POTSDAM INSTITUTE FOR CLIMATE IMPACT RESEARCH

On the Economics of Low Stabilization – Geopolitical Risks and Opportunities

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Visitors Program of the Federal Republic of Germany

- Germany´s Global Commitment -

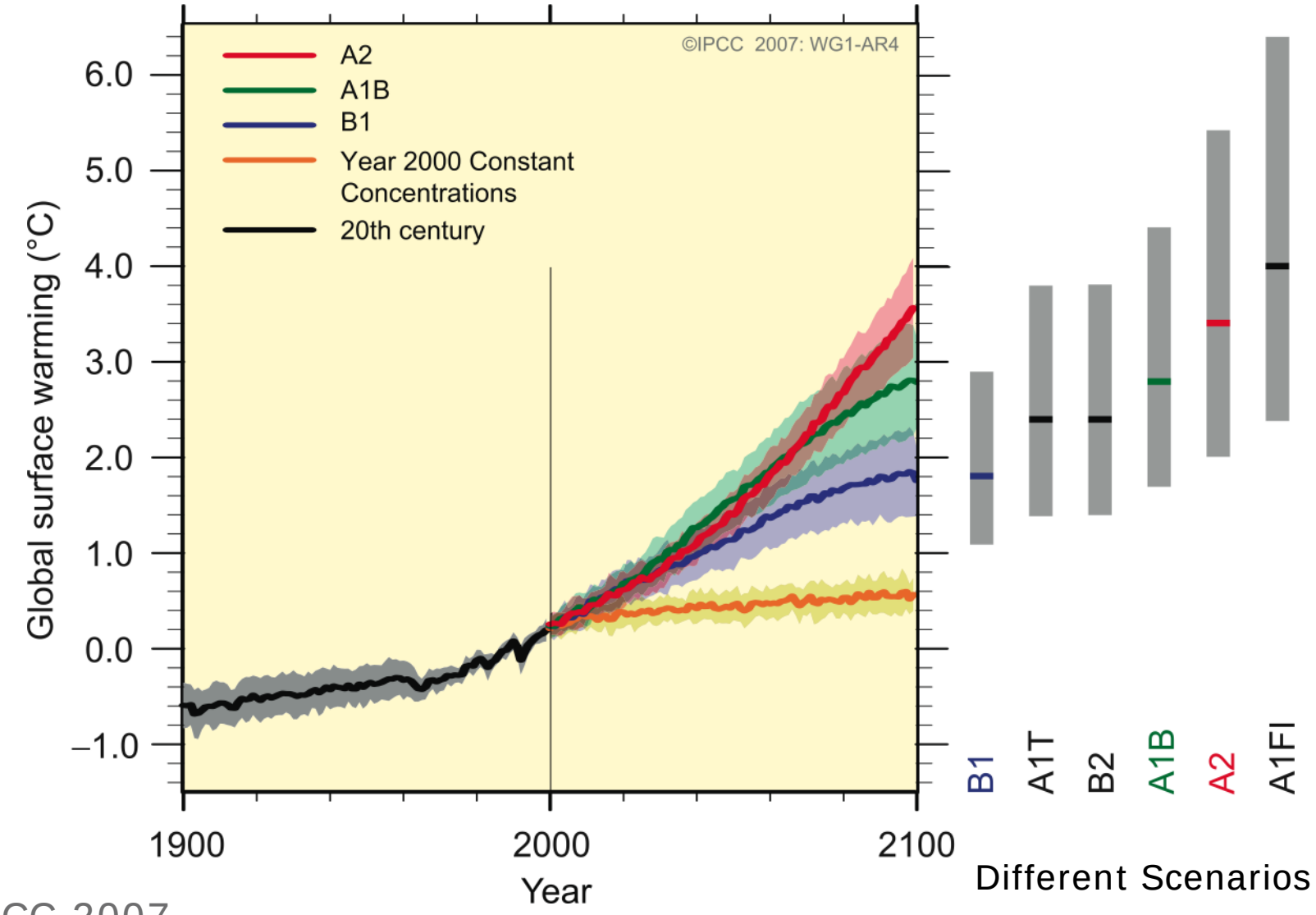
Berlin, 4 June 2010

INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE

Working Group III
Mitigation of Climate Change

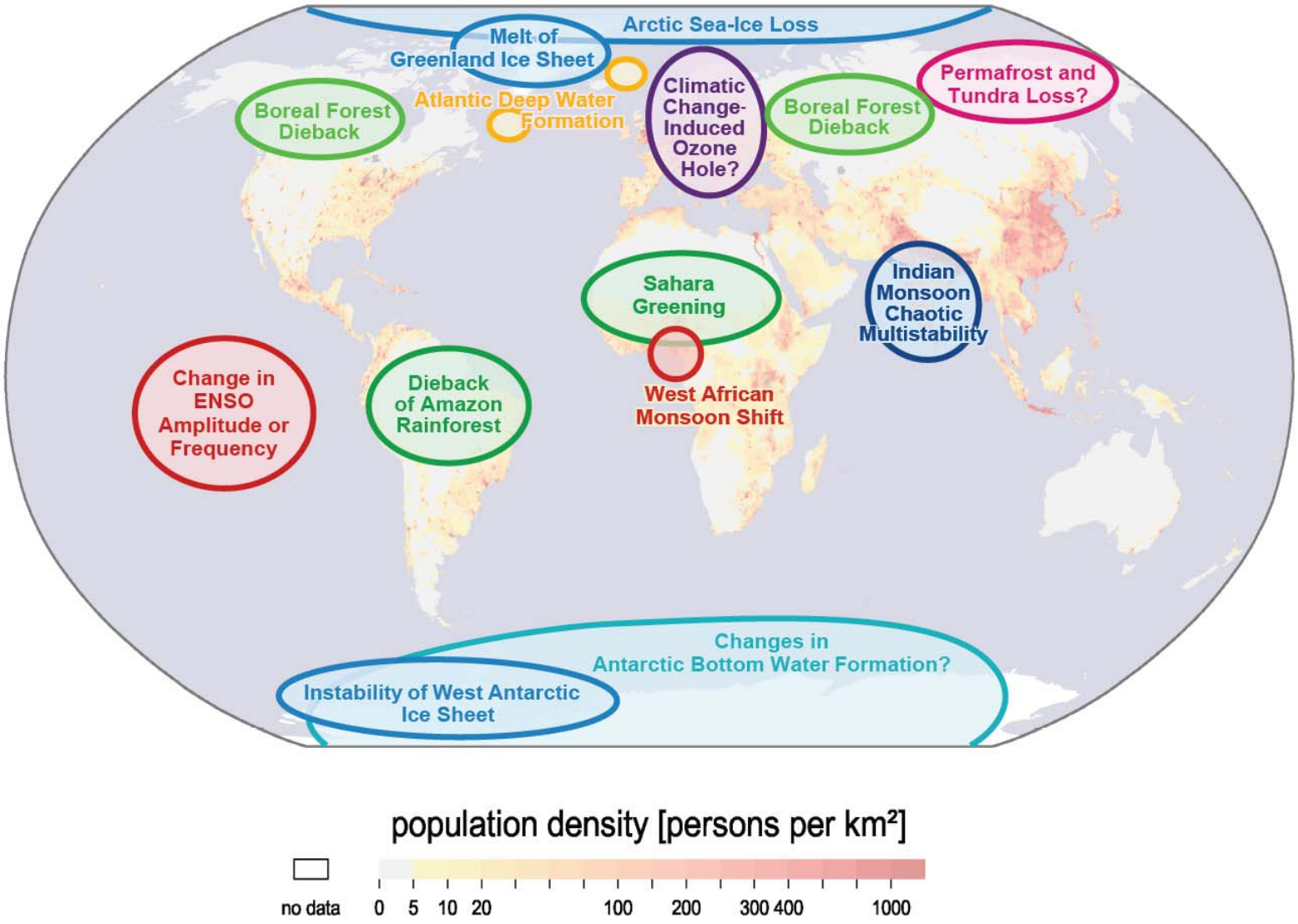
Technische Universität Berlin

Projections of Global Mean Temperature



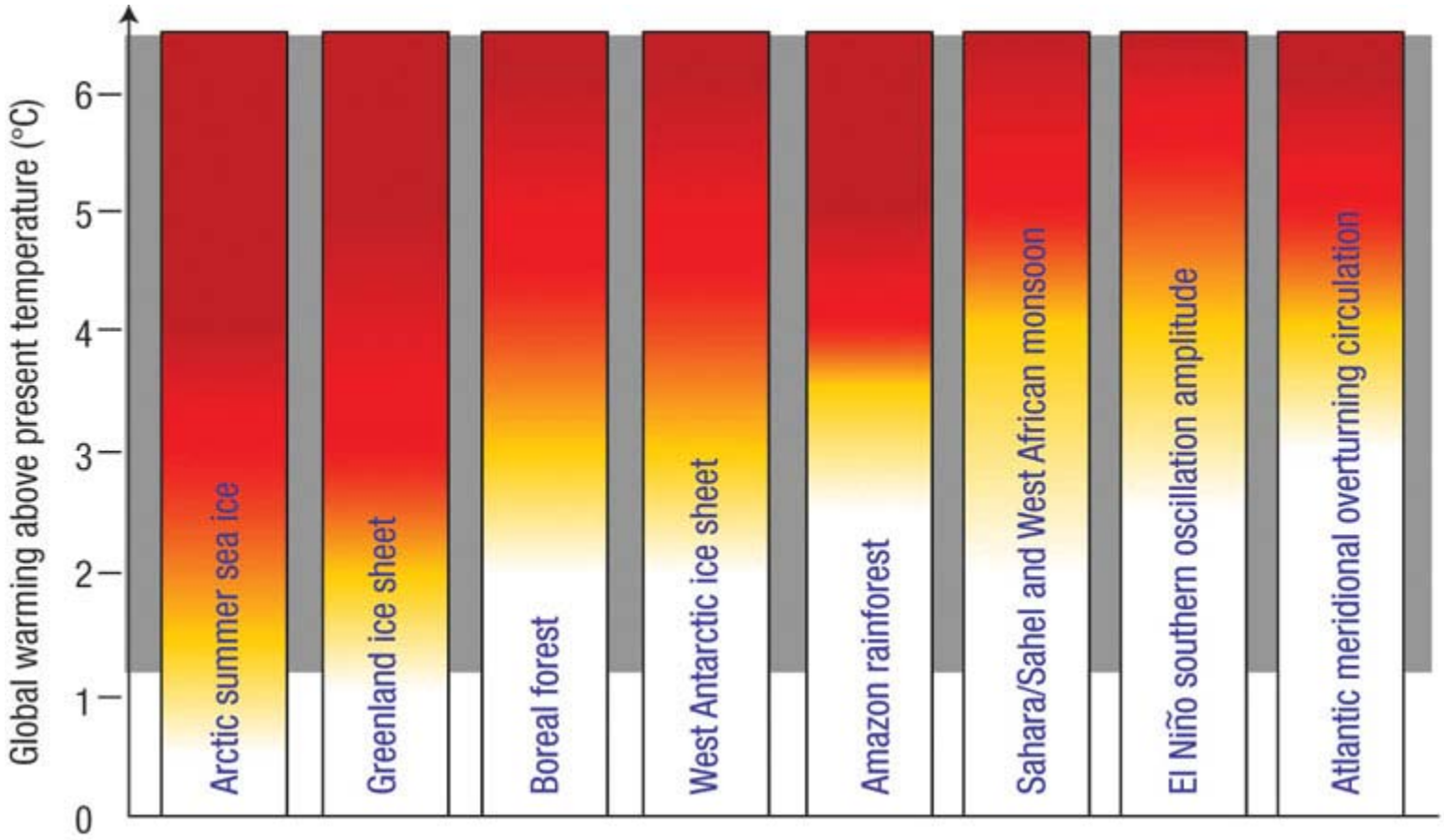
IPCC 2007

Tipping Points in the Earth System



T. M. Lenton & H. J. Schellnhuber (Nature Reports Climate Change, 2007)

Burning Embers

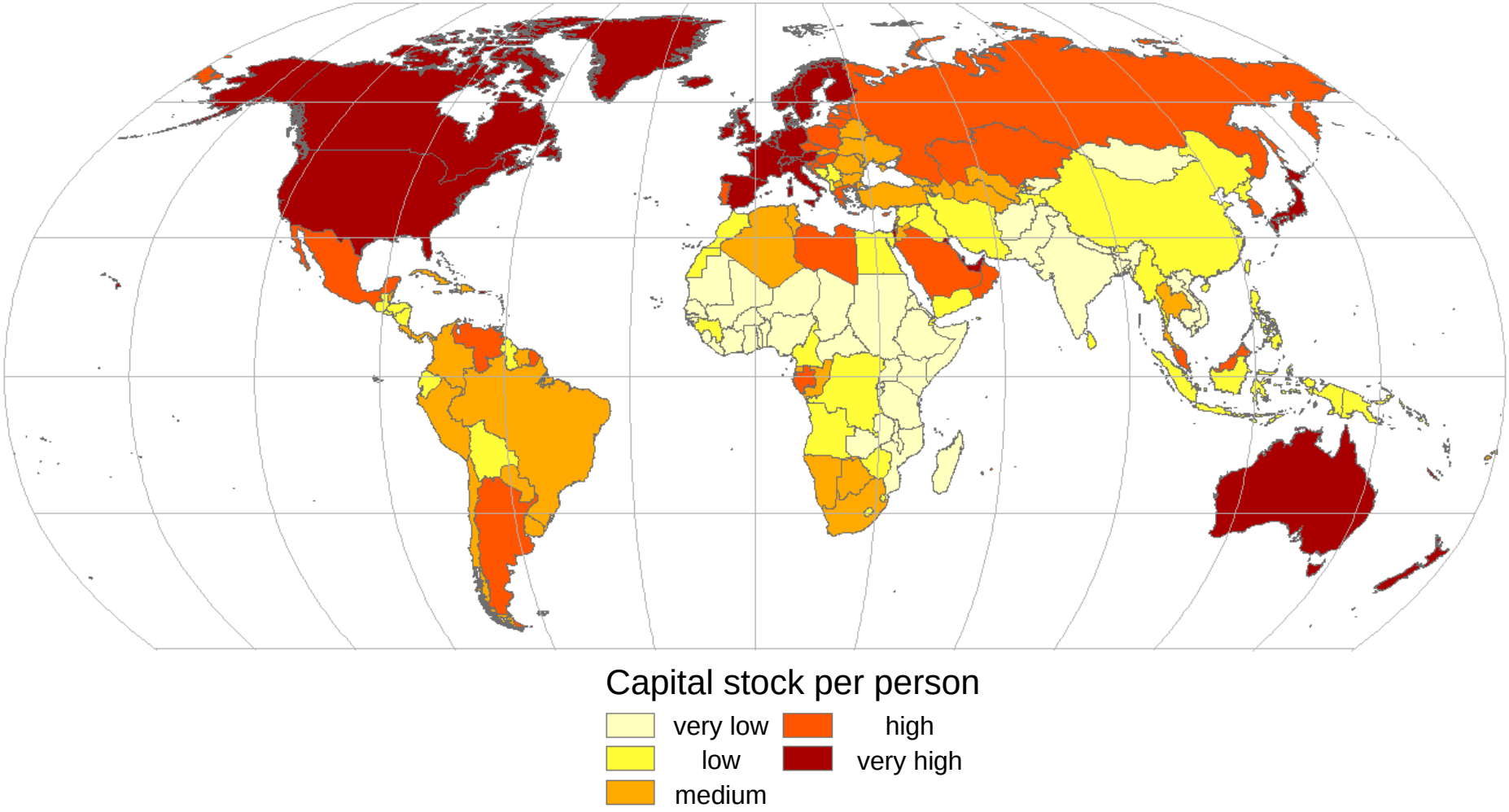


Year 2100 range (IPCC 2007)

Potential policy-relevant tipping elements that could be triggered by global warming this century, with shading indicating their uncertain thresholds. For each threshold, the transition from white to yellow indicates a lower bound on its proximity, and the transition from yellow to red, an upper bound. The degree of uncertainty is represented by the spread of the colour transition.

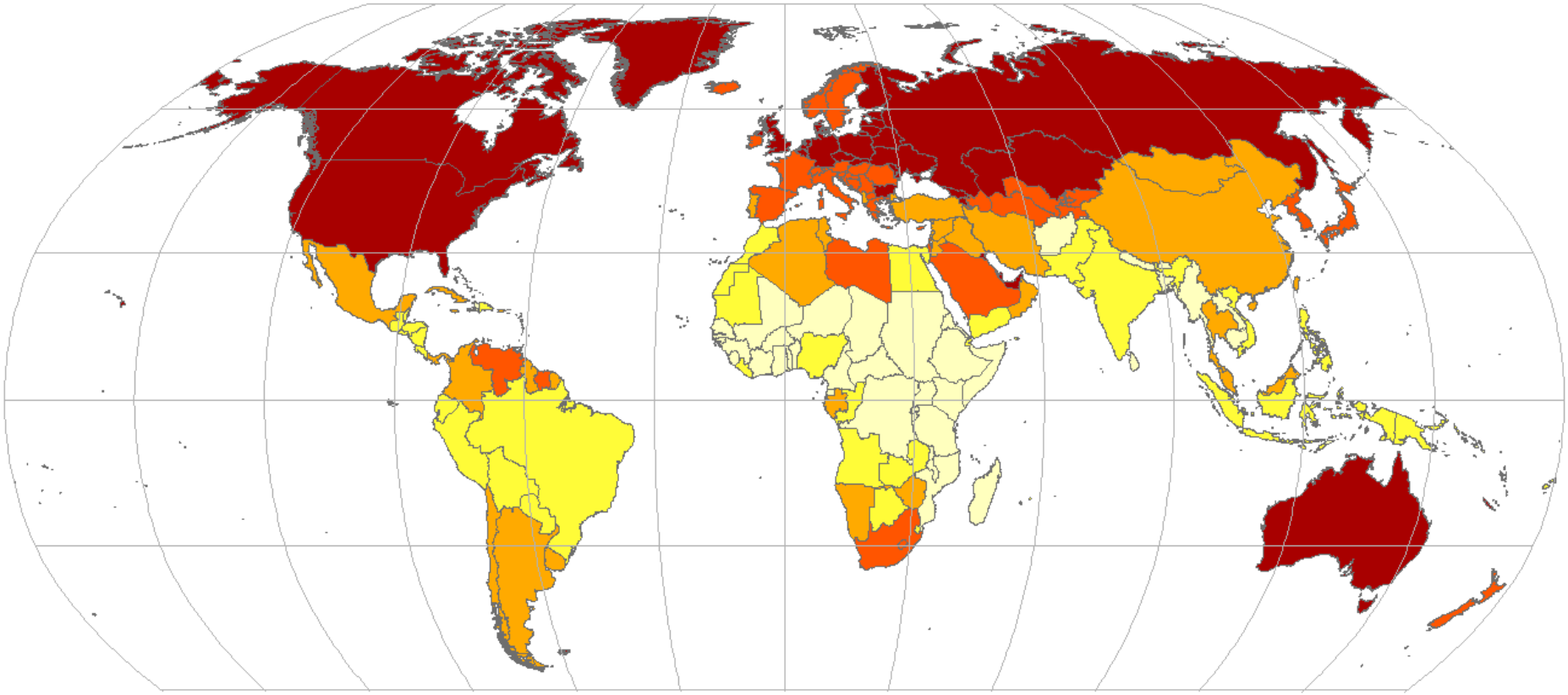
T. M. Lenton & H. J. Schellnhuber (Nature Reports Climate Change, 2007)

World Map of Wealth



Source: Füssel (2007)

World Map of Carbon Debt

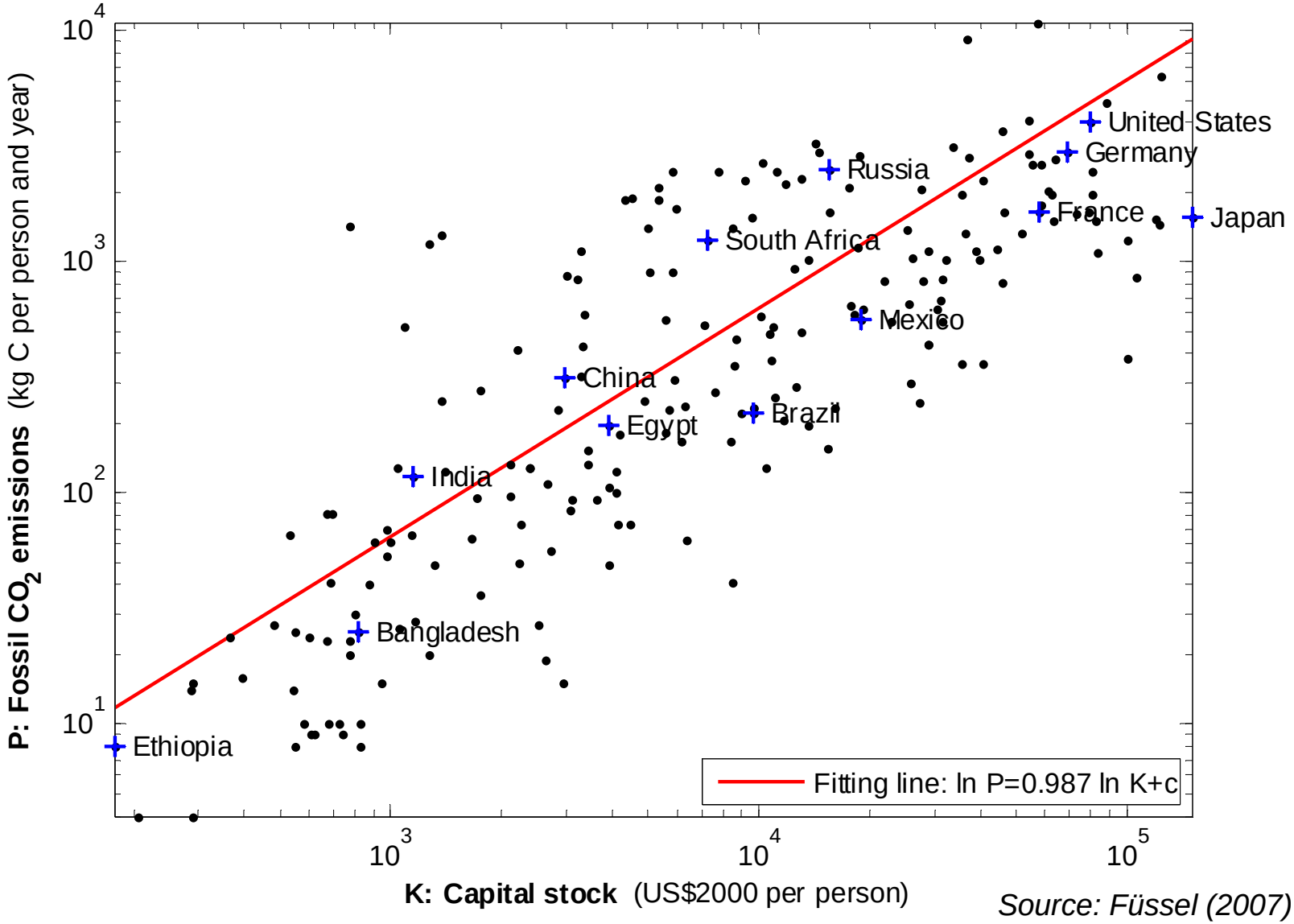


Carbon emissions per person from fossil fuel burning (1950-2003)

very low
low
medium
high
very high

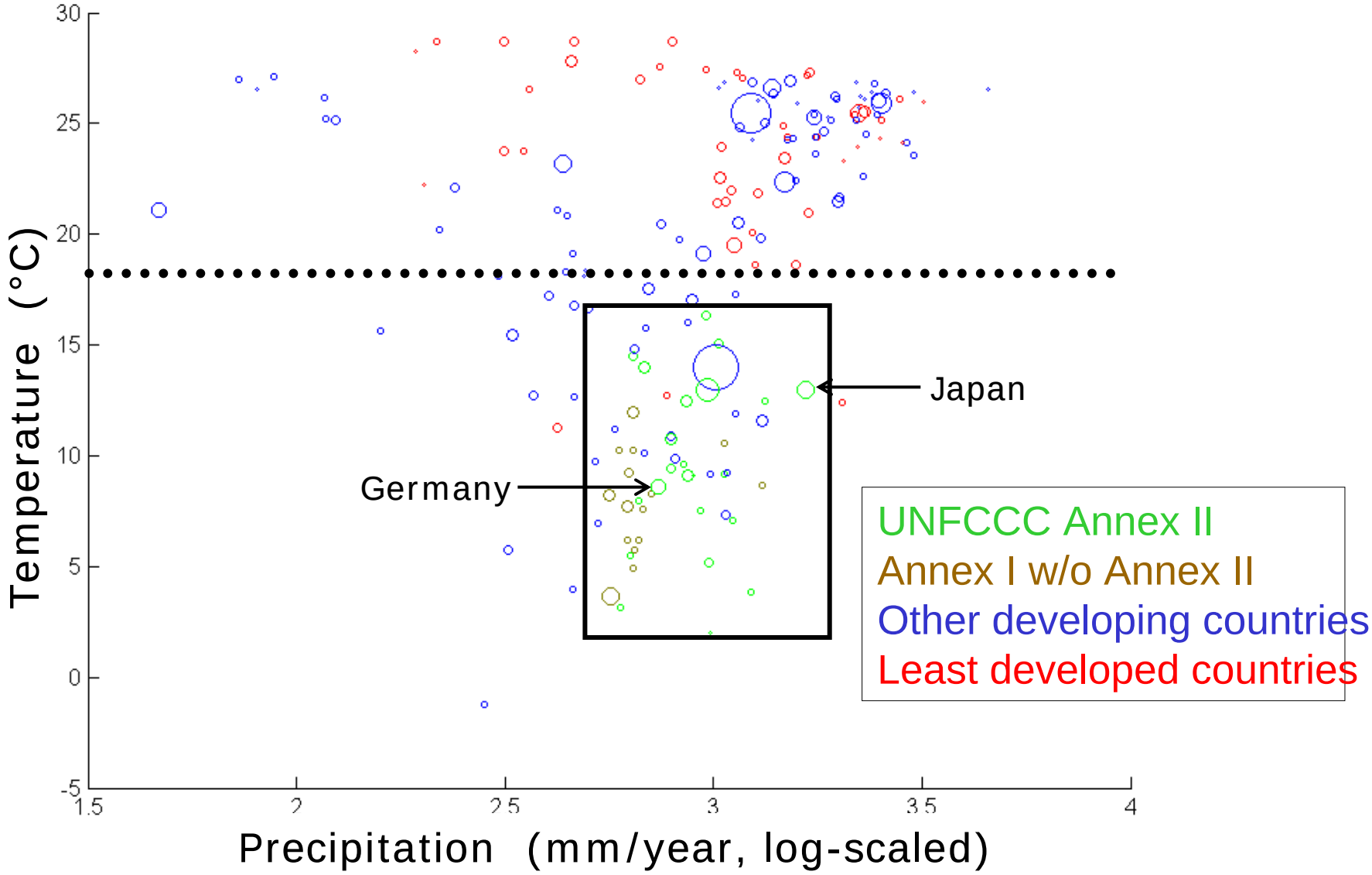
Source: Füssel (2007)

Carbon Dept and Wealth

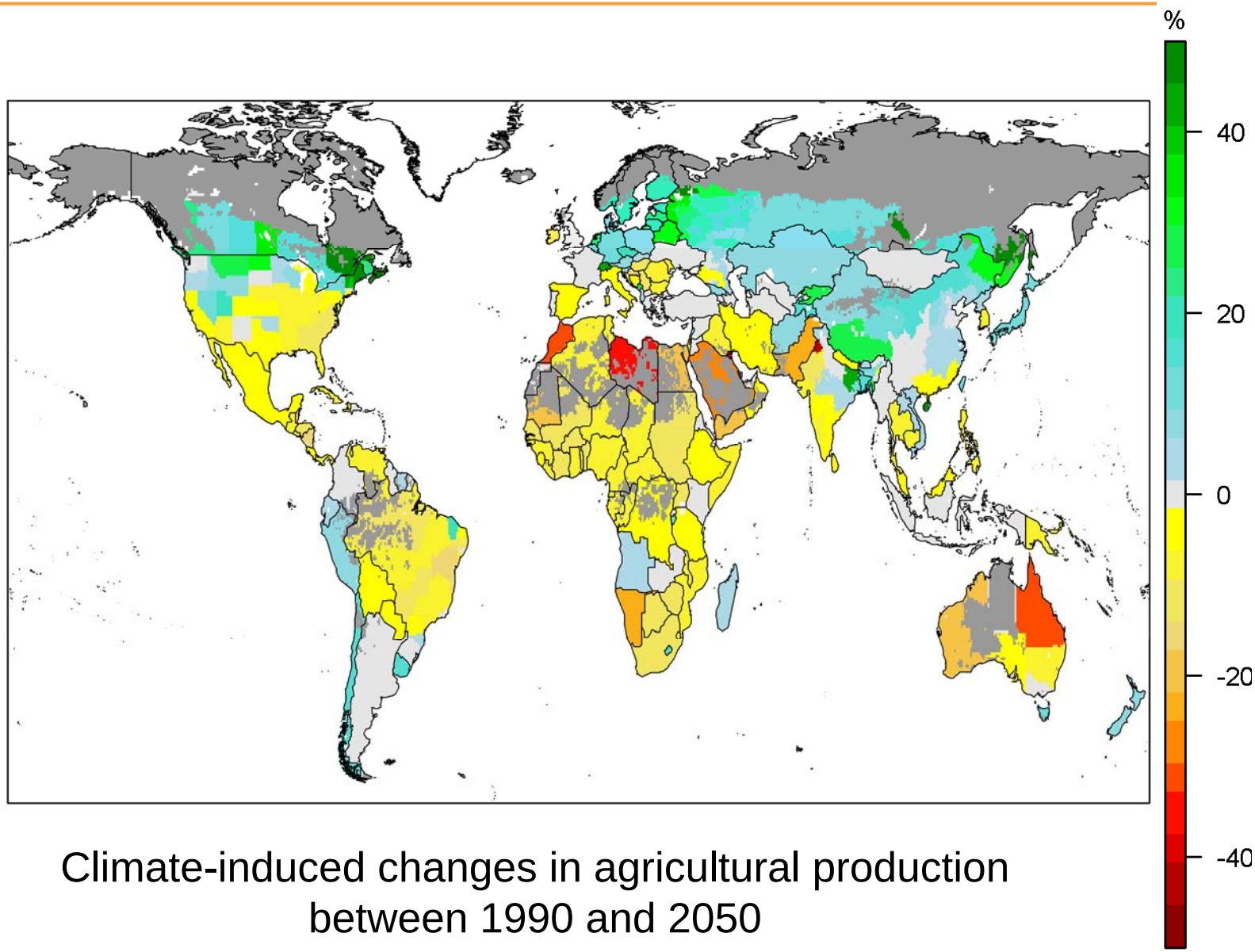


Source: Füssel (2007)

Climate and socio-economic development



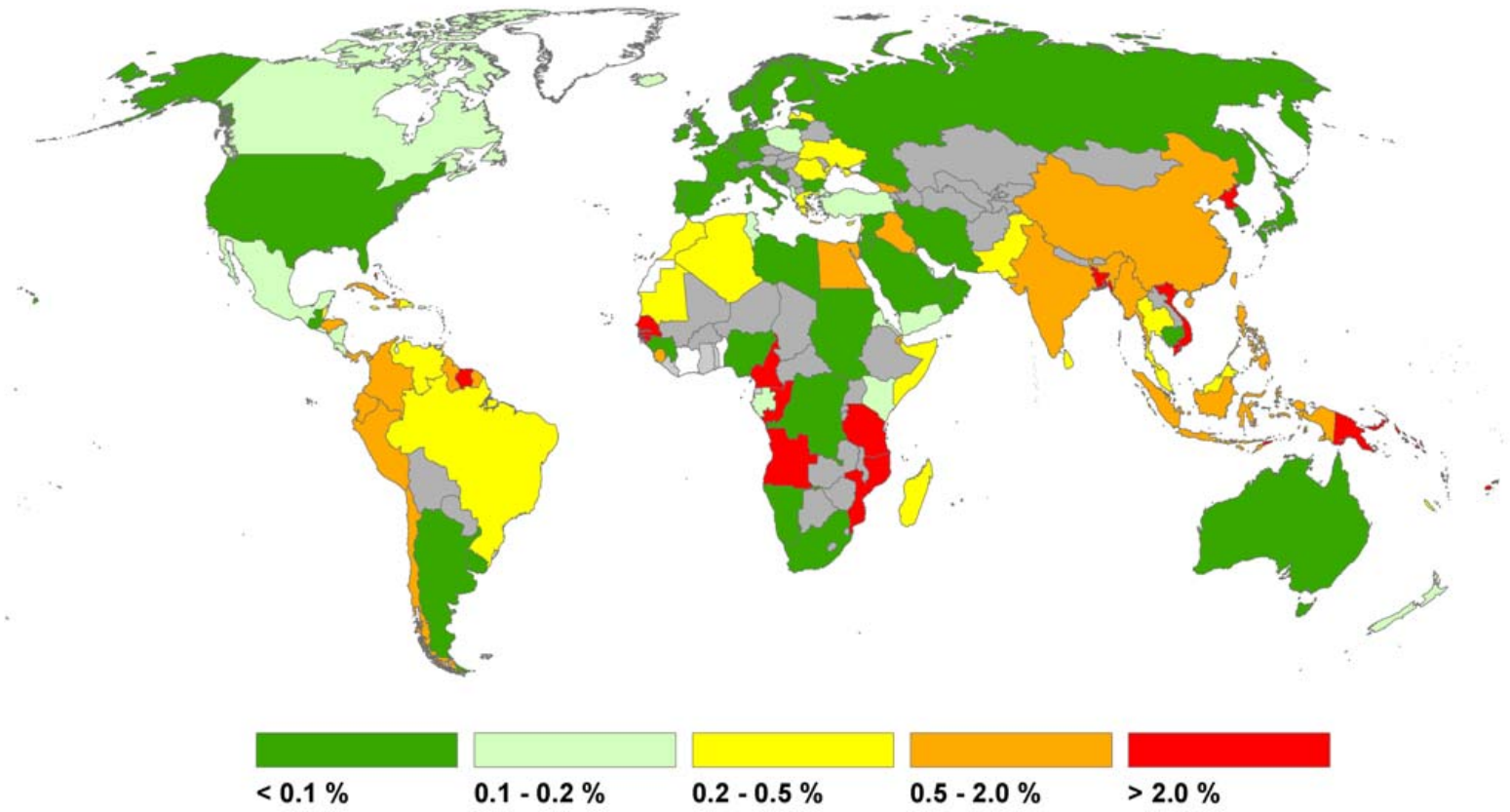
Change in Agricultural Production



Climate-induced changes in agricultural production between 1990 and 2050

Füssel et al., 2010

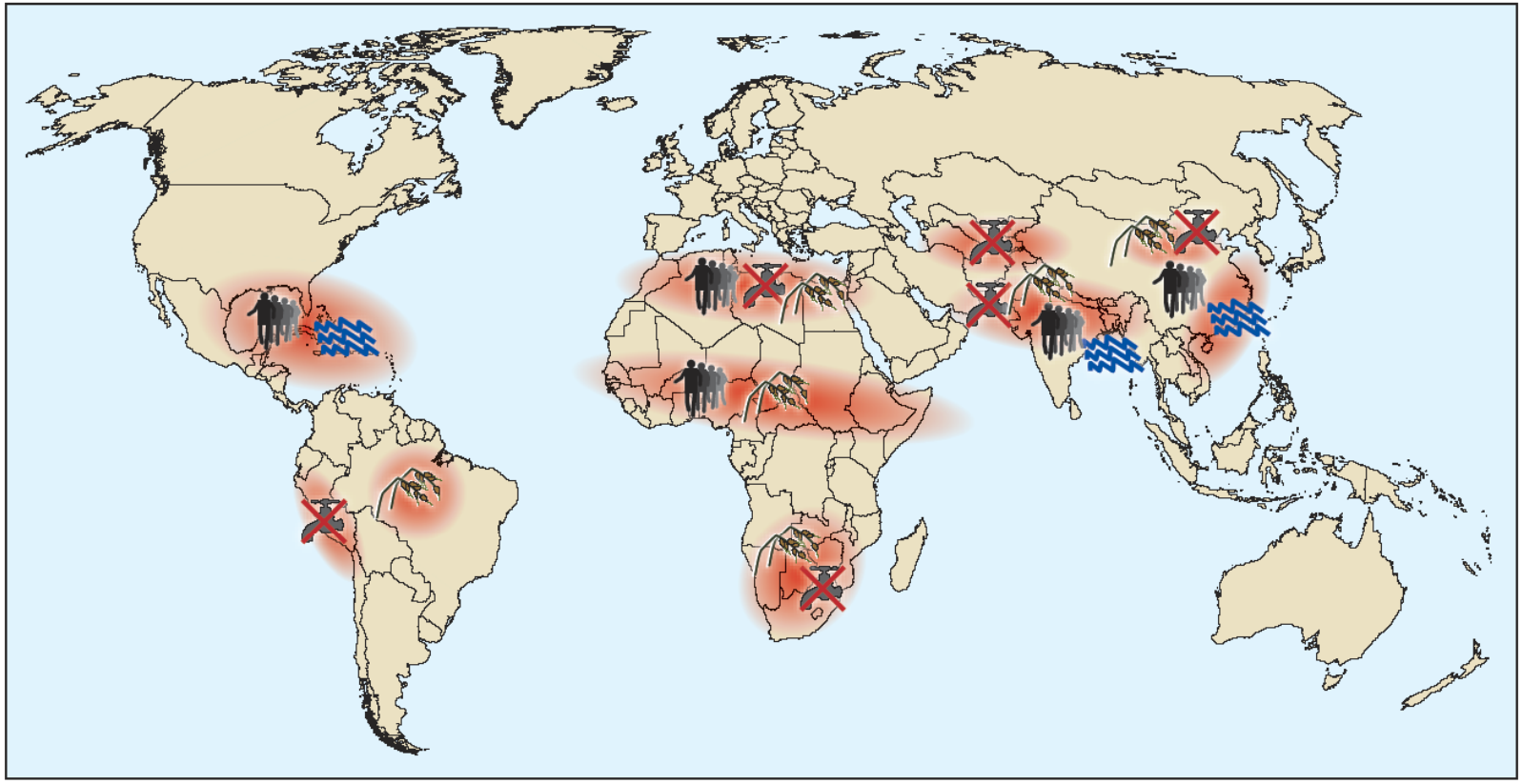
Flood Risk by Sea Level Rise



Increase of population share threatend by sea level rise on an annual basis

Füssel et al., 2010

Risks to international security



Conflict constellations in selected hotspots

Climate-induced degradation of freshwater resources

Climate-induced decline in food production

Hotspot

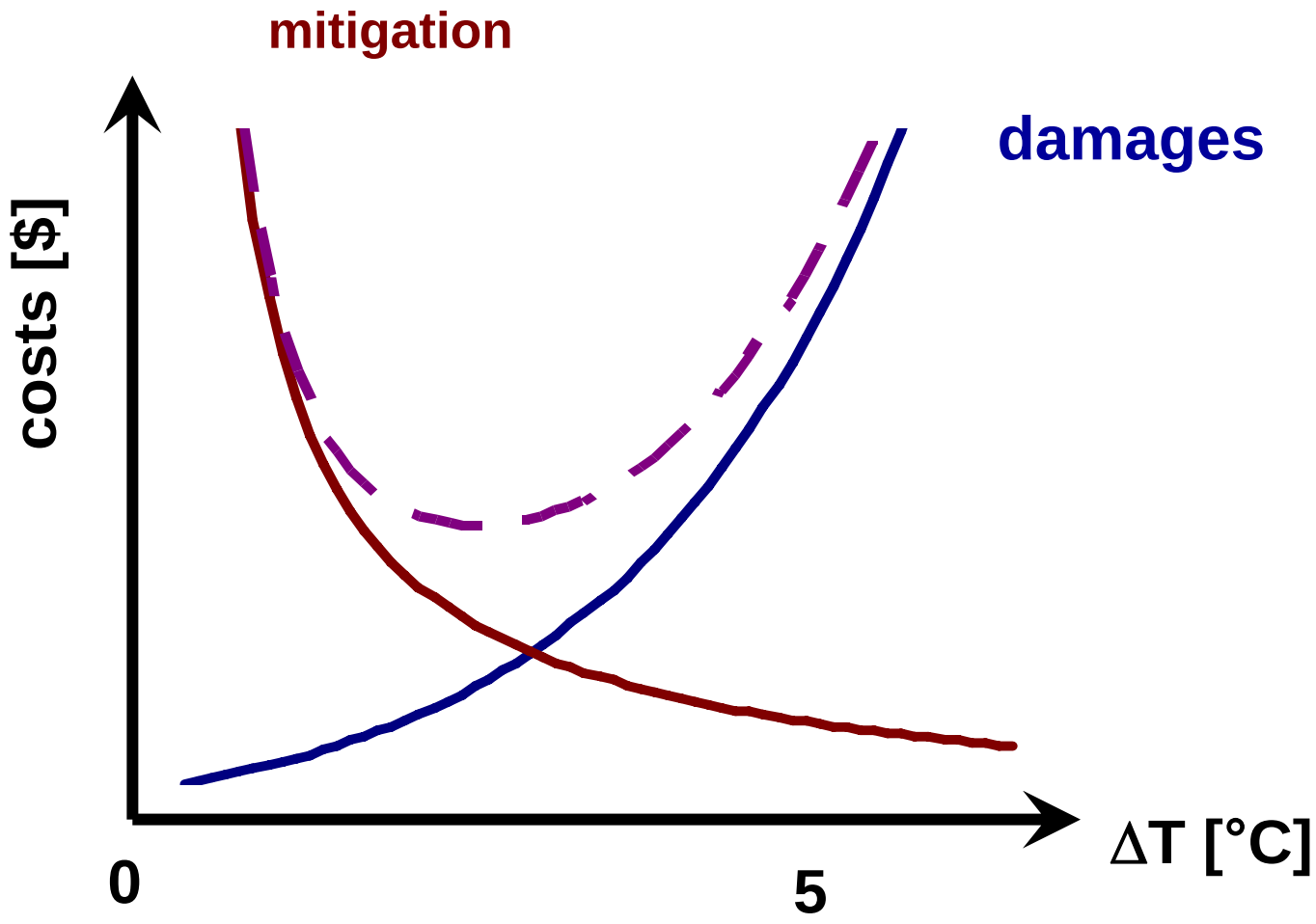
Climate-induced increase in storm and flood disasters

Environmentally-induced migration

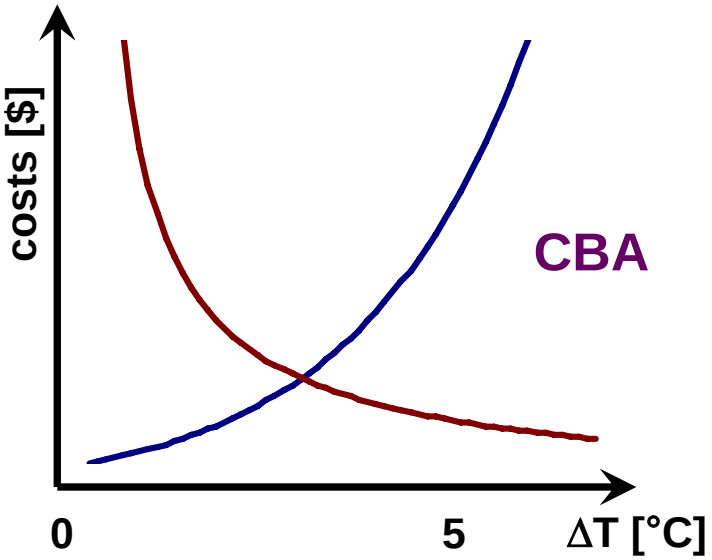
Source: WBGU (2007)

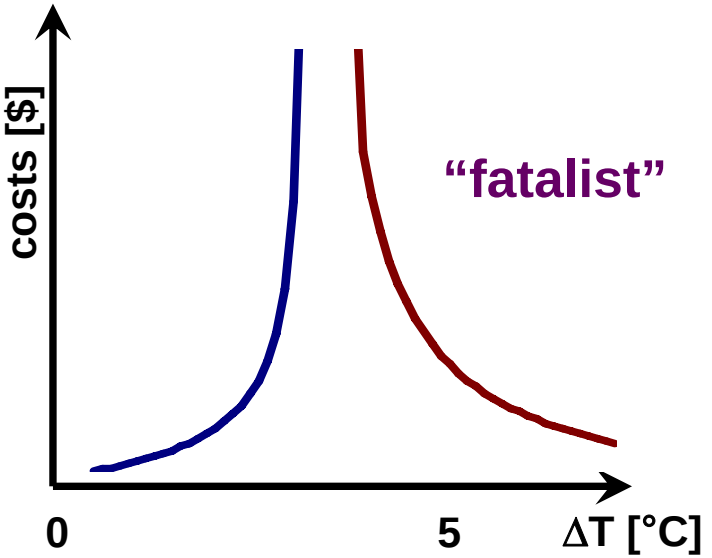
What is the Optimal Level of Mitigation?

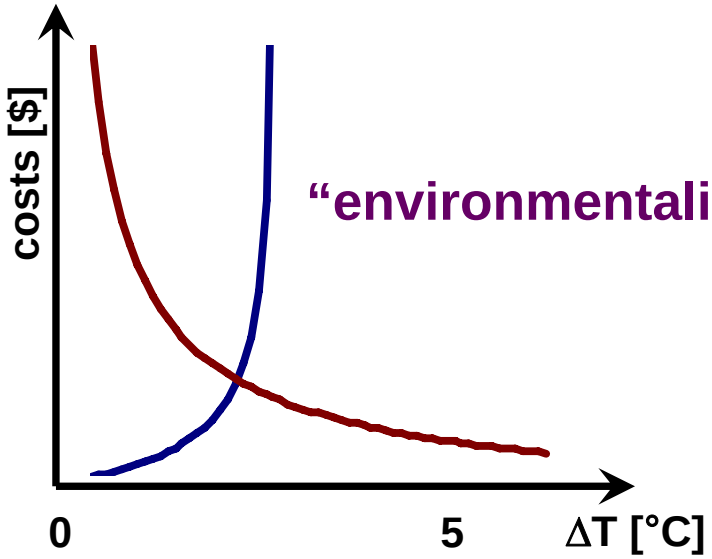
Economist's perspective:

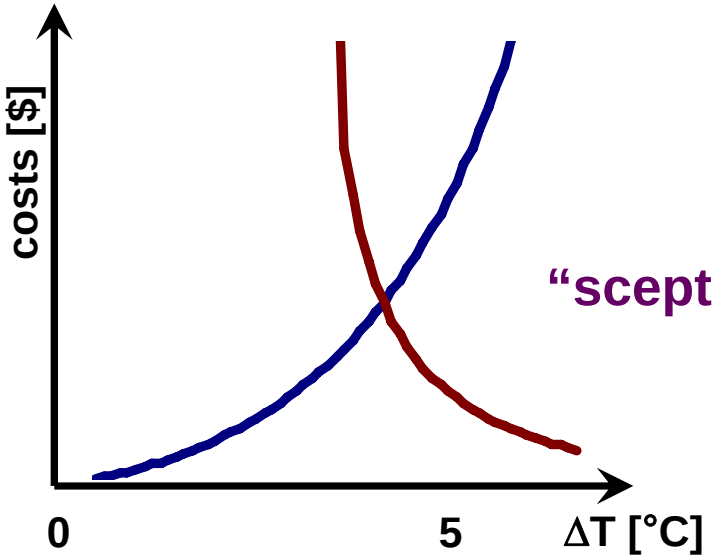


Different Perspectives

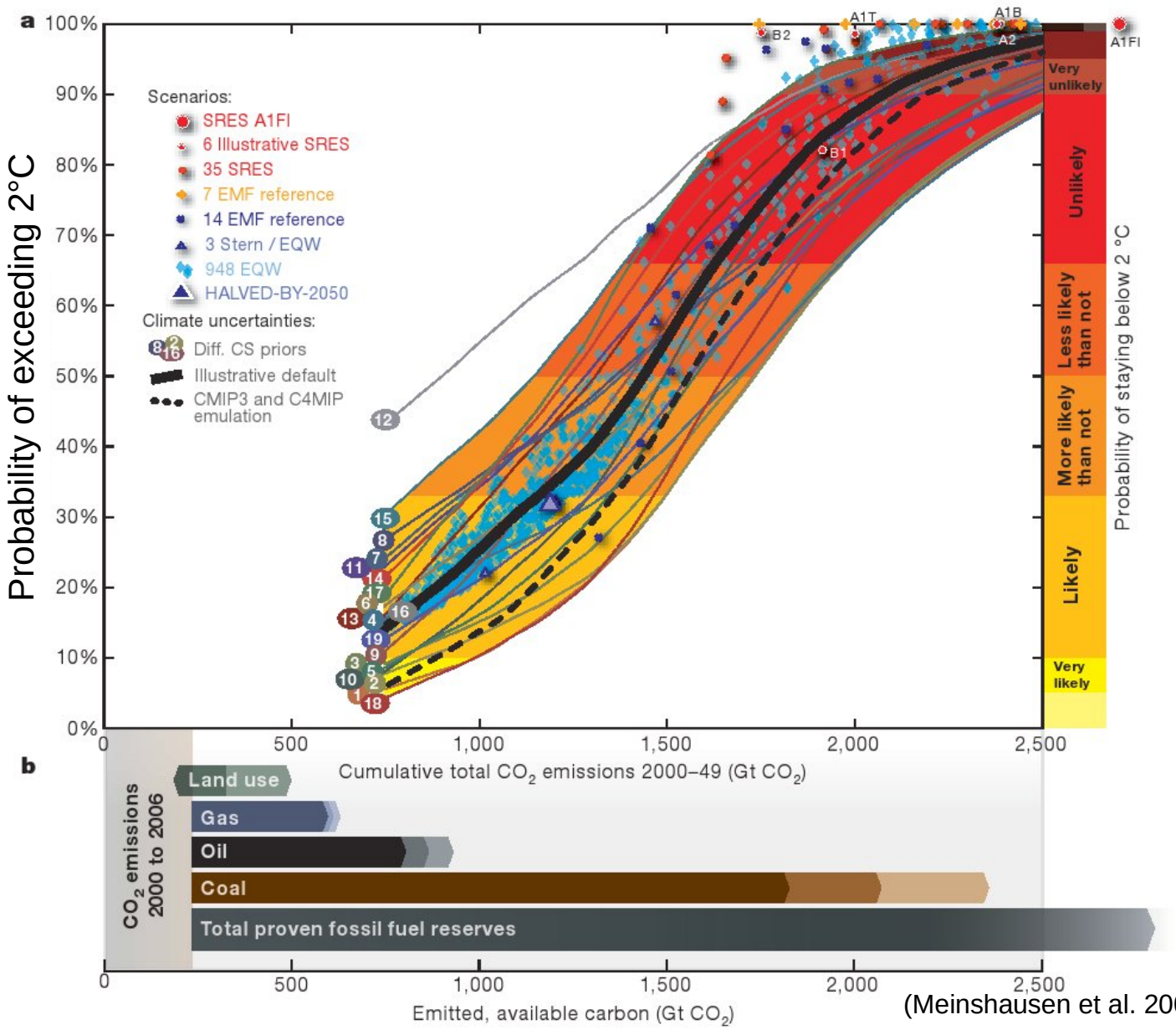








Climate Protection Implies a Remaining Stock of Emissions

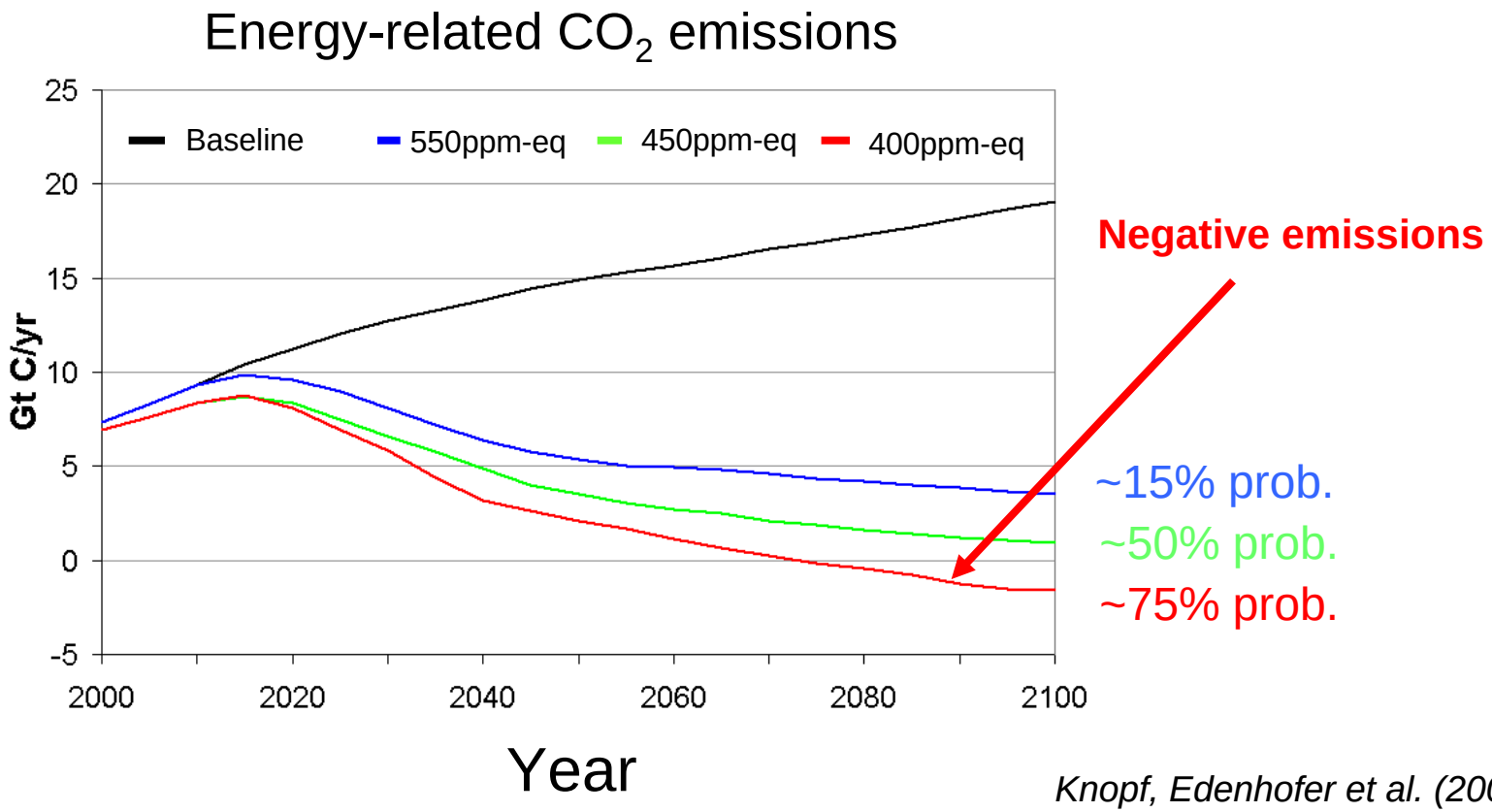


(Meinshausen et al. 2009)

The Economics of Atmospheric Stabilisation

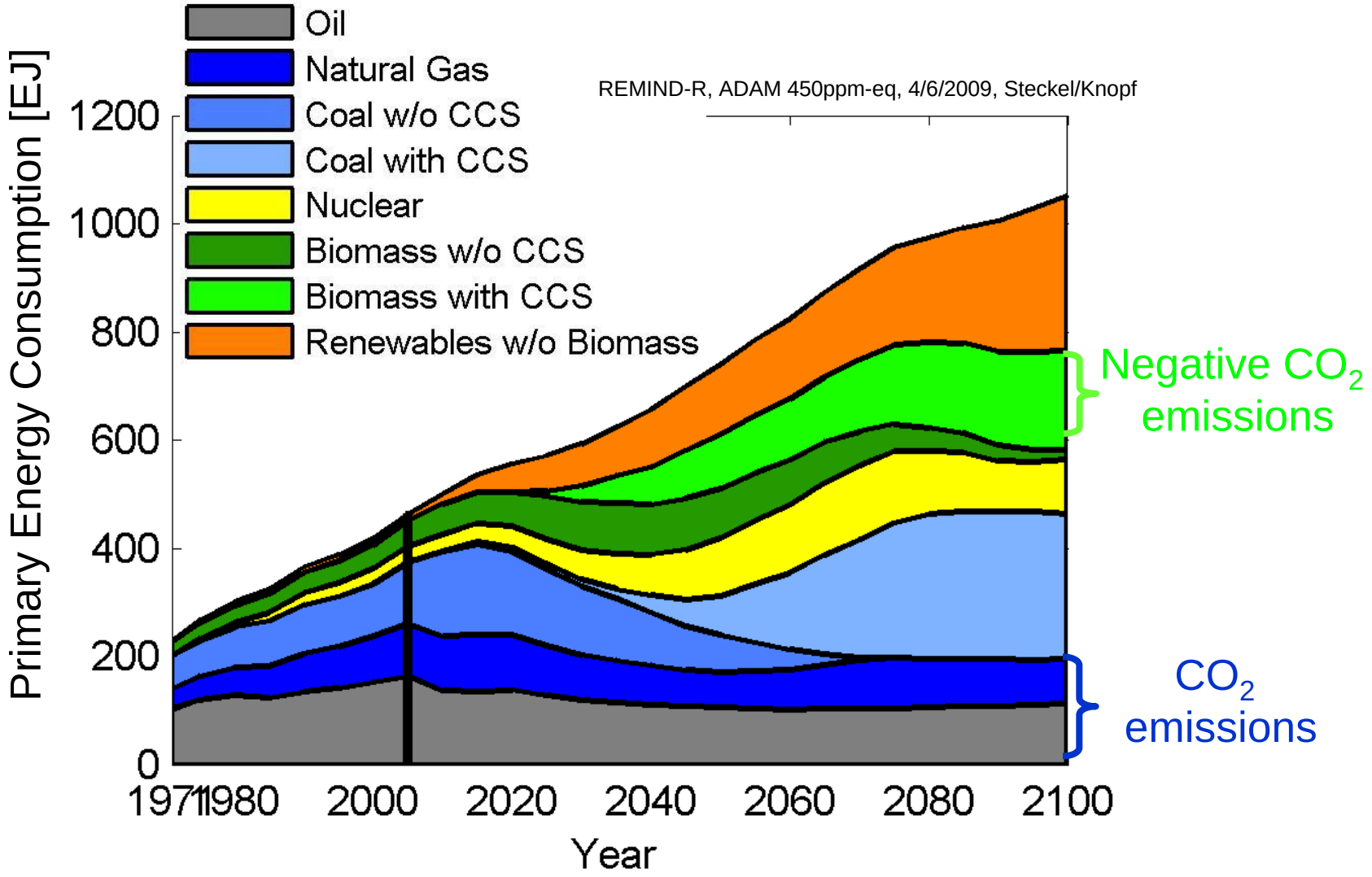
ADAM model comparison:

Analysis of 3 stabilisation targets with different probabilities to reach the 2° target: 550ppm-eq, 450ppm-eq, 400ppm-eq



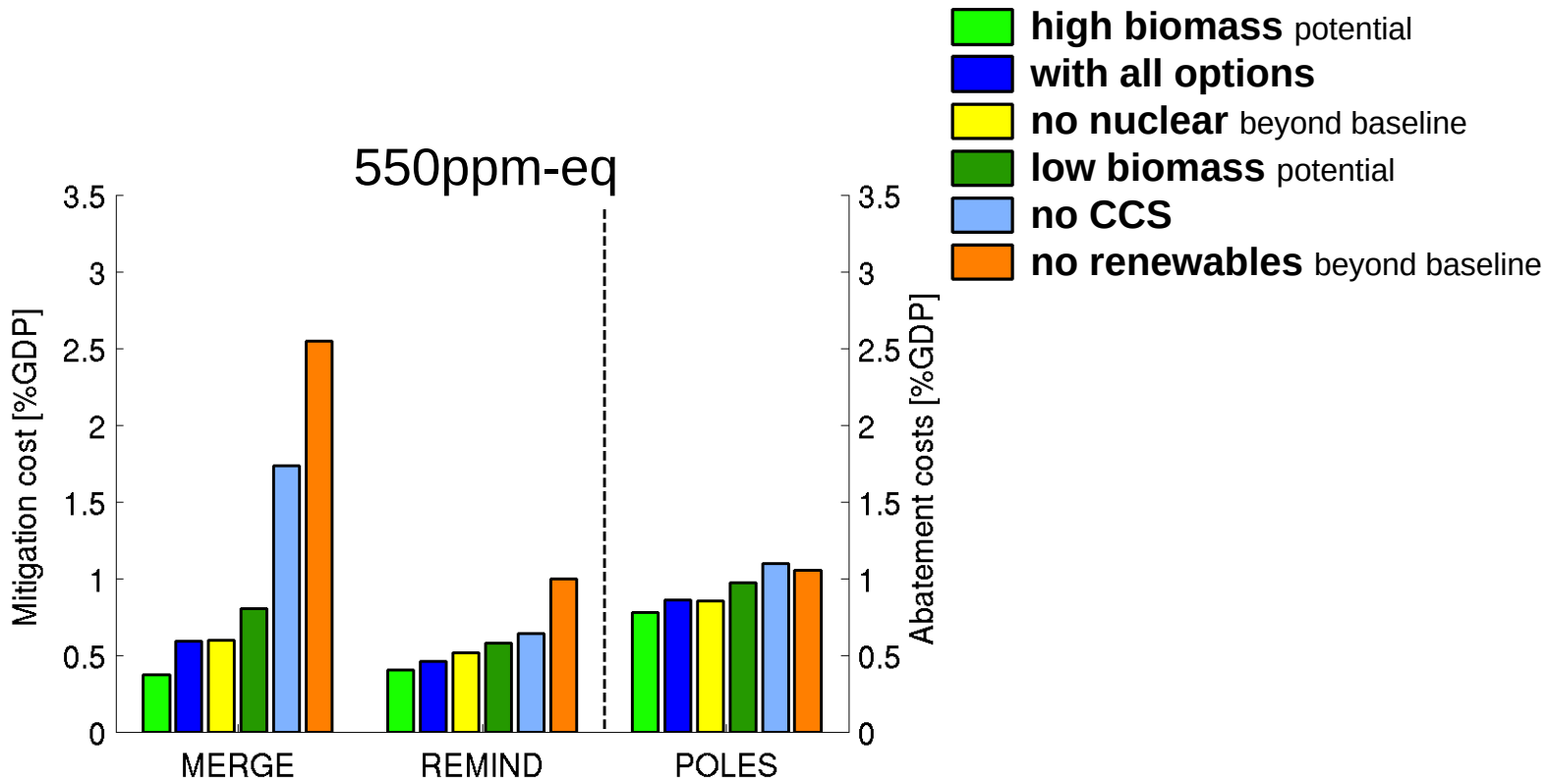
Knopf, Edenhofer et al. (2009)

The Great Transformation



Based on IEA Data (1971-2005) and REMIND-R results for 450ppm-eq (ADAM); Graphic by Steckel/Knopf (PIK)

Mitigation Costs: Technology Options, 550ppm

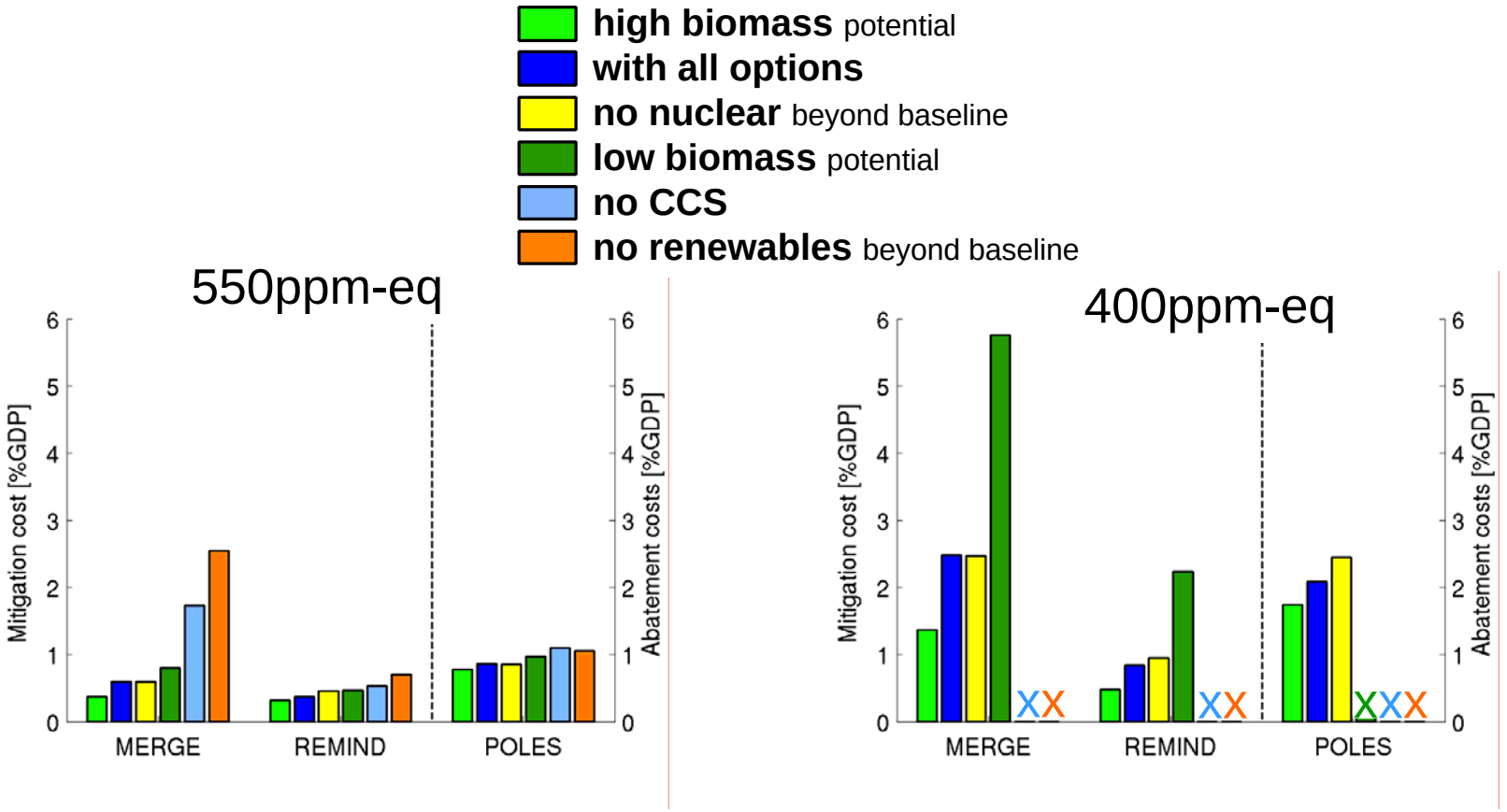


Knopf, Edenhofer et al. (2009)

➔ Renewables and CCS are the most important options

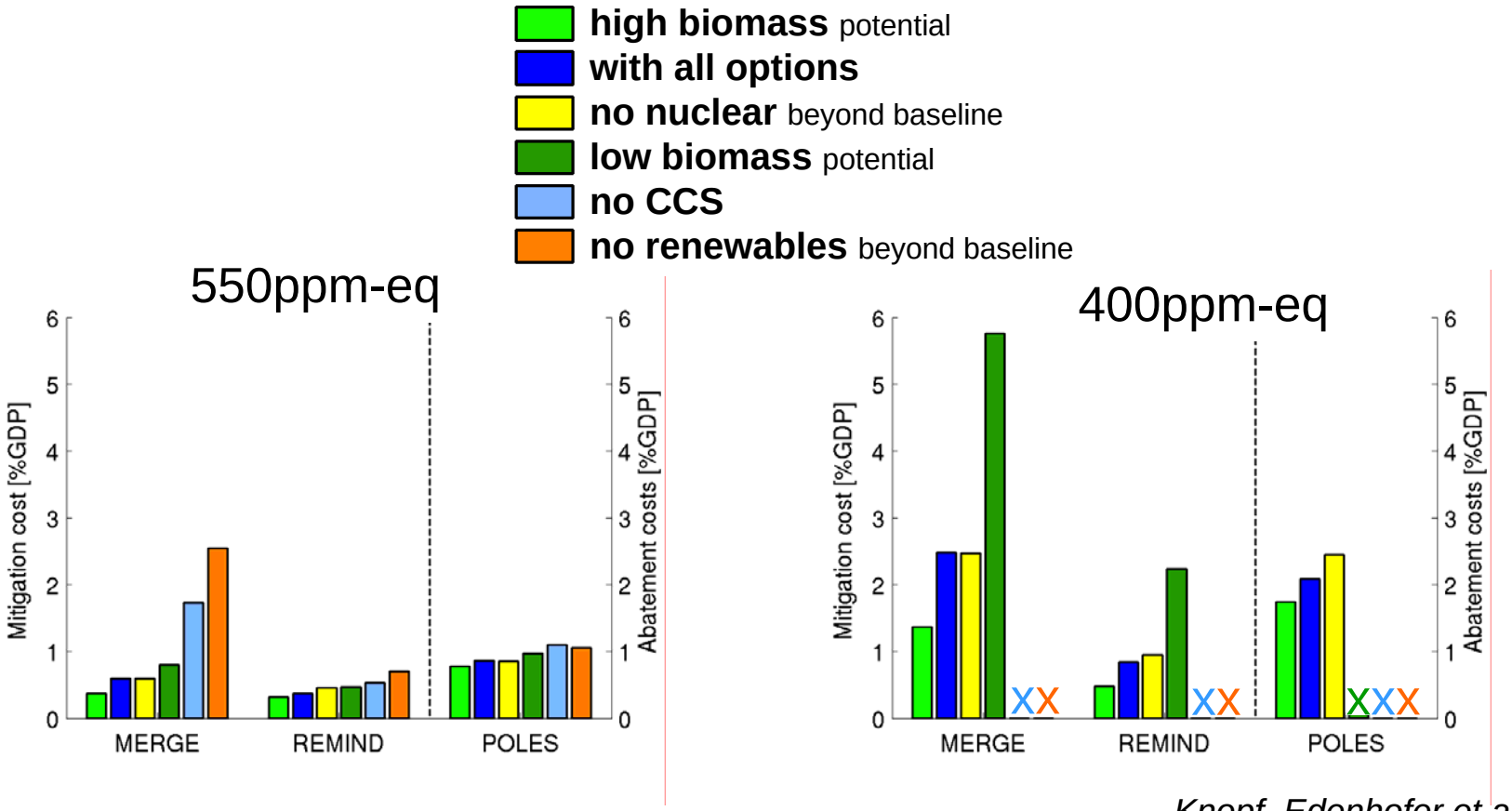
➔ Ranking of options: Robust picture throughout all models

Technology Options for Low Stabilisation



Knopf, Edenhofer et al. (2009)

Technology Options for Low Stabilisation



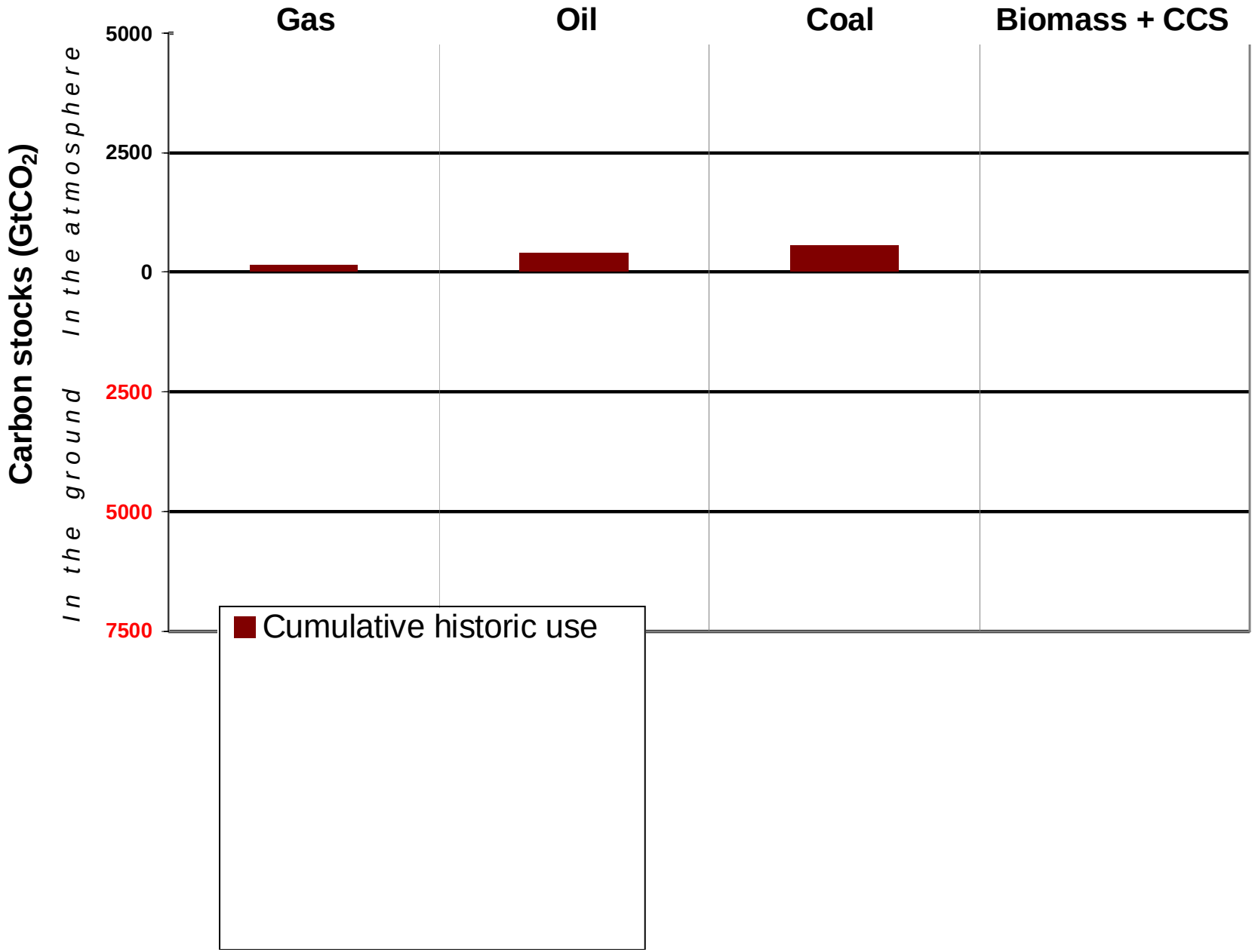
Knopf, Edenhofer et al. (2009)

➔ 400 ppm neither achievable without CCS nor without an extension of renewables

➔ Biomass potential dominates the mitigation costs of low stabilisation

➔ Nuclear is not important beyond its (high) use in the baseline

Limited Disposal Space of the Atmosphere…



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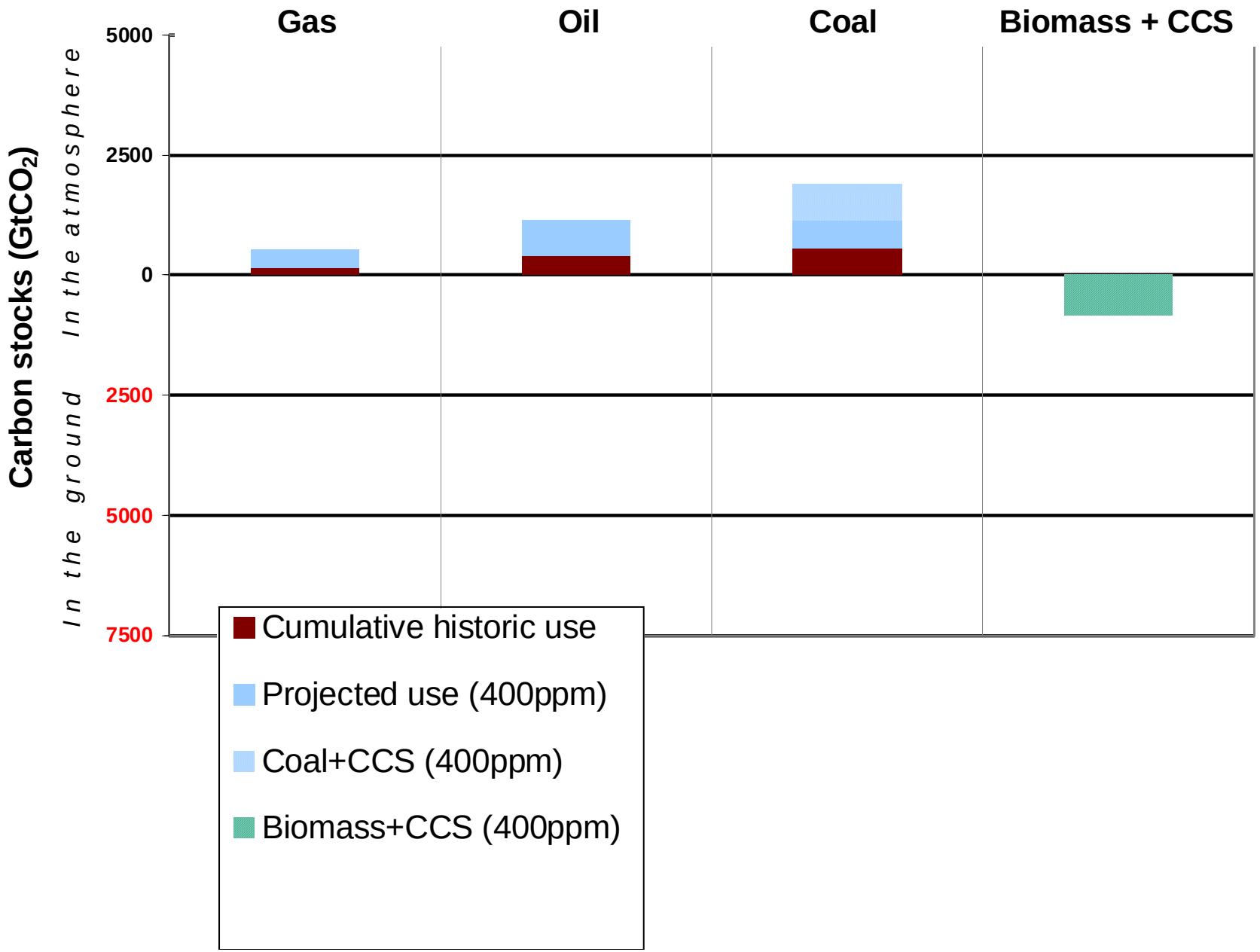

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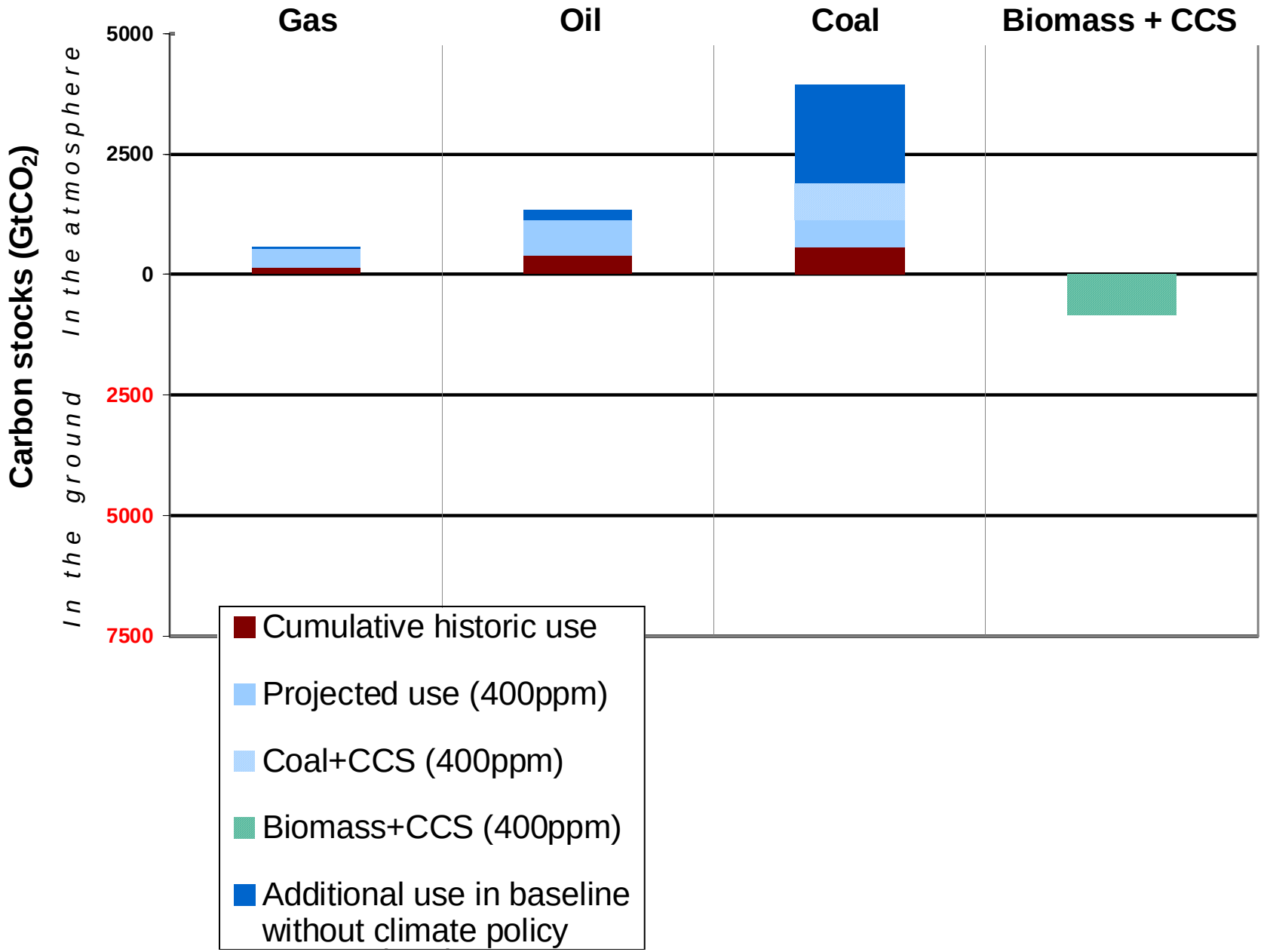
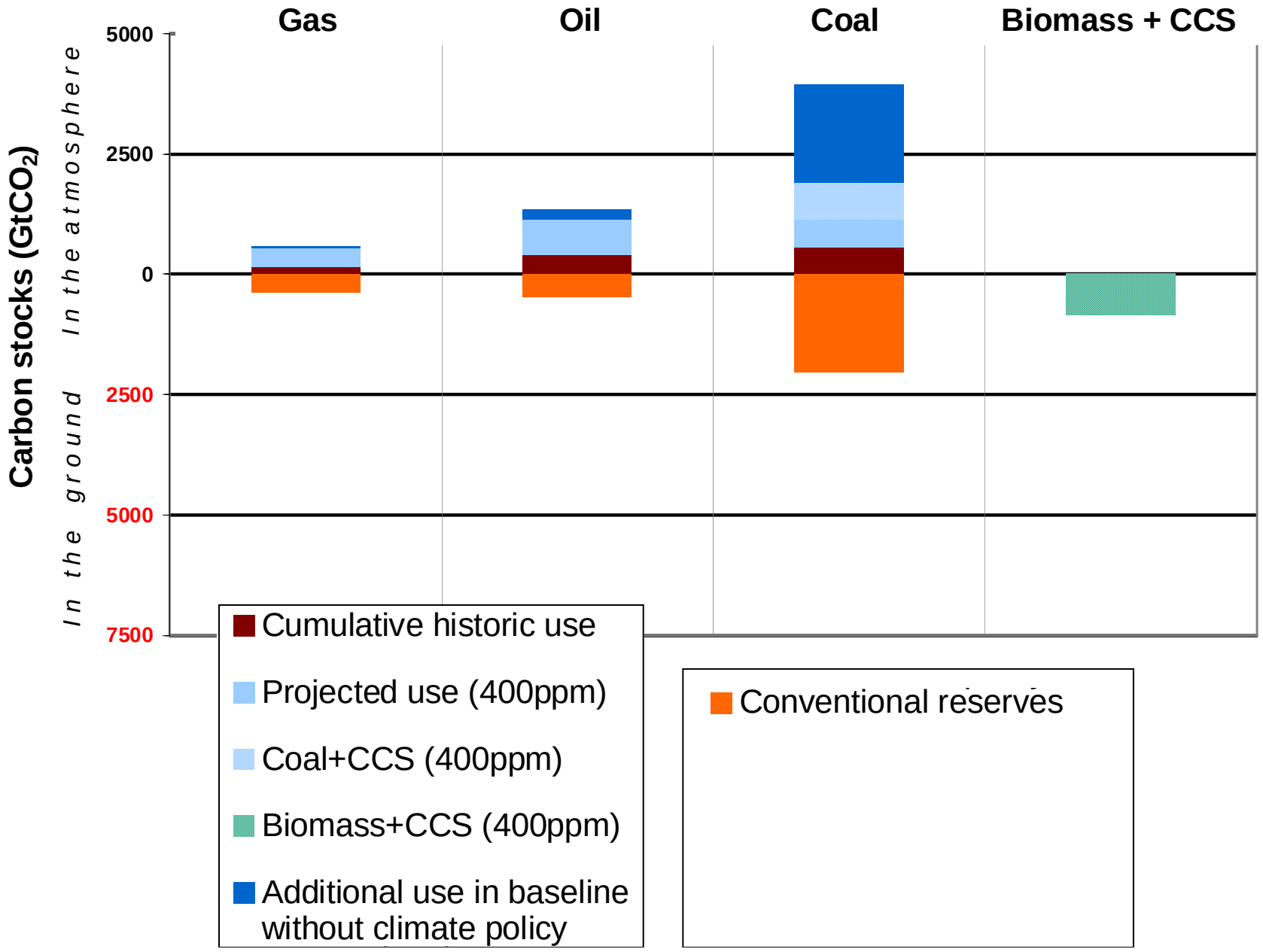
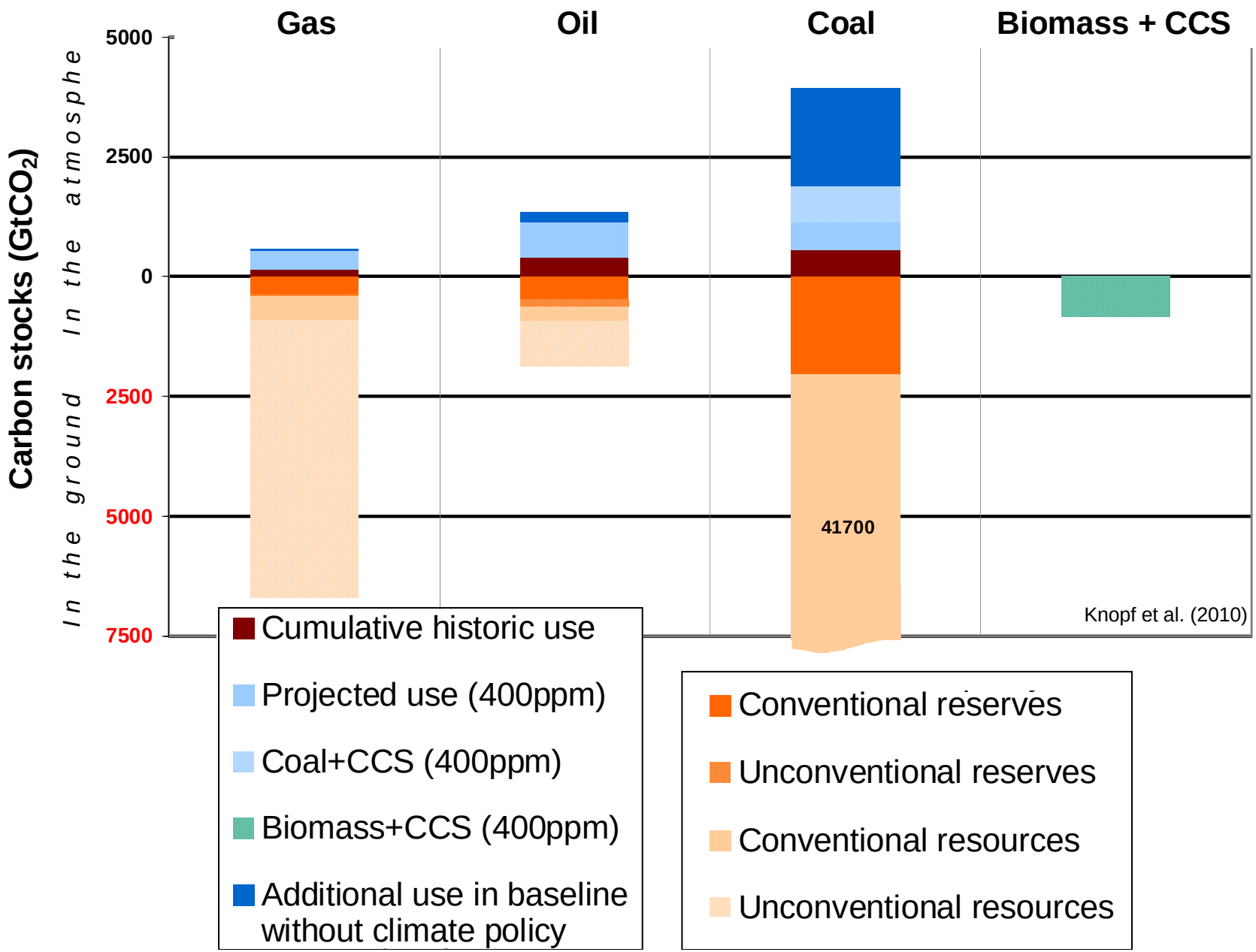


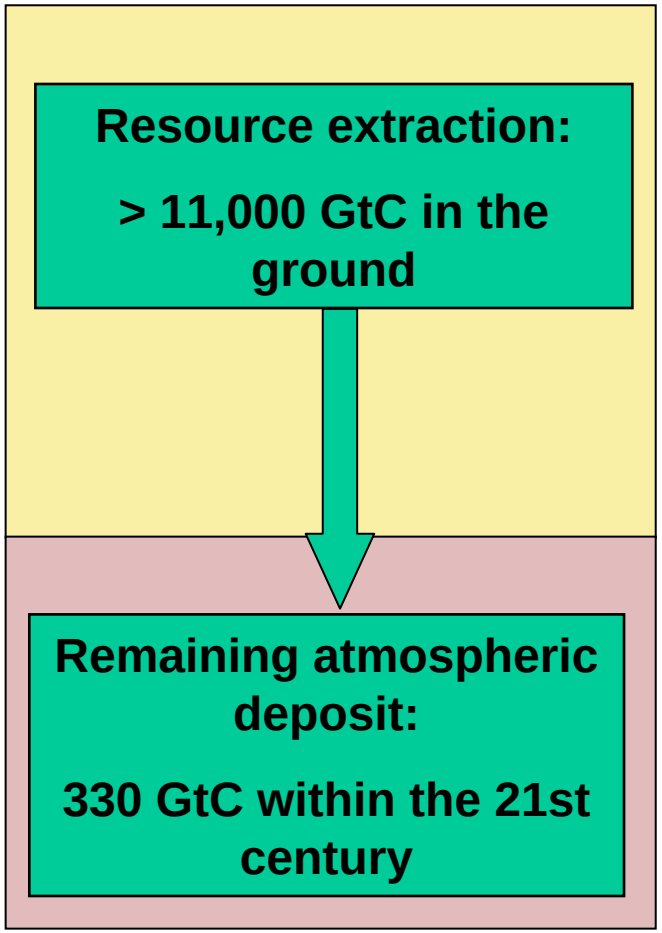
…Unlimited Fossil Resources



…Unlimited Fossil Resources



The Economics of Climate Mitigation



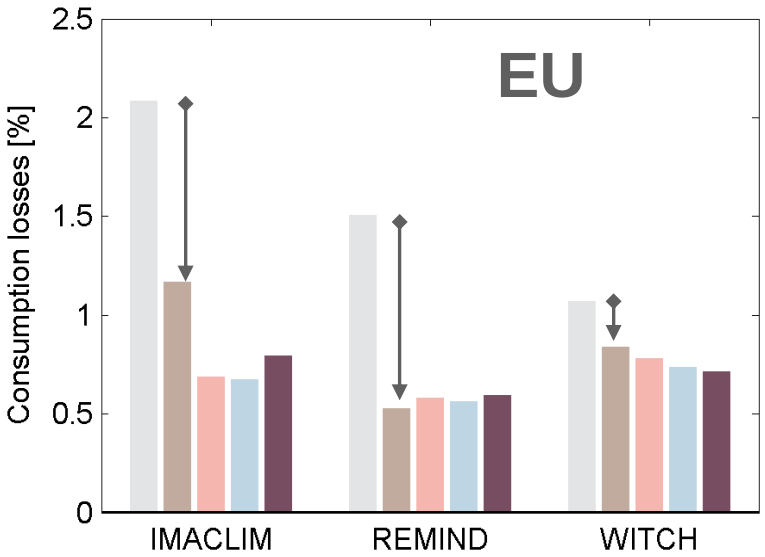
Issuing of permits in accordance with the remaining atmospheric deposit:

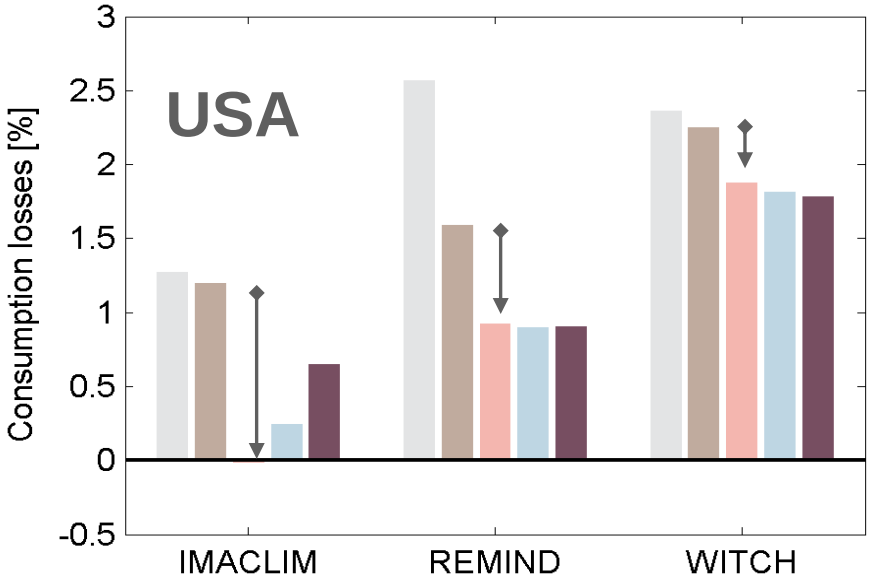
1) Dividing the global budget into national budgets by international negotiations

2) International and intersectoral permit trade for a cost-effective achieving of the budget

3) Long-term credibility of the budget

The Case for Early Action





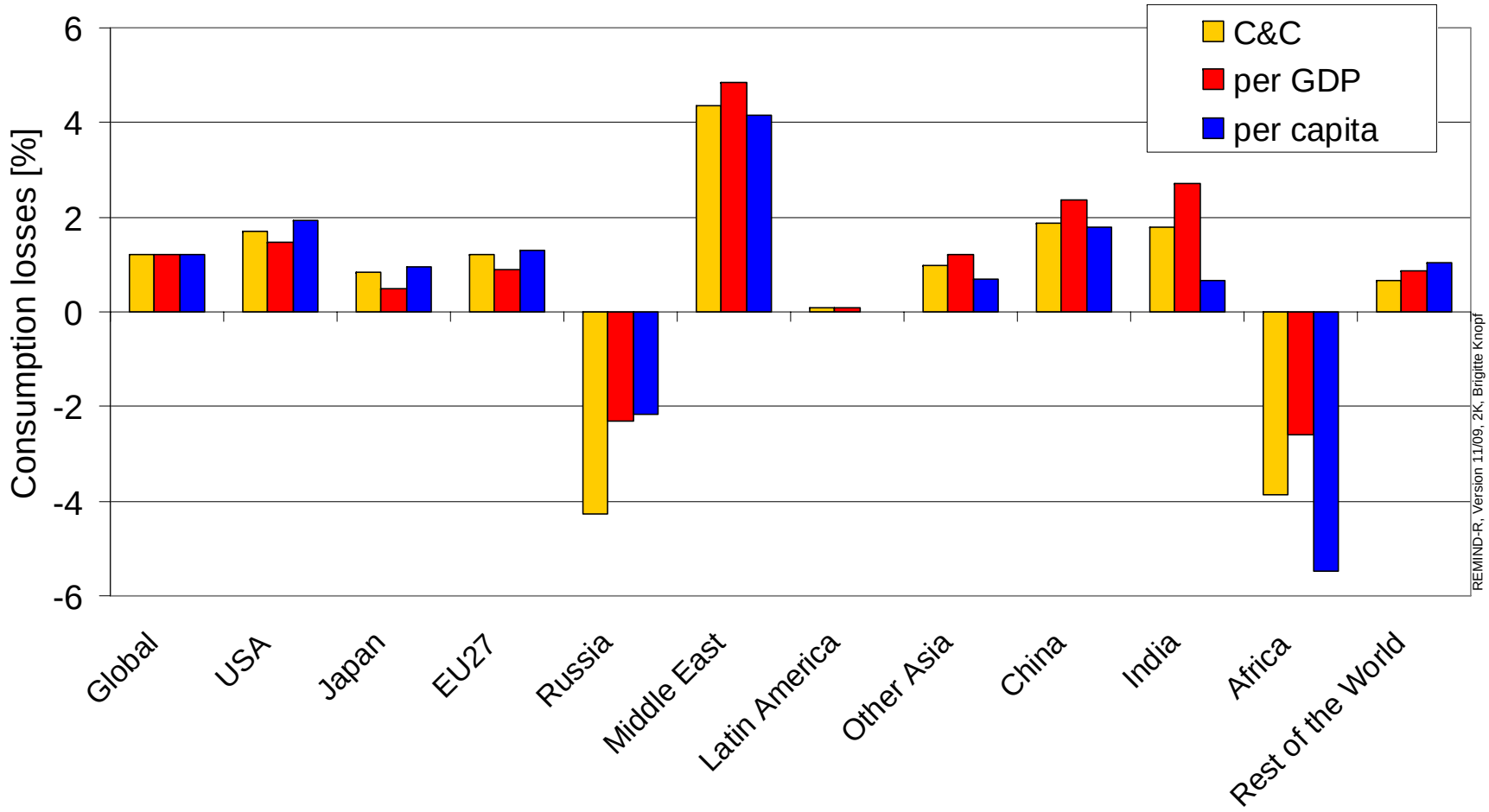
Delay 2020
EU 2010, others 2020
Annex I 2010, others 2020
Annex I + CHN + IND 2010
All 2010

Luderer et al., 2009;
Jakob et al., in prep.

➔ If a global climate agreement is delayed until 2030, stabilization at 450ppm CO_2 or below will become infeasible

➔ The EU and USA enjoy a 'first mover advantage', i. e. lower mitigation costs even if other countries start later → benefit of anticipation

Regional Mitigation Costs: Winners and Losers



Edenhofer et al., 2009

Roadmap for a Global Deal