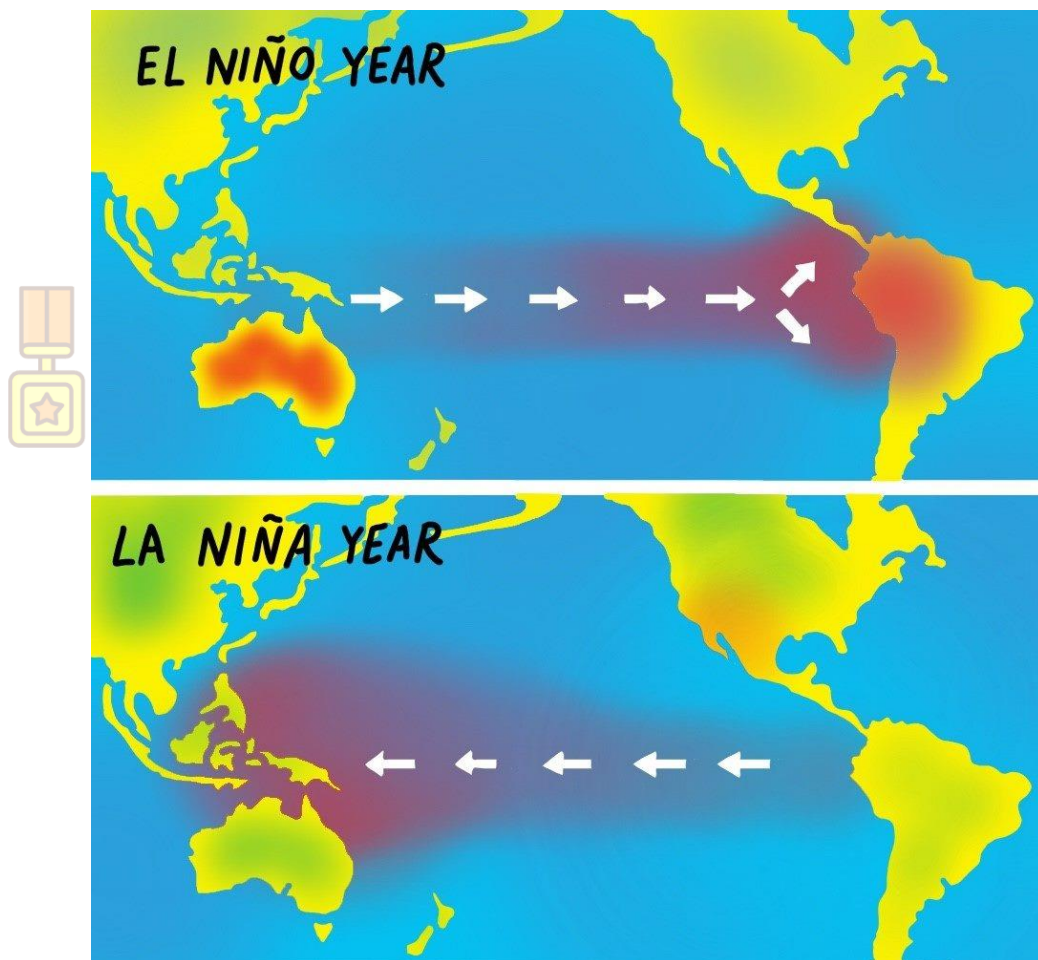


# La Nina Impacted Air Quality In India

## Why In News

- **Monsoon rainfall** over India is known to be strongly influenced by El Nino and La Nina events, the alternating warming and cooling of the **eastern Pacific Ocean** that impacts weather across the world. A new study by Indian researchers has now suggested that even air quality in the country could be influenced by the two weather events.



## All You Need To Know

- The study, by researchers at the Bengaluru-based **National Institute of Advanced Studies** and Pune-based **Indian Institute of Tropical Meteorology**, has argued that the **unusual air quality** in some Indian cities in the winter of 2022 could be attributed to the record-breaking spell of La Nina prevailing at that time.



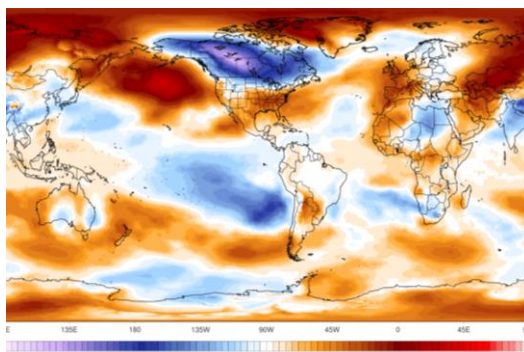
- This is the **first time that air quality** in Indian cities has been linked to a La Nina event — and indirectly to climate change, which is making El Nino and La Nina more severe.
- During October to January, northern Indian cities, particularly Delhi, experience very high concentrations of **PM2.5**. A **variety** of meteorological factors — temperature, moisture, heaviness in air, wind speed and direction — play a role in trapping pollutants in the lower levels of the atmosphere.



- These factors are also responsible for **transporting pollutants** from other regions, particularly those generated by agriculture waste burning in Punjab and Haryana, to Delhi and adjoining areas.
- The **western and southern parts** of the country have always had relatively **lower levels of pollution**, because of their proximity to oceans.
- The winter of 2022, however, showed a significant deviation from this normal. Northern Indian cities, **including Delhi, were cleaner than usual**, while cities in the west and the south, like **Mumbai, Bengaluru and Chennai**, experienced worse-than-usual air quality.

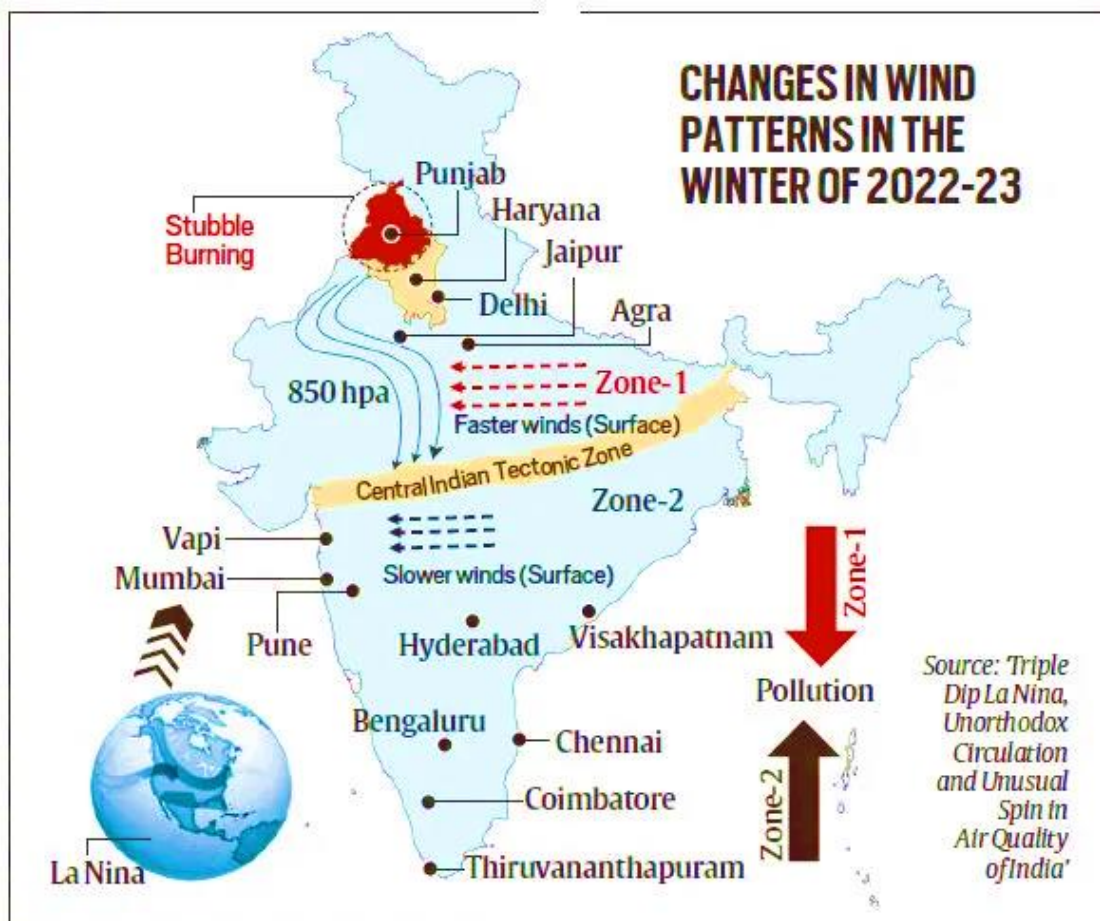


- The study said **PM2.5 concentrations in Ghaziabad** that winter saw a **reduction of about 33% from normal**, while in **Noida**, the concentration was **28% below normal**.
- **Delhi saw a reduction of about 10%**. Simultaneously, the concentrations in **Mumbai rose by 30%**, while **Bengaluru registered a 20% rise**.
- The most crucial factor in explaining the **anomaly of winter 2022** was a change in the normal wind direction.



- During this time, **wind usually blows in the northwesterly direction**: for example, from Punjab towards Delhi and further into the Gangetic plains. This is one of the main reasons why agricultural waste pollutants in Punjab and Haryana flow into Delhi.

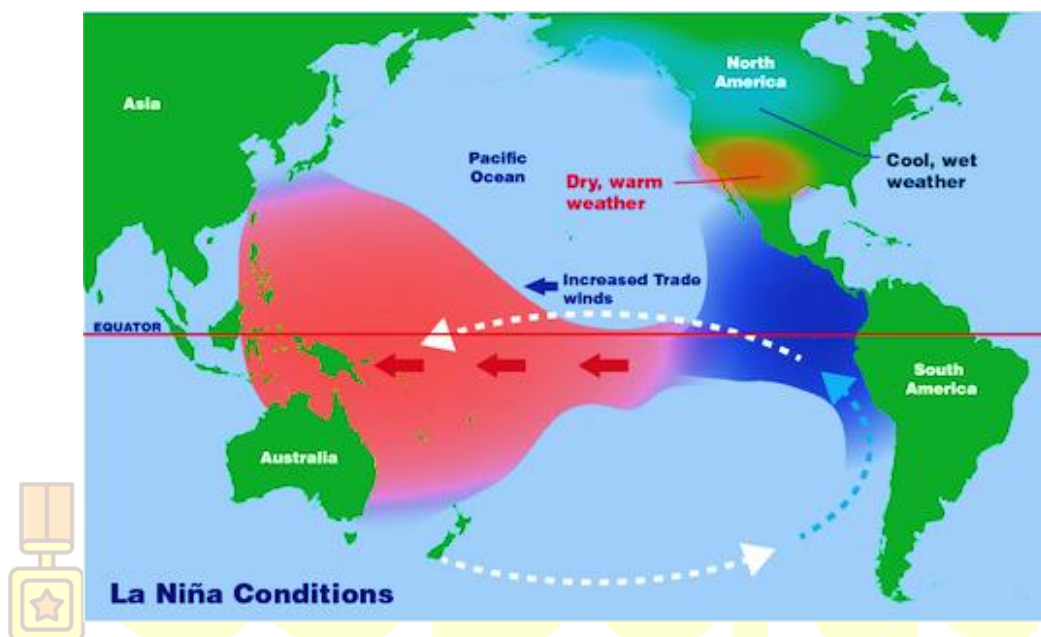
- In the winter of 2022, however, the **wind circulation was in the north-south direction**. The pollutants being carried from Punjab and Haryana bypassed Delhi and surrounding areas and flew over Rajasthan and Gujarat to southern regions.
- “There was **no change in the local sources of emissions** in Delhi and Mumbai. But the additional pollutant load from the northern states, which usually lands in Delhi and surrounding areas, moved in a different trajectory and reached peninsular India, some landing in Mumbai as well,” explained Gufran Beig, the lead researcher and one of the leading air pollution experts in the country.
- The **local circulation of wind near Mumbai** also had an anomalous behaviour that year. Wind currents alternate between blowing from the land to the sea every few days.



- When blowing from the land towards the sea, the winds carry pollutants out of the city. **In 2022, however**, instead of changing direction every four to five days, the winds persisted in one direction for more than a week or 10 days, leading to greater accumulation of pollutants in Mumbai.



- Beig said the **wind behaviour in both cases** had something to do with the extended La Nina which, by the winter of 2022, had been persisting for an unusually long three years.
- “When we used the **global air circulation** data as a result of La Nina in our computer models, we found the emergence of wind patterns over the Indian region that were very similar to the observed changes.



- When we ran the models with data from previous years, when a strong La Nina was not present, these **anomalous wind patterns disappeared**. It showed a strong sensitivity to La Nina conditions,” Beig said.
- Beig said not all **La Nina events might produce noticeable** changes in wind circulation over India. “This one was a particularly strong event. And the impact on air circulation became evident only in the third year of La Nina. So, there may be an accumulative effect,” he said.
- He said it was **not yet entirely clear whether El Nino** would produce an opposite effect for air quality over India.
- The study did add that changes in **wind patterns were not the only reasons** for the unusual trends in air quality that year.
- It mentioned local meteorological conditions, unrelated to La Nina, that could also have resulted in the reduction of pollutant concentrations over northern India.