


The 2007 IPCC Report

Richard McGehee



Seminar on the Mathematics of Climate Change
School of Mathematics
September 30, 2008

The 2007 IPCC Report

2007 Nobel Peace Prize




http://nobelprize.org/nobel_prizes/peace/laureates/2007/

The 2007 IPCC Report

What is the IPCC?

“The World Meteorological Organization (WMO) and the United Nations Environment Programme (UNEP) established the **Intergovernmental Panel on Climate Change (IPCC)** in 1988. The role of the IPCC is to assess on a comprehensive, objective, open and transparent basis the scientific, technical and socio-economic information relevant to understanding the scientific basis of risk of human-induced climate change, its potential impacts and options for adaptation and mitigation.”

<http://www.ipcc.ch/>

The 2007 IPCC Report

What is the IPCC?

- 130 countries
- 800 authors
- 2500 scientific experts
- huge bureaucracy
- political considerations
- not prone to hyperbole

The 2007 IPCC Report

Progression of Stridency

1990 (First Assessment Report): “The **unequivocal** detection of the enhanced greenhouse effect is not likely for a decade or more.”

1995 (Second Assessment Report): “The balance of evidence suggests a discernible human influence on global climate.”

2001 (Third Assessment Report): “There is new and stronger evidence that most of the warming observed over the past 50 years is attributable to human activities.”

<http://en.wikipedia.org/wiki/IPCC>

The 2007 IPCC Report

Progression of Stridency

2007 (Fourth Assessment Report)

“Warming of the climate system is **unequivocal**, as is now evident from observations of increases in global average air and ocean temperatures, widespread melting of snow and ice, and rising global average sea level.” (p. 5)

“Most of the observed increase in global average temperatures since the mid-20th century is **very likely** due to the observed increase in anthropogenic greenhouse gas concentrations.” (p. 10)

Summary for Policy Makers, IPCC AR4
http://ipcc-wg1.ucar.edu/wg1/Report/AR4WG1_Print_SPM.pdf



The 2007 IPCC Report

Public Reaction

"A United Nations report issued today by the world's top climate scientists said global warming was 'very likely' man-made and would bring higher temperatures and a steady rise in sea levels for centuries to come regardless of how much the world slows or reduces its greenhouse gas emissions. ... 'Warming of the climate system is **unequivocal** ...'"

USA Today, February 1, 2007
http://www.usatoday.com/weather/climate/globalwarming/2007-02-01-ippc-report_x.htm



The 2007 IPCC Report

Public Reaction

'Global warming is here and humans are "very likely" the blame, an international group of scientists meeting in Paris, France, announced Friday. "The evidence for warming having happened on the planet is **unequivocal**," said U.S. government scientist Susan Solomon, who also is a member of the Intergovernmental Panel on Climate Change.'

CNN, February 2, 2007
<http://www.cnn.com/2007/TECH/science/02/02/climate.change.report/index.html?iref=newssearch>



The 2007 IPCC Report

Public Reaction

Climate Change Verdict: Science Debate Ends, Solution Debate Begins

by David Biello

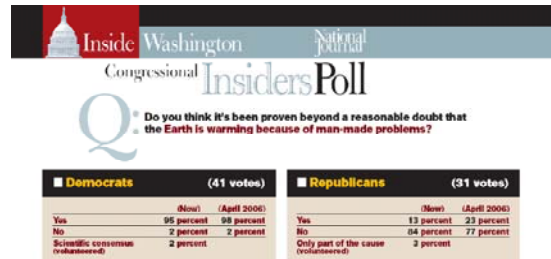
The debate over whether Earth's climate is changing and if humanity is responsible for that change closed in Paris on February 2. The Intergovernmental Panel on Climate Change (IPCC) released its summary for policymakers—a summation of the salient science in its much longer report due in May—in which it said that climate change is "**unequivocal**" and estimated the chances of humans being behind it at 90 percent, or "**very likely**."

Scientific American Online, February 8, 2007
<http://www.sciam.com/article.cfm?articleID=A1E03678-E7F2-99DF-349533FA71189693>



The 2007 IPCC Report

Public Reaction



National Journal, Feb 3, 2007
http://syndication.nationaljournal.com/images/203Insiderspoll_NJLogo.pdf



The 2007 IPCC Report

Terminology

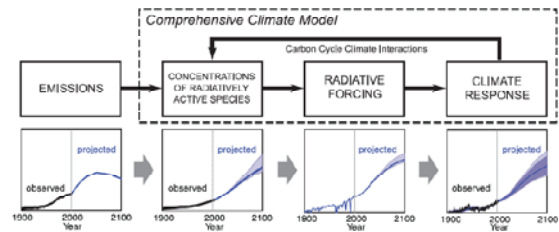
Likelihood Terminology	Likelihood of the occurrence/ outcome
Virtually certain	> 99% probability
Extremely likely	> 95% probability
Very likely	> 90% probability
Likely	> 66% probability
More likely than not	> 50% probability
About as likely as not	33 to 66% probability
Unlikely	< 33% probability
Very unlikely	< 10% probability
Extremely unlikely	< 5% probability
Exceptionally unlikely	< 1% probability

Technical Summary, IPCC AR4, p.23
http://ipcc-wg1.ucar.edu/wg1/Report/AR4WG1_Print_TS.pdf



The 2007 IPCC Report

Prediction Methodology



Global Climate Projections, IPCC AR4, p.753
http://ipcc-wg1.ucar.edu/wg1/Report/AR4WG1_Print_CH10.pdf



The 2007 IPCC Report

Emission Scenarios

“Emission scenarios” for the 21st century are derived from “storylines.” Complex economic models are fed storyline inputs. The outputs are predictions for greenhouse gas emission throughout the 21st century.

The storylines used for the fourth annual report have the labels A1B, A1FI, A1T, A2, B1, and B2.

The storylines and scenarios are described in the IPCC *Special Report on Emission Scenarios*.

<http://www.grida.no/climate/ipcc/emission/089.htm>



The 2007 IPCC Report

SRES Storylines

The A1 storyline and scenario family describes a future world of very rapid economic growth, low population growth, and the rapid introduction of new and more efficient technologies. Major underlying themes are convergence among regions, capacity building, and increased cultural and social interactions, with a substantial reduction in regional differences in per capita income. The A1 scenario family develops into four groups that describe alternative directions of technological change in the energy system.

etc.

<http://www.grida.no/climate/ipcc/emission/091.htm#4.2.1>



The 2007 IPCC Report

SRES Storylines

The A1 scenarios are of a more integrated world. The A1 family of scenarios is characterized by:

- Rapid economic growth.
- A global population that reaches 9 billion in 2050 and then gradually declines.
- The quick spread of new and efficient technologies.
- A convergent world - income and way of life converge between regions. Extensive social and cultural interactions worldwide.

http://en.wikipedia.org/wiki/Special_Report_on_Emissions_Scenarios



The 2007 IPCC Report

SRES Storylines

There are subsets to the A1 family based on their technological emphasis:

- A1FI - An emphasis on fossil-fuels.
- A1B - A balanced emphasis on all energy sources.
- A1T - Emphasis on non-fossil energy sources.

http://en.wikipedia.org/wiki/Special_Report_on_Emissions_Scenarios



The 2007 IPCC Report

SRES Storylines

The A2 scenarios are of a more divided world. The A2 family of scenarios is characterized by:

- A world of independently operating, self-reliant nations.
- Continuously increasing population.
- Regionally oriented economic development.
- Slower and more fragmented technological changes and improvements to per capita income.

http://en.wikipedia.org/wiki/Special_Report_on_Emissions_Scenarios



The 2007 IPCC Report

SRES Storylines

The B1 scenarios are of a world more integrated, and more ecologically friendly. The B1 scenarios are characterized by:

- Rapid economic growth as in A1, but with rapid changes towards a service and information economy.
- Population rising to 9 billion in 2050 and then declining as in A1.
- Reductions in material intensity and the introduction of clean and resource efficient technologies.
- An emphasis on global solutions to economic, social and environmental stability.

http://en.wikipedia.org/wiki/Special_Report_on_Emissions_Scenarios



The 2007 IPCC Report

SRES Storylines

The B2 scenarios are of a world more divided, but more ecologically friendly. The B2 scenarios are characterized by:

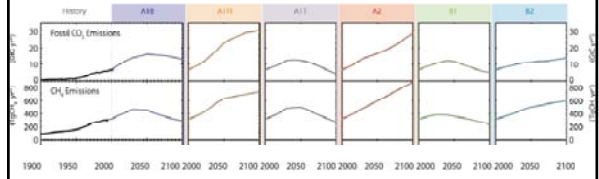
- Continuously increasing population, but at a slower rate than in A2.
- Emphasis on local rather than global solutions to economic, social and environmental stability.
- Intermediate levels of economic development.
- Less rapid and more fragmented technological change than in B1 and A1.

http://en.wikipedia.org/wiki/Special_Report_on_Emissions_Scenarios



The 2007 IPCC Report

Emission Scenarios

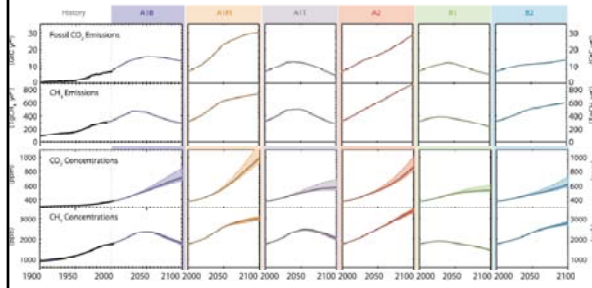


Global Climate Projections, IPCC AR4, p.803
http://ipcc-wg1.ucar.edu/wg1/Report/AR4WG1_Print_CH10.pdf



The 2007 IPCC Report

Greenhouse Gas Predictions

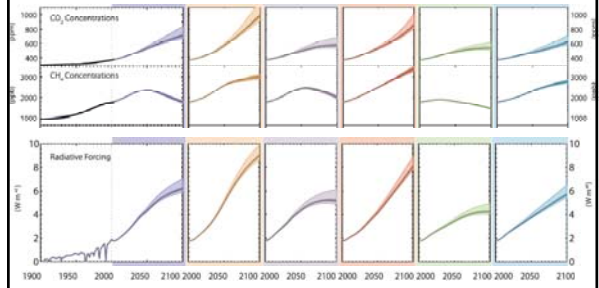


Global Climate Projections, IPCC AR4, p.803
http://ipcc-wg1.ucar.edu/wg1/Report/AR4WG1_Print_CH10.pdf



The 2007 IPCC Report

Radiative Forcing Predictions

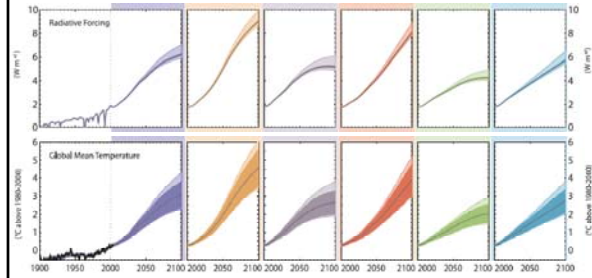


Global Climate Projections, IPCC AR4, p.803
http://ipcc-wg1.ucar.edu/wg1/Report/AR4WG1_Print_CH10.pdf



The 2007 IPCC Report

Global Mean Temperature Predictions

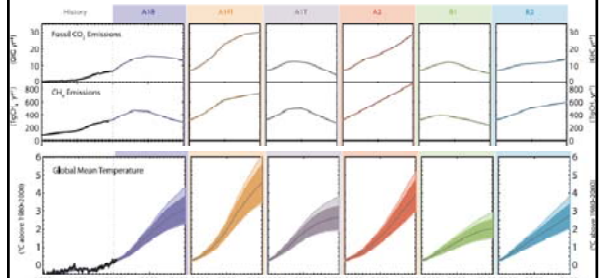


Global Climate Projections, IPCC AR4, p.803
http://ipcc-wg1.ucar.edu/wg1/Report/AR4WG1_Print_CH10.pdf

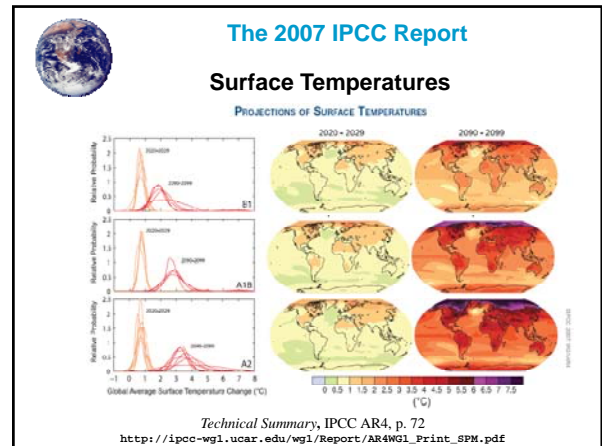
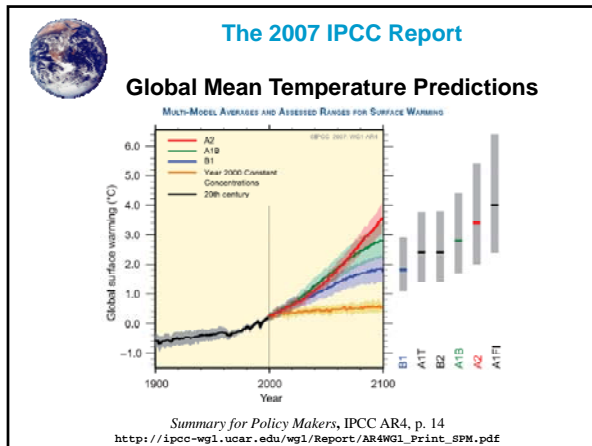


The 2007 IPCC Report

Global Mean Temperature Predictions



Global Climate Projections, IPCC AR4, p.803
http://ipcc-wg1.ucar.edu/wg1/Report/AR4WG1_Print_CH10.pdf

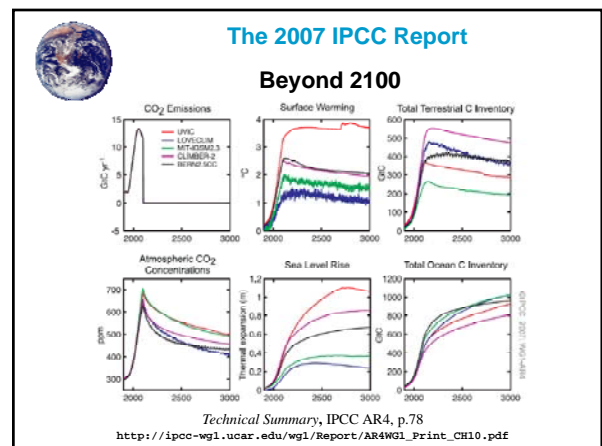
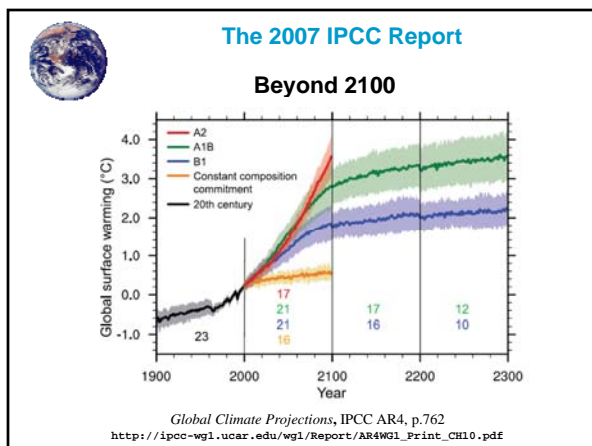
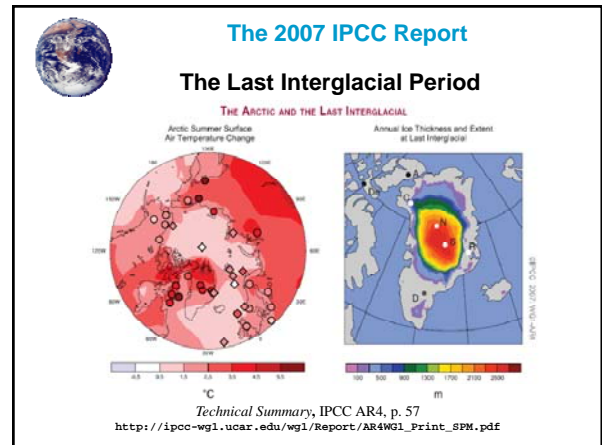


The 2007 IPCC Report

The Last Interglacial Period

Global average sea level was likely between 4 and 6 m higher during the last interglacial period, about 125,000 years ago, than during the 20th century, mainly due to the retreat of polar ice. Ice core data suggest that the Greenland Summit region was ice-covered during this period, but reductions in the ice sheet extent are indicated in parts of southern Greenland. Ice core data also indicate that average polar temperatures at that time were 3°C to 5°C warmer than the 20th century because of differences in the Earth's orbit. The Greenland Ice Sheet and other arctic ice fields likely contributed no more than 4 m of the observed sea level rise, implying that there may also have been a contribution from Antarctica.

Technical Summary, IPCC AR4, p. 58
http://ipcc-wg1.ucar.edu/wg1/Report/AR4WG1_Print_SPM.pdf





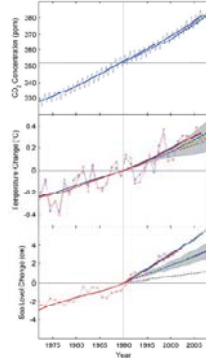
The 2007 IPCC Report IPCC Track Record

Comparison of IPCC 1990 predictions to actual observations.

Atmospheric CO₂: A-

Global mean temperature: B-

Sea Level: F

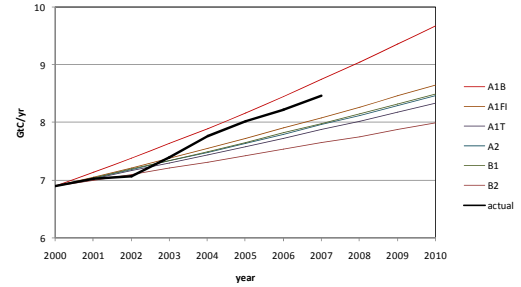


Stefan Rahmstorf, et al. Recent Climate Observations Compared to Projections, *Science* 316 (4 May 2007), p.709. <http://www.sciencemag.org/cgi/content/abstract/316/5825/709>



The 2007 IPCC Report IPCC Track Record

Emissions: Projections vs Actual



The 2007 IPCC Report IPCC Track Record

IPCC Emissions Scenarios

