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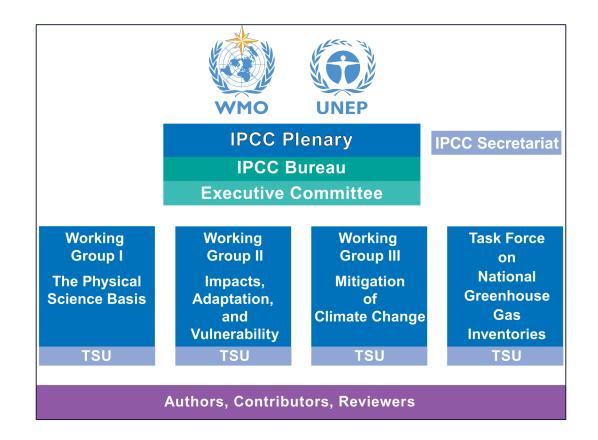
Intergovernmental Panel on Climate Change Sixth Assessment Report Working Group I [2021]

The Physical Science Basis

Ram Ramaswamy [NOAA/ GFDL, Princeton] Review Editor [Chapter 7]

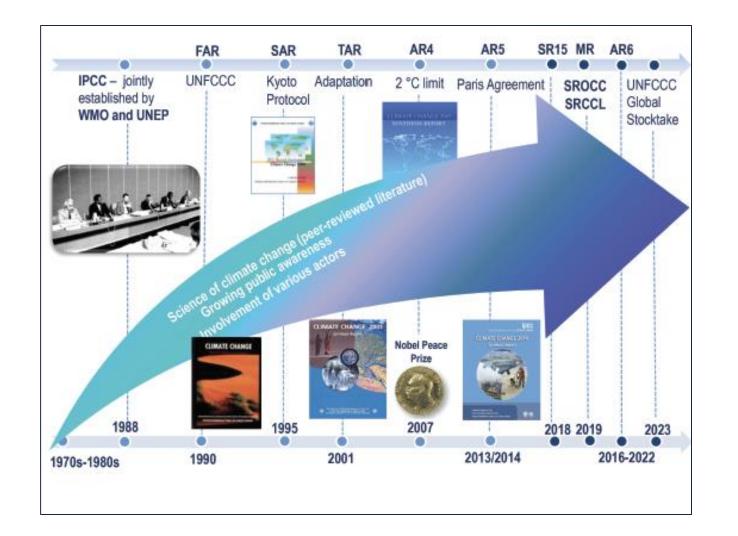
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Organization of the IPCC





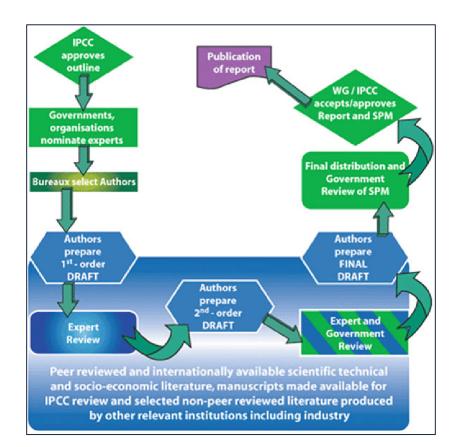
Evolution of the IPCC Assessment Reports





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Generation of the Report



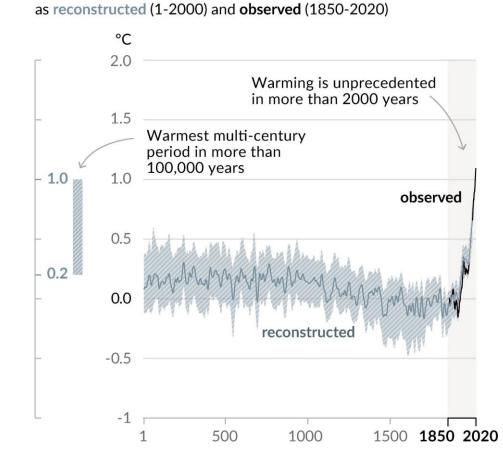


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Figure SPM.1

Observed Change in Global Surface Temperature



a) Change in global surface temperature (decadal average)

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The climate system is now out of energy balance

FAQ 7.1: The Earth's energy budget and climate change Since at least 1970, there has been a persistent imbalance in the energy flows that has led to excess energy being absorbed by different components of the climate system.

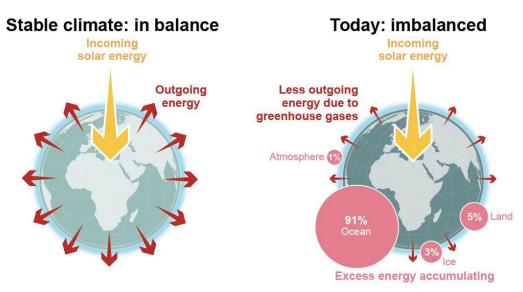


Figure FAQ7.1

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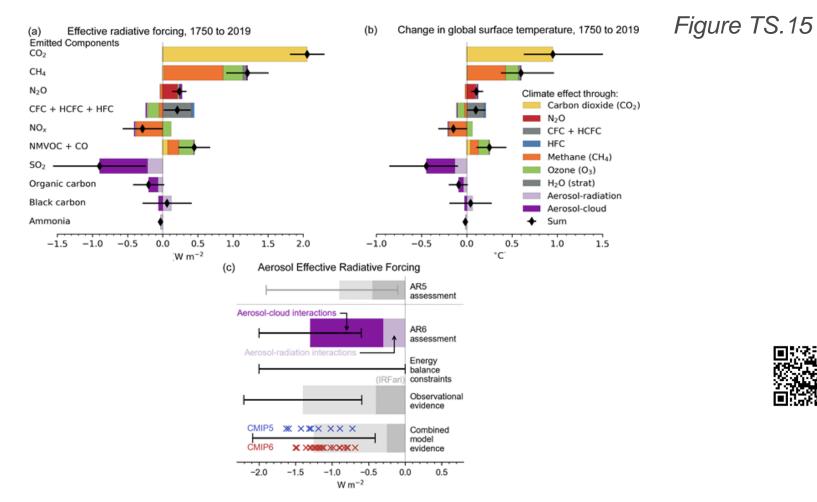
Human-induced perturbations to Earth's Radiation Budget

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Human influence has warmed the climate at a rate that is unprecedented in at least the last 2000 years

1850

1900

simulated using human & natural and only natural factors (both 1850-2020) °C 2.0 1.5 observed simulated 1.0 human & natural 0.5 simulated natural only 0.0 (solar & volcanic) -0.5

1950

2000

2020

b) Change in global surface temperature (annual average) as observed and

Figure SPM.1

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Figure SPM.2

Observed warming is driven by emissions from human activities, with greenhouse gas warming partly masked by aerosol cooling

b) Aggregated contributions to a) Observed warming 2010-2019 warming relative to 2010-2019 relative to 1850-1900 1850-1900, assessed from °C attribution studies °C 2.0 2.0 1.5 1.5 1.0 1.0 0.5 0.5 0.0 0.0 -0.5 -0.5 -1.0 -1.0 **Total human** Well-mixed greenhouse Other human drivers Solar and volcanic drivers Internal variability influence gases

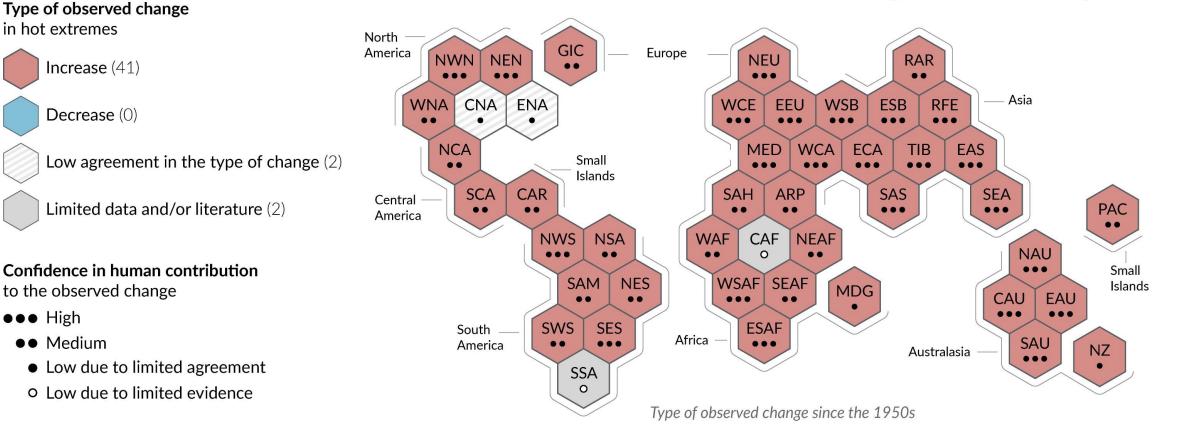
Figure SPM.3

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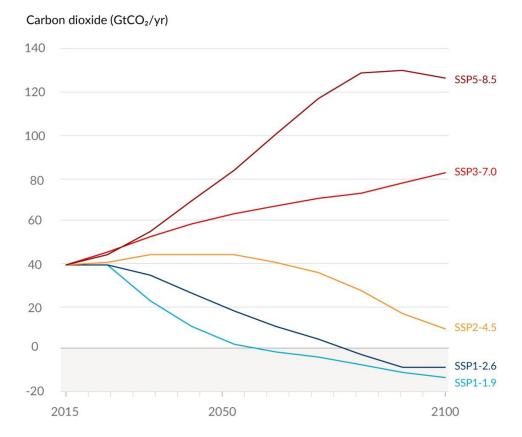
Climate change is already affecting every inhabited region across the globe, with human influence contributing to many observed changes in weather and climate extremes

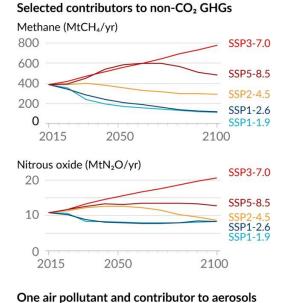
a) Synthesis of assessment of observed change in **hot extremes** and confidence in human contribution to the observed changes in the world's regions



Future emissions cause future additional warming, with total warming dominated by past and future CO₂ emissions

a) Future annual emissions of CO₂ (left) and of a subset of key non-CO₂ drivers (right), across five illustrative scenarios



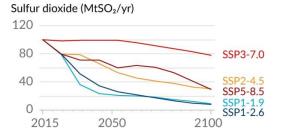


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Figure SPM.4

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SIXTH ASSESSMENT REPORT Working Group I – The Physical Science Basis INTERGOVERNMENTAL PANEL ON Climate change

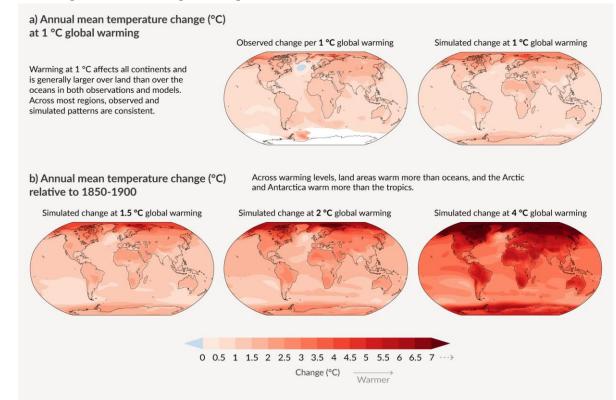
Human activities affect all the major climate system components, *Figure SPM.8* with some responding over decades and others over centuries

a) Global surface temperature change relative to 1850-1900

°C 5 SSP5-8.5 4 SSP3-7.0 3 SSP2-4.5 2 SSP1-2.6 SSP1-1.9 0 -1 1950 2050 2000 2015 2100

IPCC AR6 WG1

With every increment of global warming, changes get larger inFigure SPM.5regional mean temperature, precipitation and soil moisture

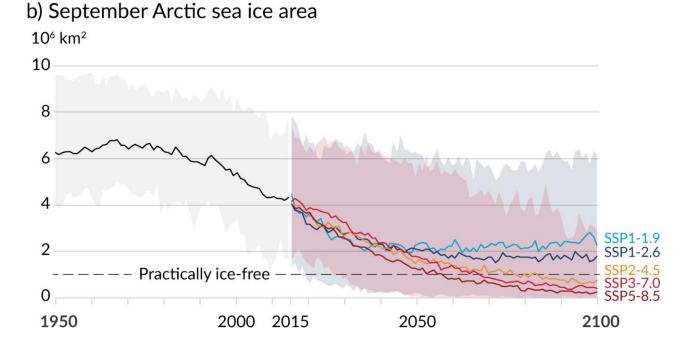


Human activities affect all the major climate system components, *Figure SPM.8* with some responding over decades and others over centuries

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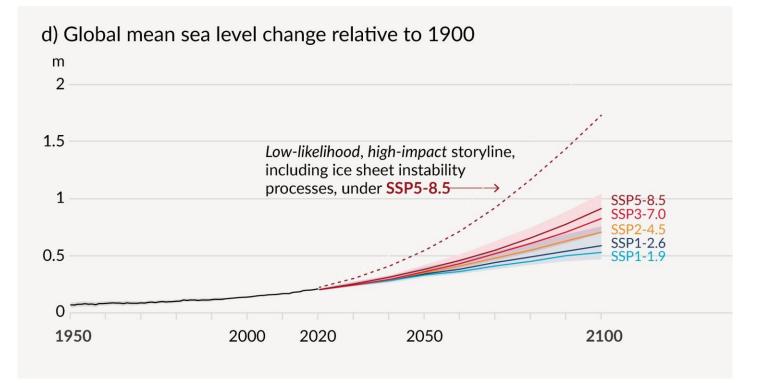
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Human activities affect all the major climate system components, *Figure SPM.8* with some responding over decades and others over centuries



Projected changes in extremes are larger in frequency and intensity with every additional increment of global warming

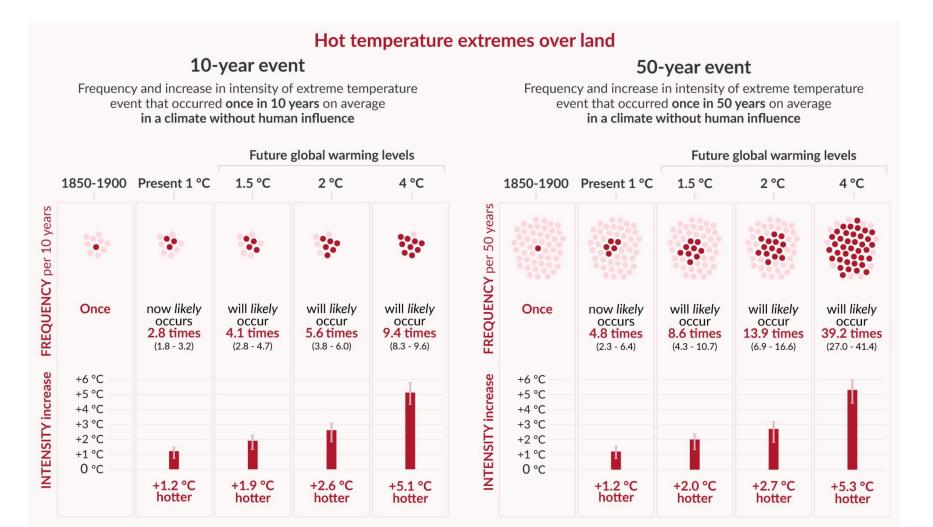


Figure SPM.6

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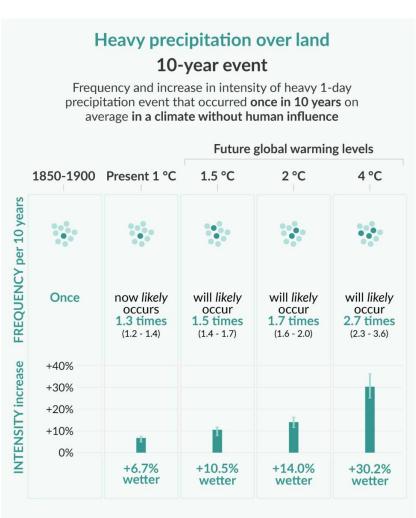
Projected changes in extremes are larger in frequency and intensity with every additional increment of global warming

Figure SPM.6

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[Credit: NASA]

Recent changes in the climate are widespread, rapid, and intensifying, and unprecedented in thousands of years.





[Credit: Yoda Adaman | Unsplash

It is indisputable that human activities are causing climate change, making extreme climate events, including heat waves, heavy rainfall, and droughts, more frequent and severe.





[Credit: Hong Nguyen | Unsplash]

Climate change is already

affecting every region on Earth, in multiple ways.

The changes we experience will increase with further warming.

