

## ***Winter Air Pollution in Northern Part of India***

The Centre for Science and Environment (CSE) has analysed air quality trends with special focus on cities outside Delhi and the National Capital Region (NCR). The latest analysis by the CSE has found that when pollution spikes during winter, entire northern India experiences smog episodes.

### **What is Particulate Matter?**

- Particulate Matter (PM), also called particle pollution, is a term for a mixture of solid particles and liquid droplets found in the air.
- It includes:
  - PM 2.5: It refers to fine particulate matter smaller than 2.5 micrometres in diameter.
  - PM10: inhalable particles, with diameters that are generally 10 micrometres and smaller.
- Sources of PM: Some are emitted directly from a source, such as construction sites, unpaved roads, fields, smokestacks or fires.

This analysis aims to understand the synchronised pattern of pollution during winter when atmospheric changes entrap pollution across the region. This analysis has covered 137 continuous ambient air quality monitoring stations (CAAQMS) spread across 56 cities in the six states. CAAQMS facilitates in measuring a real time monitoring of Air Pollution, including particulate matter, all round the year.

The northern region has been divided into five sub-regions which include:

1. Punjab and Chandigarh
2. NCR (includes Delhi and 26 other cities/towns that fall within NCR)
3. Haryana (excluding cities already included in NCR)
4. Uttar Pradesh (excluding cities in NCR)
5. Rajasthan (excluding cities in NCR).

This is an assessment of annual and seasonal trends in PM 2.5 concentration for the period 1st January 2019 to 30th November, 2021.

### **Methodology and Data:**

A huge volume of data points have been cleaned and data gaps have been addressed based on the USEPA (United States Environmental Protection Agency) method. Meteorological data for the analysis is sourced from the Palam weather station of the India Meteorological Department (IMD). Fire count data is from National Aeronautics and Space Administration (NASA)'s Fire Information for Resource Management System, specifically the Visible Infrared Imaging Radiometer Suite (VIIRS). Estimates of contribution of farm stubble fire smoke to Delhi's air quality is sourced from the Union Ministry of Earth Science's System of Air Quality and Weather Forecasting and Research (SAFAR).

### **Important Findings:**

- Pollution levels in smaller towns: Most smaller towns have considerably lower annual average PM2.5 levels, but during early winter when the smog engulfs the entire region and farm stubble fires spike it further, smaller towns report levels comparable to Delhi.
- Early winter smog is synchronised across the region, but lasts longer in Delhi-NCR: Normally, the smog episodes of November synchronise across the northern region.

- But they linger longer only in Delhi, NCR and Uttar Pradesh during the rest of the winter.
- Atmospheric changes during winter that lead to inversion, calm conditions, change in wind direction, and seasonal drop in ambient temperature entraps pollution across north India.
- Number of days with air quality in 'very poor' and 'severe' categories: Delhi and NCR cities lead the chart for the most 'severe' days in 2021.
- Cities vulnerable to the pollution build-up: While the whole of north India is vulnerable to the pollution build-up, the overall annual average of Delhi and NCR is among the highest in the region.
- Industrial towns remain vulnerable throughout the year: The heavy and prolonged monsoon this year brought down PM 2.5 levels substantially across the region.
  - Even though the monsoon reduced overall pollution in the region, the levels in industrial cities were comparatively higher than other cities during monsoon.
- Problem of farm fires: Farm fires are one of the biggest episodic events during winter.
- Two levels of analysis have been carried out: The daily trend in fire count and the trend in average Fire Radiative Power (FRP) reported by NASA satellites.
  - FRP is the rate of emitted radiative energy by the fire at the time of observation that is reported in MW (megawatts).
  - FRP is considered a better measure of emissions from biomass burning as intensity of FRP indicates the quantum of biomass burned.
- This year, Punjab has noted the maximum number of fires after Haryana, UP, Rajasthan and Delhi.
- Nitrogen dioxide (NO<sub>2</sub>) levels: There is a significant increase in the amount of NO<sub>2</sub> in air during November compared to October and September.
  - NO<sub>2</sub> comes entirely from combustion sources and significantly, from vehicles.

The analysis has put a spotlight on the cities of Punjab, Haryana, Uttar Pradesh, Rajasthan, Delhi and NCR to understand the synchronised pattern of pollution during winter when atmospheric changes entrap pollution across the region. It shows even smaller cities with lower annual average levels, record pollution levels that are as bad as or even worse than Delhi. This demands action at scale and speed across all key sectors of pollution in the larger region.

The stark evidence from the northern region underscores the urgent need for harmonised action in all states to ensure access to clean fuels and technology in industry and power plants, massive scaling up of public transport, walking and cycling infrastructure and enhanced municipal services for complete segregation of waste and recycling.

#### Reference

1. <https://www.cseindia.org/winter-smog-not-just-a-delhi-ncr-problem-says-cse-11092>