WBGU

GERMAN ADVISORY COUNCIL ON GLOBAL CHANGE

Climate Change and Development

A challenge for renewable energies

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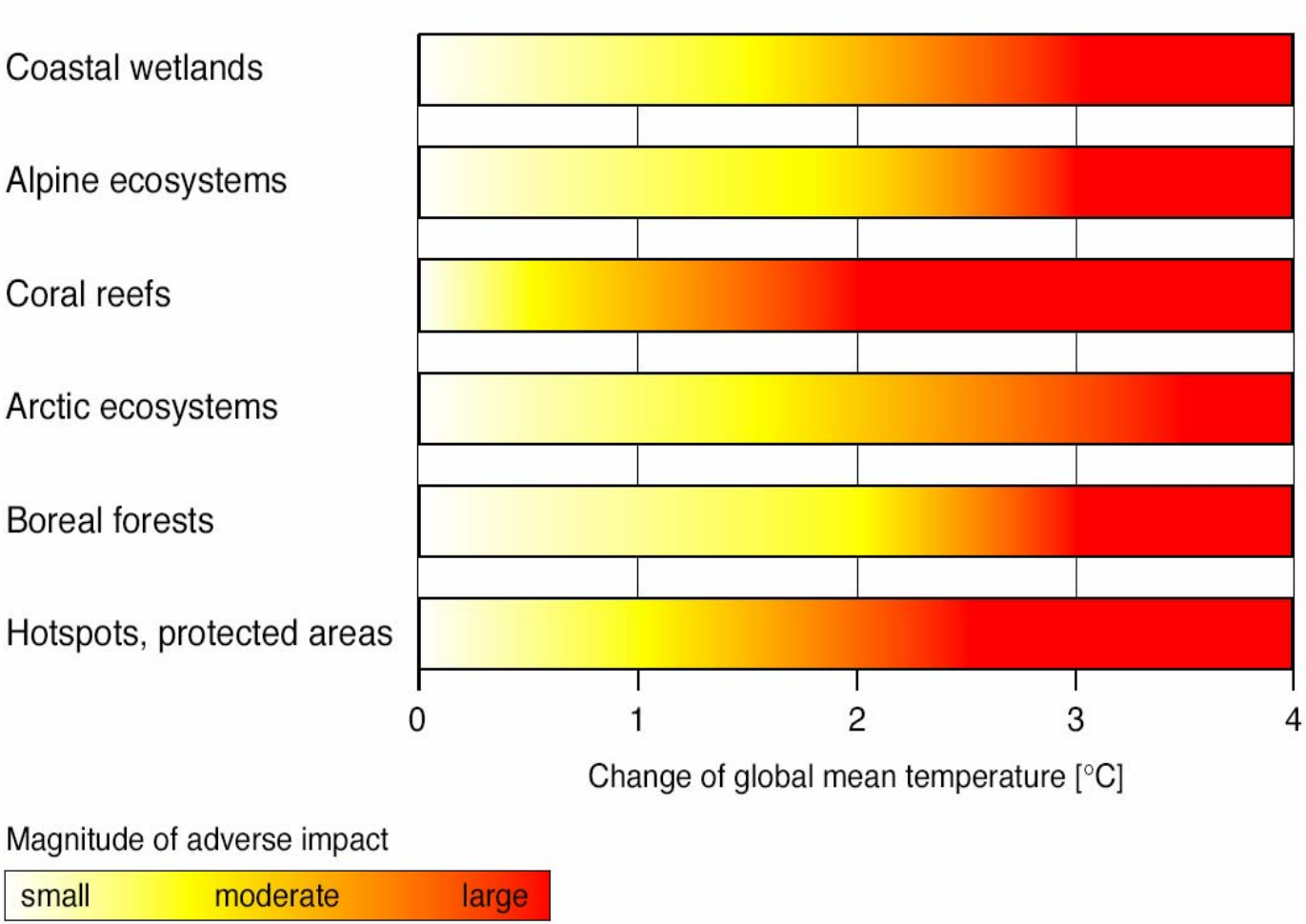
Climate change impacts on ecosystems



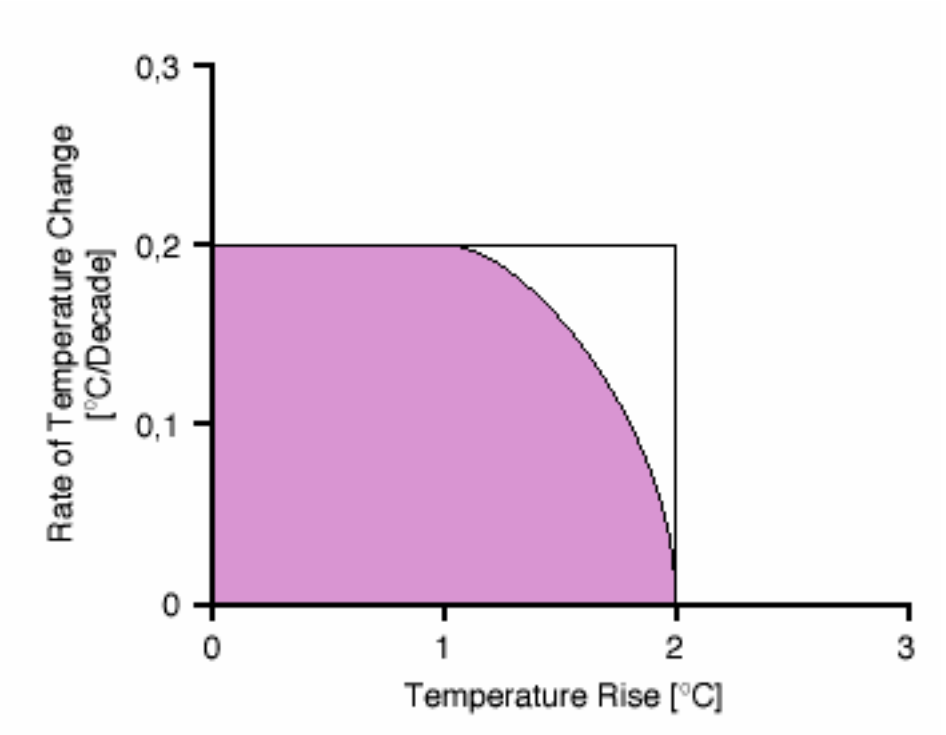
Challenge: climate change
WBGU: Tolerable Window

IPCC-Projections for 2100:1,4-5,8 °C

Emission Reduction needed by 2050:

At least 30% globally

Industrialised countries: 80%



The WBGU guard rail (1)

- An increase in global mean temperature of more than 2°C must be avoided
- Global mean temperature increased already by 0.6°C since industrialization and we are already committed to more

Long-term scenarios

Basis for WBGU exemplary path:
A1T-450-scenario (IPCC-Post-SRES-scenario,
IIASA, MESSAGE-Model)

A high economic growth

1 economic and social convergence, globalisation
cooperation between regions

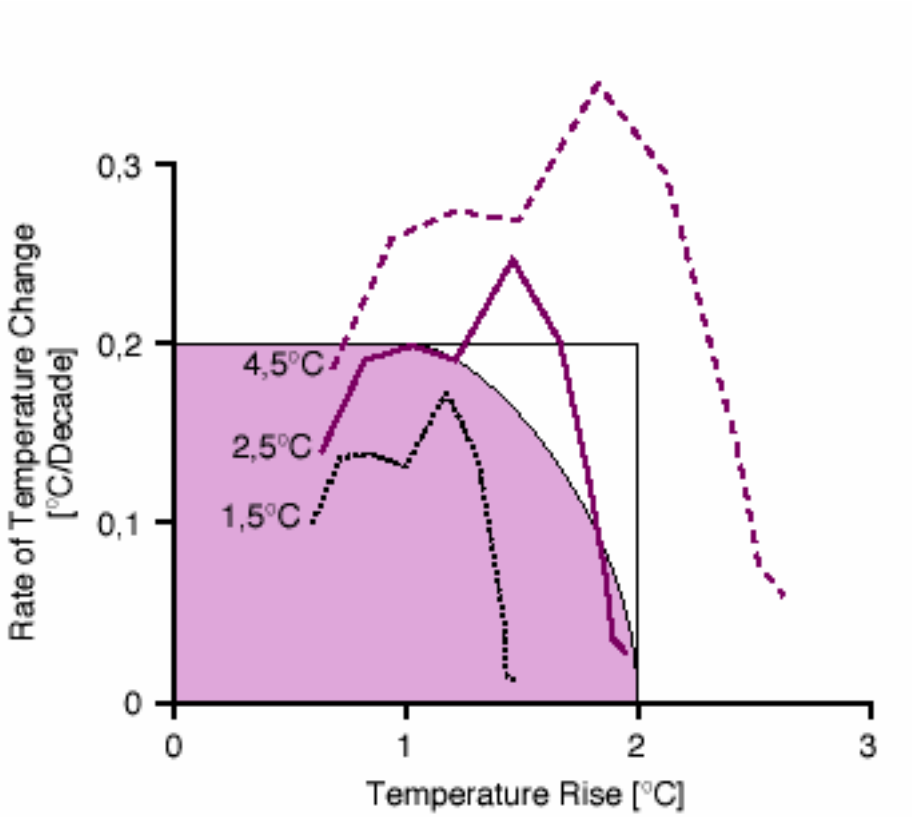
T dynamical technological development
towards non-fossile energy sources

450 CO_2-stabilisation concentration in ppmv

Challenge: climate change
WBGU: Tolerable Window

450ppm CO2 path (until 2100)

Different values of climate sensitivity



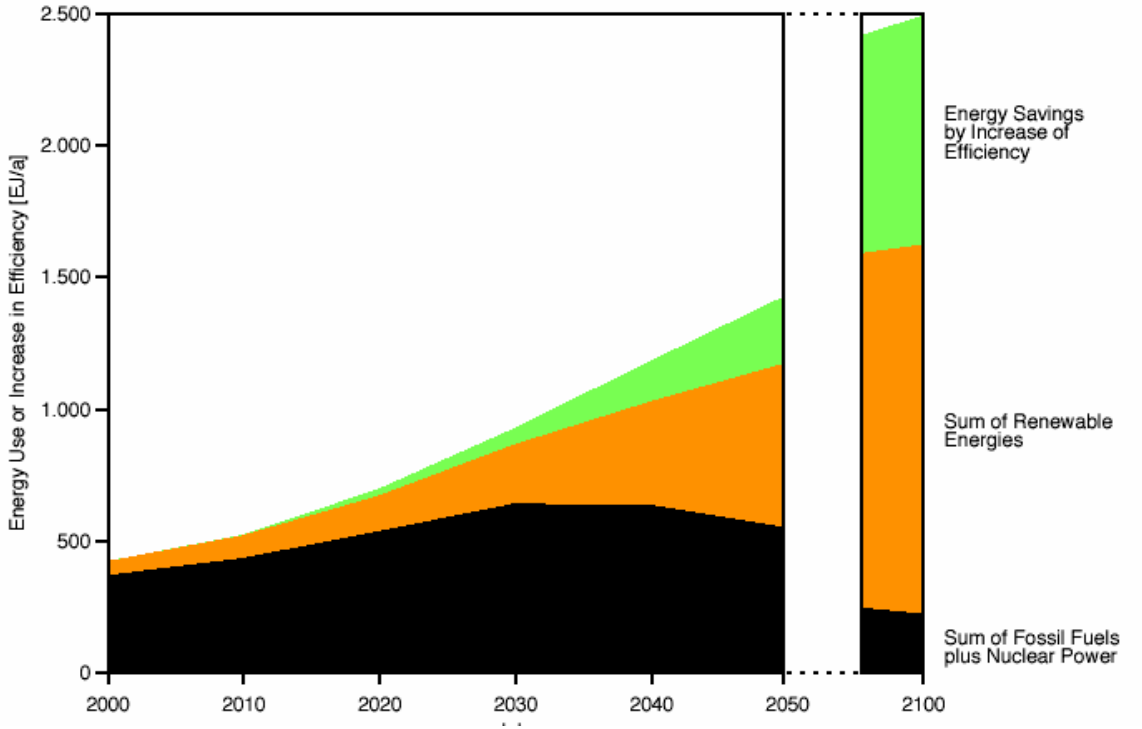
Necessary reduction targets

- Anthropogenic greenhouse gas emissions must be reduced by 45-60% up to 2050 (compared to 1990)
- Annex I countries: emissions reduction by at least 20% until 2020
- If these targets are not met a dangerous interference with the climate system cannot be avoided in the 21st century

WBGU Exemplary path: Increased Energy Productivity

WBGU: 1,6% p.a
(historically: 1%)

Productivity
Increase:
„Factor 3“
by 2050



Characteristics of WBGU exemplary path:

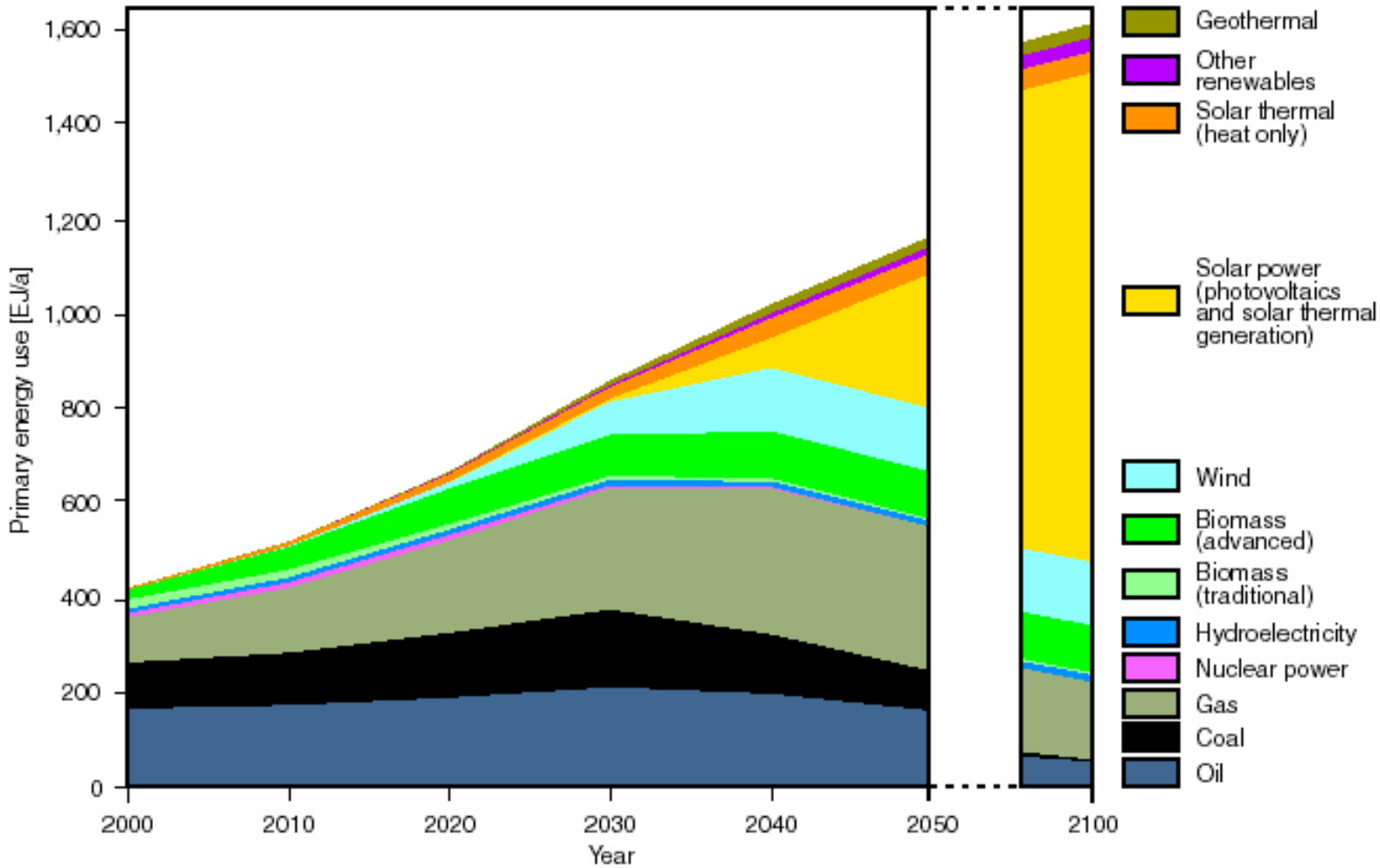
Increased energy productivity

Phase-out of non-sustainable energy sources

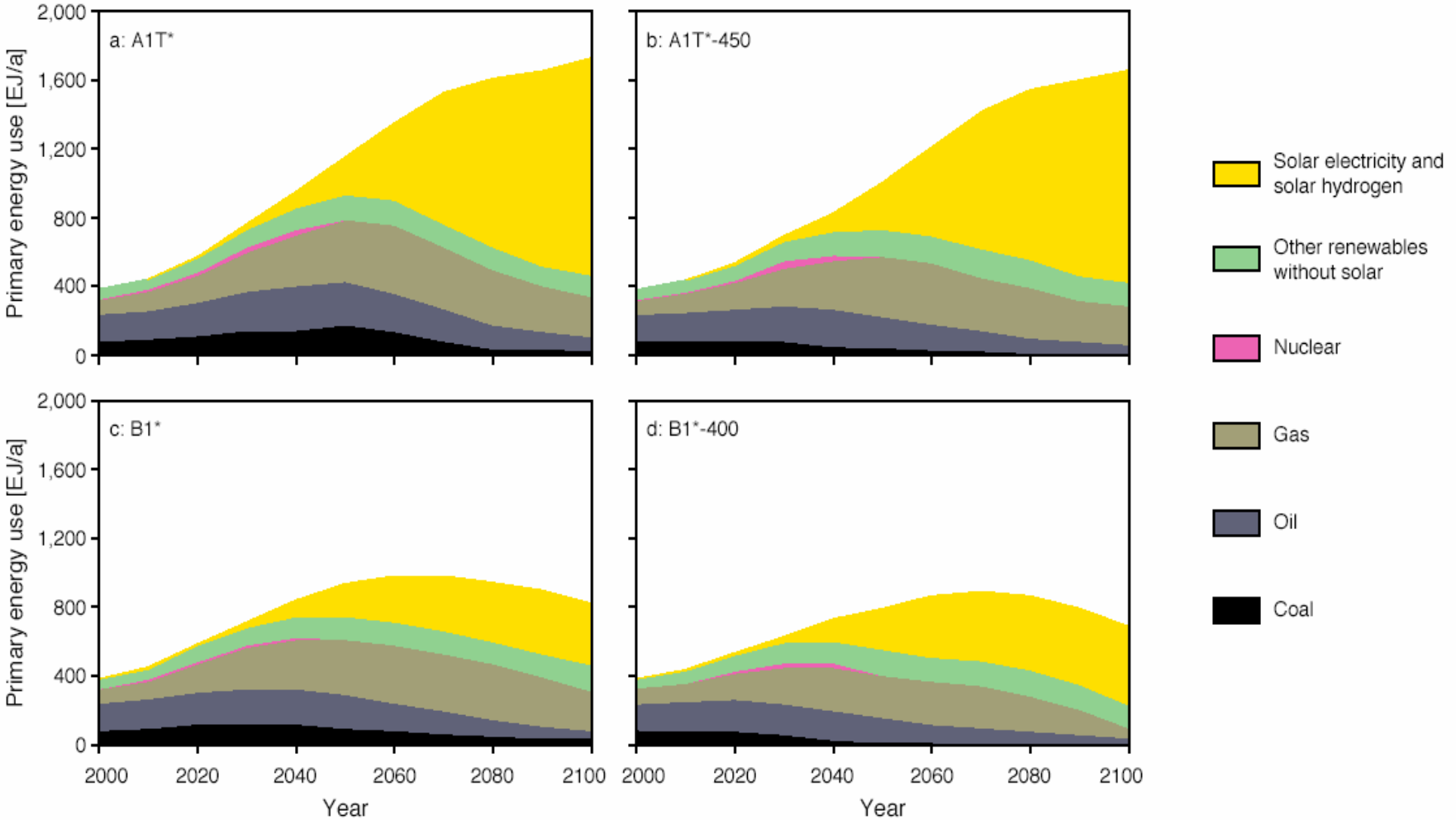
Phase-in of renewable energy: 20% by 2020, 50%
By 2050, 85% by 2100

CO2 storage necessary

WBGU Exemplary Path: Global Energy Mix

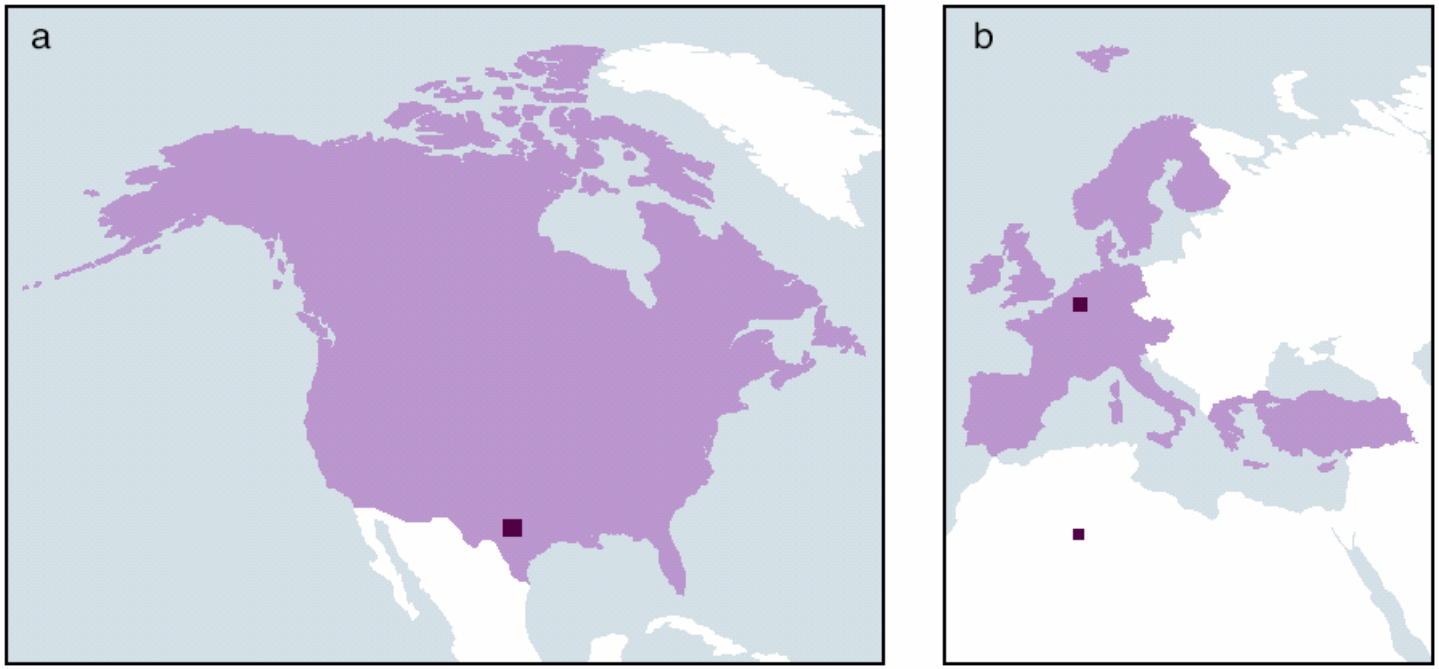


Primary energy use in IIASA-WBGU scenarios



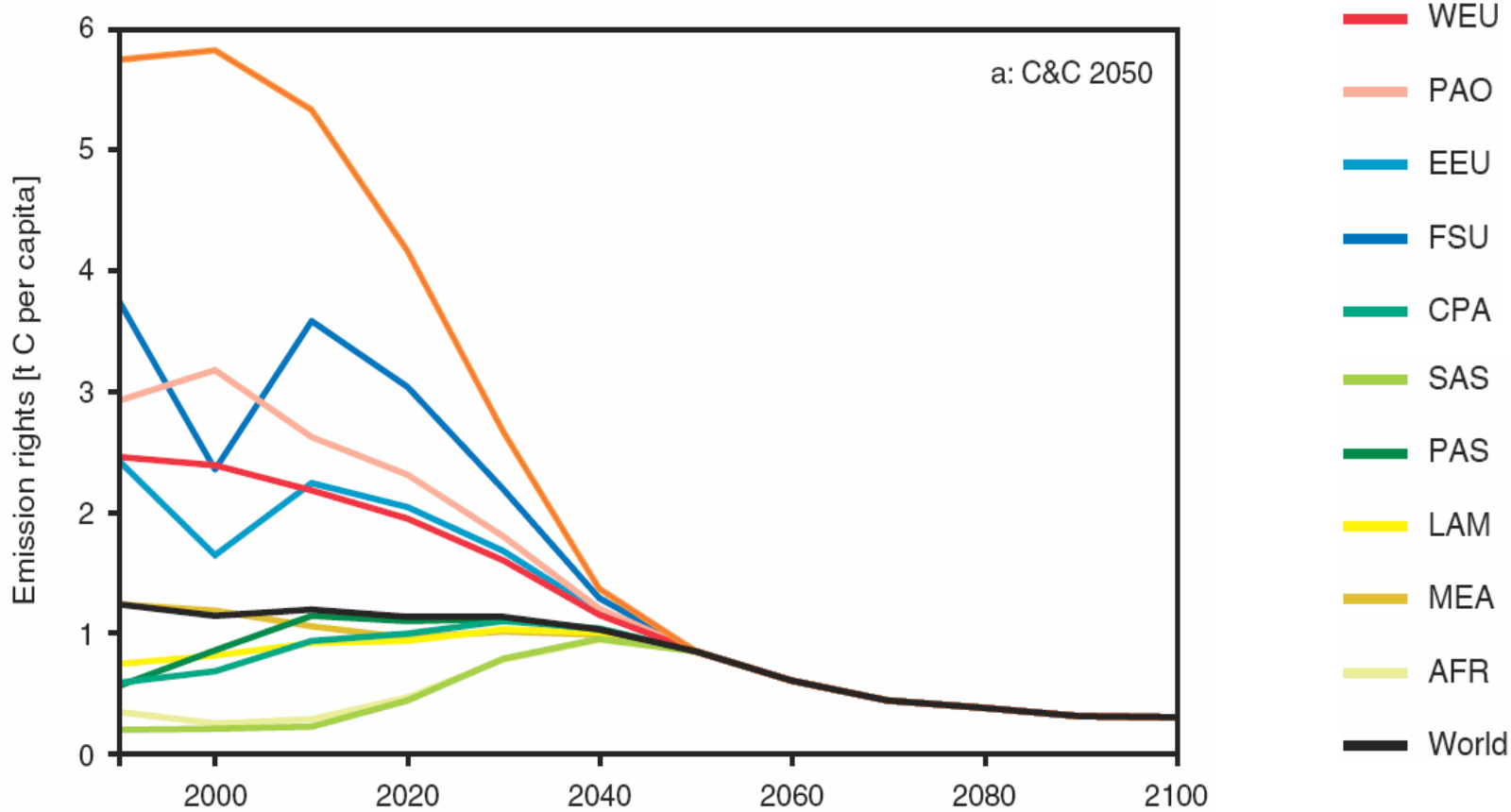
Areas needed for solar electricity

2050



The squares represent the surface areas that would be needed to produce the solar power assumed in the exemplary path for the year 2050. (a) Areas required for North America, assuming generation in Texas (100 per cent in solar power plants). (b) Areas required for Western Europe, whereby two-thirds of the solar power are generated in central Europe and one-third in the Sahara.

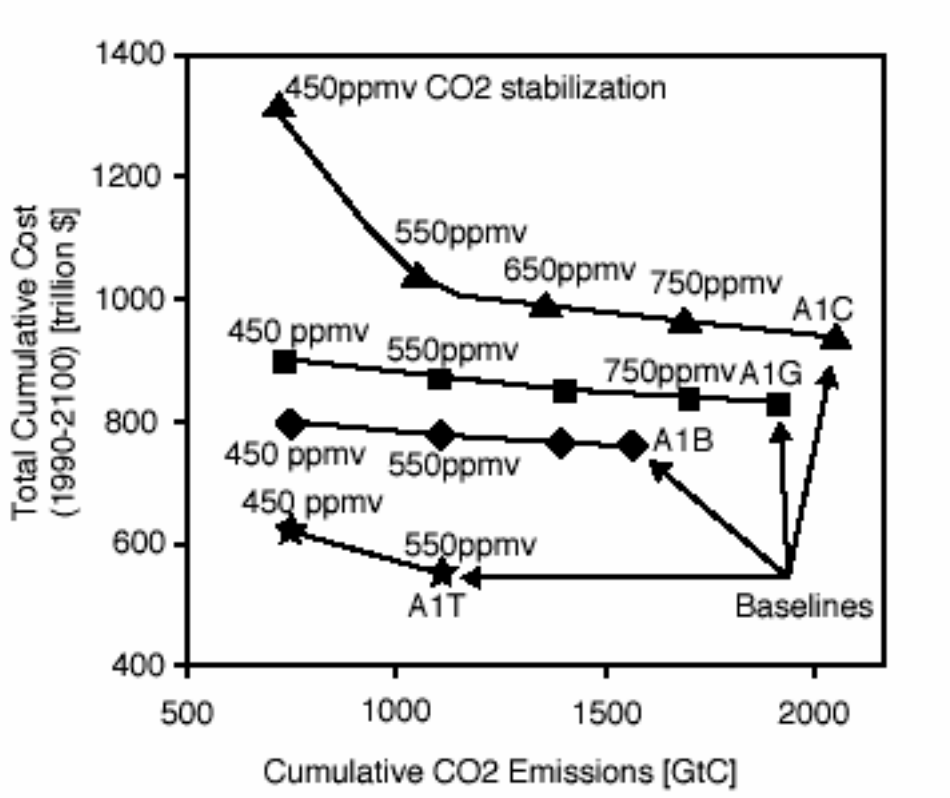
Emission entitlements



NAM – North America (USA, Canada), WEU – Western Europe (incl.Turkey), PAO – Pacific OECD (Japan, NZ,Australia), EEU – Central and Eastern Europe, FSU – Newly independent states of the former Soviet Union, CPA – Centrally planned Asia and China, SAS – South Asia (incl. India), PAS – Other Pacific Asia, LAM – Latin America and the Carribean, MEA – Middle East, AFR – Sub-Saharan Africa

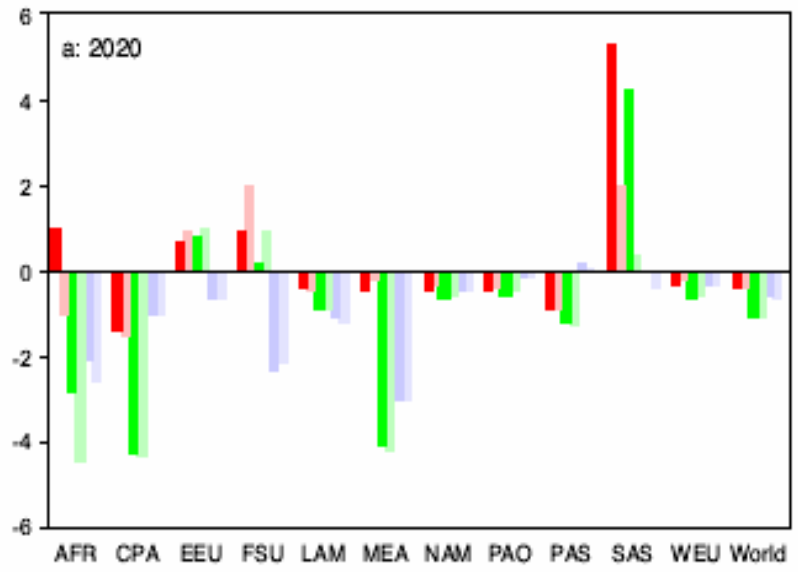
Costs

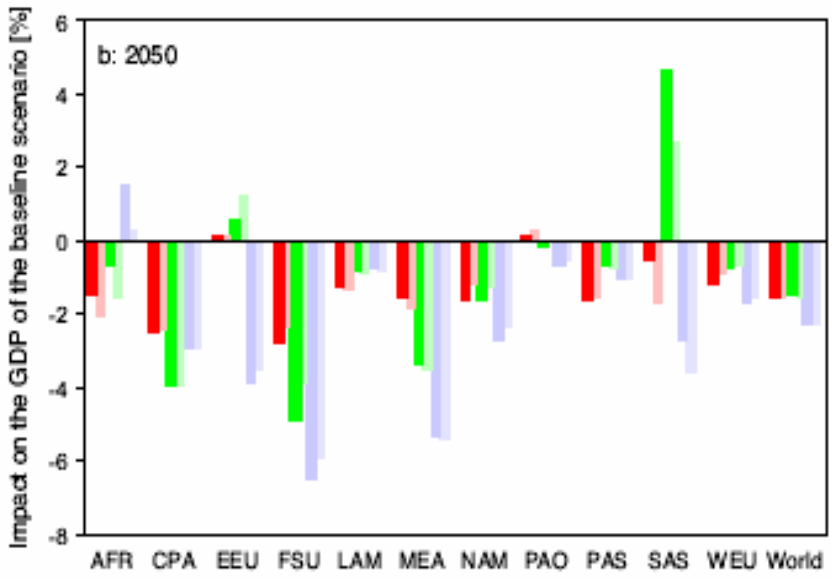
Cumulative energy system costs, SRES and Post-SRES-scenarios



source: Riahi und Roehrl, 2000

Effects of Mitigation on GDP





C&C 2050
- A1T*-450
- B1*-400
- B2-400

AFR – Sub-Saharan Africa, CPA – Centrally planned Asia and China, EEU – Central and Eastern Europe, FSU – Newly independent states of the former Soviet Union, LAM – Latin America and the Carribean, MEA – Middle East, NAM – North America (USA, Canada), PAO – Pacific, PAS – Other Pacific Asia, SAS – South Asia (incl. India), WEU – Western Europe (incl.Turkey).

Prerequisites for successful climate protection policy

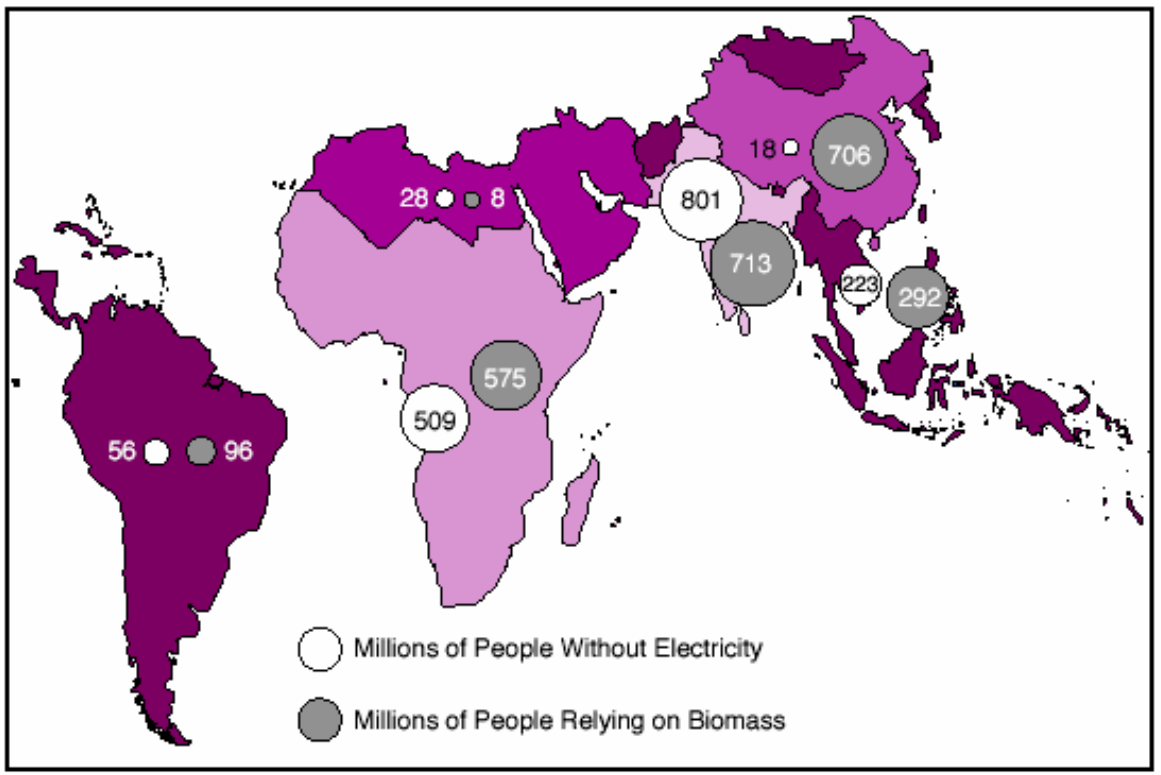
- Integration of all countries
- Coherence of environment and development policy
- Development of the South
- Technology transfer
- Market access of developing countries to world market

Prevention of a dangerous interference with the climate system

- Guard rails have to be taken into account
- Landmark decisions have to be taken now
- Every delay reduces coping capacities
- There is no alternative to the Kyoto Protocol !

Challenge: Sustainable Development

- 2 billion people live in energy poverty
- Access to modern energy services condition for development
- 1,6 millions die every year due to traditional biomass burning



Source: IEA

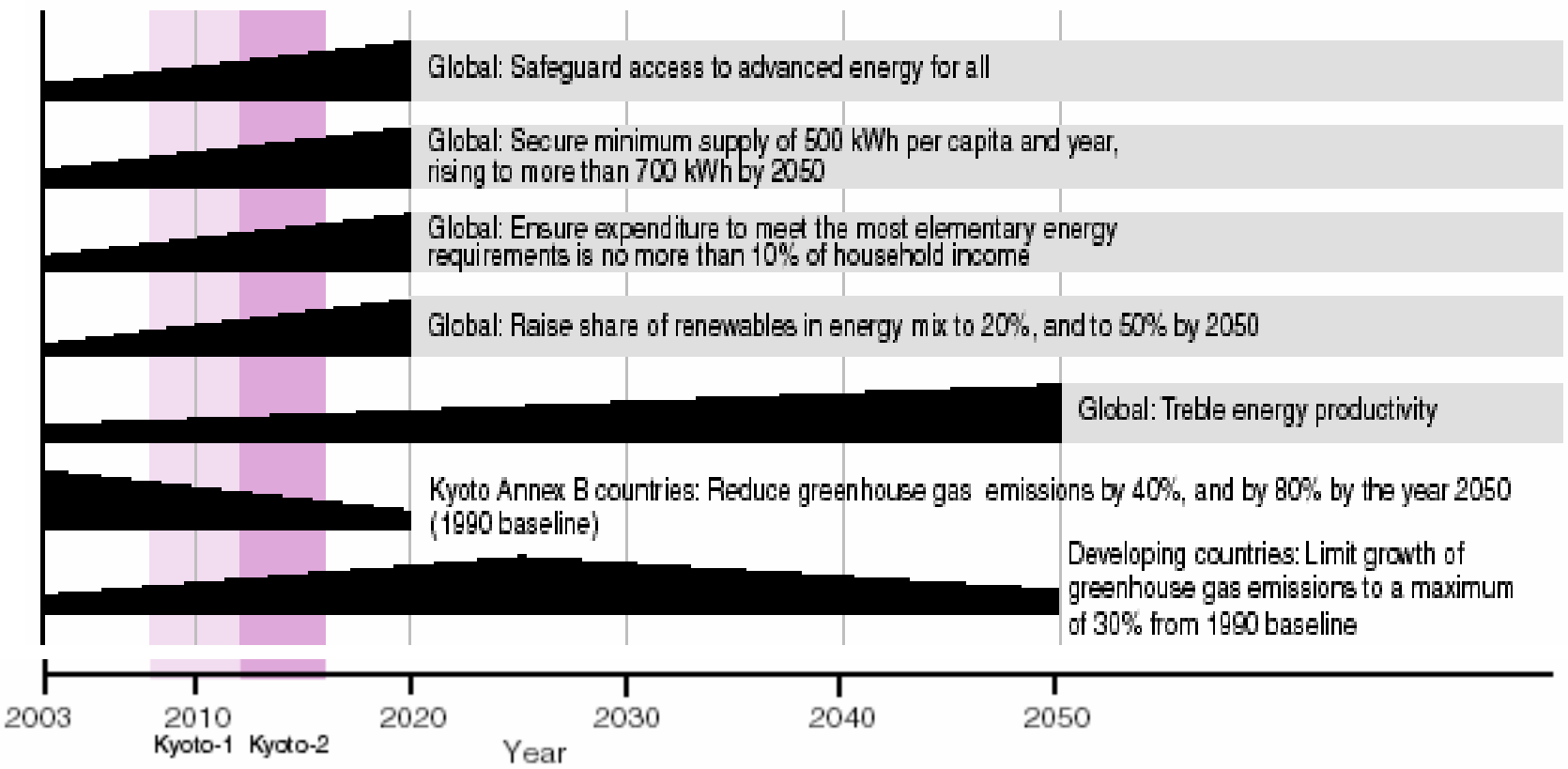
Traditional Cooking (Burkina Faso)

Timber for Ouagadougou

The WBGU guard rail (2)

- Meeting of individual requirements for energy
- Limiting the proportion of income spent for energy
- Preventing disease caused by energy use
- Access to advanced energy for all

WBGU Transformation roadmap: targets



WBGU transformation strategy

Improving energy productivity (factor 3 by 2050):

- Key tool: Ecological financial reforms (tax reforms, phase-out of subsidies)
- EU: 20% of electricity by 2012 from co-generation, binding national targets
- Improved information of end users (mandatory labelling)
- Standards (buildings, international minimum efficiencies for power plants)

WBGU transformation strategy

Eradicating energy poverty:

focussing international cooperation on

sustainable development

- Implement new World Bank Policy in practice
- Integrate sustainable energy supply within poverty reduction strategies (PRSP)
- Strengthen role of regional development banks
- New GEF window for sustainable energy systems

WBGU transformation strategy

Mobilizing financial resources for the energy transition

Private sector capital :

- Public-Private-Partnerships
- German and EU CDM-Standard

Public sector capital:

- Raising level of German ODA to at least 0,5% of GDP by 2010
- Strengthen GEF as financial institution

Innovative financial tools:

- charge the use of global commonse.g. emissions-based user charge on international aviation

WBGU transformation strategy

Model projects for strategic leverage

Model projects - examples

- Substitution of traditional biomass use by biogenic bottled gas
- Energy-efficient buildings in the low-cost sector (South African townships)
- One-million-huts electrification programme“ for DC (off-grid)

Energy partnerships

- Strategic Energy partnership, e.g. between EU and North Africa

WBGU transformation strategy

Advancing Research and Development

Increase government expenditure on energy research

- Ten-fold by 2020 (OECD)

International cooperation

- UN: World Energy Research Cooperation Programme (WERCP) (in analogy to World Climate Research Programme)

WBGU transformation strategy

Main elements

- Improving energy productivity
- Expanding renewables substantially
- Eradicating energy poverty
- Mobilizing financial resources
- Using model projects for strategic leverage
- Advancing research and development
- Strengthening global energy policy institutions

The full reports are available as download under:

www.wbgu.de