“Wet bulb” temperature: Climate change and unsurvivable heatwaves

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Humid heatwaves

Climate change to cause humid heatwaves that will kill even healthy people

If warming is not tackled, levels of humid heat that can kill within hours will affect millions across south Asia within decades, analysis finds.

Extreme heatwaves that kill even healthy people within hours will strike parts of the Indian subcontinent unless global carbon emissions are cut sharply and soon, according to new research.

Even outside of these hotspots, three-quarters of the 1.7bn population – particularly those farming in the Ganges and Indus valleys – will be exposed to a level of humid heat classed as posing “extreme danger” towards the end of the century.

The new analysis assesses the impact of climate change on the deadly combination of heat and humidity, measured as the “wet bulb” temperature (WBT). Once this reaches 35C, the human body cannot cool itself by sweating and even fit people sitting in the shade will die within six hours.

The revelations show the most severe impacts of global warming may strike those nations, such as India, whose carbon emissions are still rising as they lift millions of people out of poverty.

“It presents a dilemma for India between the need to grow economically at a fast pace, consuming fossil fuels, and the need to avoid such potentially lethal impacts,” said Prof Elfatih Eltahir, at Massachusetts Institute of Technology in the US who led the new study. “To India, global climate change is no longer abstract – it is about how to save potentially vulnerable populations.”

Heatwaves are already a major risk in South Asia, with a severe episode in 2015 leading to 3,500 deaths, and India recorded its hottest ever day in 2016 when the temperature in the city of Phalodi, Rajasthan, hit 51C. Another new study this week linked the impact of climate change to the suicides of nearly 60,000 Indian farmers [1].

Eltahir said poor farmers are most at risk from future humid heatwaves, but have contributed very little to the emissions that drive climate change. The eastern part of China, another populous region where emissions are rising, is also on track for extreme heatwaves and this risk is currently being examined by the scientists.

Their previous research, published in 2015 [2], showed the Gulf in the Middle East, the heartland of the global oil industry, will also suffer heatwaves beyond the limit of human survival if climate change is unchecked, particularly Abu Dhabi, Dubai, Doha and coastal cities in Iran.

The new work, published in the journal *Science Advances* [3], used carefully selected computer climate models that accurately simulate the past climate of the South Asia to conduct a high resolution analysis of the region, down to 25km.

The scientists found that under a business-as-usual scenario, where carbon emissions are not curbed, 4% of the population would suffer unsurvivable six-hour heatwaves of 35C WBT at least once between 2071-2100. The affected cities include Lucknow in Uttar Pradesh and Patna in Bihar, each currently home to more than two million people.

Vast areas of South Asia – covering 75% of the area's population – would endure at least one heatwave of 31C WBT. This is already above the level deemed by the US National Weather Service to represent "extreme danger" [4], with its warning stating: "If you don't take precautions immediately when conditions are extreme, you may become seriously ill or even die." [5]

However, if emissions are reduced roughly in line with the global Paris climate change agreement, there would be no 35C WBT heatwaves and the population affected by the 31C WBT events falls to 55%, compared to the 15% exposed today.

The analysis also showed that the dangerous 31C WBT level would be passed once every two years for 30% of the population – more than 500 million people – if climate change is unchecked, but for only 2% of the population if the Paris goals are met. "The problem is very alarming but the intensity of the heatwaves can be reduced considerably if global society takes action," said Eltahir.

South Asia is particularly at risk from these extreme heatwaves because the annual monsoon brings hot and humid air on to the land. The widespread use of irrigation adds to the risk, because evaporation of the water increases humidity. The projected extremes are higher in the Gulf in the Middle East, but there they mostly occur over the gulf itself, rather than on land as in South Asia.

The limit of survivability, at 35C WBT, was almost reached in Bandar Mahshahr in Iran in July 2015 [6], where 46C heat combined with 50% humidity. "This suggests the threshold may be breached sooner than projected," said the researchers.

Prof Christoph Schär, a climate scientist at ETH Zurich, Switzerland, and who was not involved in the study, said: "This is a solid piece of work, which will likely shape our perception of future climate change. In my view, the results are of concern and alarming."

The report demonstrates the urgency of measures to both cut emissions and help people cope better with such heatwaves, he said. There are uncertainties in the modelling – which Schär noted could underestimate or overestimate the impacts – as representing monsoon climates can be difficult and historical data is relatively scarce.

Prof Chris Huntingford, at the UK Centre for Ecology and Hydrology, said: "If given just one word to describe climate change, then 'unfairness' would be a good candidate. Raised levels of carbon dioxide in the atmosphere are expected to cause deadly heatwaves for much of South Asia. Yet many of those living there will have contributed little to climate change."

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* The Guardian. Wednesday 2 August 2017 19.00 BST: https://www.theguardian.com/environment/2017/aug/02/climate-change-to-cause-humid-heatwaves-that-will-kill-even-healthy-people

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By the end of this century

Unsurvivable heatwaves could hit India and Pakistan by the end of this century, scientists warn

A combination of extreme heat and humidity could cause humans to overheat and die.

Climate change could bring deadly summer heatwaves to millions of people living in southern Asia by the end of this century, scientists predict.

Soaring temperatures could lead to unsurvivable levels of heat and humidity, it is claimed.

The regions likely to be hardest hit include northern India, Bangladesh and southern Pakistan, home to 1.5 billion people.

The evidence is based on recent research showing the most deadly effects of hot weather come from a combination of high temperature and high humidity.

This is recorded using a measurement known as “wet-bulb” temperature, which reflects the ability of moisture to evaporate.

When wet-bulb temperatures reach 35C, the human body cannot cool itself enough to survive more than a few hours.

In today’s climate, wet-bulb temperatures have rarely gone above 31C anywhere on Earth. But in 2015, the limit was almost reached in the Persian Gulf region, during a year when heat killed an estimated 3,500 people in Pakistan and India.

The new research shows that without serious reductions in greenhouse gas emissions, extreme heatwaves could raise wet-bulb temperatures to between 31C and 34.2C.

“It brings us close to the threshold of survivability, and anything in the 30s is very severe,” said study author Dr Elfatih Eltahir, from Massachusetts Institute of Technology in the US.

By 2100, around 70 per cent of India’s population was expected to suffer occasional exposures to 32C wet-bulb temperatures, the researchers wrote in the journal *Science Advances*. And two per cent could be subjected to deadly heat at the 35C limit.

Dr Eltahir added: “With the disruption to the agricultural production, it doesn’t need to be the heatwave itself that kills people. Production will go down, so potentially everyone will suffer.”

Press Association

John von Radowitz

* *The Independent Online*, Wednesday 2 August 2017 20:06 BST
http://www.independent.co.uk/environment/heatwave-unsurvivable-climate-change-india-pakistan-bangladesh-2100-global-warming-a7874016.html

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Footnotes

[1] ESSF (article 41673), India: Suicides of nearly 60,000 farmers linked to climate change, study claims.

[2] ESSF (article 41674), Wet bulb temperature: Extreme heatwaves could push Gulf climate beyond human endurance, study shows.

[3] http://advances.sciencemag.org/content/3/8/e1603322

[4] http://www.nws.noaa.gov/om/heat/heat_index.shtml

[5] http://www.nws.noaa.gov/om/heat/ww.shtml

[6] https://www.theguardian.com/world/2015/aug/04/middle-east-swelters-in-heatwave-as-temperatures-top-50c