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Fact sheet No 187: Air Pollution Including WHO's 1999 Guidelines for Air Pollution Control - Revised September 2000 (WHO, 2000, 4 p.)



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AIR POLLUTION (including WHO's 1999 Guidelines for Air Pollution Control)

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Exposure to air pollution is as old as the use of fire by human beings

Air pollution, both indoors and outdoors, is a major environmental health problem affecting developed and developing countries alike. It comes from sources of dust, gases and smoke, and is generated mainly by human activities but also naturally. When inhaled, air pollutants affect the lung and respiratory tract but can also be taken up and transported by the blood stream throughout the body. Through deposition in the environment, air pollutants can also contaminate food and water.

Health impact

Every year millions of people die or suffer serious health effects from air pollution: mainly respiratory diseases, asthma, chronic obstructive pulmonary disease, cardiovascular disease and cancer of the lung.

- An estimated 3 million people die each year because of air pollution (see Figures for breakdown); this figure represents about 5% of the total 55 million deaths that occur annually in the world. It is possible, because of uncertainty in the estimates, that the actual death toll is anywhere between 1.4 and 6 million annually.
- Many studies consistently show the direct link between mortality rates and daily ambient concentrations of suspended particulate matter that have diameters below 10 μm . Life expectancy can be significantly reduced in communities with high levels of particulate matter.
- Indoor air exposure to suspended particulate matter increases the risk of acute respiratory infections, one of the leading causes of infant and child mortality in developing countries. In Asia, such exposure accounts for between half and one million excess deaths every year. In sub-Saharan Africa the estimate is 300,000-500,000 excess deaths.
- Around 30-40% of cases of asthma and 20-30% of all respiratory diseases may be linked to air pollution in some populations.
- Studies in SPaulo, Brazil, have shown that a 75 $\mu\text{g}/\text{m}^3$ increase in concentrations of nitrogen dioxide (NO_2) was related to a 30% increase in deaths from respiratory illness in children under five years of age.
- In adult non-smokers chronic exposure to environmental tobacco smoke increases mortality from lung cancer by between 20% and 30%.
- Air pollution also damages plant and animal life and contaminates water sources, threatening

economic and social welfare as well as health.

The effects of air pollution depend on levels of exposure and susceptibility of the exposed population. People suffering from respiratory conditions such as asthma, both the very young and old, and people living in poverty, are particularly at risk.

Air pollution also affects the workforce, and indoor air pollution is the primary cause in as many as 50 million cases of occupational chronic respiratory disease each year - a third of all occupational illnesses. These are widespread, debilitating and affect people in their social and economic prime of life. They are preventable with a minimum of resources.

Air pollution and pollutants

The common picture of air pollution is of smoking industrial chimneys and traffic exhausts affecting the surrounding populations - ambient air pollution. Even though the main sources of air pollutants are man-made - traffic and industry - natural sources also contribute (e.g. volcanoes).

Indoor air pollutants are an even greater threat to the health of millions. In developing countries, the domestic use of coal and biomass materials as fuel for heating and cooking is a major source of indoor pollution. The greatest threat in this case is to women and children living in poverty.

Air pollutants

Air pollutants are classified as suspended particulate matter, gases and vapours that are present in the atmosphere in abnormally high concentrations.

- Particulate matter affects more people on continuing basis than any other pollutant. There are more monitoring data and epidemiological evidence available on particulate pollution exposure than on any other pollutant and its health effects.
- The main components of suspended particulate matter are coarse particles such as soil and mineral ash or fine particles found in wood smoke or coming from engine exhausts.
- Gaseous air pollutants are principally oxides of nitrogen (NO_x), ozone (O_3), carbon monoxide (CO), sulphur dioxide (SO_2), ammonia (NH_3) and volatile organic compounds.
- Other air pollutants include chlorinated fluorocarbons (CFCs) and other "greenhouse" gases, lead and other heavy metals and radon.

Trends

Concentrations of sulphur dioxide and suspended particulate matter are decreasing in developed countries, while those of NO_x and ozone are either constant or increasing. In developing countries, increasing traffic and its exhaust as well as industrial emissions are raising concentrations of SO_2 , NO_x and O_3 and suspended particulate matter.

Ambient air pollution

Without proper controls, industry is a major source of air pollution. In this way, industrial operations can affect the health of workforces, the general environment and the health of nearby (and sometimes very far removed) populations.

- Particular industries with significant health impacts include: chemical, paper and pulp, cement, glass and ceramics, iron and steel, non-ferrous metals, leather, refining and processing petroleum, and particularly from coal and oil burning plants producing electric power.
- Motor vehicles account for about 30% of emissions of nitrogen oxides, 50% of hydrocarbons, 60% of lead and 60% of carbon monoxide in cities of developed countries. In city centres the values rise to 95% for carbon monoxide and up to 70% for nitrogen oxides.

Indoor air pollution

Even today, homes of the poor in developing countries are dangerous, unhealthy places - a rule of thumb states that a pollutant released indoors is 1000 times more likely to reach people's lungs than a pollutant released

outdoors.

Some 2000 million people throughout the world use wood or other biomass fuels (cow dung, crop residues and grass) for cooking and heating. The domestic burning of these fuels is an inefficient process that produces many pollutants, some of which may be carcinogenic. The problems are worsened in areas where people spend most of their time indoors.

- A 20% reduction in indoor air pollution could reduce mortality from acute respiratory infection by at least 4-8% in some populations.

Coal burning for heating and cooking in developing countries results in indoor particle concentrations of up to 10,000 $\mu\text{g}/\text{m}^3$, a level that is much higher even than ambient concentrations in polluted cities in Asia.

Pollution control

Air pollution has long been associated with industrial processes and energy generation. Pollution control followed the European Industrial Revolution and increased in importance after World War II with economic expansion. Various steps have been taken to prevent the destruction of the environment and the removal or at least minimizing hazards to human health.

WHO's response

Guidelines and standards

WHO has produced the *WHO Air Quality Guidelines*. They are available from WHO or on the web site at: www.who.int/peh/air/airindex. The *Guidelines* provide background information which enables countries to set their national or regional air quality standards in the context of existing environmental, social, economic and cultural conditions.

The *Guidelines* set out the range of ambient concentrations in exposure-response relationships and give guideline values; the air quality guideline value defines a concentration of air pollutant below which no adverse effect to human health is expected. Guideline values for 38 non-carcinogenic compounds and some carcinogens are set in relation to different exposure times. The table below gives some examples of the guideline value for common gaseous pollutants.

WHO Guidelines values (1999) for common pollutants

<i>Pollutant</i>	<i>Annual ambient air concentration ($\mu\text{g}/\text{m}^3$)</i>	<i>Guideline value ($\mu\text{g}/\text{m}^3$)</i>	<i>Concentration at which effects on health start to be observed ($\mu\text{g}/\text{m}^3$)</i>	<i>Exposure time</i>
CO	500-7000	100 000 60 000 30 000 10 000	Not applicable	15 min 30 min 1 hour 8 hours
Lead	0.01-2.0	0.5	Not applicable	1 year
NO ₂	10-150	200 40	365-565	1 hour 1 year
O ₃	10-100	120	Not applicable	8 hour
SO ₂	5-400	500 125 50	1000 250 100	10 min 24 hour 1 year

Application of the *WHO Air Quality Guidelines* should help significantly to reduce the burden of excess mortality and preventable disability from a highly preventable source of ill-health.

Air quality management

For more than 20 years the WHO with the UN Environmental Programme (UNEP) assessed trends in ambient air pollution until this programme was replaced by the Air Management Information System (AMIS). Under the umbrella of WHO's Healthy Cities Programme, AMIS provides a means of actively sharing information between its members through a set of user-friendly databases. It is planned as a component of WHO's Global Air Quality Partnership, which brings together:

- UN agencies and programmes (e.g. WHO, UNEP and the UN Development Programme) as well as the World Bank and Regional Banks
- Regional Collaborating Centres
- national aid agencies (including those of Australia, Canada, Japan, Nordic countries and the USA)
- national Environmental Protection Agencies (including those of Canada, China, Germany, Japan and the USA)
- individual cities (a target of 300 has been set), such as Beijing, Bombay, Chicago, Jakarta, London, Manila, Mexico City and Santiago, and
- other bodies such as nongovernmental organizations and the OECD
- Data on air pollution in cities are routinely collected and shared.
- A CD-ROM with data from more than 100 cities was published in 1998 and is being widely distributed
- Databases have been created on AMIS focal points, air pollution management capabilities and indoor air pollutant concentrations.

For further information, journalists can contact the Office of the Spokesperson, WHO, Geneva. Tel: (+41 22) 791 2599. Fax: (+41 22) 791 4858. E-mail: inf@who.int. All WHO Press Releases, Fact Sheets, as well as other information on this subject can be obtained via the WHO home page <http://www.who.int/>

Further information can be obtained from the web site of the responsible WHO programme at: <http://www.who.int/peh/>.

