



Cold Wave

Prelims: Cold Wave, Westerly Winds, IMD, Fog, Indo-Gangetic Plain.

Mains: Factors Responsible for Cold Wave.

Why in News?

Delhi and other parts of northwest India have been **reeling under a Cold Wave since the beginning of 2023.**

- The lowest minimum temperature recorded this month was **1.9 degrees Celsius on January 8**, the second-lowest minimum temperature in January in 15 years.
- Fog and **low cloud coverage brought severe cold day conditions to the region**, when temperatures remained below normal over parts of **Delhi, Punjab, Haryana, Chandigarh, Himachal Pradesh, Rajasthan, Uttar Pradesh and Madhya Pradesh.**

What Factors are Responsible for this Cold Wave?

- **Large Scale Fog:**
 - One of the major factors contributing to colder than normal temperatures over north India in January 2023 is the **large-scale fog cover**, according to [India Meteorological Department \(IMD\)](#).
 - Fog has been lasting for longer durations, **preventing sunlight from reaching the surface and affecting the radiation balance.** There is no heating in the day time, and then **there is the impact of the night.**
- **Foggy Nights:**
 - Foggy or cloudy nights are usually **associated with warmer nights, but if the fog remains for two or three days, cooling begins even at night.**
 - Light winds and **high moisture near the land surface have been contributing to the formation of a blanket of fog** over large swathes of the [Indo-Gangetic plains](#) in the morning.
- **Westerly Winds:**
 - Since there has not been any significant impact of [western disturbances](#) over the region, cold northwesterly winds have also been contributing to low temperatures.
 - Westerly and **northwesterly winds of around 5 to 10 kmph in the afternoon have also been contributing to the dip in temperature**

What is Cold Wave?

- **About:**
 - A cold wave is a rapid fall in temperature **within 24 hours to a level requiring substantially increased protection to agriculture**, industry, commerce, and social activities.
- **Cold Wave Conditions:**

- For the plains, a cold wave is declared when the minimum temperature is **10 degrees Celsius or below and is 4.5 degrees Celsius (C) less than normal for two consecutive days.**
 - A "severe" cold day is when the maximum temperature is at least 6.5 notches below normal.
- For coastal stations, the **threshold value of minimum temperature of 10 degree Celsius is rarely reached.** However, the local people feel discomfort due to the wind chill factor which reduces the minimum temperature by a few degrees depending upon the wind speed.
 - A wind chill factor is a measure of the cooling effect of the wind on the temperature of the air.
- **India's Core Cold Wave Zone:**
 - **India's 'core cold wave zone'** covers Punjab, Himachal Pradesh, Uttarakhand, Delhi, Haryana, Rajasthan, Uttar Pradesh, Gujarat, Madhya Pradesh, Chhattisgarh, Bihar, Jharkhand, West Bengal, Odisha and Telangana.
- **Causes of Cold Wave in India:**
 - **Absence of Cloud Cover in the Region:** Clouds trap some of the outgoing infrared radiation and radiate it back downward, warming the ground.
 - Snowfall in the upper Himalayas that has blown cold winds towards the region.
 - **Subsidence of Cold Air over the Region:** Subsidence is the downward movement of cold and dry air closer to the surface.
 - **La Nina:** Prevailing **La Nina** conditions in the Pacific Ocean. La Nina is the abnormal cooler sea surface temperatures reported along the equatorial Pacific Ocean and it is known to favour cold waves.
 - During La Nina years, the severity of cold conditions becomes intense. The frequency and area covered under the grip of a cold wave becomes larger.
 - **Western Disturbances:** Western disturbances can cause cold waves in India. Western disturbances are weather systems that **originate in the Mediterranean Sea and move eastward**, bringing cold winds, precipitation and cloud cover to the northwest regions of India. These disturbances can lead to a drop in temperature and cause cold wave conditions. However, not all western disturbances bring cold wave conditions.

What is the India Meteorological Department?

- IMD was established in 1875.
- It is an agency of the Ministry of Earth Sciences of the Government of India.
- It is the principal agency responsible for meteorological observations, weather forecasting and seismology.

Source: IE