

Role of Geography and Weather in Delhi's Air Pollution

Why in news?

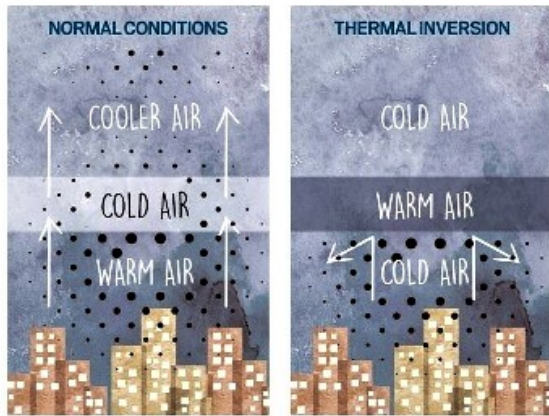
As the Air Quality Index (AQI) in Nation Capital Region dipped to the 'severe' category, Stage 4 of the Graded Action Plan (GRAP) has kicked in.

What exactly is the cause for Delhi's air pollution?

- Air pollution in Delhi, and the whole of the Indo Gangetic plains, is a complex phenomenon that is dependent on a variety of factors.
- **Dust** - Road dust along with construction and demolition dust is the most prominent polluter of air.
- **Vehicles** - Vehicles are the second largest polluter, with 20 % of PM 2.5 load and approximately 9 % of PM 10.
- **Thermal plants** - The coal thermal plants in the immediate 300-km periphery of Delhi and industrial point sources also contribute to the pollution.
- **Open burning** - Open burning of waste by neighbourhoods and municipalities, stubble burning, Diwali crackers, etc. adds to this issue.
- **Geography** - The geographical nature of the region makes Delhi a pollution trap with weather and wind speed playing a key role.

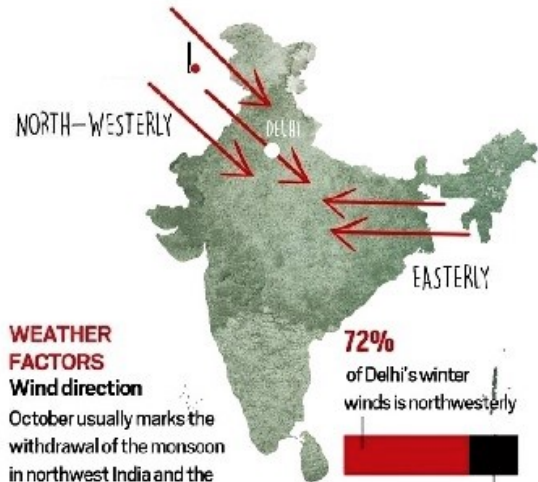
What is the role of weather in Delhi's air pollution?

- **Wind direction** - During the southwest monsoon, the prevalent direction of the wind is easterly.
- The winds travel from over the Bay of Bengal, carrying moisture and rainfall to this part of the country.
- Once the monsoon withdraws, however, the predominant direction of the winds changes to north-westerly.
- These winds carry particulate matter (essentially smoke and soot) from crop-burning in Punjab to the area above Delhi, and then onward down the Gangetic basin.
- **Fall in air temperature** - As it gets cooler, the inversion height (the layer beyond which pollutants cannot disperse into the upper atmosphere) comes down.
- When that happens, larger concentrations of pollutants in the air hang closer to the surface, and lead to worsening AQIs.
- In summer, the ventilation is very strong and the land is so hot that pollutants rise high and dissipate.
- But in October-November, the pollutants are like a lid sitting above the entire Indo-Gangetic basin, perhaps at a height of 1 km.



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



WEATHER FACTORS

Wind direction

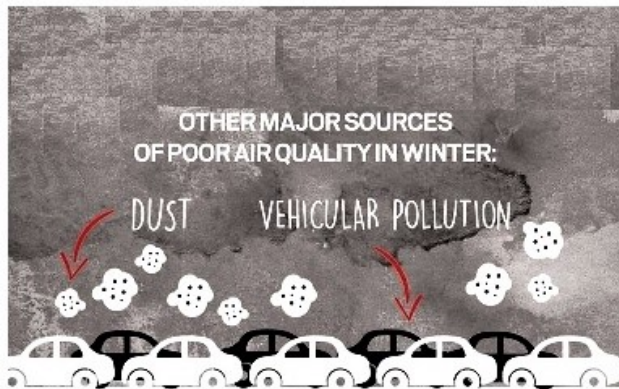
October usually marks the withdrawal of the monsoon in northwest India and the direction of wind changes from easterly to north-westerly. The storms carrying dust arrive from Rajasthan, and, sometimes, Pakistan and Afghanistan

72% of Delhi's winter winds is north-westerly

28% comes from the Indo-Gangetic plains

Source: National Physical Laboratory

DELHI AIR POLLUTION



Cold, dry weather means dust is prevalent in the entire region



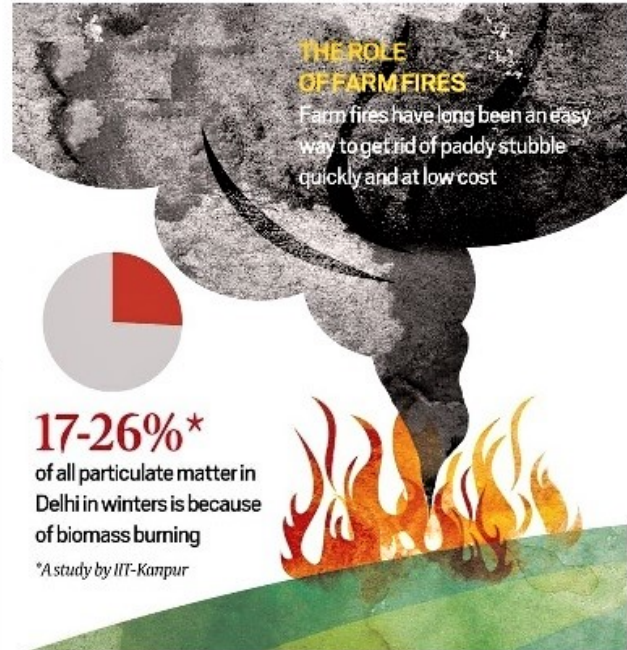
Dust pollution contributes

56%
of the PM10



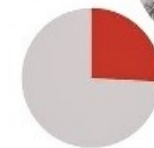
Vehicular pollution contributes

20%
of the PM2.5



THE ROLE OF FARM FIRES

Farm fires have long been an easy way to get rid of paddy stubble quickly and at low cost



17-26%*

of all particulate matter in Delhi in winters is because of biomass burning

*A study by IIT-Kanpur

What about the geography of Delhi?

- Geography plays a major role not just in Delhi, but also in the Indo-Gangetic basin that extends from Haryana in the west to the middle of Bihar in the east.
- This area is like a long valley surrounded by higher structures (Malwa and Deccan plateaus, Aravalli Mountains, the Himalayas).
- This topography makes the Indo-Gangetic plain similar to California, which is peculiarly susceptible to pollution.

References

1. [The Indian Express | Delhi's geography and weather conditions are also fouling its air](#)
2. [The Indian Express | What is GRAP, Delhi-NCR's action plan to combat rising air pollution?](#)

Quick facts

Graded Response Action Plan

- GRAP is a set of emergency measures that kick in to prevent further deterioration of air quality once it reaches a certain threshold in the Delhi-NCR region.
- The GRAP was formulated in 2016 and approved by the Supreme Court in the same year.
- It was notified in 2017 by the Centre, and draws its authority from this notification.
- It was planned after several meetings of EPCA (Environment Pollution (Prevention and Control) Authority) with state government officials and experts.
- The plan is incremental in nature.
- Only when the air quality shifts from poor to very poor, the measures listed have to be followed.
- If air quality reaches the severe stage, [GRAP](#) talks about shutting down schools and implementing the odd-even road-space rationing scheme.

Fight against pollution

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A look at the city's Graded Response Action Plan to fight air pollution

STAGE 1: POOR QUALITY AIR (AQI between 201 and 300)

- Mechanised sweeping, washing of roads
- Enforcing ban on firecrackers, increased scrutiny of vehicles for pollution standards
- Large unregistered C&D sites can be shut

STAGE 2: VERY POOR AIR (AQI between 301 and 400)

- Dust control measures at C&D sites
- Parking fee to surge by 3-4 times
- Stop use of coal/firewood in eateries
- Augmenting frequency of CNG/electric bus and Metro services

STAGE 3: SEVERELY POLLUTED AIR (AQI between 401 and 450)

- Bar BS-III petrol and BS-IV vehicles from roads
- Govts can take decision on shutting primary schools
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- Ban on all non-essential construction work

STAGE 4: SEVERE+ (AQI between 451 and 500)

- Ban on entry of diesel commercial vehicles (barring B6-VI) in Delhi, except those carrying essential commodities or providing essential services
- Odd-even vehicle policy may be rolled out



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