

Rising Heatwaves in India: The Case of Jharkhand

A heatwave, defined by an extended period of unusually high temperatures, presents a significant environmental and public health challenge. The increasing frequency of heatwaves, their expansion into regions previously unaffected, and their occurrence at a typical time of the year signal a growing concern. Projections by the Intergovernmental Panel on Climate Change (IPCC) suggest that these events will become more frequent as global warming continues.

A heat wave, as per the India Meteorological Department (IMD), occurs when temperatures hit at least 40°C in plains or 30°C in hilly areas. It's termed severe if the rise is 7°C or more above normal. In places where 40°C is common, a 4–5°C rise signals a heat wave, while 6°C or more marks a severe one. Any region hitting 45°C or more qualifies as a heat wave zone, regardless of its usual climate.

According to IMD data, the forecast for the number of heatwave days across the country during the April to June 2025 season indicates that above-normal heatwave days are likely in parts of the Peninsula, Central India, East India, and the plains of Northwest India

Trend Analysis of Extreme Heat & Heatwaves in Jharkhand

Jharkhand has witnessed a significant rise in extreme heat events over the past three and a half decades, with heatwaves becoming more frequent and intense between 1990 and 2024. **The state experienced a total of 590 heat wave days over the 35-year study period. A clear seasonal concentration of heat wave events is observed, with May contributing the highest number (275 days), followed by April (183 days) and June (132 days).** This seasonal clustering is consistent with the regional climatology, where pre-monsoon months typically experience high solar insolation, low humidity, and suppressed convective activity factors conducive to extreme heating of land surfaces.

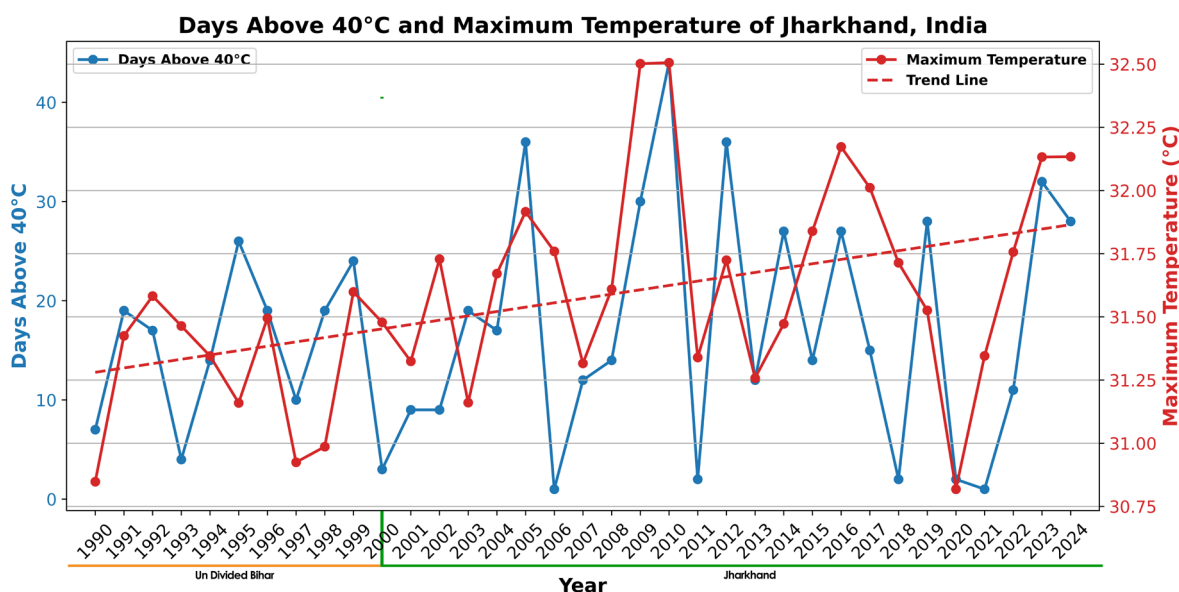


Figure 1: Yearly mean temperature trend and number of heatwaves from 1990 to 2024 over Jharkhand.
Data Source: IMD

A trend analysis of annual heat wave days reveals a 300% increase in frequency from 1990 to 2024, indicating a statistically significant intensification of extreme temperature events. The estimated linear trend slope suggests an annual increase of 0.13 heat wave days/year (Figure 1).

Parallel analysis of mean summer temperatures (April - June) shows an upward trend of 0.017°C/year, amounting to an overall 7.69% temperature rise over the study period (Figure 2). This reflects a warming rate slightly higher than global averages, emphasising regional climate sensitivity.

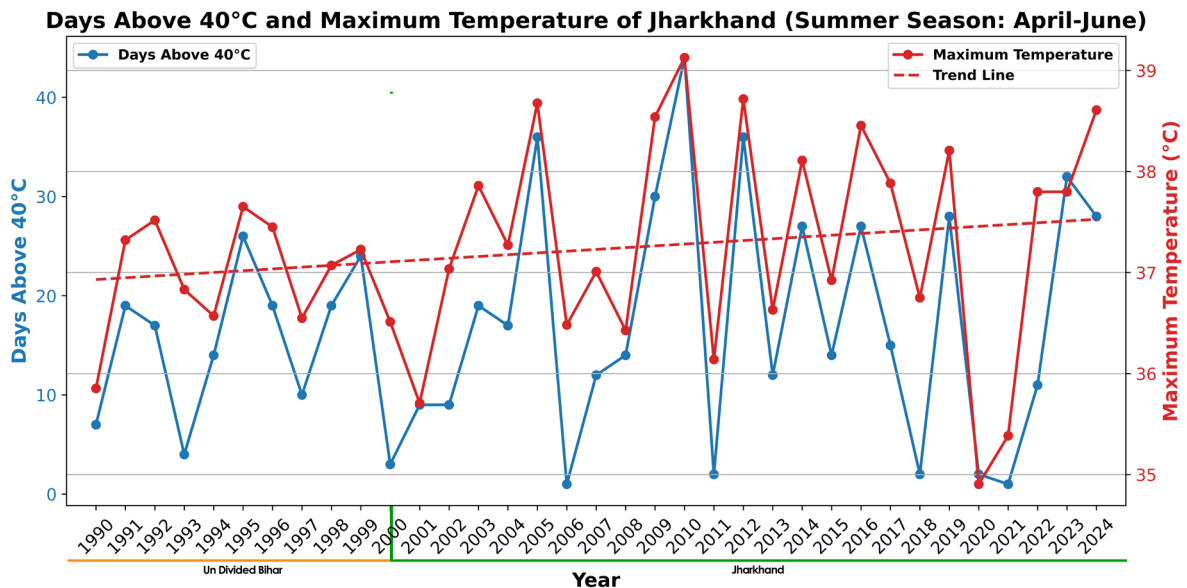


Figure 2: April, May and June (Summer Season) mean Yearly temperature trend and number of heatwaves from 1990 to 2024 over Jharkhand. Data Source: IMD

Heat Wave Frequency and Intensity from 2020 to 2024

A clear escalation in the frequency and intensity of heat waves from 2020 to 2024. In 2020, heat waves were minimal, with only two days in late May exceeding significant temperature thresholds. However, **each subsequent year saw an increase in both the number and severity of heat waves**. By **2022**, there were 7 notable heat wave events in April and May, with temperatures frequently surpassing previous years' peaks.

This trend intensified in **2023**, with 12 prolonged periods of extreme heat, particularly in the summer months. The year **2024** marked the most severe activity, with 21 days of sustained high temperatures from April to June, indicating a sharp rise in heat wave frequency and intensity over the five-year period (Figure 3).

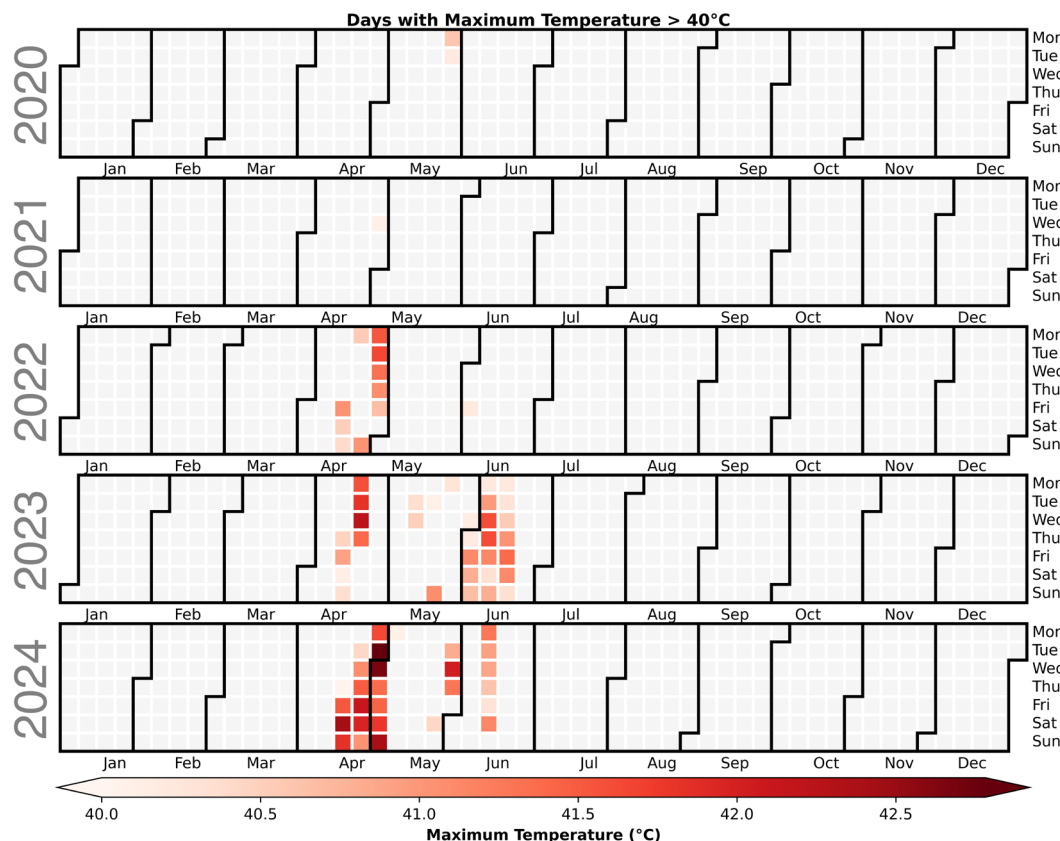


Figure 3: Daily Maximum Temperature from 2020 to 2024 over Jharkhand.
Data Source: Indian Meteorological Department

Regional Heatwave Trend in Jharkhand

Western and central districts including Garhwa (1,188 days / 34 days per annum), Palamu (993 days / 29 days per annum), Latehar (935 days / 27 days per annum), and Simdega (827 days / 24 days per annum) consistently reported higher frequencies of heatwave occurrences, as shown in Figure 4. These regions are predominantly characterized by rocky terrain, lateritic soils, and sparse moisture retention capacity, which contribute to rapid surface heating. Their western inland location exposes them to hot, dry westerly winds from central and northwestern India during pre-monsoon months, intensifying daytime temperatures. The continental climatic setting of this zone far from moderating influences like large water bodies results in greater diurnal temperature variation and prolonged periods of high heat. In contrast, **Godda** and **Sahibganj** recorded the lowest number of heat wave days (87 days each), likely due to their proximity to the Santhal Pargana plateau and the Rajmahal Hills, which are marked by terrain and elevated landforms.

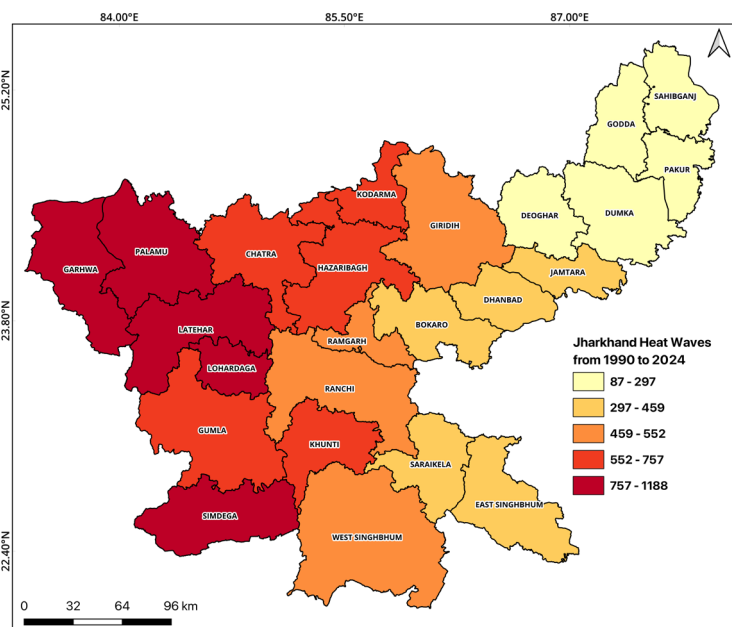


Figure 4: District-Wise Number of heat waves from 1990 to 2024 in Jharkhand, India. Data Source: Indian Meteorological Department

Key Highlights

- 590 heatwave days recorded in Jharkhand over 35 years (1990–2024).
- May accounts for the highest number of heatwave days (275), followed by April (183) and June (132).
- 300% increase in annual heatwave frequency observed from 1990 to 2024.
- Heatwaves are increasing at a rate of +0.13 days/year, showing significant intensification.
- Mean summer temperature (Apr–Jun) increased by 0.017°C/year, totaling a 7.69% rise over the study period.
- Year 2024 saw the highest intensity with 21 heatwave days, up from just 2 days in 2020.
- Western & central districts like Garhwa (1,188 days) and Palamu (993 days) recorded the highest heatwave occurrences.
- Eastern districts like Godda and Sahibganj reported the lowest heatwave days (87-297).
- Dry westerlies and poor moisture retention in lateritic soils fuel intense heating in western Jharkhand.

The Way forward

Heat wave mitigation measures are essential to reduce the health, economic, and environmental impacts of extreme heat, especially in urban and vulnerable rural settings. These measures are generally categorised into short-term (emergency response) and long-term (planning and policy) strategies.

To effectively address the growing threat of heat waves in Jharkhand, it is essential to implement a comprehensive strategy that includes strengthening public awareness campaigns in local languages, enhancing health system preparedness with adequate resources and staff training, and improving urban planning through increased green spaces and reliable water and power supply.

Regularly updating and enforcing local heat action plans, fostering collaboration among government, NGOs, and communities, and integrating lessons from recent heat events will be crucial for building long-term resilience and minimising the health and economic impacts of extreme heat in the state.

Scan here to read the report



For further details, please contact:

Centre for Environment and Energy Development (CEED)

Email: trinath@ceedindia.org; info@ceedindia.org