



News & Highlights

Climate Change: Losing Ground?

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Climate change carries with it the prediction of warming global temperatures and increasingly variable weather, plus associated detrimental impacts around the world. Measurements from 2018, and the events of that year, continue to support this prediction. Both the National Aeronautics and Space Administration (NASA)

and the US National Oceanic and Atmospheric Administration (NOAA) identified 2018 as the fourth hottest year on record (Fig. 1) [1,2]. In addition, despite world-wide efforts undertaken to reduce greenhouse gas emissions, energy-related carbon dioxide emissions in 2018 reached a historic high [3]. On 11 May 2019, the

Land & ocean temperature percentiles Jan–Dec 2018
NOAA's National Centers for Environmental Information
Data source: GHCN–M version 3.3.0 & ERSST version 4.0.0

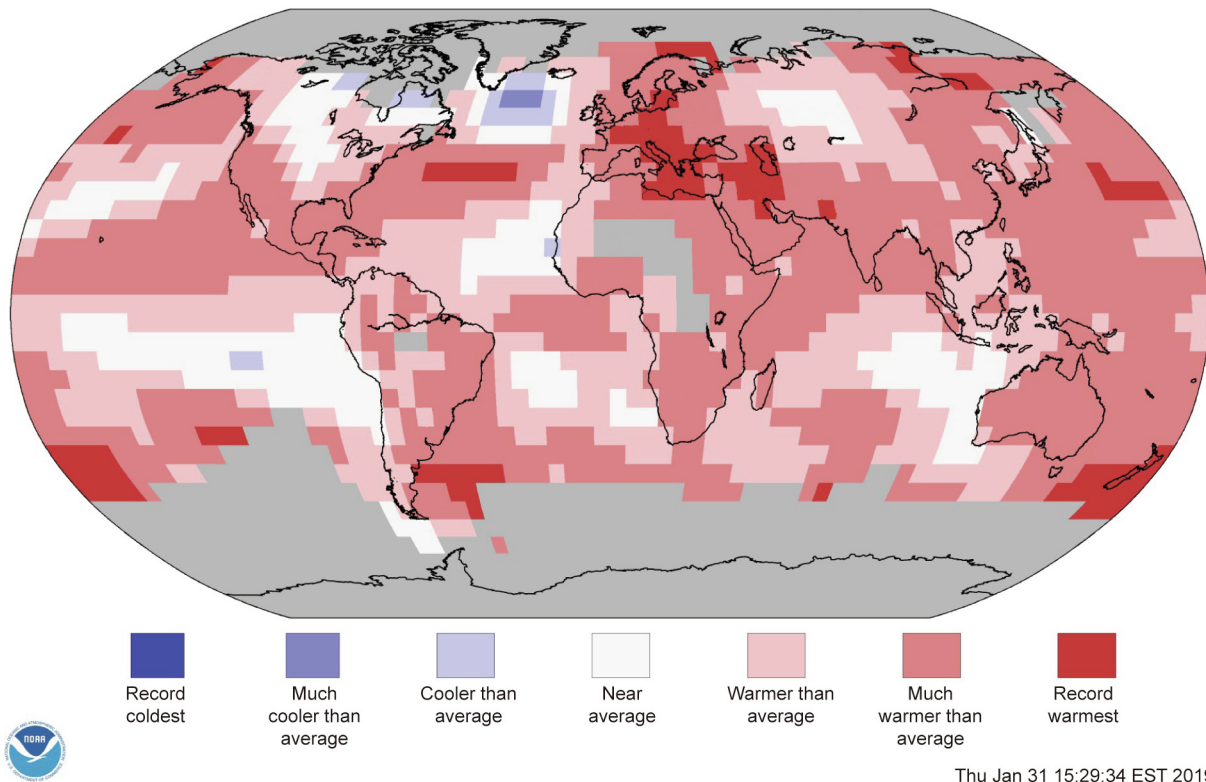


Fig. 1. 2018 was the fourth hottest year on record, according to analyses by both NASA and NOAA [2]. Credit: National Centers for Environmental Information/NOAA.

amount of carbon dioxide in the Earth's atmosphere surpassed 415 parts per million for the first time in at least 800 000 years [4].

The Paris Agreement, signed in 2016, was drafted to combat climate change through international commitments to reducing emissions. The coalition set a long-term goal of limiting the increase in average global temperature to less than 2 °C, with a target of 1.5 °C [5]. To meet this 1.5 °C target, global carbon dioxide emissions will need to be cut by about 45% by 2030 and reach net zero by 2050, according to a 2018 report from the United Nations Intergovernmental Panel on Climate Change [6]. This includes reducing the use of coal by nearly 80% in a little over a decade [7].

Germany, for example, plans to eliminate coal power within 20 years, but still relies on coal-fired power plants to supply almost 40% of its electricity despite concerted efforts to switch to renewable energy sources [8]. In the United States, although coal use is on the decline, it is largely being replaced with cheap natural gas [9], which also produces carbon dioxide emissions. And though many countries are trying to reduce and eliminate its use, coal remains a key fuel for energy production around the world. Globally, most coal-fired power is generated in developing nations in Asia, where power plants are roughly 12 years old on average and have decades remaining in their expected lifetimes [10].

Compounding the difficulty in transitioning away from fossil fuels for energy generation, global demand for energy has continued to rise, increasing by 2.3% in 2018, the highest growth rate in a decade [10]. The International Energy Agency (IEA) attributed this growth to the robustness of the global economy and higher needs for heating and cooling in some areas [10]. Accompanying this increased demand was a parallel spike in carbon dioxide emissions from energy production, which reached a record high of 33.1 billion tonnes last year, more than 10 billion tonnes of which came from coal use [3].

This evidence of increasing emissions and warming coincided with increasingly extreme weather events and more devastating natural disasters in 2018. In the United States, spending on natural disasters ranked the fourth highest since 1980, with 14 weather- and climate-related disasters that each cost more than \$1 billion USD [11]. Global spending on natural disasters reached \$155 billion USD [12]. In addition to the unusually destructive wildfires and hurricanes in the United States in 2018, drought and wildfires ravaged Europe, floods devastated Japan, and Typhoon Mangkhut pummeled the Philippines and Hong Kong, China (Fig. 2) [12].

Measurements also indicate that rising sea levels continue as a concern [13]. Glaciers in both the Arctic and Antarctic are currently retreating at unprecedented rates [14,15]. Ice melt in Antarctic is particularly worrisome. “What we're beginning to see now, proba-

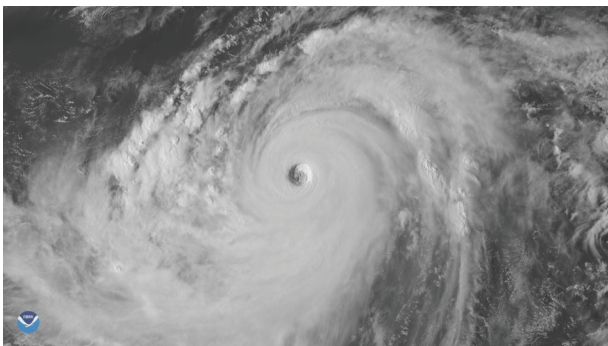


Fig. 2. The strongest storm on Earth in 2018, Typhoon Mangkhut at its peak spanned almost 900 km and reached one-minute-sustained gusts of 285 km·h⁻¹. After battering the Philippines the day before, Mangkhut struck southern China on 16 September 2018, leading to insurance claims of at least \$1 billion USD in China alone. Credit: NOAA.

bly only in the last five to ten years, is a real acceleration of ice loss from Antarctica—which is what everyone feared,” said Nicholas Golledge, a glaciologist at Victoria University of Wellington in New Zealand. Any response of the ice sheet to emissions reductions will be slow, on the order of centuries or millennia, he said. A certain amount of sea level rise is now “locked in,” he said, but reducing emissions could still help slow the rate.

In terms of achieving the reductions in emissions estimated to be needed to meet the Paris Agreement goal, continuing to develop the renewable energy sector seems to hold the most promise. The best options, said Mark Z. Jacobson, a civil and environmental engineer at Stanford University in the United States, are technologies that are proven to work and can be deployed quickly, like solar and wind power. These technologies provide solutions not only to climate change, he said, but to air pollution and energy security issues as well. However, growth in the renewable energy sector stalled in 2018 after almost 20 years of strong growth [16].

Despite this setback, Jacobson said he remains optimistic about the prospects for changes to make a difference. For a five-hour period on 5 May 2019, the state of California in the United States was able to supply more than 92% of its electricity demand through renewable energy sources, peaking at 96% of the supply needed for a half-hour span [17]. As the cost of implementing renewable technologies continues to fall, going 100% renewable will become increasingly feasible, he said. “Places that are trying are succeeding, and that gives me hope.”

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