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Ambient (outdoor) air pollution

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Key facts

- **Air pollution is one of the greatest environmental risks to child health**
- **In 2019, 99% of the world's population was living in places where the WHO air quality guidelines levels were not met.**
- **The combined effects of ambient air pollution and household air pollution are associated with 6.7 million premature deaths annually.**
- **Ambient (outdoor) air pollution is estimated to have caused 4.2 million premature deaths worldwide in 2019.**
- **Some 89% of those premature deaths occurred in low- and middle-income countries, and the greatest number in the WHO South-East Asia and Western Pacific Regions.**
- **Policies and investments supporting cleaner transport, energy efficient homes, power generation, industry and better municipal waste management would reduce key sources of outdoor air pollution. Access to clean household energy would also greatly reduce ambient air pollution in some regions.**

Overview

Outdoor air pollution is a major environmental health problem affecting everyone in low-, middle-, and high-income countries.

Ambient (outdoor) air pollution in both cities and rural areas was estimated to cause 4.2 million premature deaths worldwide per year in 2019; this mortality is due to exposure to fine particulate matter, which causes cardiovascular and respiratory disease, and cancers.

WHO estimates that in 2019, some 68% of outdoor air pollution related premature deaths were due to ischaemic heart disease and stroke, 14% were due to chronic obstructive pulmonary disease, 14% were due to acute lower respiratory infections, and 4% of deaths were due to lung cancers.

People living in low- and middle-income countries disproportionately experience the burden of outdoor air pollution with 89% (of the 4.2 million premature deaths) occurring in these areas. The greatest burden is found in the WHO South-East Asia and Western Pacific Regions. The latest burden estimates reflect the significant role air pollution plays in cardiovascular illness and death.

Policies reducing air pollution

Addressing air pollution, which is the second highest risk factor for noncommunicable diseases, is key to protecting public health.

Most sources of outdoor air pollution are well beyond the control of individuals and this demands concerted action by local, national and regional level policy-makers working in sectors like energy, transport, waste management, urban planning and agriculture.

There are many examples of successful policies 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; and

- for health-care activities: putting health services on a low-carbon development path can support more resilient and cost-efficient service delivery, along with reduced environmental health risks for patients, health workers and the community. In supporting climate friendly policies, the health sector can display public leadership while also improving health service delivery.

Pollutants

Particulate matter (PM)
PM is a common proxy indicator for air pollution. There is strong evidence for the negative health impacts associated with exposure to this pollutant. The major components of PM are sulfates, nitrates, ammonia, sodium chloride, black carbon, mineral dust and water.

Carbon monoxide (CO)
Carbon monoxide is a colourless, odourless and tasteless toxic gas produced by the incomplete combustion of carbonaceous fuels such as wood, petrol, charcoal, natural gas and kerosene.

Ozone (O$_3$)
Ozone at ground level – not to be confused with the ozone layer in the upper atmosphere – is one of the major constituents of photochemical smog and it is formed through the reaction with gases in the presence of sunlight.

Nitrogen dioxide (NO$_2$)
NO$_2$ is a gas that is commonly released from the combustion of fuels in the transportation and industrial sectors.

Sulfur dioxide (SO$_2$)
SO$_2$ is a colourless gas with a sharp odour. It is produced from the burning of fossil fuels (coal and oil) and the smelting of mineral ores that contain sulfur.

To read more details about these pollutants and other types, please visit this page.

Air quality guidelines

The WHO Global air quality guidelines (AQG) offer global guidance on thresholds and limits for key air pollutants that pose health risks. These guidelines are of a high methodological quality and are developed through a transparent, evidence-based decision-making process. In addition to the guideline values, the WHO Global air quality guidelines provide interim

targets to promote a gradual shift from high to lower concentrations and their associated health benefits. For example, through the achievement of interim target one (35 μg/m*3*), around 300 000 deaths would be saved worldwide annually.

The guidelines also offer qualitative statements on good practices for the management of certain types of particulate matter (PM), for example black carbon/elemental carbon, ultrafine particles, and particles originating from sand and dust storms, for which there is insufficient quantitative evidence to derive AQG levels.

Table 0.1. Recommended AQG levels and interim targets

Pollutant	Averaging time	Interim target				AQG level
		1	2	3	4	
$PM_{2.5}$, μg/m³	Annual	35	25	15	10	5
	24-hour[a]	75	50	37.5	25	15
PM_{10}, μg/m³	Annual	70	50	30	20	15
	24-hour[a]	150	100	75	50	45
O_3, μg/m³	Peak season[b]	100	70	–	–	60
	8-hour[a]	160	120	–	–	100
NO_2, μg/m³	Annual	40	30	20	–	10
	24-hour[a]	120	50	–	–	25
SO_2, μg/m³	24-hour[a]	125	50	–	–	40
CO, mg/m³	24-hour[a]	7	–	–	–	4

[a] 99th percentile (i.e. 3–4 exceedance days per year).
[b] Average of daily maximum 8-hour mean O_3 concentration in the six consecutive months with the highest six-month running-average O_3 concentration.

WHO response

Recognizing the gravity and urgency of the problem, all WHO Member States approved resolution A68.8, "Health and the Environment: addressing the health impact of air pollution," at the World Health Assembly in 2015, complemented by a road map for action the following year.

WHO, as the coordinating authority on international health, supports countries in protecting public health through evidence-based policies and actions. Considering the significant health burden and the multiple potential benefits of interventions, WHO supports countries by providing evidence, building institutional capacity and leveraging the health argument to convene sectors to tackle air pollution.

To support reducing air pollution levels and to protect populations from health risks, WHO's Air Quality and Health Unit works in three cross-cutting areas:

1. knowledge, evidence and measuring progress
2. institutional capacity building and technical support
3. leadership and coordination.

Member States and sub-national entities are typically responsible for the implementation and
monitoring of policies to promote air quality for health. Successful policies
and solid governance depend on coordinated action between a variety of stakeholders and sec-
tors. Cooperation with other UN agencies and non-state actors is essential and is integrated
into WHO's work to ensure synergies and maximize impact on the ground.

A full list of WHO's activities to combat ambient air pollution can be found here and here.