

**Environment**

# Growing number of Earth's 'vital signs' endangered by climate change

Key climate indicators from greenhouse gas levels to ice loss have reached record levels this year in what researchers call a "critical and unpredictable new phase of the climate crisis"

By [James Dinneen](#)

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## 🔥 A wildfire burns in California on 30 July 2024

David McNew/Getty Images

A growing number of the planet's "vital signs" have reached record levels due to climate change and other environmental threats, according to a stark report by a group of prominent researchers.

“We are on the brink of an irreversible climate disaster,” write [William Ripple](#) 

<https://directory.forestry.oregonstate.edu/people/ripple-william> at Oregon State University and his colleagues. “This is a global emergency beyond any doubt. Much of the very fabric of life on Earth is imperilled.”

The report is the fifth annual State of the Climate report led by Ripple in an effort to present a clear warning of what the researchers say is a crisis given the extremes measured across key climate indicators, from greenhouse gas levels to tree cover loss.

“The climate crisis isn’t a distant threat, it’s a here-and-now crisis,” says [Michael Mann](#)  <https://earth.sas.upenn.edu/people/michael-mann> at the University of Pennsylvania, one of several well-known co-authors of the report, which also includes historian [Naomi Oreskes](#)  <https://histsci.fas.harvard.edu/people/naomi-oreskes>, Earth scientist [Tim Lenton](#)  <https://scholar.google.co.uk/citations?user=DiCOJ64AAAAJ&hl=en> and oceanographer [Stefan Rahmstorf](#)  <https://www.pik-potsdam.de/members/stefan/homepage>.

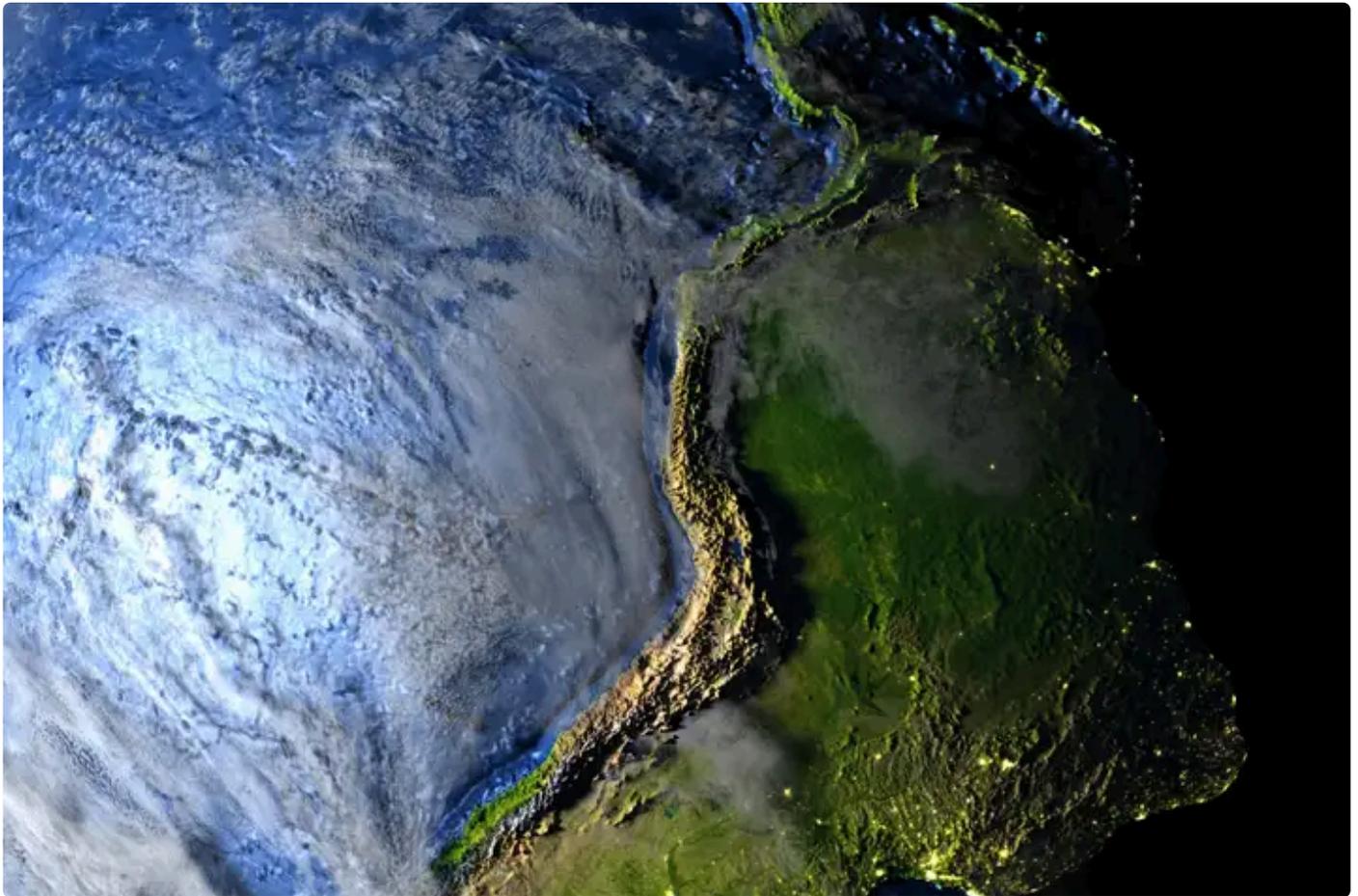
The researchers assessed 35 “planetary vital signs”, including the amount of heat in the oceans and the thickness of glaciers. The vital signs also include measures of the human factors driving many of those changes, such as meat production per capita and subsidies for fossil fuels.

Of those 35 metrics, the report finds 25 of them have reached record levels this year, most of them breaking [records set in 2023](#)  </article/2422583-red-alert-after-key-global-warming-records-were-smashed-in-2023/>. The human population rose to 8.12 billion people earlier this year, while the ruminant livestock population – a major source of methane – reached 4.22 billion animals. Greenhouse gas emissions this year have surpassed the equivalent of 40.4 billion tonnes of carbon dioxide, driving atmospheric levels of CO<sub>2</sub>, [methane and nitrous oxide](#)  </article/2406098-how-big-a-problem-are-methane-and-other-non-co2-greenhouse-gases/> – a powerful greenhouse gas emitted from soil – to new highs.

The impacts of climate change have also reached record levels. There is more heat in the oceans and seawater is more acidic, while sea level continues to rise. Record amounts of mass were lost from [Greenland’s ice sheet](#)  </article/2442637-fossils-show-greenland-was-once-ice-free-and-could-be-again/>. Heat-related mortality in the US has also increased. It now stands at 0.62 per 100,000 person-years, a more than 30 per cent rise over 2023.

“We have now brought the planet into climatic conditions never witnessed by us or our prehistoric relatives within our genus, *Homo*,” the researchers write.

Five of the indicators did not set records last year, but did in 2024. That includes record consumption of coal and oil. The Antarctic ice sheet lost more mass than at any point over the past 22 years of records. A record 11.9 million hectares of forest burned. And global average temperatures rose further above average than at any point in at least the past 145 years.



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Unexpectedly, the eastern Pacific Ocean is cooling. If this "cold tongue" continues, it could reduce greenhouse gas warming by 30 per cent – but also bring megadrought to the US

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“It is staggering that, in a world where billions of people are already suffering from the impacts of climate change, fossil fuel emissions and deforestation rates are not slowing, but they are actually increasing,” says [Thomas Crowther](https://crowtherlab.com/about-tom-crowther/) [🔗 https://crowtherlab.com/about-tom-crowther/](https://crowtherlab.com/about-tom-crowther/), an ecologist at ETH Zurich in Switzerland and a co-author of the report.

Some of the indicators set records in the right direction in terms of mitigating climate change. For instance, [solar and wind energy consumption](#)  /article/2387712-the-renewable-energy-revolution-is-happening-faster-than-you-think/ reached record highs, and in the world of finance there was a record level of divestment from fossil fuels. The proportion of emissions covered by carbon pricing also rose to record levels this year, and the rate of deforestation in Brazil saw a decline.

But the researchers argue this is far from sufficient. “Tragically, we are failing to avoid serious impacts, and we can now only hope to limit the extent of the damage,” they write.

Such direct language is unusual for a scientific report. But the authors argue this is justified, a sentiment in line with a [statement](#)  <https://www.jstor.org/stable/26891410> published by Ripple and his colleagues in 2020 – and now signed by more than 15,000 researchers – that said scientists have a moral obligation to warn people of the dangers of climate change.

According to the new report, “with the increasingly undeniable effects of climate change, a dire assessment is an honest assessment”.



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