Heat Waves

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Why is in news? Will India experience more heat wave days this summer?

The India Meteorological Department (IMD) announced above-average heat wave days for India, impacting southern, central, east, and northwestern regions. The announcement comes even as India is already struggling to keep up with its power demand.

A Reuters analysis reported that **India's hydroelectricity output fell at the steepest pace in at least 38 years**.

Hydroelectric output will remain low in the coming months, leading to a greater dependence on coal at a time when India has, in its **Nationally Determined Contributions under the Paris Agreement**, promised to reduce the emissions intensity of its GDP by 45% by 2030, compared to the 2005 level.

What does the forecast say?

The IMD forecast has said most of India will experience **above-normal maximum and minimum temperatures**.

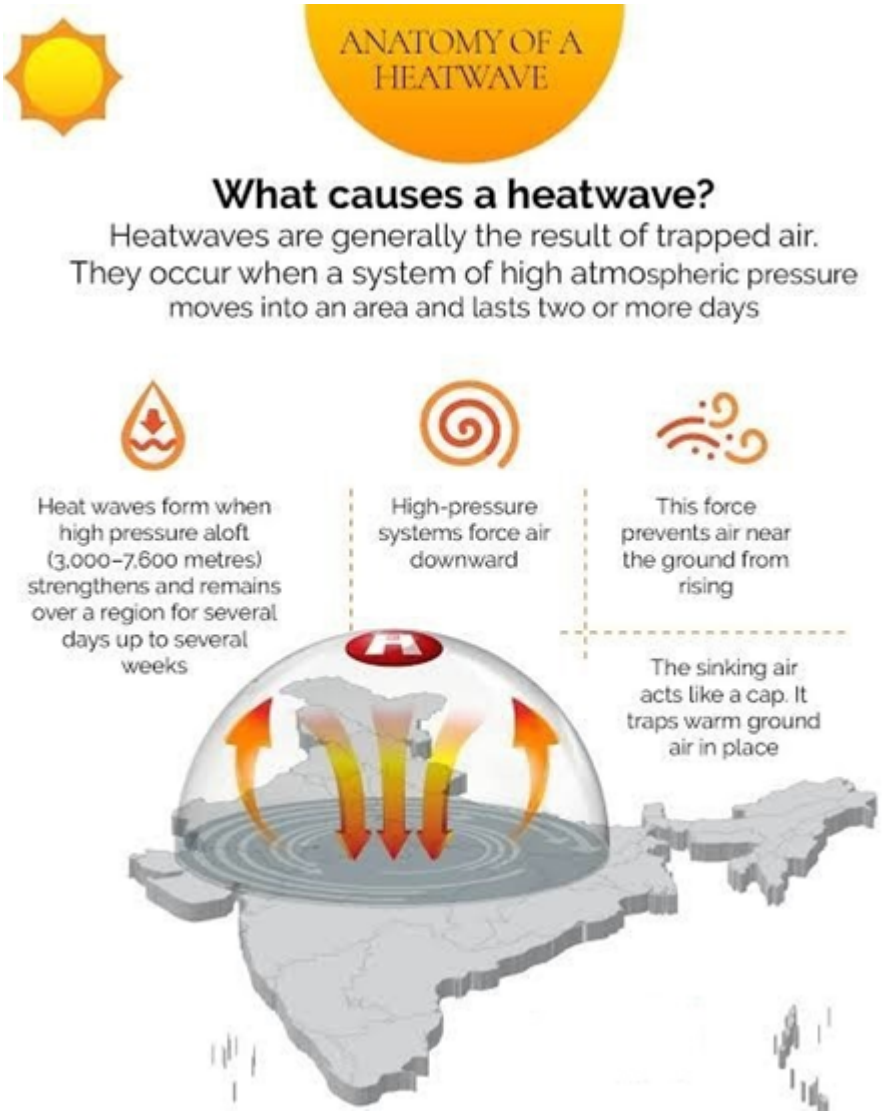
The El Niño event, which **causes weak rainfall and more heat over India**, has weakened since the beginning of the year, the forecast noted.

However, **moderate El Niño conditions** still exist over the equatorial Pacific, increasing the sea surface temperature.

The **heat redistribution affects airflows above the ocean**. Since the Pacific Ocean covers almost a third of the earth, changes in its temperature and changes in wind patterns can disrupt weather worldwide.

January 2024 was the warmest in 175 years, the U.S. National Oceanic and Atmospheric Administration noted. The average global land and ocean surface temperature was also higher.

The **El Niño is, however, likely to weaken during the upcoming season**. Some models have even predicted the possibility of La Niña conditions developing during the monsoon, which can intensify rainfall across South Asia.



Heat wave:

A **period of abnormally high temperatures** is called a heat wave.

The IMD declares a heat wave if the **maximum temperature** of a weather station **reaches at least 40 degrees C** in **the plains** and **at least 30 degrees C in hilly regions**, with a departure of **around 4.5-6.4 degrees C from the normal maximum temperature**.

The IMD can also declare a heat wave if the actual maximum temperature **crosses 45 degrees C,** and a '**severe heat wave'** if it crosses **47 degrees C**.

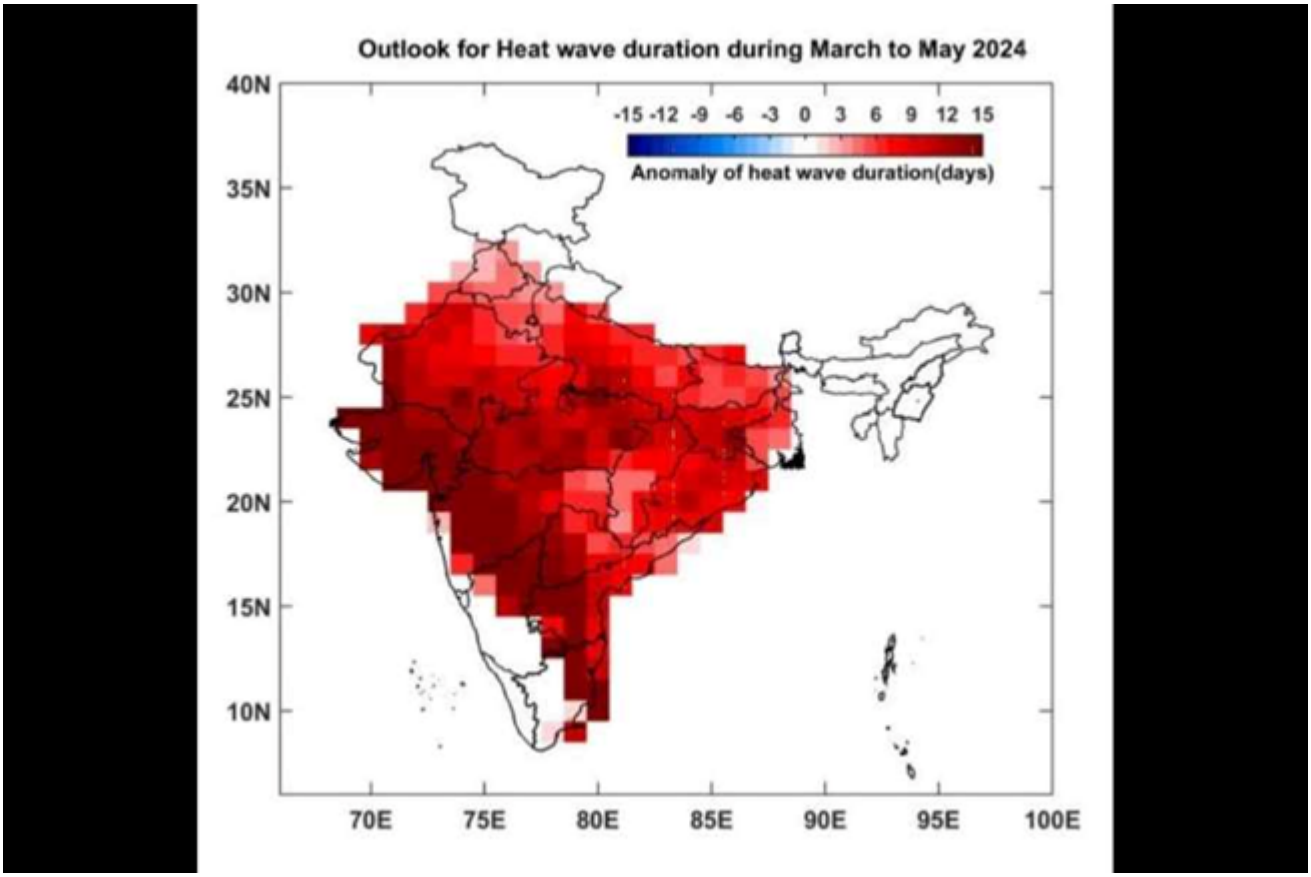
Qualitatively, a heat wave can also occur when the temperature of the air becomes fatal to the human body.

Heat waves in India are typically recorded **between March and June and tend to peak in May**.

Heat Index:

The Heat Index is a parameter that considers **both temperature and humidity** to calculate the apparent temperature or "feel like" temperature for human beings.

It helps in **understanding the impact of humidity on high temperatures** and how it contributes to human discomfort during hot weather.



The Heat Index has been launched on an **experimental basis by the India Meteorological Department** (IMD).

It aims to **provide general guidance for regions experiencing higher apparent temperatures** causing discomfort to people.

High Heat Index values indicate a greater risk of heat-related stress and health issues. It serves as a warning for potential heat-related illnesses and dangers.

The Heat Index categorizes the apparent temperature into different levels using colour codes:

Green: Experimental heat Index less than 35°C.

Yellow: Experimental heat Index in the range 36-45°C.

Orange: Experimental heat Index in the range 46-55°C.

Red: Experimental heat Index greater than 55°C.

Favourable conditions for Heat wave:

Transportation / Prevalence of hot dry air over a region (There should be a region of warm dry air and appropriate flow pattern for transporting hot air over the region).

Absence of moisture in the upper atmosphere (As the presence of moisture restricts the temperature rise).

The sky should be **practically cloudless** (To allow maximum insulation over the region).

Large amplitude anti-cyclonic flow over the area.

It is occurring mainly during March to June and in some rare cases even in July but peak month of the heat wave over India is May.

How do heat waves occur in India?

Heat waves are formed for **one of two reasons** - warmer air is flowing in from elsewhere or it is being produced locally. It is a **local phenomenon** when the air is warmed by higher land surface temperature or because the air sinking down from above is compressed along the way, producing hot air near the surface.

A study published on February 20, 2023, in **Nature Geoscience** offers explanations as to how different processes contribute to the formation of a heat wave.

In spring, India typically has **air flowing in from the west-northwest**. The **Middle East is warming faster** than other regions in latitudes similarly close to the equator and serves as a source of the warm air that blows into India.

Air flowing in from the northwest rolls in over the mountains of Afghanistan and Pakistan, so some of the compression also happens on the leeward side of these mountains, entering India with a bristling warmth.

The air flowing over the oceans is also expected to bring cooler air, but the Arabian Sea is warming faster than most other ocean regions.

The **strong upper atmospheric westerly winds** that come in from the Atlantic Ocean over to India during spring control the near-surface winds. The energy to run past the earth near the surface, against the surface friction, can only come from above. This descending air compresses and warms up to generate some heat waves.