POTSDAM INSTITUTE FOR CLIMATE IMPACT RESEARCH

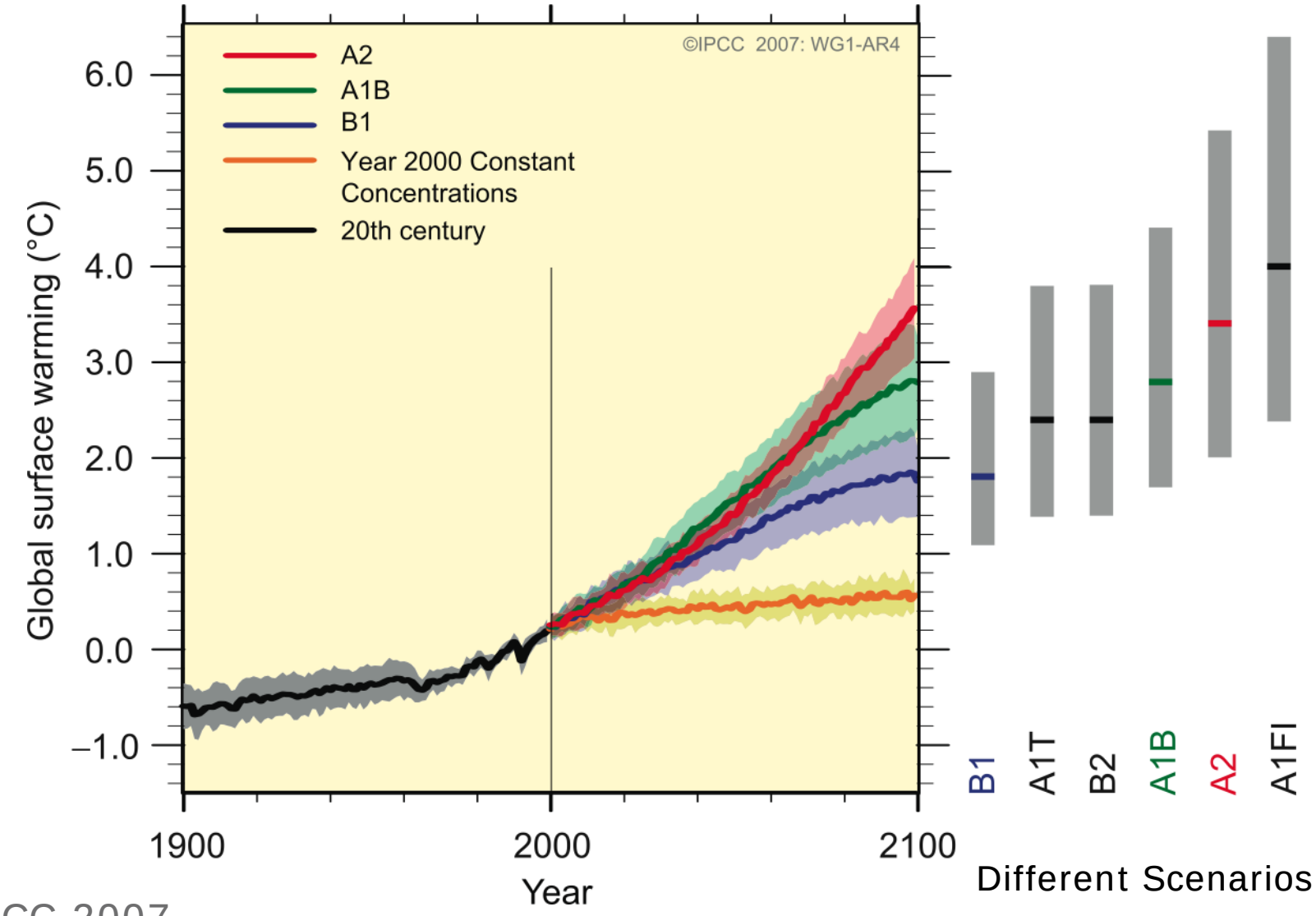
Prof. Dr. Ottmar Edenhofer

A Sustainable Future: Stabilising the Climate and Transforming the Energy System

Berlin, 7 April 2011

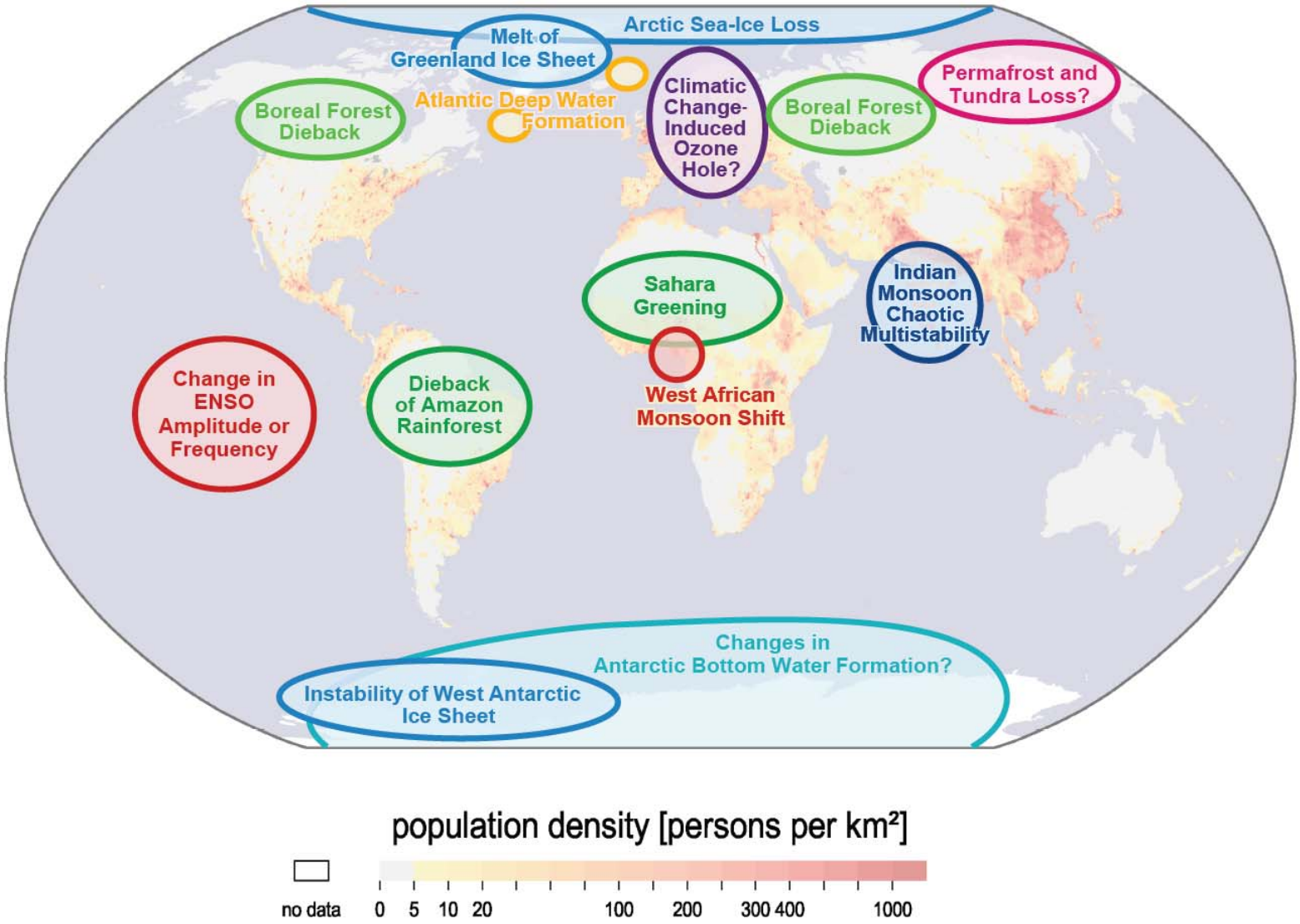
International Conference on Micro Perspectives for Decentralized Energy Supply

Projections of Global Mean Temperature



IPCC 2007

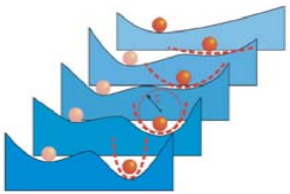
Tipping Points in the Earth System

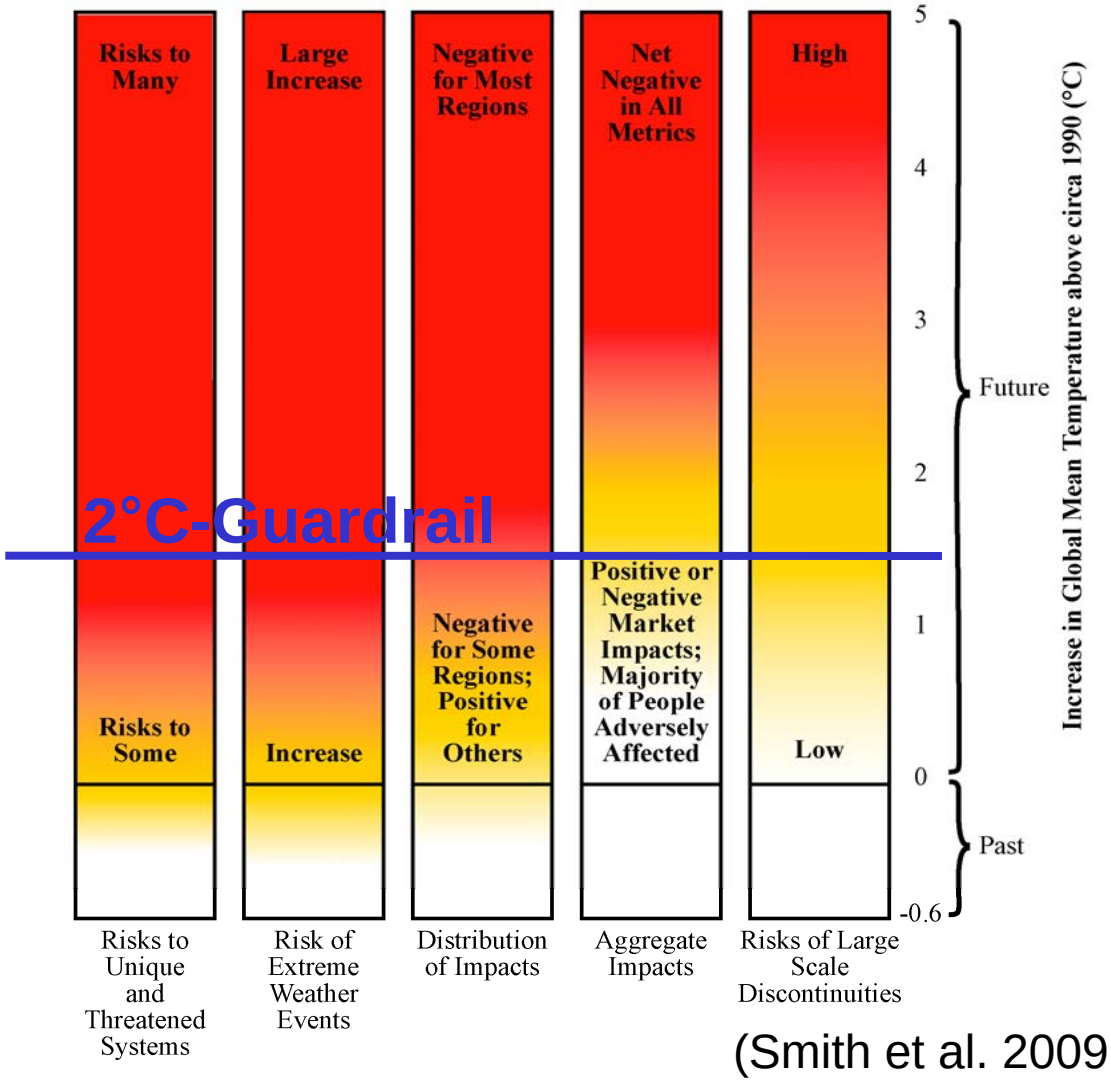


T. M. Lenton & H. J. Schellnhuber (Nature Reports Climate Change, 2007)

Why 2°C?

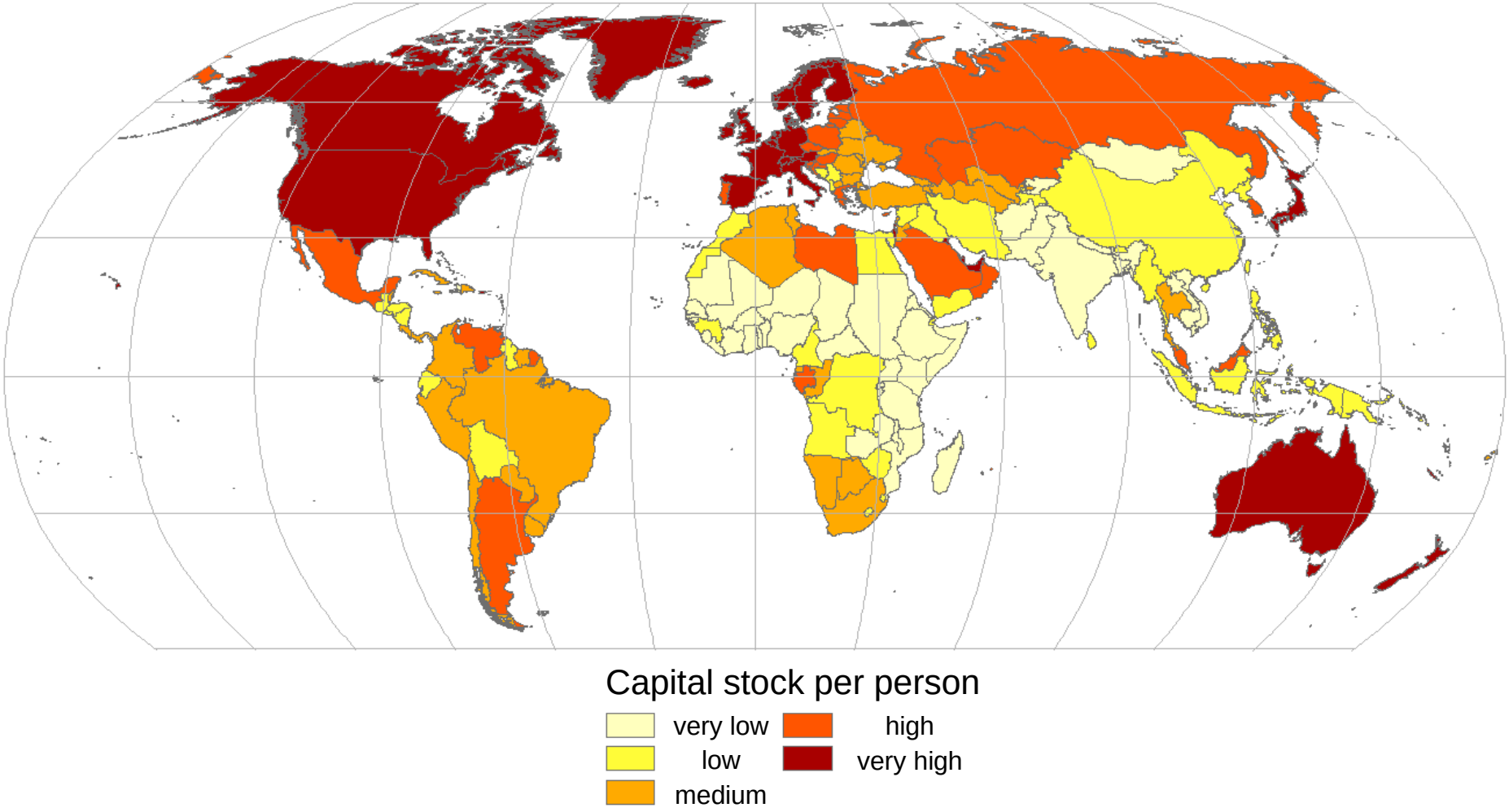
Global Damage is a Highly Non-Linear Function of ΔGMT





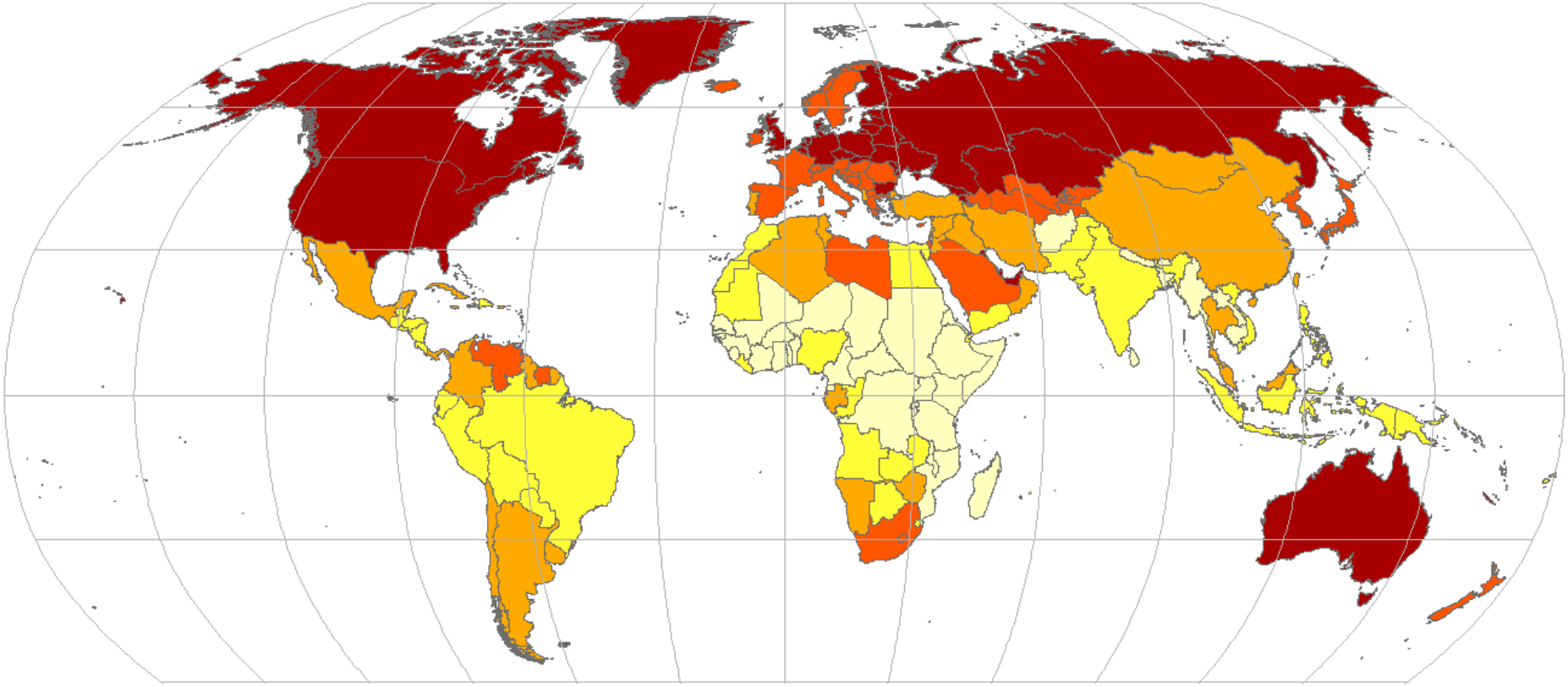
(Smith et al. 2009 PNAS)

World Map of Wealth



Source: Füssel (2007)

World Map of Carbon Debt

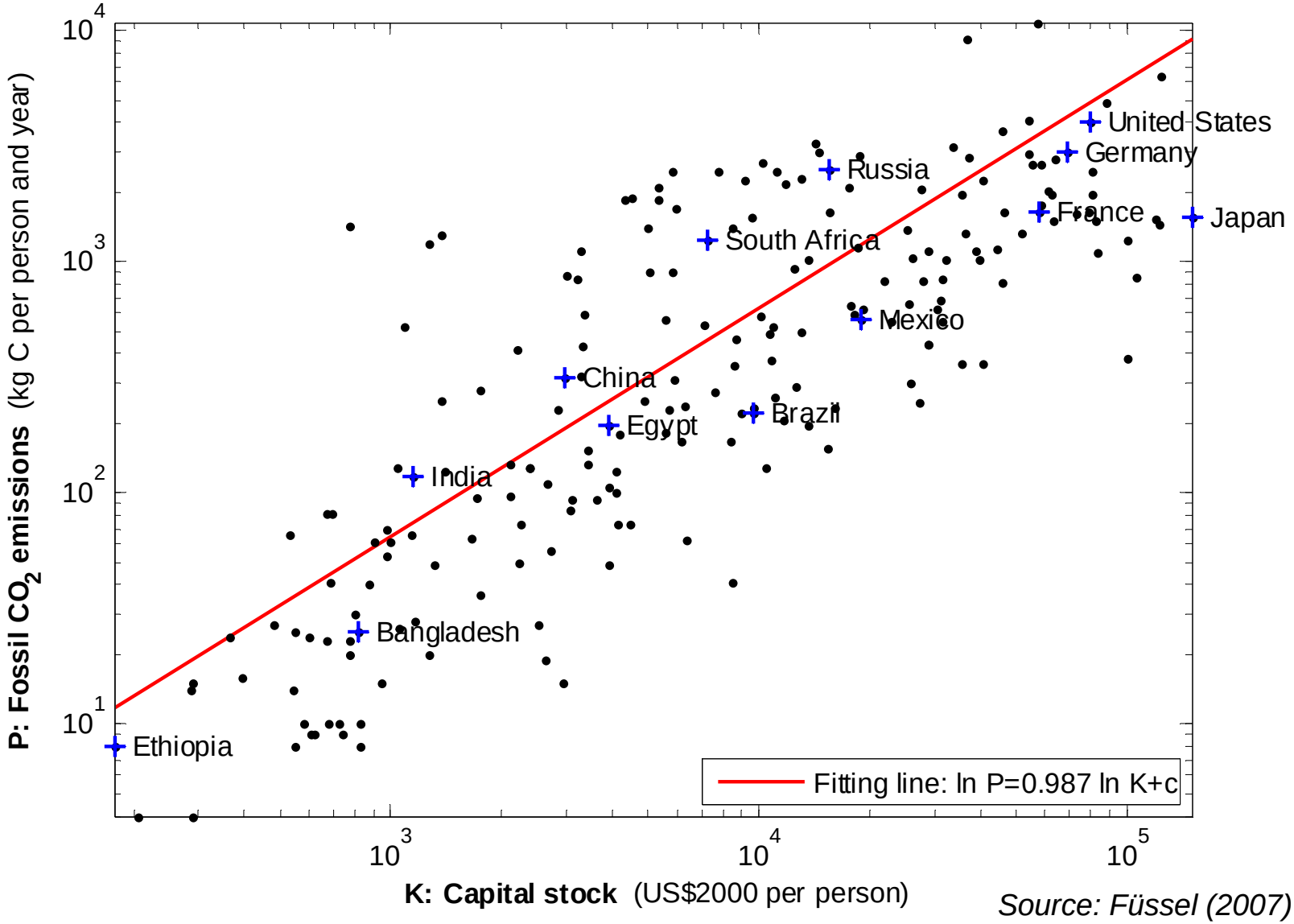


Carbon emissions per person from fossil fuel burning (1950-2003)

very low
low
medium
high
very high

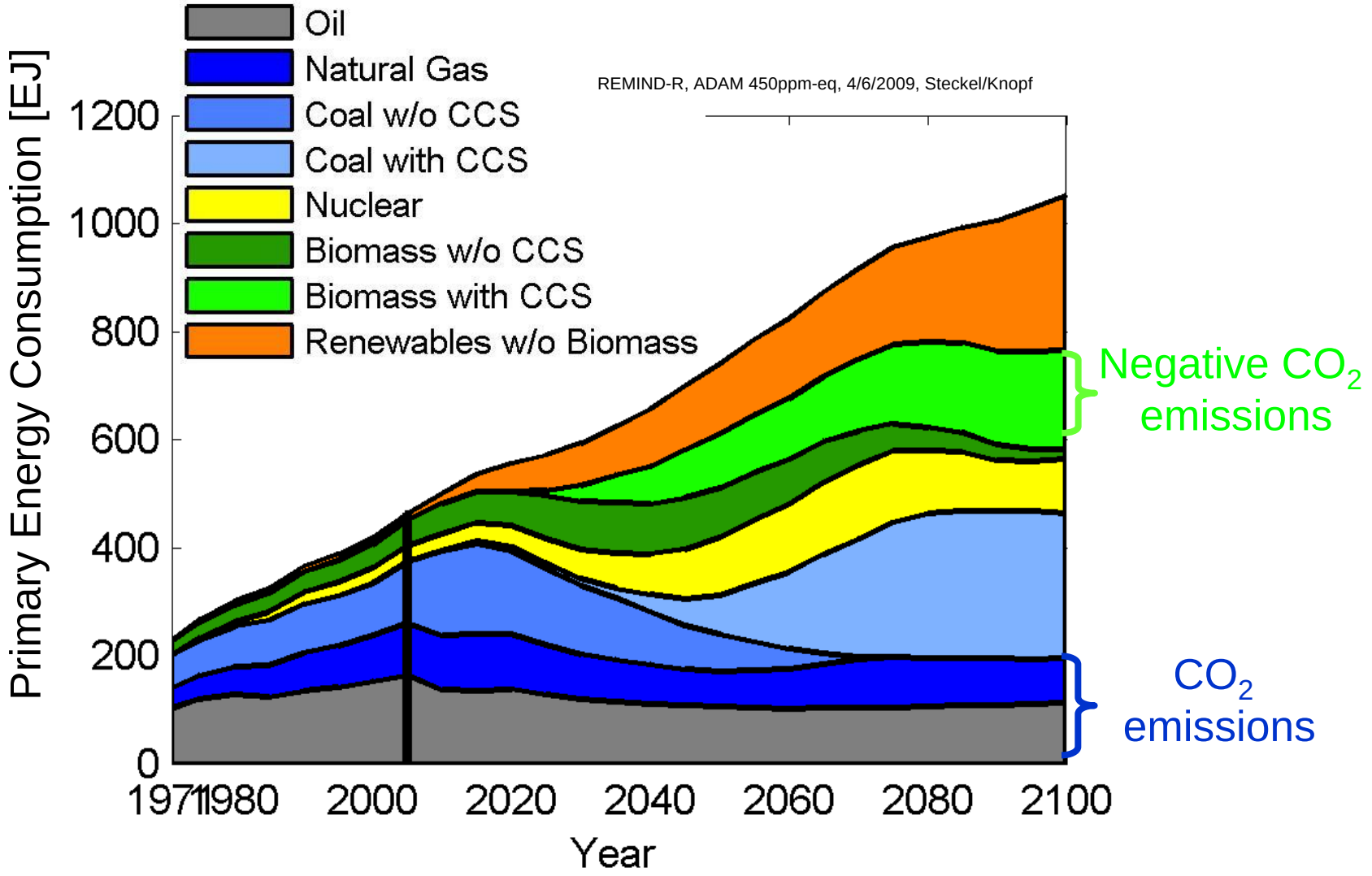
Source: Füssel (2007)

Carbon Debt and Wealth



Source: Füssel (2007)

The Great Transformation



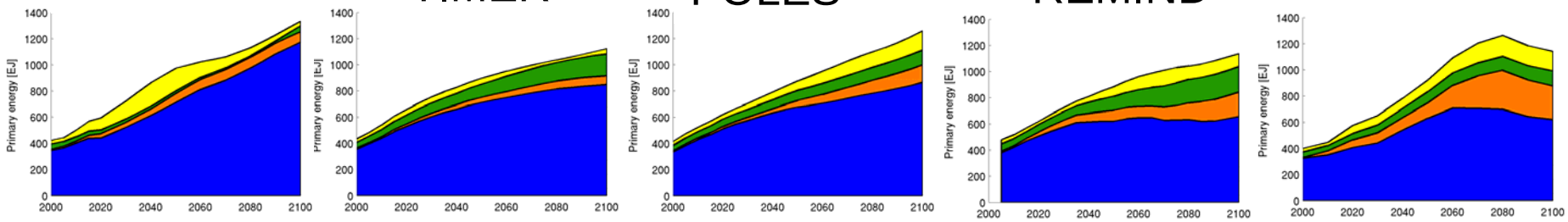
Based on IEA Data (1971-2005) and REMIND-R results for 450ppm-eq (ADAM); Graphic by Steckel/Knopf (PIK)

Transformation of the Energy System

models →

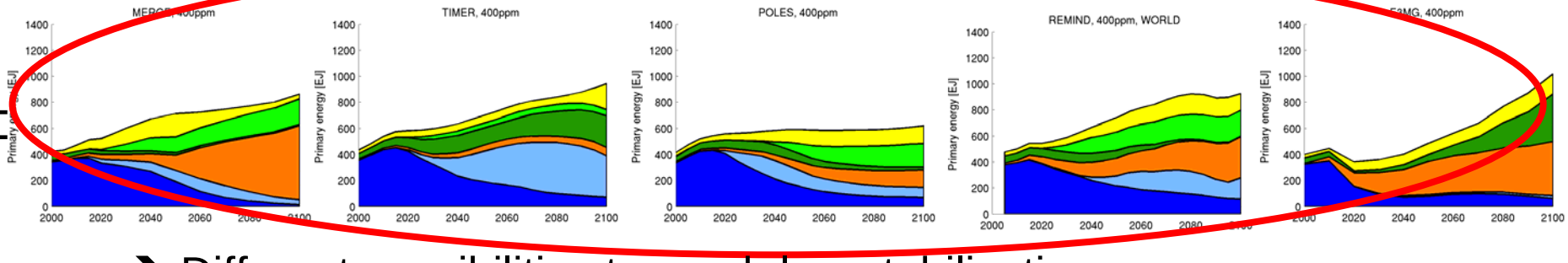
Baseline

MERGE | TIMER | POLES | REMIND | E3MG



Many different pathways to transform the energy system

400 ppm-eq



➔ Different possibilities to reach low stabilisation

➔ 400ppm can be achieved by all models

(Knopf, Edenhofer et al. 2009)

Fukushima, 10 March 2011

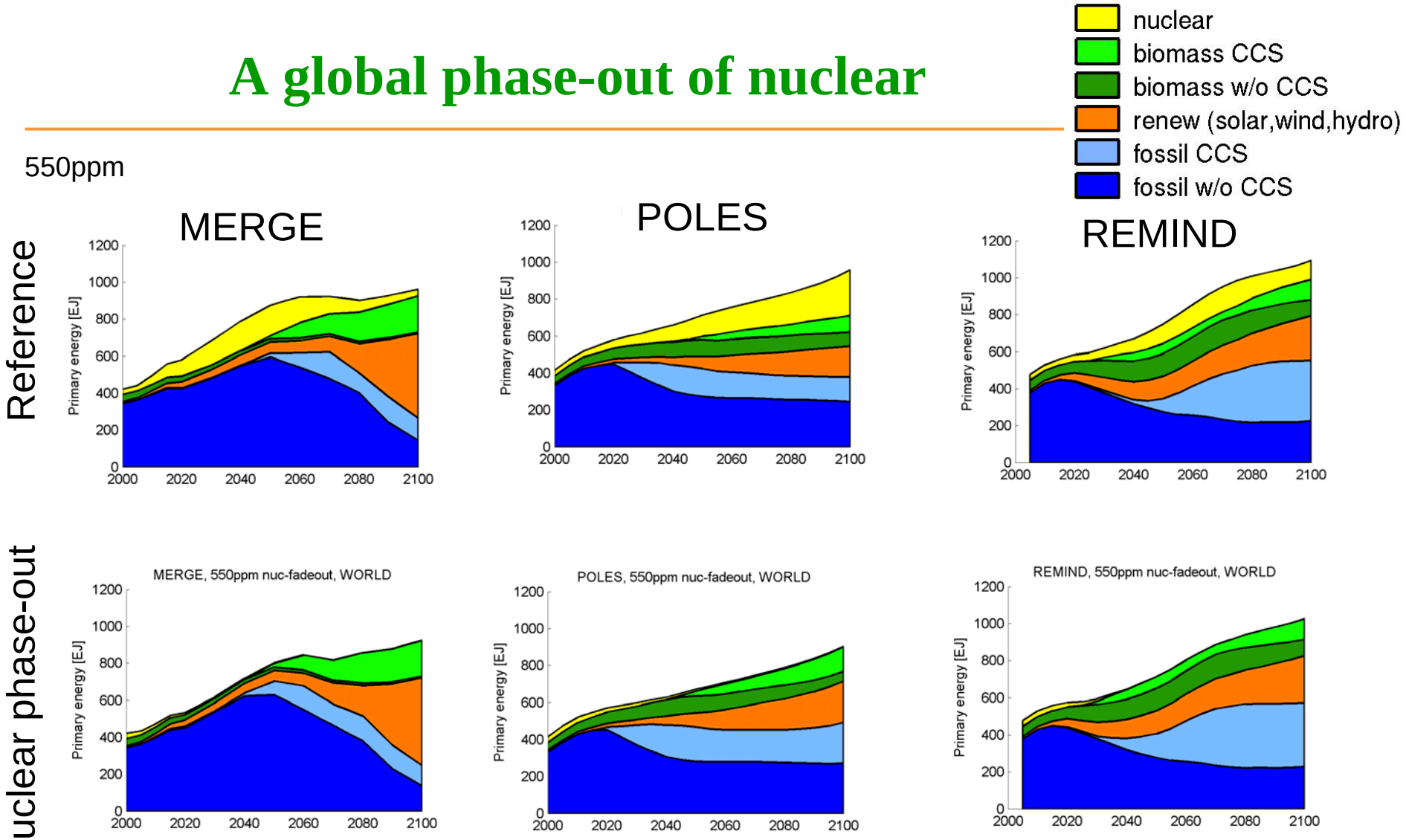
Seemingly safe and clean…

Fukushima, 16 March 2011

…evidently not!

A global phase-out of nuclear

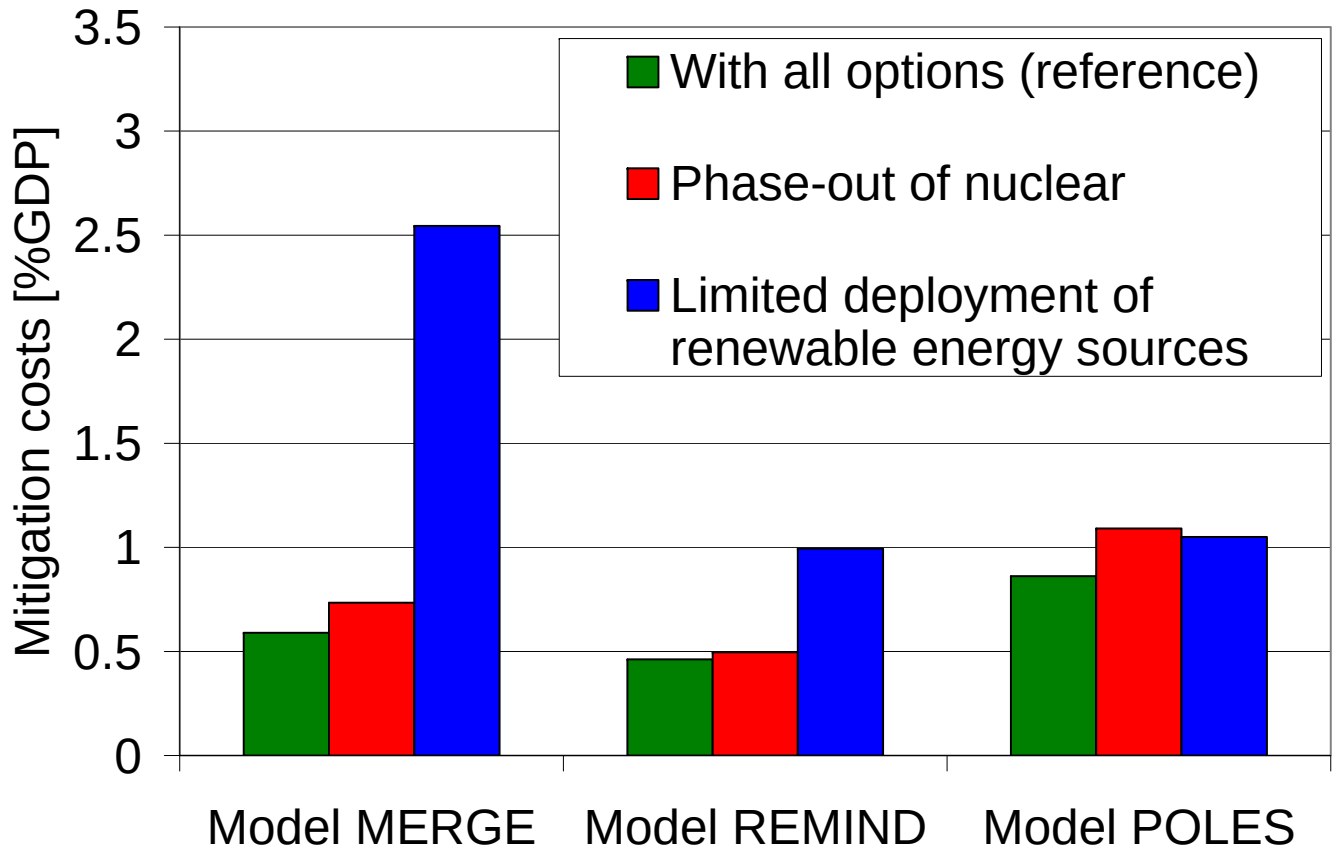
550ppm



➔ With a nuclear phase-out, CCS and renewable energy sources become more important

Edenhofer et al. 2010

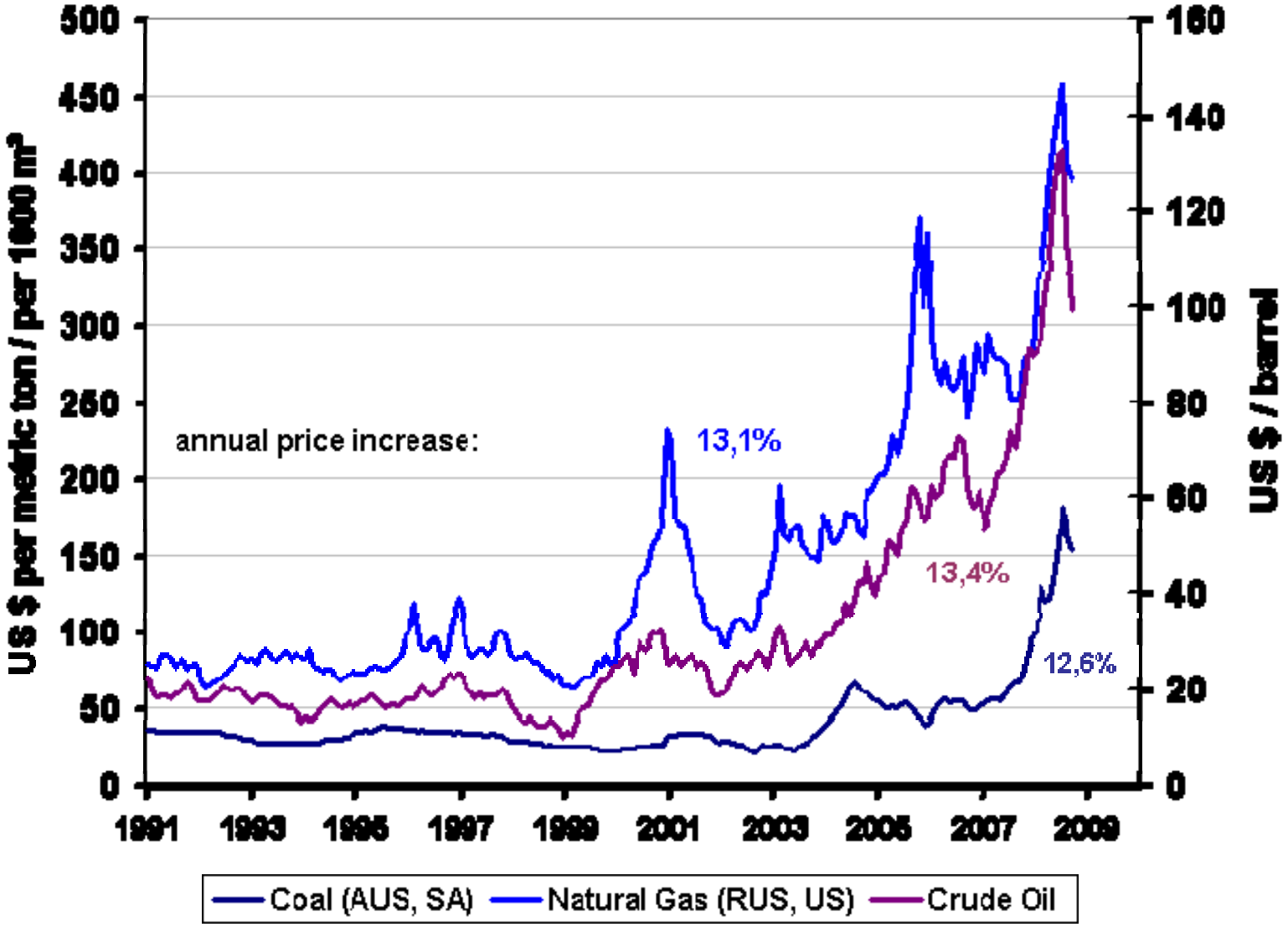
A global phase-out of nuclear is affordable



➔ Mitigation costs increase only moderately when abandoning additional deployment of nuclear energy but increase considerably when only limited deployment of renewable energy sources is possible

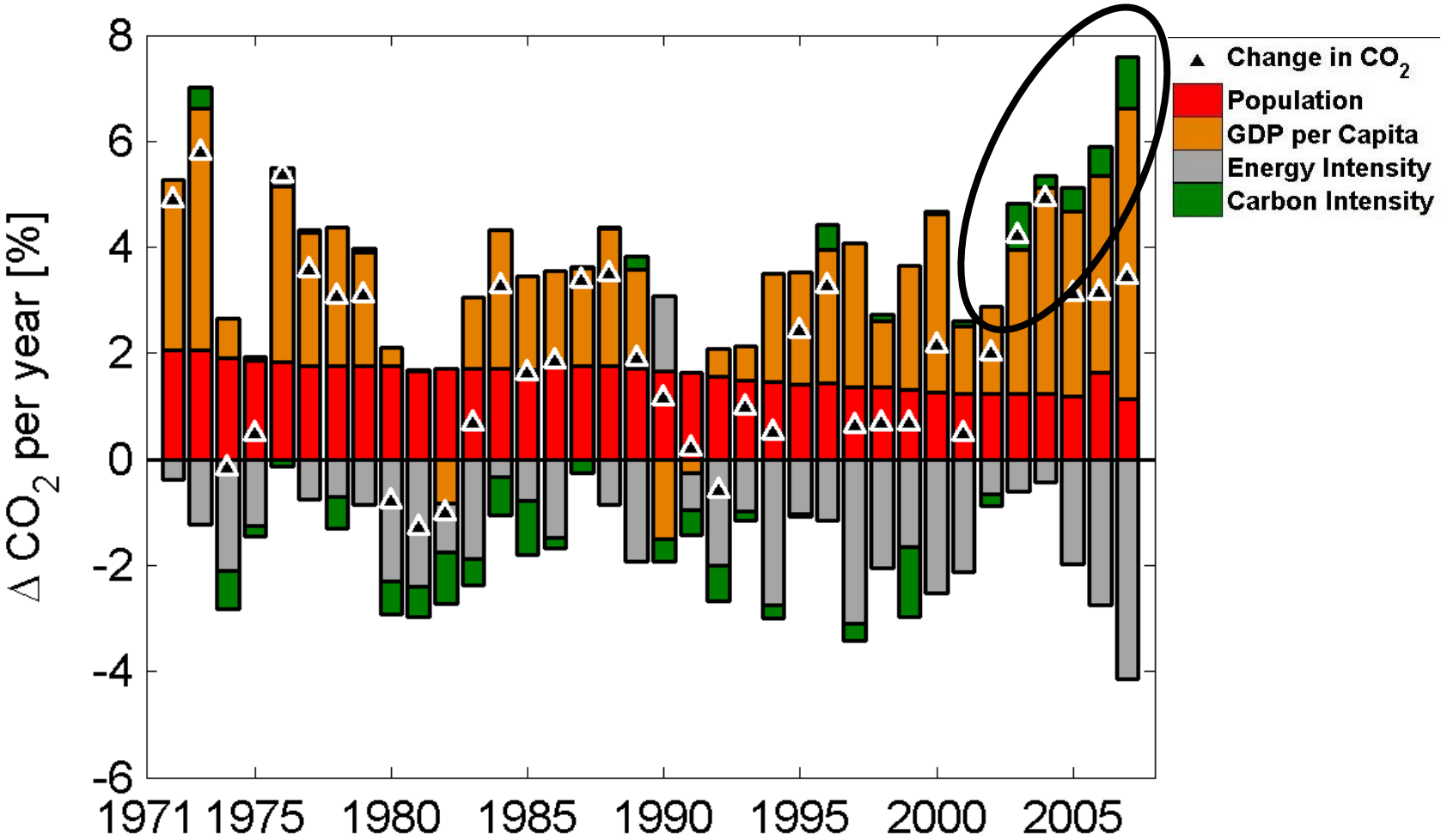
Edenhofer et al. 2010

Global Fossil Fuel Prices 1991 - 2008

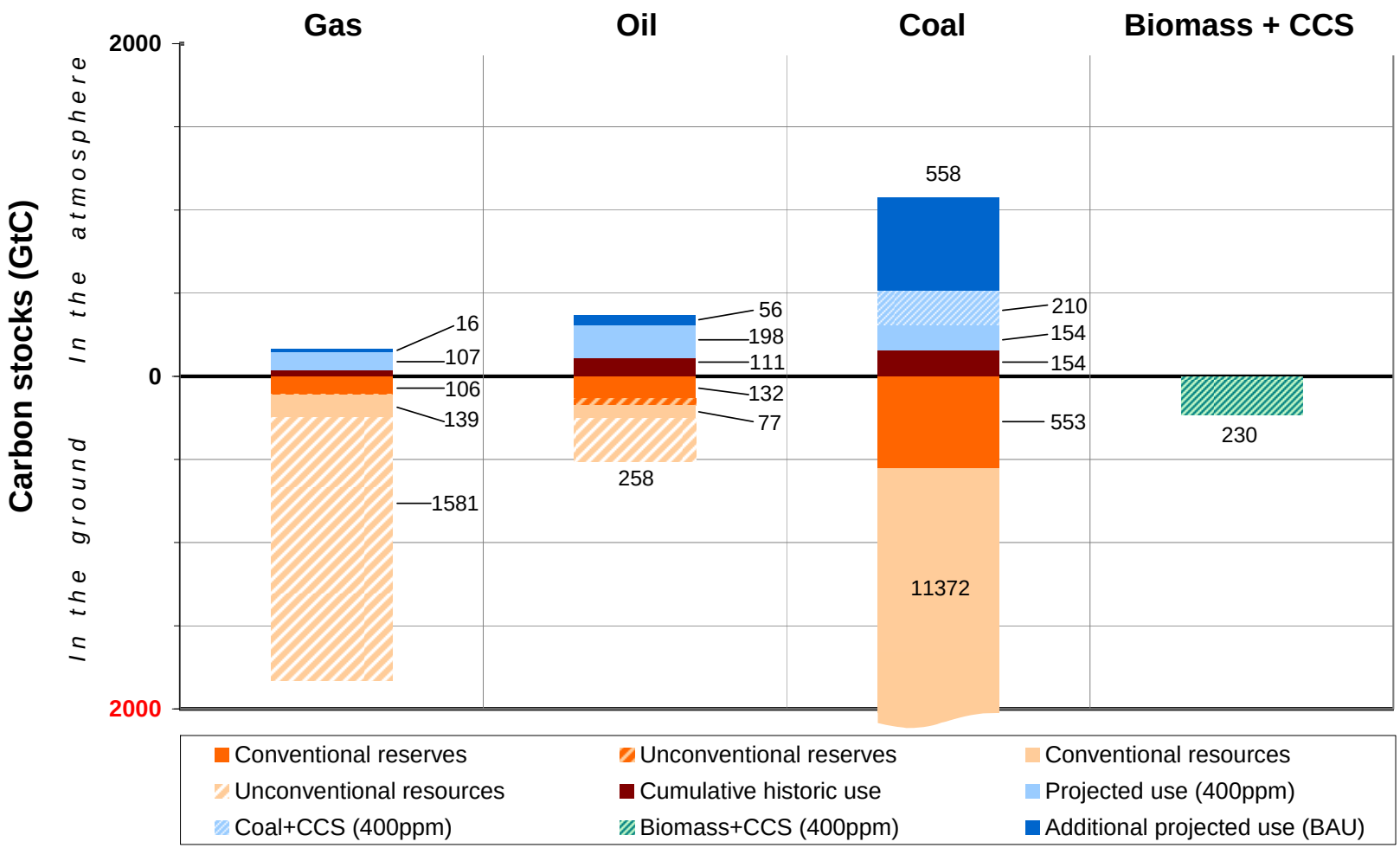


Source: IMF International Commodities Database

Renaissance of Coal



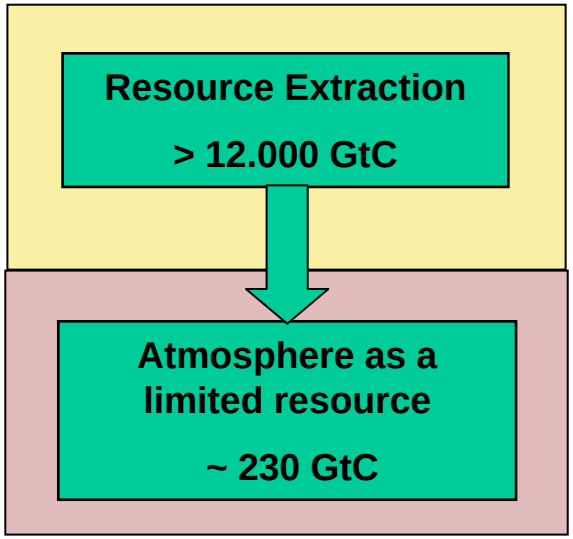
The Supply Side of Global Warming



Cumulative historic carbon consumption (1750-2004), estimated carbon stocks in the ground and estimated future consumption (2005-2100) for business-as-usual (BAU) and ambitious 400-ppm-CO_2-eq. scenario

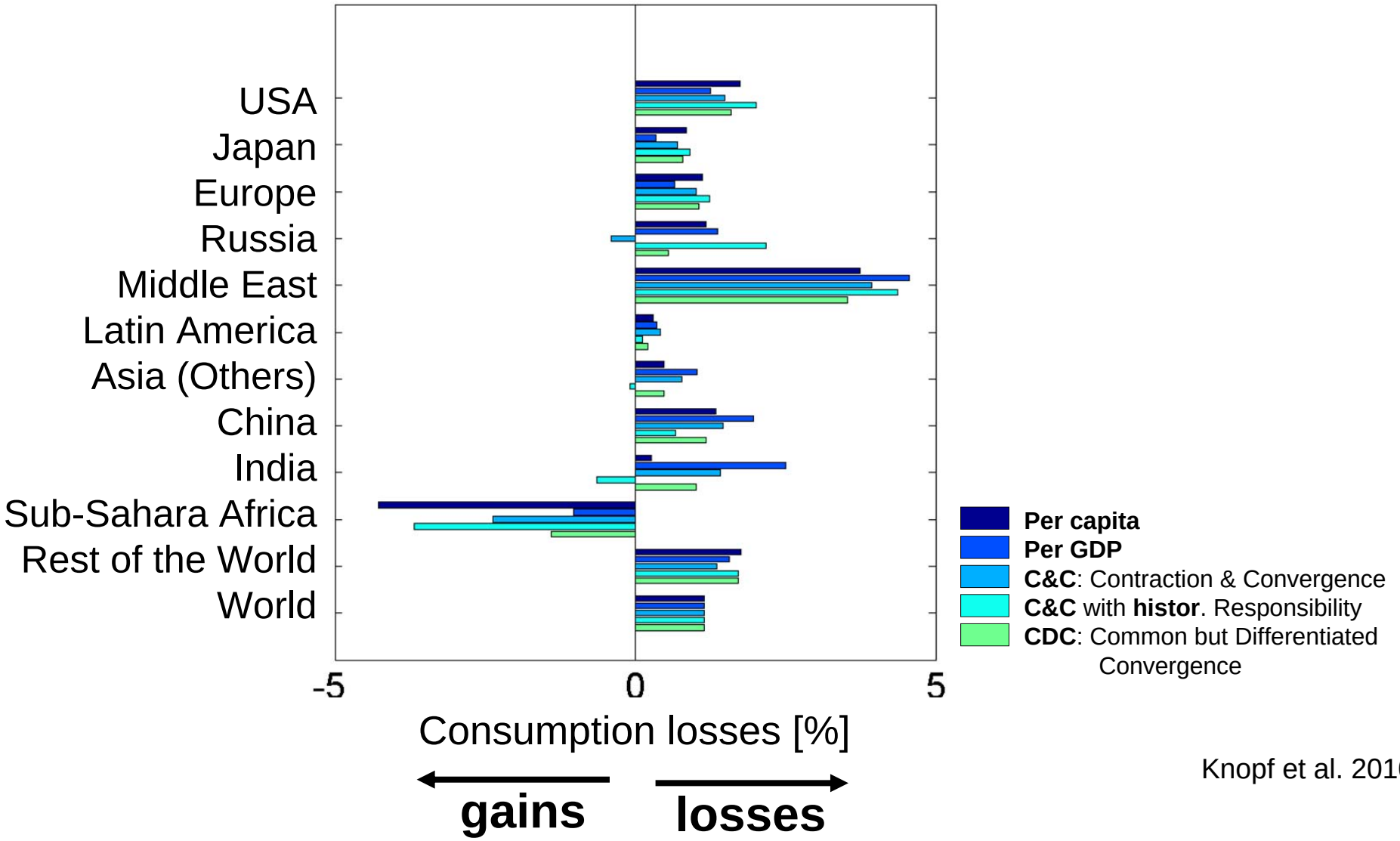
Source: Kalkuhl, Edenhofer and Lessmann, 2009

Atmosphere As a Global Common



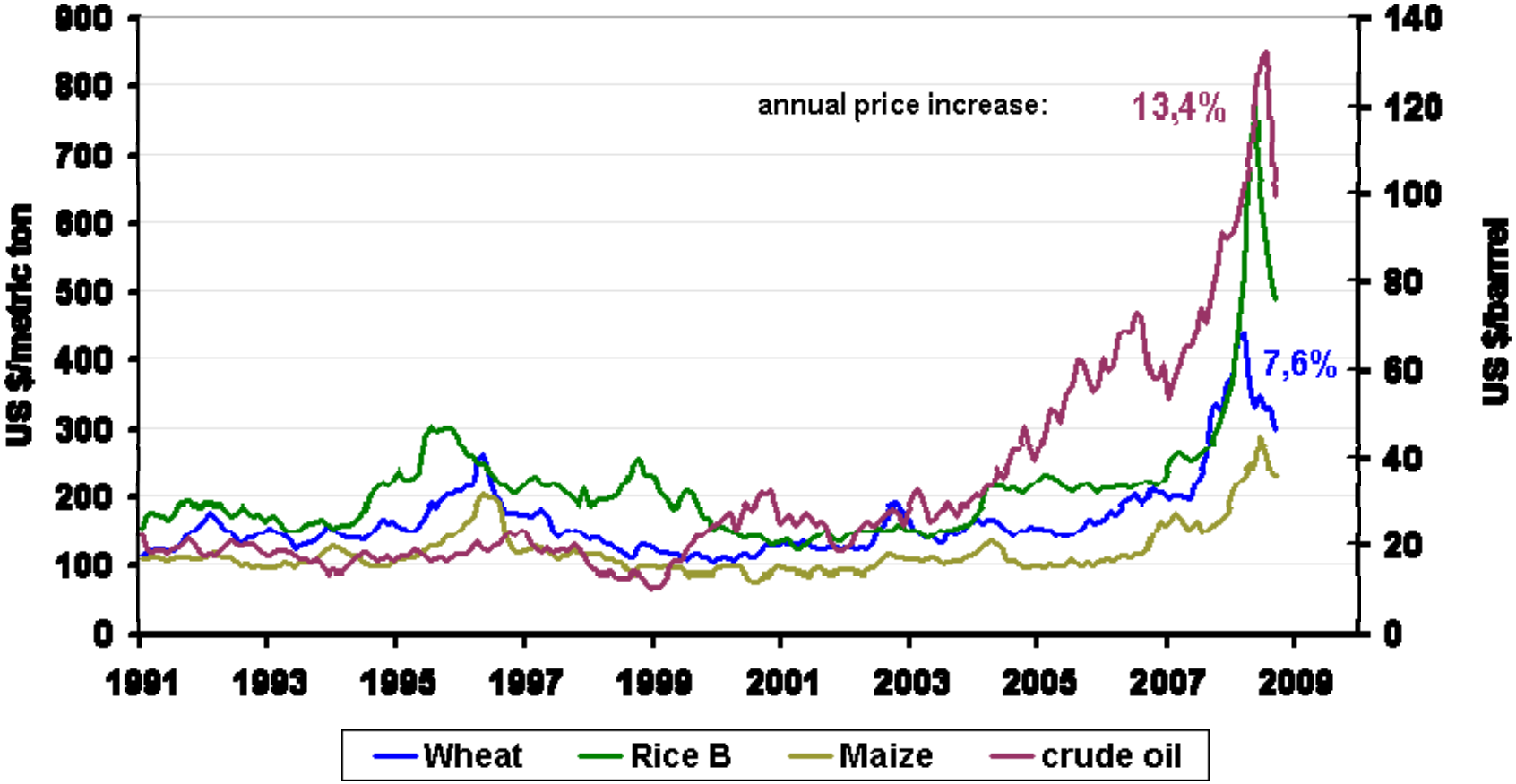
- Atmosphere is a scarce resource – fossil carbon is not
- Economic approach to deal with scarcity in an efficient way:
  - Establish prices on scarcities
- How to determine the scarcity price on carbon?
  - Assigning property rights according to the scarcity of the atmosphere
  - Distributing the emission rights according to principles of fairness and justice

Allocation of Emission Rights



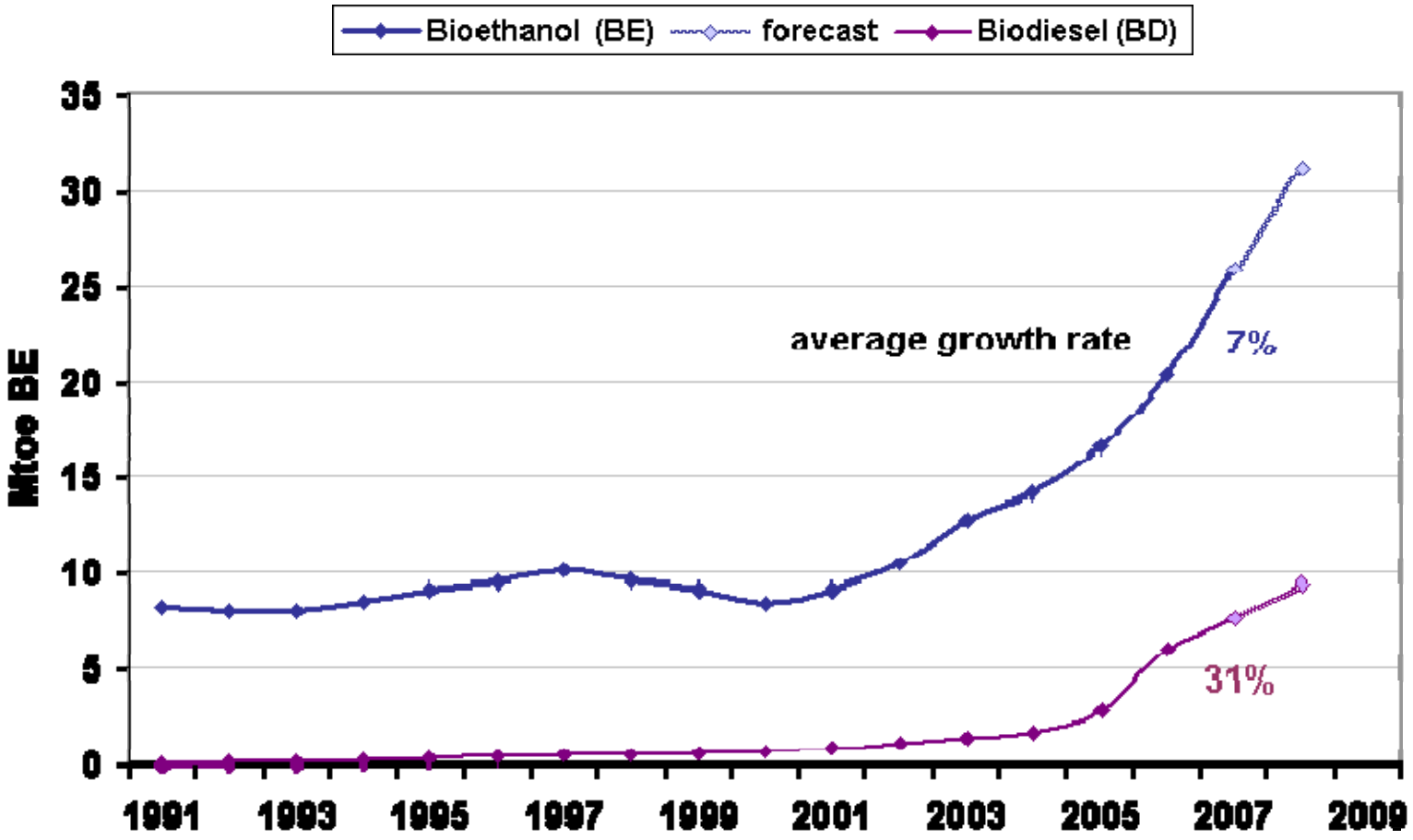
Knopf et al. 2010

Market Prices for staple foods and crude oil
monthly averages 1991 - 2008



Source: IMF; FAO International Commodity Prices

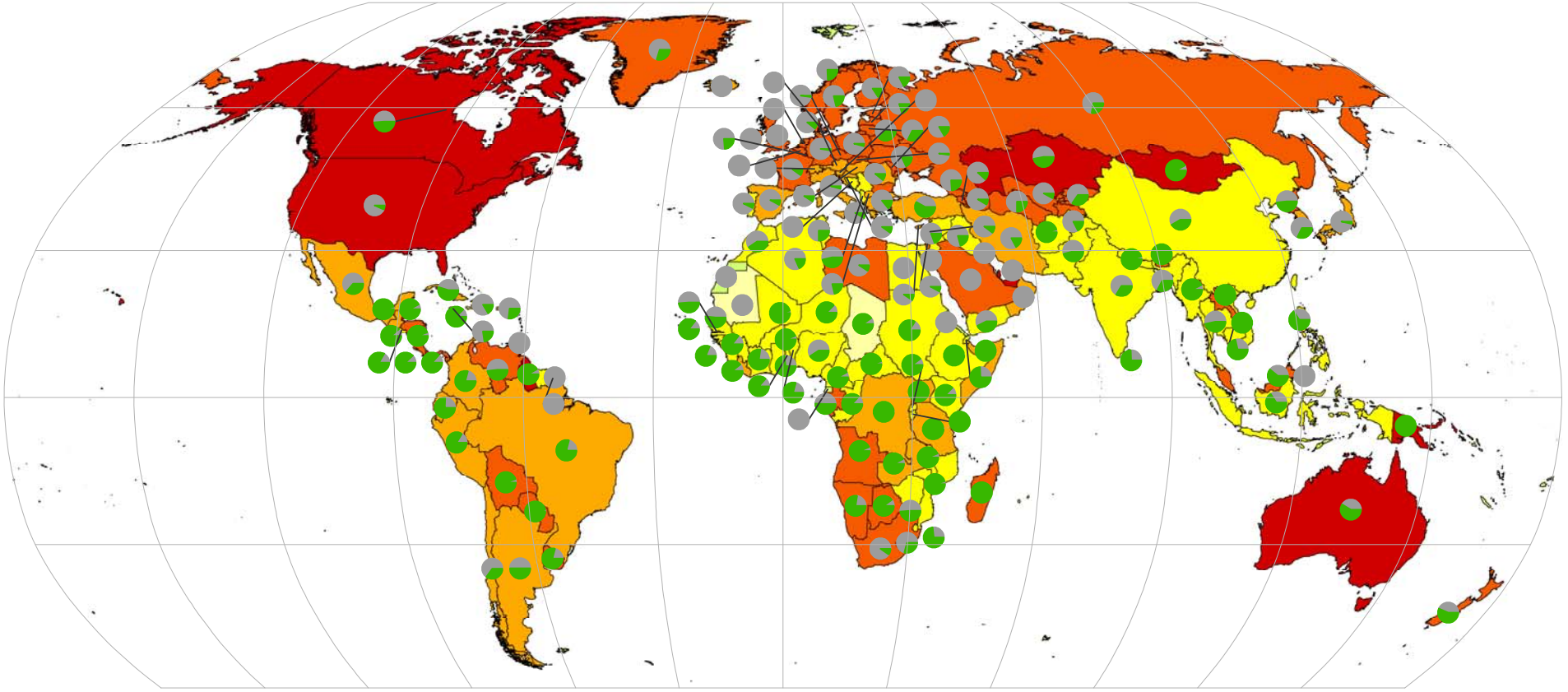
Annual World Biofuel Production 1991 - 2008



Source: BP Statistical Energy Review; WRI

Reducing Deforestation: Fossil vs. LUCF CO_2 Emissions

CO_2 emissions per person and year, 1950 - 2003



CO_2 emissions from fossil fuel combustion and cement production, and including land use change (kg C per person and year from 1950 - 2003)

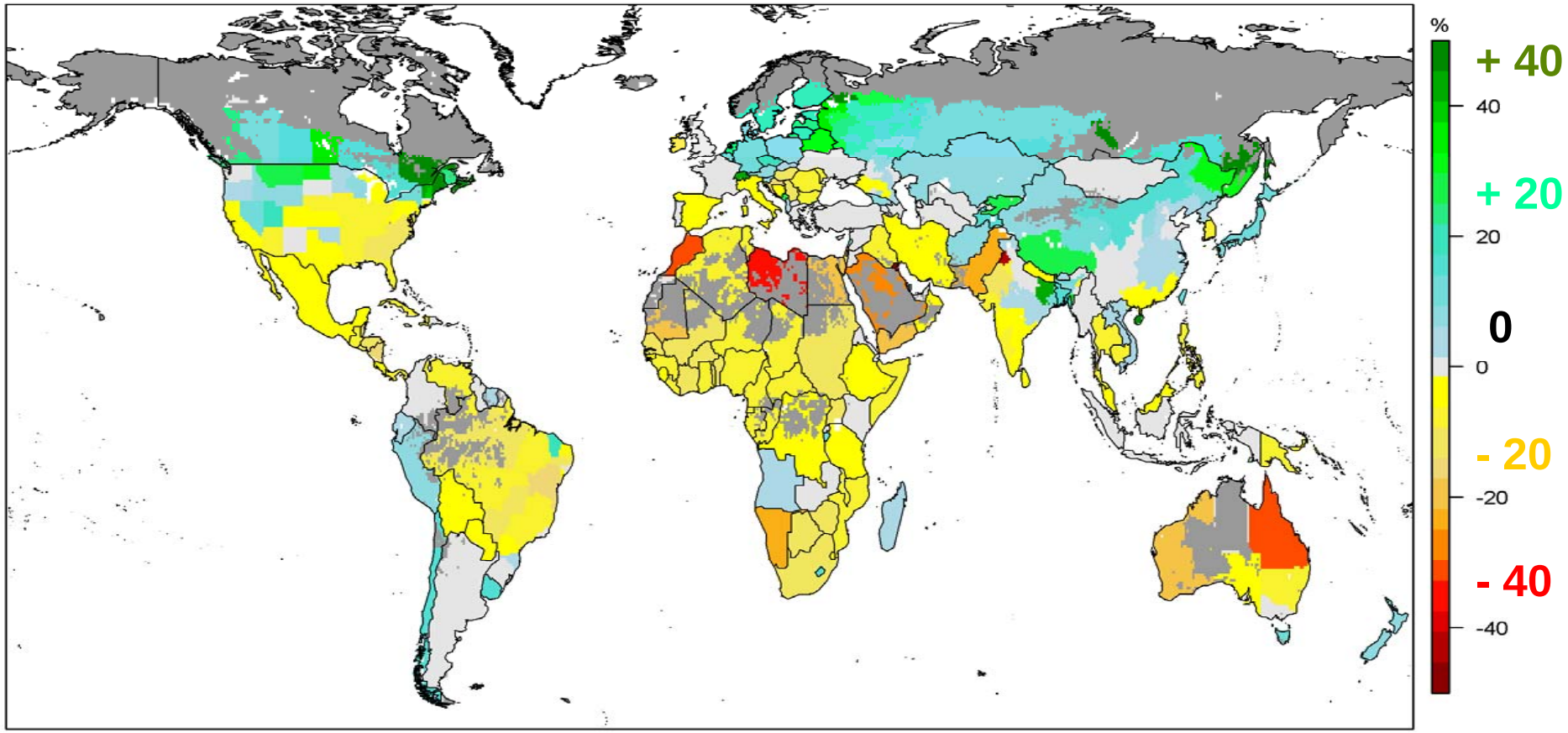
-1000 - 0	1000 - 2000
0 - 100	2000 - 5000
100 - 1000	5000 - 15000

Ratio

Emissions per year from fossil fuel combustion and cement production

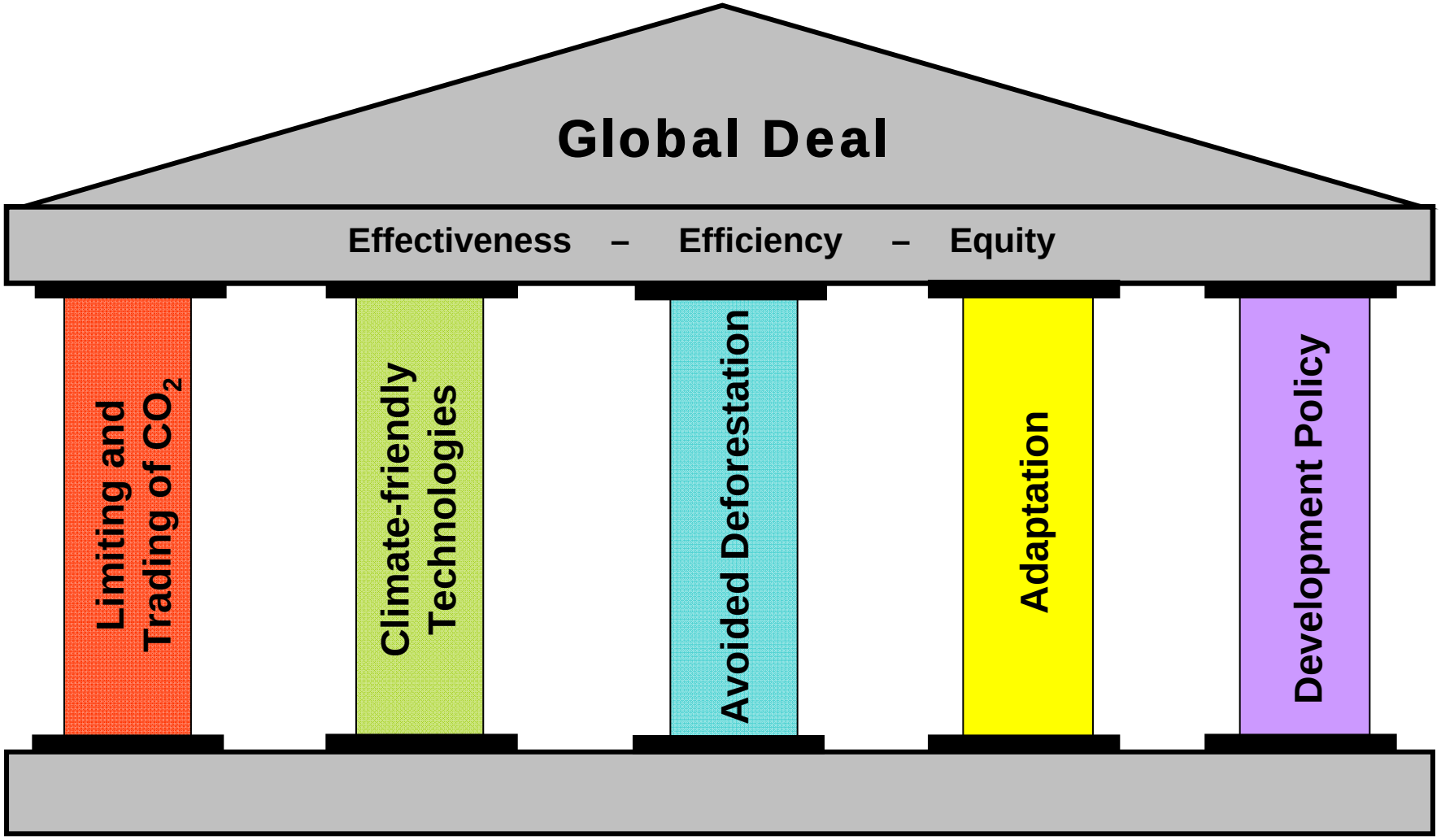
Emissions per year from land use change

Agricultural Productivity

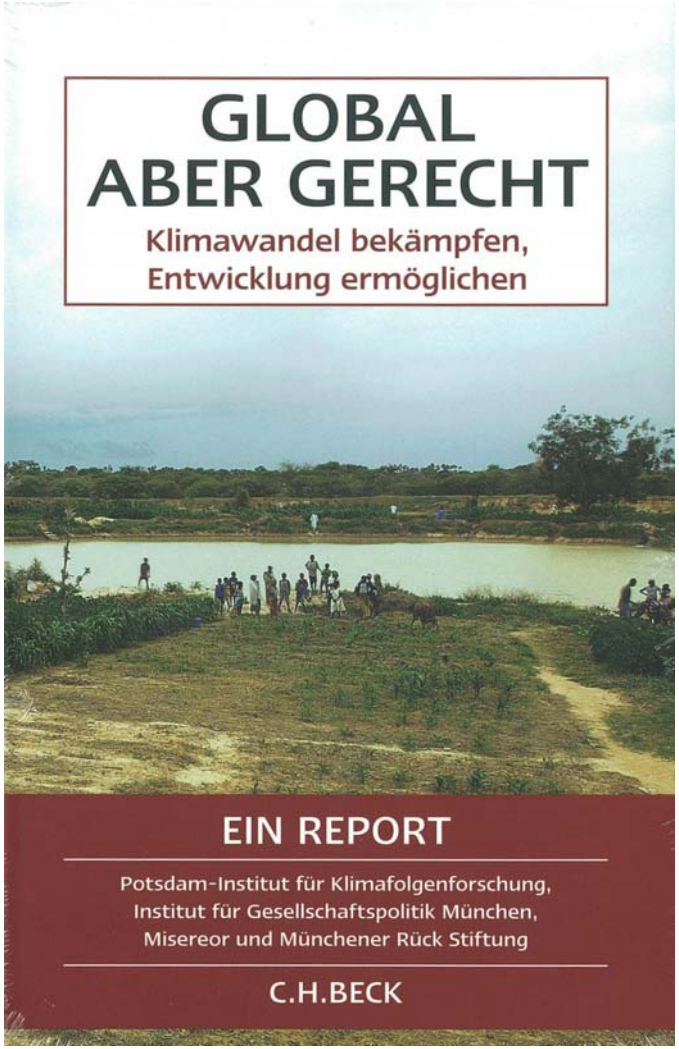


Change of agricultural production (all crops) in percent due to yield changes as a result of climate change between 1990 and 2050

Source: Müller et al. 2010


Global Deal
Effectiveness – Efficiency – Equity
Limiting and Trading of CO_2
Climate-friendly Technologies
Avoided Deforestation
Adaptation
Development Policy

Book Cover



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