

India's heat hotspots rise by 40%

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New Delhi: The fractions of land area experiencing extreme heat have increased by up to 40 per cent across parts of central and northwest India, while other regions face rising risks from drought, dangerous humidity and bursts of intense rainfall, a study has found.

Scientists say the study offers fresh insights into how a warming climate is reshaping India's exposure to extreme weather, with different regions increasingly facing different combinations of heat, drought, humidity and intense rainfall.

The changing patterns

underline the need for region-specific adaptation responses — actions to address heat stress and urban heat in northwest India, drought risk in the southern peninsular region, and the risks of intense rainfall and floods in north-eastern India.

"Hotspots for each type of extreme weather are expanding into new areas — but at different places," said Madhavan Rajeevan, an atmospheric physicist and former secretary in the Union earth sciences department who supervised the study.

Rajeevan and his colleagues analysed rainfall and temperature data from 1971 through 2022 and combined seven indicators of extreme

conditions — maximum and minimum temperatures, heavy rainfall, successive dry days, drought, humidity and excess heat — into a "climate index".

Scientists at the US National Oceanic and Atmospheric Administration had developed a similar index for climate extremes in the mid-1990s to track changes in extreme weather and provide a clearer picture of the evolving climate risks.

Rajeevan said he had wanted to develop an extreme climate index for India, which he and his collaborators have now done. "The index can be improved over time — we can add more extreme weather in-

dicators," Rajeevan said.

Their analysis has shown that the area affected by dangerous humid heat — a combination of high temperature and humidity that makes it harder for the body to shed heat — has expanded inland from coastal areas, increasing by 10 per cent over the past five decades.

"Areas marked by heat and drought extremes have changed from small pockets to large, connected regions," Rajeevan said. While global warming is likely to be contributing to these changes, the scientists said local factors were also at play.

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Heat hotspots

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Northwestern India showed the strongest trend towards extreme heat, with large-scale aridity, declining soil moisture and intense heating of the land surface among the contributing factors, the researchers said, describing their findings in the *International Journal of Climatology*.

Maximum temperatures are rising also across southern India, where the researchers say declining rainfall, the urban heat-island effect and other climate-related factors may be combining to intensify heat.

The study has found that parts of the eastern coastal regions and southern India are drying the fastest, with persistent drought hotspots in Odisha, Andhra Pradesh and Tamil Nadu. The Northeast, by contrast, is increasingly ex-

periencing heavier single-day downpours.

The Northeast is warming rapidly at night, leading to very few cold nights, probably because of a combination of regional warming and reduced forest-cooling effects.

"Most previous analyses of climate change had focused on individual extreme events, whether extreme heat or extreme rainfall, or drought-like conditions," said Thota Mohan, a scientist at the National Centre for Medium Range Weather Forecasting and the study's lead author.

"We combined seven measures of extreme weather to obtain a single index of extreme climate. This allows us to determine the most relevant changes in the extremes across specific regions. It allows us to see the contrasts across regions much better."