

What is air pollution?

Air pollution is the contamination of the 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), carbon monoxide (CO), ozone (O₃), black carbon (BC), sulfur dioxide and nitrogen oxides (NO_x). 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 by governments around the world to protect citizens against the adverse impacts of air pollutants.

Air pollution is often not visible to the naked eye as the size of the pollutants are smaller than the human eye can detect. 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. The fact that you cannot see the air pollution does not mean that it does not exist.

What are the main health impacts of particulate matter?

The health impacts of particulate matter depend on the level of exposure (frequently expressed in µg/m³) and the duration of exposure (which can be either short term e.g. 8 or 24 hours or long term e.g. annual). Individual sensitivity to the health impacts of particulate matter can vary.

Short-term exposure to particulate matter (or PM) is likely to cause acute health reactions such as irritation to the eyes, nose, and throat, coughing, wheezing and increased frequency of acute lower respiratory infections, deep in your lungs.

More prolonged and continued exposure to either high or lower levels of air pollution can also lead to an increased risk of respiratory infections, exacerbation of asthma, bronchitis or serious chronic effects including reduced lung function, ischaemic heart disease, stroke, lung cancer and premature death. Such symptoms are a particular concern in rural and periurban settings where use of wood, agricultural waste and animal dung is used for cooking, heating and lighting and exposure levels can be high and prolonged over long periods of time. Such symptoms are also of serious concern in dense urban settings where traffic volume is high and industrial emissions take place.

Who are vulnerable to air pollution?

- Children, especially under-five, and older people are particularly vulnerable.
- People, with pre-existing diseases such as asthma and other respiratory disease, cardiovascular diseases, are at greater risk of health effects.
- Pregnant women. Evidence has shown that pregnancy increases vulnerability to the effects of particulate exposure with potential effects to the unborn child such as low and pre-term birth weight.
- 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.
- Construction workers, traffic police, road sweepers and those working outdoors and in highly polluted settings.
- Smokers of tobacco products as well as people who are exposed to second-hand smoke.

Global level

The 2005 WHO Global Air Quality Guidelines are the most up to date providing the latest scientific evidence (see https://www.who.int/phe/health_topics/outdoorair/outdoorair_agg/en/). They set targets for air quality which would protect the large majority of individuals from the effects of air pollution on health. The Guideline values are as follows;

Air pollutant	Value
Fine Particulate Matter (PM _{2.5})	10 µg/m ³ annual mean 25 µg/m ³ 24-hour mean
Coarse Particulate Matter (PM ₁₀)	20 µg/m ³ annual mean 50 µg/m ³ 24-hour mean
Ozone (O ₃)	100 µg/m ³ 8-hour mean
Nitrogen dioxide (NO ₂)	40 µg/m ³ annual mean 200 µg/m ³ 1-hour mean
Sulfur dioxide (SO ₂)	20 µg/m ³ 24-hour mean 500 µg/m ³ 10-minute mean

The Guidelines indicate that by reducing annual average fine particulate matter (PM_{2.5}) concentrations from 35 micrograms per cubic metre (µg/m³), common in many developing cities, to the WHO guideline level of 10 µg/m³, we could reduce air pollution-related deaths by around 15%, and by reducing air pollution levels, we can help countries reduce the global burden of disease from respiratory infections, heart disease, and lung cancer. Also, action to reduce the direct impact of air pollution will also cut emissions of gases which contribute to climate change and provide other health benefits.

The air quality standards set in each country will vary according to specific approaches to balancing risks to health, technological feasibility, economic considerations and other political and social factors. This variability will depend on the country's level of development, capability in air quality management and other factors. In formulating policy targets, governments should consider their own local circumstances carefully using WHO guidelines to the maximum extent possible.

Air Quality Index (AQI) is a tool to simplify the reporting of levels of air pollutants which can be linked to a system of colour coding, alerts and public health advice. Thailand's AQI system from the Pollution Control Department, is available as an app called **Air4Thai** both iOS and Google Play and can be downloaded via http://air4thai.pcd.go.th/webV2/aqi_info.php. Alternatively levels of key pollutants can be compared to national air quality standards (http://www.pcd.go.th/info_serv/reg_std_airsnd01.html) or the WHO Air Quality Guidelines, which identify the concentrations of air pollutants which would not be expected to cause adverse health effects.

Local level

Most sources of outdoor air pollution are well beyond the control of individuals and demands concerted action by local, national and regional level policy-makers working in sectors like transport, energy, waste management, urban planning, and agriculture. Examples of successful policies in transport, urban planning, power generation and industry that reduce air pollution:

For industry: clean technologies that reduce industrial smokestack emissions; improved management of urban and agricultural waste, including capture of methane gas emitted from waste sites as an alternative to incineration (for use as biogas);

For energy: ensuring access to affordable clean household energy solutions for cooking, heating and lighting;

For transport: shifting to clean modes of power generation; prioritizing rapid urban transit, walking and cycling networks in cities as well as rail interurban freight and passenger travel; shifting to cleaner heavy-duty diesel vehicles and low-emissions vehicles and fuels, including fuels with reduced sulfur content;

For urban planning: improving the energy efficiency of buildings and making cities more green and compact, and thus energy efficient;

For power generation: increased use of low-emissions fuels and renewable combustion-free power sources (like solar, wind or hydropower); co-generation of heat and power; and distributed energy generation (e.g. mini-grids and rooftop solar power generation);

For municipal and agricultural waste management: strategies for waste reduction, waste separation, recycling and reuse or waste reprocessing; as well as improved methods of biological waste management such as anaerobic waste digestion to produce biogas, are feasible, low cost alternatives to the open incineration of solid waste. Where incineration is unavoidable, then combustion technologies with strict emission controls are critical.

Individual level

To reduce your own contribution to air pollution levels, WHO advises the following actions during high-pollution episodes:

- **Do not use wood burning stoves, candles, and incense** as these will all add to air pollution levels by producing particulate matter.
- **Stop use of cigarettes and other tobacco 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 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.
- **Conserve energy by turning off lights and electronics when not being used.**

To minimize exposure, WHO advises the following actions during high-pollution episodes:

- **Find out the levels of air pollution in your neighbourhood and follow any advice from local authorities** to guide your planned activities.
- **Remain indoors as much as possible.** All people, particularly those at risk, children and elderly people, should stay indoors as much as possible and away from roads with heavy traffic. External doors and windows should remain closed to reduce the penetration of pollution from outside.
- **Avoid prolonged or heavy exertion and intense exercise outside.**
- **Pay particular attention to keeping the rooms inside homes clean:** Wet mopping and dusting is preferable to sweeping or vacuuming as these can stir up additional dusts and particles.
- **Create a clean room for sleeping particularly for young children or elderly persons.** 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. If you are certain your air conditioner does not draw air from outdoors and has an appropriate filter.
- For air purifiers, to effectively remove airborne particulate matter a **High-Efficiency Particulate Arrestance or HEPA filter with a rating of at least H13 or above** is needed. Avoid the use of ionization filter technology as it will generate ozone and create additional health hazards.
- **Masks or particulate respirators may help in special circumstances if you have to be outside for long periods of time but should not be relied upon for protection in absence of other measures.** Masks should be disposable, properly fitted, regularly changed and have a rating of at least N-95. Dust masks are not appropriate as they offer no protection against fine particles.

Finally and most importantly, visit your family doctor or health clinic if you are feeling unwell.

WHO Member States recently adopted a resolution (2015) and a road map (2016) for an enhanced global response to the adverse health effects of air pollution.

WHO is custodial agency for 3 air pollution-related Sustainable Development Goals indicators:

- 3.9.1 Mortality from air pollution
- 7.1.2 Access to clean fuels and technologies
- 11.6.2 Air quality in cities.

WHO develops and produces air quality guidelines recommending exposure limits to key air pollutants (indoor and outdoor).

WHO creates detailed health-related assessments of different types of air pollutants, including particulates and black carbon particles, and ozone.

WHO produces evidence regarding the linkage of air pollution to specific diseases, such as cardiovascular and respiratory diseases and cancers, as well as burden of disease estimates from existing air pollution exposures, at country, regional, and global levels.

WHO develops tools such as AirQ+ for assessing the health impacts from various pollutants, but also the Health Economic Assessment Tool (HEAT) to assess walking and cycling interventions, the Green+ tool to raise importance of green space and health, the Sustainable Transport Health Assessment Tool (STHAT) and the Integrated Transport and Health Impact Modelling Tool (ITHIM).

WHO is developing a Clean Household Energy Solutions Toolkit (CHEST) to provide countries and programmes with the tools needed to create or evaluate policies that expand clean household energy access and use, which is particularly important as pollutants released in and around the household (household air pollution) contribute significantly to ambient pollution. CHEST tools include modules on needs assessment, guidance on standards and testing for household energy devices, monitoring and evaluation, and materials to empower the health sector to tackle household air pollution.

WHO assists Member States in sharing information on successful approaches, on methods of exposure assessment and monitoring of health impacts of pollution.

WHO is leading the Joint Task Force on the Health Aspects of Air Pollution within the Convention on Long-range Transboundary Air Pollution to assess the health effects of such pollution and to provide supporting documentation.

WHO and UNEP provide the secretariat for the Asia-Pacific Regional Forum on Health and Environment in which ministers of both health and environment are jointly committed. The Forum addresses environment and health priorities in ways that add value to the ongoing efforts of countries and other regional and sub regional bodies.

In Thailand, WHO has been collaborating with Ministry of Public Health and other partners since 2015 on the issue of air pollution and its effects on health. Specifically, WHO supported a risk assessment of Polycyclic Aromatic Hydrocarbons (PAHs) in organic burnings in Northern Thailand to examine the levels of PAH in the air and street food. This assessment led to recommendations on PAH standards.

References

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