

Health Impacts of Air Pollution

What is air pollution?

- Air pollution is the contamination of indoor or outdoor air by a range of gasses and solids that modify its natural characteristics. Key health harmful pollutants include particulate matter (PM_{2.5} and PM₁₀)¹, carbon monoxide (CO), ozone (O₃), black carbon (BC), sulfur dioxide and nitrogen oxides (NO_x).
- Air pollution is often not visible to the naked eye as the sizes of the pollutants are smaller than the human eye can detect. The fact that you cannot see the air pollution does not mean that it does not exist. They can become visible in some situations for example in the form of sooty smoke from the open burning of crop residues or other waste, as well as from burning wood, coal, petrol and diesel fuels for cooking and heating, transport or power production.

What are the most health harmful air pollutants?

- The World Health Organization has air quality guidelines for air pollutants which are regarded as most harmful to health. These include ozone, oxides of nitrogen, sulfur dioxide, and carbon monoxide, as well as fine particulate matter. Fine particulate matter (PM 2.5) is the key indicator used in making health estimates of air pollution impacts and is most commonly measured or monitored. The values in the WHO guidelines for PM 2.5 and PM 10 are as follows:

Pollutant	Values	
PM _{2.5}	10 µg/m ³ annual mean	25 µg/m ³ 24-hour mean
PM ₁₀	20 µg/m ³ annual mean	50 µg/m ³ 24-hour mean

Source: WHO 2016. Ambient (outdoor) air quality and health, can be accessed from <http://www.who.int/mediacentre/factsheets/fs313>

What is the current situation in the National Capital Region of India?

- Many areas of National Capital region (NCR) are recording ambient levels of air pollution that exceed thresholds and limits for key air pollutants that pose health risks. On occasions these levels can reach severe levels. During Diwali (19 October 2017), even though there was a ban² by the Supreme Court of India on sale of fire crackers in the NCR area up to 1 November 2017 but the level of air pollutants in Delhi far exceeded the WHO and Indian Government's permissible limits and air quality index was in the severe category. The levels breached the severe category once again on 7 November 2017. As per the Central Pollution

¹ Particulate less than 2.5 micrometers and 10 micrometers respectively

² <http://www.businesstoday.in/current/economy-politics/firecrackers-sale-ban-delhi-ncr-diwali-supreme-court/story/261665.html>

Control Board, the absence of wind and increase of moisture levels led to the pollutants being trapped near to the earth's surface³.

Air quality index of Delhi and National Capital Region from 17 October to 8 November 2017

	Index Value (Average of past 24 hours)							
	17 Oct ⁴	20 Oct ⁵	21 Oct ⁶	23 Oct ⁷	30 Oct ⁸	5 Nov ⁹	7 Nov ¹⁰	8 Nov ¹¹
Delhi	306	403	389	306	328	368	448	478
Faridabad	301	NA*	445	356	NA*	334	409	472
Ghaziabad	367	412	454	395	404	439	475	372
Gurgaon	248	397	345	221	318	345	368	459
Noida	295	402	402	323	332	423	468	469

*NA – not available

(Data from Central Pollution Control Board Air Quality Index Bulletin)

What has been the response of the Government to the current situation?

- A Supreme Court appointed panel has recommended emergency measures like increase up to four times the present parking fees to discourage the use of private cars, and increased frequency of trains and reduced fares for Delhi metro. The Indian Medical Association has declared the situation as a public health emergency and recommended postponement of the Delhi Half Marathon scheduled for 17 November 2017¹².
- The Delhi Government announced closure of all schools in Delhi until 12 November 2017¹³.
- The Delhi Government has issued health advisory urging people to stay indoors as much as possible, and have encouraged using public transport and carpooling. .

What are the main health impacts of particulate matter?

- The health impacts of particulate matter depend on the exposure duration and level of pollution. Importantly individual sensitivity to the health impacts of particulate matter can vary.

³ <http://indiatoday.intoday.in/story/with-wind-completely-absent-delhi-air-quality-plunges/1/1083787.html>

⁴ http://cpcb.nic.in/upload/Downloads/AQI_Bulletin_20171017.pdf

⁵ http://cpcb.nic.in/upload/Downloads/AQI_Bulletin_20171020.pdf

⁶ http://cpcb.nic.in/upload/Downloads/AQI_Bulletin_20171021.pdf

⁷ http://cpcb.nic.in/upload/Downloads/AQI_Bulletin_20171023.pdf

⁸ http://cpcb.nic.in/upload/Downloads/AQI_Bulletin_20171030.pdf

⁹ http://cpcb.nic.in/upload/Downloads/AQI_Bulletin_20171105.pdf

¹⁰ http://cpcb.nic.in/upload/Downloads/AQI_Bulletin_20171107.pdf

¹¹ http://cpcb.nic.in/upload/Downloads/AQI_Bulletin_20171108.pdf

¹² <http://indianexpress.com/article/india/ima-declares-public-health-emergency-state-in-delhi-wants-half-marathon-cancelled-492626/>

¹³ <https://www.ndtv.com/delhi-news/delhi-school-closed-till-sunday-says-minister-cites-poor-air-quality-1772719>

- Increased exposure to particulate matter (PM) is likely to cause acute health reactions such as irritation to eyes, nose, and throat, along with coughing, wheezing and acute lower respiratory infections, and a sore chest. More severe effects may include an increased risk of respiratory infections, exacerbation of asthma, bronchitis or chronic effects including reduced lung function, ischaemic heart disease, stroke, lung cancer and may even cause premature death.
- Short term exposure (hours to days) to high level of pollutants can lead to acute symptoms whereas long term exposure (months to years) to lower level of pollutants can lead to chronic effects.

What are the factors affecting a normally healthy person's vulnerability to air pollution?

People are more vulnerable to having adverse health reactions to air pollution in the following situations:

- **Particularly high concentrations of particulate matter.** A number of factors, including increased burning of fuel for winter, burning of agricultural crop residues, and the weather all can combine to create air pollution peaks. High concentrations of particulate matter are more often found in winter months when the temperature and wind affect the build-up of air pollution and its persistence locally. Normally, when air gets colder, a layer of warm air traps a layer of cold air nearer the ground. This acts like a lid over a cloud of smog and stops it from rising and drifting away.
- **Close proximity to activities generating high levels of pollution** including:
 - Heavy traffic on roads, vehicles not complying to pollution norms;
 - Thermal (coal-based) power plants and other factories emitting polluting smoke;
 - Uncontrolled construction or demolition sites;
 - Use of biomass fuel for domestic energy needs;
 - Burning fire crackers;
 - Burning electronic waste, crop residues, waste from houses, hospitals, etc.

What additional factors can affect a person's vulnerability?

- **Age of person exposed.** Children, especially under-five, and older people are particularly vulnerable.
- **Health status of person exposed.** People, with pre-existing diseases such as asthma and other respiratory diseases, cardiovascular diseases, are at a greater risk of health effects.
- **Pregnant women.** Evidence has shown an increased vulnerability during pregnancy to the effects of particulate exposure with potential effects to the unborn child such as low and pre-term birth weight.
- **Low socioeconomic status.** Persons with low socioeconomic status with a pre-existing disease, poor nutritional status and poor housing conditions, including where household combustion of solid fuels takes place for cooking, heating or lighting. People living on the street and in poor housing are particularly vulnerable.

- **Occupational exposures.** Construction workers, traffic attendants, road sweepers and those working outdoors and in highly polluted settings;
- **Smoking of tobacco products** and exposure to second-hand smoke

2. What can one do to prevent the harmful effects of air pollution?

- Firstly, take all available measures to minimize your exposure to air pollution
 - Find out the nearest pollution monitoring station in the neighbourhood or look for websites with live data on air pollution and regularly check the published levels of air pollution and follow any advice from local authorities to guide your planned activities.
 - Maintain cleanliness inside homes. Wet mopping and dusting is preferable to sweeping or vacuuming (unless your vacuum has a High-Efficiency Particulate Air (HEPA) filter) as these can stir up additional dusts and particles.
 - Create a clean room for sleeping. A good choice would be one with few windows and doors.
 - If the room has windows, keep them closed.
 - Run an air conditioner or air purifier or central air conditioning system if you are certain your air conditioner does not draw air from outdoors and has a filter.
- Secondly, avoid adding to air pollution levels
 - Wood burning stoves, candles, and incense will all add to the existing air pollution levels as they produce particulate matter.
 - Stop use of cigarettes and other smoking products as these will also add to air pollution as well as other adverse health effects
 - Reduce unnecessary travel by cars, scooters and other motorized vehicles. This will not only prevent additional personal exposure but it will also prevent adding to already high pollution levels for others.
 - Do not burn leaves, garbage, crop residue, plastic or other materials. Burning these materials adds greatly to local pollution levels. In residential areas this is particularly hazardous.
- Finally and most importantly visit a doctor or health facility if you are feeling unwell and experiencing adverse effects from air pollution.

3. Air pollution emergencies

What does it mean when there is high air pollution episode “alert” or “emergency”

- This is when daily or hourly concentrations of air pollution rise significantly above normal levels, as advised by the WHO guideline levels and relevant Government standards. In India this is generally when 24hr levels reach a severe level of more than 250 Ug/m³ and remain so for several days.
- In many countries, Governments define air pollution “emergencies” by reference to a daily Air Quality Index (or AQI). These figures often are used to forecast for the days ahead. The Air Quality Index is a national figure based on short-term measurements and is not the same as WHO Air Quality Guidelines which are long-term exposure measurements.
- When there is an air pollution alert, people are more likely to have an immediate health reaction to air pollution, including respiratory or cardiovascular issues. This is particularly the case for vulnerable groups.
- During air pollution emergencies, local authorities may introduce stricter measures to restrict or limit activities such as driving in city areas, increasing the enforcement of laws against open burning of waste and crop residues.

What should one do if there is an air pollution emergency?

- **Check the advice from local authorities to guide your planned activities.**
- **Remain indoors as much as possible.** During high-pollution episodes everyone, particularly those at high risk, children and elderly people, should stay indoors as much as possible and particularly away from roads with heavy traffic. External doors and windows should remain closed to reduce the penetration of pollution from outside.
- **Prolonged or heavy exertion outside should be avoided.**
- **Limit unnecessary travel by cars, scooters and other motorized vehicles.** This will not only prevent additional personal exposure but it will prevent adding to already high pollution levels for others.
- **Prevent additional sources of air pollution indoors.** Avoid using anything that burns, such as wood burning stoves, candles and incense. Do not smoke cigarettes.
- **Pay particular attention to keeping the rooms inside homes clean.** Wet mopping and dusting is preferable to sweeping or vacuuming (unless your vacuum has a *High-efficiency particulate arrestance* (HEPA) filter) as these can stir up additional dusts and particles.
 - **Create a clean room for sleeping.** A good choice would be one with few windows and doors. If the room has windows, keep them closed. Run an air conditioner or air

purifier or central air conditioning system if you are certain your air conditioner does not draw air from outdoors and has a filter.

- **Consider using air conditioners and air purifiers to remove particulate matter from indoors:** Various types of air purifier exist, including HEPA filters and electronic air cleaners, such as electrostatic precipitators. All air purifiers need to be used according to manufacturers' guidelines. Avoid using an air purifier that works by generating ozone, which will increase the pollution in your home.
- **Masks or particulate respirators may help for short periods of time.** Disposable respirators known as N95 or N99 respirators may help if people have to be outdoors for a short period of time. N95 is adequate for filtering most of the PM2.5 particles, but sensitive persons can consider using N99 version. (
- The fitting of the mask is very important. Masks should provide a tight seal around the users mouth and nose and should not be relied upon for long periods of time. Do not rely on dust masks for protection. Paper "comfort" or "dust" masks are designed to trap large particles, such as sawdust and offer little protection from fine particles. Similarly scarves or bandanas are not effective and should not be relied upon.
- **Visit a doctor or health facility if you are feeling unwell experiencing any of adverse effects from air pollution.**