

General Air Quality Information

What are we breathing?

Outdoor air, also called “ambient air,” is a vast blanket of gases surrounding the Earth. The air we breathe at ground level is a mixture of invisible and odorless gases, mostly nitrogen and oxygen, with smaller amounts of water vapor, argon, carbon dioxide, neon, helium, and hydrogen.

What is air pollution?

We say the air is “polluted” when it contains enough unhealthy gases and particles to harm people, animals, plants, and even objects such as buildings and statues. Air pollution can be present as a solid, liquid or gas. When we see smoke, we are really seeing tiny solid [particulate matter](#) suspended in the air. [Acid rain](#) is an example of gases and liquids mixing with otherwise clean air. Polluted air contains harmful gases and particles, often as a result of combustion activities. The air we breathe depends on natural cleaning forces--such as wind and rain--to help remove, dilute and disperse the dirt and pollution in the air.

Where does air pollution come from?

Natural air pollution

Natural air pollution has always been part of the Earth's history. Particles of soot and various gases from volcanoes, forest fires, and decaying organic materials in oceans and swamps enter the atmosphere at irregular intervals, sometimes at levels that have dramatic effects on our climate. Windstorms can fill the air with dust which affects the air hundreds of miles away. The explosion of ash and soot from Mt. St. Helens in May of 1980, for example, affected the air quality throughout the Pacific Northwest and the rest of the country for months after the initial eruption.

Naturally produced pollutants are not necessarily as serious a problem as man-made pollution because they are not concentrated over large cities and many are less harmful than man-made pollutants.

Man-made air pollution

Since little can be done by humans about natural air pollution, our main concern has to be with the pollutants introduced to the atmosphere by human activities. Most of the gaseous components of air are part of the natural cycle, and ecosystems have natural ways of keeping the many parts of the system in balance. The problem comes when the activities of people introduce large quantities of additional compounds to the air, which can unbalance and disrupt the normal biochemical cycle.

Air pollution sources

Humans burn different materials as fuel, and the act of combustion releases harmful gases and particles that can pollute the air. In general, the quality of the air depends upon how efficiently people use fuel. Such choices affect our lives in many ways: how we choose to move around to get from place to place (transportation choices), how we heat our homes, what we do with garbage (including yard waste) and how society creates the many products we all use everyday, all contribute to air pollution in some fashion.

Air pollution is often the result of incomplete combustion from burning coal, wood, oil, and gasoline. Pollutants are also released from materials that evaporate.

Any place or object from which pollutants are released is a **source** of air pollution. There are many different air pollution sources.

A **stationary source** (also referred to as a point source) is a source that stays in one place. A **major source** is a **Clean Air Act** term that refers to how much pollution the source emits. In general, a source is considered to be major if it emits more than 100 tons per year of one **criteria pollutant**, more than 10 tons per year of any single **toxic air pollutant**, or more than 25 tons per year of any combination of toxic air pollutants. Major sources are usually industrial operations such as chemical manufacturing facilities, oil refineries, and power plants.

Area source is a term used to describe sources that emit pollution in smaller quantities than major sources. Sometimes called non-point sources, area sources individually may not release much pollution; however, numerous area sources together can contribute quite a bit of pollution. Examples of area sources are woodstoves, dry cleaners, gas stations, small manufacturing companies, unpaved roads and disturbed natural land surfaces.

Mobile source is a term used to describe a wide variety of vehicles, engines, and equipment that generate air pollution and that move, or can be moved, from place to place. **On-road** or highway sources include vehicles used on roads for transportation of passengers or freight. **Nonroad** sources include vehicles, engines, and equipment used for construction, agriculture, transportation, recreation, and many other purposes. Within these two broad categories, on-road and nonroad sources are further distinguished by size, weight, use, and/or horsepower.

How is Air Quality Measured?

To prevent air pollution from reaching levels that can cause harm, it is important to be able to detect the presence of pollutants and to identify their emission sources. Measuring and monitoring air pollution is a crucial part of air pollution control. The **Clean Air Act** requires certain methods of monitoring for **criteria pollutants** in the air. All states and tribes use the same methods to detect pollution in the air, making it possible to compare air quality data from one place to another. Refer to the **[national air quality monitoring program website](#)** for more information.

What are the criteria air pollutants?

Certain air pollutants are so pervasive that they show up wherever air quality is poor. The [United States Environmental Protection Agency](#) (USEPA) uses six [criteria pollutants](#) as indicators of air quality:

[Carbon monoxide \(CO\)](#) is a colorless, poisonous gas formed when substances burn, particularly fuels like gasoline, oil, wood, etc. Breathing too much CO interferes with how the body absorbs oxygen, and therefore especially affects people with respiratory and/or heart disease.

[Lead \(Pb\)](#) is a heavy metal that is hazardous to human health. Pb occurs in the atmosphere as small particles, typically from emissions from lead smelters and other metal processing plants. Levels of Pb in the air across the United States have decreased by more than 90% since the [Clean Air Act](#) banned leaded gasoline.

[Nitrogen dioxide \(NO₂\)](#) is a poisonous gas produced from burning fossil fuels like oil and gas. NO₂ is a major component of acid rain and ground-level ozone. Breathing too much NO₂ is harmful to the lungs and aggravates asthmatic symptoms.

[Ozone \(O₃\)](#) is a gas which is formed by a chemical reaction between nitrogen oxides (NO_x) and volatile organic compounds in the presence of sunlight and warm temperatures. At ground-level, O₃ is often referred to as smog. Breathing too much O₃ can damage lung tissue, and aggravate respiratory problems like asthma and emphysema. High O₃ levels are also harmful to plants, crops and trees, as well as a variety of materials like rubber and paints.

[Particulate matter \(PM\)](#) pollution generally consists of a mixture of very small particles of dust, pollen, ash, soot, metals and other various solid and liquid chemicals found in the atmosphere. There are two categories of particle matter pollutants: PM_{2.5} and PM₁₀. PM_{2.5}, also known as “fine particles” is particulate matter 2.5 microns or smaller in diameter. PM₁₀, also known as “inhalable coarse particles” is particulate matter 10 microns or smaller in diameter. Breathing high levels of particulate matter is harmful to lung tissue and aggravates asthma symptoms. Too much particulate in the air also affects visibility, obscuring how far in the distance one can see.

[Sulfur Dioxide \(SO₂\)](#) is a colorless gas formed during the combustion of fuels containing sulfur, such as coal. Breathing SO₂ irritates the respiratory system and aggravates asthma symptoms.

For each of the six [criteria pollutants](#), the USEPA has established "primary" standards to protect public health, and "secondary" standards to protect other aspects of public welfare, such as protecting wildlife and ecosystems, preventing crop and vegetation damage, preventing materials damage, or assuring visibility. These standards are called the [National Ambient Air Quality Standards](#) (NAAQS). Areas of the country where air pollution levels persistently exceed these standards may be designated as [nonattainment areas](#).

Other main air pollutants

[Volatile Organic Compounds \(VOC\)](#) are a large group of different compounds which each contain carbon and hydrogen (also known as hydrocarbons). Many VOCs are considered to be toxic air pollutants. VOCs are found in gasoline, solvents, oil based paints and inks, and in many consumer products such as aerosol spray products-- materials which "evaporate". VOCs react with nitrogen oxides, sunlight and heat to form ozone.

[Toxic Air Pollutants](#), also referred to as "hazardous air pollutants" or "air toxics", are a group of pollutants that are known or suspected to cause cancer or other serious health effects such as reproductive effects, birth defects, or to cause adverse environmental effects. There are literally thousands of sources of toxic pollutants. Because of the substantial risks to human health, these compounds are regulated separately from the criteria air pollutants. The degree to which a toxic air pollutant affects a person's health depends on many factors, including the quantity, duration, and frequency of exposures, the toxicity of the chemical and personal susceptibility.

We are exposed to literally thousands of toxic air pollutants everyday. Some of these pollutants are present in the form of gasoline vapor, cleaning solvents, and paint strippers. Large and small manufacturing facilities, as well as people's daily automobile driving, all contribute to air toxic pollution. In the United States, 42 percent of air toxic emissions come from mobile sources like cars, trucks, buses or farm equipment. Area sources or smaller sources such as dry cleaners, gas stations, and small manufacturing companies produce 34 percent of the air toxics nationwide. 24 percent of the air toxics come from large stationary sources, known as point sources, such as chemical plants, oil refineries and pulp and paper mills.

Who controls air pollution?

USEPA and the Clean Air Act

The [Clean Air Act](#) is the federal law meant to help keep the air clean. The law provides the legal authority for the USEPA's air pollution control programs. See [The Plain English Guide to the Clean Air Act](#) for more general information. On a national level, the USEPA conducts basic research about air pollution and sets national standards for controlling pollution.

The [USEPA Region 9](#) office in San Francisco administers this law in Arizona, California, Hawaii, Nevada, the Pacific Islands, and the Tribal Nations located within those states. USEPA Region 9 staff work to improve the region's air quality and protect public health by working with state and tribal governments to develop and implement effective air pollution control programs.

State Agencies

The [Clean Air Act](#) places most of the responsibility on states to prevent and control air pollution. In order for a state to operate an air quality program, the state must adopt a plan, called a State Implementation Plan (SIP), and obtain approval of the plan from the USEPA. Federal

approval provides for some consistency in different state programs and ensures that a state program complies with the requirements of the [Clean Air Act](#) and the USEPA rules. A SIP adopted by the state government and approved by the USEPA is legally binding under both state and federal law and may be enforced by either government.

Indian Tribes

The [Clean Air Act](#) also acknowledges that in some cases, it is appropriate for Indian tribes to prevent and control air pollution within the boundaries of Indian country. Although not required to do so, a tribe may develop and enact its own air quality control plan, called a Tribal Implementation Plan (TIP), and obtain approval for the plan from the USEPA. A TIP adopted by a tribal government and approved by the USEPA is legally binding under both tribal and federal law and may be enforced by either government.

Until a TIP is adopted and approved by the USEPA or in those cases where a tribe opts not to adopt its own program, it is the USEPA's responsibility to implement the [Clean Air Act](#) in Indian country. The USEPA recognizes the primary role for tribes in protecting air resources in Indian country and is working with tribes to protect the air in the absence of approved tribal programs.