Air pollutants

Basic properties of the major (outdoor) air pollutants

Nitrogen dioxide (NO2)

Nitrogen Dioxide is one of a group of gases called nitrogen oxides (NOx) which is formed iduring the combustion of fossil fuels. NO2 is a reddish-brown gas with a pungent and irritating odour. It reacts in the air with water vapour to form nitrous and nitric acid and then toxic organic nitrates. This contributes to the production of acid rain that can kill trees, fish and animal life

The majority of nitrogen oxides emitted from a vehicle exhaust are in the form of nitric oxide (NO), which is not directly considered harmful to health. However, this gas can react with other gases present both in the exhaust and the atmosphere, to form nitrogen dioxide. Nitrogen dioxide is harmful to health and is also an important component of ground level ozone formation.

Whenever anything is burnt in air, nitrogen oxides are formed. This is because the air we breathe is mostly made up of nitrogen (78%) and oxygen (21%) and these combine when energy (from burning material) is available.

Particulate Matter (PM10)

Particulate matter in the atmosphere can be from a whole range of sources, both natural, such as sand or sea spray, and man made, such as construction dust or soot. The smaller a particle, the longer it can remain suspended in the atmosphere. Very fine particles made up of carbon from combustion and chemical compounds (sulphates and nitrates) can remain in the atmosphere for weeks. Particulate matter is also usually the pollution that you get to see, as it is often visible as 'dark dust' when it collects on surfaces.

The amount of particulate matter in the air has decreased rapidly over the last 30 years. This is due to a decrease in coal burning, heavy industry and improved industrial pollution control measures.

Attention is currently focused on finer particles known as PM10. These fine particles can be breathed more deeply into the lungs and are more likely to have a toxic effect than larger particles. Even smaller particulates known as PM2.5 are also being studied, however these are not measured in many locations in the UK. This however, may change in the next couple of years.

As particulate matter is composed of such a large range of chemicals and materials from a variety of sources, the control of pollution levels is very difficult.

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Carbon Monoxide (CO)

Carbon Monoxide (CO) is a colourless, odourless poisonous gas produced by incomplete, or inefficient, combustion of fuel including 'cold' or badly tuned engines.

Badly ventilated domestic fuel appliances (gas, oil or solid fuel) can cause high levels indoors, as can smoking.

As traffic is a major source of carbon monoxide, ambient concentrations will generally be highest close to busy roads. Monitoring data suggests that annual average CO levels have been decreasing over the last few years. This is probably due to improved vehicle engine efficiency and the introduction of catalytic converters. The effect of technological improvements has been cancelled out to some degree by an increase in traffic levels.

Carbon Dioxide (CO2)

As opposed to carbon monoxide, carbon dioxide (CO2) is produced by 'complete' fossil fuel combustion.

While ambient levels do not have any direct health effects, it is an important 'greenhouse gas' which is believed to contribute to global warming.

Its major anthropogenic (man-made) sources are road transport, power stations and other industrial combustion processes and domestic heating.

Sulphur Dioxide (SO2)

Sulphur dioxide (SO2) is produced when a material, or fuel, containing sulphur is burned. SO2 is a colourless gas. It can be oxidised to sulphur trioxide, which in the presence of water vapour is readily transformed to sulphuric acid.

Globally, much of the sulphur dioxide in the atmosphere comes from natural sources, but in the UK the major contributors are power stations (65% of the total emissions). Sulphur dioxide levels in this country have dropped considerably over recent years due to cleaner power stations and a decreased use of coal. Also reduced levels of sulphur in vehicle fuels have helped bring about a lower level from transport emissions.

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VOC's (Including Benzene and 1,3 Butadiene)

The term 'hydrocarbons' is often used when discussing traffic pollution. This refers to a group of chemicals of which volatile organic compounds (VOCs) are a subgroup.

Volatile Organic Compounds (VOCs) comprise of a range of chemical compounds, all of which contribute, to varying degrees, to the formation of ground level ozone. Both Benzene and 1,3 Butadiene are part of the 'VOC' group.

Current attention is focused on 1,3 butadiene, primarily because one of its sources are from vehicle exhausts, and benzene.

Benzene in the atmosphere either comes from the combustion or evaporation of petrol. Levels are therefore highest close to busy roads or in the vicinity of petrol filling stations. As only very small concentrations of VOC's are typically found in the atmosphere, the monitoring process is very complicated and expensive. As monitoring has only been carried out for the last few years, it is impossible to identify any upward or downward trend in levels. Monitoring of Benzene has taken place in the Chiltern District in the past and results are available in the monitoring & results section.

Lead

The main source of lead in the atmosphere has historically been from the combustion of petrol in vehicles. Since the phasing out of leaded petrol, air-borne lead levels have fallen dramatically and lead is no longer the major problem it once was.

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Low Level Ozone (O3)

Ozone is an unstable gas with a characteristic fresh, penetrating odour. The smell is noticeable after thunderstorms, where the energy from the flashes of lightning has created short-lived ozone from the oxygen in the atmosphere.

While naturally occurring, ozone in the upper atmosphere, 'the ozone layer', protects the Earth, ground level ozone (O3) is harmful to health.

Ozone is not emitted directly from any man made source in significant quantities, but is formed by a complex set of reactions involving nitrogen oxides and hydrocarbons in the presence of light from the sun.

Once formed, ozone can remain in the atmosphere for many days and is often transported over long distances. It is for this reason that a real reduction in ozone levels can only be achieved through global action by everyone. Ozone is therefore not a pollutant currently in the Air Quality Regualtions. It is however still considered when looking at air quality.

Nitric oxides destroy ozone; therefore ozone concentrations are actually lower next to busy roads. For the same reason, ozone levels are usually higher in rural locations than in urban areas.

It is also a strong oxidising agent. Ozone is therefore a pollutant that can damage your health, farm crops, vegetation and materials such as rubber.