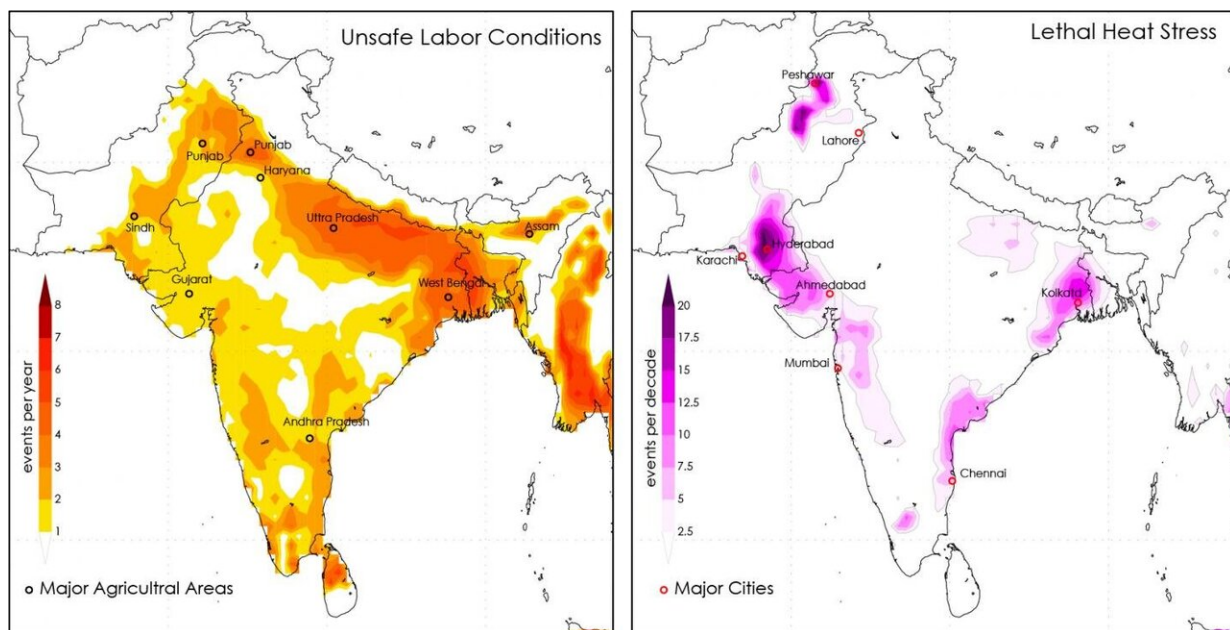


Deadly heat waves will be common in South Asia, even at 1.5 degrees of warming

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With 2 degrees Celsius of warming, the population of South Asia will experience more than double the exposure to unsafe labor temperatures (left) and will have almost three times the exposure to temperatures that cause lethal heat stress (right). Credit: Saeed et. al/ Geophysical Research Letters/AGU

Residents of South Asia already periodically experience heat waves at the current level of warming. But a new study projecting the amount of heat stress residents of the region will experience in the future finds with 2 degrees Celsius of warming, the population's exposure to heat stress

will nearly triple.

Limiting warming to 1.5 degrees Celsius will likely reduce that impact by half, but deadly heat stress will become commonplace across South Asia, according to the new study in *Geophysical Research Letters*, short-format reports with immediate implications spanning all Earth and space sciences.

With almost one quarter of the world's population living in South Asia, the new study underlines the urgency of addressing climate change.

"The future looks bad for South Asia, but the worst can be avoided by containing warming to as low as possible," said Moetasim Ashfaq, a computational climate scientist at Oak Ridge National Laboratory and corresponding author of the new study. "The need for adaptation over South Asia is today, not in the future. It's not a choice anymore."

Earth has warmed by 1 degree Celsius since the start of the Industrial Revolution, according to the Intergovernmental Panel on Climate Change. On the current climate trajectory, it may reach 1.5 degrees Celsius of warming in 2040. This deadline leaves little time for South Asian countries to adapt. "Only half a degree increase from today is going to cause a widespread increase in these events," Ashfaq said.

A hot region getting hotter

People living in South Asia are especially vulnerable to deadly heat waves because the area already experiences very hot, humid summers. Much of the population live in densely populated cities without regular access to air conditioning, and about 60% perform agricultural work and can't escape the heat by staying indoors.

In the new study, the researchers used climate simulations and

projections of future population growth to estimate the number of people who will experience dangerous levels of heat stress in South Asia at warming levels of 1.5 and 2 degrees Celsius. They estimated the wet bulb temperature residents will experience, which is similar to the heat index, as it takes into account humidity as well as temperature. A wet bulb temperature of 32 degrees Celsius (89.6 degrees Fahrenheit) is considered to be the point when labor becomes unsafe, and 35 degrees Celsius (95 degrees Fahrenheit) is the limit to human survivability—when the body can no longer cool itself.

Their analysis suggests at 2 degrees of warming, the population's exposure to unsafe labor temperatures will rise more than two-fold, and exposure to lethal temperatures rises 2.7 times, as compared to recent years.

Curbing warming to 1.5 degrees Celsius will likely cut that exposure in half, but large numbers of people across South Asia will still experience extreme temperatures. An increase in heat events that create unsafe labor conditions are likely to occur in major crop producing regions in India, such as West Bengal and Uttar Pradesh, and in Pakistan in Punjab and Sindh. Coastal regions and urban centers such as Karachi, Kolkata, Mumbai, Hyderabad and Peshawar are also likely to be heavily affected, according to the study.

"Even at 1.5 degrees, South Asia will have serious consequences in terms of heat stress," Ashfaq said. "That's why there is a need to radically alter the current trajectory of greenhouse gas emissions."

The results differ from a similar study conducted in 2017, which predicted that heat waves of lethal temperatures will occur in South Asia toward the end of the 21st century. The researchers suspect the earlier study is too conservative, as deadly heat waves have already hit the region in the past. In 2015, large parts of Pakistan and India experienced

the fifth deadliest heat wave in the recorded history, which caused about 3,500 heat-related deaths.

"A [policy framework](#) is very much needed to fight against heat stress and [heat](#) wave-related problems," said T.V. Lakshmi Kumar, an atmospheric scientist at India's SRM Institute of Science and Technology who was not involved in the work. "India has already committed to reduce emissions to combat [climate change](#) issues."

The study was supported by National Climate Computing Research Center, which is located within ORNL's National Center for Computational Sciences and supported under a Strategic Partnership Project between Department of Energy and National Oceanic and Atmospheric Administration.

More information: Fahad Saeed et al, Deadly heat stress to become commonplace across South Asia already at 1.5°C of global warming, *Geophysical Research Letters* (2021). [DOI: 10.1029/2020GL091191](https://doi.org/10.1029/2020GL091191)

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