

COP26: Introduction to climate change

Highlights

- Climate change commonly refers to the increase in global average temperatures caused by human action.
- The pollution of greenhouse gases, such as CO₂, into the atmosphere causes climate change.
- Climate change is already having effects, such as rising sea levels and increased extreme weather events.
- Climate change creates an average of 21.5 million climate migrants a year.
- The UK will host the UN's annual climate summit, COP26, 1st Nov-12th Nov this year.

What is climate change?

“Climate change” is the change in the long-term regional and global averages of temperature, humidity, rainfall patterns and the weather more generally, over the span of seasons, years, and decades, as well as their effects, due to both natural and human causes. The term is also often used interchangeably with “global warming”, referring to the currently observed phenomenon of long-term heating of the Earth's atmosphere due to human activity, which results in anthropogenic (human-caused) climate change. The term “climate change” grew in popularity as part of a public relations effort to dispute the dangers of the phenomenon by the Bush White House.

Global warming occurs because of human activity changing the strength of the greenhouse effect: where particular gases in the atmosphere (greenhouse gases) absorb heat radiated up from the Earth and release it in all directions, heating up the Earth's lower atmosphere, similar to the function of a greenhouse. Most of these gases are naturally occurring in Earth's atmosphere, **but human activity has increased their concentrations and therefore caused the atmosphere to trap more heat**, causing the lower atmosphere to warm up causing changes in the climate.

Long-lived greenhouse gases that stay semi-permanently in the atmosphere and do not respond physically or chemically to changes in temperature are described as “forcing” climate change, while gases such as water vapour that do respond to changes in temperature are considered “feedbacks”. The key forcing greenhouse gases are:

- Carbon Dioxide (CO₂) – naturally produced during breathing, volcanic eruptions and decomposition, **but human activity such as burning fossil fuels, deforestation and land-use changes have increased its atmospheric concentration by 48% since the start of the industrial revolution**, to levels not seen for at least 2 million years.
- Methane (CH₄) – A hydrocarbon that is a more potent greenhouse gas than CO₂, but also much less abundant in the atmosphere. CH₄ is naturally produced by wetlands, as well as by sources such as thawing permafrost, and from human activities such as

decomposition of waste in landfills and agriculture; with livestock farming (especially ruminants like cows and sheep) being the greatest human source of methane. Human activity has increased its atmospheric concentration to around 2.5 times pre-industrial levels.

- Nitrous Oxide (N₂O) – produced by soil cultivation practices, particularly fertiliser use, fossil fuel combustion, nitric acid production and biomass burning.
- Chlorofluorocarbons (CFCs) - Synthetic compounds entirely of industrial origin, now largely regulated in production and release into the atmosphere by international agreement because of their contribute to destruction of the ozone layer.

The impacts of climate change

Climate change's effects are many, varied and far-reaching. Some key trends include:

- Increasing temperature – the last four decades have been successively warmer than any preceding decade since 1850, the current highest temperature records exceed the last long warm period 6500 years ago, and temperatures have increased faster since 1970 than any other previous 50-year span in the past 2000 years.
- Increased rainfall – average rainfall has also probably increased since 1950, and that human activity has contributed to changes in rainfall patterns.
- Rising sea levels – global mean sea levels have risen by 0.2 metres since 1901, and the rate of rise is increasing.
- Changes in oceans – oceans are getting warmer, saltier, and more acidic, and have lower oxygen levels. These effects have consequences for marine life, such as coral reef bleaching.
- Reduced ice and snow – glaciers are in retreat globally and Arctic Sea ice is decreasing. Spring snowfall in the northern hemisphere has decreased.
- Likelihood of extreme weather – extreme weather, such as heatwaves, heavy rainfall (e.g., monsoons) and hurricanes have increased in frequency and intensity, as have compound events such as concurrent heatwaves and droughts, fire weather and flooding.

Overall, **climate change will result in a more inhospitable climate globally**, with extremes in temperature, rainfall and other weather events occurring more often. Such events will be at increased frequency and in places they did not previously occur. These events, in turn, have a wide range of knock-on effects, such as **mass displacement of people and reduced food and water security** – since 2010, climate change related weather events have displaced an average of 21.5 million people per year. Another potential issue is **the increased range and intensity of disease outbreaks such as malaria**, which can spread further and faster in a warmer, wetter world.

These trends are expected to increase in direct proportion to the amount of warming that occurs. However, this increase is not necessarily in proportion to the amount of greenhouse gases emitted. The amount of warming is tied to total global emissions to date, rather than average rate of emissions, as well as to the capacity of the planet's carbon sinks, such as the

C. Cooper, J. I. Rubio Gorrochategui, R. Chakraborty, A. Thompson,
J. Buckley

chair@sfl.org.uk

18 September 2021

oceans. These carbon sinks mitigate this increase in greenhouse gases in the atmosphere by absorbing some of the carbon emitted annually, a capacity which is gradually decreasing as these sinks “fill up”. Furthermore, due to the long-lived nature of greenhouse emissions, the total emissions to date have already committed us to a certain amount of future warming. Consequently, all future emissions have a greater potential impact on warming as time goes on. “Net Zero” emissions targets are important, but equally **it is important is that we cut emissions as quickly as possible.**



What is COP26?

Tackling climate change is a global priority. Over the last three decades, the United Nations (UN) has organised global summits called “Conference of the Parties” (COPs) to transform climate change from being a fringe issue, raising it to a primary global priority. COP26 will be the 26th annual summit and will take place in Glasgow from Monday 1st November – Friday 12th November 2021. The current President of COP is the United Kingdom. World leaders will meet in Glasgow along with businesses, government representatives, negotiators, and citizens to provide substance to the summit discussions.

This is no ordinary international summit. Most scientists would argue that COP26 has a unique urgency in the fight against climate change. At COP21 in Paris, world leaders agreed in 2015 that:

- The global rise in temperature should be limited to well below 2 °C, with a target of no more than 1.5 °C.
- Governments should set aside funding to tackle climate change and to meet the above goal.
- Governments were required to submit emissions-reduction plans called “Nationally Determined Contributions” (NDCs).
- Each successive COP would seek to update the NDCs based on what is agreed to be the highest ambition at that point in time.

COP26 has been delayed by a year due to the COVID-19 pandemic. This year-long delay is a setback since it means valuable time has been lost in formulating consensus-based multilateral efforts to tackle the climate crisis. The goal of limiting global warming to 1.5 °C seems unlikely to be realised since the window of opportunity to meet that target is rapidly shrinking. This means that the decade to 2030 is vital for climate success.

C. Cooper, J. I. Rubio Gorrochategui, R. Chakraborty, A. Thompson,
J. Buckley

chair@sfl.org.uk

18 September 2021

SfL and COP26



As the socialist society representing scientists, researchers and all other members of the science, technology, engineering and mathematics community who are also members of the Labour movement, SfL intends to provide our services to our elected representatives whenever they ask for assistance on matters concerning our brief. It is for that reason that we will be **providing a series of briefings and other resources to the shadow cabinet and the wider Labour Party in advance of COP26.**

The series of briefings and reports that SfL created throughout the COVID-19 pandemic will form the template for these COP26 briefings. In this new iteration of this practice, we intend to submit high quality reports on the issues being discussed at COP26, as well as informing the Labour Party about articles published on both the general and specified media that could be worth reading on the matter. A non-exhaustive list of areas that we are intending to cover is as follows:

- An introduction to climate change (this briefing)
- Problems with the Paris agreement
- Carbon capture and storage
- Hydrogen gas central heating
- Carbon markets and carbon pricing
- Heat pumps
- Eco7 and batteries
- Electric cars
- Nuclear, and new nuclear
- Rewilding
- Transport
- Climate justice
- Degrowth

If there are other areas of science within the COP26 remit that you or your colleagues would like more information on, please do contact chair@sfl.org.uk and we will endeavour to accommodate.

C. Cooper, J. I. Rubio Gorrochategui, R. Chakraborty, A. Thompson,
J. Buckley
chair@sfl.org.uk
18 September 2021



Further reading

Quick reads

[What is a COP?](#)

Web article. A short summary on what a COP is, provided by the United Nations.

[The Paris agreement](#)

Web article. A short summary of the Paris Climate Change Agreement, provided by the United Nations.

[Overview: Weather, Global Warming and Climate Change](#)

Web article. A short summary of the various aspects of climate change, provided by NASA.

Longer reads

[AR6 Climate Change 2021: The Physical Science Basis](#)

Report. Summary of the up-to-date physical understanding of the climate system and climate change, bringing together the latest advances in climate science, and combining multiple lines of evidence from paleoclimate, observations, process understanding, and global and regional climate simulations. Including a summary for policymakers, provided by the Intergovernmental Panel on Climate Change.

[Methane Tracker 2020](#)

Report. The International Energy Agency's methane tracker, summarising the contribution to total emitted methane from various sources of methane, including detailed estimates that incorporate new data for oil and gas supply as well as the latest evidence from the scientific literature and measurement campaigns.

Other Media

[Climate Change 101 with Bill Nye | National Geographic](#)

Video (4 min). A short video by National Geographic giving a quick overview of climate change.

[What is Climate Change?](#)

Video (13 min). A more detailed video by Crash Course, giving a discussion of the topic, including and brief overview, details on how climate trends can be measured over millennia, and some of the effects over climate change.

Scientists for Labour

Scientists for Labour is a socialist society affiliated to the Labour Party. Our aims are to both promote good science in politics, and to promote Labour values in science. More information about Scientists for Labour, including how to join, can be found at www.scientistsforlabour.org.uk. You can follow us on Twitter @scientists4lab.

Scientists for Labour is a voluntary organisation. The work we do is only possible due to small donations. If you can, please consider helping us, so we can continue fighting for science. The donations page can be accessed [here](#).