WMO

UNEP

A Global Perspective on Climate Change

By

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At

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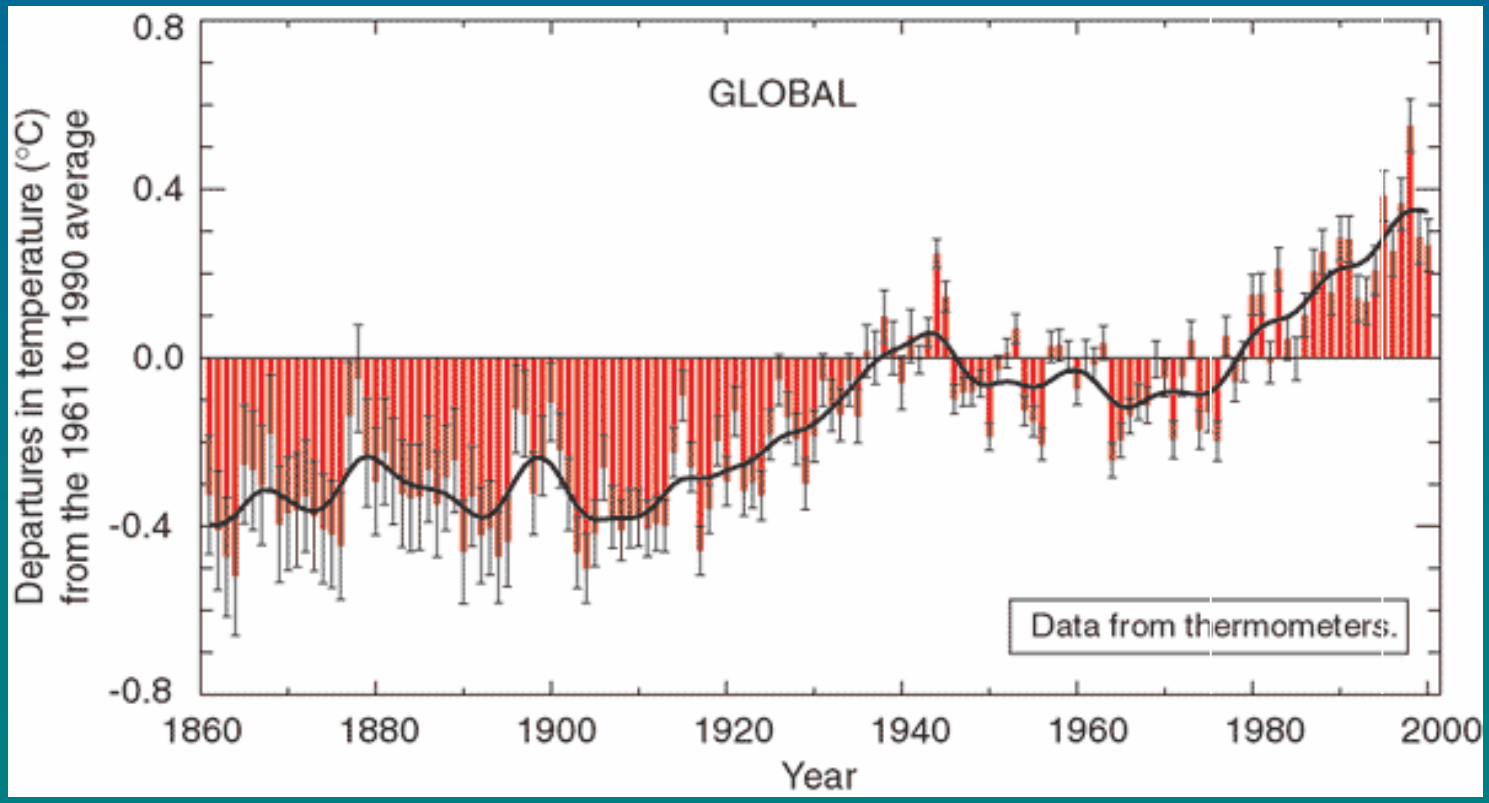
Climate Change: Is it for Real?

It is likely that -

- Globally 1990s was the warmest decade and 1998 the warmest year
- The number of hot days have ↑while cold days and frost ↓ in all land areas during the 20th century
- Continental precipitation has ↑ by 5-10% over the 20th century although it may have ↓ in some regions
- Frequency and severity of droughts have ↑ particularly in Asia and Africa
- Non polar glaciers have retreated during the 20th century
- Snow cover has ↓ in areas by 10% since 1960

But for Sure…It's been Hot



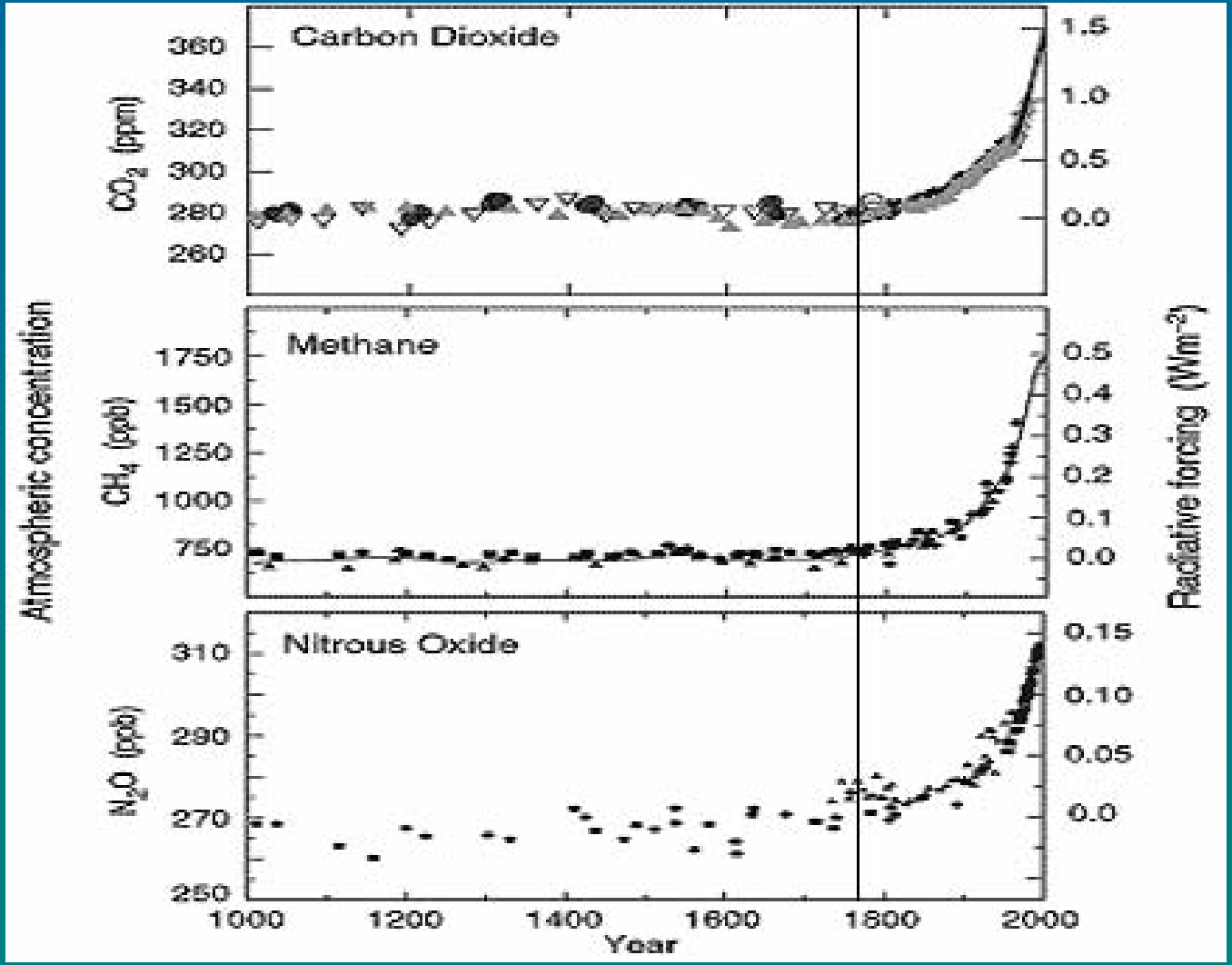
Combined annual land and sea surface temperature anomalies (°C)

Source-IPCC WGI

Greenhouse Gas Concentration in the Atmosphere

- Today's CO_2 concentration has not been exceeded during the past 420000 years and likely not during the past 20 million years
- The ↑ in CO_2 emissions during the Industrial era has been dramatic when compared to the preceding several thousand years
- The average rate of ↑since 1980 is 0.4% per year
- Most of the emissions in the last 20 years are due to fossil fuel burning while rest 10-30% due to land use change

Changes in Atmospheric Composition over the Past Thousand Years



Source-IPCC WGI

Detecting the Anthropogenic Signal

There is a growing body of evidence that human activities are responsible for the change in the climate system

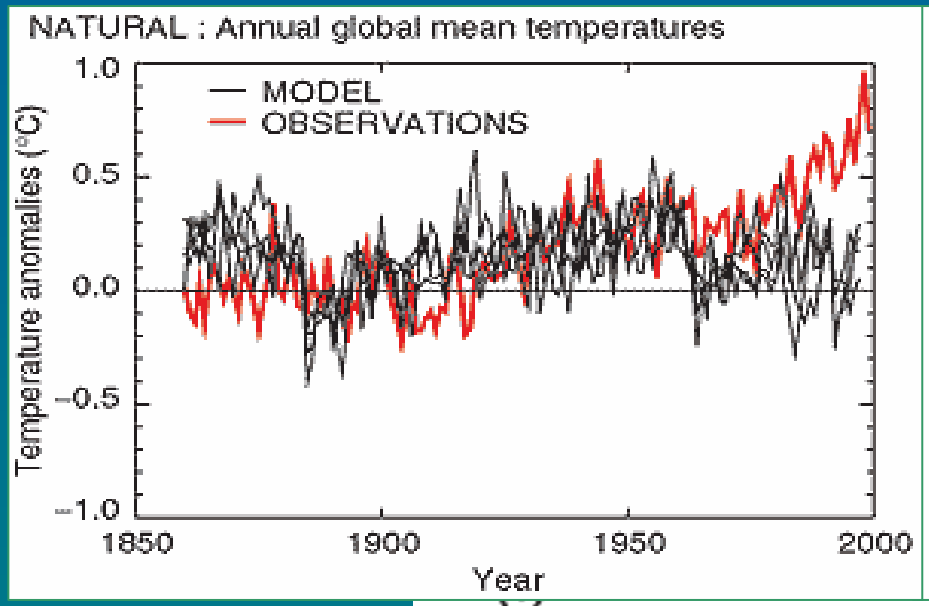
The warming over the past hundred years is unlikely to be due to internal variability of the climate system alone

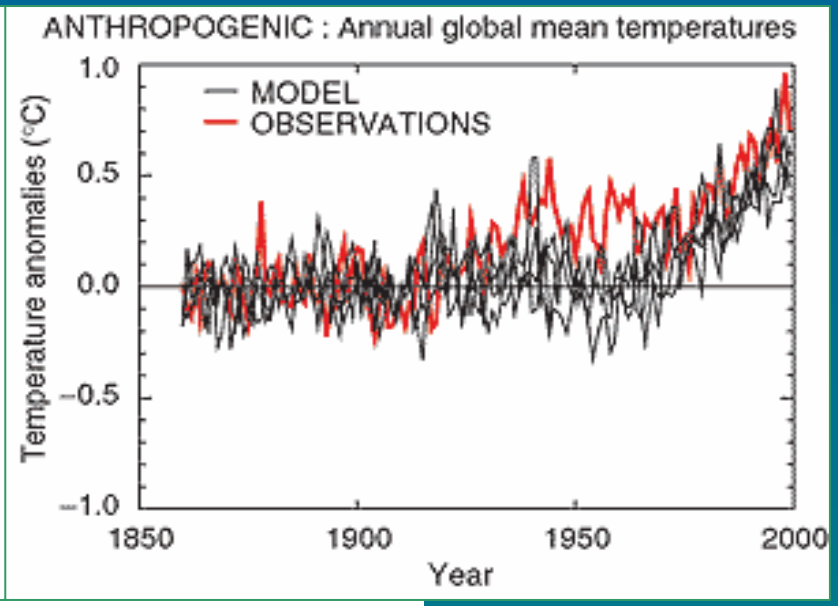
The estimated rate and magnitude of global warming due to increasing concentrations of greenhouse gases alone are comparable with or larger than observed warming

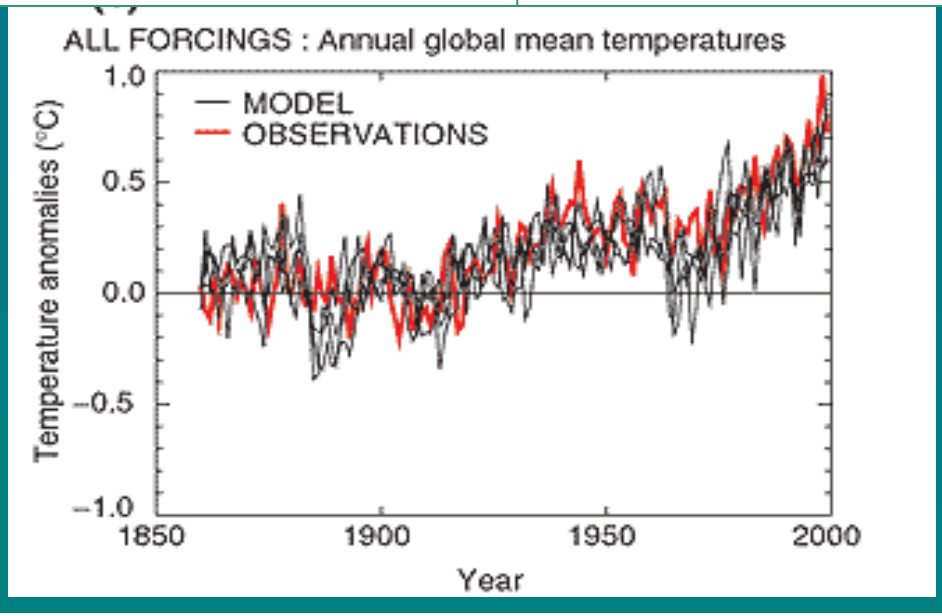
There is new and stronger evidence that most of the warming observed over the last 50 years is attributable to human activities.

Source: IPCC TAR

Verification of Human Influence







Source-IPCC WGI

A Peep into the Future

On running the AOGCM (complex numerical models)

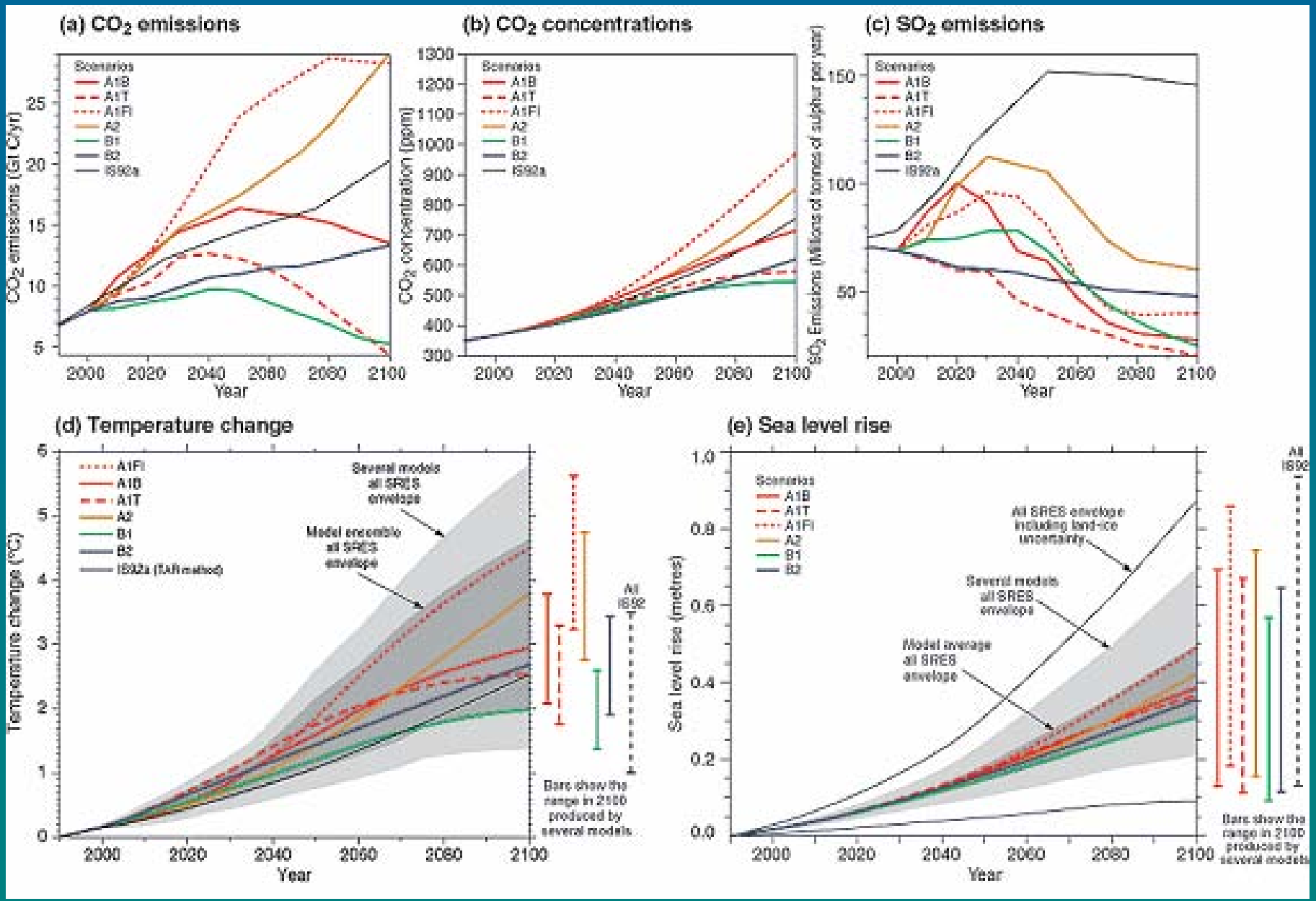
- The global averaged surface temperature is projected to increase by 1.4 to 5.8 ^{o}C over the period 1990-2100
- Increases in winter temperature are likely to be more, particularly in the northern latitudes
- Globally averaged water vapour, evaporation and precipitation are projected to increase, although regionally the effect could vary

There are several levels of uncertainty associated with these projections

- scenario related uncertainty
- simulation uncertainty
- scientific uncertainty

Source:IPCC TAR

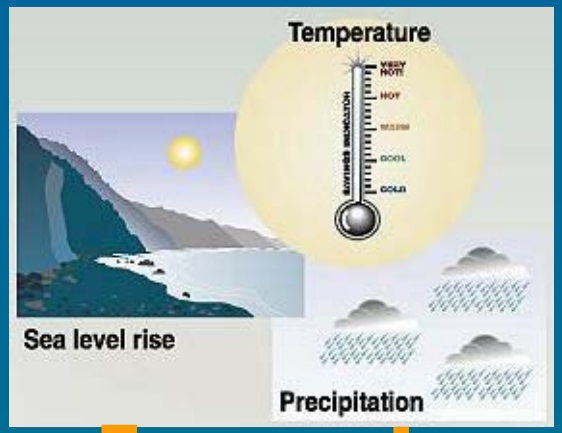
The Global Climate of the 21st Century



Source: IPCC TAR

Emission Scenarios

- These emission scenarios are from the Special Report on Emission Scenarios (SRES)
- The SRES reviews existing literature, most of which is MER based, from the World Bank, IEA and USDoE.
- Scenarios of GDP growth are typically expressed as MER (the preferred measure for GDP growth, as opposed to PPP which is a preferred measure for assessing differences in economic welfare).
- IPCC scenarios include PPP-based scenarios
- Contrary to claims, IPCC scenarios are consistent with historical data, including that from 1990 to 2000, and with the most recent near term (up to 2020) projections of other agencies.
- Long-term emissions are based on multiple, interdependent driving forces, and not just economic growth.



Impacts

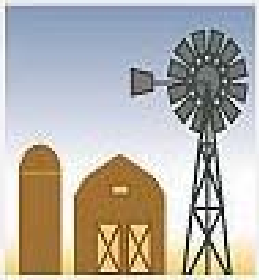
Health

Weather-related mortality

Infectious diseases

Air-quality respiratory illnesses

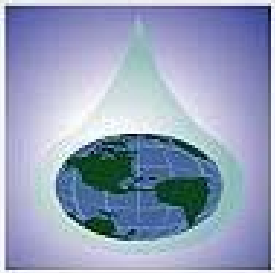
Agriculture



Crop yields

Irrigation demands

Water resources



Water supply

Water quality

Competition for water

coastal areas

Erosion of beaches

Inundation of coastal lands

additional costs to protect coastal communities

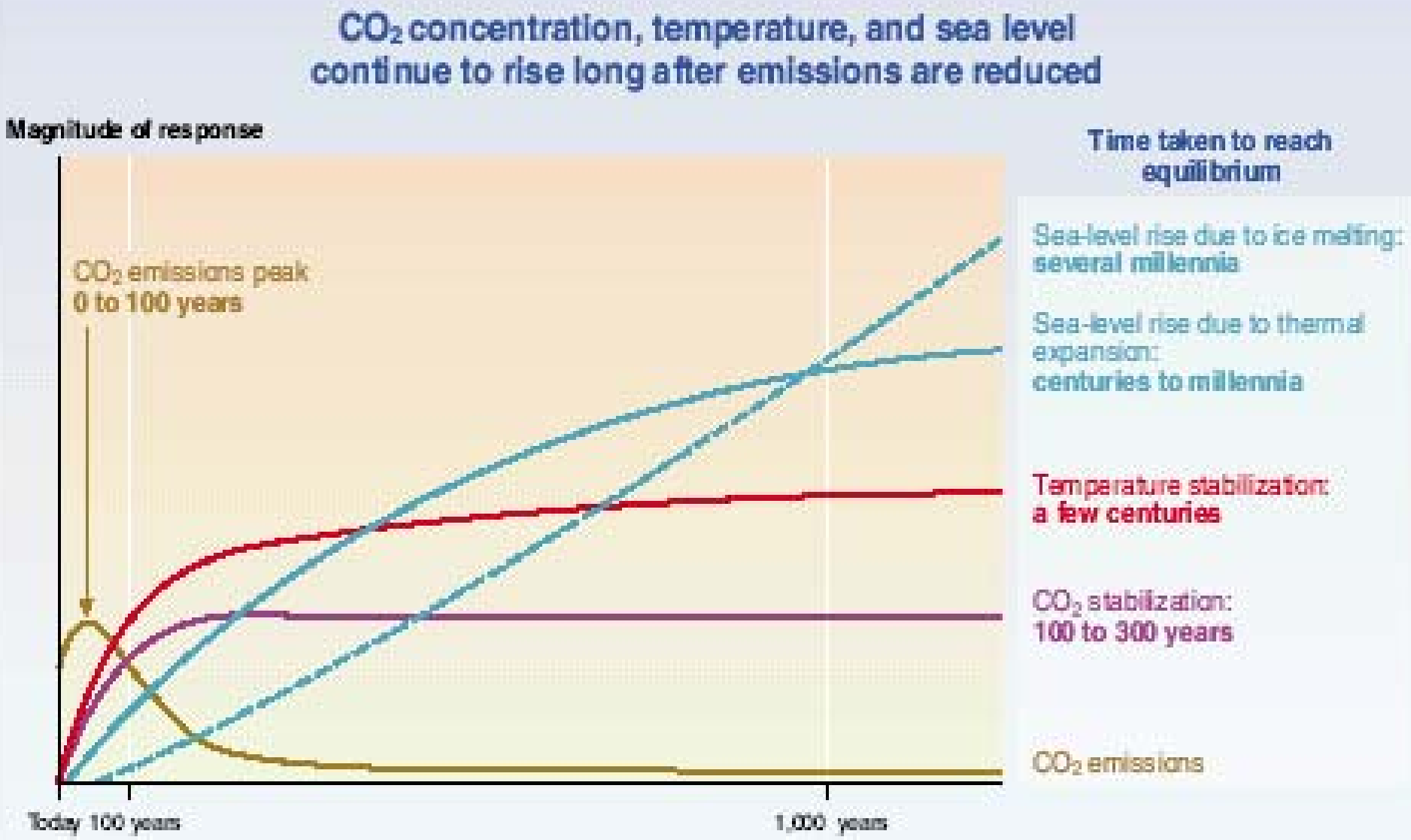
Species and natural areas

Loss of habitat and species

Cryosphere: diminishing glaciers

Source: GRID Arendal

Adaptation - an Immediate Necessity



Source: IPCC Synthesis Report

Importance of Agriculture

- Largest source of employment - 76.17% and 57% of the population involved in agricultural enterprises in China and India respectively
- High percentage of GDP comes from agriculture in agrarian economies in Asia and Africa
- The ultimate role of agriculture is to provide food and fibre to the human population - It holds the key to food security

Impacts of Climate Change on Agriculture

- Crop yields and patterns would change due to direct effects of changes in temperature, precipitation, CO_2 concentrations
- Indirect effects of changes in soil moisture, distribution and frequency of infestation by pests and diseases, etc
- Climate Change will exacerbate water shortages in already water scarce areas of the world
- Climatic variability and change will seriously endanger sustained agricultural production in Asia and Africa in the coming decades

Threat to Food Security and Human Health

- Temperature increases of 2.5°C or more could prompt food prices to increase
- Climate change will lower the incomes of vulnerable populations and increase the absolute number of people at risk of hunger
- Increases in extreme events are likely to increase the stress related deaths of livestock
- Inland fisheries in Africa will be more vulnerable to drought and habitat destruction
- Temperature increases will extend disease vector habitats
- In areas where sanitary infrastructure is inadequate, there will be increased frequency of water-borne diseases

Climate Variability and Extreme Events that can be Expected in the Future

- Higher maximum and minimum temperatures
- More intense precipitation events
- Intensified droughts and floods
- Increase in intensity of cyclone peak winds
- Increased summer drying in continental interiors
- Intensification of mid-latitude storms

Characteristics of Coastal Areas and Small Island States in Particular*

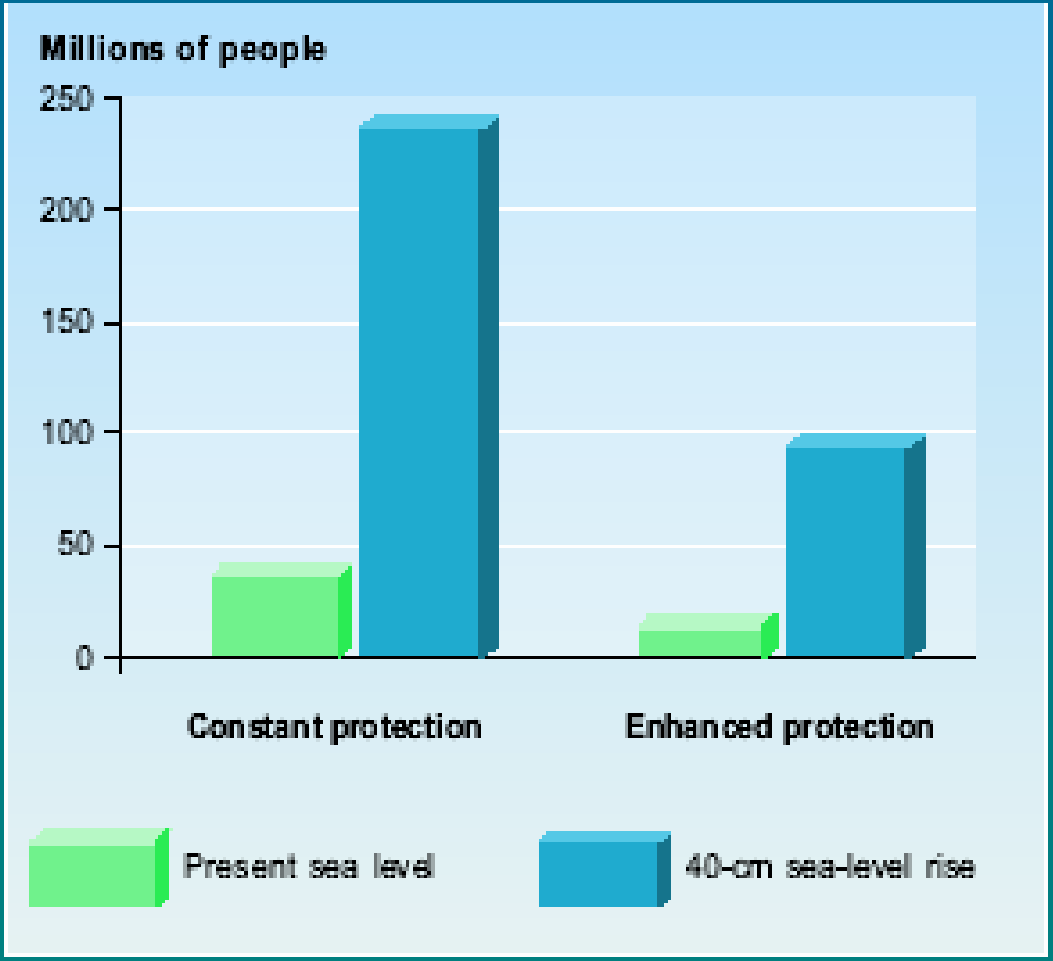
- Limited physical size, which effectively reduces some adaptation options to climate change and sea-level rise (e.g., retreat; in some cases entire islands could be eliminated, so abandonment would be the only option)
- Generally limited natural resources, many of which already are heavily stressed from unsustainable human activities
- High susceptibility to natural hazards such as tropical cyclones (hurricanes) and associated storm surge, droughts, tsunamis, and volcanic eruptions
- High population densities, especially of coastal cities

*** very relevant for Cyprus considering the 648km coastline and high dependence on tourism**

Populations that Inhabit Small Islands and Coastal Regions are at Particular Risk

- Increased risk of coastal flooding and erosion; tens of millions of people living in deltas, low-lying coastal areas, and on small islands face the risk of displacement of populations and loss of infrastructure
- Resources critical to island and coastal populations such as freshwater, fisheries, coral reefs and atolls, beaches, and wildlife habitat would also be at risk
- Areas of greatest absolute increase in populations at risk are south and southeast Asia, with lesser but significant increases in east Africa, west Africa, and the Mediterranean.
- Significant portions of highly populated coastal cities are also vulnerable to permanent land submergence and especially to more frequent coastal flooding superimposed on surge heights, due to sea-level rise.

The Relationship between Adaptation and the Number of People Flooded Annually by Storm Surges in Coastal Areas



Source: IPCC Synthesis Report

Assessing Vulnerability

The impacts of climate change will fall disproportionately upon developing countries and the poorer sections of society in all countries and thereby exacerbate inequities in health status and access to adequate food, clean water and other resources, between the developed and the developing as well as between the rich and the poor

Sustainable Development

- Definition of Sustainable Development (Brundtland Commission Report, 1989) : "It is that form of development which meets the needs of the present generation without compromising the ability of future generations to meet their own needs"

- North–South divide
  - The North focuses on income and local environment
  - The South considers social, cultural, and political dimensions while defining sustainability

"It took Britain half the resources of the planet to achieve this prosperity. How many planets will a country like India require!"

Mahatma Gandhi

Spaceship Earth and the need for sustainable development

Kenneth Boulding:

"For the sake of picturesqueness, I am tempted to call the open economy the "cowboy economy," the cowboy being symbolic of the illimitable plains and also associated with reckless, exploitative, romantic, and violent behavior, which is characteristic of open societies. The closed economy of the future might similarly be called the "spaceman" economy, in which the earth has become a single spaceship, without unlimited reservoirs of anything, either for extraction or for pollution."

Concept of Entropy as Applicable to

- Matter
- Energy
- Information
- Nicholas Georgescu–Roegen (1971):

"Automobiles driven by batteries charged by the sun's energy are cheaper both in terms of scarce low entropy and healthy conditions – a reason why I believe they must, sooner or later, come about."

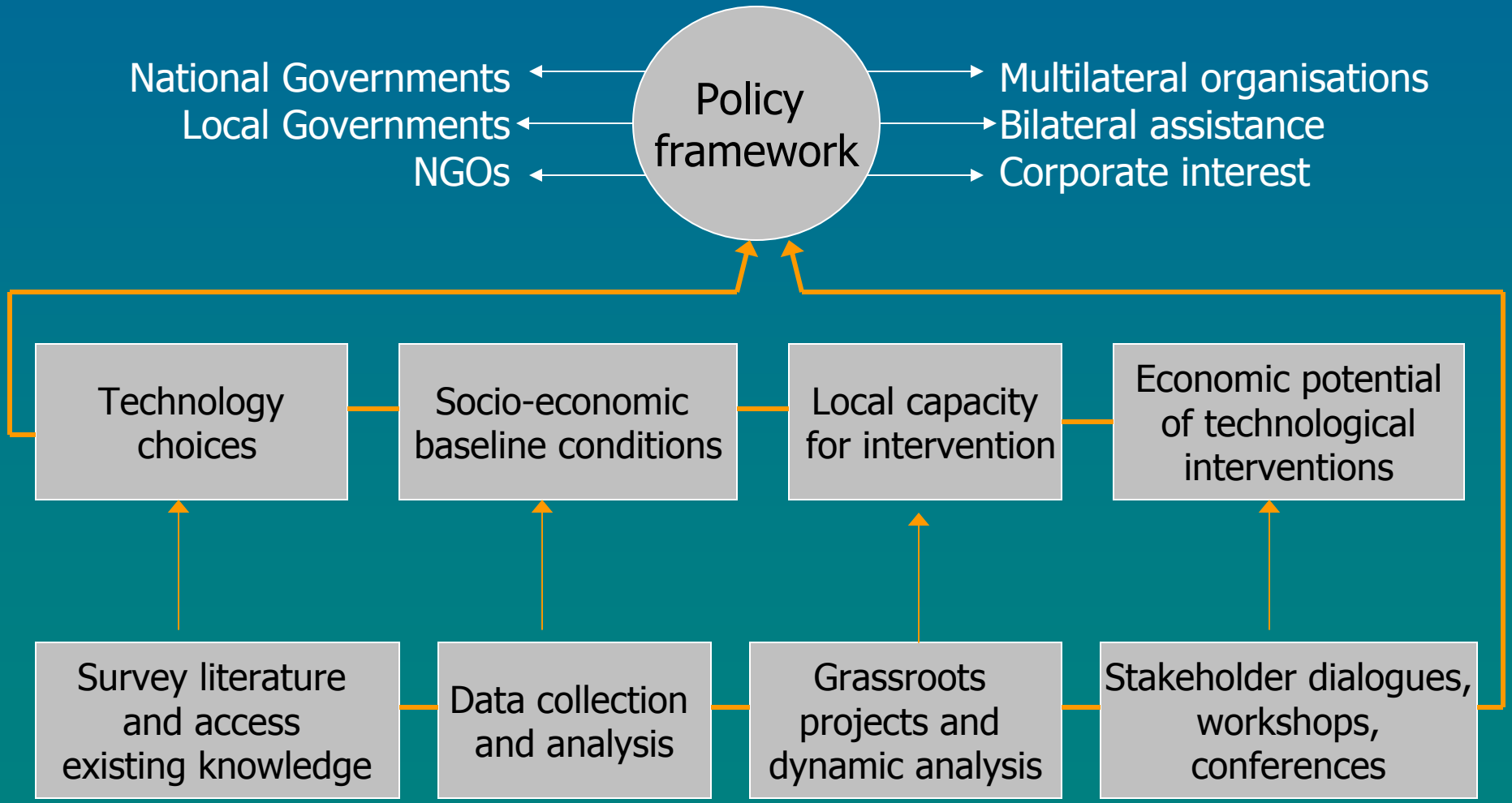
Integrating New and Sustainable Technologies for Elimination of Poverty (INSTEP)

- Conceptualized because:
  - Limited success of poverty alleviation programmes
  - No globally replicable models targeting major aspects of poverty
- Approach:
  - Various dimensions
  - Interrelationship between poverty, environment, and economic growth
  - Urgency to tackle rural poverty

Integrating New and Sustainable Technologies for Elimination of Poverty (INSTEP): Activities

- Assessment of new and sustainable technologies for rural poverty elimination
- Areas for technology adaptation and technology gaps
- Policy frameworks and financial and market mechanisms promoting these technologies
- Model projects at the grassroots level
  - 'technological solution set'
  - mechanisms for incorporation
- Map of geographical areas for replication of model projects
- Annual conferences, publications, electronic newsletter, and interactive web site

INSTEP Global: the 'Integrated Solutions Approach'



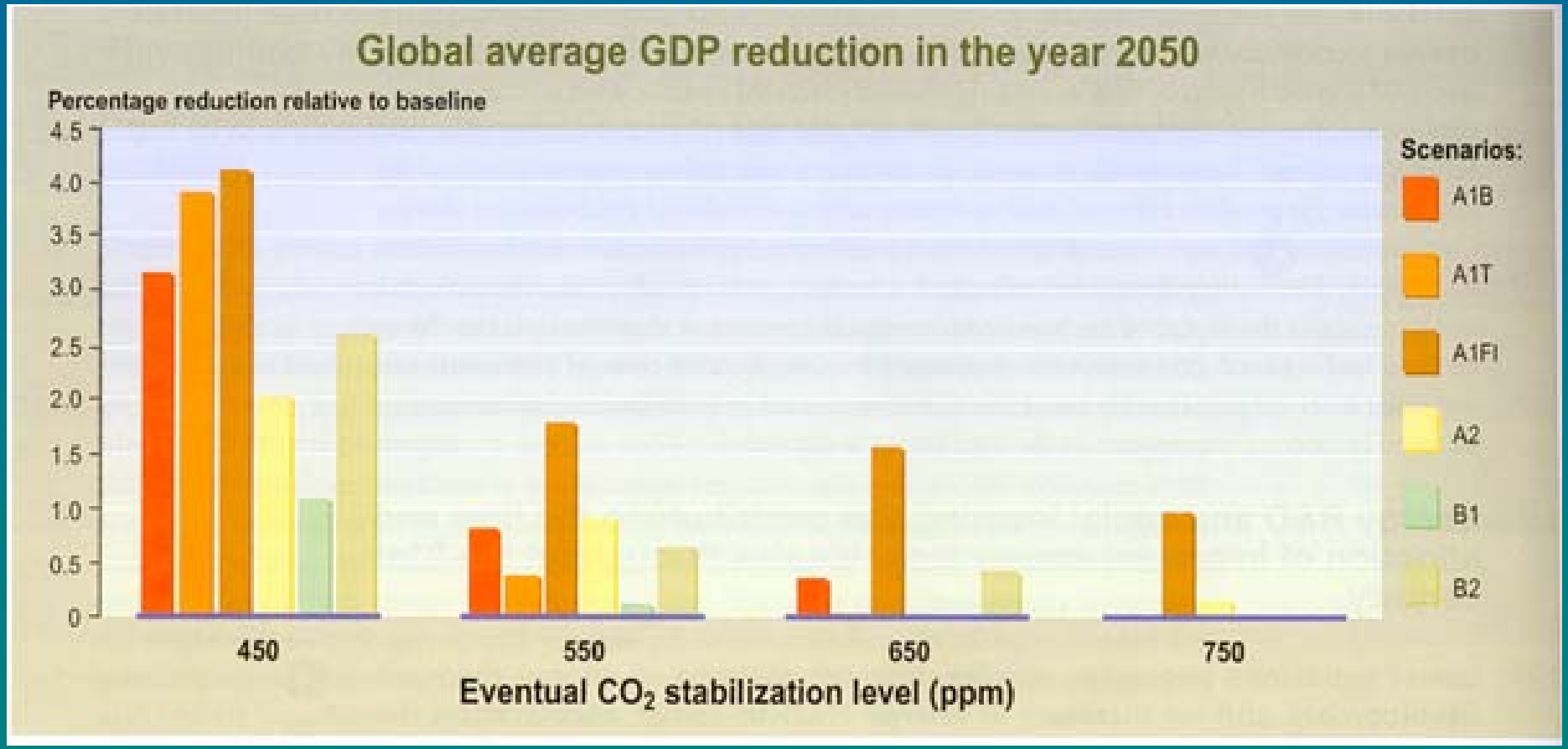
Cost of Meeting Kyoto Targets: Model Estimates - 2010

(As % of total GDP)

	No trading	Annex I trading
USA	0.42–1.96	0.24–0.91
OECD Europe	0.31– 0.99	0.13–0.81
Japan	0.19–1.20	0.05–0.45

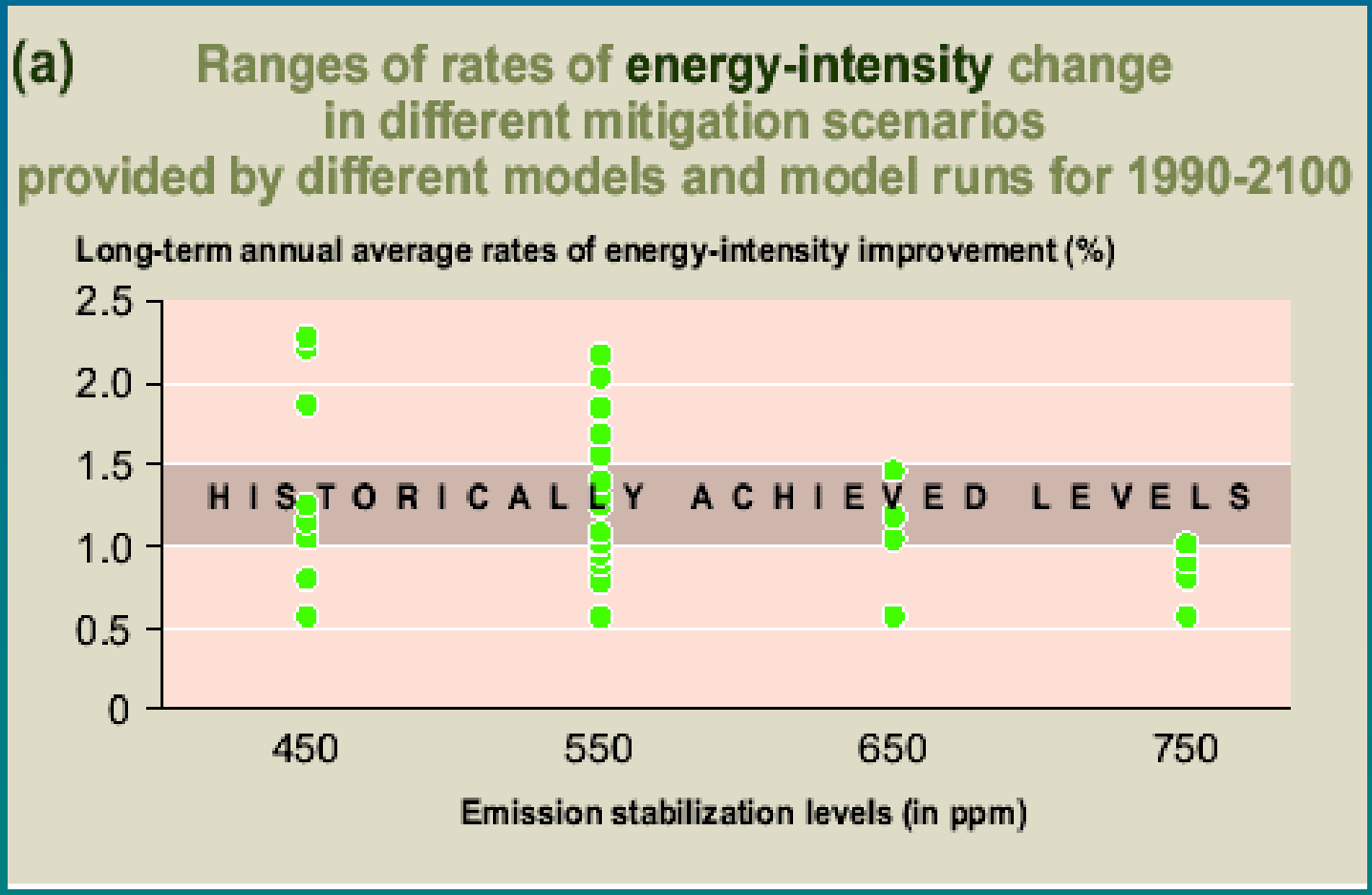
Source: IPCC, TAR

Global GDP Reductions Caused by Mitigation Activities (2050)



Source: IPCC Synthesis Report

Acceleration of energy system change



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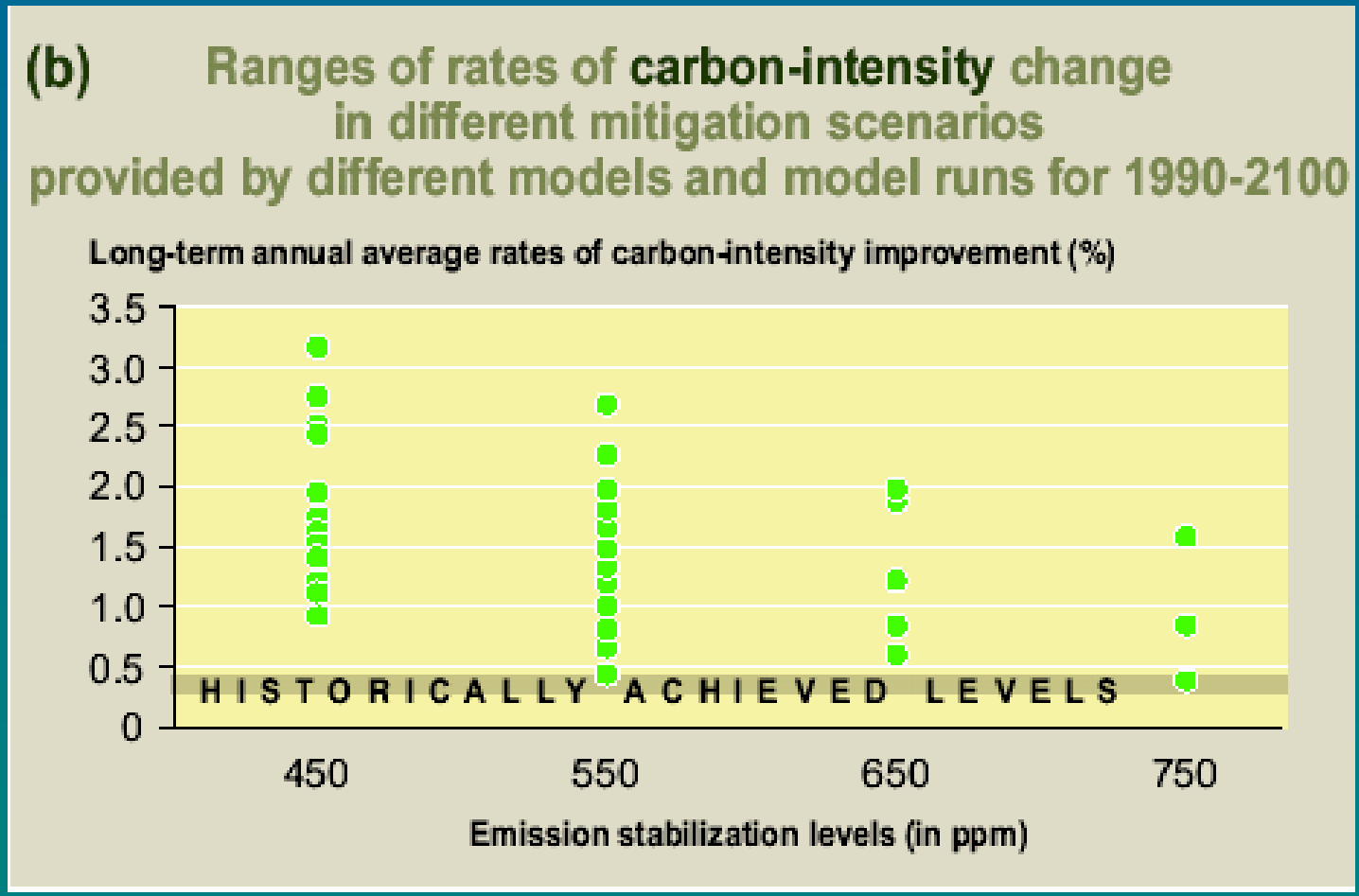

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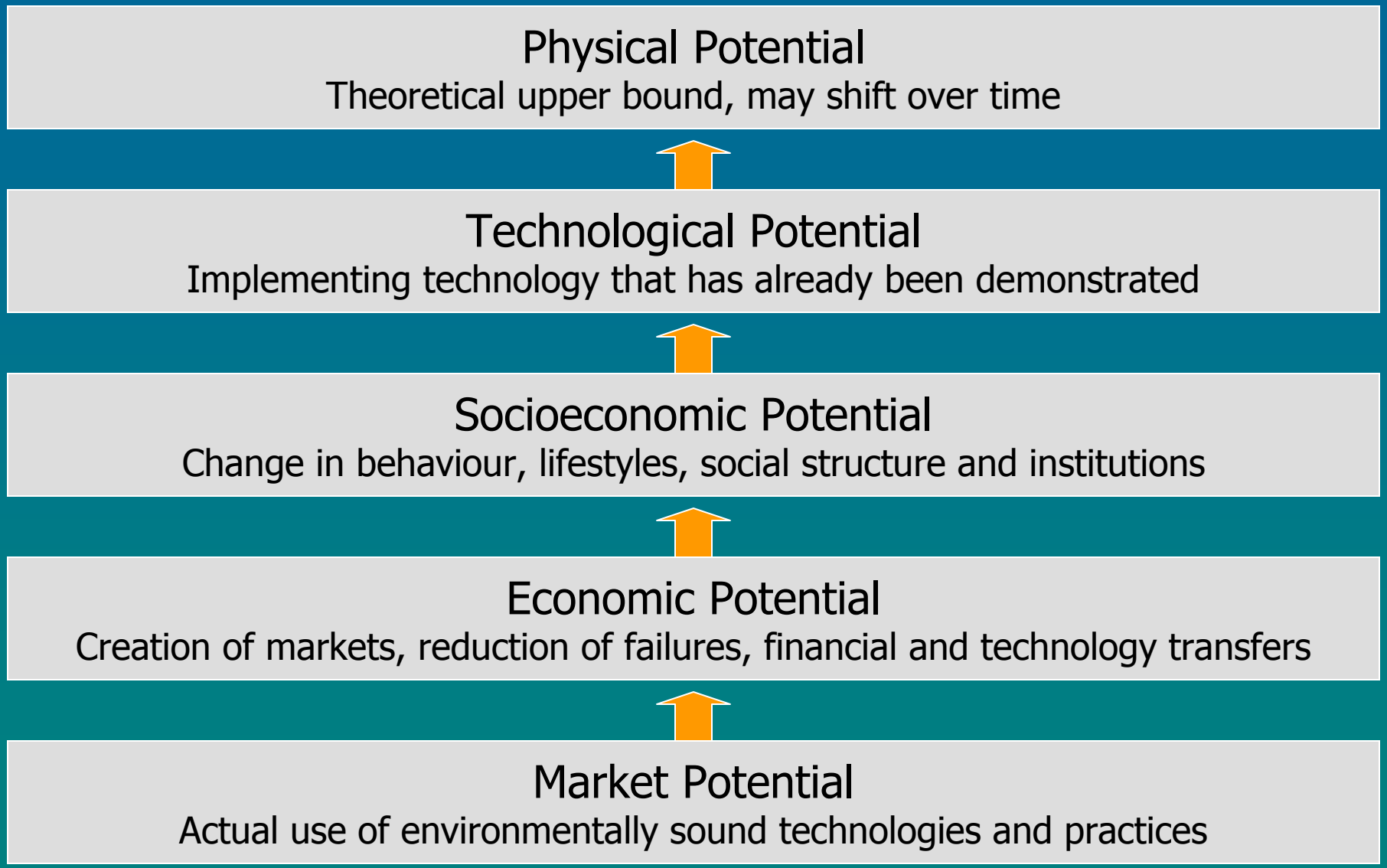
Concepts of Mitigation Potentials



Overview of Energy and Environment Situation in Different Countries

	Local pollution	Energy use per capita	Cumulative contribution to global pollution	Technological & economic resources for change
OECD countries	Low	High	Very high	Very High
Economies in transition	Very high	High	High	Moderate
Developing countries	High	Low	Low	Moderate

What a Distorted World!

- Total official aid in 2003 - $68.5 billion (0.25% of donor countries' income)
- Worldwide military expenditures (estimated 2004) - $950 billion
- USA military expenditure - $466 billion
- Estimated increase in ODA for meeting Millennium Development Goals - $50 billion annually (Zedillo Panel)
- Post cold war transition – swords to ploughshares – a myth
- G-8 Summit, 2004: "poverty is an unacceptable human condition which does not have to be inevitable"

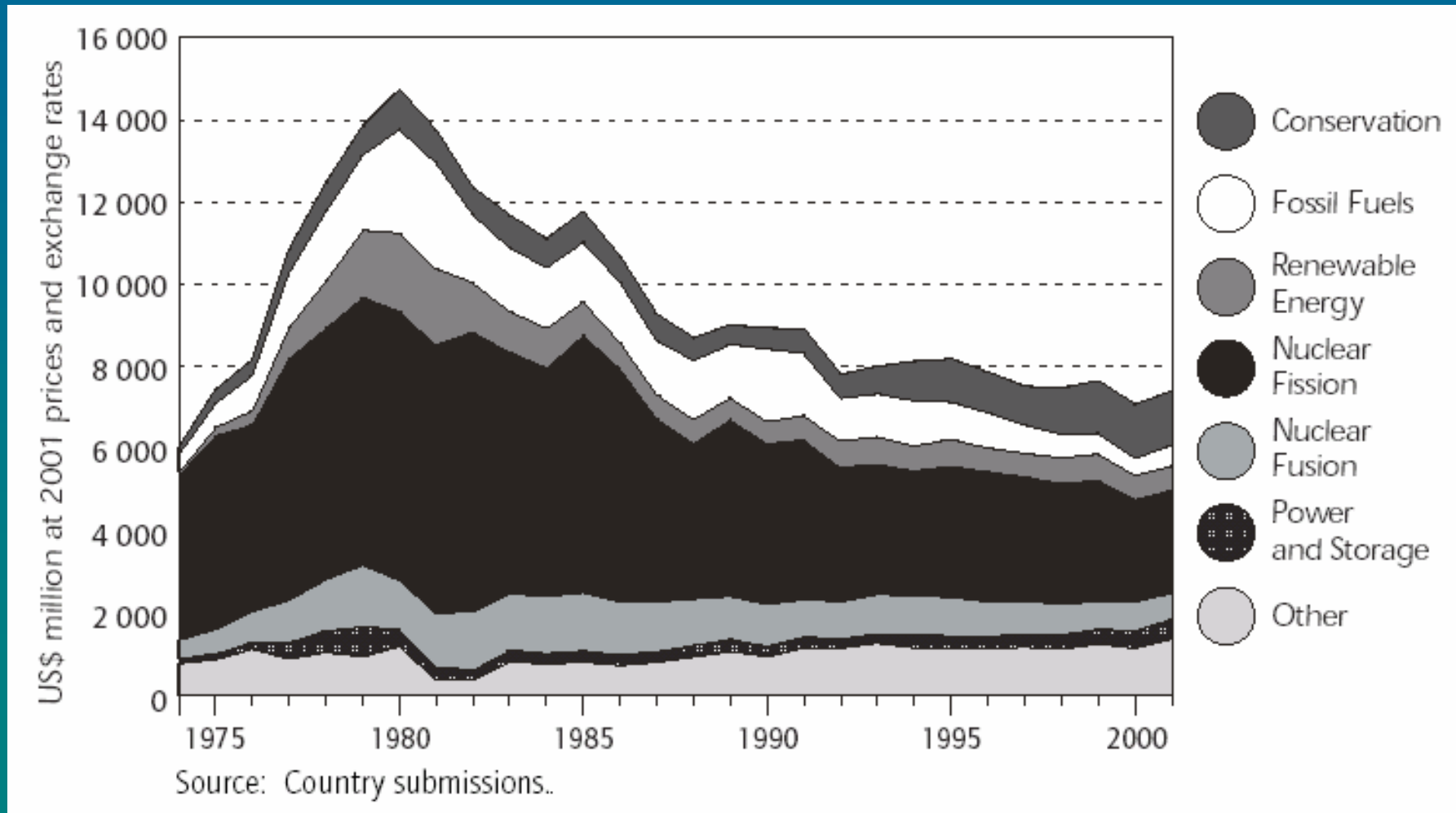
Need for Climate Cooperation

- Inertia and the possibility of irreversibility in the interacting climate, ecological and socio-economic systems are the main reasons why anticipatory adaptation and mitigation are beneficial.
- Successful implementation of GHG mitigation options would need to overcome technical, economic, political, cultural, social, behavioral and/or institutional barriers.
- National responses to climate change can be more effective if deployed as a portfolio of policy instruments to limit or reduce net emissions; exchange of knowledge useful.
- Technology development and deployment are important components of cost-effective stabilisation, and are universally relevant.

Technological Options for Reducing Net CO_2

- Reducing energy consumption, by increasing the efficiency of energy conversion and/or utilisation
- Switching to less carbon intensive fuels, for example natural gas instead of coal
- Increasing the use of renewable energy sources or nuclear energy each of which emits little or no net CO_2
- Sequestering CO_2 by enhancing biological absorption capacity in forests and soils
- Capturing and storing CO_2, chemically or physically

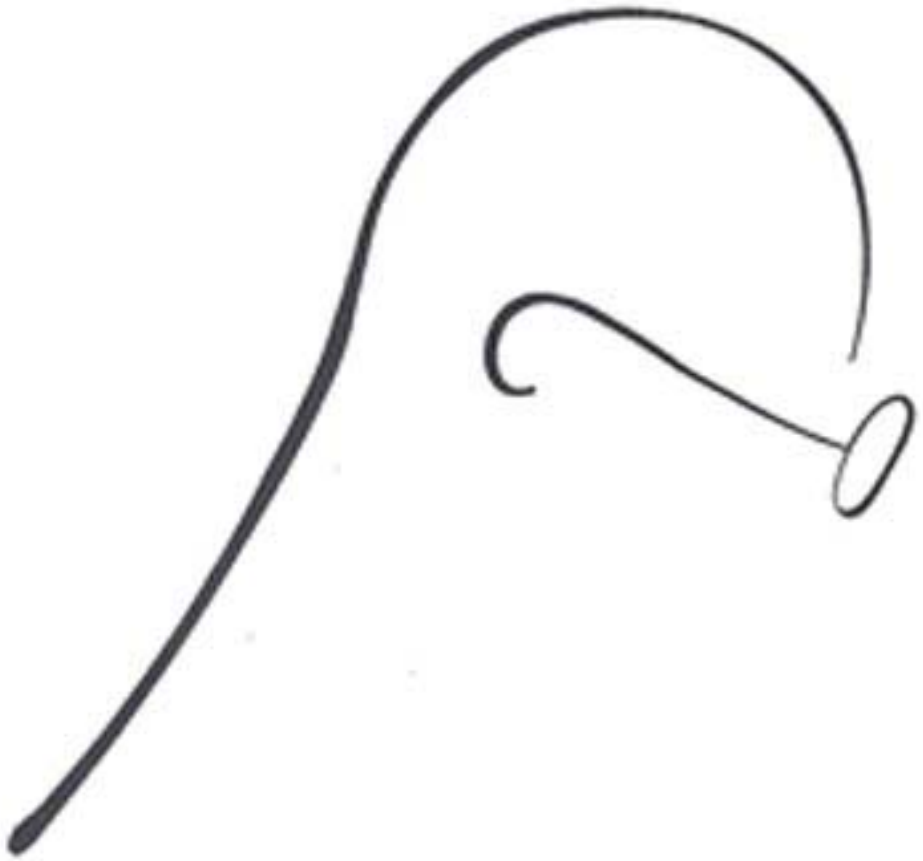
Government Energy R&D Budgets in IEA Countries, 1974 to 2001



Source: Energy Policies of IEA Countries 2003

The Challenge Today

- Exploit Mitigation Potentials to the fullest
- Unprecedented need for global vision and commitment
- Technology is the key, but social and economic context of critical relevance
- Need to redefine technology related priorities within global framework
- Address equity implications of climate change effectively



Be the change you want to see in the world