



## Battling the Winter Smog: Delhi's Pollution Predicament

This editorial is based on [“Delhi's battle against pollution”](#) which was published in The Hindustan Times on 24/10/2023. It talks about the deteriorating air quality and the factors that contribute to the pollution crisis.

**For Prelims:** [Air quality index](#), [SAFAR](#), [stubble burning](#), [Smog](#), [Temperature inversion](#).

**For Mains:** Delhi Air pollution and its causes, Government initiatives and Way Forward

Recently, Delhi got a trailer of the inevitable environmental misery that awaits it in the coming months: Air pollution. On Some day, the [air quality index](#) surpassed 300 on a scale topping out at 500, as a blanket of haze shrouded the skies and a distinct smell of dust and smoke pervaded the outdoors. Luckily, winds picked up the following day and the skies cleared up.

For the 20 million residents of the city (and millions more in neighboring states), it was a relief for the air to improve — from “very poor” to just “poor”.

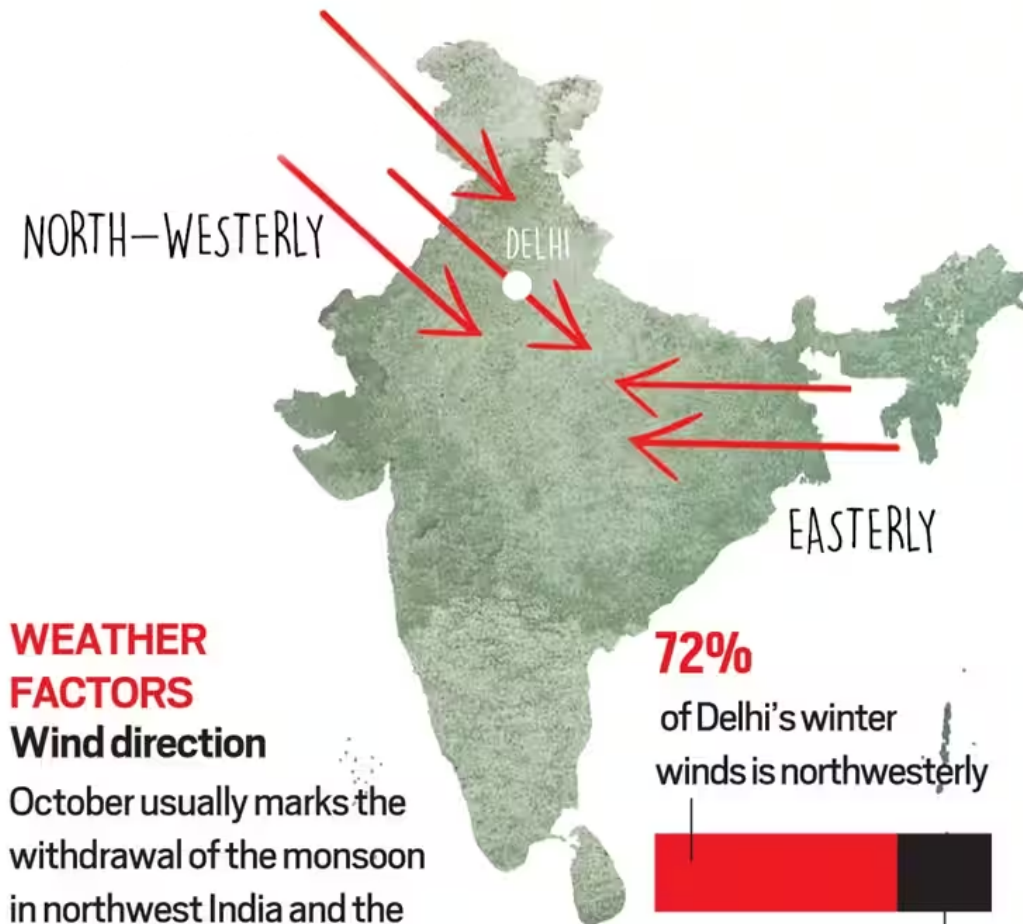
Delhi's pollution is a serious health hazard that affects millions of people every year. According to a study by the [Indian Council of Medical Research](#), **air pollution was responsible for 1.67 million deaths in India in 2019**, and Delhi had the highest per capita mortality rate due to air pollution among all states.

### What are the Reasons behind Rising Pollution levels in Delhi during Winters?

- **Stubble Burning:** Farmers in Punjab and Haryana **burn crop residues** to clear their fields for the next season. This produces a lot of smoke and particulate matter that gets carried by the wind to Delhi and other parts of north India.
  - According to [SAFAR](#), in 2021, [stubble burning's](#) contribution to Delhi pollution was 25%.
  - Stubble burning emits toxic pollutants in the atmosphere containing harmful gasses like Carbon Monoxide (CO), methane (CH<sub>4</sub>), carcinogenic polycyclic aromatic hydrocarbons, [volatile organic compounds \(VOC\)](#).
- **Wind Direction:** Wind direction plays a significant role in Delhi's air pollution, especially during the winter months. The **predominant direction of winds in Delhi is north westerly post-monsoon**. These winds bring dust and smoke to the city when stubble is being burnt in Haryana and Punjab.
  - According to a study conducted by National Physical Laboratory, **72% of Delhi's wind in winters comes from the northwest**.
  - A change in wind direction means these pollutants are not carried into the city.

- For example, on October 25, 2023, the air quality improved marginally when the wind changed direction from north to northeast.

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**WEATHER FACTORS**  
**Wind direction**

October usually marks the withdrawal of the monsoon in northwest India and the direction of wind changes from easterly to north-westerly. The storms carrying dust arrive from Rajasthan, and, sometimes, Pakistan and Afghanistan

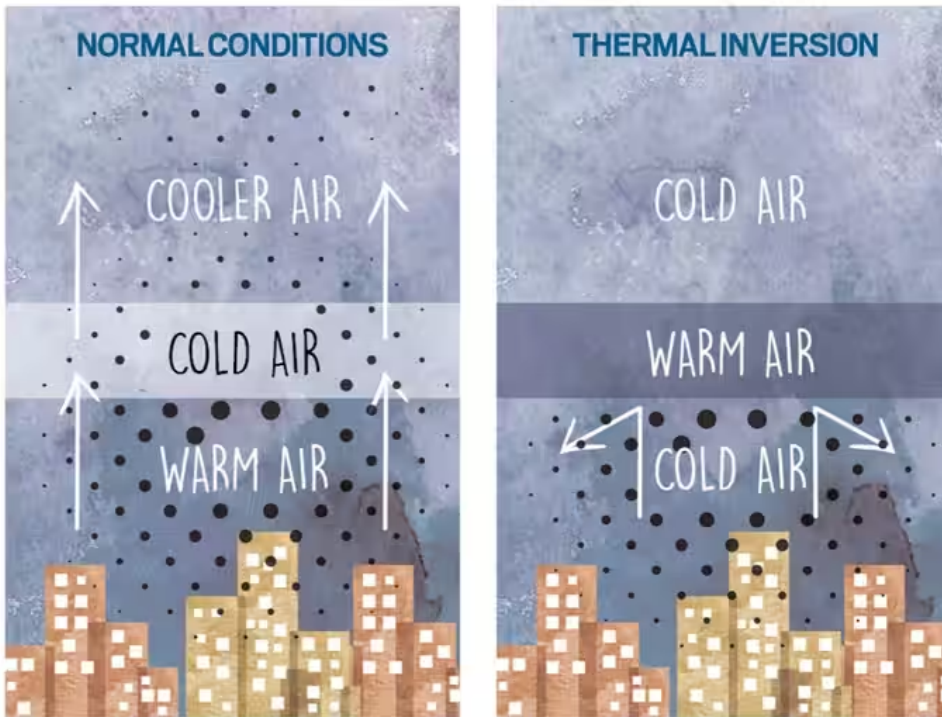
**72%**  
of Delhi's winter winds is northwesterly



**28%**  
comes from the Indo-Gangetic plains



- **Temperature Inversion:** [Temperature inversion](#) is a **phenomenon that occurs when the air temperature increases with altitude, instead of decreasing as usual.** This creates a layer of warm air above a layer of cold air, trapping the pollutants near the ground.
  - Temperature inversion affects Delhi's pollution in winter, when the weather is cold and calm. The **pollutants from stubble burning, vehicle emissions, industrial emissions, and other sources accumulate in the lower atmosphere** and form a thick layer of [smog](#).



### Dip in temperature

When the temperature dips, it lowers the inversion height, which is the layer beyond which pollutants cannot disperse into the upper layer of the atmosphere. The concentration of pollutants in the air increases when this happens

- **Dry and Still Air:** In winters, there is less rainfall and wind speed, which means that the pollutants do not get washed away or diluted by fresh air. The pollutants remain suspended in the air for longer periods of time.



## Wind speed

High-speed winds are very effective at dispersing pollutants, but winters bring a dip in wind speed as compared to summers



- **Vehicular and Industrial Emissions:** Delhi has a large population and a large number of vehicles, which emit harmful gases and particles. The industries in and around Delhi also contribute to the pollution by burning fossil fuels and releasing chemicals into the air.
  - A study by IIT Delhi noted that vehicular emissions contribute around 25% to Delhi's [PM2.5](#) levels.
- **Dust storms, Firecrackers, and Domestic Biomass Burning:** These are some of the other sources of pollution that increase during winters. Dust storms bring dust particles from arid regions, firecrackers produce smoke and metals during Diwali and other occasions, and domestic biomass burning for heating adds to the carbon monoxide and particulate matter in the air.
  - A 2015 study conducted by IIT-Kanpur states that **17-26% of all particulate matter in Delhi in winters is because of biomass burning.**

## Government Initiatives to Control Delhi's Pollution

- **Green War Room:** A nine-member team that monitors the actions taken by 20 government agencies against pollution on a real-time and daily basis.
- **Anti-Pollution Campaign:** Delhi Government has recently launched a major anti-pollution campaign, Yuddh Pradushan Ke Viruddh, which includes a tree transplantation and other such initiatives.
- **Green Delhi App:** A mobile app that allows citizens to report any instances of pollution such as garbage burning, industrial emissions, or traffic congestion.
- **Bio-Decomposer:** A solution developed by PUSA institute that helps farmers decompose the crop residue in their fields without burning it. The government provides free spraying of bio-decomposer in Delhi's farmlands.
- **Water Sprinklers:** The use of water sprinklers, mechanized road sweeping machines, anti-smog guns, and sprinkling facilities on high-rise buildings to reduce dust and particulate matter in the

air.

- **Industry Pollution:** The monitoring of industrial sites and ensuring that they use clean and authorized fuel. The government has also extended piped natural gas (PNG) to industries and set up the country's first e-waste eco-park in Delhi.
- **PUC Certificates:** The enforcement of pollution under control (PUC) certificates for vehicles and banning trucks that carry non-essential goods from entering the city. The government has also hired 1,000 private CNG vehicles to augment the public transport system.
- **Smog Towers:** The installation of smog towers that use large fans and filters to purify the air. The first smog tower has been set up at Connaught Place and has shown positive effects.
- **Pollution Hotspots:** The identification of 21 pollution hotspots in Delhi and deploying special teams to monitor and mitigate the sources of pollution in these areas.

## What Measures should be taken to Control Delhi's Pollution?

- **Congestion Charge:** Implementing a congestion charge for private vehicles during peak hours is an effective way to reduce traffic congestion and encourage the use of public transport or carpooling. The revenue generated from this charge can be reinvested in green projects or used to subsidize electric vehicles, further incentivizing environmentally friendly choices.
  - A congestion charge is a fee that drivers have to pay to enter or use certain areas or roads that are prone to traffic congestion.
- **Cap-and-Trade for Industrial Emissions: A cap-and-trade system sets a limit on industrial emissions and promotes a market-driven approach to reducing pollution.** This system creates financial incentives for industries to reduce their emissions and invest in cleaner technologies, ultimately leading to a decrease in overall pollution.
- **Drones for Pollution Control:** The use of drones **to identify and disperse pollution hotspots** is a proactive approach to managing air quality. This technology can help mitigate the immediate impact of pollutants on the environment and public health while also monitoring and identifying sources of pollution for targeted intervention.
  - For instance, the New Engineering Education Transformation (NEET) cohort's **drone system is designed to provide real-time air quality data with a 15-meter resolution** that is publicly accessible through a user-friendly interface.
- **Vertical Gardens:** Vertical gardens are an aesthetically pleasing and environmentally beneficial addition to urban areas. They not only enhance the visual appeal of the city but also **help purify the air by absorbing carbon dioxide and releasing oxygen**. Additionally, they can provide habitats for birds and insects, contributing to urban biodiversity.
- **Rewards for Low-Carbon Lifestyles:** Encouraging citizens to adopt low-carbon lifestyles through a rewards system is an innovative approach. By **providing incentives like points or vouchers or tax benefits for eco-friendly behaviors such as using public transport or carpooling**, people are more likely to make environmentally conscious choices, reducing their carbon footprint.

### Drishti Mains Question:

Analyze the key factors contributing to Delhi's pollution and suggest measures that could be taken to address the persistent problem of air pollution in Delhi.

## UPSC Civil Services Examination Previous Year Question (PYQ)

### Prelims

**Q. In the cities of our country, which among the following atmospheric gases are normally considered in calculating the value of Air Quality Index? (2016)**

1. Carbon dioxide

2. Carbon monoxide
3. Nitrogen dioxide
4. Sulfur dioxide
5. Methane

**Select the correct answer using the code given below:**

- (a) 1, 2 and 3 only  
(b) 2, 3 and 4 only  
(c) 1, 4 and 5 only  
(d) 1, 2, 3, 4 and 5

**Ans: (b)**

### **Mains**

**Q.** Describe the key points of the revised Global Air Quality Guidelines (AQGs) recently released by the World Health Organisation (WHO). How are these different from its last update in 2005? What changes in India's National Clean Air Programme are required to achieve revised standards? **(2021)**

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