WMO

UNEP

Our Climate

Key findings from the IPCC Fourth Assessment Report

R. K. Pachauri

Chairman, IPCC

Director-General, TERI

Rotary Club
Oslo
7th January 2008

IPCC

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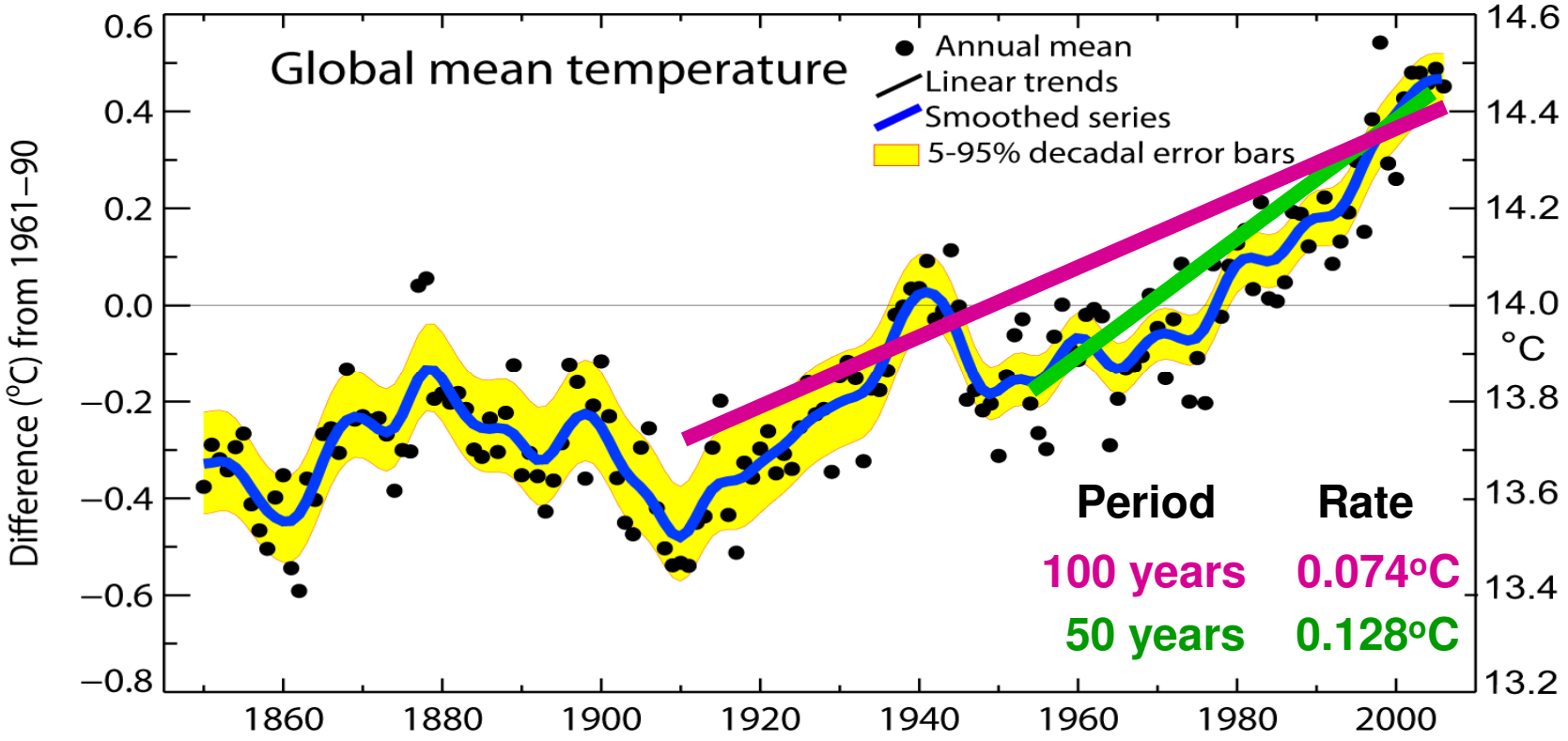
I. Observed changes in climate

Warming of the climate system is unequivocal, as is now evident from observations of increases in average air and ocean temperatures, widespread melting of snow and ice, and rising average sea level

I. Observed changes in climate

Changes in global average surface temperature



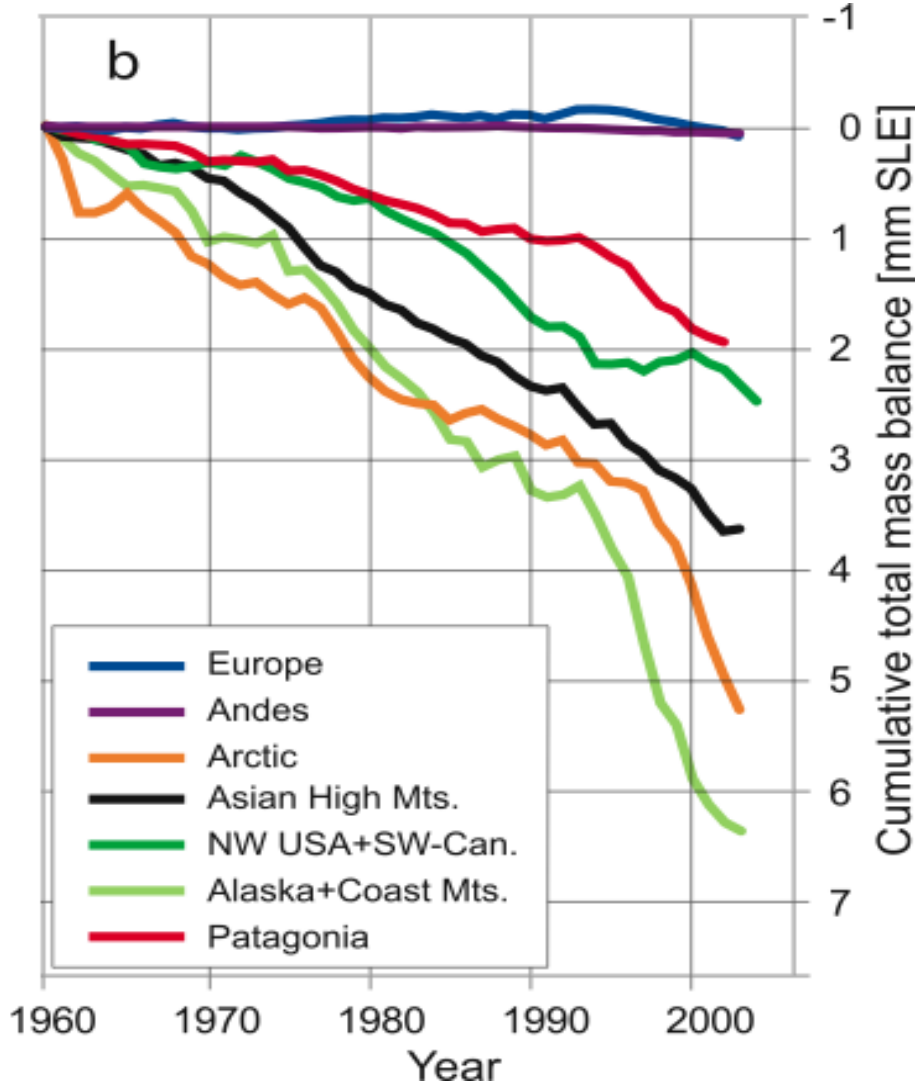
Eleven of the last twelve years rank among the twelve warmest years in the instrumental record of global surface temperature

I. Observed changes in climate

Cumulative balance of glacier mass

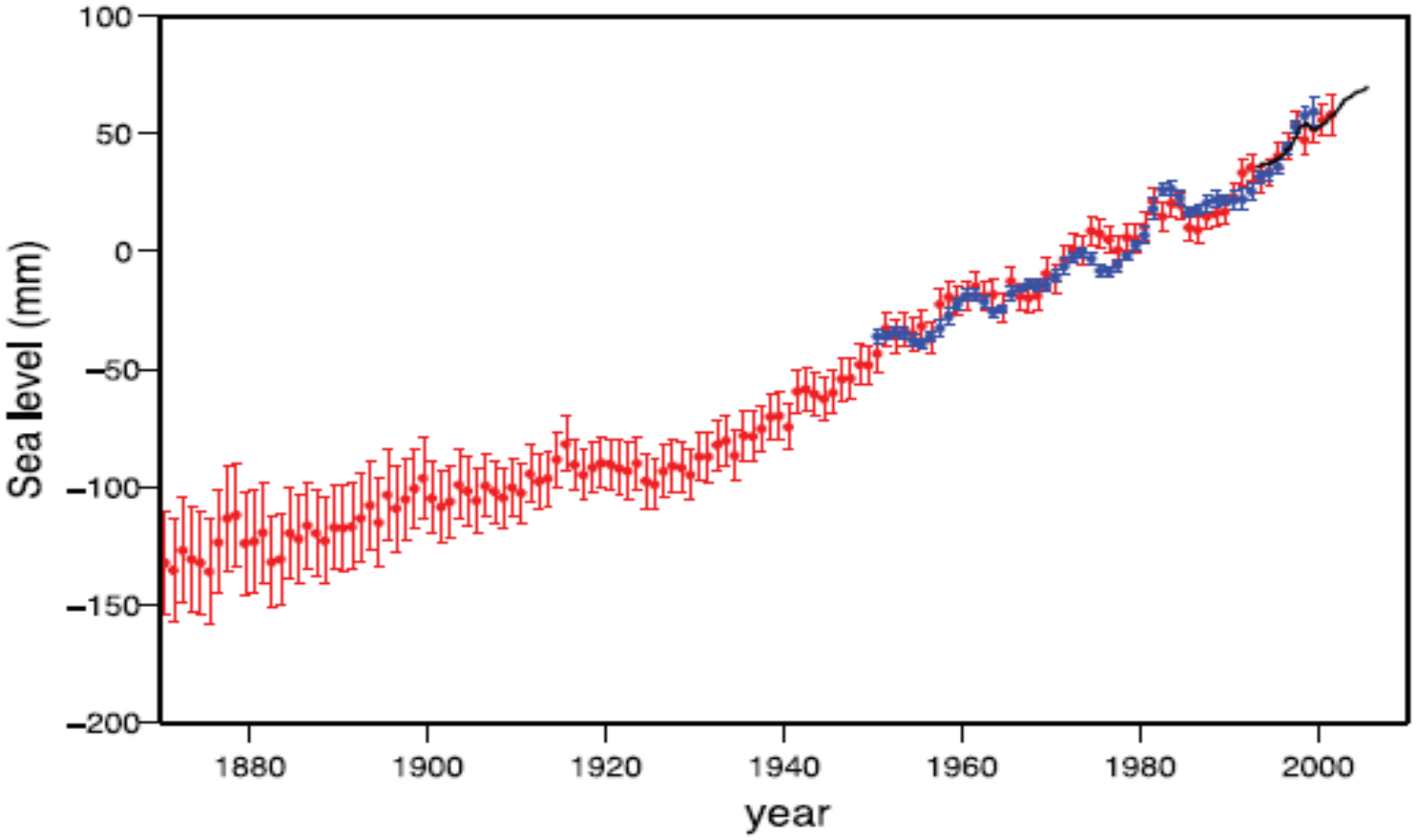
Water supplies stored in glaciers are projected to decline in the course of the century

Decreases in glaciers have contributed about 28% of sea level rise since 1993



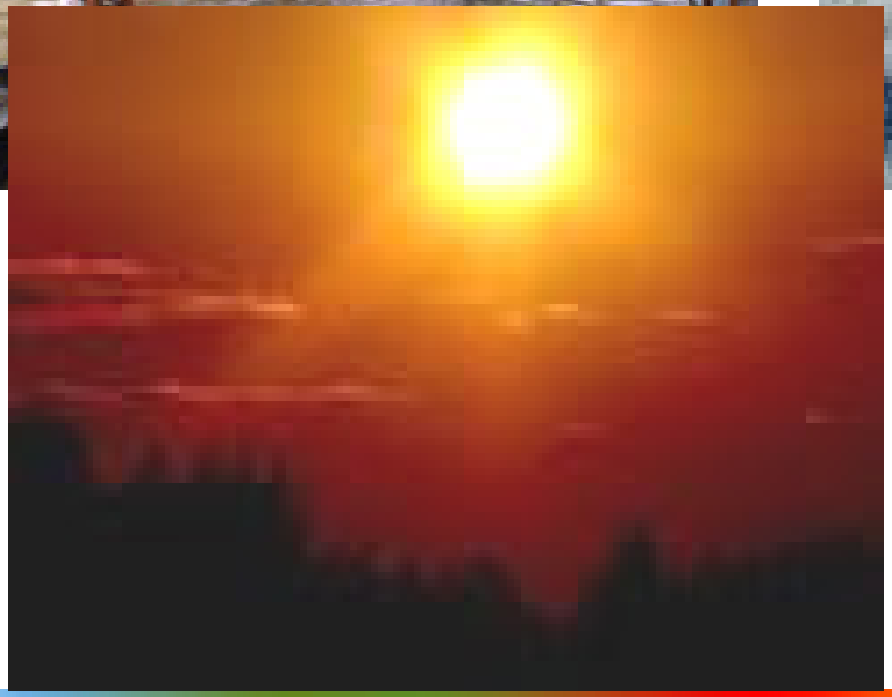
I. Observed changes in climate

Changes in global average sea level



Global average sea level has risen since 1961 at an average rate of 1.8mm/yr and since 1993 at 3.1mm/yr

I. Observed changes in climate



II. Causes of change

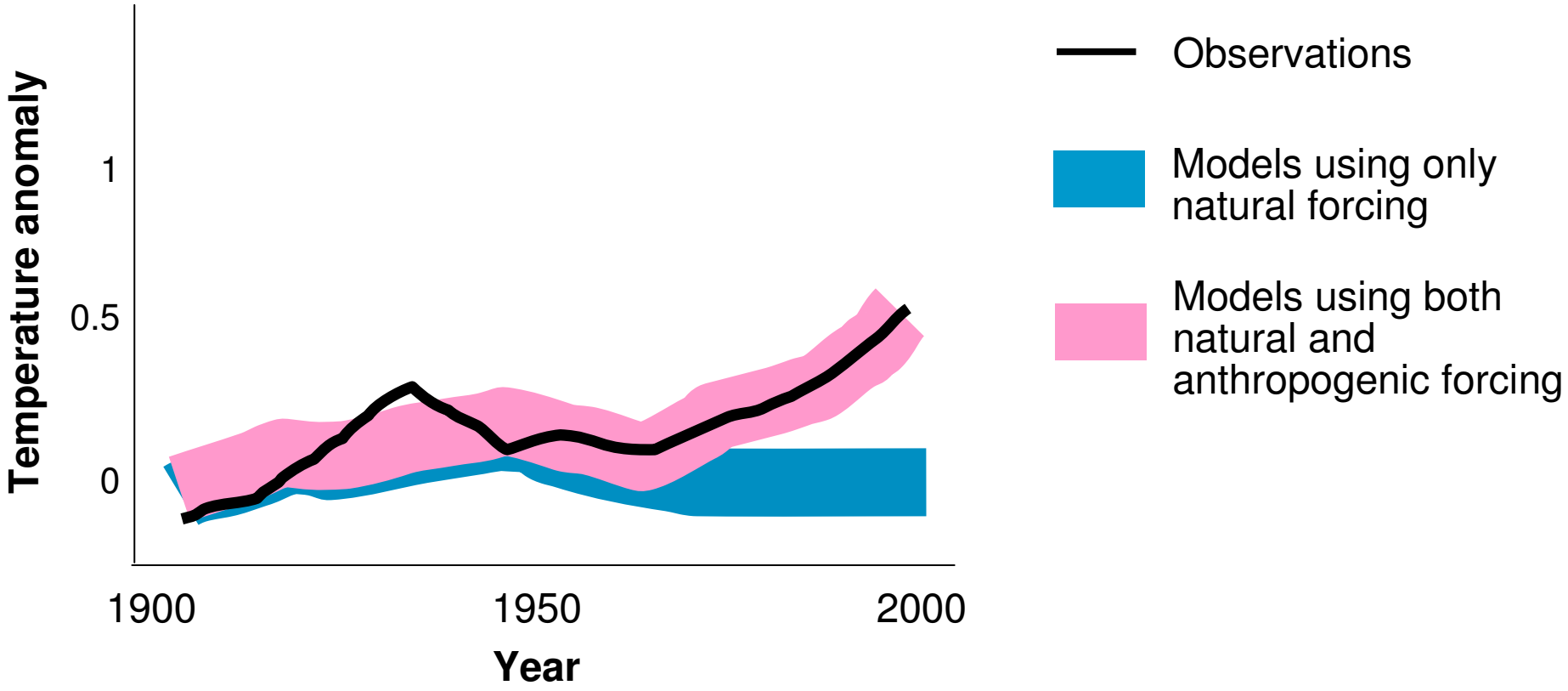
Global **GHG emissions** due to human activities have grown since pre-industrial times, with an increase of **70%** between 1970 and 2004

CO_2 annual emissions grew by about **80%** between 1970 and 2004

Most of the observed increase in temperatures since the mid-20th century is very likely due to the increase in anthropogenic GHG concentrations

II. Causes of change

Global temperature change

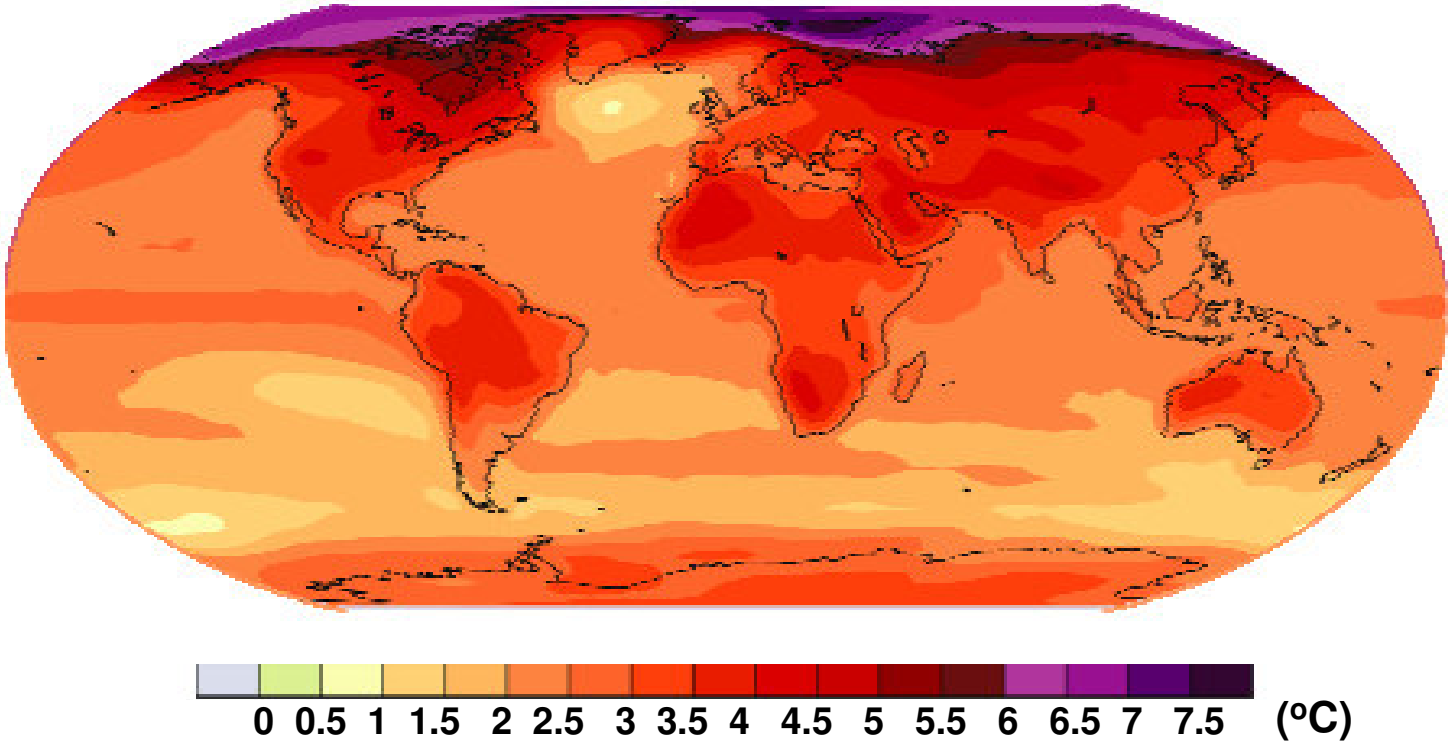


Observed patterns of warming are simulated only by models that include anthropogenic forcings

III. Projected climate change and impacts

Projected surface temperature changes

(2090-2099 relative to 1980-1999)

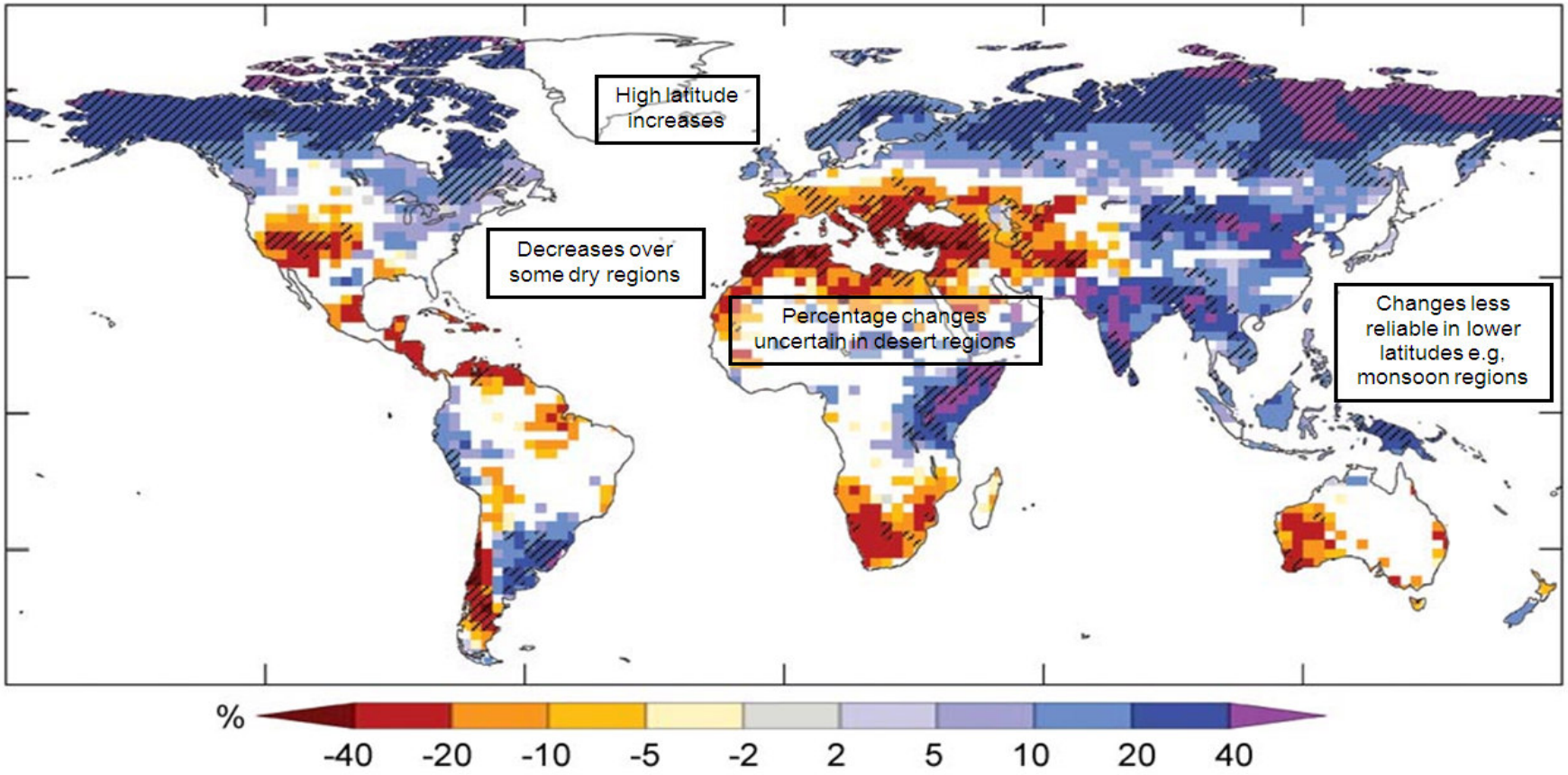


Continued emissions would lead to further warming of 1.8ºC to 4ºC over the 21st century

III. Projected climate change and impacts

Change in annual runoff

(2041-60 relative to 1900-70)



The negative impacts of climate change on freshwater systems outweigh its benefits

III. Projected climate change and impacts

Climate change could lead to some abrupt or irreversible impacts:

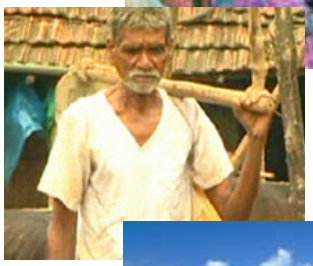
Partial **loss of ice sheets** on polar land could imply metres of sea level rise

20-30% of species are likely to be at risk of **extinction** if increases in warming exceed 1.5-2.5°C

III. Projected climate change and impacts

Some systems, populations and regions are likely to be especially affected:

Tundra, mountains, coral reefs



Poor and marginalised communities

The Arctic, Africa, small islands

Coastal systems and mega-deltas

III. Projected climate change and impacts

Vulnerability of coastal deltas

Coastal populations are expected to increase rapidly, while coastal settlements are at increased risk of sea-level rise

III. Projected climate change and impacts

Negative impacts in Europe

Inland and coastal flooding

Health risks due to heat-waves

Reduction of water availability and crop productivity in South Europe

Species losses and reduced snow cover in mountains

IV. Adaptation and mitigation options

Adaptive capacity is intimately connected to **social and economic development**

Even **societies with high adaptive capacity** remain vulnerable to climate change

Adaptation can reduce vulnerability especially when it is embedded within **broader sectoral initiatives**

But adaptation alone is not expected to cope with all the projected effects of climate change

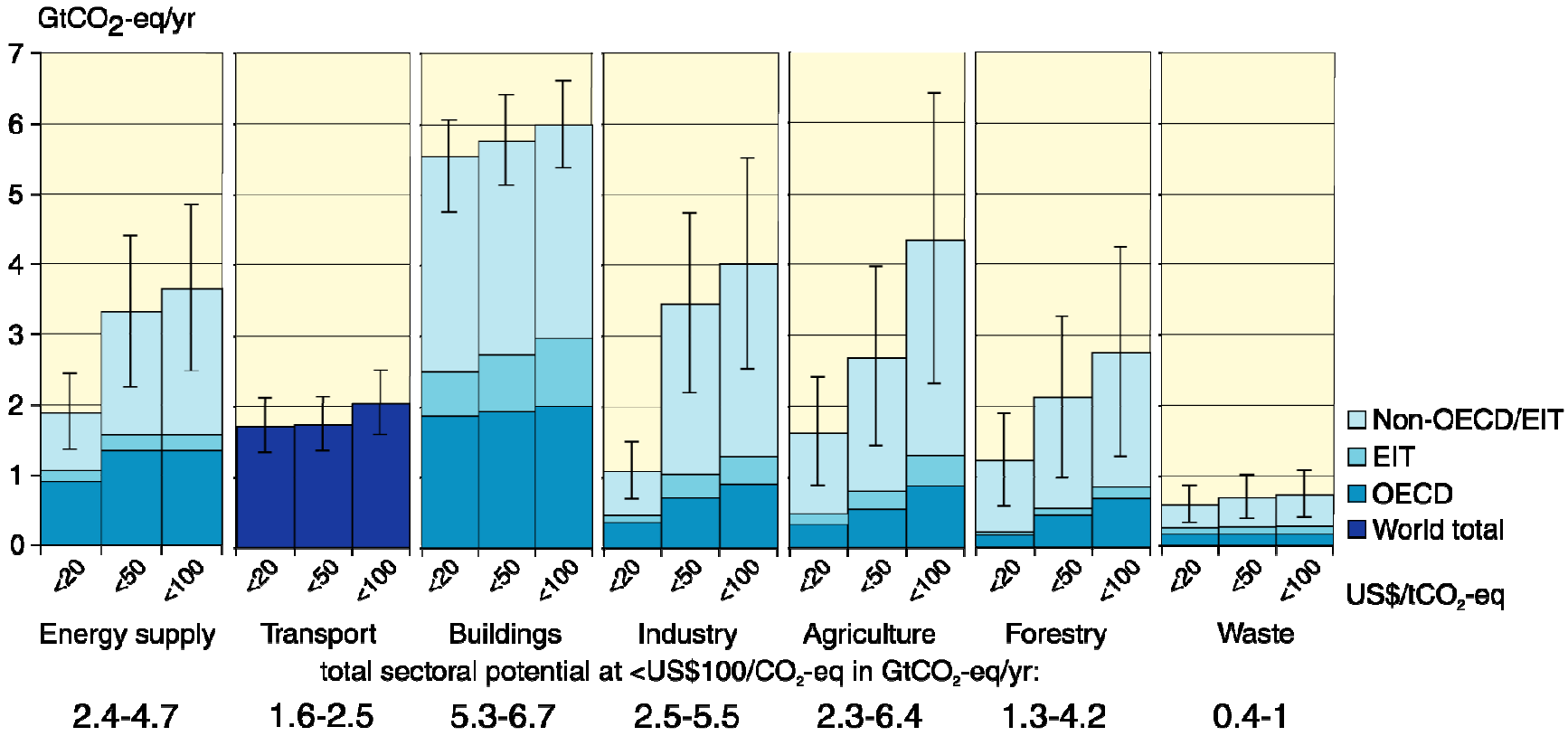
IV. Adaptation and mitigation options

All stabilisation levels assessed can be achieved by deployment of a portfolio of **technologies that are currently available or expected to be commercialised** in coming decades

This assumes that **investment flows, technology transfer and incentives** are in place for technology development

IV. Adaptation and mitigation options

Economic mitigation potential by sector in 2030



There is substantial potential for the mitigation of GHG emissions that could offset the projected growth of global emissions or reduce emissions

IV. Adaptation and mitigation options

Mitigation options in energy supply

Technologies currently available	Improved supply and distribution efficiency; fuel switching from coal to gas; nuclear power; renewable heat and power; combined heat and power; early applications of Carbon Dioxide Capture and Storage (CCS)
Technologies projected to be commercialised before 2030	CCS for gas, biomass and coal-fired electricity generating facilities; advanced nuclear power; advanced renewable energy, including tidal and wave energy, concentrating solar, and solar photovoltaics
Policies, measures and instruments	Reduction of fossil fuel subsidies; taxes or carbon charges on fossil fuels; feed-in tariffs for renewable energy technologies; renewable energy obligations; producer subsidies

IV. Adaptation and mitigation options

Mitigation options in transport

Technologies currently available	More fuel efficient vehicles; hybrid vehicles; cleaner diesel vehicles; biofuels; modal shifts from road transport to rail and public transport systems; non-motorised transport; land-use and transport planning
Technologies projected to be commercialised before 2030	Second generation biofuels; higher efficiency aircraft; advanced electric and hybrid vehicles with more powerful and reliable batteries
Policies, measures and instruments	Fuel economy, biofuel blending and CO_2 standards for road transport; taxes on vehicle purchase, registration; road and parking pricing, land use regulations; infrastructure planning; public transport facilities, non-motorised forms of transport

IV. Adaptation and mitigation options

Mitigation options in buildings

Technologies currently available	Efficient lighting and daylighting; efficient electrical appliances and heating and cooling devices; improved cook stoves, insulation; passive and active solar design; alternative refrigeration fluids, recovery and recycling of fluorinated gases
Technologies projected to be commercialised before 2030	Integrated design of commercial buildings including intelligent meters that provide feedback and control; integrated solar photovoltaics
Policies, measures and instruments	Appliance standards and labelling; building codes and certification; demand-side management; public sector leadership; energy service companies

IV. Adaptation and mitigation options

Mitigation options in industry

Technologies currently available	Efficient end-use electrical equipment; heat and power recovery; material recycling and substitution; control of non-CO_2 gas emissions; process-specific technologies
Technologies projected to be commercialised before 2030	Advanced energy efficiency; CCS for cement, ammonia and iron manufacture; inert electrodes for aluminium manufacture
Policies, measures and instruments	Provision of benchmark information; performance standards; subsidies; tax credits; tradable permits; voluntary agreements

IV. Adaptation and mitigation options

Key mitigation instruments, policies and practices:

Regulations and standards

Taxes and charges

Effective carbon-price signal

Appropriate energy infrastructure investments

Research, development and demonstration

International and regional cooperation

Changes in lifestyle & management practices

V. Mitigation targets

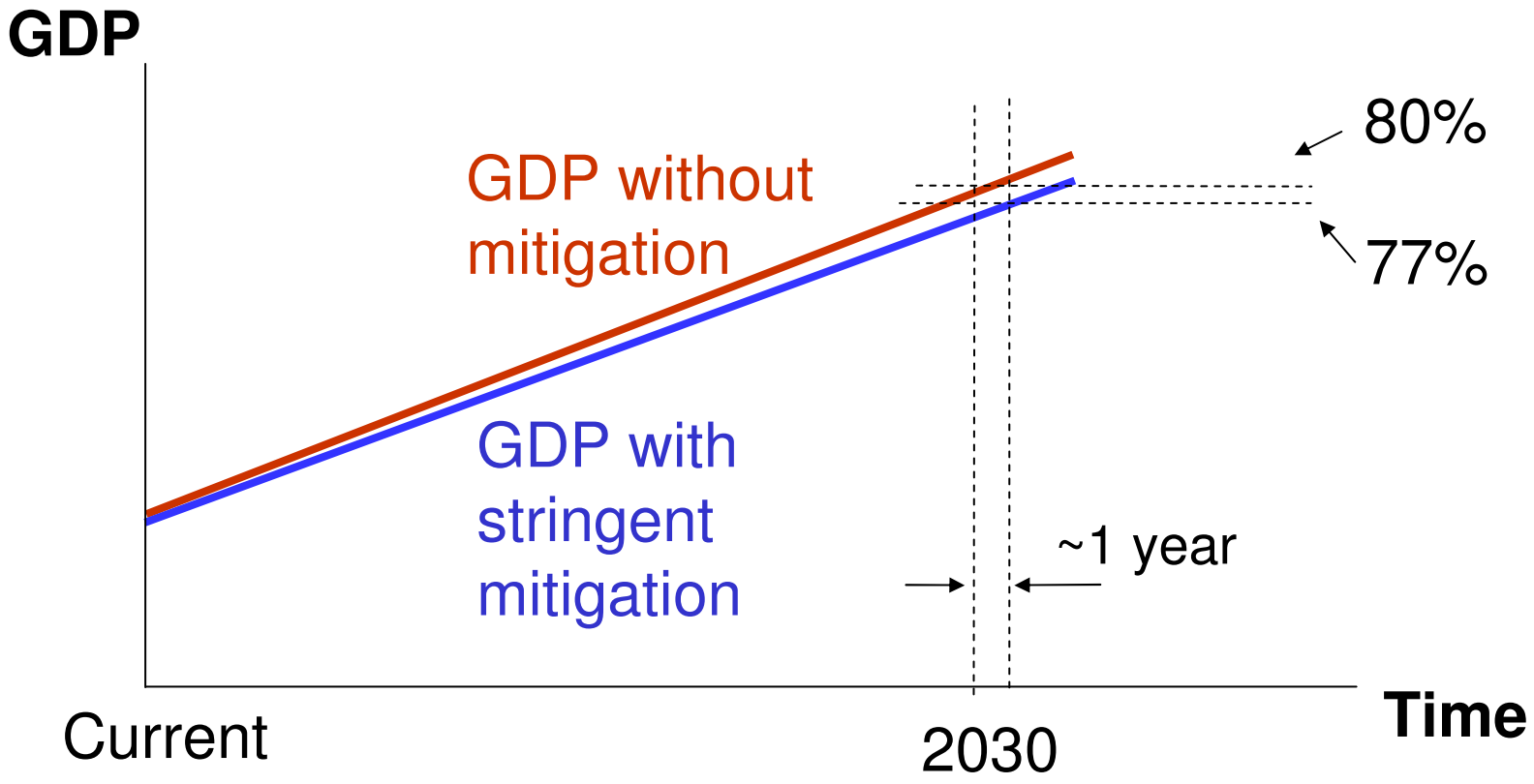
Characteristics of stabilisation scenarios

Stabilization level (ppm CO_2-eq)	Global mean temp. increase (ºC)	Year CO_2 needs to peak	Global sea level rise above pre-industrial from thermal expansion (m)
445 – 490	2.0 – 2.4	2000 – 2015	0.4 – 1.4
490 – 535	2.4 – 2.8	2000 – 2020	0.5 – 1.7
535 – 590	2.8 – 3.2	2010 – 2030	0.6 – 1.9
590 – 710	3.2 – 4.0	2020 – 2060	0.6 – 2.4

Mitigation efforts over the next two to three decades will have a large impact on opportunities to achieve lower stabilisation levels

V. Mitigation targets

Impacts of mitigation on GDP growth



Stringent mitigation would postpone GDP growth of one year at most over the medium term

V. Mitigation targets

In 2050, global average **costs for mitigation** are between a 1% gain and 5.5% decrease of global GDP
- less than 0.12 percentage points in annual GDP

Mitigation actions can result **co-benefits** that may offset a substantial fraction of mitigation costs

Costs of impacts of climate change will increase as temperatures increase

Choices about the scale and timing of mitigation involve balancing the economic costs of more rapid emission reductions against the medium and long term risks of delay

V. Mitigation targets

Beyond the Kyoto Protocol

Developed countries need to significantly reduce their emissions below 1990 levels:

- 40% by 2020
- 80% by 2050

Developing country emissions need to deviate below their projected baseline within the next few decades

V. Mitigation targets

Core decisions of the Bali Roadmap

Conclusion of a post-Kyoto treaty by **2009**

Launch of an **Adaptation Fund** for developing countries

Stage for a strategic programme on **deforestation** and **technology transfer**

Stage for commitments by **developing countries** to measurable and verifiable national mitigation actions

On-going work to implement **existing commitments**

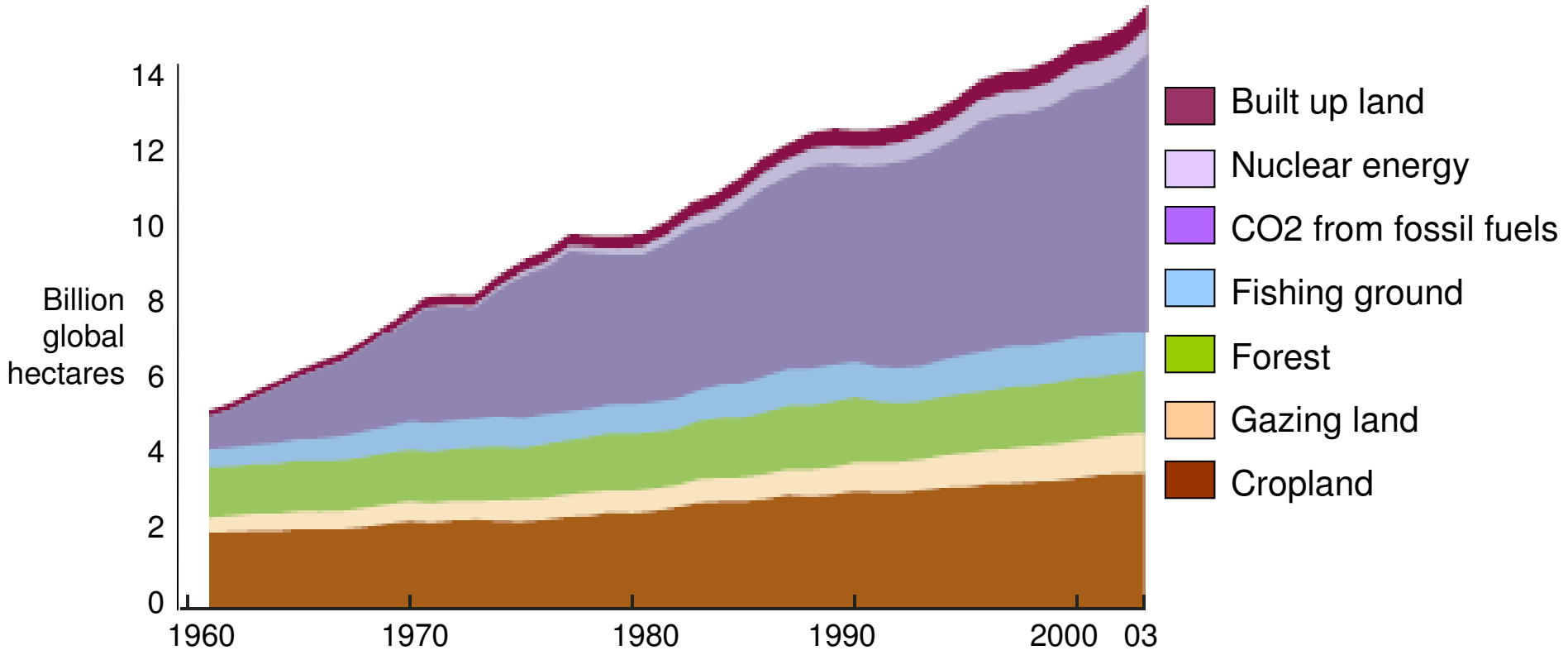
VI. Towards a new development path

Common drivers lie behind mitigation policies and policies addressing economic development, poverty, employment, energy security, and local environmental protection

Linking these policies will have numerous **co-benefits** reducing greenhouse gases mitigation costs

VI. Towards a new development path

Ecological footprint and bio-capacity by region



The CO_2 footprint from the use of fossil fuels is the fastest growing component of our ecological footprint

Source: WWF, Living Planet Report 2006

IPCC

VI. Towards a new development path

The dominant path to industrialisation has been characterised by high concurrent GHG emissions

Committing to alternative development paths would require **major changes** in areas other than climate change:

Economic structure

Technology

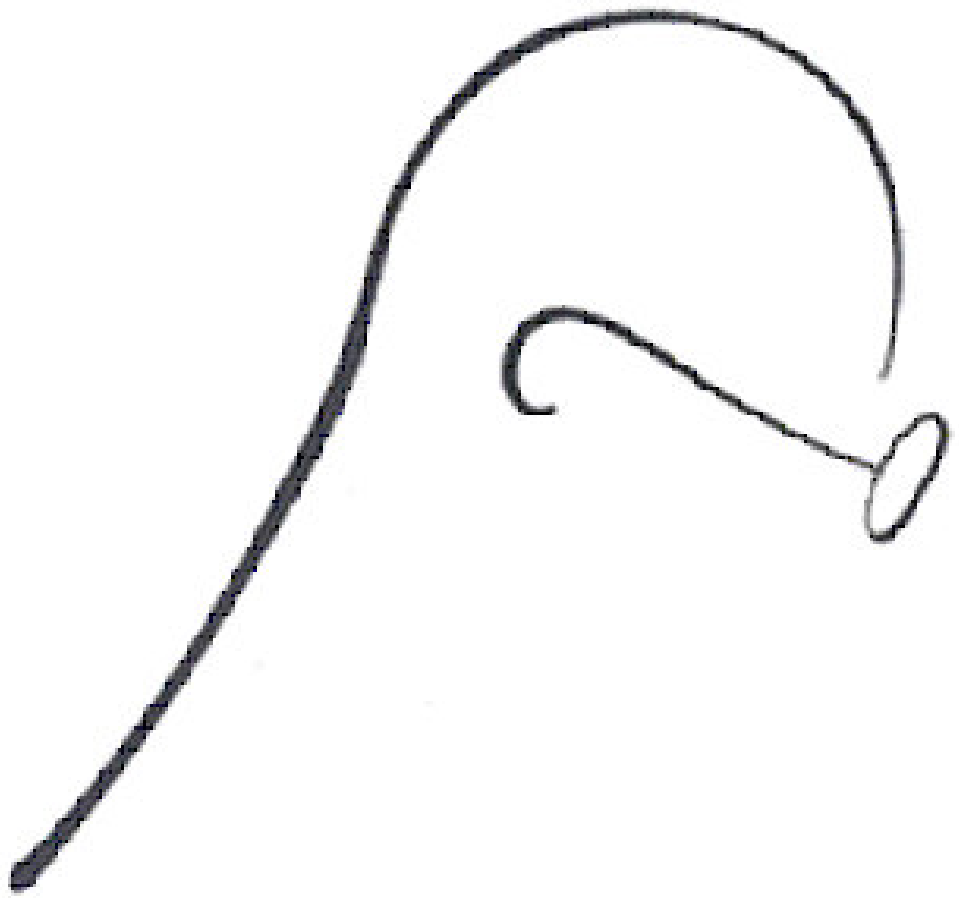
Geographical distribution of activities

Consumption patterns

Urban design and transport infrastructure

Demography

Institutional arrangements and trade patterns



A technological society has two choices. First it can wait until catastrophic failures expose systemic deficiencies, distortion and self-deceptions…

Secondly, a culture can provide social checks and balances to correct for systemic distortion prior to catastrophic failures.