

# Global carbon emissions from fossil fuels reached record high in 2023

Declining coal use helped shrink U.S. emissions 3%, according to new estimates from the Global Carbon Project, even as global emissions keep the world on a path to exceed 1.5 degrees Celsius of warming before 2030 and 1.7 degrees soon after.

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By

University of Exeter and Stanford Doerr School of Sustainability

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Global carbon emissions from fossil fuels have risen again in 2023 – reaching record levels, according to research published Dec. 5 by the Global Carbon Project, an international consortium of scientists from more than 90 institutions.

The researchers estimate that the world's emissions of carbon dioxide will exceed 40 billion tons in 2023, including nearly 37 billion tons from fossil fuels. Overall emissions are up 1.1% compared to 2022 levels and 1.5% compared to pre-pandemic levels, continuing a 10-year plateau.

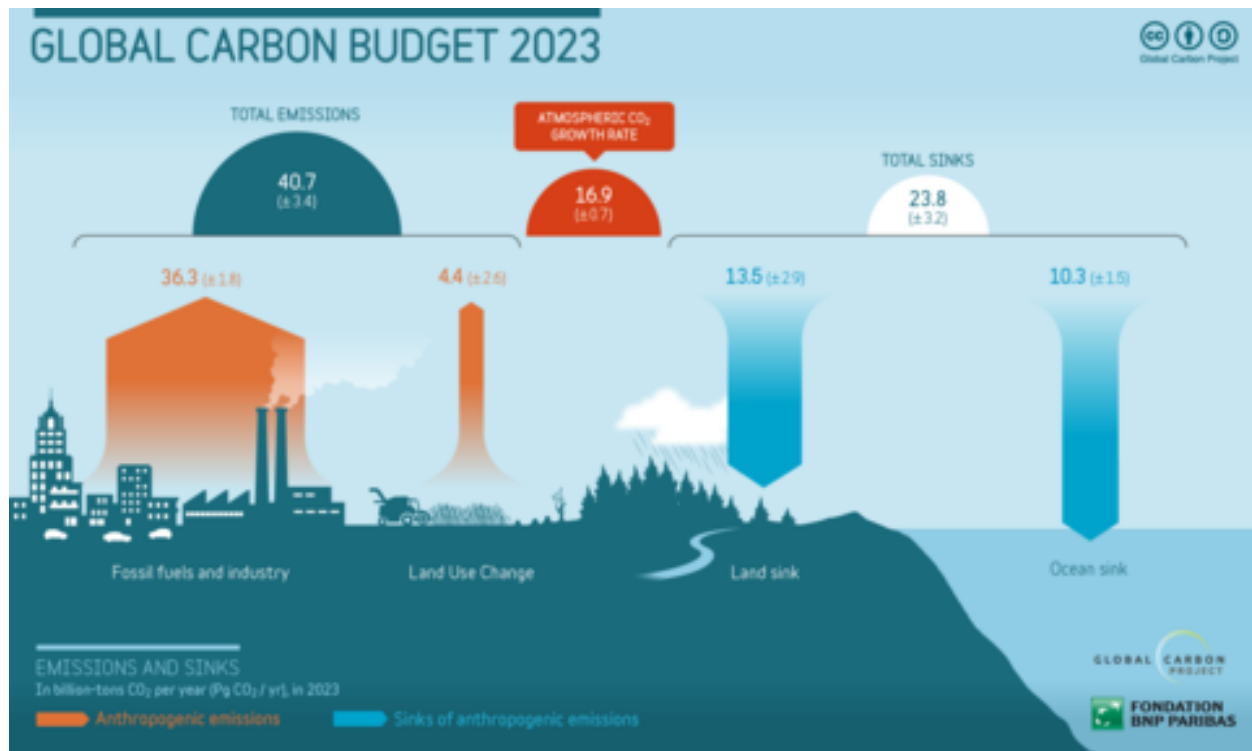


Image credit: Friedlingstein et al. 2023 Global Carbon Budget 2023. *Earth System Science Data*  
 The United States, the planet's second largest emitter after China, saw emissions decline 3% in 2023 compared to 2022, primarily due to a long-term decline in coal use driven by both economic and environmental factors, said Earth system scientist [Rob Jackson](#) of Stanford University, who has chaired the Global Carbon Project for nearly a decade.

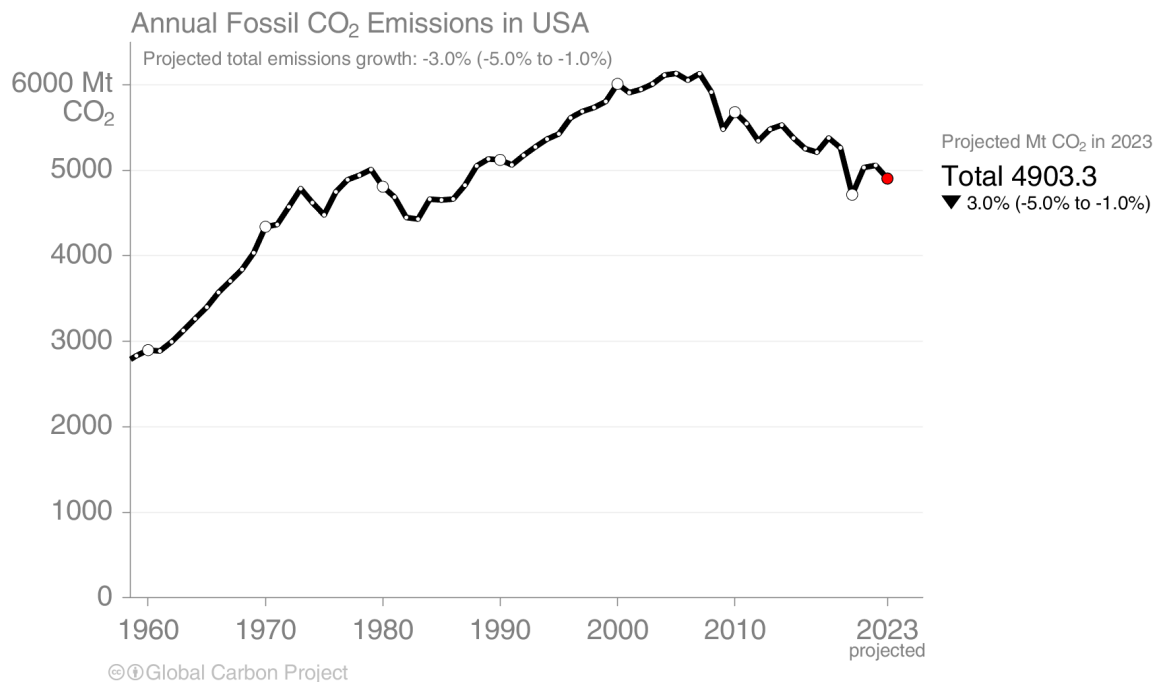
“Cleaning up our energy system saves lives today, not just at some future point. Thousands of people are still alive because we have substantially cut coal use,” said Jackson, the Michele and Kevin Douglas Provostial Professor in the [Stanford Doerr School of Sustainability](#).  
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**Rob Jackson** Michele and Kevin Douglas Provostial Professor

Bigger changes are urgently needed, however. “There’s a common narrative, especially in Congress, that the U.S. has cut emissions more than any other country. But that’s only true because our emissions were so high to start with,” Jackson said. On a per capita basis, U.S. emissions remain twice those of Europe and China, and eight times those of India.



*Image credit: Global Carbon Project*

Transportation is the largest source of emissions in the United States, and one of the most difficult to predict. “Three years after COVID first hit, we don’t know yet what the long-term effects on mass transit will be,” Jackson said. “Electric vehicles are starting to slow oil use a bit in the United States, but we remain far from net zero in the U.S. and globally.”

Although small compared to the emissions impact from fossil fuels and transportation, wildfires had an unusually large carbon footprint this year, with analysis of satellite records showing Canada’s emissions reached six to eight times the nation’s 20-year average due to an extreme wildfire season. Globally, fires contributed about 6 million tons of carbon dioxide during the first nine months of the year, 7-9% more than average.

## Warming beyond 1.5 degrees Celsius appears ‘inevitable’

The Global Carbon Project’s new estimates arrive in the middle of the climate summit known as COP28, where countries that signed the 2015 Paris Agreement are discussing efforts to achieve the accord’s goal of keeping global warming well below 2 degrees Celsius above pre-industrial levels, and preferably below 1.5 degrees Celsius.

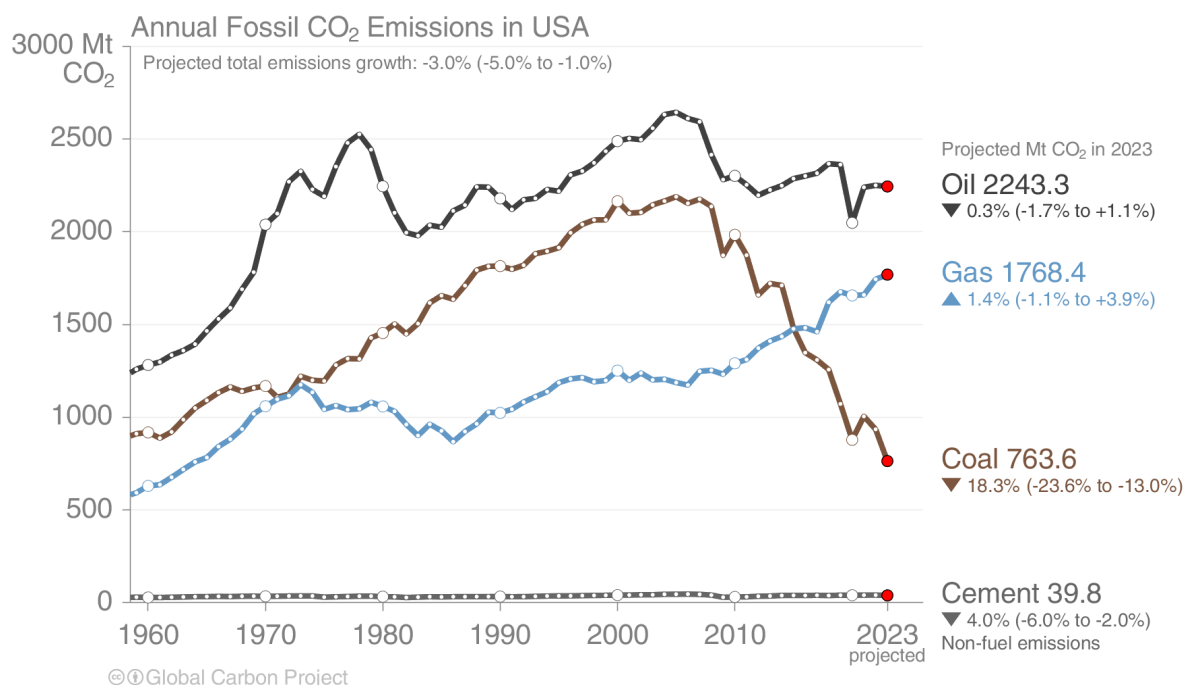
“The impacts of climate change are evident all around us, but action to reduce carbon emissions from fossil fuels remains painfully slow,” said lead study author [Pierre Friedlingstein](#) of the [Global Systems Institute](#) at the University of Exeter in the UK. “It now looks inevitable we will overshoot the 1.5 C target of the Paris Agreement, and leaders meeting at COP28 will have to agree rapid cuts in fossil fuel emissions even to keep the 2 C target alive.”

## How long until we cross 1.5 degrees Celsius of global warming?

The 2023 Global Carbon Budget estimates the remaining carbon budget before the 1.5°C target is breached consistently over multiple years, not just for a single year.

At the current emission levels, the Global Carbon Budget team estimates a 50% chance global warming will exceed 1.5°C consistently around 2030.

This estimate is subject to large uncertainties, primarily due to persistent questions about how much warming will result from greenhouse gases besides carbon dioxide – particularly methane, which is about 80 times more powerful than carbon dioxide at trapping heat during its first 20 years in our atmosphere. However, it's clear that the remaining carbon budget, and therefore the time left to meet the 1.5°C target and avoid more severe impacts of climate change, is running out fast.



*Image credit: Global Carbon Project*

The latest CO<sub>2</sub> data demonstrate that current efforts are insufficient to put global emissions on a downward trajectory towards “net zero,” said [Corinne Le Quéré](#), a professor of climate change science at University of East Anglia’s School of Environmental Sciences.

“Net zero” refers to the goal of cutting emissions to the point where any greenhouse gases still produced by human activities can be removed using technology. “But some trends in emissions are beginning to budge, showing climate policies can be effective,” Le Quéré said. Emissions from fossil fuels declined in 27 countries during the decade ending in 2022 while their economies grew – up from 22 countries decreasing their emissions in the decade ending in 2012.

If current carbon dioxide emissions levels persist, the remaining carbon budget for a 50% chance to limit warming to 1.5 C could be exceeded in seven years, and in 15 years for 1.7 C. Returning

global temperatures below these thresholds after they have been crossed would require a massive scale-up of carbon dioxide removal after global net zero emissions has been reached.

Currently, about half of all CO<sub>2</sub> emitted is absorbed by land and ocean sinks, the Global Carbon Project reports, with the rest remaining in the atmosphere where it causes climate change. Technology-based carbon dioxide removal pulled only about 10,000 tons of the gas from the atmosphere in 2023. Over a million times more carbon dioxide entered the atmosphere this year because of fossil fuels.

### **Learn more**

The Global Carbon Budget report, produced by an international team of more than 120 scientists, provides an annual, peer-reviewed update, building on established methodologies in a fully transparent manner. Explore the complete 2023 report at the [Global Carbon Atlas](#).

*This story was adapted from materials provided by the University of Exeter.*

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