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

Climate Change 2007
The Physical Science Basis

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, CO₂ 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.”

Direct Observations of Recent Climate Change

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.
Future Risks:
Rise Above 1980-1999 of 1-2°C (1.8-3.6°F)

- Up to 30% of species at increasing risk of extinction
- Disappearance of Glaciers
- Increase cereal productivity mid-high latitudes
- Decrease cereal productivity low latitudes
- Decrease freshwater availability for billion people
- 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°C (3.6-5.4°F)

- ~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°C (5.4-7.2°F)

- ~40% of terrestrial biosphere becomes net carbon source
- High latitudes flood
- Decrease cereal productivity in some regions
- Decrease all cereal productivity in low latitudes
- ~30% of global coastal wetlands lost
- 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°C (7.2-9.0°F)

- Sea ice reduction in Canadian Arctic
- Significant extinctions around the globe
- Increased deaths, disease, and injury due to floods
- Altered distribution of disease vectors
- Increased frequency of cardio-respiratory diseases due to climate-induced smog
- Increased mortality from droughts

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 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

<table>
<thead>
<tr>
<th>Stabilization levels (ppm CO₂-eq)</th>
<th>Global mean temperature increase (°C)</th>
<th>Range of GDP reduction Present-2030 (%)</th>
<th>Reduction of average annual GDP growth rates (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>590 – 710</td>
<td>3.2 – 4.0</td>
<td>-0.6 – 1.2</td>
<td>&lt; 0.06</td>
</tr>
<tr>
<td>535 – 590</td>
<td>2.8 – 3.2</td>
<td>0.2 – 2.5</td>
<td>&lt; 0.1</td>
</tr>
<tr>
<td>445 – 535</td>
<td>2.0 – 2.8</td>
<td>&lt; 3</td>
<td>&lt; 0.12</td>
</tr>
</tbody>
</table>

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
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.

Thank you