IPCC Fifth Assessment Report

Synthesis Report

Ramón Pichs-Madruga (IPCC WGIII Vice Chair)
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IPCC AR5 Synthesis Report
IPCC plenary comprises of 195 member countries in the world.

IPCC Bureau comprises of 34 elected members; IPCC elects its bureau members once in a 5-7 years cycle.

3 working groups & a Task Force on National Greenhouse Gas Inventories.

Authors, Contributors, Reviewers, Review Editors.
The IPCC Synthesis Report

Integration of three Working Group Reports of the 5th Assessment, 2013-2014

- **WG I**: The Physical Science Basis
- **WG II**: Impacts, Adaptation and Vulnerability
- **WG III**: Mitigation of Climate Change
The IPCC Synthesis Report

- Written by 60 authors from Working Group reports
- Chaired by the IPCC Chair R.K. Pachauri
- Member governments approved the SPM on 1\textsuperscript{st} November 2014 (total membership of IPCC is 195 governments)
Key Messages

→ Human influence on the climate system is clear

→ The more we disrupt our climate, the more we risk severe, pervasive and irreversible impacts

→ We have the means to limit climate change and build a more prosperous, sustainable future

AR5 WGI SPM, AR5 WGII SPM, AR5 WGIII SPM
Humans are changing the climate

It is extremely likely that we are the dominant cause of warming since the mid-20th century.

Globally averaged combined land and ocean surface temperatures
Temperatures continue to rise

Each of the past 3 decades has been successively warmer than the preceding decades since 1850.
Oceans absorb most of the heat

→ More than 90% of the energy accumulating in the climate system between 1971 and 2010 has accumulated in the ocean

→ Land temperatures remain at historic highs while ocean temperatures continue to climb
GHG emissions growth between 2000 and 2010 has been larger than in the previous three decades.
Sources of emissions

Energy production remains the primary driver of GHG emissions

- 35% Energy Sector
- 24% Agriculture, forests and other land uses
- 21% Industry
- 14% Transport
- 6.4% Building Sector

2010 GHG emissions

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Antropogenic forcings are extremely likely the cause of warming.
Some of the changes in extreme weather and climate events observed since about 1950 have been linked to human influence.
Impacts are already underway

- Tropics to the poles
- On all continents and in the ocean
- Affecting rich and poor countries
Projected climate changes

Continued emissions of greenhouse gases will cause further warming and changes in the climate system

- Oceans will continue to warm during the 21st century
- Global mean sea level will continue to rise during the 21st century
- It is very likely that the Arctic sea ice cover will continue to shrink and thin as global mean surface temperature rises
- Global glacier volume will further decrease
Potential Impacts of Climate Change

- Food and water shortages
- Increased poverty
- Increased displacement of people
- Coastal flooding
Climate Change Poses Risk for Food Production

Percentage of yield projections

![Bar chart showing percentage of yield projections for different time periods (2010-2029, 2030-2049, 2050-2069, 2070-2089, 2090-2109). The chart indicates the range of yield change with different color legends: 50 to 100%, 25 to 50%, 10 to 25%, 5 to 10%, 0 to 5%, 0 to −5%, −5 to −10%, −10 to −25%, −25 to −50%, and −50 to −100%.](chart.png)
Stabilization of atmospheric concentrations requires moving away from the baseline – regardless of the mitigation goal.

Based on Figure 6.7

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Stabilization of atmospheric concentrations requires moving away from the baseline – regardless of the mitigation goal.
Figure SPM.10, A reader’s guide

From climate change risks to GHG emissions

(A) Risks from climate change...  (B) ...depend on cumulative CO₂ emissions...

(C) ...which in turn depend on annual emissions over the next decades
The risks from climate change, assessed by the WGII of the IPCC AR5, and aggregated in five “Reasons for Concerns”

Levels of risk across the Reasons for Concern can be associated with a level of global temperature change.

Here shown for a warming by 2°C
The link between cumulative CO₂ emissions and global mean temperature

The pink plume is from WGI complex models. It includes the uncertainty from non-CO₂ gases and climate and carbon cycle uncertainty, using the likely range.
The link between cumulative CO$_2$ emissions and global mean temperature

The ellipses show results from the WGIII models, using a simple climate model. It does not include climate and carbon cycle uncertainty, but explores more comprehensively the scenario uncertainty from a range of CO2 and non-CO$_2$ pathways.
Levels of risks can be connected to cumulative CO$_2$ emission levels, for the average climate response,
The link between changes in annual GHG emissions by 2050 and the cumulative CO$_2$ emissions of the WGIII scenario categories.
Levels of risks can now be connected to GHG emission changes by 2050. Added uncertainty arises from action on non-CO₂ gases, timing of pre-2050 action, and ambition of post-2050 action.
The constraint on changes in GHG emissions by 2050 depends on the sensitivity of the climate response. Here, with large climate sensitivity...
The constraint on changes in GHG emissions by 2050 depends on the sensitivity of the climate response.

Here, with low climate sensitivity
Limiting Temperature Increase to 2°C

Measures exist to achieve the substantial emissions reductions required to limit likely warming to 2°C (40-70% reduction in GHGs globally by 2050 and near zero GHGs in 2100).

A combination of adaptation and substantial, sustained reductions in greenhouse gas emissions can limit climate change risks.

Implementing reductions in greenhouse gas emissions poses substantial technological, economic, social, and institutional challenges.

But delaying mitigation will substantially increase the challenges associated with limiting warming to 2°C.
Mitigation Measures

More efficient use of energy

Greater use of low-carbon and no-carbon energy
- Many of these technologies exist today

Improved carbon sinks
- Reduced deforestation and improved forest management and planting of new forests
- Bio-energy with carbon capture and storage

Lifestyle and behavioural changes
Ambitious Mitigation Is Affordable

- Economic growth reduced by ~ 0.06% (BAU growth 1.6 - 3%)
- This translates into delayed and not forgone growth
- Estimated cost does not account for the benefits of reduced climate change
- Unmitigated climate change would create increasing risks to economic growth
The window for action is rapidly closing

65% of our carbon budget compatible with a 2°C goal already used

Total Carbon Budget: 2900 GtCO2

Amount Used 1870-2011: 1900 GtCO2

Amount Remaining: 1000 GtCO2
The Choices We Make Will Create Different Outcomes

With substantial mitigation

Without additional mitigation

Change in average surface temperature (1986–2005 to 2081–2100)