As we witness our planet transforming around us we watch, listen, measure ... respond.
Author Team

234 authors from 65 countries
28% women, 72% men
63% first-time IPCC authors

Review Process

78,000+ review comments
46 countries commented on Final Government Distribution

14,000 scientific publications assessed
Climate Change 2021
The Physical Science Basis
Recent changes in the climate are widespread, rapid, and intensifying, and unprecedented in thousands of years.
Human influence has warmed the climate at a rate that is unprecedented in at least the last 2000 years.
Human influence has warmed the climate at a rate that is unprecedented in at least the last 2000 years.

Changes in global surface temperature relative to 1850-1900

Warming is unprecedented in more than 2000 years

1.1 °C warmer
Human influence has warmed the climate at a rate that is unprecedented in at least the last 2000 years.

Changes in global surface temperature relative to 1850-1900
Highest in at least 2 million years

Fastest rates in at least 3000 years

Lowest level in at least 1000 years

Unprecedented in at least 2000 years
Extreme heat
More frequent
More intense

Heavy rainfall
More frequent
More intense

Drought
Increase in some regions

Fire weather
More frequent

Ocean
Warming
Acidifying
Losing oxygen

Unless there are immediate, rapid, and large-scale reductions in greenhouse gas emissions, limiting warming to 1.5°C will be beyond reach.
Future emissions cause future additional warming

- **Very high** CO₂ emissions
- **High** CO₂ emissions
- **Intermediate** CO₂ emissions
- **Low** CO₂ emissions
- **Very low** CO₂ emissions
Future emissions cause future additional warming

- **Very high** CO₂ emissions
- **High** CO₂ emissions
- **Intermediate** CO₂ emissions
- **Low** CO₂ emissions
- **Very low** CO₂ emissions

1.5 °C
Future emissions cause future additional warming

- Very high CO$_2$ emissions
- High CO$_2$ emissions
- Intermediate CO$_2$ emissions
- Low CO$_2$ emissions
- Very low CO$_2$ emissions

Temperature change from 1950 to 2100

- Near-term warming
- 1.5°C warming threshold
Future emissions cause future additional warming
With every additional amount of global warming, changes get larger.

Simulated changes…

…at 1.5°C

…at 2°C

…at 4°C
With every additional amount of global warming, changes get larger.

Extreme rainfall intensifies by 7% for each additional 1°C.
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.
Observed warming is driven by emissions from human activities, with greenhouse gas warming partly masked by aerosol cooling.
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Human influence, main driver of…

- ...Hot extremes, which have become more frequent and more intense
Human influence, main driver of…

• …**Hot extremes**, which have become more frequent and more intense

• …**ocean warming** since the 1970s, and **ocean acidification**.
Human influence, main driver of…

• **Hot extremes**, which have become more frequent and more intense

• **ocean warming** since the 1970s, and ocean acidification.

• changes we see in the **frozen areas** of the planet:
Human influence, main driver of…

• …Hot extremes, which have become more frequent and more intense

• …ocean warming since the 1970s, and ocean acidification.

• …changes we see in the frozen areas of the planet:

  ➔ global retreat of glaciers since the 1990
Human influence, main driver of…

• …Hot extremes, which have become more frequent and more intense

• …ocean warming since the 1970s, and ocean acidification.

• …changes we see in the frozen areas of the planet:
  ➞ global retreat of glaciers since the 1990s
  ➞ 40% decrease in Arctic sea ice since 1979
Human influence, main driver of…

- **Hot extremes**, which have become more frequent and more intense

- **Ocean warming** since the 1970s, and ocean acidification.

- Changes we see in the frozen areas of the planet:
  - Global retreat of glaciers since the 1990s
  - 40% decrease in Arctic sea ice since 1979
  - Decrease in spring snow cover since the 1950s.
Climate change is already affecting every region on Earth, in multiple ways.

The changes we experience will increase with further warming.
New regional information

- Inform decisions related to risk management and adaptation
- A third of our report is dedicated to regional climate information
New regional information

- Inform decisions related to **risk management** and **adaptation**

- **A third** of our report is dedicated to **regional climate information**
Climatic impact-drivers

- Heat & cold
- Rain & drought
- Snow & ice
- Wind
- Coastal & oceanic
- Other
- Open ocean

A climatic impact-driver could go over thresholds known to lead to severe consequences for people, agriculture, or wildlife.

Threshold
Changes to the Water cycle

With warmer temperature

- Atmosphere can hold more water
- More and faster evaporation
- Heavier precipitation
Changes to the Water cycle

- More global warming
  - Heavier rainfall
  - Intensifying dry seasons and droughts
Rainfall and Monsoon

Annual Rainfall on Land
Increasing

Monsoons
Changing in complex ways

Photos: Left: Arek Socha, Pixabay: Right: James Martin Phelps
Interactive atlas

https://interactive-atlas.ipcc.ch/

#IPCCData  #IPCCAtlas
There’s no going back from some changes in the climate system…
Ocean and ice sheets

Ocean temperature
Increasing

Greenland Ice Sheet
Melting

Sea level
Rising

Photo Credits from left: NOAA; Konrad Steffen; Allan Grinberg
…However, some changes could be slowed and others could be stopped by limiting warming.
To limit global warming, strong, rapid, and sustained reductions in CO$_2$, methane, and other greenhouse gases are necessary. This would not only reduce the consequences of climate change but also improve air quality.
Every tonne of CO₂ emissions adds to global warming

Global surface temperature increase since 1850-1900 (°C) as a function of cumulative CO₂ emissions (GtCO₂)

- Very high CO₂ emissions
- High CO₂ emissions
- Intermediate CO₂ emissions
- Low CO₂ emissions
- Very low CO₂ emissions

Historical global warming
Every tonne of CO₂ emissions adds to global warming

Global surface temperature increase since 1850-1900 (°C) as a function of cumulative CO₂ emissions (GtCO₂)

- **Very high** CO₂ emissions
- **High** CO₂ emissions
- **Intermediate** CO₂ emissions
- **Low** CO₂ emissions
- **Very low** CO₂ emissions

Increasing temperatures
CO$_2$

Carbon dioxide

OCEAN

LAND
\( \text{CO}_2 \)  \hspace{1cm} \text{CH}_4

Carbon dioxide  \hspace{1cm} \text{Methane}
The climate we experience in the future depends on our decisions now.
Thank you.

More Information:

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IPCC Working Group I TSU:
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