

ipcc

INTERGOVERNMENTAL PANEL ON climate change

CLIMATE CHANGE 2013

The Physical Science Basis

WG I

WORKING GROUP I CONTRIBUTION TO THE
FIFTH ASSESSMENT REPORT OF THE
INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE



IPCC 101

A brief summary of what the IPCC is, what they do, and why it is important.

Sources: IPCC WG I Report - Summary for Policy Makers (SPM), IPCC Special Report on Managing Risk (SREX), Draft WG I Assessment Report (Physical Science Basis), various books, periodicals, and on-line resources

Definitions

- Weather – “The state of the atmosphere at a given time and place . . .” {Webster}
- Climate – “Meteorological conditions, including temperature, precipitation, and wind, that prevail in a region.” {Webster}
- Climate Change – “A change in the state of the climate that can be identified (e.g., by using statistical tests) by changes in the mean and/or variability of its properties and that persists for an extended period, typically decades or longer. Climate change may be due to natural internal processes or external forcings, or to persistent anthropogenic changes in the composition of the atmosphere or in land use .” {IPCC SPM}

Report' s Expressions of Confidence (Needed to translate report language)

- Virtually Certain: 99-100% probability
- Extremely likely: 95-100% probability
- Very Likely: 90-100% probability
- Likely: 66-100% probability
- More likely than not: 50-100%
- About as Likely: 33-66% probability
- Unlikely: 0-33% probability
- Very unlikely: 0-10% probability
- Extremely unlikely: 0-5% probability
- Exceptionally unlikely: 0-1% probability

What is the IPCC?

- Intergovernmental Panel on Climate Change
- Sponsored by:
 - United Nations Environmental Programme (UNEP)
 - World Meteorological Organization (WMO)
- Chartered to “Assess” the state of scientific knowledge of Climate Change and produce periodic (every 5 years) a report of their findings.
- 5th Assessment is now due (4th was on 2007)

Who Is On The Panel

- Current panel is 831 individual scientists from around the world drawn from the field of experts in Meteorology, Physics, Oceanography, Statistics, Oceanography, Engineering, Ecology, Social Sciences, and Economics
- Selected by the sponsoring organizations from over 3,000 candidates nominated by their government or academic institutions.

How Is IPCC Organized

- Working Group I (WG I): Focuses of the Physical Science Basis – 258 Experts
- Working Group II (WG II): Assess the impacts, adaptation strategies and vulnerability related to climate change – 302 Experts
- Working Group III (WG III): Covers mitigation response strategy – 271 Experts
- Reports written by selected authors and subjected to independent review

IPCC 5th Assessment Reports (AR5)

- Special Report (WG I & WG II) – Managing the Risks of Extreme Events and Disasters to Advance Climate Change Adaptation (SREX) – published in 2012 [594 pages]
- WG I Technical Summary – Draft released 30 September 2013, Final Report due January 2014 [129 pages]
- WG I - Summary for Policy Makers published 9/27/13) [33 pages]
- WG I – AR5 - Final Draft Assessment released 30 September, 2013 – 14 Chapters and 3 Annexes [Total 2,122 pages]
- WG II – Due Mid March 2014
- WG III – Due Early April 2014
- AR5 (Synthesis Report) – Due October 2014

Chapter Technical Focus (1)

- Chapter 1 Introduction [64 Pages]
- Chapter 2 Observations: Atmosphere and Surface [165 Pages]
- Chapter 3 Observations: Ocean [106 Pages]
- Chapter 4 Observations: Cryosphere [105 Pages]
- Chapter 5 Information from Paleoclimate Archives [140 Pages]

Chapter Technical Focus (2)

- Chapter 6 Carbon and Other Biochemical Cycles [169 Pages]
- Chapter 7 Clouds and Aerosols [149 Pages]
- Chapter 8 Anthropogenic and Natural Radiative Forcings [141 Pages]
- Chapter 9 Evaluation of Climate Models [207 Pages]
- Chapter 10 Detection and Attribution of Climate Change: from Global to Regional [134 Pages]

Chapter Technical Focus (3)

- Chapter 11 Near Term Climate Change: Projections and Predictability [123 Pages]
- Chapter 12 Long Term Climate Change: Projections, Commitments and Irreversibility [177 Pages]
- Chapter 13 Sea Level Change [124 Pages]
- Chapter 14 Climate Phenomena and their Relevance for Future Climate Change [147 Pages]

Chapter Technical Focus (4)

- Annex I Atlas of Global and Regional Climate Projections [85 Pages]
- Annex II Climate System Scenario Tables [52 Pages]
- Annex III Glossary [34 Pages]

Chapter 1 - Overall Finding of WG I

Warming of the climate system is unequivocal *, and since the 1950s, many of the observed changes are unprecedented over decades to millennia. The atmosphere and ocean have warmed, the amounts of snow and ice have diminished, sea level has risen, and the concentrations of greenhouse gases have increased.

*** Webster's New College Dictionary: "Admitting of no doubt or misunderstanding: CLEAR"**

Chapter 2 - Ocean

Ocean warming dominates the increase in energy stored in the climate system, accounting for more than 90% of the energy accumulated between 1971 and 2010 (*high confidence*). It is *virtually certain* that the upper ocean (0–700 m) warmed from 1971 to 2010, and it *likely* warmed between the 1870s and 1971.

Chapter 3 - Cryosphere

Over the last two decades, the Greenland and Antarctic ice sheets have been losing mass, glaciers have continued to shrink almost worldwide, and Arctic sea ice and Northern Hemisphere spring snow cover have continued to decrease in extent (*high confidence*).

Chapter 4 - Sea Level

The rate of sea level rise since the mid-19th century has been larger than the mean rate during the previous two millennia (*high confidence*). Over the period 1901 to 2010, global mean sea level rose by 0.19 [0.17 to 0.21] meters.

Chapter 6 - Carbon and Other Biogeochemical Cycles

The atmospheric concentrations of carbon dioxide, methane, and nitrous oxide have increased to levels unprecedented in at least the last 800,000 years. Carbon dioxide concentrations have increased by 40% since pre-industrial times, primarily from fossil fuel emissions and secondarily from net land use change emissions. The ocean has absorbed about 30% of the emitted anthropogenic carbon dioxide, causing ocean acidification.

Chapter 8 - Anthropogenic and Natural Radiative Forcings

Total radiative forcing is positive, and has led to an uptake of energy by the climate system. The largest contribution to total radiative forcing is caused by the increase in the atmospheric concentration of CO₂ since 1750.

Human influence on the climate system is clear. This is evident from the increasing greenhouse gas concentrations in the atmosphere, positive radiative forcing, observed warming, and understanding of the climate system.

Chapter 9 - Evaluation of Climate Models

Climate models have improved since the AR4. Models reproduce observed continental scale surface temperature patterns and trends over many decades, including the more rapid warming since the mid-20th century and the cooling immediately following large volcanic eruptions (*very high confidence*).

Chapter 10 - Detection and Attribution of Climate Change: from Global to Regional

Observational and model studies of temperature change, climate feedbacks and changes in the Earth's energy budget together provide confidence in the magnitude of global warming in response to past and future forcing.

Human influence has been detected in warming of the atmosphere and the ocean, in changes in the global water cycle, in reductions in snow and ice, in global mean sea level rise, and in changes in some climate extremes. This evidence for human influence has grown since AR4. It is *extremely likely* that human influence has been the dominant cause of the observed warming since the mid-20th century.

Chapter 11 - Near Term Climate Change: Projections and Predictability

Continued emissions of greenhouse gases will cause further warming and changes in all components of the climate system. Limiting climate change will require substantial and sustained reductions of greenhouse gas emissions.

Projections for the next few decades show spacial patterns of climate change similar to those projected for the later 21st Century but with smaller magnitude.

Chapter 12 - Long Term Changes

Global surface temperature change for the end of the 21st century is *likely* to exceed 1.5°C relative to 1850 to 1900 for all RCP scenarios except RCP2.6. It is *likely* to exceed 2°C for RCP6.0 and RCP8.5, and *more likely than not* to exceed 2°C for RCP4.5.

Warming will continue beyond 2100 under all RCP scenarios except RCP2.6. Warming will continue to exhibit interannual-to-decadal variability and will not be regionally uniform.

Changes in the global water cycle in response to the warming over the 21st century will not be uniform. The contrast in precipitation between wet and dry regions and between wet and dry seasons will increase, although there may be regional exceptions.

The global ocean will continue to warm during the 21st century. Heat will penetrate from the surface to the deep ocean and affect ocean circulation. It is *very likely* that the Arctic sea ice cover will continue to shrink and thin and that Northern Hemisphere spring snow cover will decrease during the 21st century as global mean surface temperature rises. Global glacier volume will further decrease.

Chapter 13 - Sea Level Rise

Global mean sea level will continue to rise during the 21st century. The rate of sea level rise will *very likely* exceed that observed during 1971 to 2010 due to increased ocean warming and increased loss of mass from glaciers and ice sheets. Confidence in projections of global mean sea level rise has increased since AR4 because of the improved physical understanding of the components of sea level, the improved agreement of process based models with observations, and the inclusion of ice-sheet dynamical change.

Chapter 14 - Climate Phenomena and their Relevance for Future Climate Change

Climate change will affect carbon cycle processes in a way that will exacerbate the increase of CO₂ in the atmosphere (*high confidence*). Further uptake of carbon by the ocean will increase ocean acidification.

Cumulative emissions of CO₂ will largely determine global mean surface warming by the late 21st century and beyond. Most aspects of climate change will persist for many centuries even if emissions of CO₂ are stopped. This represents a substantial multi-century climate change commitment created by past, present and future emissions of CO₂.

More to Come Next Year

- WG I has dealt only with the Physical Science Basis of Climate Change
- Future Working Group Reports to be Released Next Year will Address Adaptation and Mitigation.

In the Meantime

- Stay in tune, get involved in winning the conversation. Climate Change, unchecked, will not destroy the Earth but it will destroy the environment necessary for your grandchildren and great grandchildren to survive. ACT NOW !
- “Bone Up”! Follow my suggested reading list and look over the resources on my web site: www.tfl.net/ClimateRealityResources.html