Intergovernmental Panel on Climate Change (IPCC) 4th Assessment Report

Summary for Policymakers

June 21, 2007

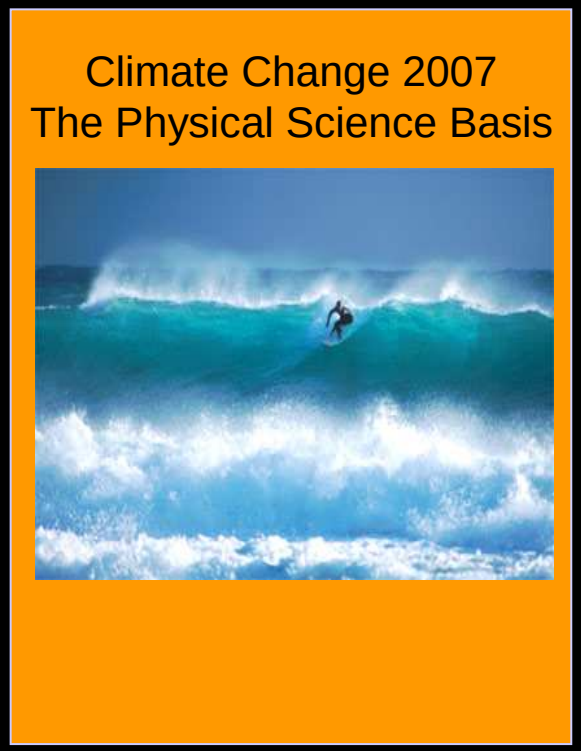
California Air Resources Board

California Environmental Protection Agency

Overview

Feb 2007	**The Physical Science Basis**
Apr 2007	**Impacts, Adaptation and Vulnerability**
May 2007	**Mitigation of Climate Change**
Nov 2007	**Final Synthesis Report**

IPCC 4th Assessment (2007)



1,250 authors
2,500 reviewers
130 countries
6 years work
1 consensus report

Policy-relevant but not policy-prescriptive reviews of the state of scientific understanding

Constraints on IPCC 4th Assessment

- End of 2005 cut-off for research
- Important findings in 2006 not included
  - Rapid Greenland and Antarctic ice melt
  - Sea surface temperatures
  - Hurricane intensity
  - Sea level rise
- Computer climate models to be improved for short-term projections (1-2 decades)
- Policy makers need more frequent, comprehensive, but succinct summaries

Physical Science Basis
Key Findings

*"**Warming** of the climate system is **unequivocal**…"*

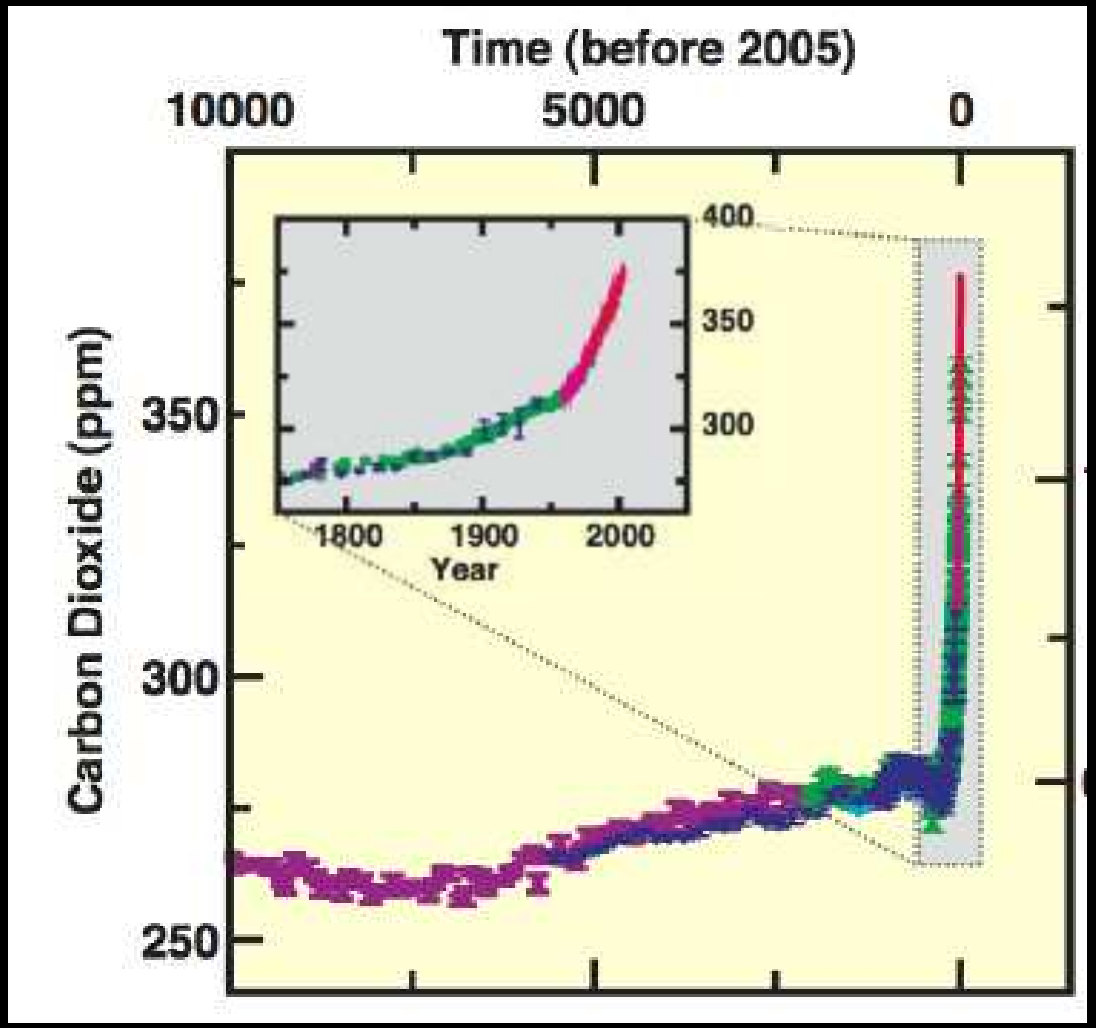
"Most of the observed warming over the last 50 years is likely to have been due to the increase in greenhouse gas concentrations."

*"**Very high confidence** that the globally averaged net effect of human activities since 1750 has been one of warming…"*

Source: IPCC *Climate Change 2007: The Physical Science Basis*—SPM

Changes in Heat-trapping Gases from Ice-Core and Modern Data

"Since the dawn of the industrial era, CO_2 and other key heat-trapping gases have increased at a rate that is very likely to have been unprecedented in more than 10,000 years."

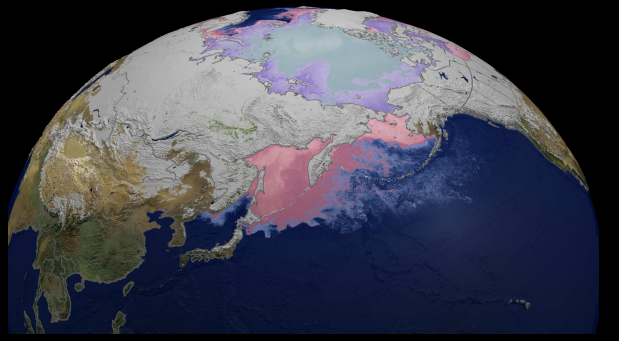


Source: IPCC *Climate Change 2007: The Physical Science Basis*—Summary for Policymakers.

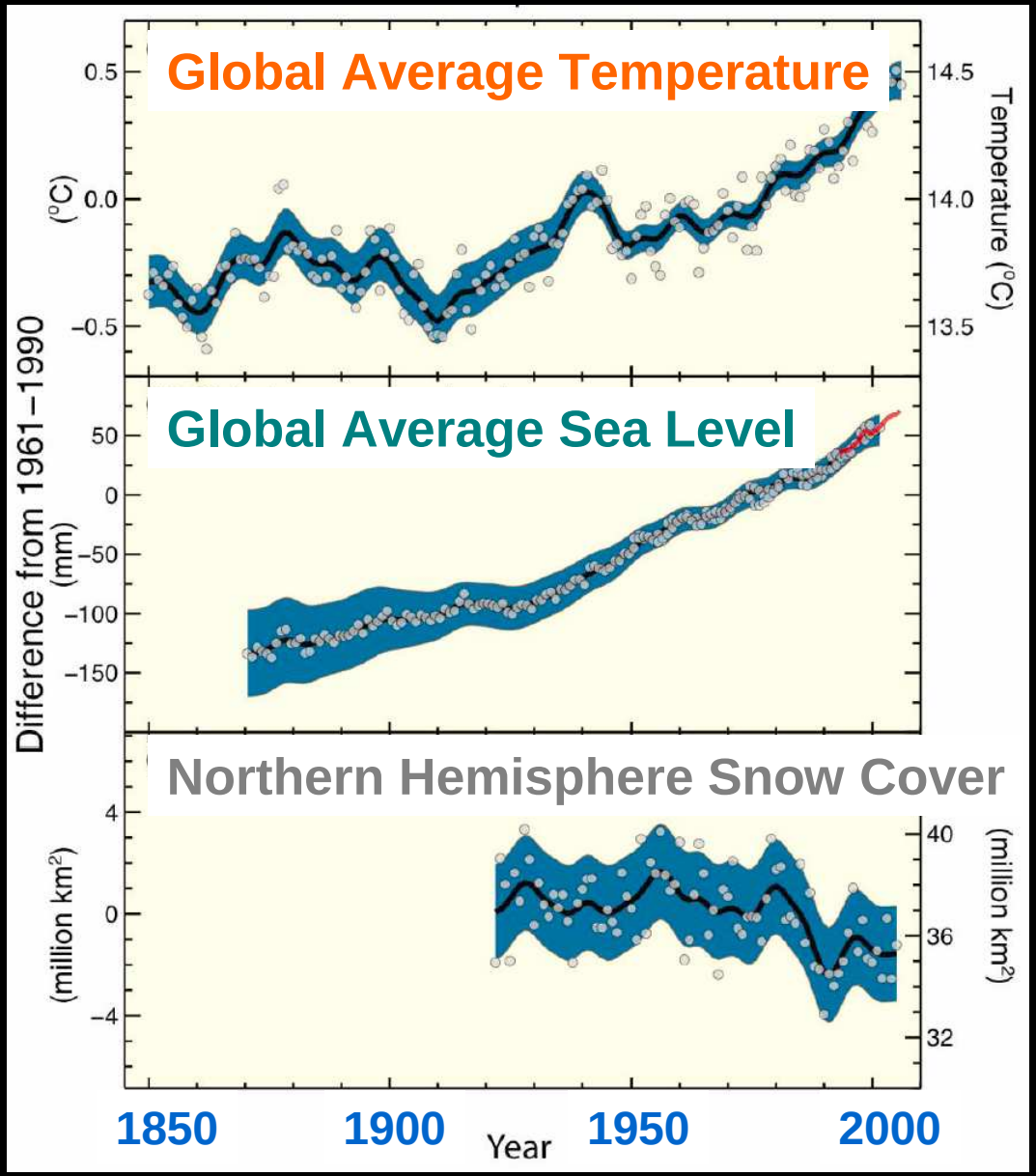
Direct Observations of Recent Climate Change

Washington Post

NOAA



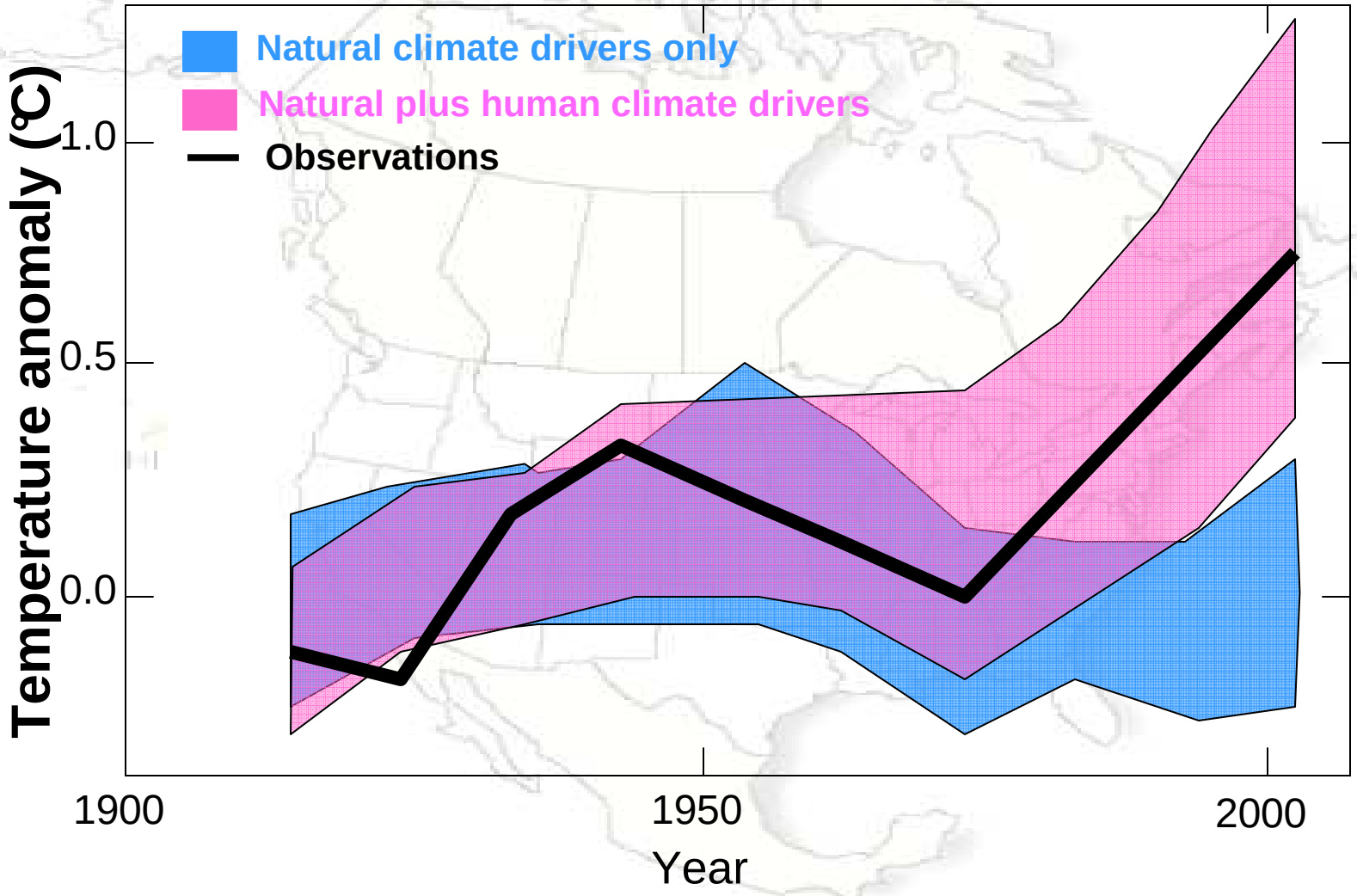
NASA



Source: IPCC *Climate Change 2007: The Physical Science Basis*—SPM

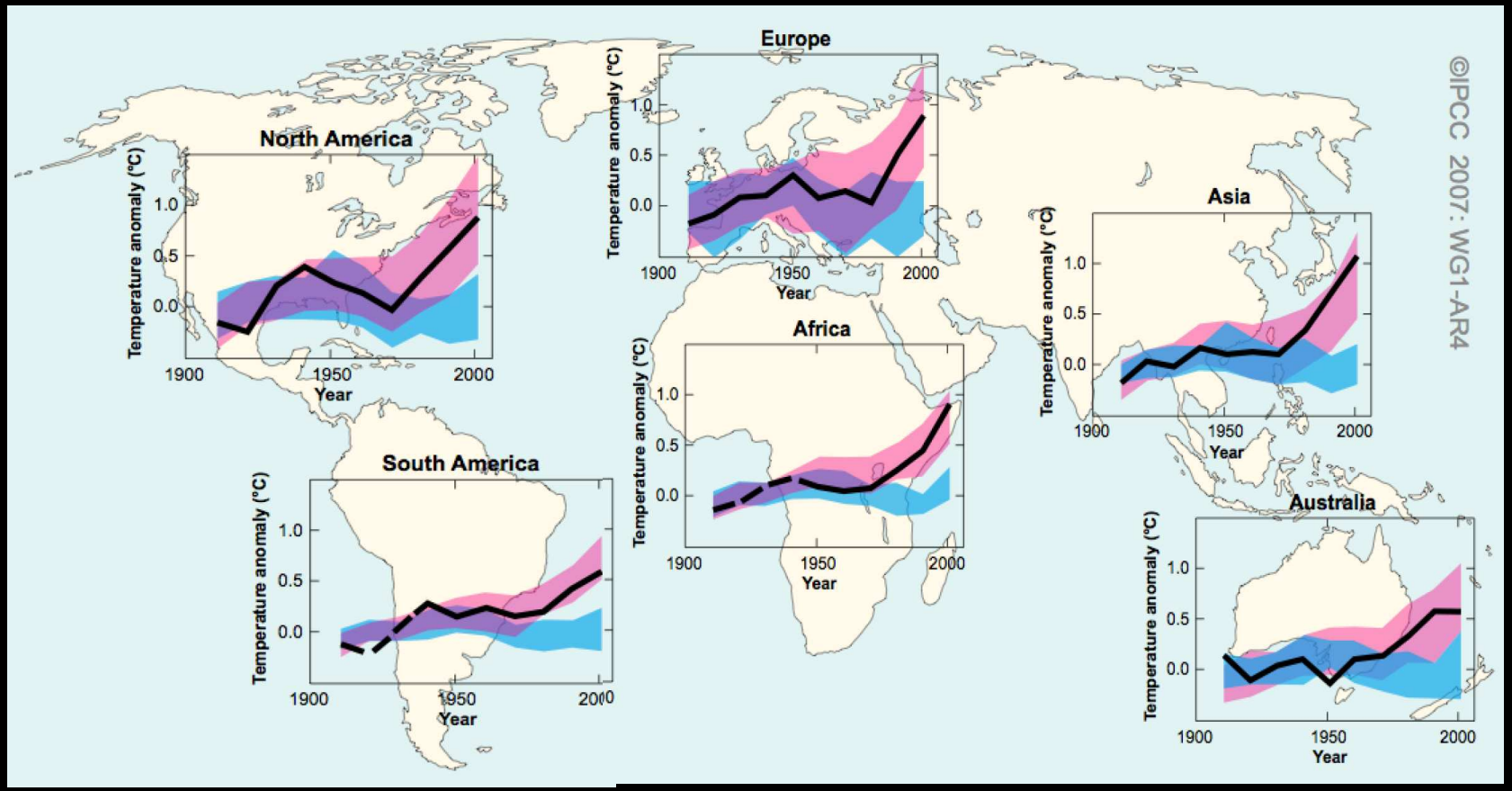
Predicted and Observed Temperature Change

North America



Source: IPCC *Climate Change 2007: The Physical Science Basis*—SPM

Predicted and Observed Temperature Change



There has been significant human-induced warming over past 50 years in each continent

Source: IPCC *Climate Change 2007: The Physical Science Basis*—SPM

Impacts, Adaptation and Vulnerability Key Findings

"It is likely that since 1970, human-induced warming has had a discernible influence on many physical and biological systems."

89% of the 29,000 datasets that IPCC examined exhibited changes in the direction expected from warming.

Source: IPCC 2007: *Climate Change Impacts, Adaptation and Vulnerability*—SPM

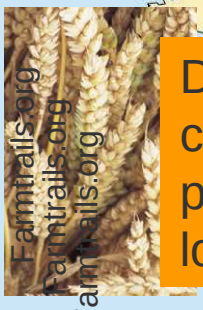
Effects of human-induced climate change are now apparent on every continent

Source: IPCC 2007: *Climate Change Impacts, Adaptation and Vulnerability*—SPM

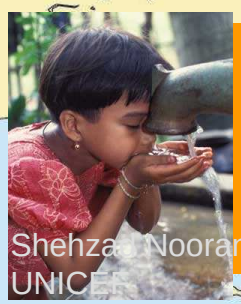
Future Risks:
Rise Above 1980-1999 of 1-2℃ (1.8-3.6℉)

Up to 30% of species at increasing risk of extinction

Increase cereal productivity mid-high latitudes



Decrease cereal productivity low latitudes



Decrease freshwater availability for billion people

Disappearance of Glaciers

Replacement of tropical forest by savanna in eastern Amazon

Most corals bleached

Source: IPCC 2007: *Climate Change Impacts, Adaptation and Vulnerability*—SPM

Future Risks:
Rise Above 1980-1999 of 2-3℃ (3.6-5.4℉)

~15% of terrestrial biosphere becomes net carbon source

Large increase area burned

Widespread coral mortality

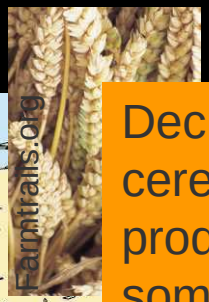
Millions more people could experience coastal flooding each year

Source: IPCC 2007: *Climate Change Impacts, Adaptation and Vulnerability*—SPM

Future Risks:
Rise Above 1980-1999 of 3-4℃ (5.4-7.2℉)

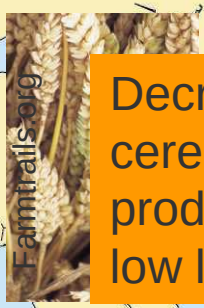
~40% of terrestrial biosphere becomes net carbon source

High latitudes flood

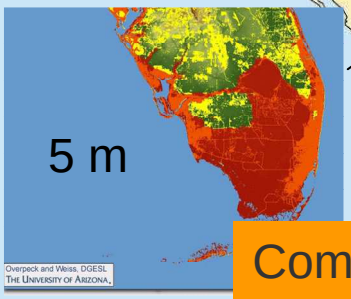


Decrease cereal productivity some regions

~30% of global coastal wetlands lost



Decrease all cereal productivity low latitudes



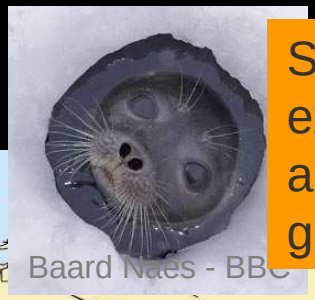
Commit to long-term ice sheet melt contribution of 4-6 meters sea level rise

Increases in coastal water temperature worsens cholera abundance

Source: IPCC 2007: *Climate Change Impacts, Adaptation and Vulnerability*—SPM

Future Risks:
Rise Above 1980-1999 of 4-5℃ (7.2-9.0℉)

Sea ice reduction in Canadian Arctic



Baard Naes - BBC

Significant extinctions around the globe

Children's Hospital Oakland

Increased frequency of cardio-respiratory diseases due to climate-induced smog

Increased mortality from droughts

UK.gov

AP/TPI / Tribune

Increased deaths, disease, and injury due to floods

Altered distribution of disease vectors

Source: IPCC 2007: *Climate Change Impacts, Adaptation and Vulnerability*—SPM

"Although many early impacts of climate change can be effectively addressed through adaptation, the options for successful adaptation diminish and the associated costs increase with increasing climate change."

Source: IPCC 2007: *Climate Change Impacts, Adaptation and Vulnerability*—SPM

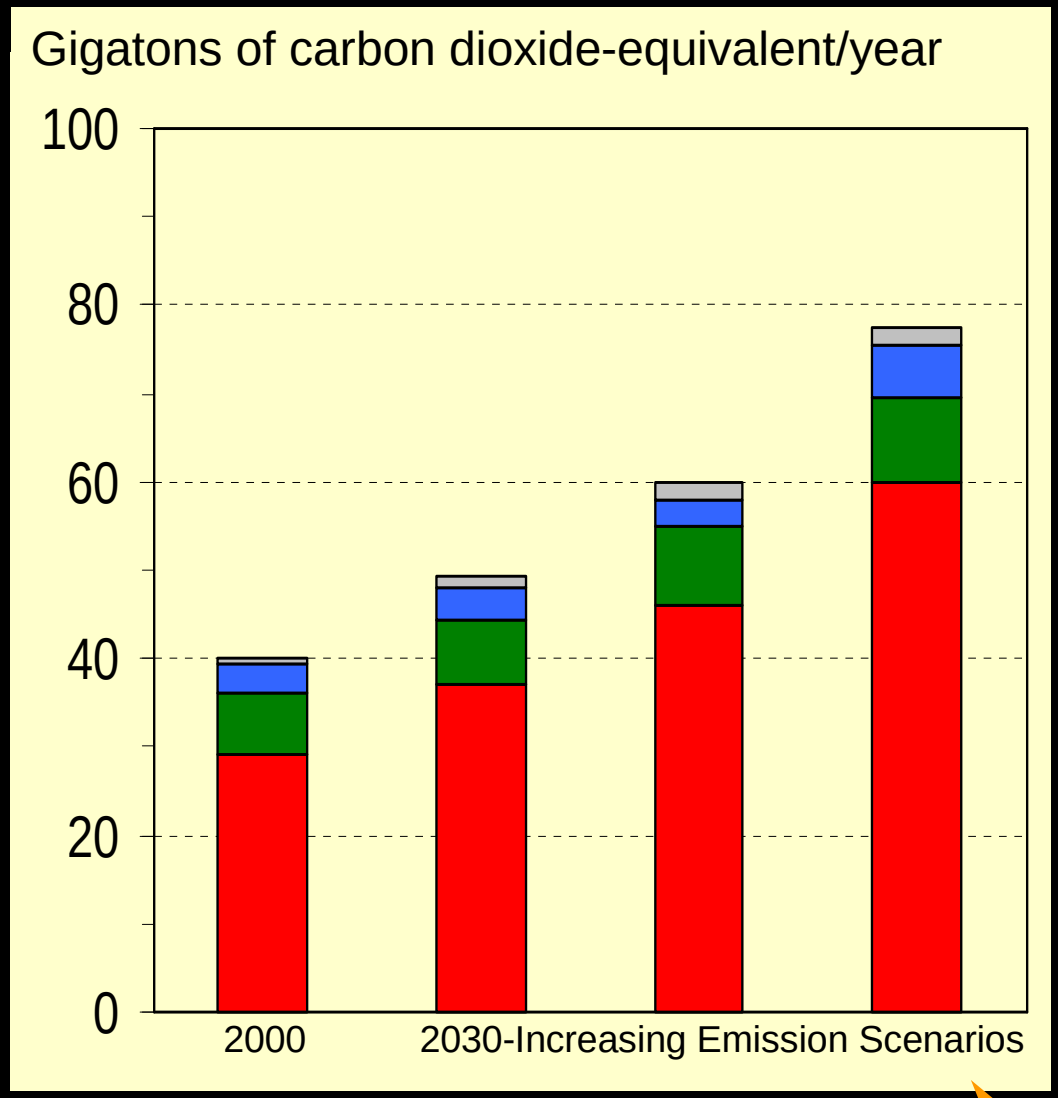
Mitigation of Climate Change Key Findings

"There is substantial economic potential for the mitigation of global greenhouse gas emissions over the coming decades, that could offset the projected growth of global emissions or reduce emissions below current levels."

Source: IPCC Climate Change 2007: *Mitigation of Climate Change*—SPM

Global Emissions for 2000 and Projected Emissions for 2030

Global emissions will increase 25-90% by 2030 (compared to 2000 levels), unless we take immediate actions.



Source: IPCC Climate Change 2007: *Mitigation of Climate Change*—SPM

Cost of Mitigation to Limit Temperature Rise in 2030

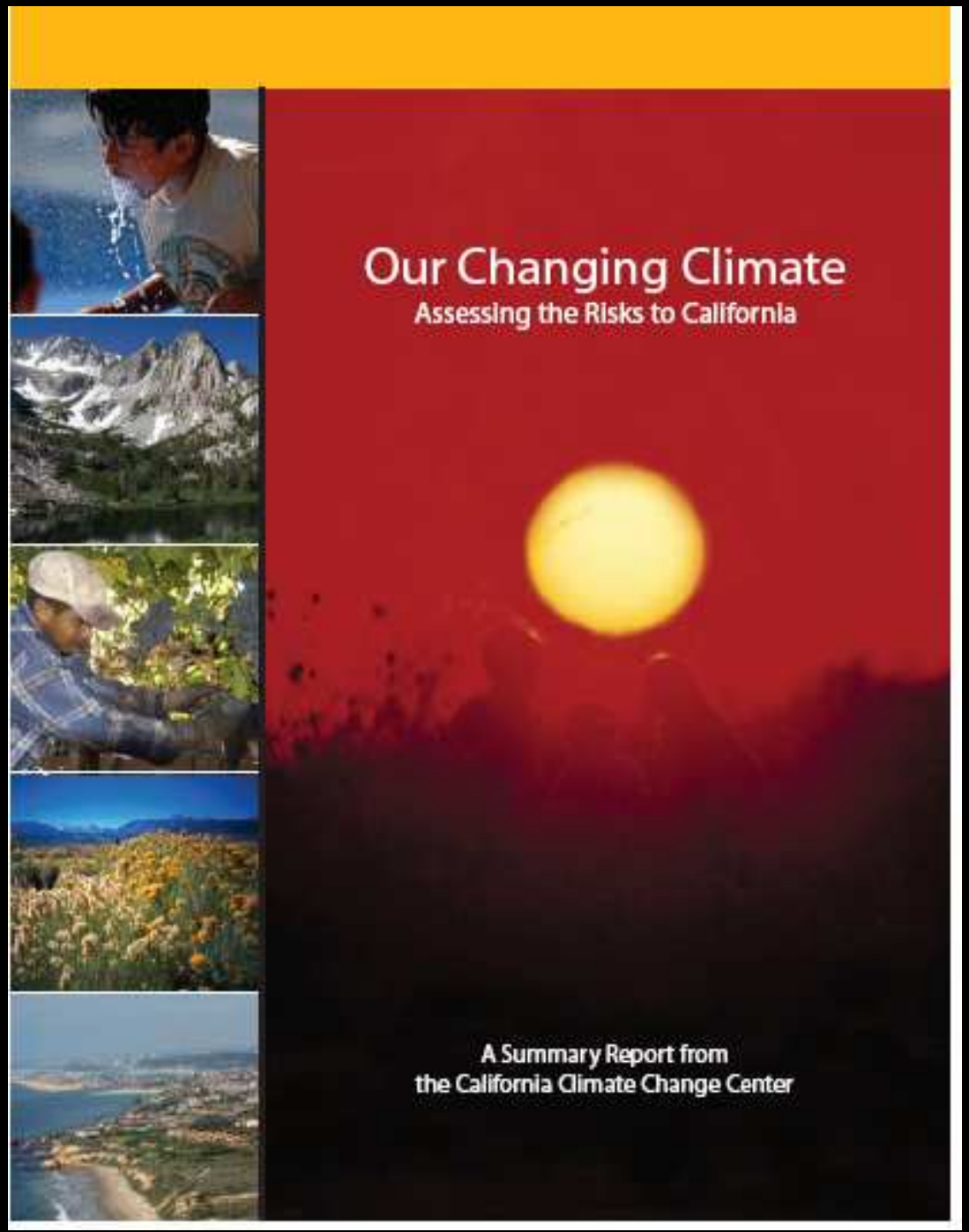
Stabilization levels (ppm CO_2-eq)	Global mean temperature increase (^oC)	Range of GDP reduction Present-2030 (%)	Reduction of average annual GDP growth rates (%)
590 – 710	3.2 – 4.0	-0.6 – 1.2	< 0.06
535 – 590	2.8 – 3.2	0.2 – 2.5	< 0.1
445 – 535	2.0 – 2.8	< 3	< 0.12

Source: IPCC Climate Change 2007: *Mitigation of Climate Change*—SPM

Roles of Developed and Developing Countries

- Emissions from some developing countries are growing rapidly, and curtailing them will need to be part of the solution.
- However, the U.S. and other developed countries bear a historical responsibility for most of the emissions in the atmosphere.

Source: IPCC Climate Change 2007: *Mitigation of Climate Change*—SPM



California Climate Change Scenarios Assessment

Gov Schwarzenegger's June 2005 Executive Order commissioned this Climate Assessment, which investigated potential climate change impacts and formed key scientific background for California's GHG emissions legislation, Assembly Bill 32

Key Conclusions

Numerous observations of long-term changes in climate

Very high confidence that human activities have contributed to recent warming effects

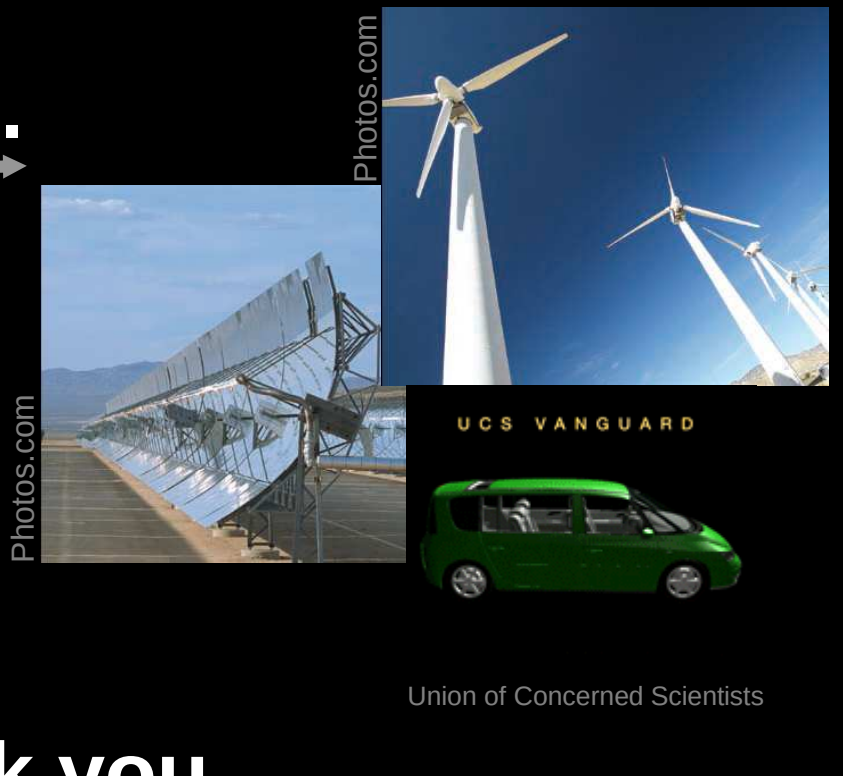
Further warming unavoidable due to past emissions, so climate adaptation investments are needed

Developing countries face a disproportionate burden of the damage and costs of climate change

Substantial technologies and policy instruments available for greenhouse gas mitigation

The degree of climate change our children and grandchildren experience in the second half of this century depends on the actions we take in this and the coming decade.

VS.



Union of Concerned Scientists

Thank you