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Democracy Dies in Darkness

## Heat waves in U.S., Europe 'virtually impossible' without climate change, study finds

Such events will become only more intense and more frequent unless humans halt the burning of fossil fuels that warm the planet, scientists say



By <u>Brady Dennis</u>

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The deadly, protracted <u>heat waves</u> that have scorched <u>parts of North America</u> and <u>Europe</u> this month would have been "virtually impossible" without climate change, according to a <u>new study</u> published Tuesday.

<u>The analysis</u> by the <u>World Weather Attribution</u> network, a coalition of scientists that conducts rapid analyses to determine how the warming atmosphere influences extreme weather events, examined weather data and computer model simulations to compare the climate as it is today, having experienced warming of about 1.2 degrees Celsius (2.2 Fahrenheit) since the late 1800s, with the climate of the past.

The results came with a sobering reminder: Once unfathomable heat waves are not only happening, but becoming more common.

"They are not rare in today's climate," Friederike Otto, co-leader of the group and a climate scientist at Imperial College London, said in an interview. "What surprises me is that people are so surprised. It is exactly what we expected to see."

Not that there is anything ordinary about the triple-digit temperatures that have persisted across large swaths of the planet this summer, crushing temperature records, threatening crops and wildlife and posing health risks to tens of millions of people each day.

At least scientifically, Otto said, the findings support a growing consensus among researchers: The warmer the world gets, the more likely regions are to experience crippling heat waves, stronger storms and other climate-fueled disasters.

Otto and researchers from the United States, the United Kingdom and the Netherlands sought to quantify the effect of climate change on heat waves that unfolded earlier this month in three regions: the U.S. Southwest and parts of Mexico, southern Europe and a swath of China.

Using the data and simulations comparing the present climate with the past, they examined periods in July when the heat was most intense over each region — 18 days in the western United States and portions of Mexico, a week in southern Europe and 14 days over the lowlands of China.

Ultimately, they found that the heat waves that baked the Southwest and southern Europe would have almost no chance of happening in a world without climate change. The Chinese heat wave was made about 50 times more likely given global warming, the study found, while the European and North American heat waves were at least 1,000 times more likely.

The findings have not yet been peer reviewed, given the rapid timeline under which the study was completed, but the group used a set of peer-reviewed methods to detail the fingerprint of climate change in each place.

In recent years, the group has used such methods to identify <u>dozens</u> of heat waves, extreme rainfalls, hurricanes, droughts and floods made more likely or more intense by climate change. Some, such as the <u>2021 Pacific Northwest heat wave</u> that killed hundreds of people, were also found to be "virtually impossible" in a world unaltered by greenhouse gas emissions.

As extraordinary as this month's heat waves would have been not so long ago, they are <u>becoming less extraordinary</u>.

Heat waves like the ones in Tuesday's study now have about a 1-in-15 chance of happening any given year in North America, about a 10 percent chance of happening any year in southern Europe and approximately a 20 percent chance of happening any year in China, the authors said.

In each case, the group found, human-caused greenhouse gas emissions made the heat wave hotter than it would otherwise have been: roughly 2.5 Celsius (4.5 Fahrenheit) hotter for the European heat wave, 2 Celsius (3.6 Fahrenheit) hotter in North America and 1 Celsius (1.8 Fahrenheit) hotter in China.

The researchers behind Tuesday's study said they did not specifically examine the role of the <u>El Niño climate pattern</u> that has developed this summer and is known to boost temperatures and alter weather patterns. But they said that climate models do account for such variations, and that whatever role El Niño plays in land-based heat waves pales in comparison to that of the warming atmosphere.

"Although the El Niño feeds into the numbers, the signal remains the same," said Mariam Zachariah, a researcher at Imperial College London and a study co-author. "The climate change signal is still evident."

Despite the emerging evidence, she said, what has <u>been on display during July</u> "is just how vulnerable our societies are to these changes."

Already, the group noted, the United States has logged numerous heat-related deaths, including of migrants trying to cross the border from Mexico. Additional deaths have been reported across Spain, Italy and other European countries, as well as in China. Hospitalizations have risen as <u>heat-stricken patients</u> seek emergency care, outdoor workers have succumbed to the searing temperatures and relentless heat has caused <u>spikes in demand for electricity</u>.

"It underscores the need for our systems to adapt much faster, because the risks are rising much faster than we are adapting," Julie Arrighi, director of the Red Cross Red Crescent Climate Center, which works to reduce the impacts of extreme weather events on vulnerable people, told reporters in a call Monday. Arrighi said leaders from the local to the national level must embrace "a cultural shift" in the way they think about extreme heat and its perils. As heat waves worsen and become more common, it is critical to scale up warning systems, develop plans that give people cool places to escape and strengthen the resilience of electric grids, water supplies and health systems.

In recent years, scientists have said with growing confidence that not only are humans <u>fueling more intense extreme weather events</u> around the planet, but that the frequency and severity of such calamities is likely to worsen with time.

The Intergovernmental Panel on Climate Change (IPCC), a United Nations-backed collection of some of the world's top climate scientists, <u>wrote</u> in its most <u>recent report</u> that "it is virtually certain that hot extremes (including heat waves) have become more frequent and more intense across most land regions since the 1950s."

Meanwhile, the panel wrote, instances of extreme cold "have become less frequent and less severe."

In an earlier report, the IPCC underscored that episodes of severe heat "will continue to increase" around the globe. Even if humans manage to hold Earth's warming to no more than 1.5 Celsius — the most ambitious goal set forth in the 2015 Paris climate accord — extreme heat events will proliferate in the near term, scientists say.

If the world cannot quit heating the planet, the problem will probably grow only worse in time. "Relative to present day conditions, changes in the intensity of extremes would be at least double at 2 (degrees Celsius), and quadruple at 3 (degrees Celsius) of global warming, compared to changes at 1.5 (degrees Celsius)," the IPCC wrote.

Even absent Tuesday's study, the scorching weather that has engulfed parts of the planet in recent weeks has offered the latest round of evidence for how profoundly things are changing.

Scientists have said that July is likely to wind up as <u>Earth's hottest single month</u> on record, and possibly in more than 100,000 years. Day after day, records for the average global annual temperature have fallen.

For the vast majority of the month, Phoenix <u>has endured</u> daily highs above 110. Temperatures in one Chinese town <u>reached 126</u> degrees Fahrenheit. In the Middle East, the heat index <u>reached 152 degrees</u> Fahrenheit, pushing levels thought to be the most intense the <u>human body can withstand</u>.

As in past heat waves, such as the brutal stretch that <u>claimed</u> more than 60,000 lives across Europe last summer, an ongoing question is whether policymakers around the world can move quickly enough — or can muster the resources — to help those most at risk avoid the most deadly form of extreme weather.

"The good news about heat is that we are aware of many different adaptations that can help," said Jane Baldwin, an assistant professor of Earth system science at the University of California at Irvine, who was not involved in Tuesday's study. "The bad news is there are still a lot of places where we haven't taken full advantage of those."

Otto is adamant that the startling heat waves of recent weeks, while no longer rare on a warming planet, do not represent a new reality.

"We don't know what the new normal is until we stop burning fossil fuels. We are not in a stable climate," she said.

Until the <u>trajectory of human emissions</u> falls sharply, temperature records will continue to fall. Heat waves will grow more fierce and more prolific, offering only a glimpse of potentially hotter stretches ahead.

"This is not what extremes in the future will look like," Otto said. "This could be even a cold year in the summers to come. This is not what we need to get used to. We need to get used to this, and worse."