



Intergovernmental Panel on Climate Change (IPCC) 2021 Summary

Executive Summary

- Each of the last four decades has been successively warmer than any decade which preceded it since 1850. The global surface temperature was 1.09°C higher in 2011-2020 than 1850-1900 and in 2019, atmospheric CO₂ concentrations were higher than at any time in at least 2 million years.
- The past five years have been the hottest on record since 1850.
- Human influence is *very likely* (90%) the main driver of the global retreat of glaciers since the 1990s and the decrease in Arctic sea-ice.
- Best estimates predict that 1.5°C will be reached in the middle of 2034 (however, there is uncertainty and estimates range between now and never).
- It is *virtually certain* that hot extremes including heatwaves have become more frequent and intense since the 1950s, while cold events have become less frequent and less severe; human induced climate change is *likely* the main driver of these changes.

Introduction

In August, the Intergovernmental Panel on Climate Change (IPCC) released the Working Group 1 contribution to its 6th Assessment Report, assessing the scientific knowledge on climate change. Differing from its predecessors, the 2021 report has one major addition: it includes specific regional information and a digital atlas which allows users to analyse local climate impacts and projections. The reports are therefore a crucial resource for society, domestic policymaking and global climate negotiations — particularly in the run-up to COP 26.

Findings of the Report

Section B, *Possible Climate Futures*, considers a set of five new illustrative emissions scenarios which compare the climate response when a broader range of greenhouse gas, land use and air pollutant futures are considered than previously. Emissions therefore vary between scenarios depending on socio-economic assumptions, levels of climate change mitigation and air pollution controls. That being said, the Report predicts that the global surface temperature will continue to increase until at least the mid-century under all emissions scenarios considered and that global warming of 1.5°C and 2°C will be exceeded during the 21st century unless deep reductions in CO₂ and other GHG emissions occur in the coming decades.

The Report also explains that with every additional increment of global warming, changes in extremes continue to become larger and that there will be an increasing occurrence of some extreme events. Areas predicted to be particularly affected include some mid-latitude and semi-arid regions and the South American Monsoon region which are predicted to see the highest increase in the temperature of the hottest days. The Arctic is projected to experience the highest increase in the temperature of the coldest days — at about 3 times the rate of global warming.

Furthermore, the Report predicts that continued global warming is projected to further intensify the global water cycle, including its variability, global monsoon precipitation and the severity of wet and dry events. A warmer climate will therefore intensify very wet and very dry weather and climate events and seasons; location and frequency of flooding and drought implications vary depending on projected changes in regional atmospheric circulations including monsoons.

While natural land and ocean carbon sinks are projected to take up, in absolute terms, a progressively larger amount of CO₂ under higher CO₂ emissions scenarios, they become progressively less effective. A decrease in efficiency is projected to result in a higher proportion of emitted CO₂ remaining in the atmosphere. Unfortunately, many changes due to past and future GHG emissions are irreversible for centuries to millennia, especially changes in the ocean, ice sheets and global sea levels. There is *high confidence* that sea levels are committed to rise for centuries to millennia due to continuing deep ocean warming and ice sheet melt, and will remain elevated for thousands of years.

Furthermore, approximately two-thirds of the global coastline has a projected regional relative sea level rise within $\pm 20\%$ of the global mean increase which will have significant impacts on areas of high population density — namely cities — of which 2/3 are on coastlines. The Report explains that cities intensify human-induced warming locally and therefore urbanisation coupled with more frequent hot extremes will increase the severity of heatwaves.

Limiting Future Climate Change

- Reaching net zero CO₂ emissions is a requirement to stabilise human-induced global temperature increase at any level, but limiting global temperature increase to a specific level would imply limiting cumulative CO₂ emissions to within a carbon budget.
- Anthropogenic CO₂ removal (CDR) has the potential to remove CO₂ from the atmosphere and durably store it in reservoirs (high confidence).
- Even if net zero CO₂ emissions were to be achieved (and sustained), other climate changes would continue in their current direction (e.g. rising sea levels).
- Emissions reductions in 2020 associated with measures to reduce the spread of COVID-19 led to temporary but detectable effects on air pollution. Global and regional climate responses to this temporary forcing are, however, undetectable above natural variability
- Atmospheric CO₂ concentrations continued to rise in 2020, with no detectable decrease in the observed CO₂ growth rate.

Further Reading/Watching:

- Summary for Policymakers (from which the above summary was produced) which includes a variety of excellent graphs to help visualise the predictions of the Report: https://www.ipcc.ch/report/ar6/wg1/downloads/report/IPCC_AR6_WGI_SPM.pdf
- Videos, including the IPCC Press Conference: <https://www.youtube.com/c/IPCCGeneva/videos>
- Interviews with the Report's authors: <https://www.ipcc.ch/2021/07/16/interviews-ar6-wg1-authors/>