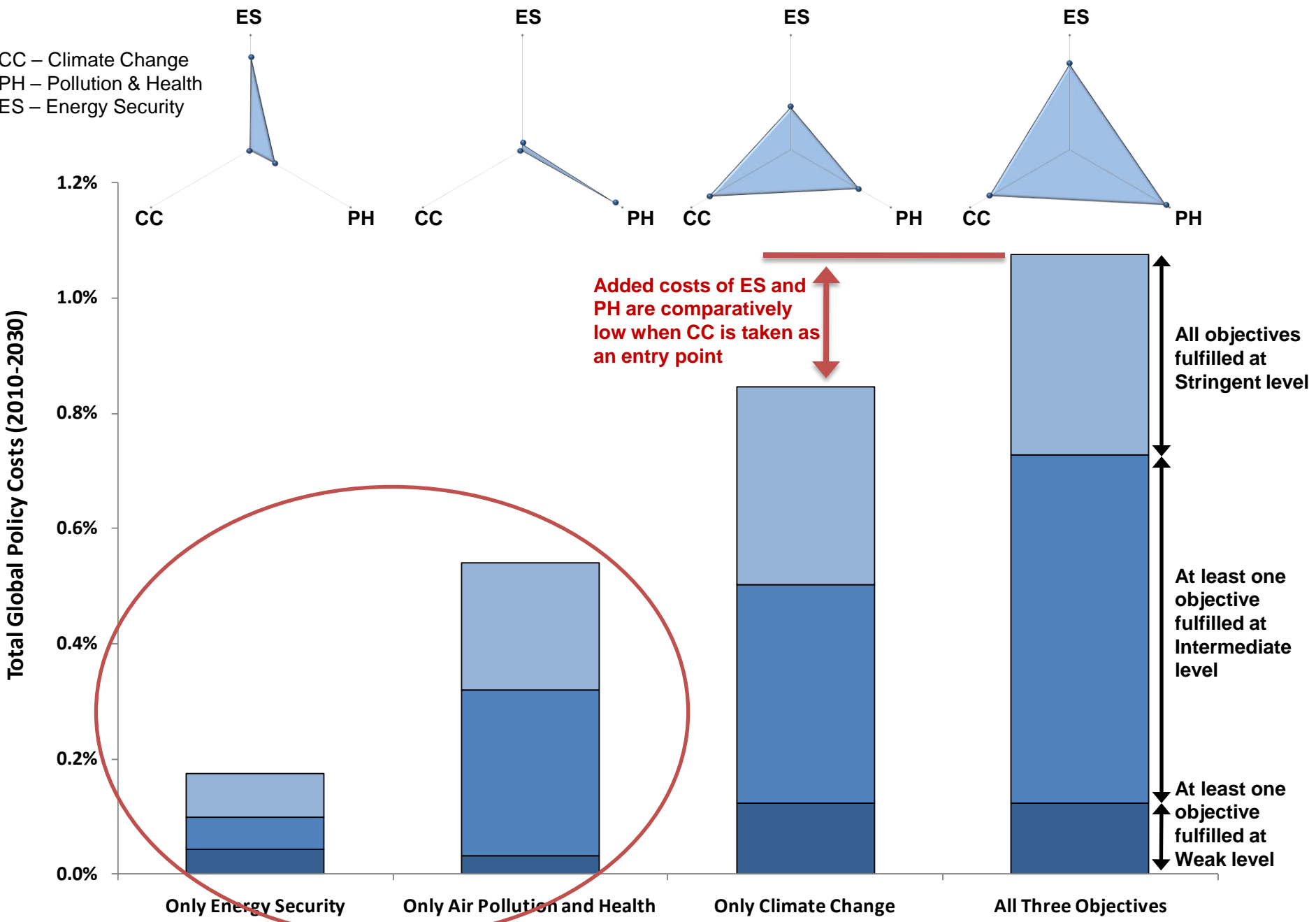
# Total Policy Costs (% GDP) and Synergistic Effects

CC – Climate Change  
 PH – Pollution & Health  
 ES – Energy Security



# Total Policy Costs (% GDP) and Synergistic Effects

CC – Climate Change  
 PH – Pollution & Health  
 ES – Energy Security



← Increasing socio-economic challenge  
to mitigation & adaptation →

SSP1

SSP2

SSP3

SSP4

SSPn...

8.5

6.0

4.5

2.6

↑ Climate Signal

↑ Mitigation Challenge

Large ensemble useful for understanding uncertainty & robustness (heuristics across or within cells)

**Main trade-offs:**

Limited comparability and internal consistency  
How to exchange information and to conduct joint INTEGRATED IAV/IAM analysis (requires guidance)

Difficult (impossible?) to communicate