

"Have the costs of achieving 2 Celsius been under-reported? An analysis of integrated assessment model results"

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Schematic framework of anthropogenic climate change drivers, impacts and responses

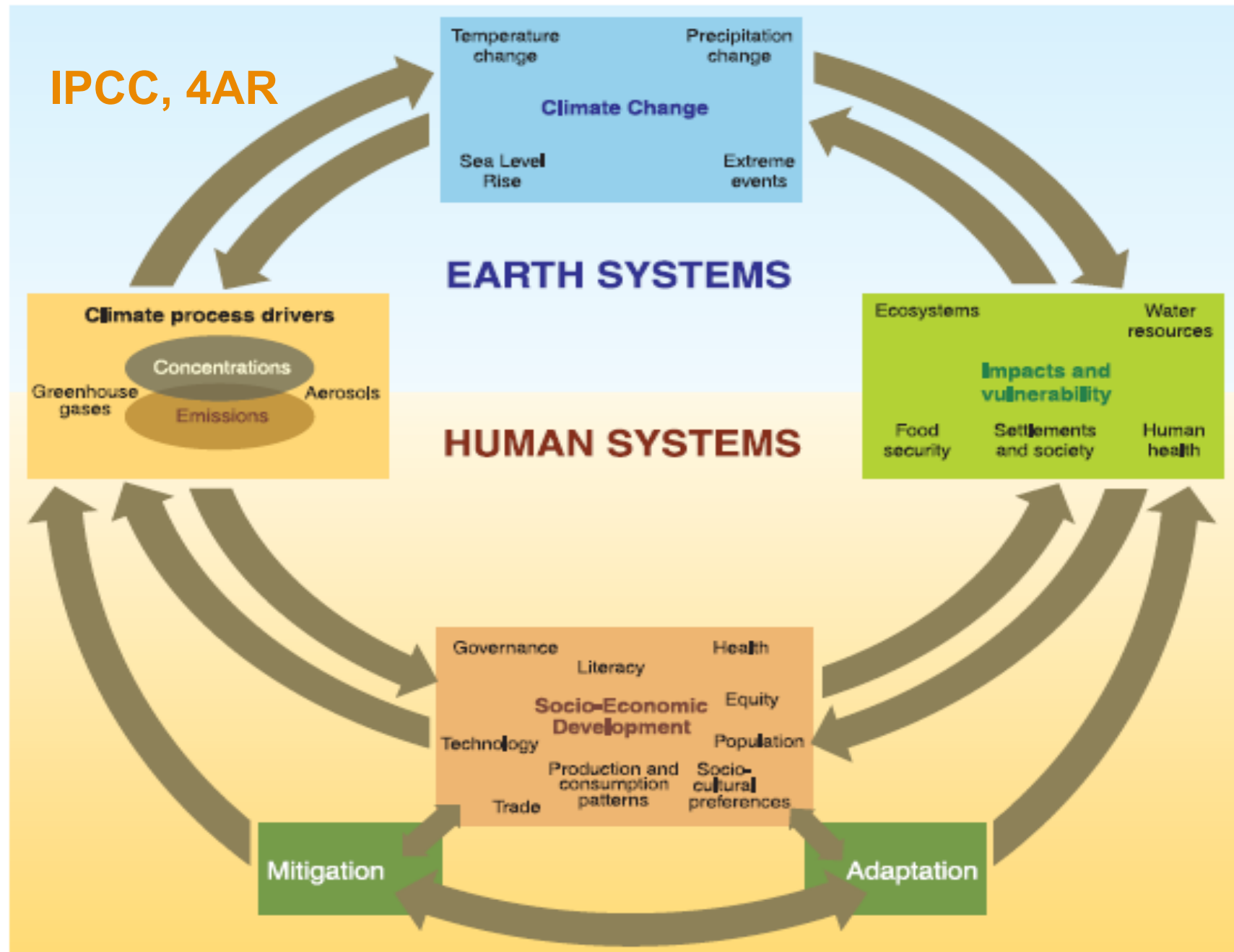
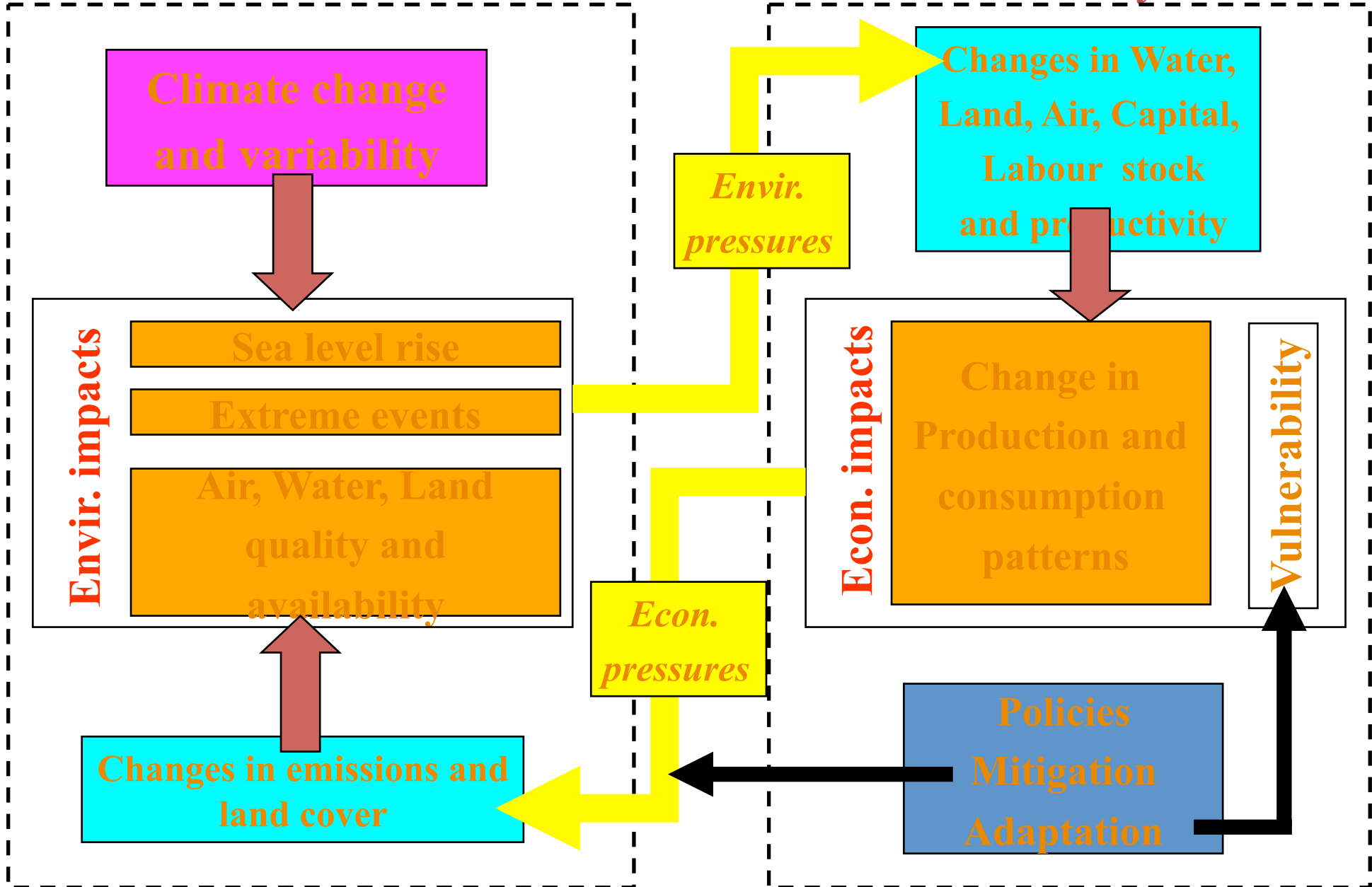


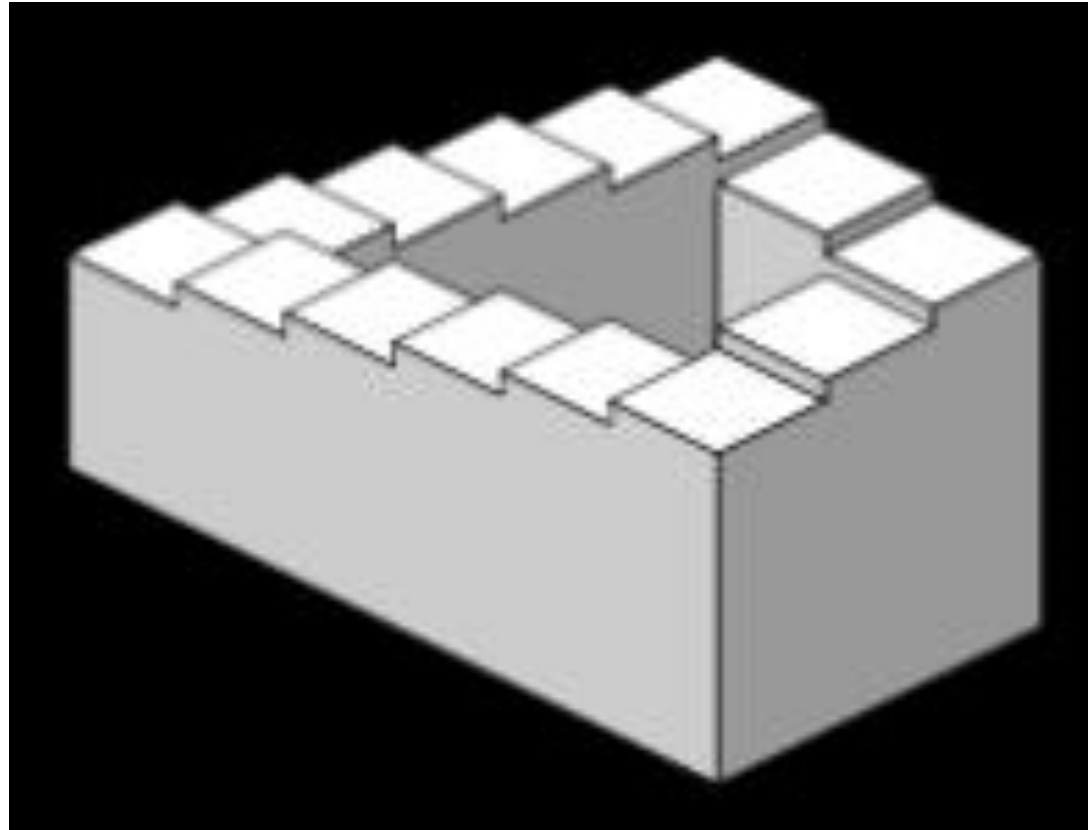
Figure 1.1. Schematic framework representing anthropogenic drivers, impacts of and responses to climate change, and their linkages.

Environmental system

Socio-Economic System



The Penrose model...

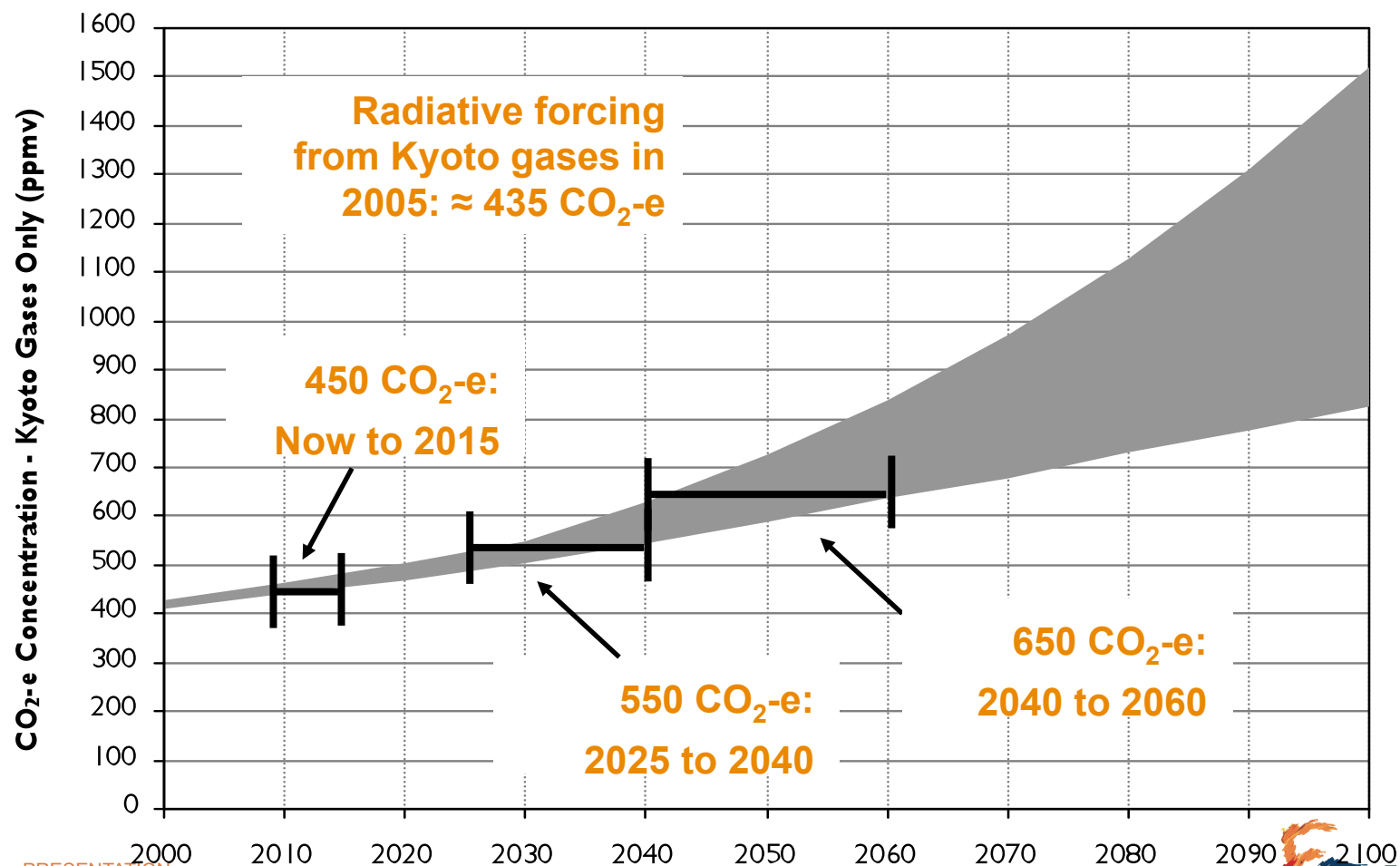


The EMF22: 10 scenarios X 10 models

- Three climate concentration goals
 - (1) 450 CO₂-e, (2) 550 CO₂-e, and (3) 650 CO₂-e
- Two means of achieving concentration goals
 - (1) not-to-exceed between this century and (2) overshoot through 2100
- Two international policy regimes
 - (1) Full participation immediately and (2) delayed participation by developing countries

Clarke, L.E., J.A.Edmonds, V.Krey, R.G.Richels, S.Rose, and M.Tavoni (2009), *Energy Economics*

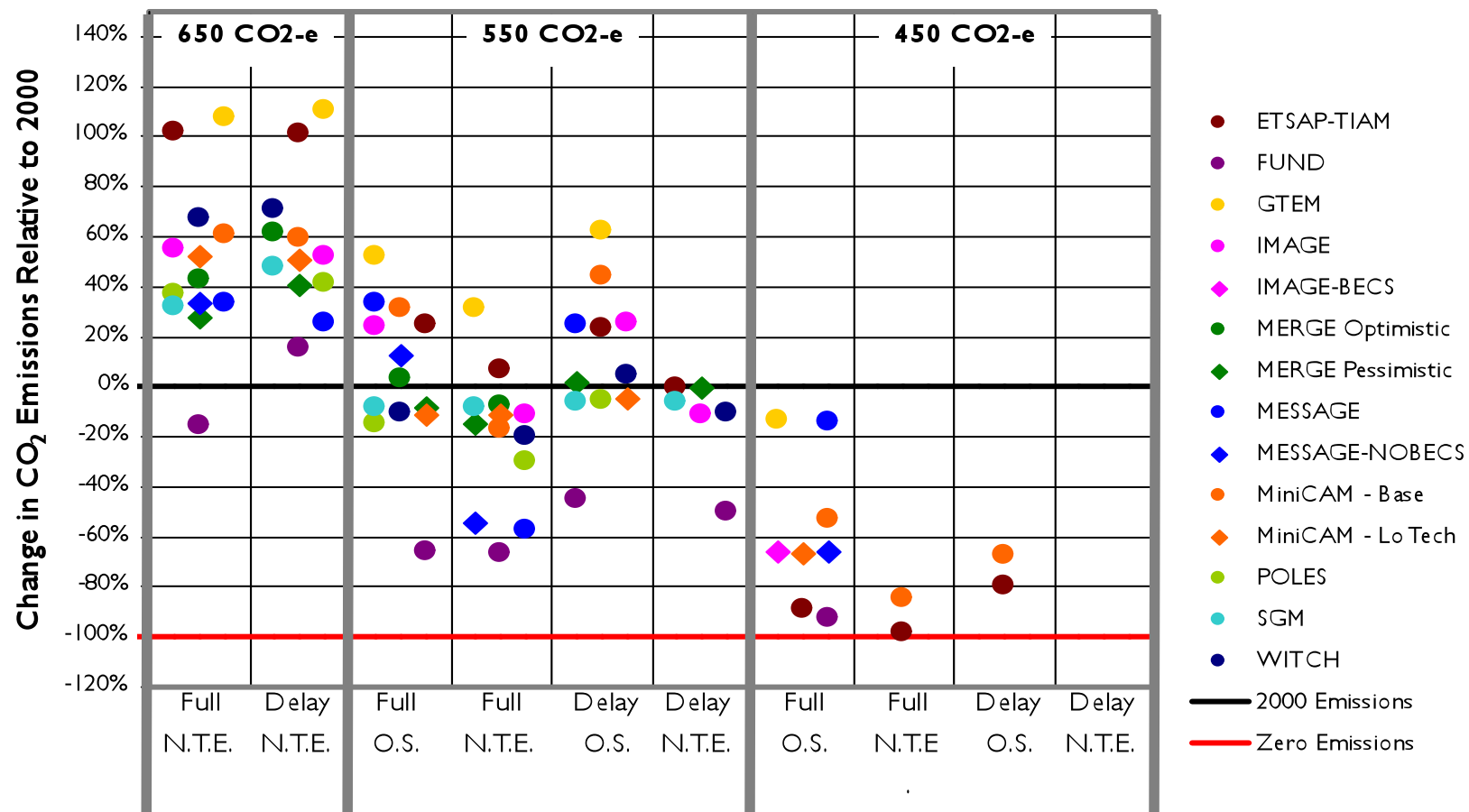
Without mitigation, CO₂-e concentrations will quickly pass the three long-term goals.



Which scenarios were the modeling groups able to provide?

Model		650 CO2-e		550 CO2-e				450 CO2-e			
		Full Not-to- Exceed	Delay Not-to- Exceed	Full Overshoot	Not-to- Exceed	Delay Overshoot	Not-To- Exceed	Full Overshoot	Not-to- Exceed	Delay Overshoot	Not-To- Exceed
1	ETSAP-TIAM	+	+	+	+	+	+	+	+	+	XX
2	FUND	+	+	+	+	+	+	+	XX	XX	XX
3	GTEM	+	+	+	+	+	XX	+	XX	XX	XX
4	IMAGE	+	+	+	+	+	+	XX	XX	XX	XX
4	IMAGE-BC	-N/A-	-N/A-	N/A-	-N/A-	N/A-	-N/A-	+	XX	XX	XX
5	MERGE Optimistic	+	+	+	+	XX	XX	XX	XX	XX	XX
5	MERGE Pessimistic	+	+	+	+	+	+	XX	XX	XX	XX
6	MESSAGE	+	+	+	+	+	XX	+	XX	XX	XX
6	MESSAGE - NOBACS	+	-N/A-	+	+	N/A-	-N/A-	+	XX	XX	XX
7	MiniCAM Base	+	+	+	+	+	XX	+	+	+	XX
7	MiniCAM LoTech	+	+	+	+	+	XX	+	XX	XX	XX
8	POLES	+	+	+	+	+	XX	XX	XX	XX	XX
9	SGM	+	+	+	+	+	+	XX	XX	XX	XX
10	WITCH	+	+	+	+	+	+	XX	XX	XX	XX

Global Emissions Reductions: 2050



PRESENTATION
TITLE

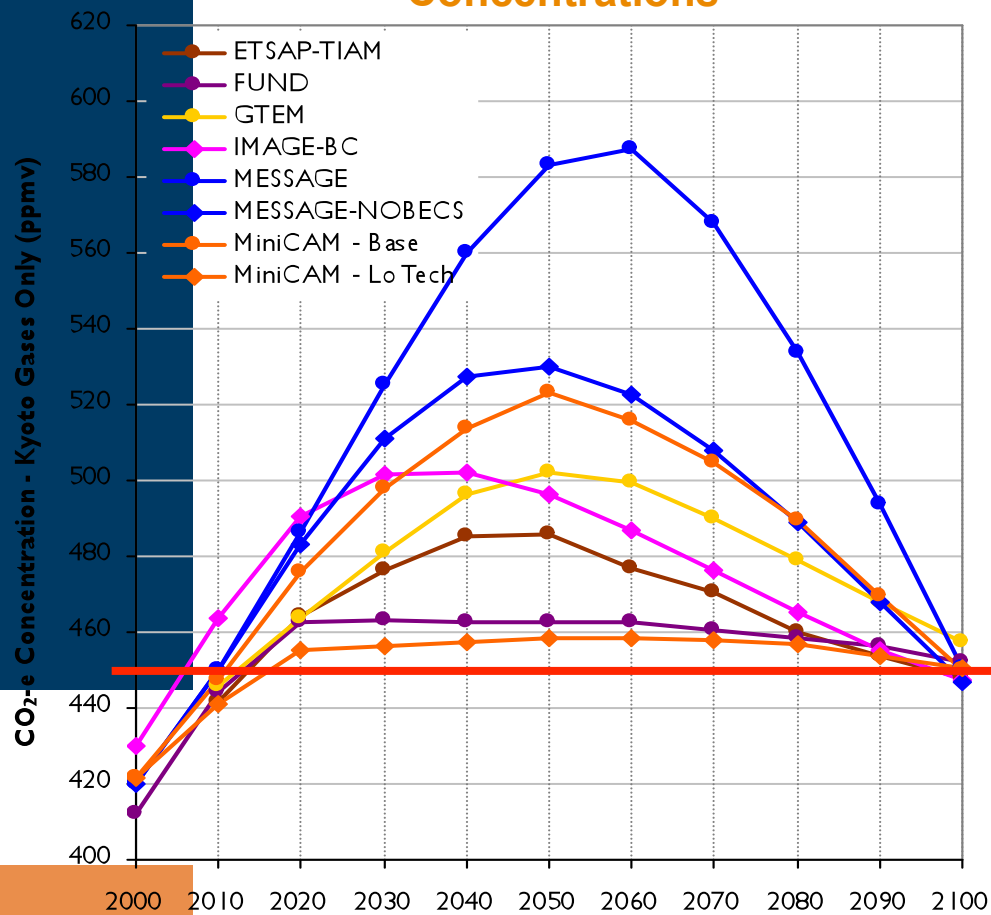
Scenarios that could not
be modeled under criteria
of study.



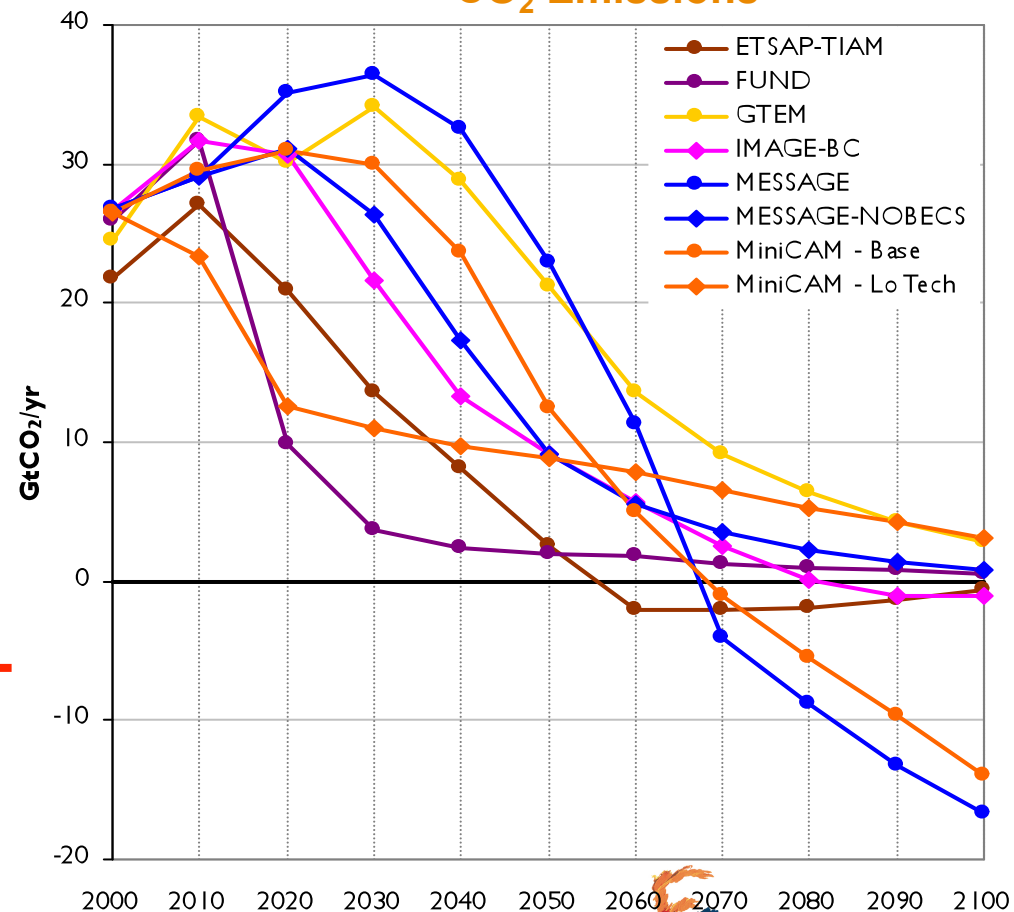
Overshooting concentrations...

450 CO₂-e Overshoot: Full Participation

Concentrations



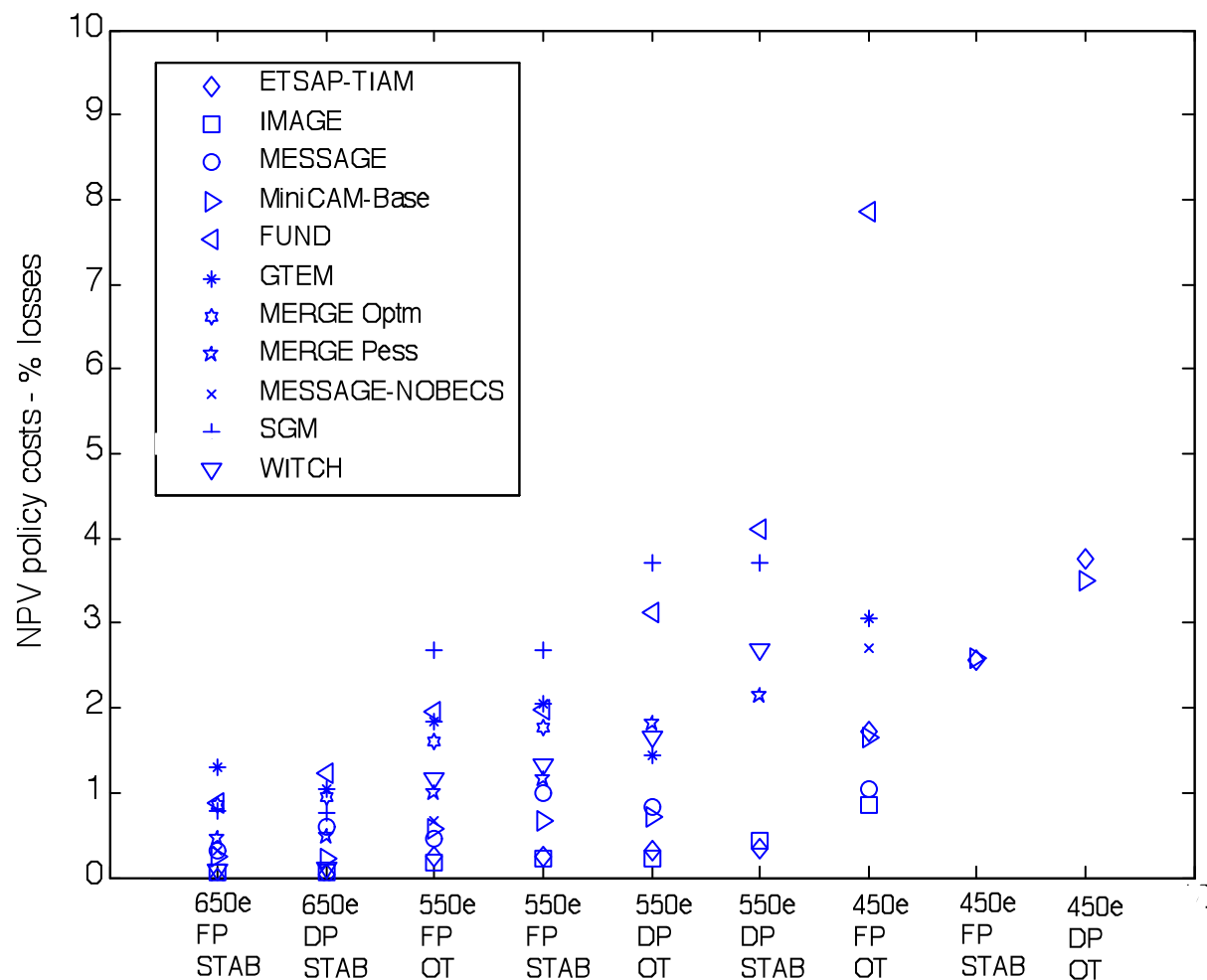
CO₂ Emissions



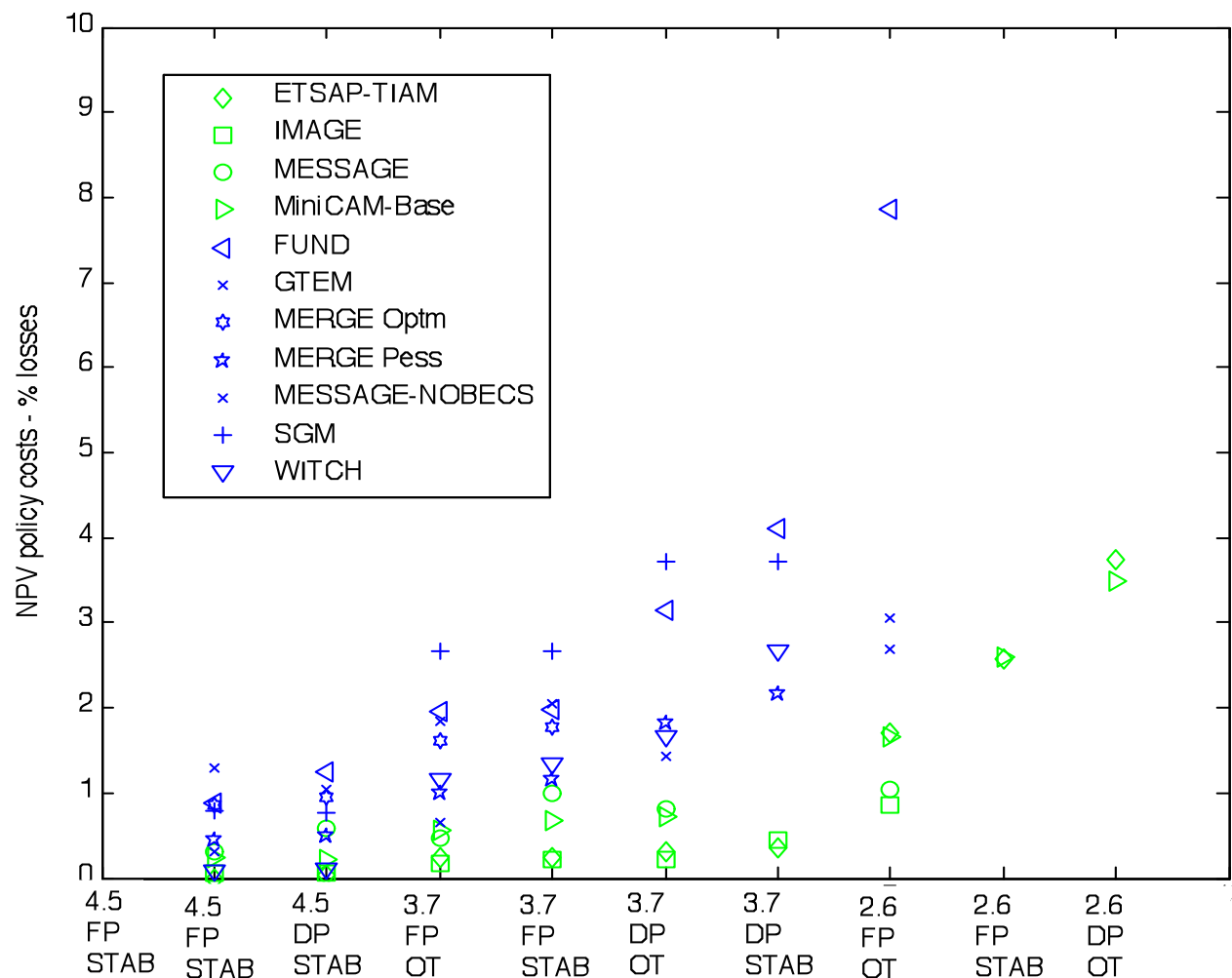
... requires CO₂ removal from the atmosphere

PRESENTATION
TITLE

The global economic costs of climate policies



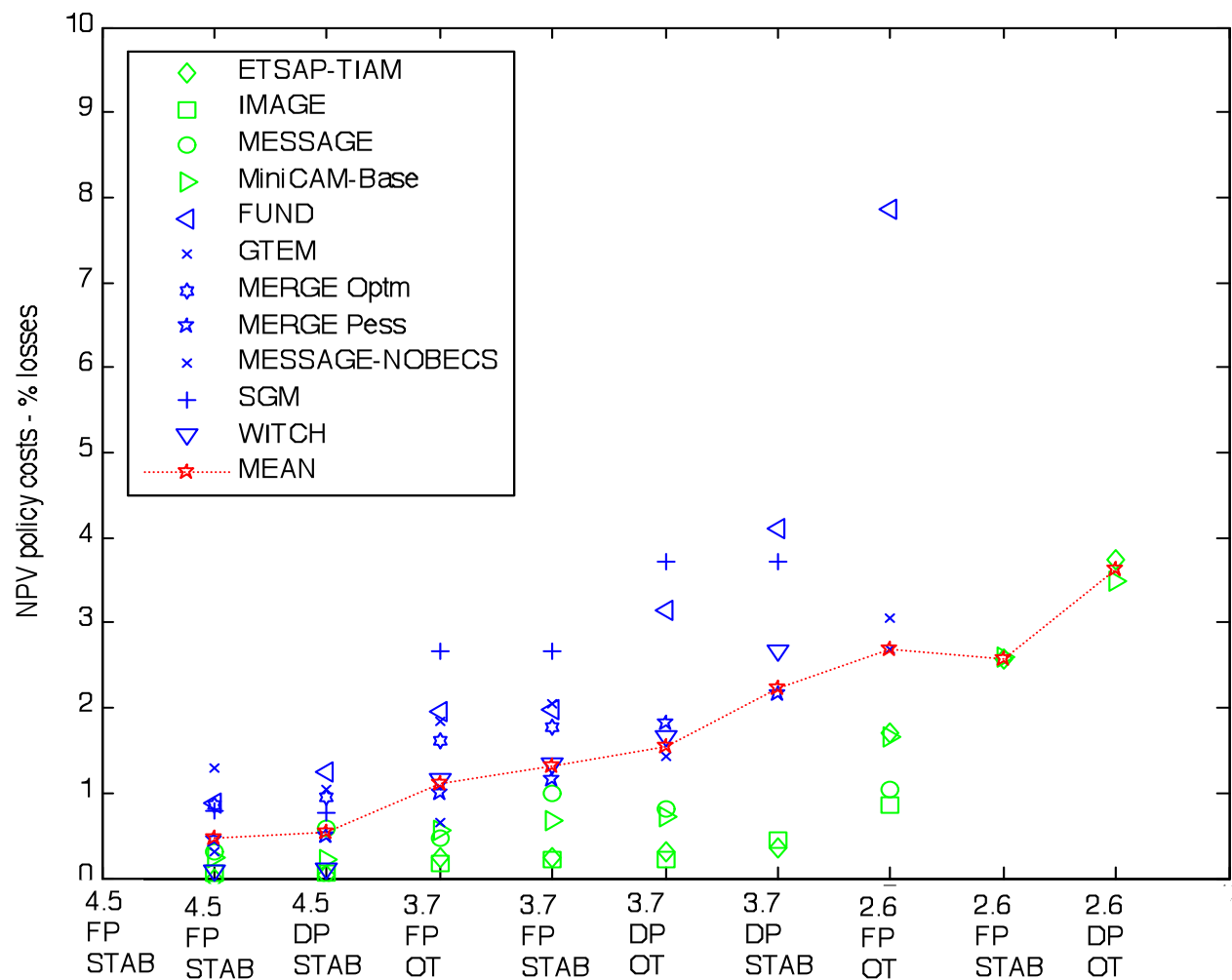
The global economic costs of climate policies



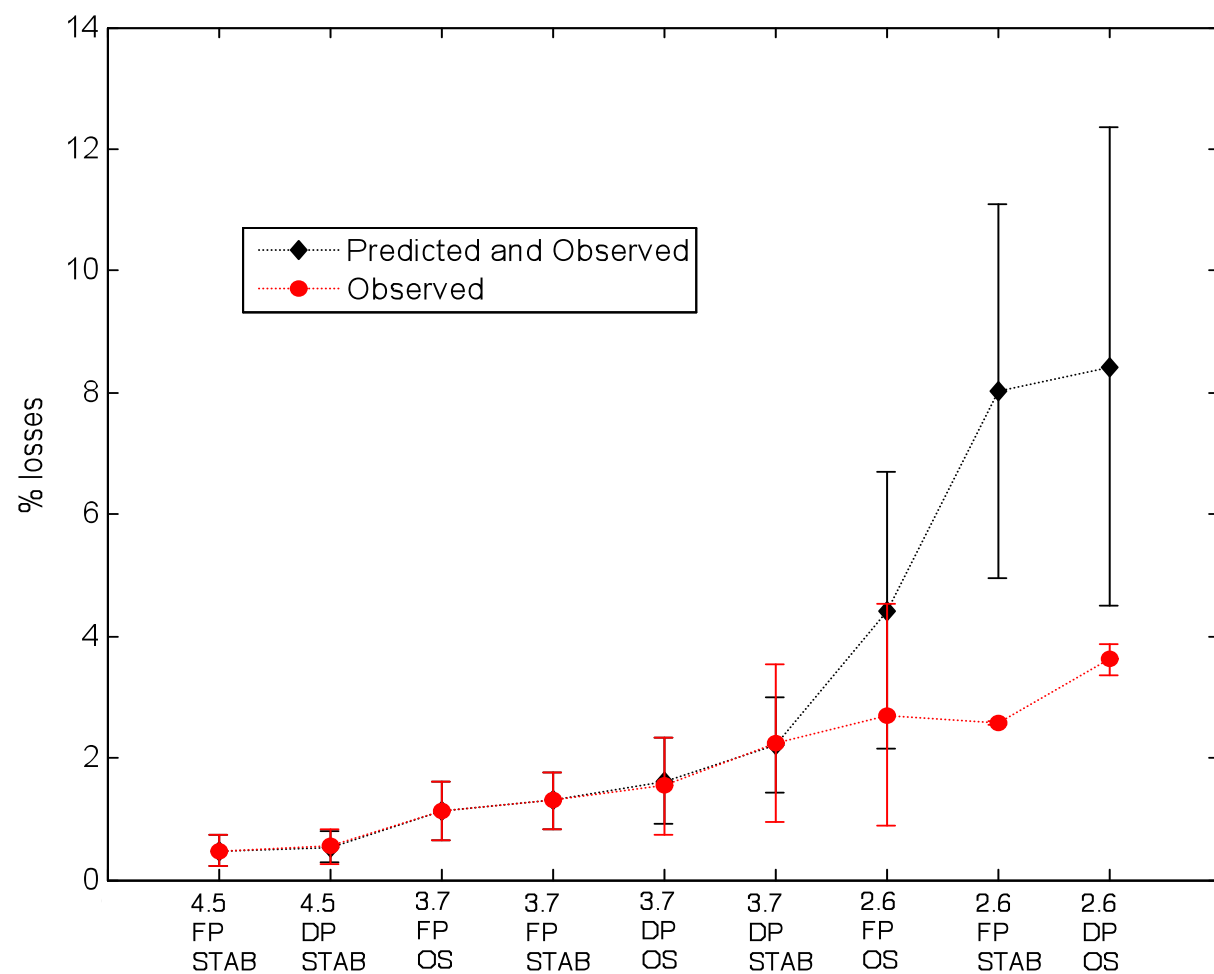
Green= BU/BECS

Blue=TOP DOWN/NO BECS

The risk of selection bias

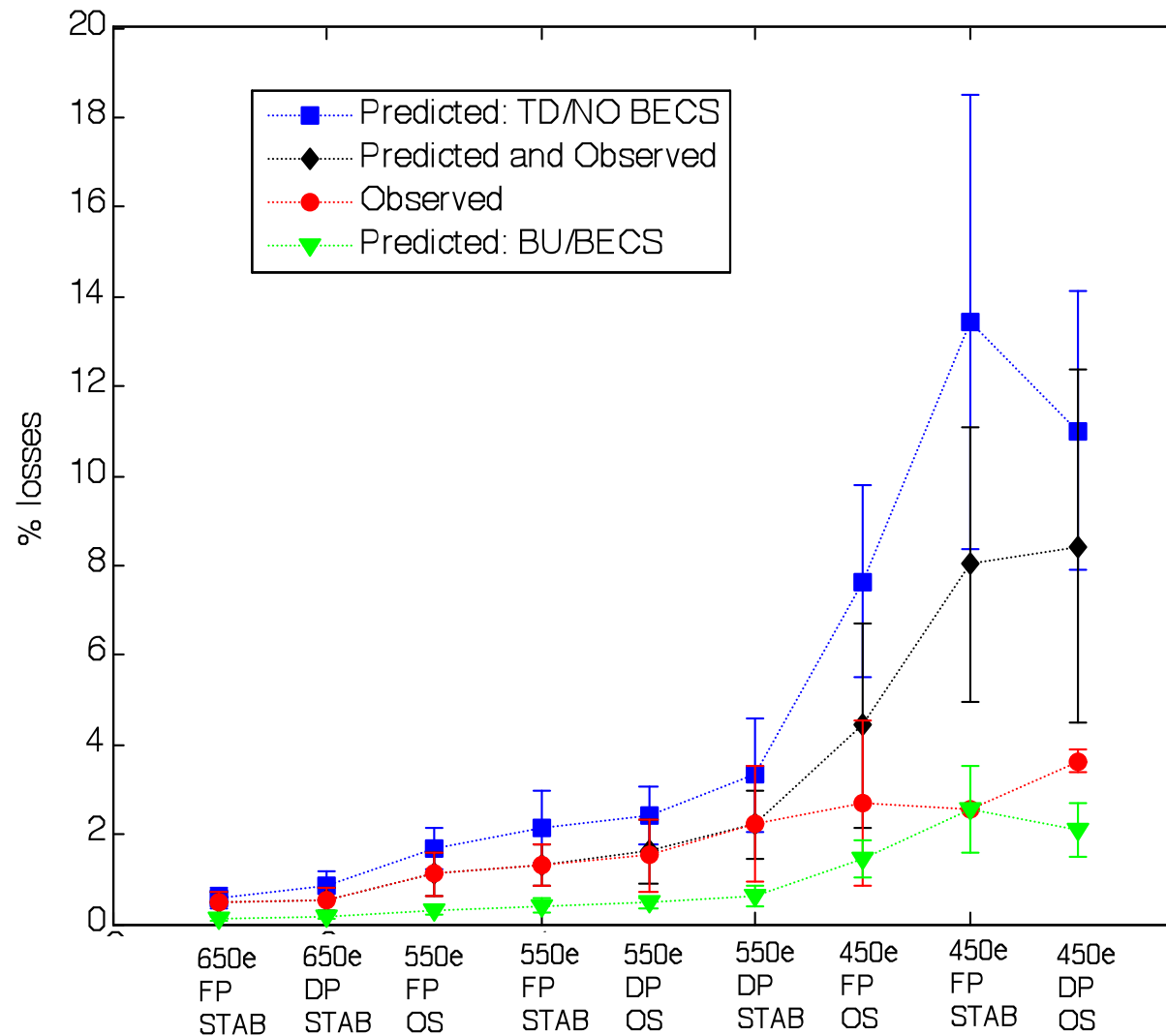


The adjusted costs of stringent climate policies

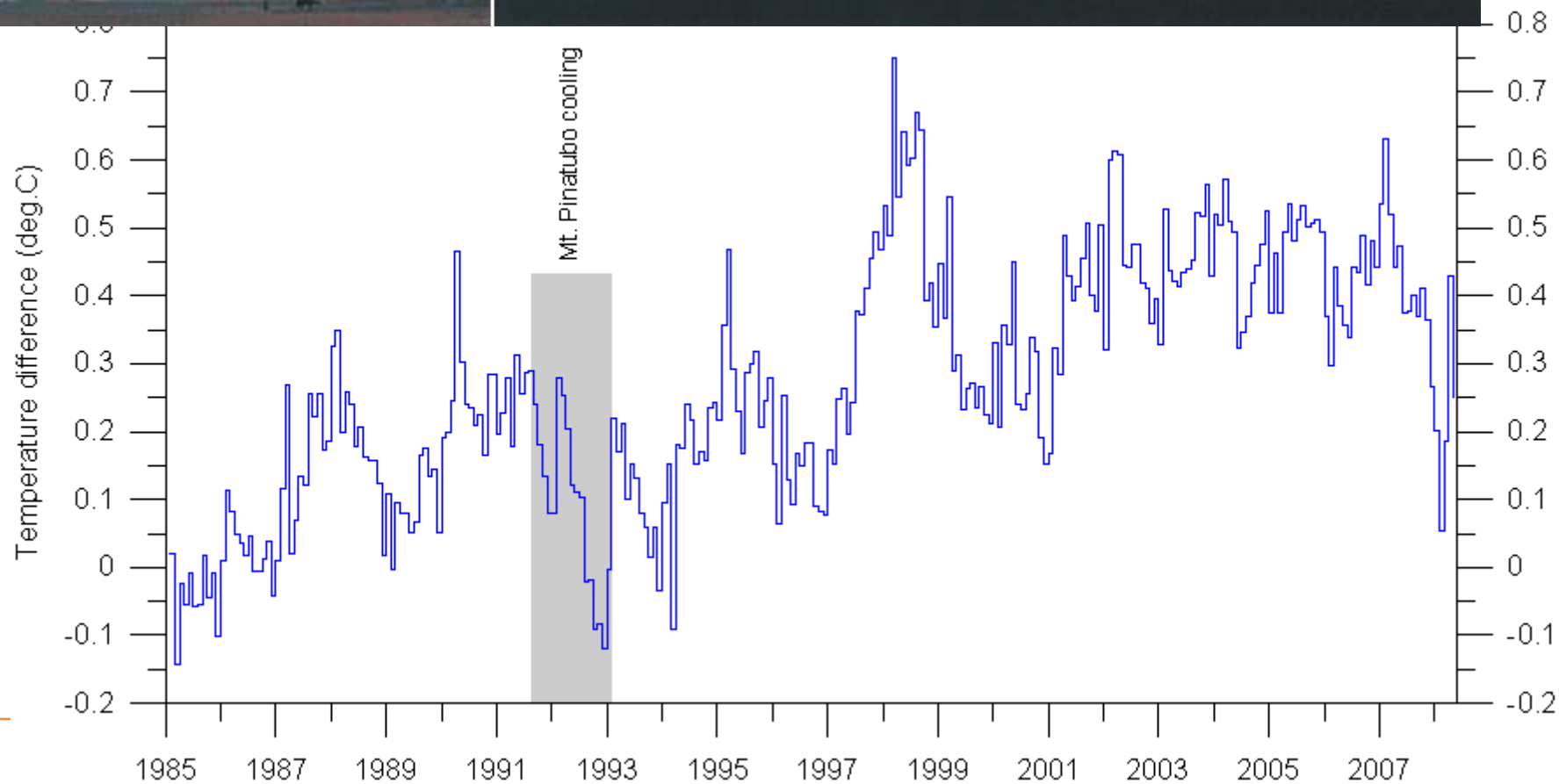


PRESENTATION
TITLE

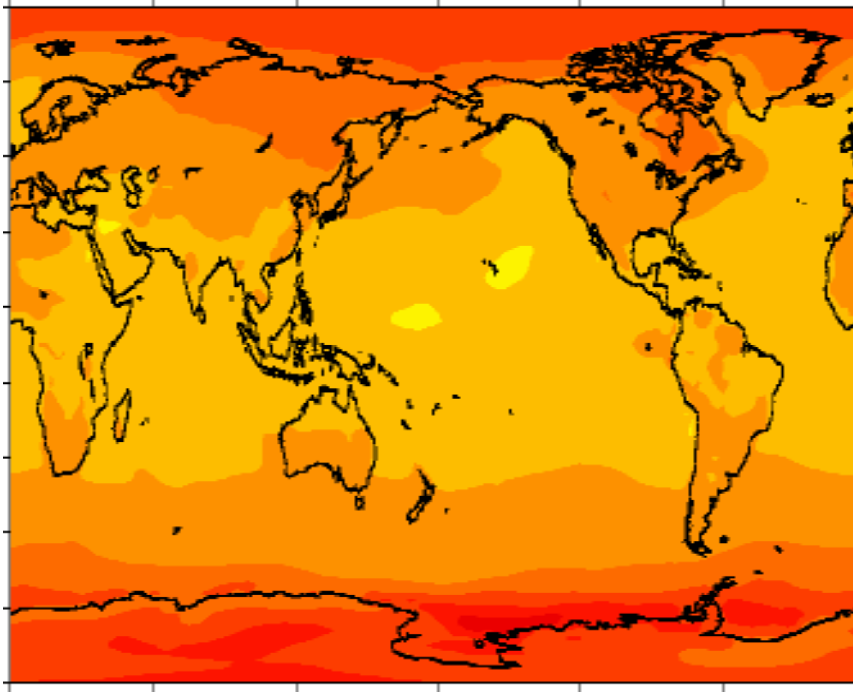
The determinants of cost differences



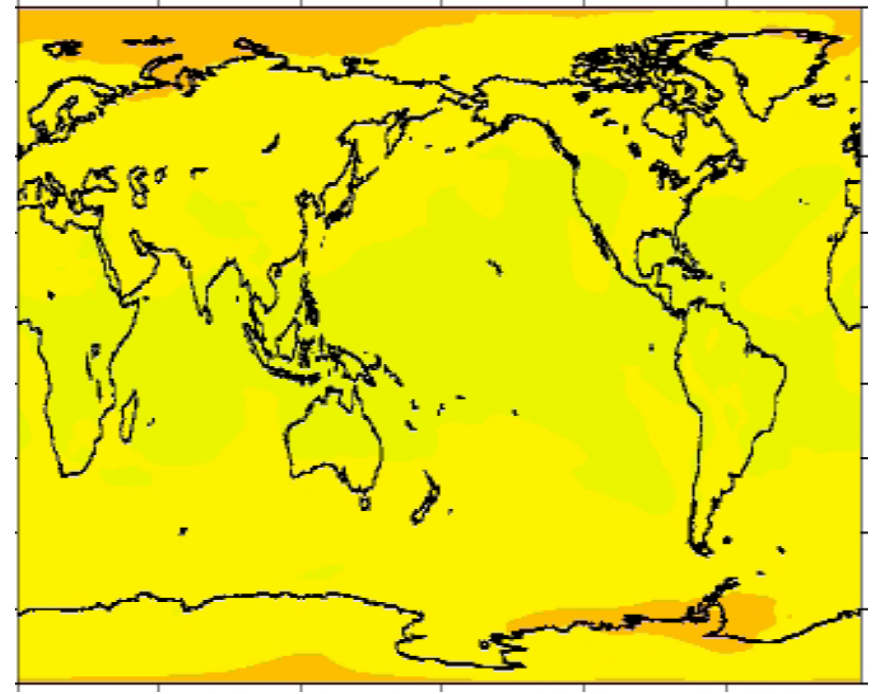
PRESENTATION
TITLE



Geoengineering



2x CO2



**2x CO2 and 1.8%
reduction in solar
intensity**

Geoengineering vs mitigating

