Summary of Key Findings

igcc Indicators of Global Climate Change

The fourth edition of the Indicators of Global Climate Change (IGCC) is now available in the journal Earth System Science Data.

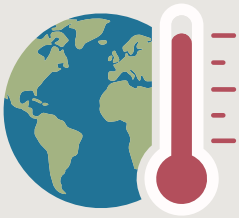
Since 2023, IGCC has provided annual updates of key global climate indicators reported by the Intergovernmental Panel on Climate Change (IPCC) that can help us to understand the state of the climate system and how it is changing.

The study aims to fill potential information gaps between IPCC reports, providing decision makers with timely and scientific information on policy-relevant global climate indicators such as levels of greenhouse gas emissions, human-caused warming, and temperature and climate extremes.

The methodologies closely follow those in the IPCC Sixth Assessment Report (AR6), whilst also tracking how they are evolving between successive IPCC report cycles.

This year's report adds a newly updated indicator - the number of days experiencing marine heatwaves - to give a total of twelve indicators.

Below we set out this year's main scientific findings.

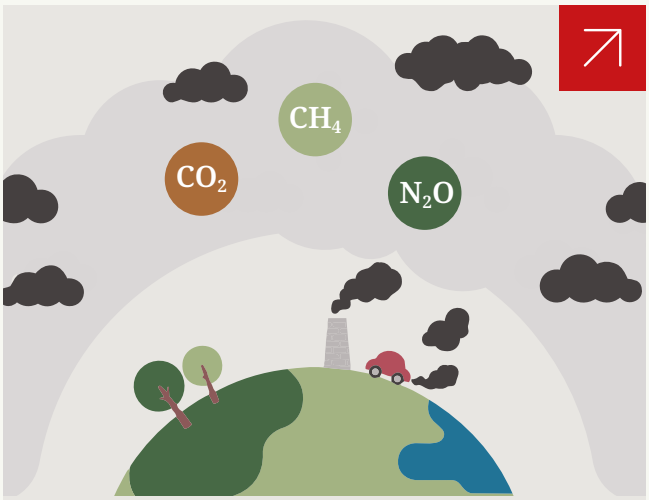


The Earth is accumulating heat at an accelerating rate

Global warming reached 1.37°C in 2025

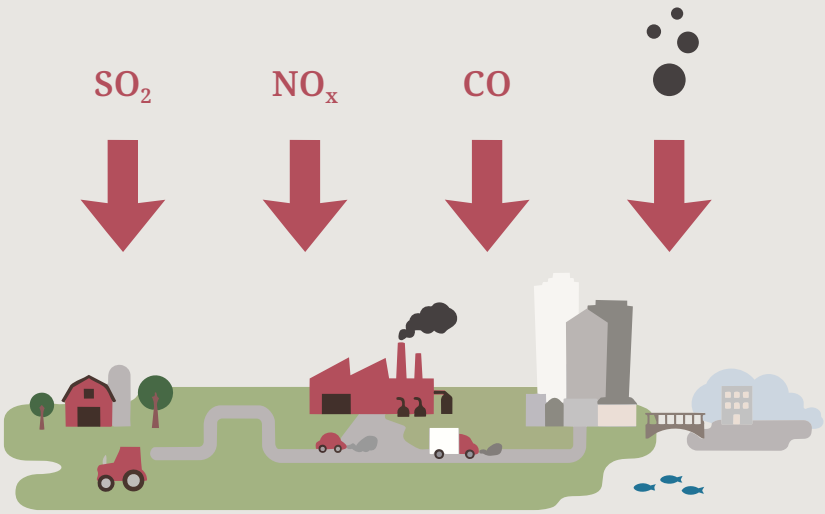
Global greenhouse gas (GHG) emissions remain at an all-time high.

- GHG emissions reached 56.8 billion tonnes (gigatonnes or Gt) of carbon dioxide equivalent emissions (CO_2e) in 2024 (the most recent year for which data is available).
- The bulk of current GHG emissions stems from the use of fossil fuels, which has risen steadily in the past few decades. Emissions from deforestation, agriculture and industry also play an important role.
- Total GHG emissions are still increasing, albeit not as fast as in the 2000s.



Atmospheric concentrations of three major GHGs have increased.

- These emissions are leading to a steady rise in the atmospheric concentrations of major greenhouse gases.
- In 2025, concentrations of carbon dioxide (CO_2), methane (CH_4) and nitrous oxide (N_2O) reached 425.6 parts per million (ppm), 1936.3 parts per billion (ppb) and 339.4 ppb, respectively.
- Concentrations of all three major GHGs have increased since 2019, with CO_2 increasing by 3.8%, CH_4 by 3.8%, and N_2O by 2.2%.

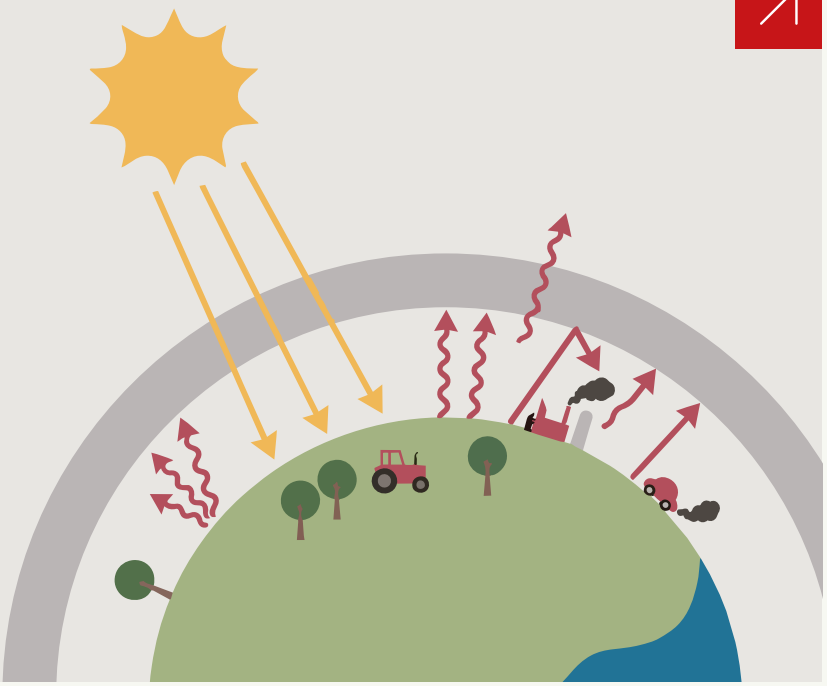


Emissions of some non-methane Short-Lived Climate Forcers (SLCFs) have decreased.

- There have been decreases in emissions of sulphur dioxide (SO_2), nitrogen oxides (NO_x), carbon monoxide (CO), and black carbon.
- While CO_2 emissions remain the dominant driver of global warming, the reduction in SO_2 emissions is unmasking part of the warming effect of GHGs.
- However, tackling aerosol emissions remains critical because the severe, immediate health and environmental damage they cause far outweighs their short-term cooling effect.

The Earth's Energy Imbalance (EEI), which measures how fast heat is accumulating in the climate system, has more than doubled in recent decades.

- EEI is a key factor behind the unprecedented high rate of global warming and other changes we are seeing in the climate system today.
- The imbalance results from more energy entering the Earth's system than leaving it, primarily as increasing GHG concentrations disrupt the natural energy balance.
- The surplus heat is being stored in the ocean, cryosphere and land at an accelerating rate, driving changes in every component of the climate system, including ocean and continental warming, permafrost thawing, ice loss, and sea level rise.



Global mean temperature continues to increase.

2025

- 2025 was the third warmest year on record, consistent with the level of human-caused global warming the world has experienced.
- Natural variability in the climate system had a limited effect on global mean temperature last year.

Decadal

- For the most recent decade (2016-2025), the temperature was 1.26°C higher than in pre-industrial times, and 0.17°C higher than the value reported in AR6 (2011–2020).
- Relative to pre-industrial times, over the 2016-2025 decade, land temperatures increased by 1.81°C, and ocean temperatures by 1.03°C.

Human-induced warming reached 1.37°C in 2025, increasing at a rate of about 0.27°C per decade.

- The rate of human-induced warming remains at an all-time high (matching last year).
- Based on our assessment of the current level and rate of global warming, if emissions continue at current levels, we can expect to reach 1.5°C around 2030.
- Averaged over the most recent decade (2016-2025), human-induced warming reached 1.24°C, meaning that almost all of the total warming experienced over the last decade was human-induced.
- CO_2 emissions remain the dominant contributor to the current rate of global warming, with the fall in aerosol emissions also a factor.

The remaining carbon budget is being rapidly depleted and is nearly exhausted.

- The remaining carbon budget from the start of 2026 has been estimated at 130 billion tonnes of CO_2.
- This central estimate will be exhausted in around three years at current levels of CO_2 emissions.

Global land precipitation has shown considerable variability over recent years and decades, but all datasets show an increase in global land precipitation compared to 2024.

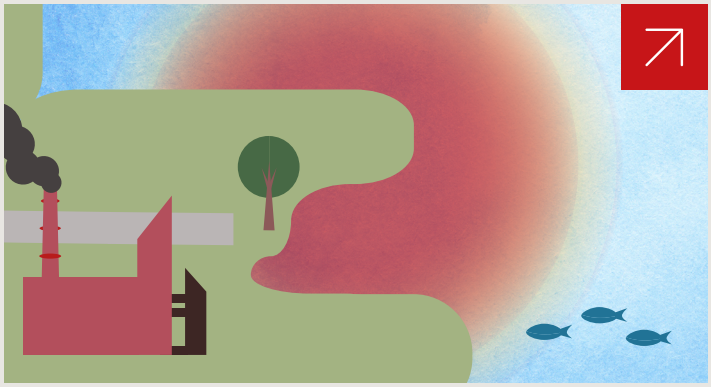
Trends in temperature extremes provide supporting evidence for the acceleration in EEI.

Warming over land

- The rapid warming over the last few decades has resulted in record extreme temperatures over land. Average maximum temperatures over land for any single day in a year reached 1.92°C over the last decade (2016-2025), an increase of 0.49°C compared to 2006-2015.

Marine heatwaves

- The number of days experiencing marine heatwaves has more than tripled globally between 1991 and 2025, consistent with the continued warming of the ocean surface. Globally, 2025 alone experienced 65 days of marine heatwaves.



In 2025, global sea level rise reached a new record of 23 cm (since 1901), and is increasing at a rate of around 1.8 mm per year.

- This is increasing coastal flooding in low-lying areas around the world, harming livelihoods and ecosystems.
- The acceleration in the rate of global sea level rise is being driven by thermal expansion of the warming ocean and melting of land-based ice.

PROGRAMME OF THE EUROPEAN UNION
Copernicus Europe's eyes on Earth
IMPLEMENTED BY ECMWF

This work was produced with funding by the Copernicus Climate Change Service (C3S) implemented by the European Centre for Medium-Range Weather Forecasts (ECMWF) on behalf of the European Commission.