



## Mains Practice Question

**Q.** Discuss the role of western disturbances in causing cold waves in India and explain how La Nina conditions can affect the severity of cold waves. (150 words)

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### Approach

- Start your answer by discussing the role of western disturbance in causation of cold waves.
- Discuss how La Nina affects the severity of cold wave.
- Conclude accordingly.

### Introduction

- 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.
- The criteria required for Cold wave formation in India as per the Indian Meteorological Department (IMD) are:
  - Minimum temperature recorded by a meteorological station on the plains must be 10 degrees Celsius or less.
  - For high-altitude hills, the minimum must be below or at 0 degrees.
  - The highest temperature must be 4.5-6.4 degrees Celsius below normal.

### Body

- Western disturbances are weather systems that originate in the Mediterranean region and play a critical role in the meteorology of the Himalayan region, including India.
  - These weather systems can cause a variety of extreme weather events such as crop damage, landslides, floods, avalanches, cold wave conditions and dense fog.
- **Role of Western Disturbances in causing Cold Waves in India:**
  - As the western disturbance moves towards India, it brings with it **moisture-laden winds** which replace chilly and dry northwesterly winds with warm and wet easterly breezes.
  - This change in wind direction can lead to a **drop in temperature and the formation of cold waves.**
  - Additionally, the excessive precipitation caused by western disturbances can lead to **dense fog, which can further reduce visibility and increase the severity of the cold wave conditions.**
- **La Nina and Cold Waves:**
  - La Nina is a weather phenomenon characterized by cooler-than-average sea surface temperatures in the central and eastern tropical Pacific Ocean.
    - During La Nina episodes, the Indian monsoon is typically weaker, which can lead to less rainfall and an increased likelihood of droughts in India.
    - This can lead to a drop in temperature and the formation of cold waves.
    - Furthermore, the **weaker monsoon can also lead to an increased frequency of western disturbances,** which can further increase the likelihood and severity of cold wave conditions.

## Conclusion

- Western disturbances play a critical role in causing cold waves in India. The moisture-laden winds and excessive precipitation caused by these weather systems can lead to a drop in temperature and the formation of cold waves.
  - Additionally, La Nina conditions can affect the severity of cold waves by weakening the Indian monsoon and increasing the likelihood of droughts.

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