

# **Understanding La Niña**

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## **Understanding La Niña: Impacts and Delays in 2024**

#### What is La Niña?

La Niña is a phase of the El Niño-Southern Oscillation (ENSO), characterized by cooler-thanaverage sea surface temperatures in the eastern and central Pacific Ocean. It is the opposite of El Niño, which causes warming in the same region. Both phenomena have significant impacts on global weather patterns.

#### How Does La Niña Affect Global Climate?

- India: Leads to normal or above-normal monsoon rainfall, benefiting agriculture.
- Africa: Can cause drought-like conditions in specific regions.
- Atlantic Ocean: Intensifies hurricanes.
- United States: Brings increased rainfall to southern states.

### La Niña and India's Climate

Winter Effects

- Colder Winters: La Niña winters in northern India are marked by colder nights, but daytime temperatures may be slightly higher.
- Wind and Pollution:
  - Higher wind speeds help disperse air pollution, improving air quality.
  - A lower Planetary Boundary Layer Height (PBLH) can trap pollutants near the ground, worsening pollution.

#### **Monsoons and Summers**

- Enhanced Monsoons: La Niña years (e.g., 2020-2022) often result in normal or abovenormal rainfall.
- Relief from Heat: La Niña reduces summer heat, providing relief from the intense heatwaves typical of El Niño years.
- El Niño Comparison: El Niño summers are hotter and disrupt monsoons, often causing droughts. For instance, 2023, an El Niño year, experienced below-normal rainfall.

#### Why is La Niña Delayed in 2024?

Typically, La Niña develops during the **pre-monsoon or monsoon season**. However, in **2024**, its onset has been **unusually delayed**, with the **Oceanic Niño Index (ONI)** at **-0.3°C** (below the **-0.5°C threshold** required for La Niña).

If La Niña forms in late **2024** or early **2025**, its impacts could include:

- Cooler Winters: Northern India may experience harsher winters.
- Stronger Monsoons: Enhanced monsoon rainfall in summer 2025.

#### Meteorological Indices to Identify La Niña

La Niña is officially declared based on the following indices:

- Oceanic Niño Index (ONI): Tracks average sea surface temperature anomalies.
- Persistence Rule: ONI values must remain at or below -0.5°C for five consecutive readings.

#### **Climate Change and ENSO Events**

Rising ocean and atmospheric temperatures due to climate change are expected to increase the frequency and intensity of both La Niña and El Niño events. Extreme La Niña events could amplify impacts such as harsher winters and heavier rainfall in India.

#### Significance of La Niña for India

- Agriculture: Boosts crop production with stronger monsoons, supporting farmers.
- Water Resources: Enhances reservoir levels, alleviating water scarcity.
- Energy: Increased rainfall aids hydropower generation.
- Heat Relief: Reduces the severity of heatwaves compared to El Niño years.

#### Conclusion

The **delayed onset of La Niña** in **2024** adds uncertainty to its potential effects on winter and monsoons. However, if it materializes in **early 2025**, India could benefit from a **robust monsoon season**, critical for agriculture and water resources.

**Monitoring ENSO patterns** is essential for **understanding and mitigating the climatic impacts** of these global phenomena.