

Pollutants

June 2007

Air pollution is becoming a problem for Auckland. Each year millions of tonnes of pollutants are released into the air in the form of smoke, dust and invisible gases. Pollutants are substances in the air which are above natural levels and may cause harm to plants and animals (including humans). Some pollutants are emitted directly into the air while others are formed by chemical reactions in the air.

Typical pollution sources include the burning of fossil fuels such as diesel, petrol, wood, gas and oil in vehicles, home heating appliances and industrial processes. Natural pollution sources include desert storms, forest fires, volcanoes and sea salt.

The following five pollutants (carbon monoxide, particulate matter, nitrogen dioxide, ozone and sulphur dioxide) are common and wide-spread in the Auckland region and have been monitored world wide for many years. Benzene and 1,3-Butadiene are pollutants of more recent concern. Lead is another common pollutant but since the removal of lead in petrol (which was a primary source), it is no longer considered a problem in the Auckland Region.

Carbon Monoxide (CO)

What is it?

CO is a colourless, odourless, tasteless and relatively inert gas which slowly converts to Carbon Dioxide (CO₂) in the air over a period of about a month. It is formed by both natural processes (such as volcanic activity) and human activities (primarily from motor vehicles).

What effect does it have?

CO interferes with the blood's ability to absorb and circulate oxygen (O₂). Lower CO levels can affect people with heart conditions such as angina, and clogged arteries. High CO levels can cause dizziness, nausea, drowsiness and impairs co-ordination and attention. Extremely high CO levels can cause death.

Particulate Matter [inhalable] (PM₁₀)

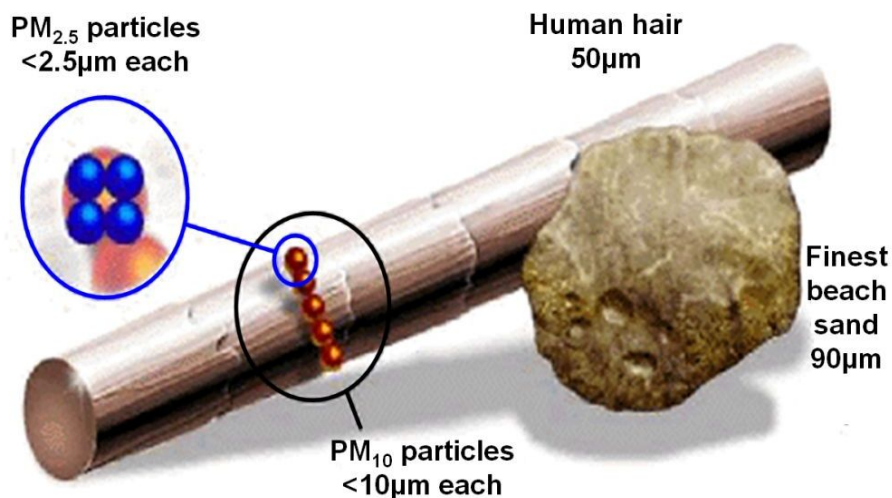
What is it?

PM₁₀ consists of solid and liquid particles in the air, which have a diameter of less than 10 micrometres (µm) or are a fifth of the size of a human hair. These particles are not visible to the human eye and can easily be inhaled and lodged in our lungs. PM₁₀ can stay suspended in the air for over a month.

PM₁₀ can be produced naturally (from pollen, bushfires, etc.) and from human activities (domestic fires, industries and motor vehicles).

What effect does it have?

PM₁₀ affects our health especially if we are asthmatic or have heart or lung disease. PM₁₀ can contribute towards heart attacks, strokes, respiratory diseases and can reduce lung function leading to premature deaths, hospitalisation, increased medication, and days off work or school. PM₁₀ can also carry carcinogenic materials into the lungs. Diesel particulate matter is the most toxic. PM₁₀ can affect visibility by creating a haze over large areas, and can contribute to soiling and corrosion of buildings.



Size of particulate matter compared with a strand of human hair and fine beach sand.

Particulate Matter [respirable] (PM_{2.5})

What is it?

PM_{2.5} is a smaller fraction of the larger PM₁₀ particulates. PM_{2.5} consists of solid and liquid particles in air, which have a diameter of less than 2.5 micrometres (µm). Particles of this size are breathable and penetrate deep into the tiny air sacs of the lungs.

What effect does it have?

PM_{2.5} has the same effects as PM₁₀ but since they are a smaller fraction, they penetrate deeper into the lungs so the health effects are greater.

Nitrogen Dioxide (NO₂)

What is it?

NO₂ is a brown, pungent, acidic gas which is mainly formed from nitric oxide (NO). These compounds may react in the air for several days forming nitric acid, and nitrate and nitrite particles. The latter are considered as part of PM_{2.5} above. NO₂ is formed by the combustion of fossil fuels (coal, oil and gas). Motor vehicles are a large source of nitrogen NO₂ in urban areas.

What effect does it have?

NO₂ can irritate the lungs, increase susceptibility and severity of asthma, and lower resistance to infections such as the flu.

Long term exposure to low levels of NO₂ can affect growth and cause damage to some plants. At high levels NO₂ contributes to 'acid rain' which affects plants and soil acidity. NO₂ can significantly affect visibility as it contributes to the formations of hazes and smog.



Brown haze over Auckland's skyline

Ozone (O₃)

What is it?

Ozone is a colourless gas naturally found in the outer atmosphere. But when formed at ground level, it is a pollutant. Ozone forms at ground level under certain conditions when nitrogen oxides and volatile organic compounds (VOCs) produced by motor vehicles, industries and domestic fires react in the presence of sunlight.

What effect does it have?

Ozone causes runny eyes, nose and throat irritation and breathing difficulties, especially in asthmatics. It can also cause lung damage, reducing lung capacity and lowering resistance to respiratory illnesses, particularly in infants and the elderly. Although Ozone is a vital component of the upper atmosphere, at ground level it is one of the main components of photochemical smog. Photochemical smog seriously reduces visibility. It also causes deterioration of materials such as rubber and paints, and damages sensitive plants.

Sulphur Dioxide (SO₂)

What is it?

SO₂ is a colourless, pungent, acidic gas which readily reacts in the air to form sulphuric acid and other compounds. SO₂ is usually oxidised in the air within a few days. SO₂ is largely produced by industrial processes but is also produced by diesel vehicles.

What effect does it have?

Exposure to SO₂ irritates the lungs, causing coughing, wheezing or breathlessness. Asthmatics are a particularly sensitive group who may suffer breathing problems. Long term exposure to high SO₂ levels and particles can aggravate heart disease and cause respiratory illness.

SO₂ reacts to form sulphate particles, which are part of PM_{2.5}, and forms acid rain which is a problem in the northern hemisphere. SO₂ is toxic to some plants, and is corrosive to some building surfaces and metals in moist conditions.

Benzene (C₆H₆)

What is it?

Benzene is a colourless, flammable gas with a sweet petrol-like odour. Motor vehicles and domestic fires are significant sources of benzene.

What effect does it have?

Short term inhalation of benzene may cause drowsiness, dizziness, headaches, as well as eye, skin and respiratory tract irritation. At high levels it can cause unconsciousness. Long term exposures have caused blood disorders and at high levels reproductive effects have been reported. Benzene is classified as a human carcinogen and is associated with an increased incidence of human leukaemia and adverse foetal development in animals¹.

1,3-Butadiene (C₄H₆)

What is it?

1,3-Butadiene is a colourless, highly reactive gas with mild petrol-like odour primarily produced by motor vehicle exhaust emissions.

What effect does it have?

Short-term inhalation of 1,3-Butadiene may cause irritation of the eyes, nasal passages, throat and lungs. 1,3-Butadiene is classified as a probable human carcinogen and is associated with an increased incidence of human leukaemia and a variety of animal tumours.

For further information on pollutants, visit www.arc.govt.nz or phone 09 366 2000. Also refer to our factsheet *Airfacts 5: Health Effects of Air Pollution*.

¹ United States Environmental Protection Agency: <http://www.epa.gov/ttn/atw/hlthef/benzene.html>