

## Primary Air Pollutants and Their Causes

**Nitrogen Oxide (NO<sub>x</sub>)** is a major contributor to smog and acid rain. Nitrogen oxides react with volatile organic compounds to form smog. In high doses, smog can harm humans by causing breathing difficulty for asthmatics, coughs in children, and general illness of the respiratory system. Acid rain can harm vegetation and run into lakes and rivers which changes the chemistry of the water, and makes it potentially uninhabitable for all but acid-tolerant bacteria.

Nitrogen oxides are produced from burning fuels, including gasoline and coal. (NO<sub>x</sub>) acid aerosols can reduce visibility.

**Particulate Matter** is any type of solid in the air in the form of smoke, dust, and vapors, which can remain suspended for extended periods. Aside from reducing visibility and soiling clothing, microscopic particles in the air can be breathed into lung tissue becoming lodged and causing increased respiratory disease and lung damage. Particulates are also the main source of haze, which reduces visibility.

Particulates are produced by many sources, including burning of diesel fuels by trucks and buses, fossil fuels, mixing and application of fertilizers and pesticides, road construction, industrial processes such as steel making, mining, agricultural burning, and operation of fireplaces and woodstoves.

**Sulfur Dioxide (SO<sub>2</sub>)** is an odorless gas at low concentrations, but can have a very strong smell at high concentrations. SO<sub>2</sub> is a gas produced by burning coal, most notably in power plants. Some industrial processes, such as production of paper and smelting of metals, produce sulfur dioxide.

Like nitrogen oxides, SO<sub>2</sub> is a major contributor to smog and acid rain. SO<sub>2</sub> is closely related to sulfuric acid, a strong acid. It can harm vegetation and metals and can cause lung problems, including breathing problems and permanent damage to lungs.

**Ozone (O<sub>3</sub>)** is a gas that is a variety of oxygen. Oxygen consists of two oxygen atoms; ozone consists of three. Ozone in the upper atmosphere, where it occurs naturally in what is known as the ozone layer, shields the Earth from the sun's dangerous ultraviolet rays. However, at ground level where it is a pollutant with highly toxic effects, ozone damages human health, the environment, crops, and a wide range of natural and artificial materials. Ground-level ozone can irritate the respiratory tract, cause chest pain, persistent cough, an inability to take a deep breath, and an increased susceptibility to lung infection. Ozone can damage trees and plants and reduce visibility.

Ground-level ozone comes from the breakdown (oxidation) of volatile organic compounds found in solvents. It is also a product of reactions between chemicals that are produced by burning coal, gasoline, other fuels, and chemicals found in paints and hair sprays. Oxidation occurs readily during hot weather. Vehicles and industries are major sources of ground-level ozone.

**Volatile Organic Compounds (VOCs)** are organic chemicals. All organic compounds contain carbon, and organic chemicals are the basic chemicals found in all living things and in all products derived from living things. Many organic compounds we use do not occur in nature, but were synthesized by chemists in laboratories. Volatile chemicals produce vapors easily. At room temperature vapors readily escape from volatile liquid chemicals.

VOCs include gasoline, industrial chemicals such as benzene, solvents such as toluene and xylene, and perchloroethylene (principal dry cleaning solvent). VOCs are released from burning fuel, such as gasoline, wood, coal, natural gas and from solvents, paints, glues, and other products used at home or work. Vehicle emissions are an important source of VOCs. Many VOCs are hazardous air pollutants; for example, benzene causes cancer.

### **How Can I Reduce My Contribution to Air Pollution?**

There are many ways to reduce air pollution. People can contribute significantly to cleaning the air if they take simple actions to reduce air pollution.

Since vehicles contribute greatly to air pollution by emitting CO, NO<sub>x</sub>, ozone, VOCs, HAPs, CFCs, and particulate matter, each driver who makes personal changes in driving habits contributes to the reduction of air pollution.

Limit driving, use public transportation, walk, use carpools, bike, or so forth. These are the best ways an individual can help reduce air pollution!

If you must drive, then try to follow these guidelines:

- Drive alternatively fueled vehicles, such as electric or bio-diesel vehicles.
- Make fewer trips in your vehicle - plan routes to avoid traffic.
- Chain multiple trips into one vehicle trip.
- Buy a vehicle with high miles per gallon.
- Accelerate and brake smoothly, also avoid lengthy idling.
- Avoid high speeds.
- Keep tires properly inflated.
- Drive a newer vehicle; the new models generally pollute less.
- Do not overfill or top off your gasoline tank.
- Do not refuel on hot days - try to refuel after dark (Not an issue with bio-diesel)
- If the vehicle is a pre-1995 model, have a professional convert the air conditioning from the dangerous CFC R-12 to the safer R-134a to reduce your contribution to the ozone hole.
- Keep your car well maintained, especially the emissions control system.
- Maintain your vehicle's air conditioning system - do not allow it to leak.