Costs and Benefits of Emissions Mitigation and the Value of Technology for Stabilizing Climate Change

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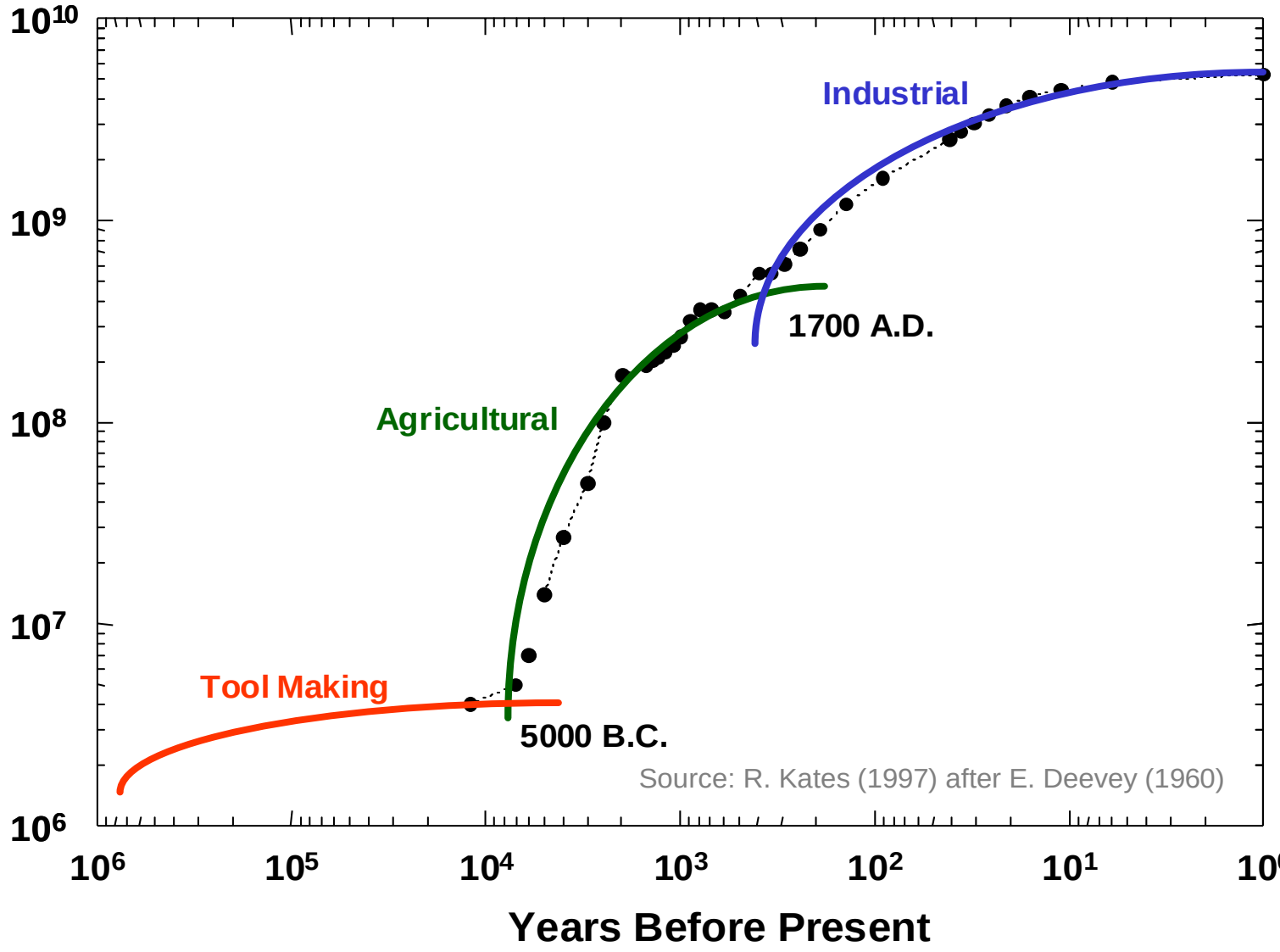
Global Energy Challenges

- Sustainable access to energy and food (a prerequisite for reaching MDGs)
- *Energy and ecosystems services*
- Security and reliability of systems
- Deep CO_2 and GHG reductions
- Investment in R&D and deployment
- Policy frameworks and life-styles

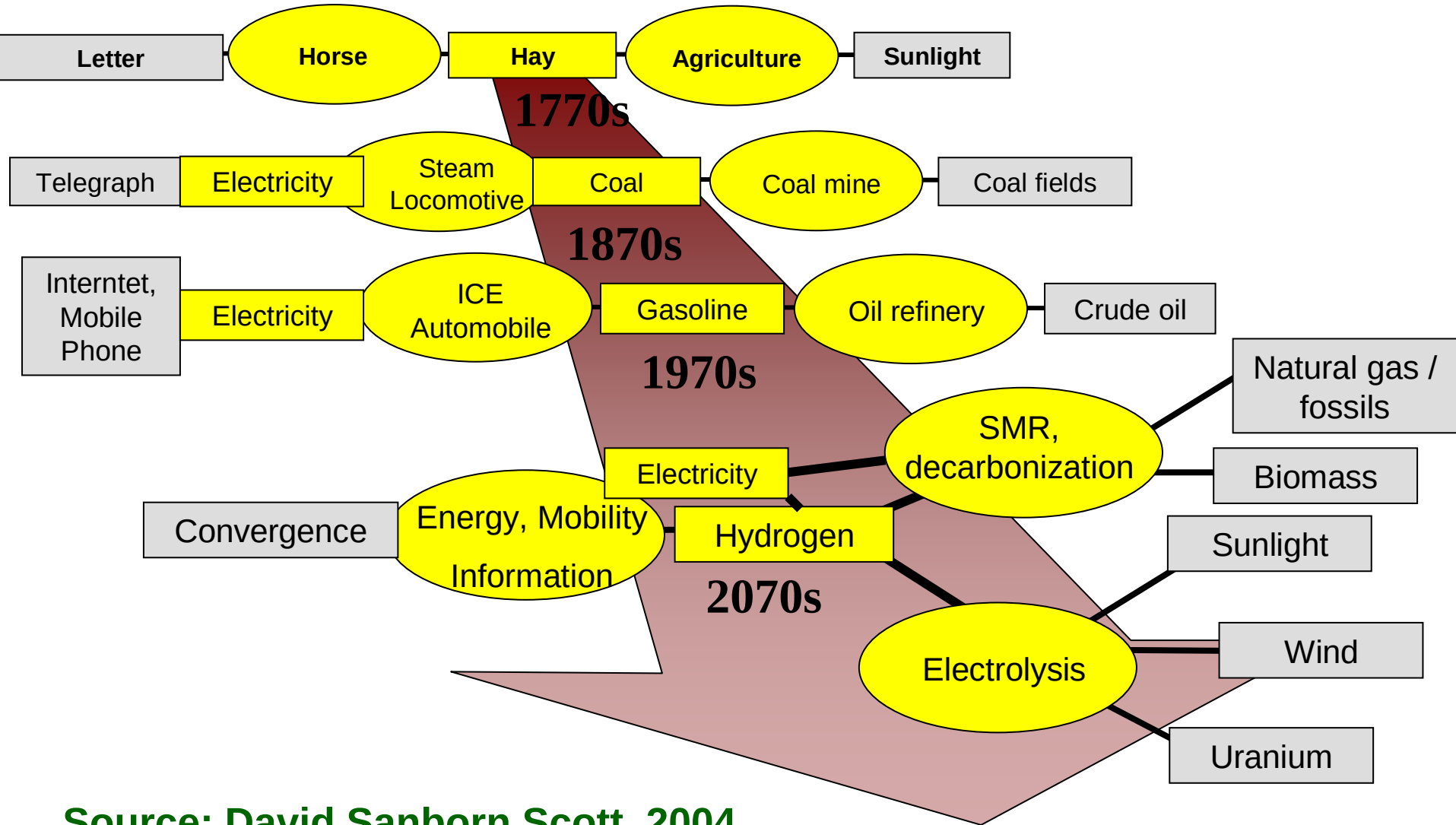
Add as many mail coaches as you please, you will never get a railroad by so doing
Joseph A. Schumpeter

- New energy systems will not emerge by simply adding new and emerging technologies to the current ones.
- A new paradigm is needed with convergence of innovative technologies, institutional structures, policy frameworks and human behavior.

Global Population Transitions



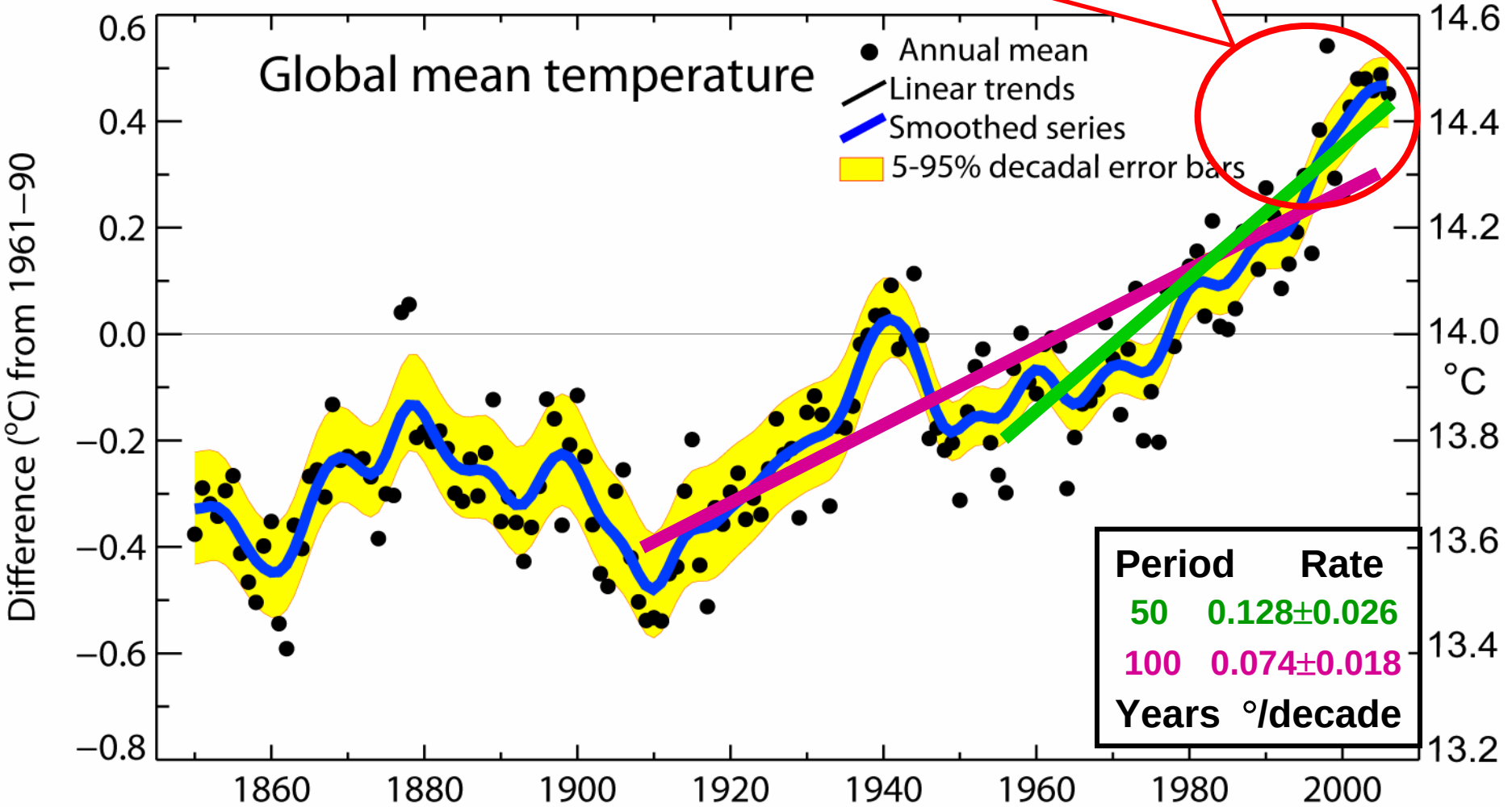
Energy Services and Sources Through Time



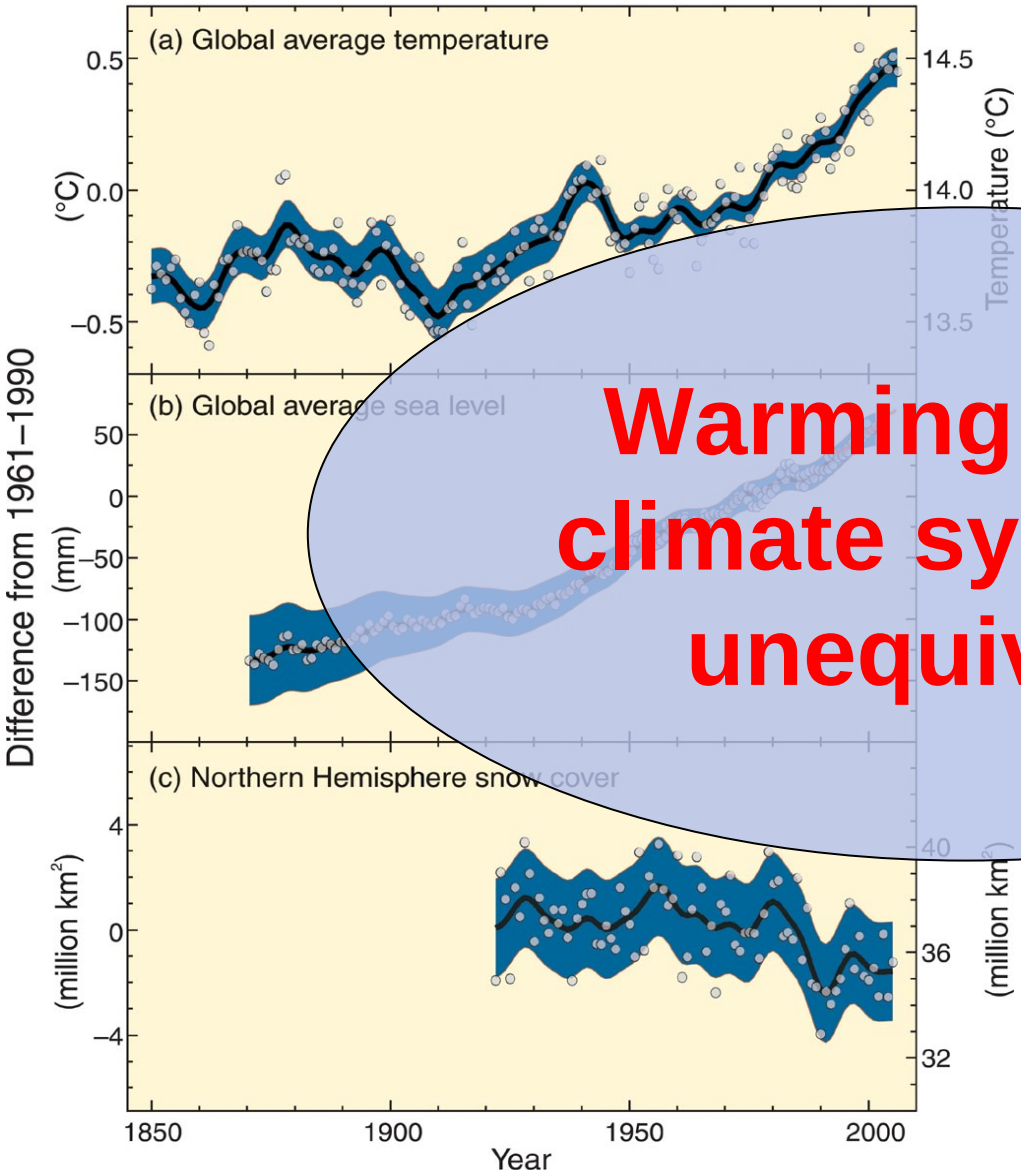
Source: David Sanborn Scott, 2004

Global Mean T sing

Warmest 12 years:
1998,2005,2003,2002,2004,2006,
2001,1997,1995,1999,1990,2000



Observed Climate Change



100-yr warming trend (1906-2005) of 0.74°C.

Increased since TAR.

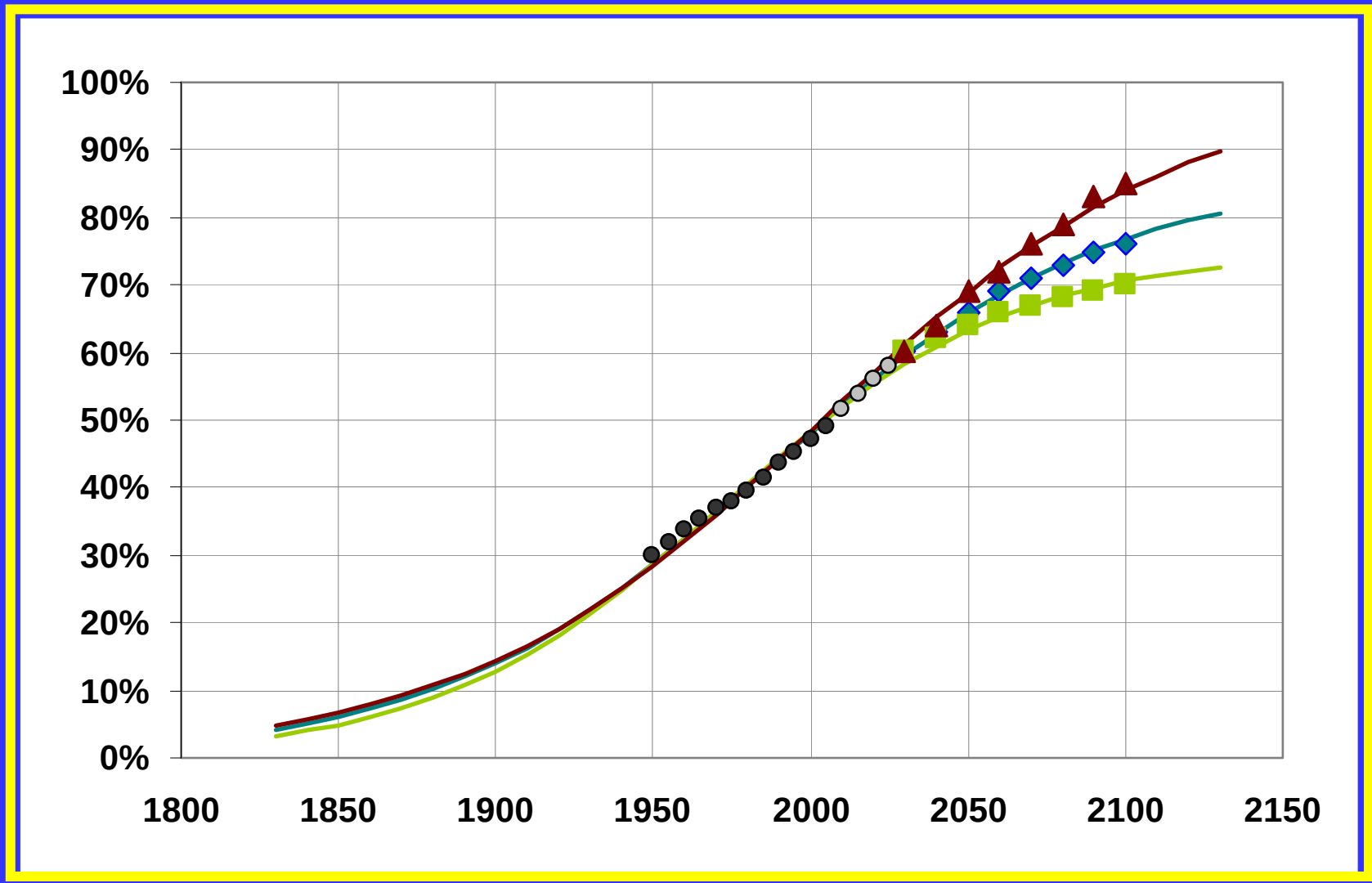
Sea level rise:
1900 – 2003: 1.8 mm per yr
1993 – 2003: 3.1 mm per yr

Warming of the climate system is unequivocal

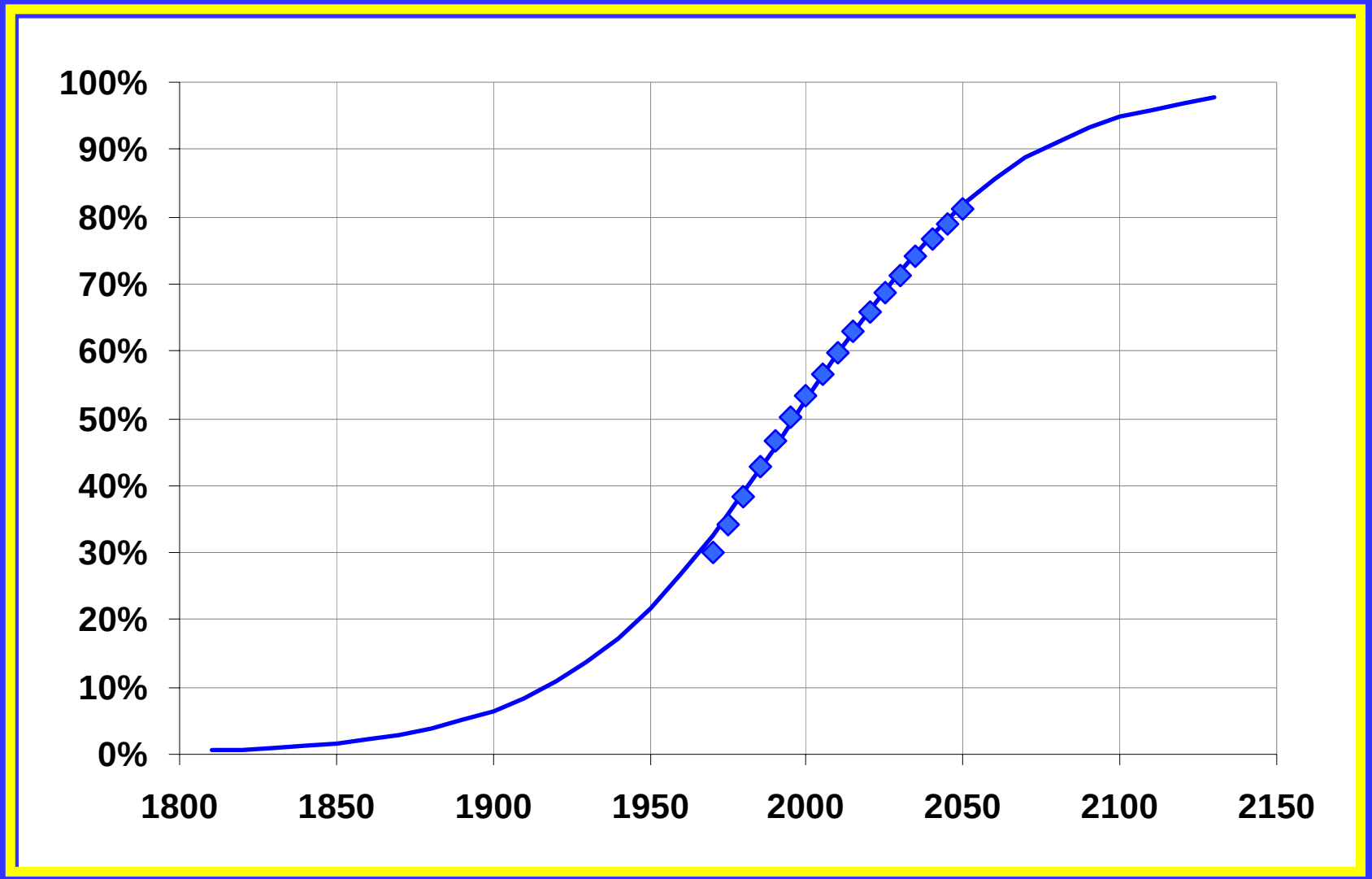
Decreasing:
- snow and ice extent
- Arctic sea ice extent
- Mountain glaciers

IPCC

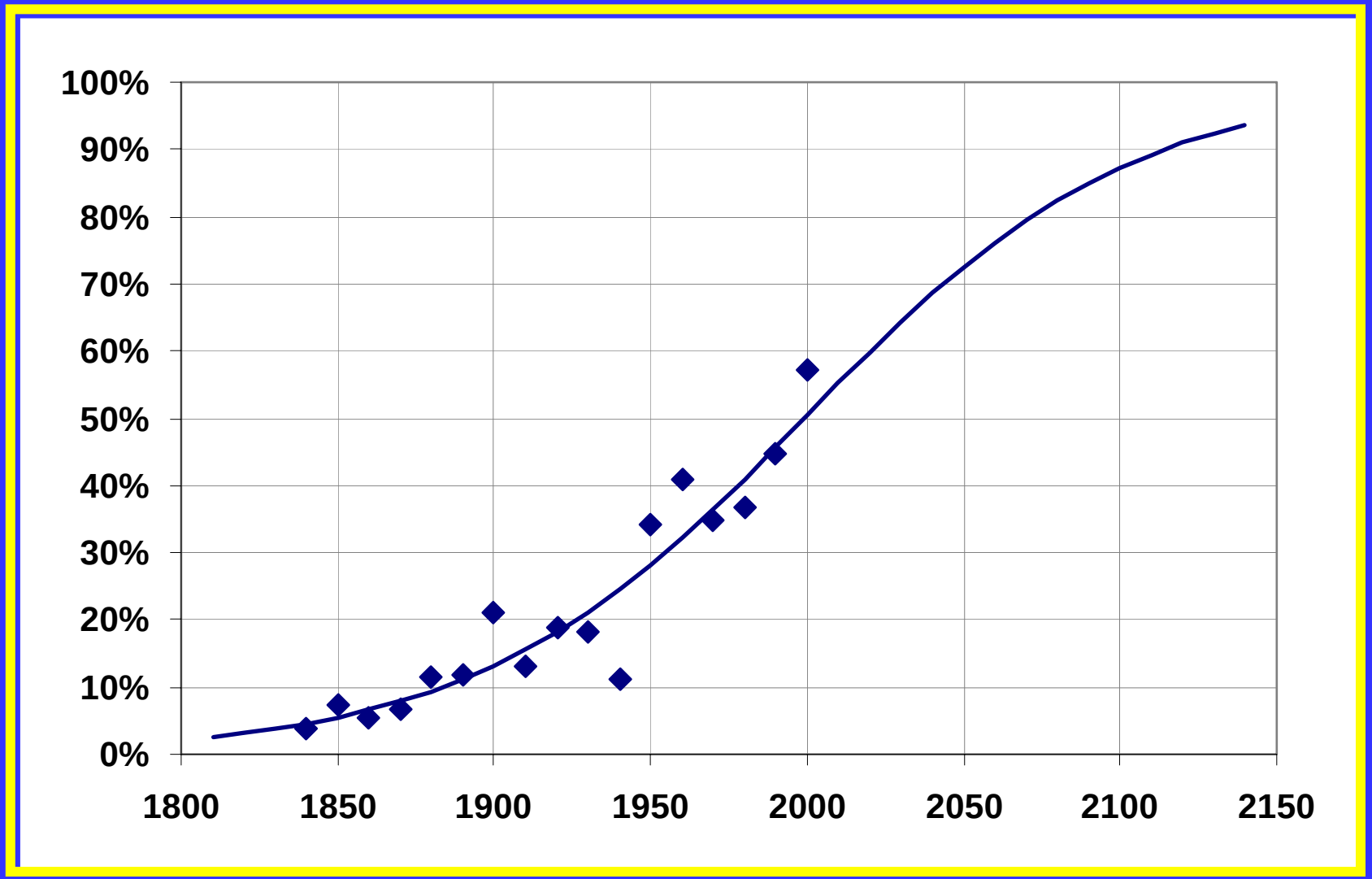
Urbanization



Education

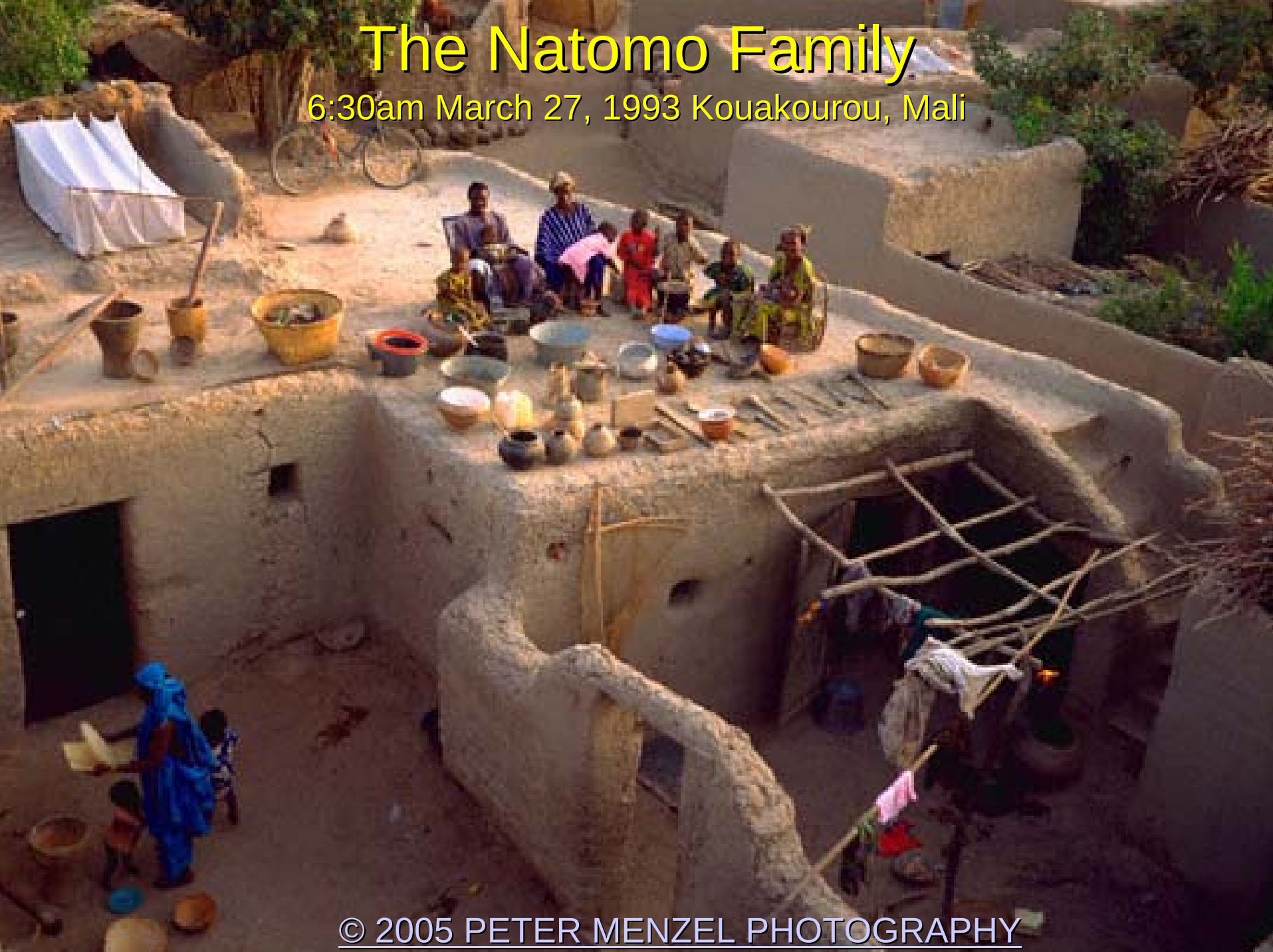

100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
1800
1850
1900
1950
2000
2050
2100
2150

Democratization

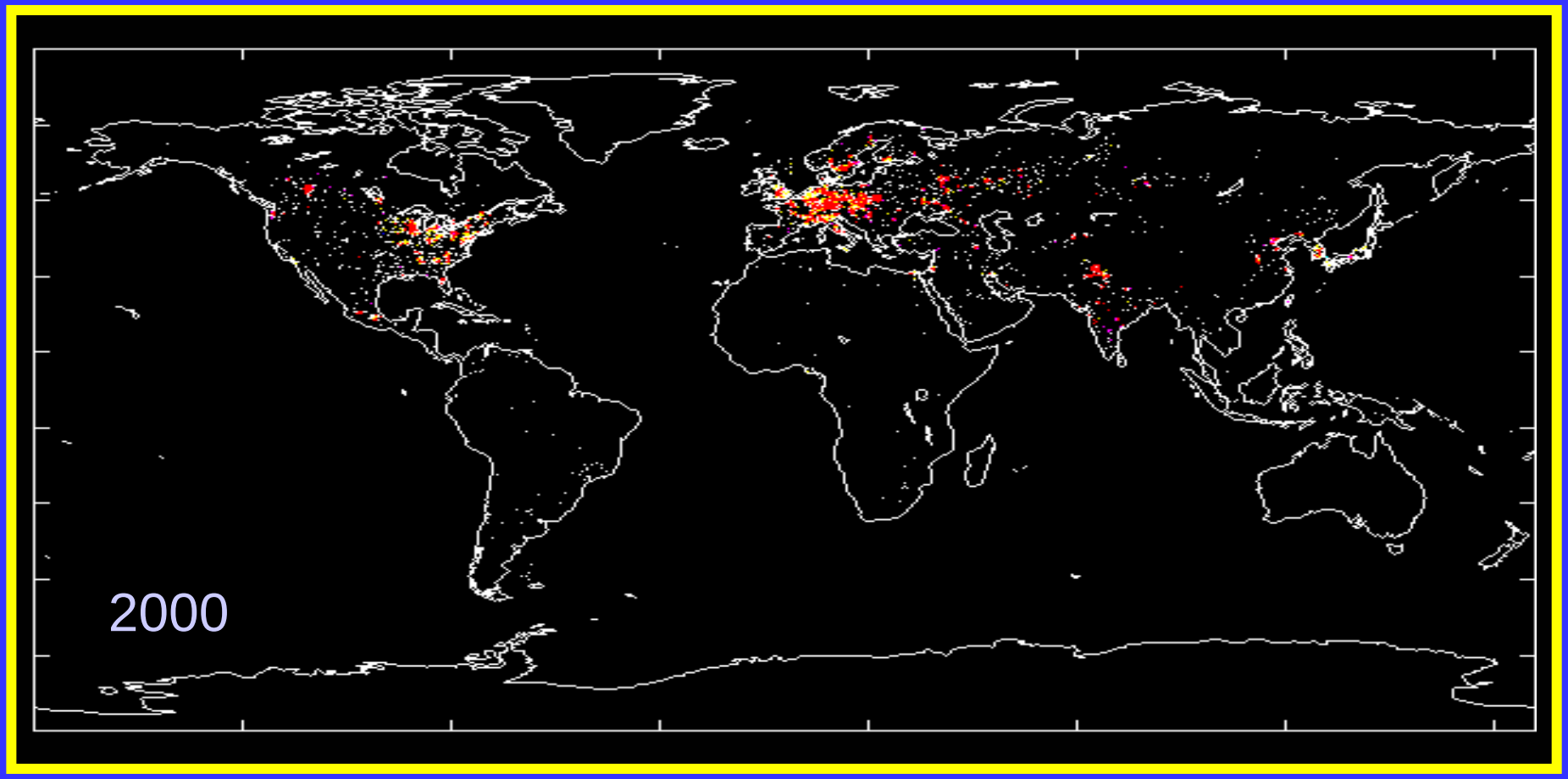


Food for a Week, Darfur Refugees, Chad

Food for a Week, Germany

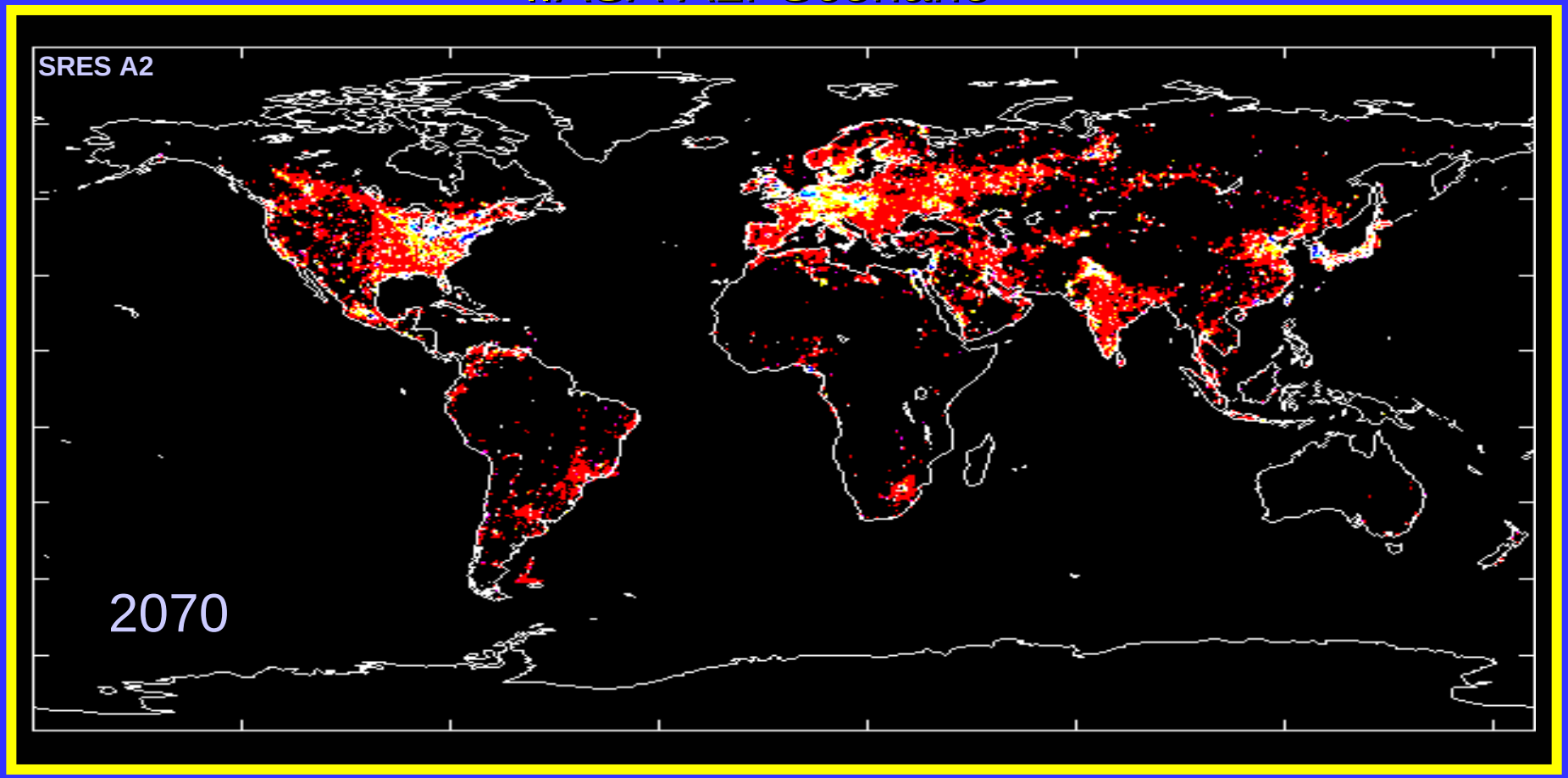

The Natomo Family
6:30am March 27, 1993 Kouakourou, Mali
© 2005 PETER MENZEL PHOTOGRAPHY

Night Lights

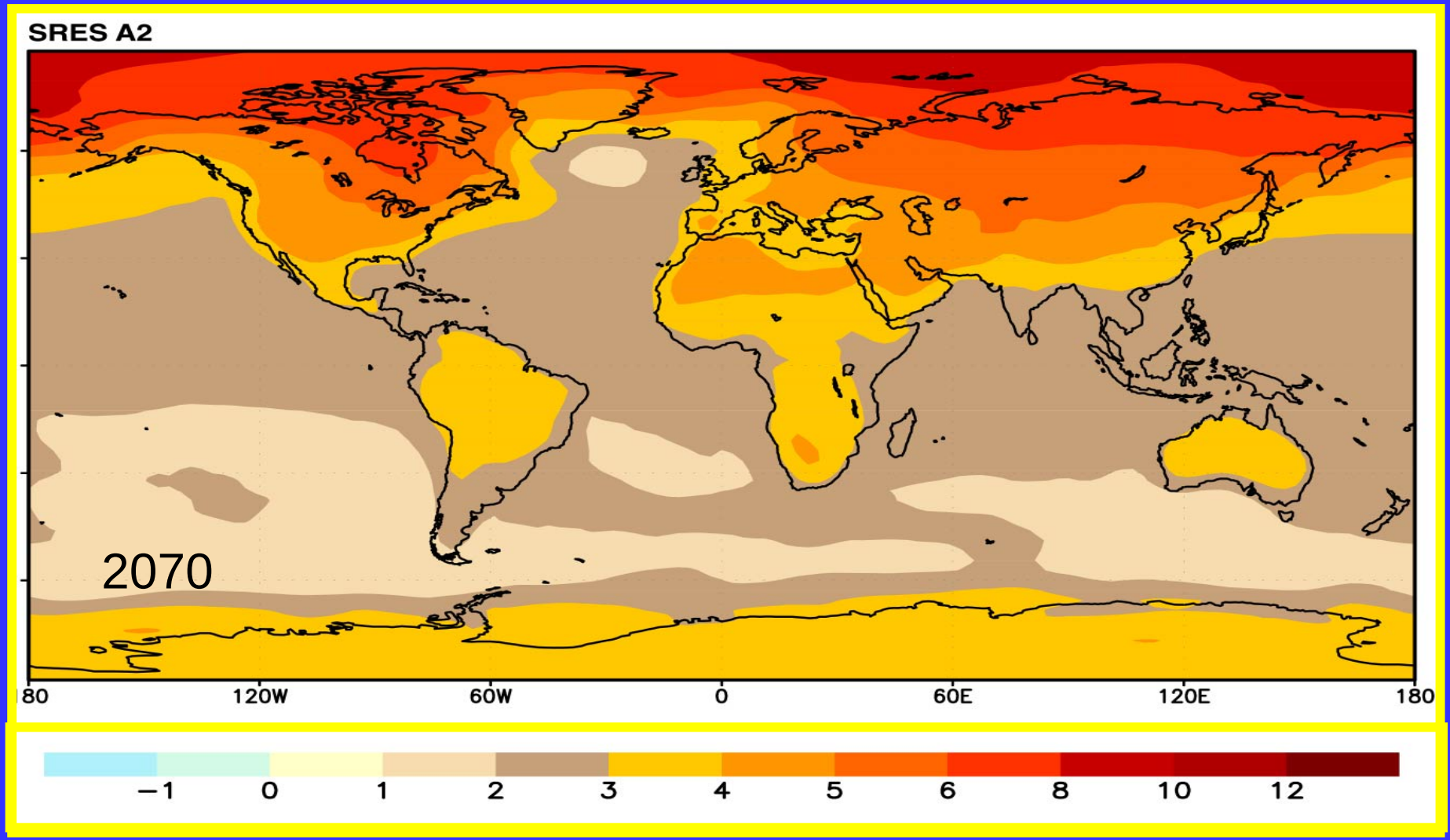


Night Lights

IIASA A2r Scenario



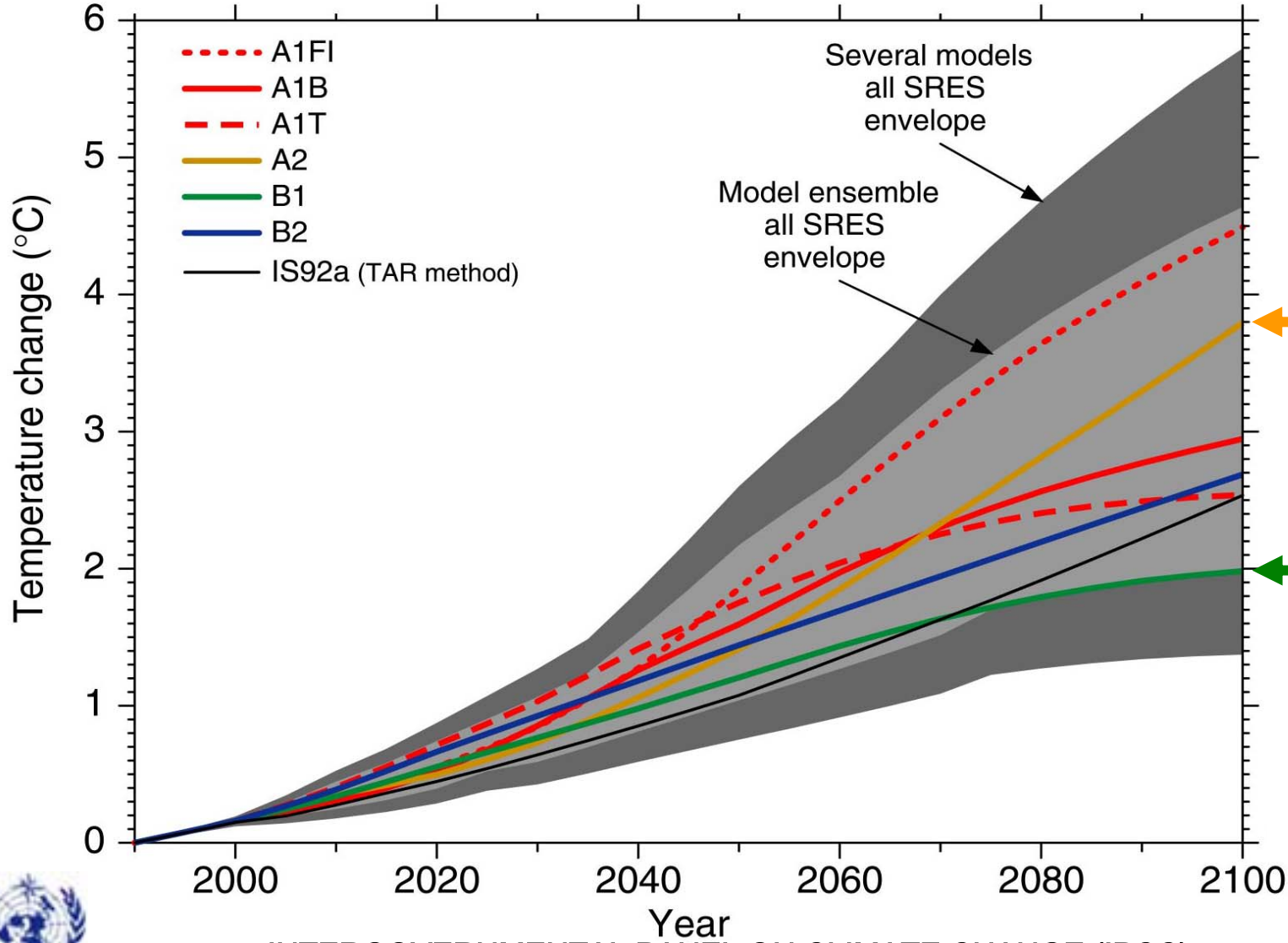
Δ Temperature



S

Global Mean Temperature Change

Six illustrative SRES scenarios, full range

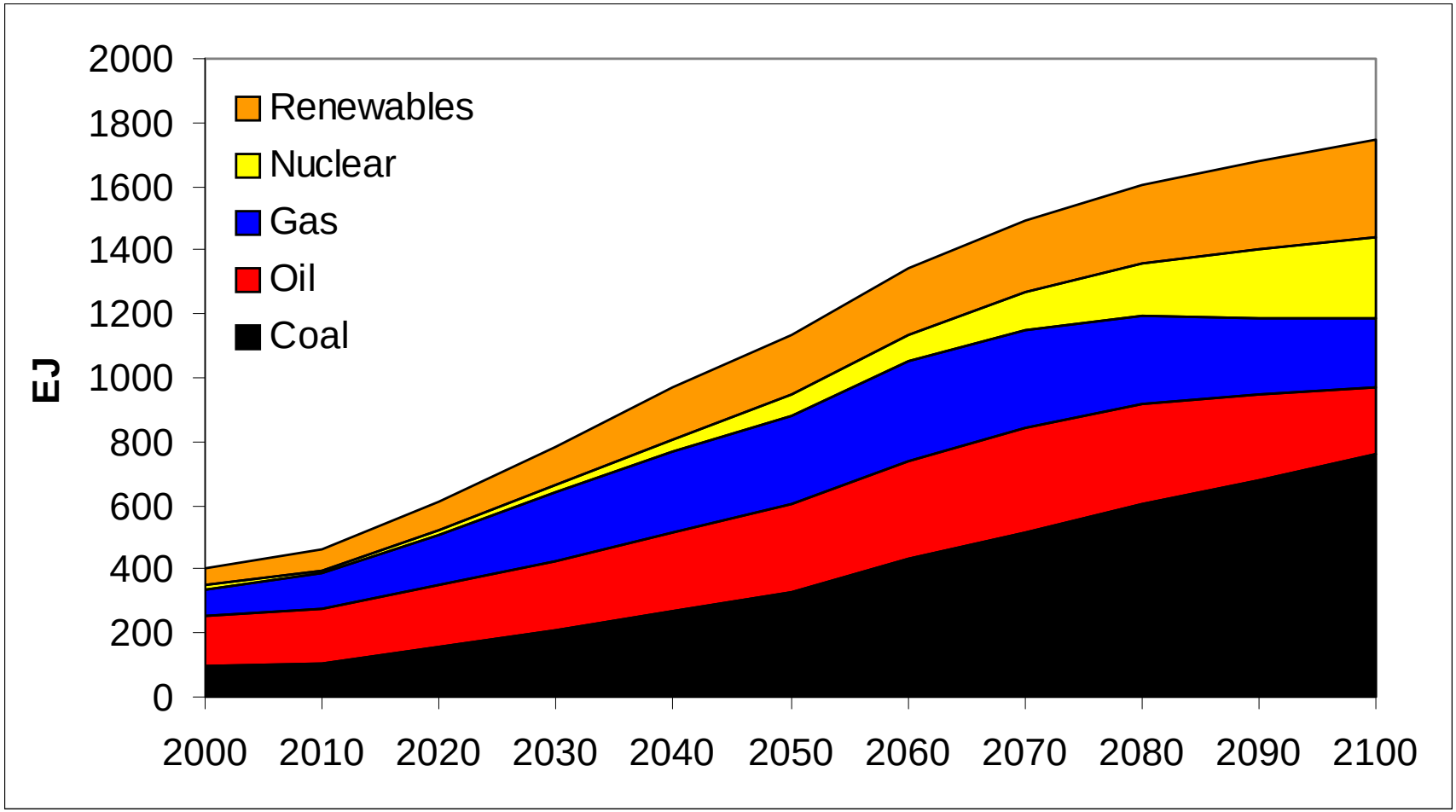


INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE (IPCC)

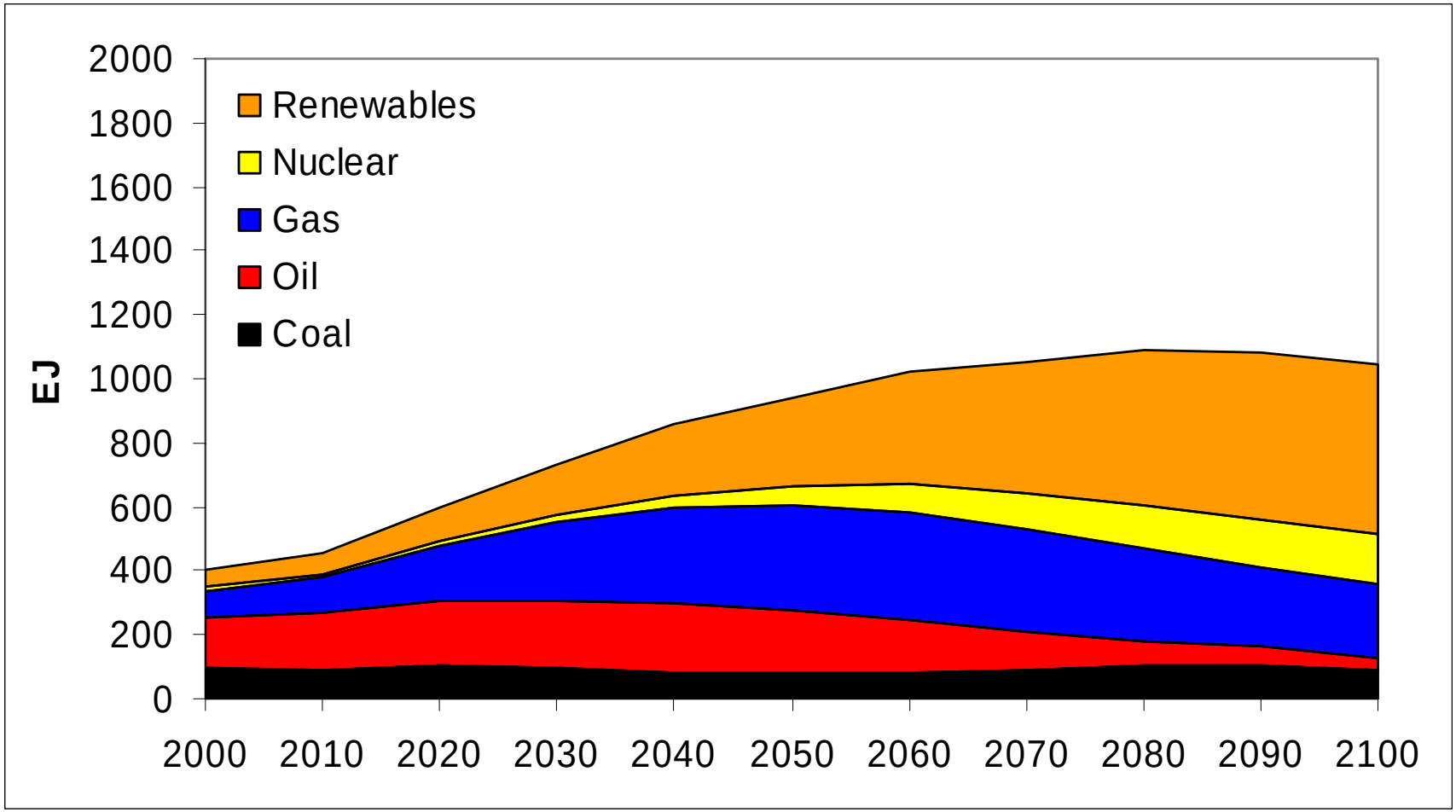
WMO

UNEP

Global Primary Energy – A2r

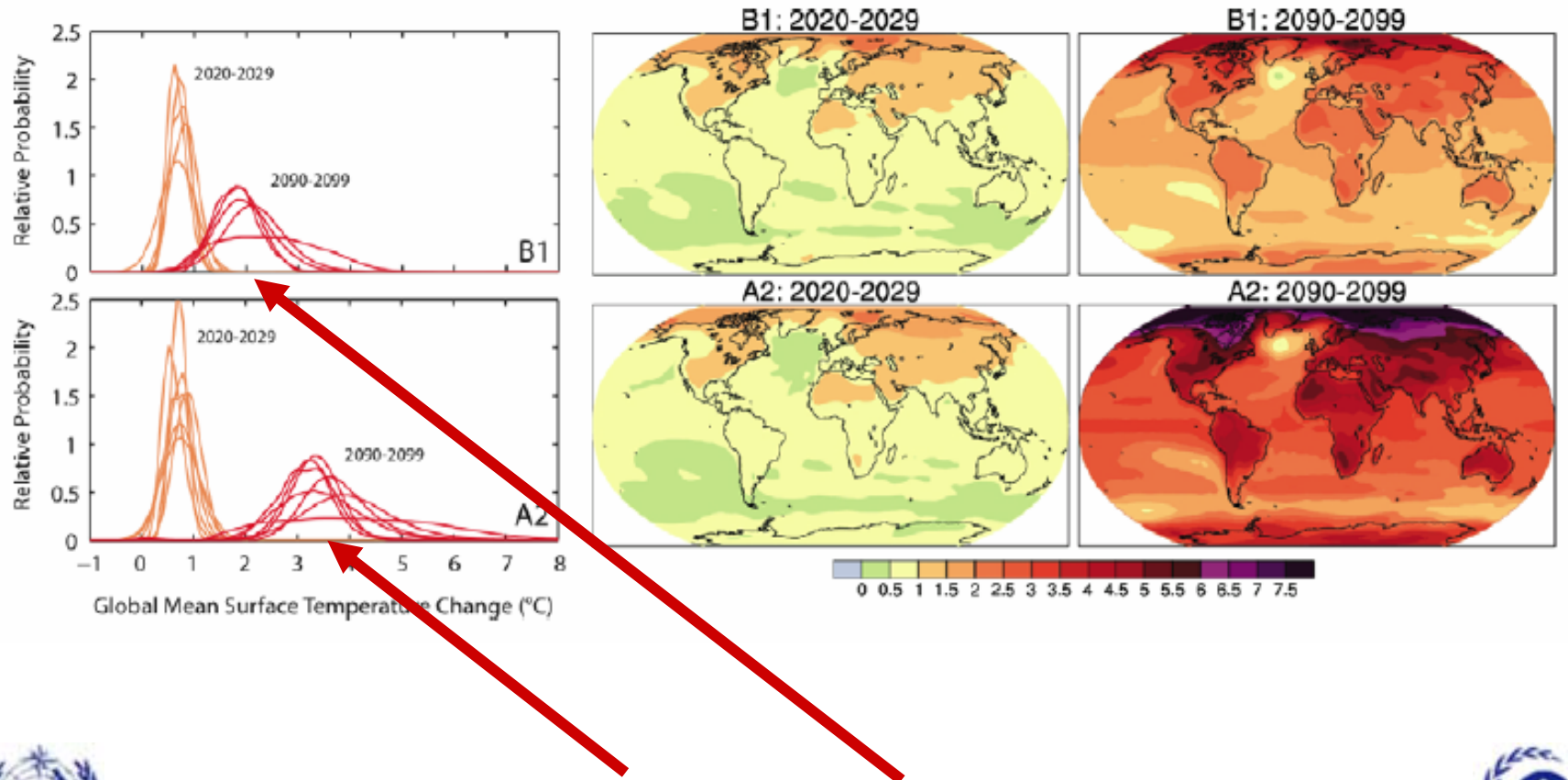


Global Primary Energy – B1

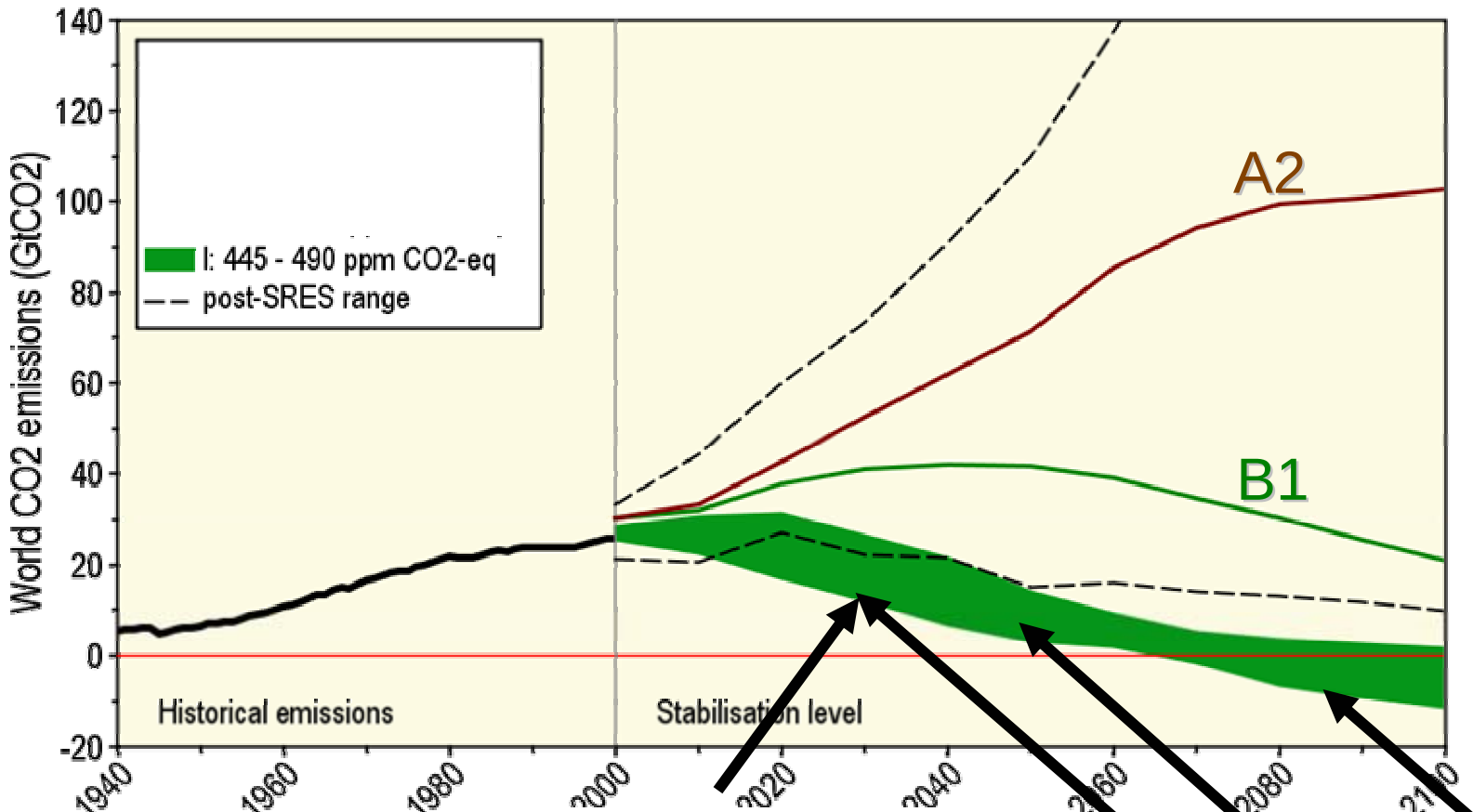


Surface Temperature Change

AOGCM projections for illustrative SRES scenarios



Long-Term Stabilization Profiles

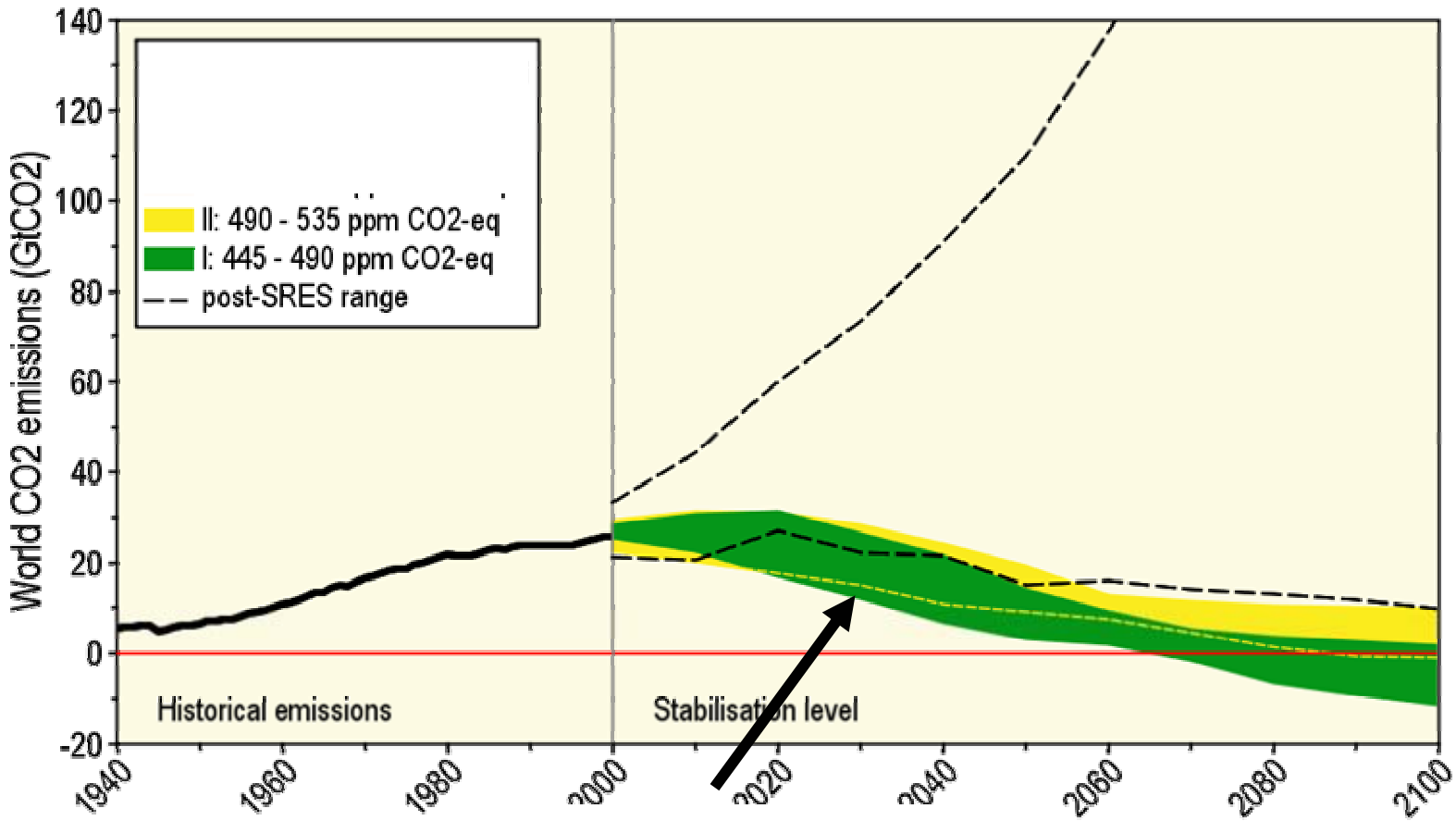


~$100/tCO$_2$

WMO

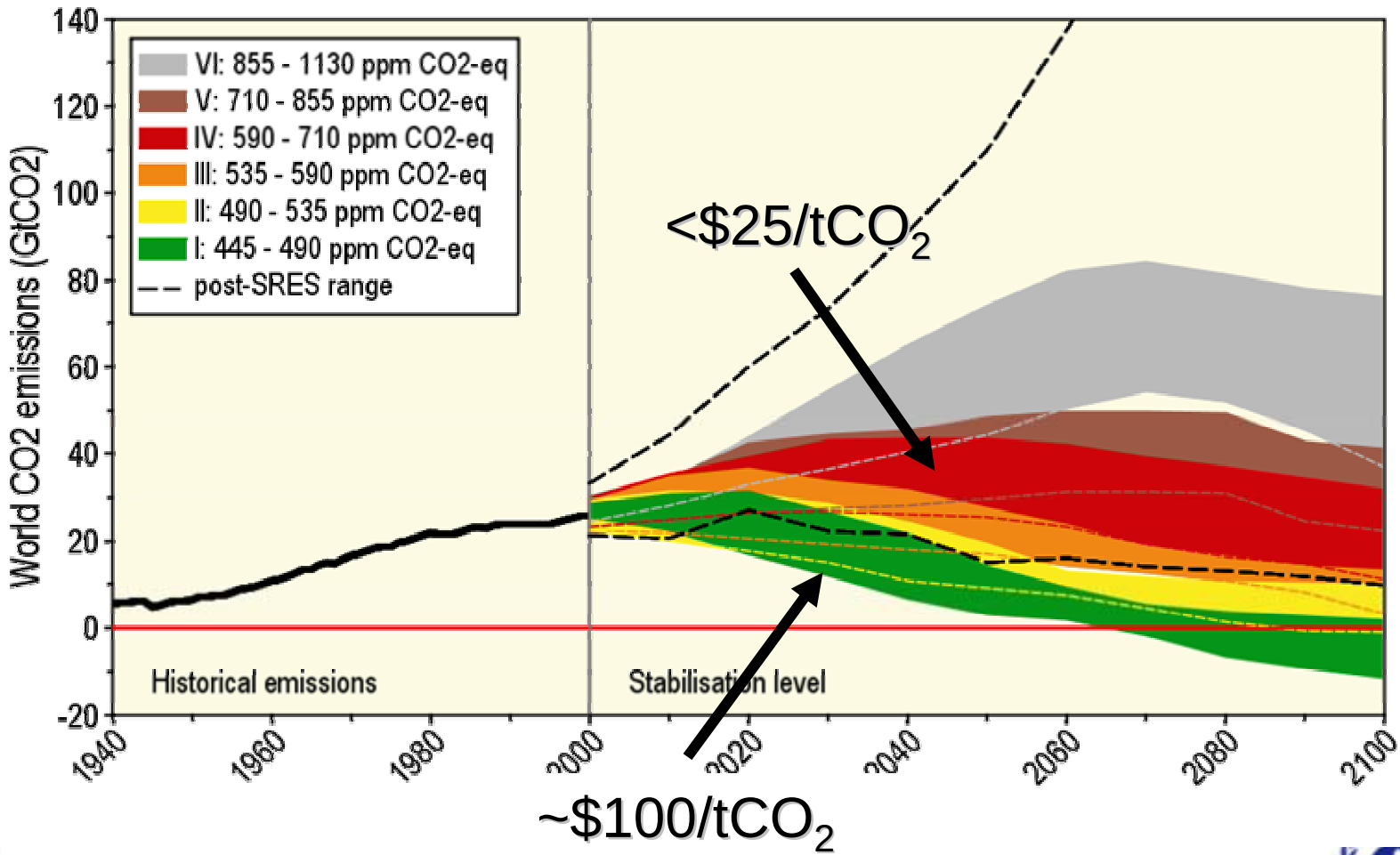
UNEP

Long-Term Stabilization Profiles

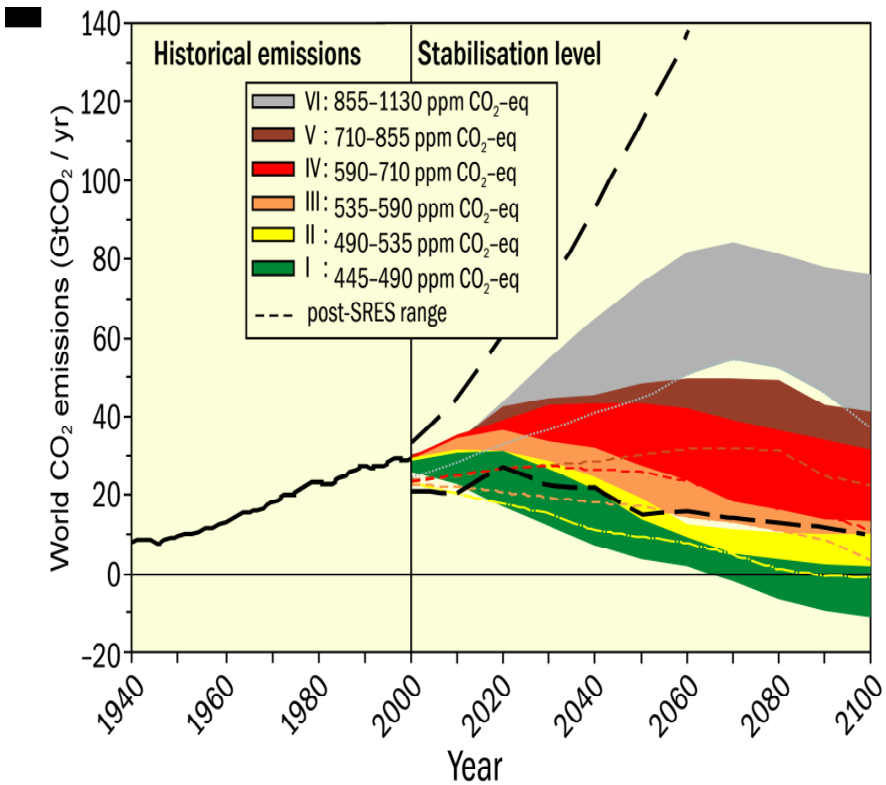


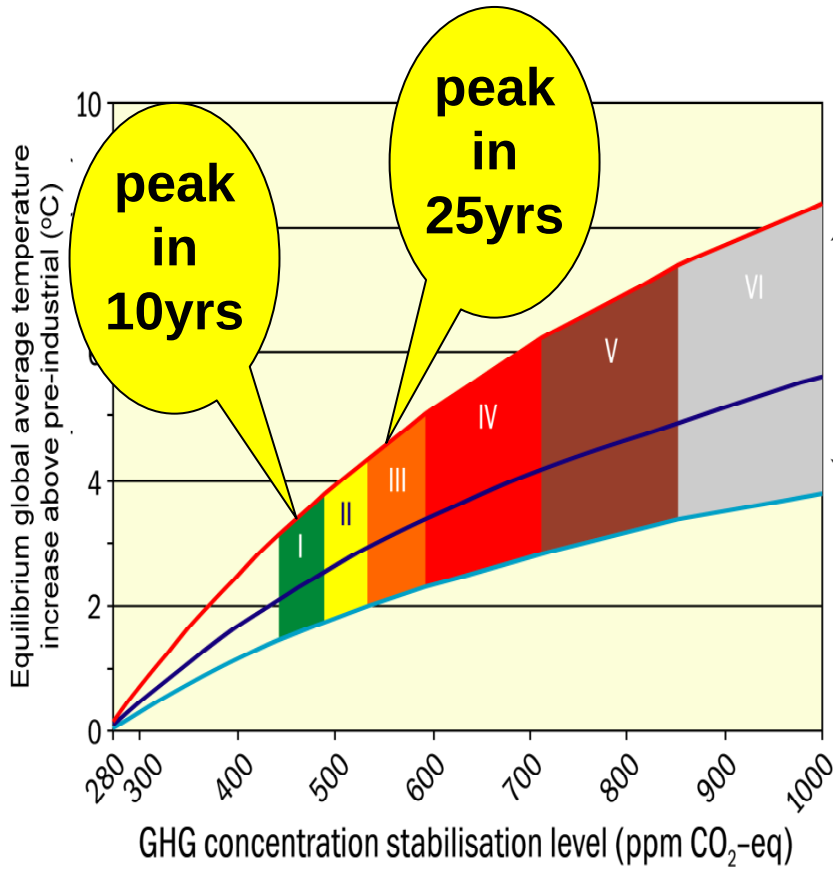
~$100/tCO$_2$

Long-Term Stabilization Profiles

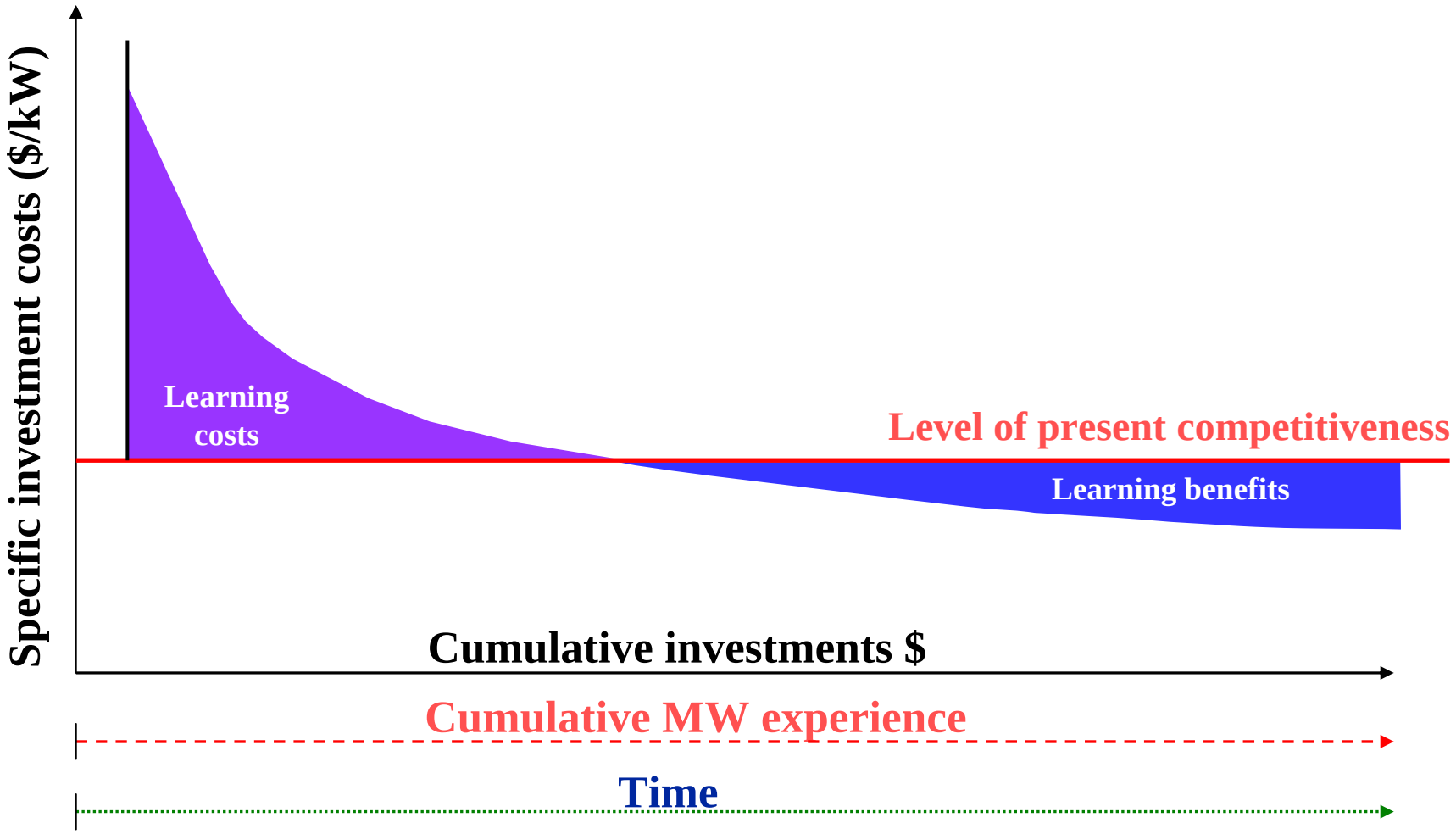


The lower the stabilisation level the earlier global emissions have to go down

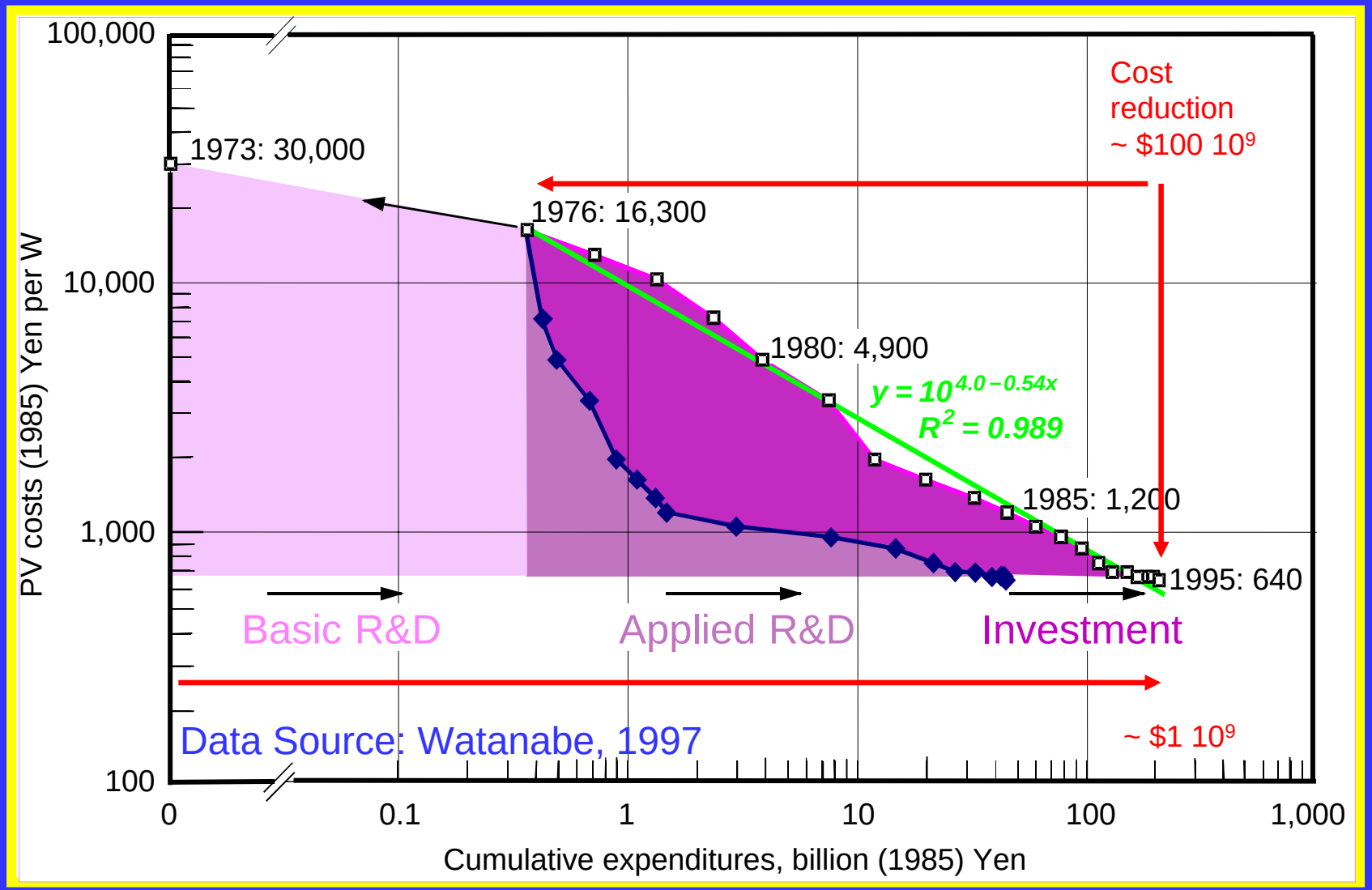




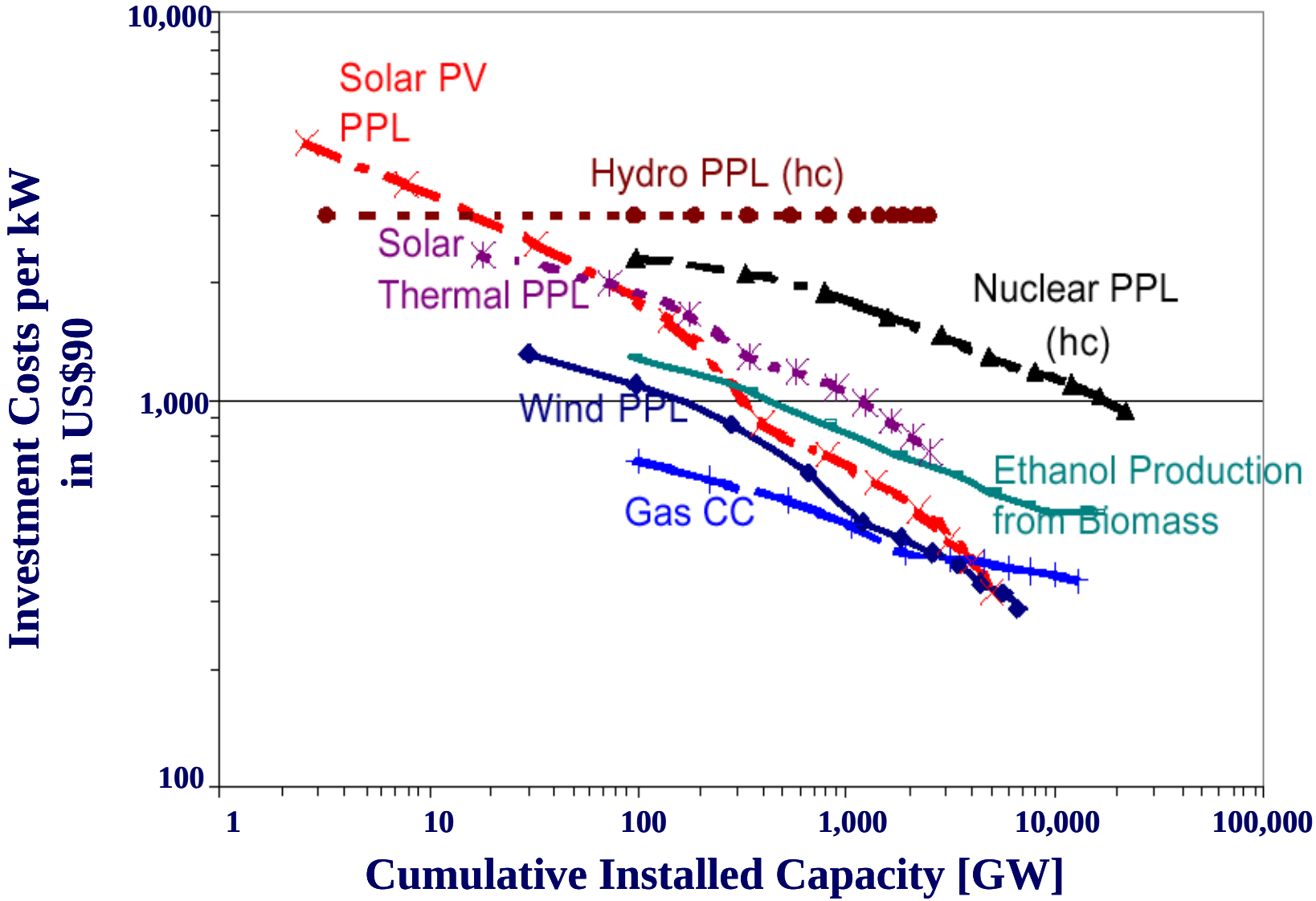
Technology Learning Costs and Benefits



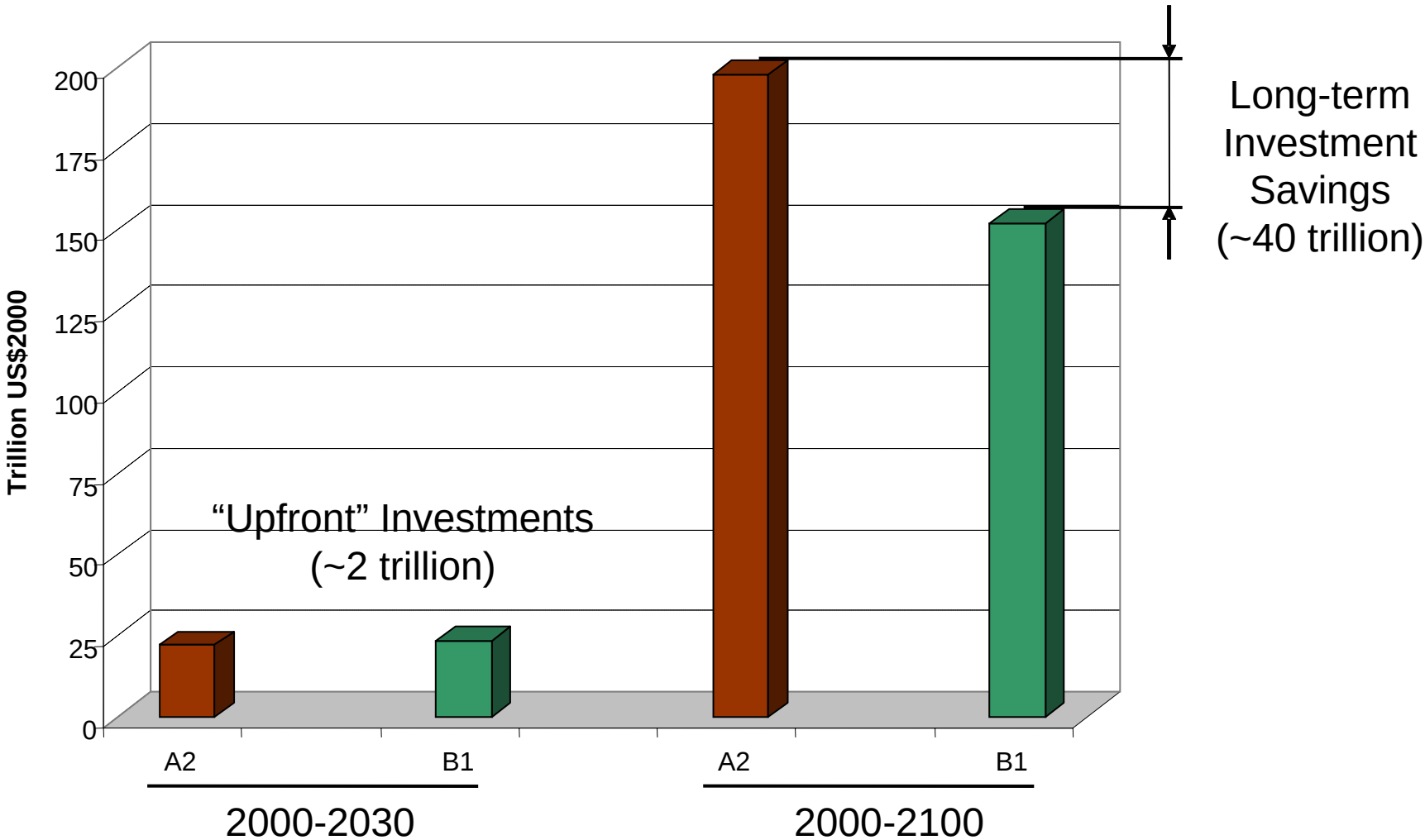
Japan - PV Costs vs. Expenditures



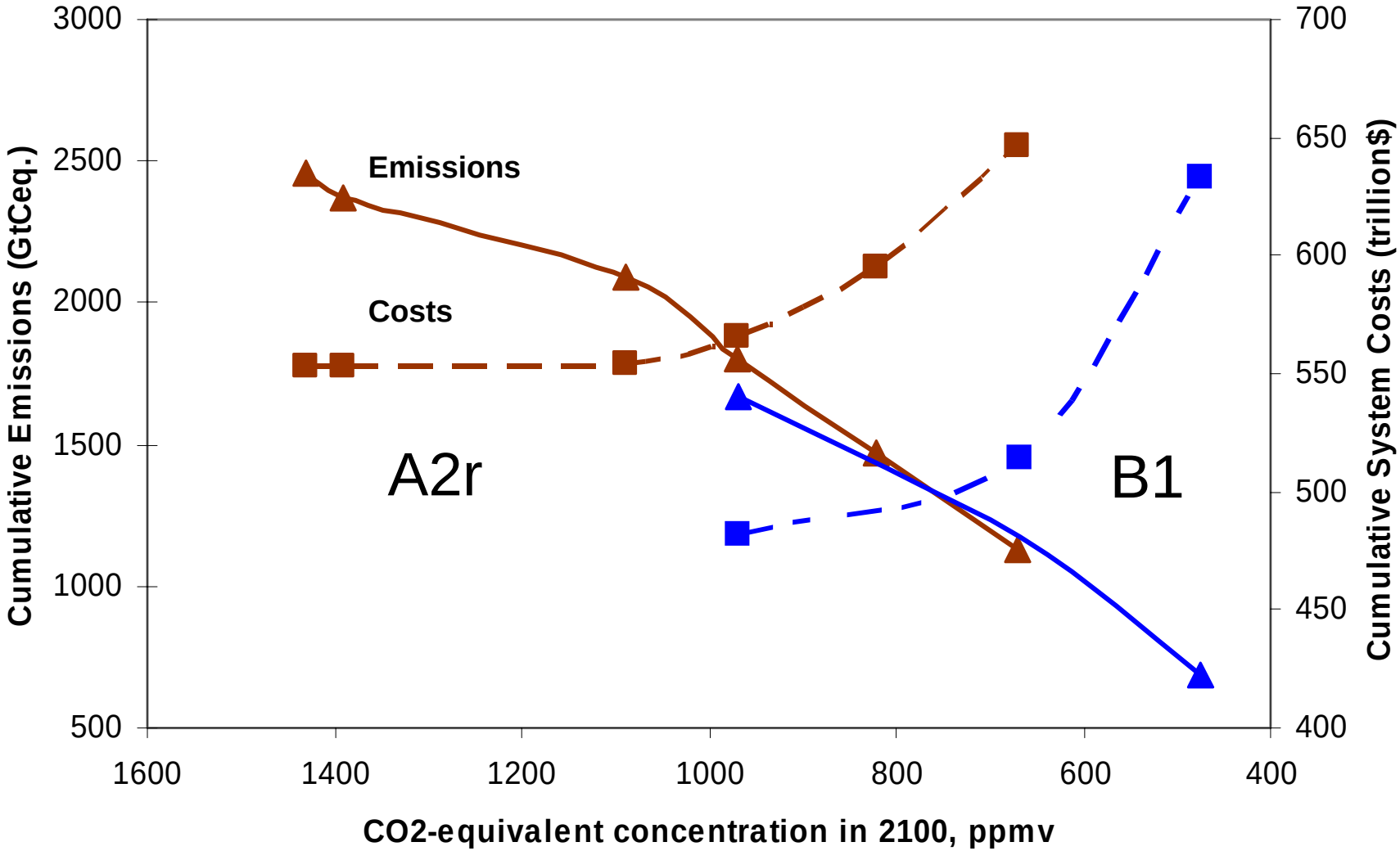
Technology Learning in SRES



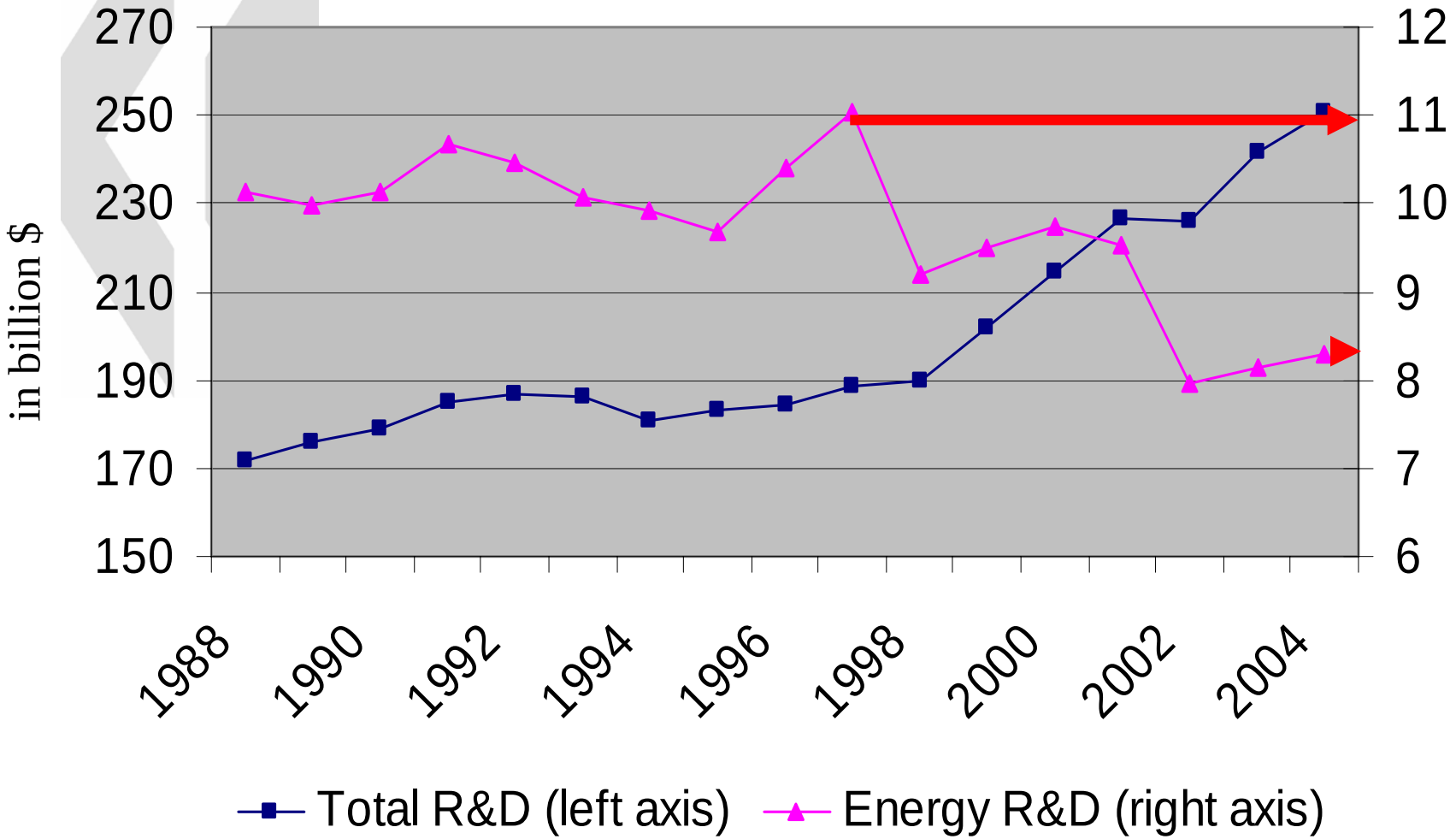
Total Energy-related Investments (World, short & long-term)



Emissions and Costs 2000-2100

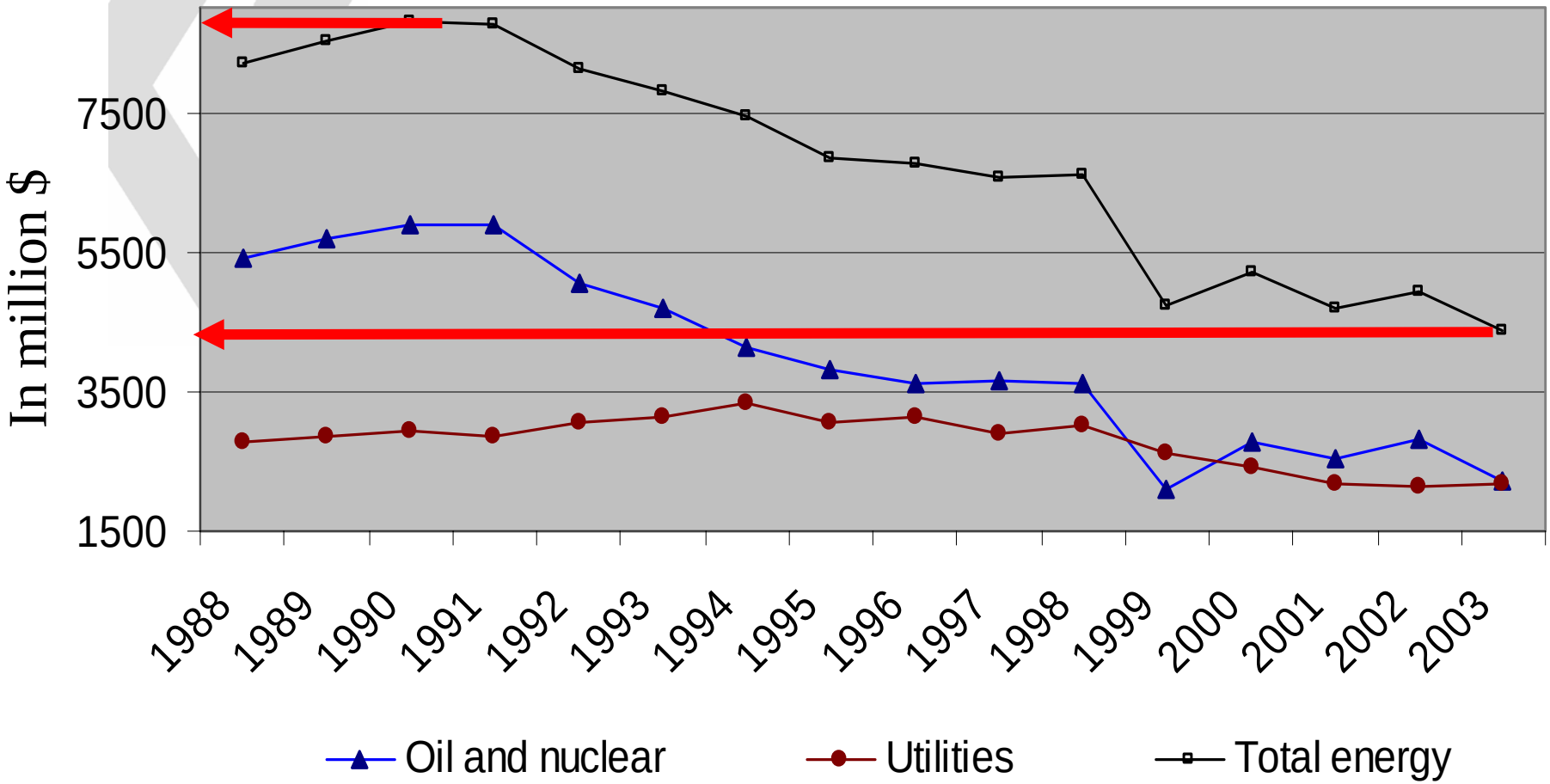


Development public R&D expenditure (in OECD)



Source: Doornbosch, 2006

Development private R&D expenditure (in OECD)



Source: Doornbosch, 2006

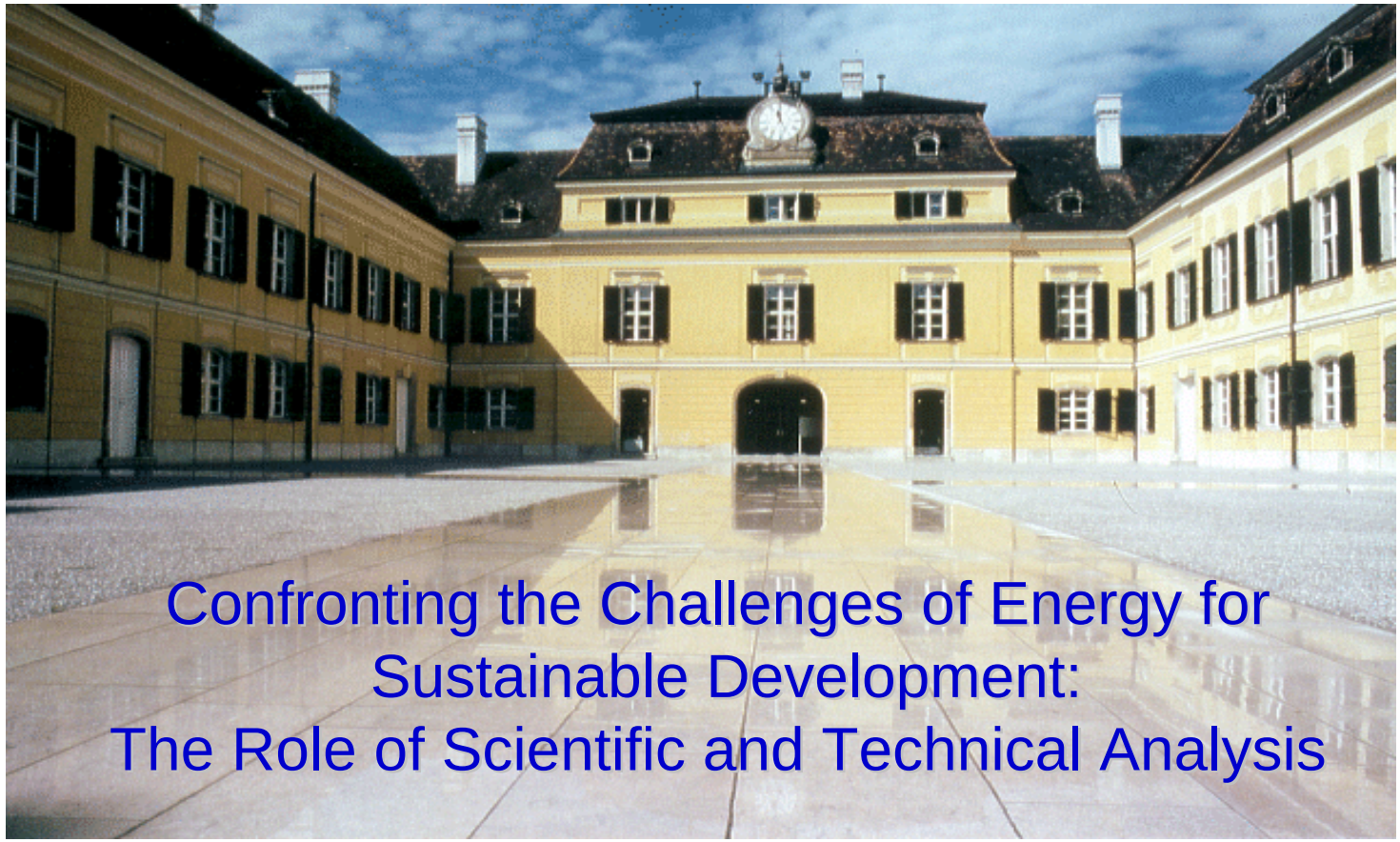
Global Mitigation Challenges

- Significant mitigation potential by 2030 and beyond at costs <$100/t$CO_2$
- Technological change essential for reducing mitigation costs and increasing potentials
- “Upfront” investments reduce longer-term mitigation costs and increase potentials
- Investment in RD&D and diffusion reduce mitigation costs

www.GlobalEnergyAssessment.org

Towards a more Sustainable Future

- The *magnitude* of the change required is *huge*
- The challenge is to find a way forward that addresses all the issues *simultaneously*
- A paradigm shift is needed: energy end-use efficiency, new renewables, advanced nuclear and carbon capture and storage.



Confronting the Challenges of Energy for Sustainable Development: The Role of Scientific and Technical Analysis

IIASA

International Institute for Applied Systems Analysis
and its international partners present

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