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[News](#) / [Explained](#) / [Everyday Explainers](#) / [PM 2.5, Sulphur Dioxide, and more: What are the pollutants in our air, and how they impact health](#)

PM 2.5, Sulphur Dioxide, and more: What are the pollutants in our air, and how they impact health

High levels of air pollution in north India: The AQI transforms complex air quality data of various pollutants into a single number. Here are the index's eight constituents, the pollutants' sources and why they are cause for concern.

By: [Explained Desk](#)

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Vehicles near the Yamuna River in October 2023, in New Delhi. Vehicular pollution is a significant source of many pollutants in the atmosphere. (Express Photo by Amit Mehra)

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Rising pollution levels in north India have led to focus returning on the Air Quality Index (AQI) score, a measure of air pollution. Delhi, for instance, recorded an AQI score of more than 400 on Monday (November 6). This puts the air in the 'severe' category, with anything beyond 100 considered to be a state of at least moderate pollution on the index.

The AQI transforms complex air quality data of various pollutants into a single number for ease of understanding. The pollutants include PM 10, PM 2.5, Nitrogen Dioxide, Ozone, Carbon, etc. Here is what each of these are, where they come from and how they can impact your health.

What is PM 10 and PM 2.5?

These are extremely fine particulate matter (PM) particles, with the digits accompanying them referring to their diameter. So, PM 10 and PM 2.5 are smaller than 10 and 2.5 microns in their diameter, respectively. One micron is about a thousandth of a millimetre and this tiny size has a role to play in how they impact

human health. The finer the particles are, the more difficult it gets to protect oneself from them.

Due to their size, the PM 2.5 particles can easily bypass the nose and throat and enter the circulatory system. The particles can also lead to chronic diseases like asthma, heart attack, bronchitis and other respiratory problems. Byproducts of emissions from factories, vehicular pollution, construction activities and road dust, such particles are not dispersed and stay suspended in the air that we breathe.

Nitrogen Dioxide (NO₂)

Nitrogen dioxide (NO₂) gets in the air from the burning of fuel, with sources including emissions from vehicles and power plants.

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The United States Environmental Protection Agency (EPA) states that short-term exposure to high levels of NO₂ can aggravate respiratory diseases like asthma, and lead to other problems such as coughing or difficulty in breathing. Long-term exposure may also contribute to the development of asthma and could increase susceptibility to respiratory infections.

As *The Indian Express* reported last week, exposure to NO₂, even for a short duration (between zero and seven days), leads to an increase in the number of emergency room visits by 53 per cent, according to a large study by AIIMS, Delhi.

Ozone (O₃)

Ozone is a gas that is present in the upper layers of the atmosphere, protecting human health from the impact of the Sun's UV rays. However, surface-level ozone is among the most significant air pollutants. It is formed by the reaction of atmospheric pollutants in the presence of sunlight.

According to a 2017 study published in the International Journal of Medical Public Health, "With increase in surface ozone levels, there is likelihood of an increase in

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risk of hospital admissions for Chronic Obstructive Pulmonary Diseases (COPD) and the number of cardiovascular and respiratory deaths.”

Sulphur Dioxide (SO₂)

According to the US government’s Environment Protection Agency, the large source of SO₂ in the atmosphere is the burning of fossil fuels by power plants and other industrial facilities. Additional sources are industrial processes and natural sources such as volcanoes.

As with other gases, SO₂ exposure is harmful to the cardiovascular system and can lead to the development of respiratory illnesses. SO₂ can also react with other compounds to form particulate matter. “At high concentrations, gaseous SO_x can harm trees and plants by damaging foliage and decreasing growth,” EPA states.

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Ammonia (NH₃)

A 2017 NASA-funded study said that in India, “A broad increase in fertilizer use coupled with large contributions from livestock waste have resulted in the world’s highest concentrations of atmospheric ammonia.”

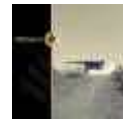
Why is this worrying? While gaseous ammonia is a natural part of Earth’s nitrogen cycle, excess ammonia is harmful to plants and reduces air and water quality.

“In the troposphere – the lowest, most dense part of the atmosphere where all weather takes place and where people live – ammonia gas reacts with nitric and sulfuric acids to form nitrate-containing particles. Those particles contribute to aerosol pollution that is damaging to human health. Ammonia gas can also fall back to Earth and enter lakes, streams and oceans, where it contributes to harmful algal blooms and “dead zones” with dangerously low oxygen levels,” the study said.

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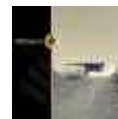
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Lead (Pb)

Lead is a naturally occurring toxic metal found in the Earth's crust. But in increased quantities, exposure to it becomes extremely dangerous to health. Important sources of environmental contamination come from mining, smelting, manufacturing and even recycling activities, according to the WHO. Also, young children are particularly vulnerable to lead poisoning because they absorb four to five times as much ingested lead as adults from a given source.

“Children who survive severe lead poisoning may be left with permanent intellectual disability and behavioural disorders. At lower levels of exposure that cause no obvious symptoms, lead is now known to produce a spectrum of injury across multiple body systems,” the WHO notes.

Carbon Monoxide (CO)

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A toxic, colourless and odourless gas, it is given off when fuel containing carbon, such as wood, coal and petrol, is burned. If CO levels are high enough, a person may become unconscious and die. Long-term exposure has been linked with an increased risk of heart disease.