

Global warming has gotten deadly. It will get worse

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PORTLAND, Ore. — The emergency department at Oregon Health Sciences University had rarely been this busy, even during the worst stages of the covid-19 pandemic. Physicians raced to provide fluids to patients who arrived breathless, dizzy and drenched in sweat. Others were brought in on stretchers, their body temperatures so high their central nervous systems had shut down. Those who could still speak told of stifling apartments and sun that made their skin sizzle. Some had tried to walk to county cooling shelters, only to collapse in the [blistering heat](#).

“The system was overwhelmed,” said Mary Tanski, chair of OHSU’s department of emergency medicine, of the towering heat dome that [toppled temperature records](#) across the Northwest this week.

Some patients didn’t survive. In Oregon, Washington and western Canada, authorities are investigating more than 800 [deaths](#) potentially linked to the punishing heat.

It will be months before experts know precisely how many of those deaths can be specifically attributed to climate change. But researchers who specialize in the science of attribution say they are “virtually certain” that warming from human greenhouse gas emissions played a pivotal role. It is a sign of how dangerous the climate crisis has gotten — and how much worse it can still become.

The heat dome was just one of a barrage of climate catastrophes that struck the world in recent weeks. Western wildfires are off to a [scorching start](#), with firefighters actively battling 44 large blazes that have burned nearly 700,000 acres. Parts of Florida and the Caribbean are bracing for landfall of [Hurricane Elsa](#), the Atlantic’s fifth named storm in what is one of the most active starts to hurricane season on record. Nearly half a million people in Madagascar [are at risk of starvation](#) as the country grapples with dust storms, locusts and its worst drought in decades. In Verkhoyansk, Siberia — usually one of the coldest inhabited places on the planet — the land surface temperature was [118 degrees](#).

“Climate change has loaded the weather dice against us,” said Katharine Hayhoe, a climate scientist at Texas Tech University and chief scientist for the Nature Conservancy. “These extremes are something we knew were coming,” she added. “The suffering that is here and now is because we have not heeded the warnings sufficiently.”

Humans burning fossil fuels have caused the globe to warm roughly 1 degree Celsius, or 2 degrees Fahrenheit, since the preindustrial era. It’s a seemingly incremental change, but it has led to disproportionately frequent and severe natural disasters.

Think of the climate as a bell curve, Hayhoe said, with temperatures distributed according to how common they ought to be. The center of the bell curve may have shifted just a couple of degrees, but the area of the curve now in the “extreme” zone has increased significantly.

Within the next week, researchers expect to publish a “rapid attribution” study that determines how climate change made the Northwest heat wave more likely. Yet precisely quantifying the role of climate change in the event has been difficult because the heat was just so extreme, said Michael Wehner, a climate scientist at Lawrence Berkeley National Laboratory in California who is contributing to the attribution effort. “It’s well beyond what straightforward statistical analysis would suggest. It’s well beyond what climate models suggest,” he continued. “But it happened.”

[Studies show](#) the chance of a given tropical storm becoming a hurricane that is Category 3 or greater has grown eight percent every decade. The acreage of the West burned by wildfire is [twice what it would otherwise be](#). The heat wave that struck the Northwest this week brought temperatures that were [as much as 11 degrees](#) above the previous all-time high.

That increase in intensity is partly due to the fact that meteorological phenomena are occurring in a hotter world. Summers in the Northwest are about three degrees Fahrenheit hotter than they were a century ago.

“But there are other, nonlinear, things going on,” Wehner, adds. For example, heat causes water to evaporate from vegetation and soil, which uses up energy and helps bring temperatures down — a phenomenon called evaporative cooling. But climate change has made the West both hotter and dryer. As the mercury ticks upward, the landscape becomes even more parched, which allows it to heat up even faster. Now, more than 93 percent of the American West is in moderate to severe drought, according to the [U.S. drought monitor](#).

Another physical phenomenon, called [the Clausius-Clapeyron equation](#), shows that for every 1 degree Celsius (1.8 degrees Fahrenheit) of warming, the atmosphere can hold 7 percent more moisture. This means that warm conditions make storms much wetter, leading to record-breaking rainfall events like Hurricane Harvey in 2017.

Scientists have been aware of these phenomena for decades, and have [long warned](#) about the potential for even moderate amounts of global warming to trigger catastrophic weather extremes.

The heat being so devastating should be a warning sign for all of us. The 2015 Paris Climate Agreement calls for humanity to limit global warming to “well below” 2 degrees Celsius. A subsequent [report](#) from United Nations scientists found that warming beyond 1.5 degrees Celsius would trigger catastrophic sea level rise, near-total loss of coral reefs and a calamitous increase in the frequency and intensity of natural disasters. But the world is unlikely to meet either of those goals. Most countries have not reduced greenhouse gas emissions nearly enough to meet targets set in the Paris agreement. Even if they meet their existing pledges, researchers say the world has [just a 5 percent chance](#) of keeping warming “well below” 2 degrees.

If we continue to burn fossil fuels at the current rate, [studies suggest](#), the Earth could be 3 to 4 degrees Celsius hotter by the end of the century. The Arctic will be free of ice in summertime. Hundreds of millions of people will suffer from food shortages and extreme drought. Huge numbers of species will be driven to extinction. Some regions will become so hot and disaster-prone they are uninhabitable. “It’s a very different planet at those levels,” Wehner said. “This is

really serious. As a society, as a species, we're going to have to learn to adapt to this. And some things are not going to be adaptable."

Extreme heat is likely to be one of those things. [Studies of heat waves](#) suggest that a half a degree Celsius increase in summertime temperatures can lead to a 150 percent increase in the number of heat waves that kill 100 people or more. [Research published last year](#) in the journal *Science* found that the human body can't tolerate temperatures higher than 95 degrees when combined with 100 percent humidity.

The scene in emergency departments across the Northwest this week underscores that science. Wait times at the OHSU emergency department were 5 to 7 hours, Tanski said. At Swedish Health Services/Cherry Hill in Seattle, doctors were seeing patients in hallways because all the rooms were full.

"I've never seen anything like this," said David Markel, an emergency physician at the Seattle hospital. During an overnight shift on Monday, he treated 12 patients for heat illness. Some were so sick their kidneys and livers were failing, their muscles starting to break down. "I don't claim to be an expert in climate change or environmental science," Markel said. "But I definitely care for people who are impacted by the extremes of climate. ... And it's like, the more crises we face the more clear it is."

Jeff Duchin, Seattle and King County's chief public health officer, put it more bluntly: "Climate change is a health emergency," he said in a [statement](#) this weekend. "And reducing greenhouse gas emissions is literally a matter of life and death."

The intensity of recent weather extremes — and the certainty of still worse events to come — weighs on scientists.

Speaking over the phone, Wehner's tone was somber as he discussed the wildfire smoke that choked California last summer, people whose homes burned down, a friend whose 90-year-old mother was killed when the town of Paradise was consumed by flames. Haltingly, he recalled watching a newscaster interview a Pakistani man whose two children had died in a 2015 heat wave. When Wehner later investigated the event, he found that climate change had made the event [1,000 times more likely](#). "It did not have to be this way," he said. "We have known enough to take action for 20 years. And if we had taken action 20 years ago, it would be a lot easier."

"But there's no 'I told you so,'" he continued. "I just feel bad. Just bad. I really wish we had been wrong. But we weren't."

The only comfort, said Hayhoe, is in knowing that action can still be taken. Though the world could exceed 1.5 degrees of warming within this decade, scientists say we can avoid crossing that threshold if we cut global greenhouse gas emissions [by about 7.6 percent per year](#).

Such cuts would require an unprecedented transformation of human society. But look at the alternative, Hayhoe said. "We have choices to make, she said. "And the quicker we make those choices, the better off we will all be. The future is in our hands."