Science and Decision-Making: the Role of IPCC Assessments

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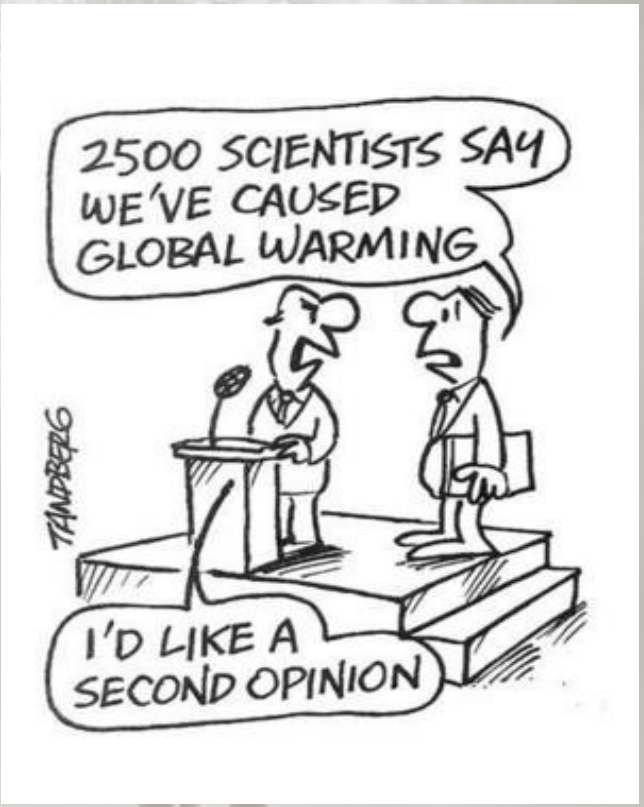
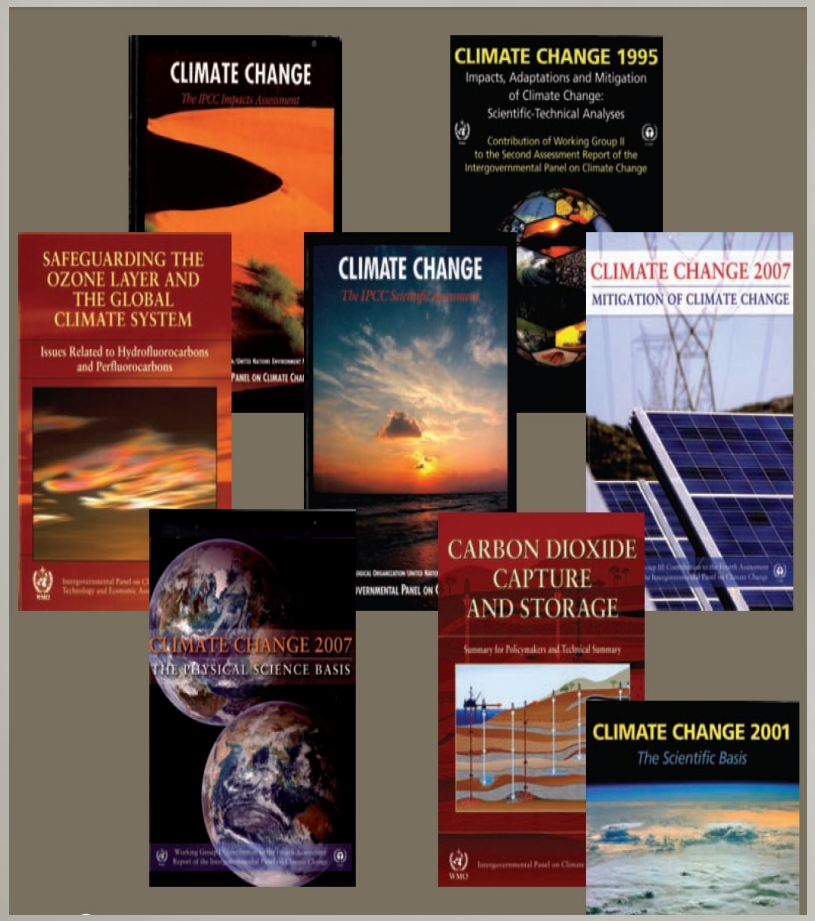
Mandate of the IPCC

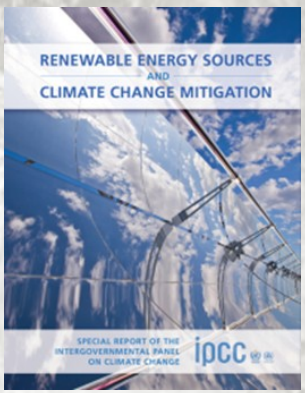
"The General Assembly […] endorses action of the World Meteorological Organisation and the United Nations Environment Programme in jointly establishing an Intergovernmental Panel on Climate Change to provide **international coordinated scientific assessments** of the magnitude, timing and potential environmental and socio-economic impact of climate change and realistic response strategies […]."



Source : UN

Work of the IPCC





SRREN

SREX

The IPCC produces Assessment Reports, Special Reports and Methodology Reports which are policy relevant and not policy prescriptive

Source : IPCC

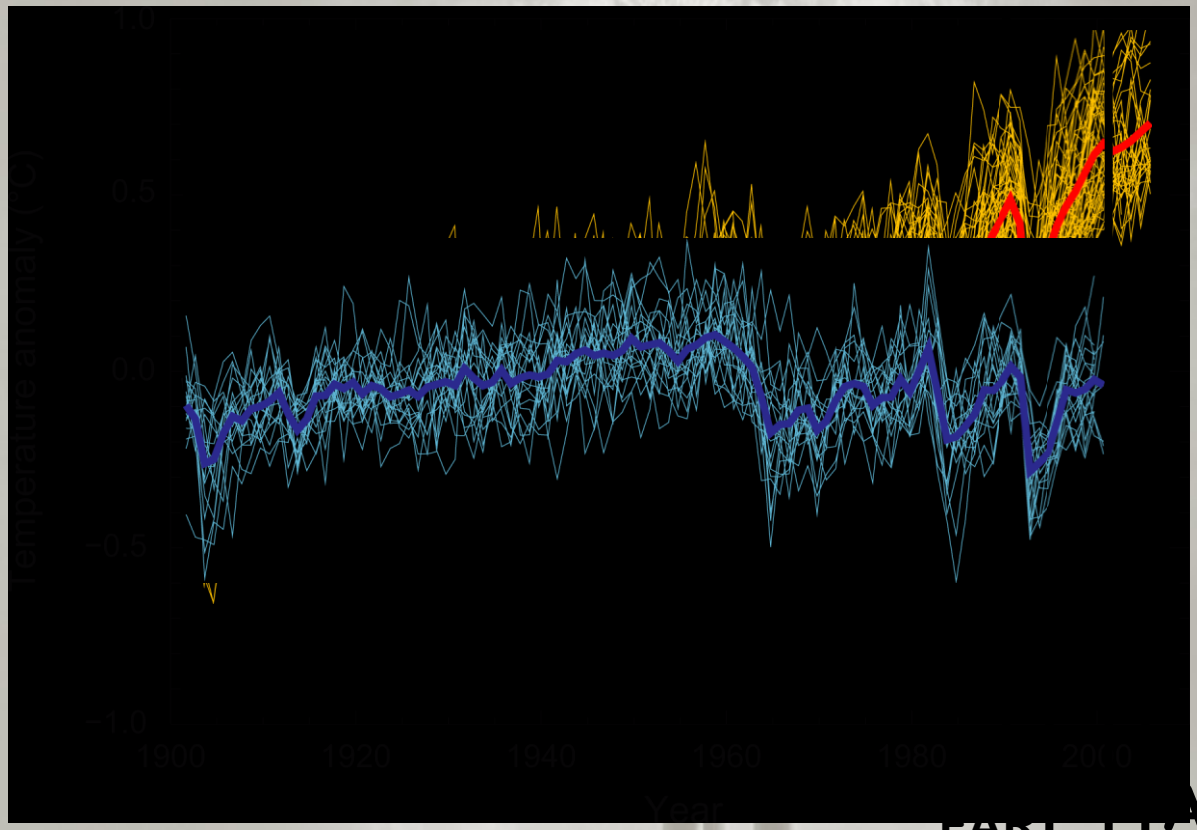
A progressive understanding: increased certainty in attribution

FAR (1990): “unequivocal detection not likely for a decade”

SAR (1995): “balance of evidence suggests discernible human influence”

TAR (2001): “most of the warming of the past 50 years is likely (odds 2 out of 3) due to human activities”

AR4 (2007): “most of the warming is very likely (odds 9 out of 10) due to greenhouse gases”



FAR

SAR

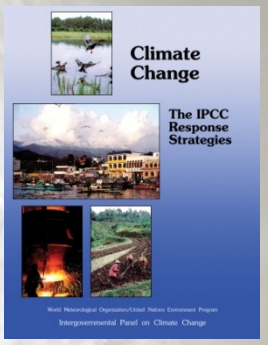
TAR

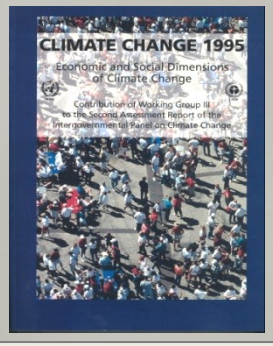
AR4

Source : IPCC

The IPCC and the UNFCCC

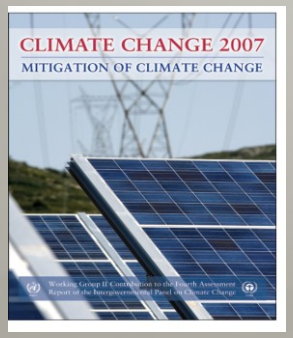
The First Assessment Report (FAR – 1990): had a major impact in defining the content of the UNFCCC.





The Second Assessment Report (SAR –1995): was largely influential in defining the provisions of the Kyoto Protocol.

The Third Assessment Report (TAR – 2001): focused attention on the impacts of climate change and the need for adaptation.



The Fourth Assessment Report (AR4 – 2007): created a strong basis for a post Kyoto agreement and long term cooperative action.

Source : IPCC

Warming of the climate system is unequivocal

125,000 years ago…

- The polar regions were significantly warmer than present for an extended period
- … which led to reductions in polar ice volume and sea level rise of 4 to 6 m.

Palaeoclimatic information supports the interpretation that the warmth of the last half century is unusual in at least the previous 1,300 years.

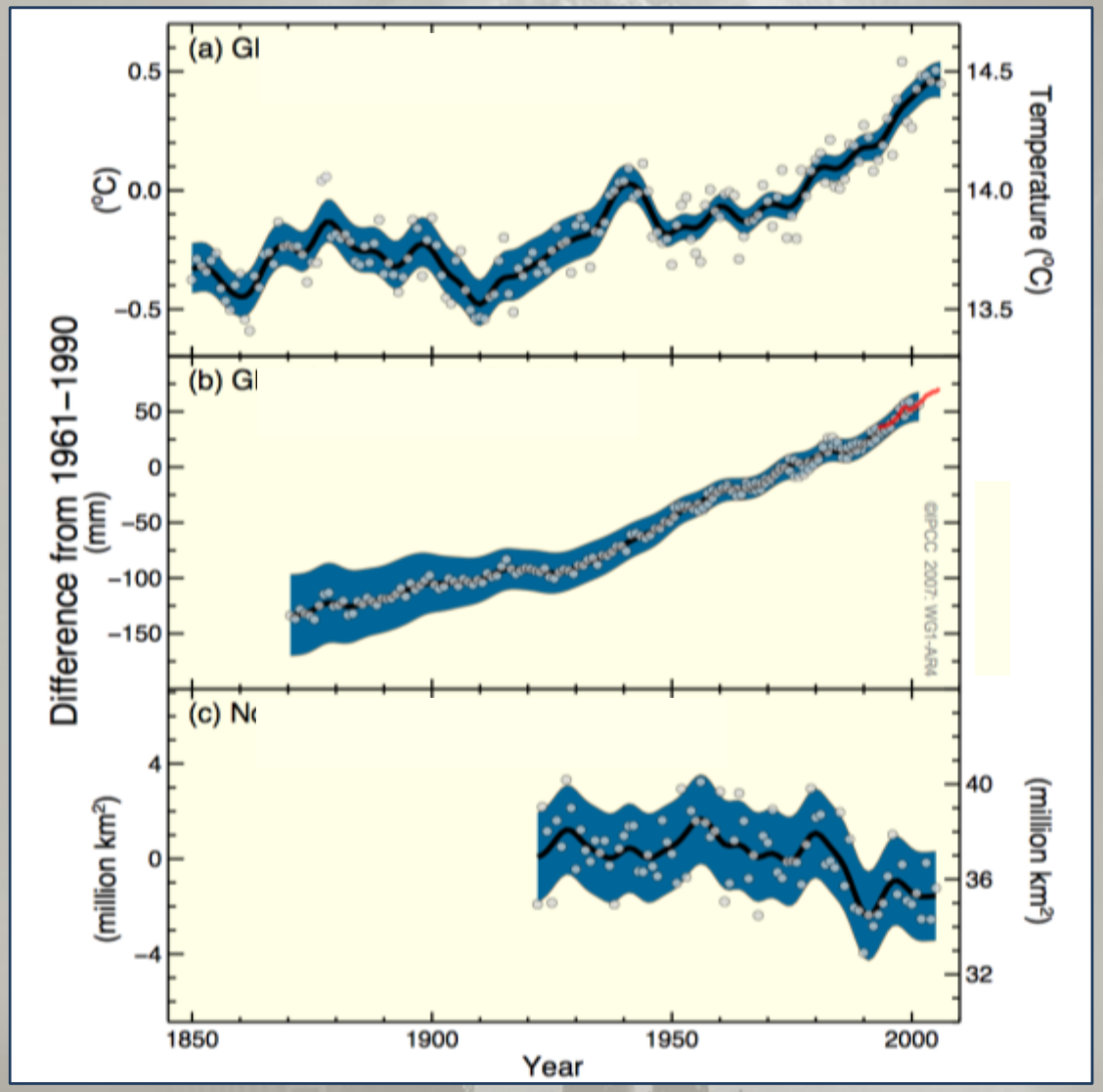
Source : IPCC

Observed Changes

Global average temperature

Global average sea level

Northern hemisphere snow cover



Source : IPCC

Understanding climate change

Causes of change

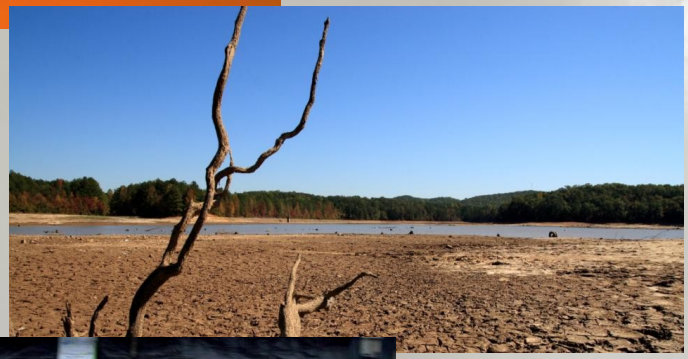
- Global **GHG emissions** due to human activities have grown since pre-industrial times, with an increase of **70%** between 1970 and 2004

- **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

Source : IPCC

Some key findings of the SREX



Changes in extreme events:

- heavy precipitation
- Warm/cold daily temperature extremes
- Heat waves
- Sea level rise

Some scenarios show that a 1-in-20 year hottest day is likely to become a 1-in-2 year event by the end of the 21st century in most regions.

Source: IPCC

Abrupt and irreversible impacts

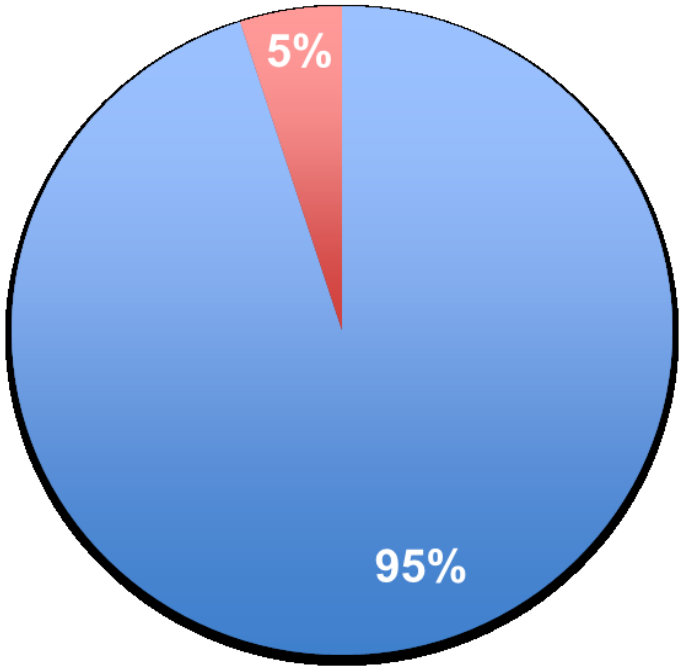
- Partial loss of ice sheets on polar land could imply meters of sea level rise, major changes in coastlines and inundation of low-lying areas

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

- Large scale and persistent changes in Meridional Overturning Circulation would have impacts on marine ecosystem productivity, fisheries, ocean CO2 uptake and terrestrial vegetation

Source: IPCC

Fatalities are higher in developing countries



From 1970-2008, over 95% of natural-disaster-related deaths occurred in developing countries

Source : IPCC

Climate science at the heart of sustainable policy making

Without appropriate measures, climate change:

- Will likely **exacerbate poverty** and slow down economic growth in developing countries
- Will act as a '**threat multiplier**', especially in developing countries

Climate change adds to the list of stressors that challenge our ability to achieve the ecologic, economic and social objectives that define sustainable development

Source : IPCC

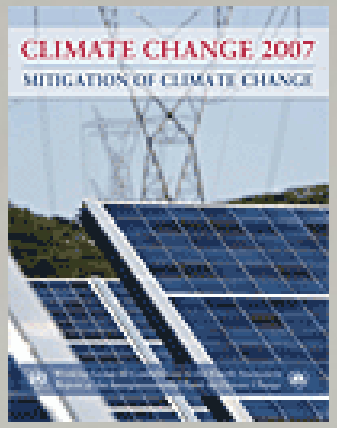
Role and limits of adaptation

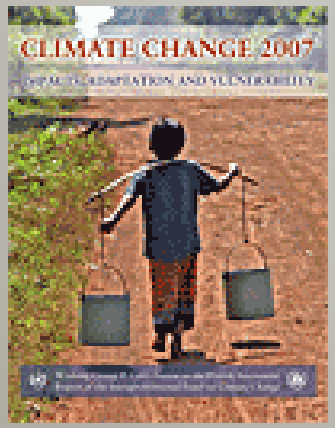
- Societies have a **long record** of adapting to the impacts of weather and climate
- Adaptation is **necessary** to address impacts resulting from the warming which is already unavoidable due to past emissions
- Adaptation to the impacts of climate change & promotion of sustainable development share **common goals**

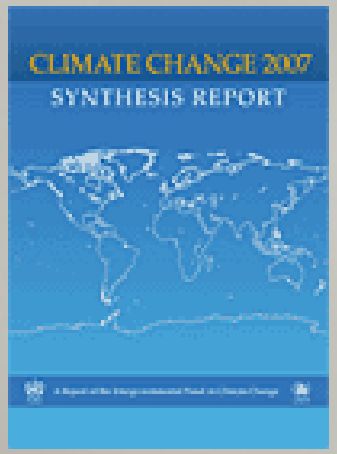
But adaptation alone is not expected to cope with all the projected effects of climate change

Source : IPCC

Adaptation and Mitigation







"Neither adaptation nor mitigation alone can avoid all climate change impacts; however, they can complement each other and together can significantly reduce the risks of climate change"

- IPCC Fourth Assessment Report

Source : IPCC

Characteristics of Stabilization Scenarios

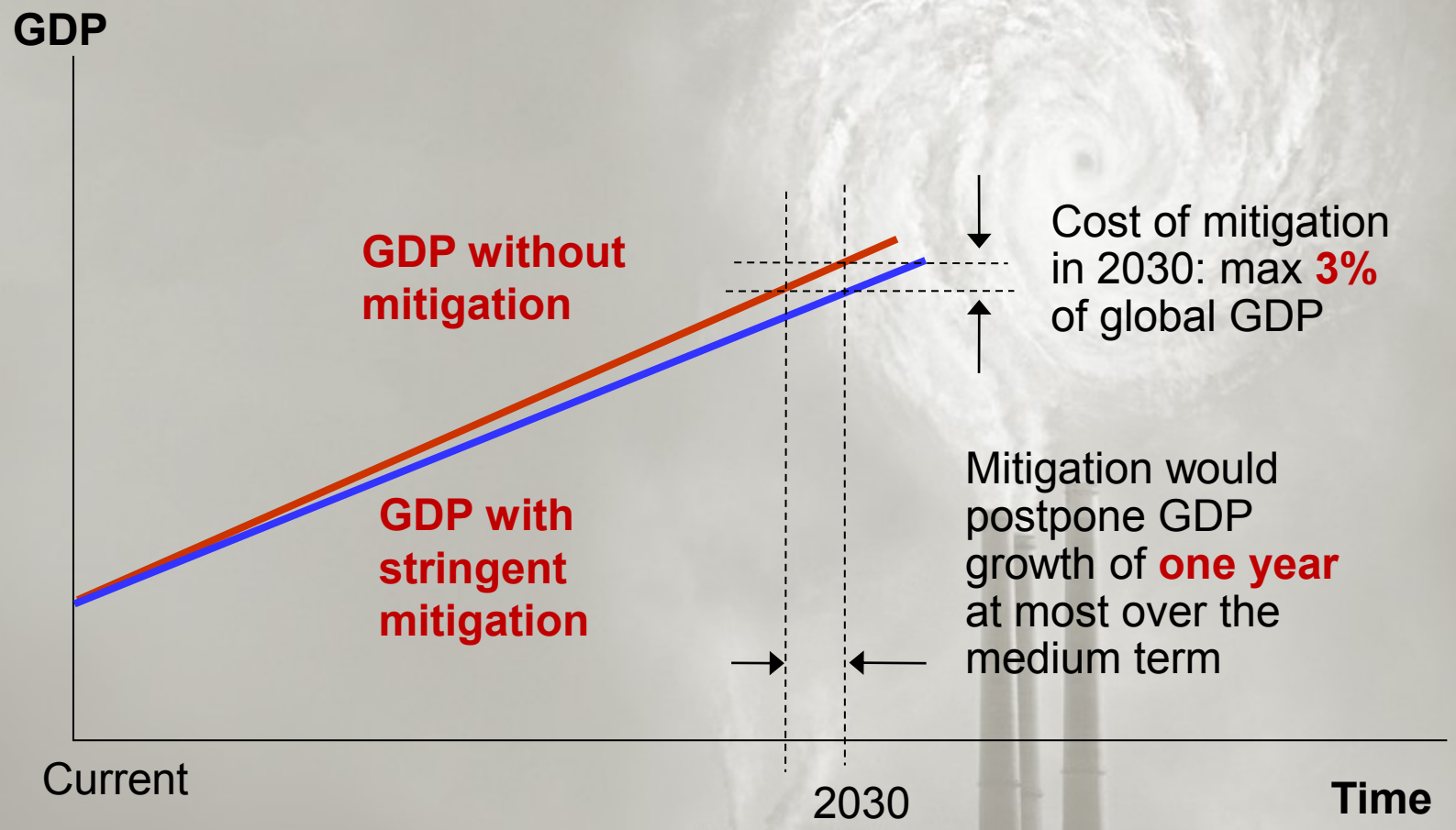
Post-TAR stabilization scenarios

Stabilization level (ppm CO2-eq)	Global mean temp. increase (ºC)	**Year CO2 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

For the lowest mitigation scenario category assessed, emissions would need to peak by 2015.

Source : IPCC

Impacts of mitigation on GDP growth (for stabilization scenario of 445-535 ppm CO2-eq)



Source : IPCC

Co-benefits of mitigation

- **Common drivers** lie behind mitigation policies and policies addressing economic development, poverty, health, employment, energy security, and local environmental protection
- **Linking policies** provide the opportunity for no-regrets policies reducing greenhouse gases mitigation costs

Source : IPCC

Climate science at the heart of sustainable policy making

Article 2 of the UNFCCC (1992)

"The ultimate objective of this Convention and any related legal instruments that the Conference of the Parties may adopt is to achieve, in accordance with the relevant provisions of the Convention, ***stabilization of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system****. Such a level should be achieved within a time-frame sufficient to allow ecosystems to adapt naturally to climate change, to ensure that food production is not threatened and to enable economic development to proceed in a sustainable manner."*

Source : UNFCCC

IPCC and the Article 2 of the UNFCCC

7 criteria that may be used to identify key vulnerabilities:

- magnitude of impacts
- timing of impacts
- persistence and reversibility of impacts
- likelihood of impacts and vulnerabilities and confidence in those estimates
- potential for adaptation
- distributional aspects of impacts and vulnerabilities
- importance of the system(s) at risk.

Determining what constitutes "dangerous anthropogenic interference with the climate system" involves value judgments. Science can support informed decisions on this issue, and provide criteria for judging which vulnerabilities might be labeled 'key'.

Source : IPCC

General conclusions

- GTM changes of up to 2°C above 1990-2000 levels would exacerbate current key impacts and trigger others such as reduced food security.
- Changes of 2 to 4°C would result in an increasing number of key impacts at all scales such as widespread loss of biodiversity and decreasing global agricultural productivity.
- Changes greater than 4°C would lead to major increases in vulnerability, exceeding the adaptive capacity of many systems.
- Regions that are already at high risk are more likely to be adversely affected in the near future by projected climate change and increases in the magnitude/frequency of extreme events.

Source : IPCC

Towards sustainable development

Committing to alternative development paths would require **structural changes** both in developed and developing countries, in a variety of areas:

- Institutional arrangements
- Geographical distribution of activities
- Demography
- Lifestyles and consumption patterns

The dominant path to industrialisation has been characterised by high concurrent GHG emissions and natural resource consumption

Source : IPCC

"We may utilize the gifts of Nature just as we choose but in her books, the debits are always equal to the credits"

- Mahatma Gandhi