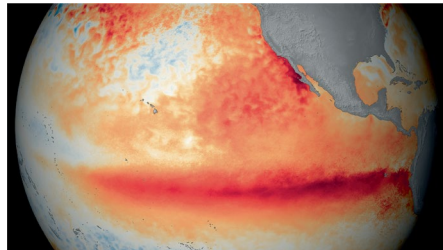


Rough years ahead



After an early forecast, El Niño has now officially arrived. As a result, global temperatures and extreme events will be elevated, affecting health, water availability, food security, wildfires and economic productivity across the world in the coming years.



In early June, the arrival of El Niño conditions in the tropical Pacific was announced¹. El Niño and its counterpart La Niña are phases of an irregular oscillation in the tropical Pacific, the El Niño Southern Oscillation (ENSO), which affects weather patterns across the world. Owing to their global reach, both phases have widespread socioeconomic impacts as they can cause crop losses, consistently decrease economic growth over multiple years², especially in tropical countries, and can elevate the risks of violent conflicts³. Even though ENSO is a natural part of the climate system, anthropogenic warming is expected to intensify both El Niño and La Niña, resulting in much higher damages in the future².

The current El Niño event follows a rare three-year La Niña event, which has been linked to, among other things, severe drought conditions in East Africa and flooding in Australia. As La Niña is associated with atmospheric cooling, the La Niña years were able to offset some of the warming attributed to greenhouse gases. A flip side is that a large amount of heat is now available to be released back into the atmosphere, and in early June, the National Oceanic and Atmospheric Administration of the United States predicted that there was a 56% and 84% likelihood of a very strong or stronger-than-average El Niño, respectively¹.

Such a strong El Niño event in 2023–2024 will have massive consequences around the world. First, we can expect record warmth in the coming years; the World Meteorological Organization has stated a 66% chance of exceeding 1.5 °C warming for at least 1 year between 2024 and 2027 (ref. 4). It should be noted, however, that this does not mean that

we have already failed to meet the Paris Agreement’s target of limiting warming to below 1.5 °C, as the target refers to consistent warming over longer timescales, not to natural variations such as ENSO.

The expected increase in droughts in some regions and extreme rainfall in other regions can pose substantial risks to agriculture. The Food and Agriculture Organization of the United Nations is particularly concerned about food security in Southern Africa, Central America and the Caribbean, and parts of Asia in the coming years⁵. While the effects of El Niño on food security are always substantial, they now coincide with other stressors as food prices have become more volatile due to the COVID-19 pandemic and the Russian invasion of Ukraine⁶. Similarly, the expected decrease in rainfall across many regions such as South and Southeast Asia might affect power demand and water-intensive industries, potentially further fuelling inflation⁷. For many countries, this El Niño event arrives at a time of multiple crises of political instability and food security, and has the potential to exacerbate them further.

But there is a silver lining to this El Niño event. The tropical Pacific is not the only ocean that is warming at the moment, we are also seeing abnormally high sea surface temperatures in the tropical and North Atlantic. Normally, this would indicate a very strong Atlantic hurricane season, but an emerging El Niño could offset some of this expected increase in hurricane activity in the Atlantic⁸. Although the risks from hurricanes are reduced, the current marine heatwave will influence weather conditions around the North Atlantic and is likely to have devastating effects on ecosystems.

Furthermore, this year’s event showcases a substantial step forward in our ability to predict and anticipate El Niño events. First predictions of a potential El Niño starting in 2023 were already made in December 2022 (ref. 9), which is much earlier than the infamous ‘spring barrier’ that states that reliable forecasting of ENSO before boreal spring has been challenging in the past. Advances in both numerical and statistical models have enabled researchers to expand the forecasting lead time more and more over recent years, and it seems that a reliable El Niño forecast is now possible more than a year in advance.

As a part of a natural climate oscillation, the occurrence of El Niño is out of human control, but the actual impacts of individual El Niño events depend mainly on the adaptive capabilities of individual countries. The recent advances in early forecasting now give affected regions much more time to prepare, for example, by stocking up on essential crops¹⁰. To this end, fundamental research on El Niño dynamics and forecasting models can enable governments and farmers to mitigate some of the impacts that this and future even stronger El Niño events will have.

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