WMO

UNEP

Climate change
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Key findings from the IPCC Fourth Assessment Report

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IPCC

The IPCC and the role of science in addressing climate change

History of climate change

1898: Swedish scientist Svante Arrhenius warns carbon dioxide from coal and oil burning could warm the planet

1988: NASA scientist James Hansen tells U.S. Congress global warming "is already happening now"

Exceptional drought hits the USA

Creation of the IPCC

1992: UNFCCC aims at stabilising atmospheric concentrations of GHG

1997: UNFCCC parties approve Kyoto Protocol mandating emission cuts by industrial nations

2005: Warmest year since record-keeping began in mid-19th Century

Kyoto Protocol takes effect

The IPCC

The work of the IPCC is guided by the mandate given to it by its parent organisations: the World Meteorological Organisation (**WMO**) and the United Nations Environment Programme (**UNEP**)

Its role is to assess on a comprehensive, objective and transparent basis the **scientific, technical and socio-economic** information relevant to understanding the scientific basis of climate change, its potential impacts and options for adaptation and mitigation

The assessments carried out by the IPCC have influenced global action on an unprecedented scale

1. First Assessment Report (1990) had a major impact in defining the content of the **UNFCCC**

2. The Second Assessment Report (1996) was largely influential in defining the provisions of the **Kyoto Protocol**

3. The Third Assessment Report (2001) focused attention on the problems of the **impacts** of climate change and the need for **adaptation**

4. The Fourth Assessment Report (2007) is creating a strong basis for a **post Kyoto Protocol** agreement

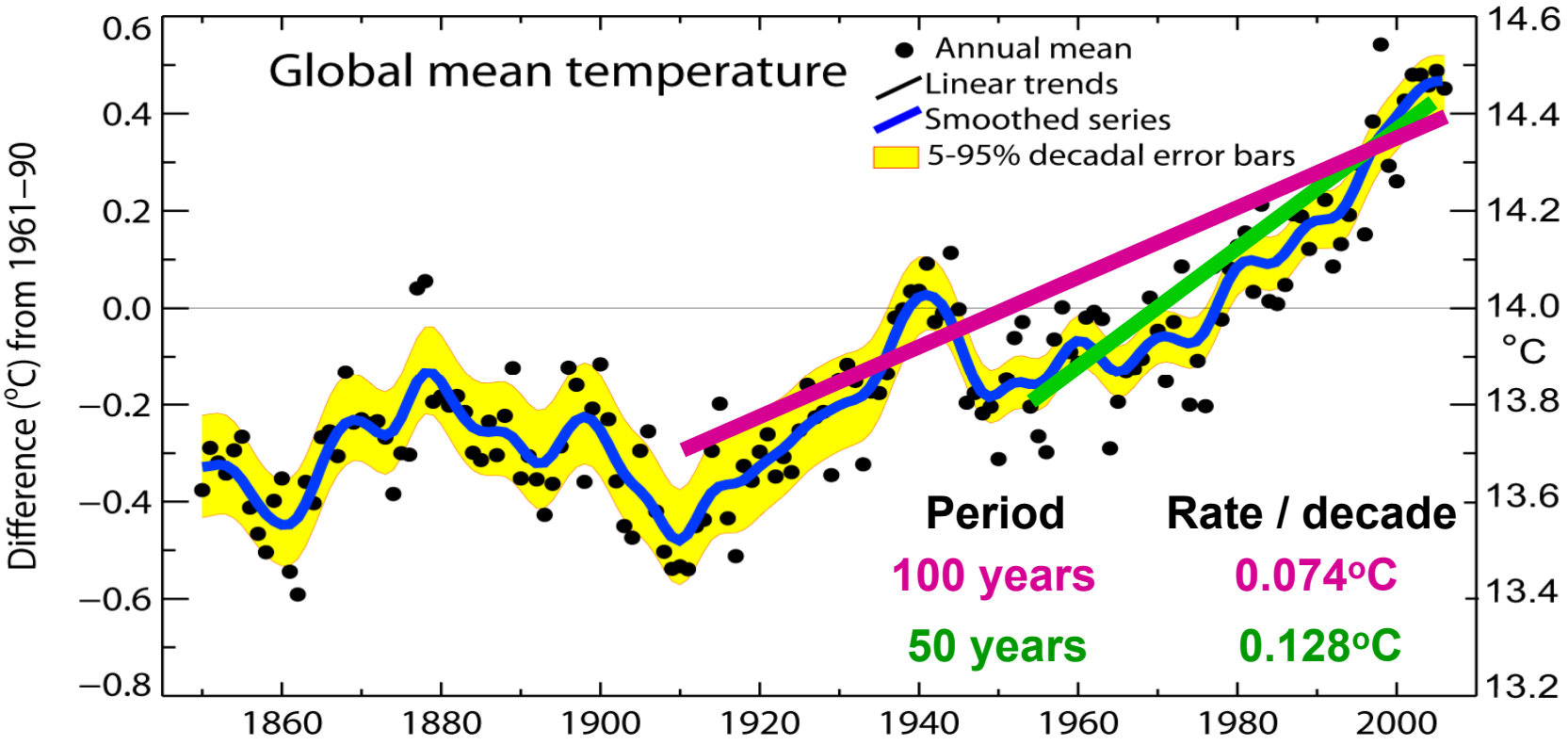
Climate change shows how science can help address problems facing humanity

By creating **knowledge** and understanding of the complex interrelationships between human actions and the environment

By defining specific **solutions** that can address the problem if applied on a large scale

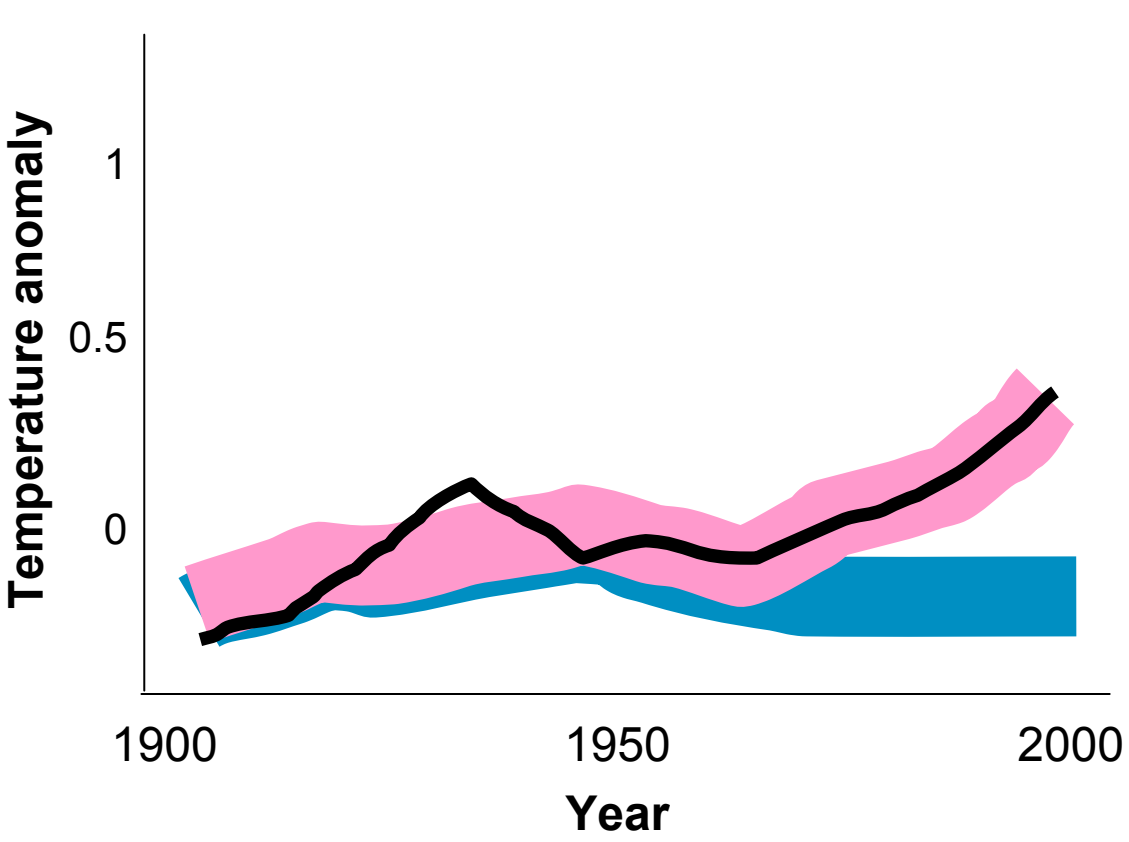
Climate change is unequivocal

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

Causes of change



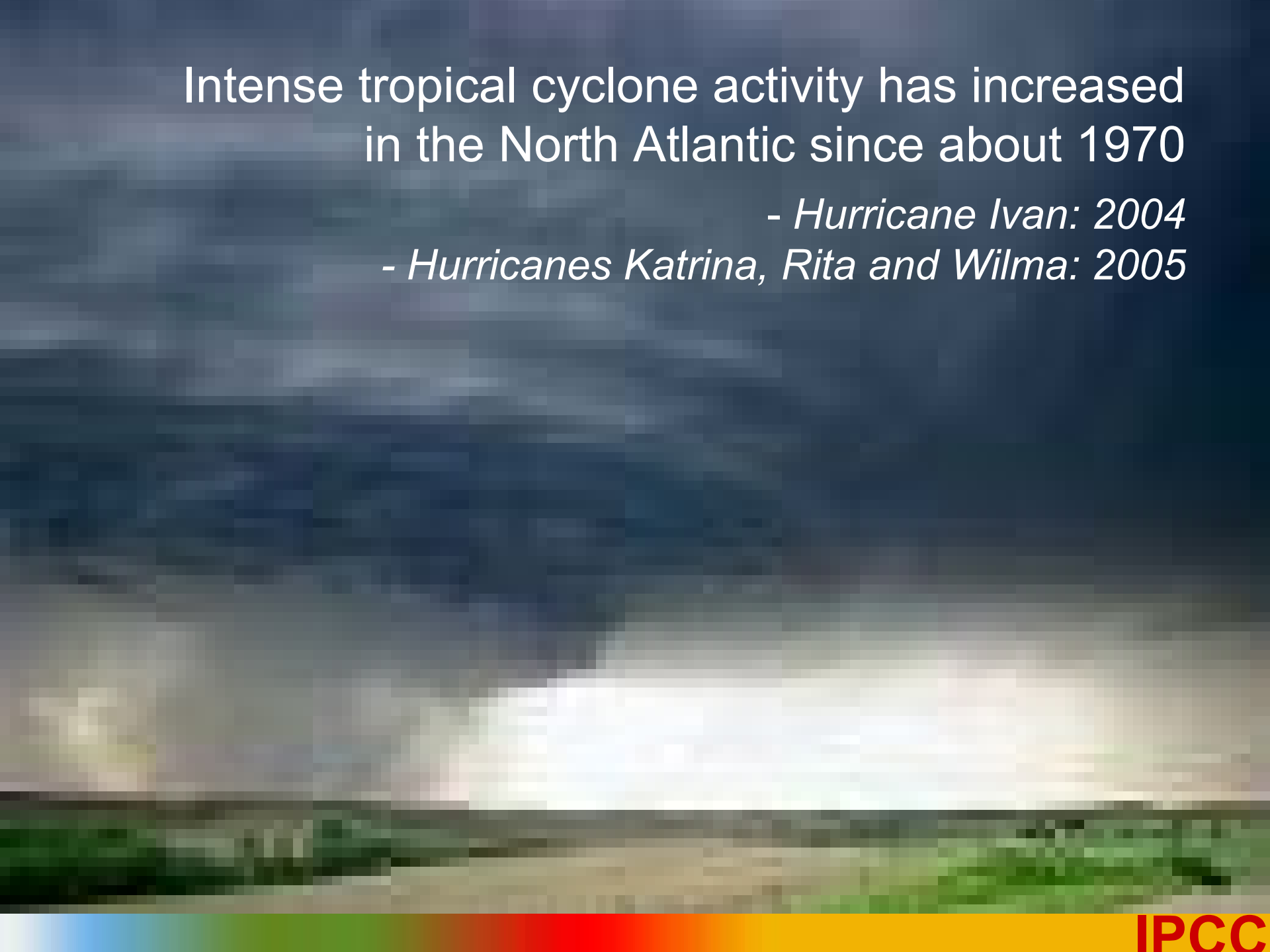
Models using only natural forcing

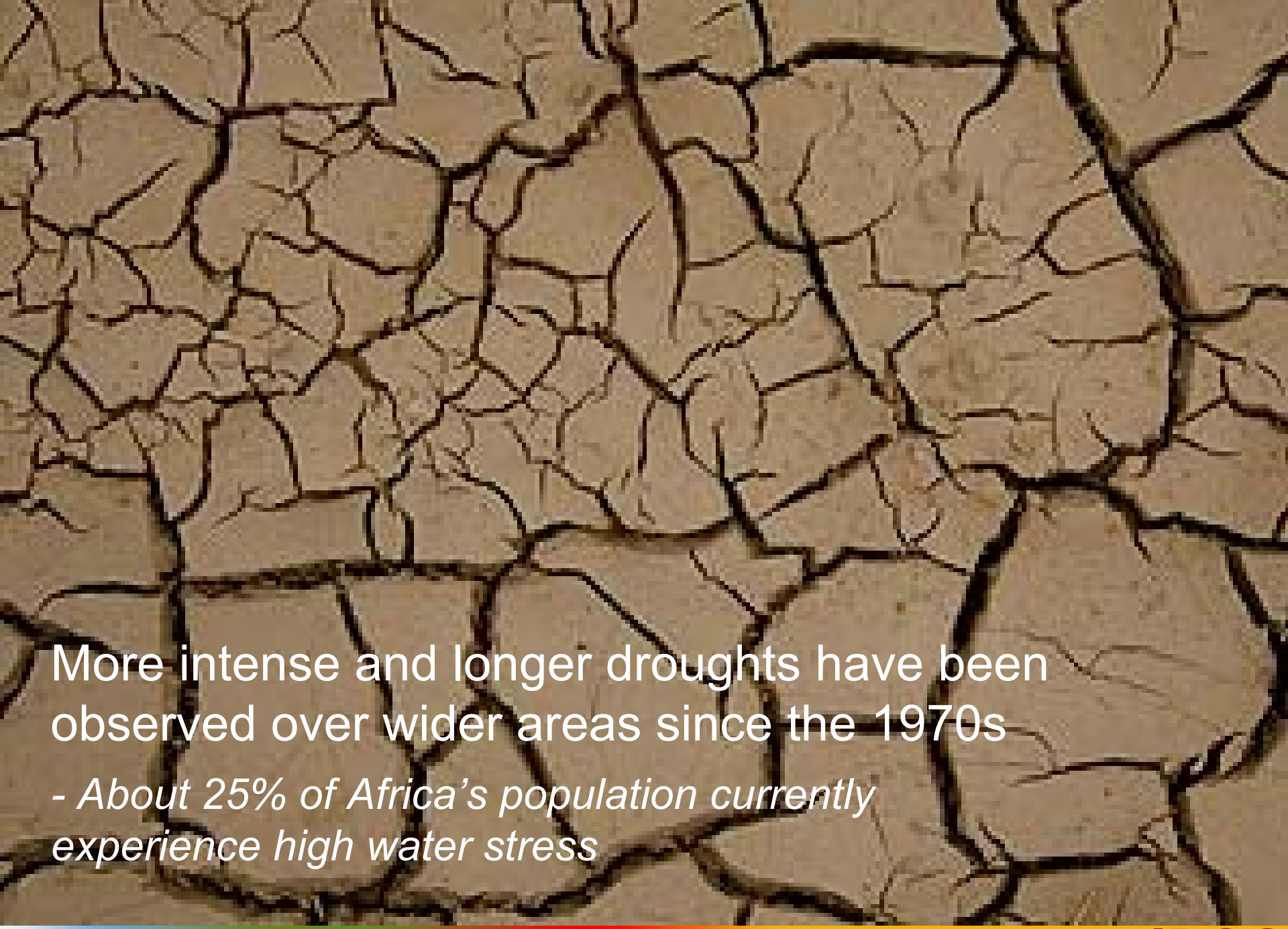
Models using both natural and anthropogenic forcing

Observations

Heat waves have become more frequent over most land areas

- Heat wave in Europe, 2003: 35 000 deaths


Intense tropical cyclone activity has increased in the North Atlantic since about 1970
- Hurricane Ivan: 2004
- Hurricanes Katrina, Rita and Wilma: 2005
IPCC

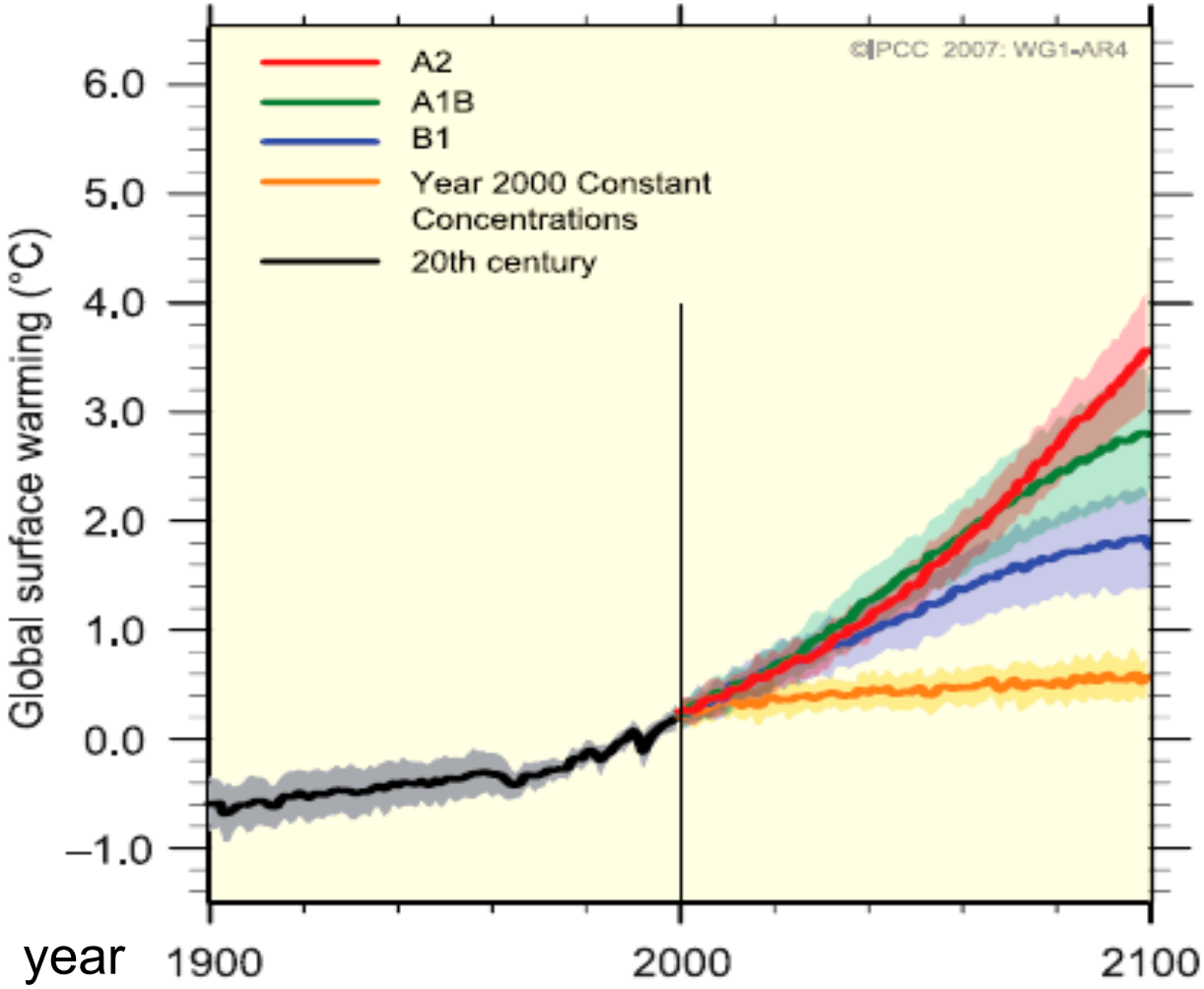


More intense and longer droughts have been observed over wider areas since the 1970s

- About 25% of Africa's population currently experience high water stress

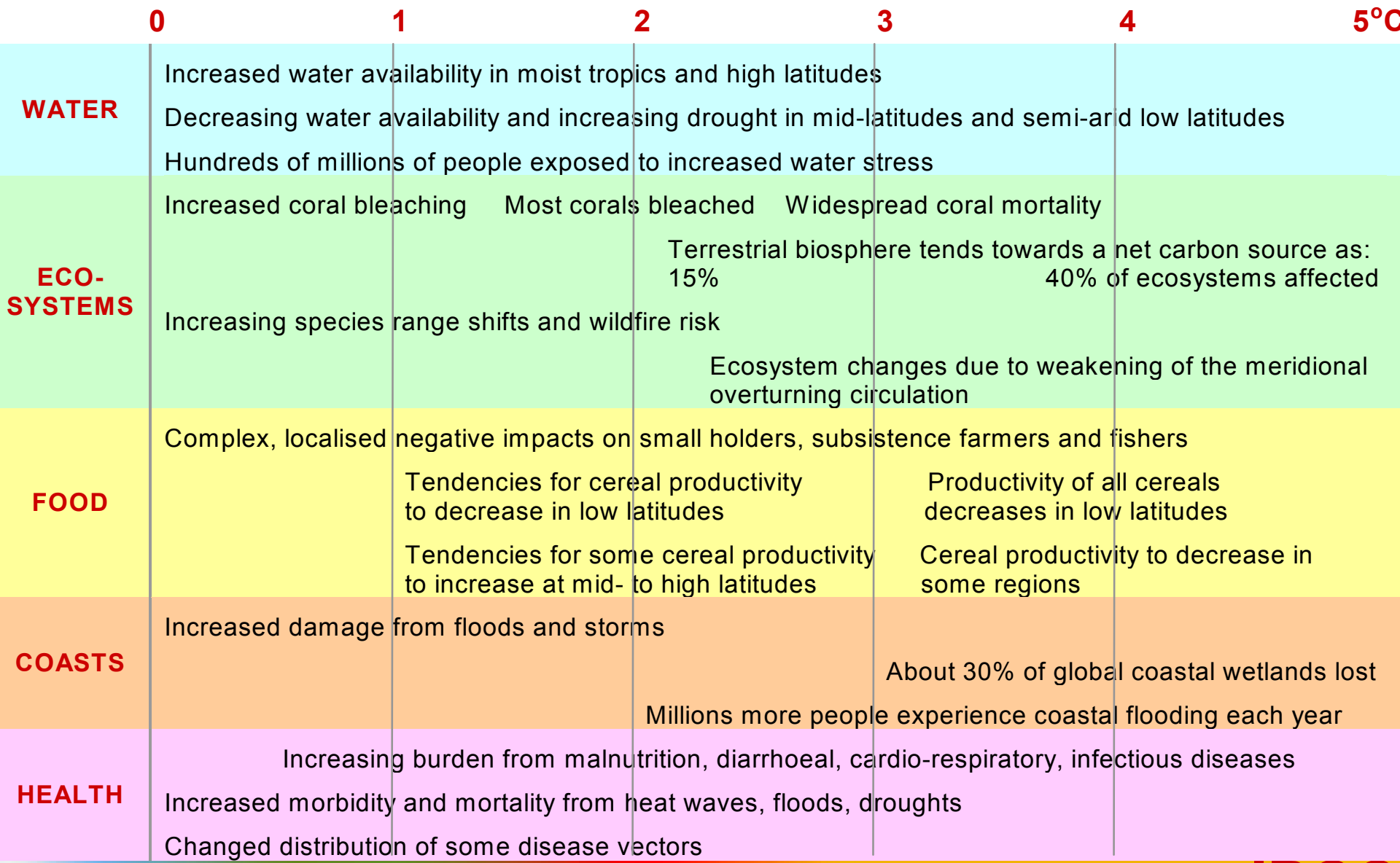
Expected trends and impacts of climate change

Ranges for predicted surface warming



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

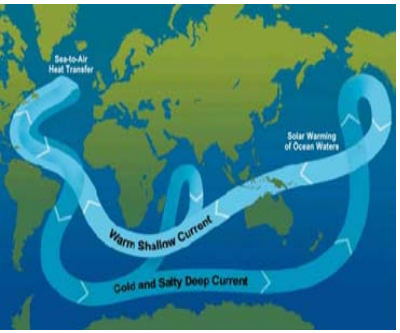
Examples of impacts associated with global average temperature change relative to 1980-1999



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**, 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

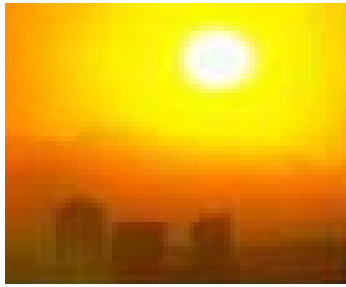


Large scale and persistent changes in **Meridional Overturning Circulation** would have impacts on marine ecosystem productivity, fisheries, ocean CO_2 uptake and terrestrial vegetation

Impacts on North America

Warming in western **mountains** is projected to cause decreased snowpack and reduced summer flows, exacerbating competition for over-allocated water resources

Increased number, intensity and duration of **heatwaves** will have potential for adverse health impacts



Coastal communities and habitats will be increasingly stressed by climate change impacts interacting with development and pollution

Impacts on poor regions

People exposed to increased water stress by 2020:

- 120 million to 1.2 billion in Asia
- 12 to 81 million in Latin America
- 75 to 250 million in Africa

Possible yield reduction in agriculture:

- 30% by 2050 in Central and South Asia
- 30% by 2080 in Latin America
- 50% by 2020 in some African countries

Crop revenues could fall by 90% by 2100 in Africa

Some research-related priorities

- ✓ Long-term field monitoring
- ✓ Regions with sparse data and small islands
- ✓ Harmonised scenarios and associated regional changes in climate and vulnerabilities
- ✓ Synergies between adaptive capacity and sustainable development
- ✓ **Multi-disciplinary, multi-institutional research**

Mitigation targets and costs

Stabilisation scenarios

Global mean temp. increase (ºC)	Stabilization level (ppm CO_2-eq)	Year CO_2 needs to peak
2.0 – 2.4	445 – 490	2000 – 2015
2.4 – 2.8	490 – 535	2000 – 2020
2.8 – 3.2	535 – 590	2010 – 2030
3.2 – 4.0	590 – 710	2020 – 2060

Costs of mitigation in 2030

Stabilisation levels (ppm CO2-eq)	Range of GDP reduction (%)	Reduction of average annual GDP growth rates (percentage pts)
445 - 535	< 3	< 0.12
535 - 590	0.2 – 2.5	< 0.1
590 - 710	-0.6 – 1.2	< 0.06

Mitigation measures would induce 0.6% gain to 3% decrease of GDP in 2030

Co-benefits of mitigation

- ✓ **Health** co-benefits from reduced air pollution
- ✓ Increased **energy security**
- ✓ More rural **employment**
- ✓ Increased **agricultural production** and reduced pressure on **natural ecosystems**

➧ **Co-benefits provide the opportunity for no-regrets policies and reduce mitigation costs**

Key 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 appropriate and effective **incentives** are in place for their development, acquisition, deployment and diffusion

Mitigation options in energy supply

(26% of global GHG emissions)

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

Mitigation options in transport
(23% of global GHG emissions)

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

Mitigation options in buildings

(potential to reduce 30% of baseline emissions in 2020)

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

Key mitigation instruments, policies and practices

Regulations and standards

Appropriate energy infrastructure investments

Research, development and demonstration

Changes in lifestyle & management practices

Effective carbon-price signal

Man did not weave the web of life,
he is merely a strand in it.

Whatever he does to the web,
he does to himself.

Chief Seattle, 1854