**Air Pollution: Everything You Need to Know**

**What contributes to air pollution?**

The air we breathe in many cities is being polluted by driving cars and trucks; burning coal, oil, and other fossil fuels; and manufacturing chemicals. Millions of people live in areas where urban smog, very small particles, and toxic pollutants pose serious health concerns.

Carbon monoxide is an odorless, colorless gas and is formed when the carbon in fuels does not completely burn. Vehicle exhaust contributes roughly 60 percent of all carbon monoxide emissions nationwide, and up to 95 percent in cities. Other sources include fuel combustion in industrial processes and natural sources such as wildfires.

**Why is air pollution a problem?**

According to the Environmental Protection Agency, the average adult breathes over 3,000 gallons of air every day. Children breathe even more air per pound of body weight and are more susceptible to air pollution.

Air pollution threatens the health of human beings and other living things on our planet. While often invisible, pollutants in the air create smog and acid rain, cause cancer or other serious health effects, diminish the protective ozone layer in the upper atmosphere, and contribute to the potential for world climate change.

**What is the difference between air pollutants and toxic air pollutants?**

Toxic air pollutants (or Hazardous Air Pollutants) are different from air pollutants. Air toxics are known or suspected to cause cancer or other serious heath effects, such as damage to respiratory or nervous systems. Toxic air pollutants may exist as particulate matter or as vapors (gases). Air toxics include metals, particles, and certain vapors from fuels and other sources.

Top-ten kinds of air pollution



Photo: Flying molecules—if you could see air pollution close up, this is what it would look like. Image courtesy of US Department of Energy.

Any gas could qualify as pollution if it reached a high enough concentration to do harm. Theoretically, that means there are dozens of different pollution gases. In practice, about ten different substances cause most concern:

**Sulfur dioxide:** Coal, petroleum, and other fuels are often impure and contain sulfur as well as organic (carbon-based) compounds. When sulfur (spelled "sulphur" in some countries) burns with oxygen from the air, sulfur dioxide (SO2) is produced. Coal-fired [power plants](https://www.explainthatstuff.com/powerplants.html) are the world's biggest source of sulfur-dioxide air pollution, which contributes to smog, acid rain, and health problems that include lung disease. Large amounts of sulfur dioxide are also produced by ships, which use dirtier diesel fuel than cars and trucks.

**Carbon monoxide**: This highly dangerous gas forms when fuels have too little oxygen to burn completely. It spews out in car exhausts and it can also build up to dangerous levels inside your home if you have a poorly maintained [gas boiler](https://www.explainthatstuff.com/gasboilers.html), stove, or fuel-burning appliance. (Always fit a [carbon monoxide detector](https://www.explainthatstuff.com/carbonmonoxidedetectors.html) if you burn fuels indoors.)

**Carbon dioxide:** This gas is central to everyday life and isn't normally considered a pollutant: we all produce it when we breathe out and plants such as crops and trees need to "breathe" it in to grow. However, carbon dioxide is also a greenhouse gas released by engines and power plants. Since the beginning of the Industrial Revolution, it's been building up in Earth's atmosphere and contributing to the problem of [global warming and climate change](https://www.explainthatstuff.com/globalwarmingforkids.html).

**Nitrogen oxides:** Nitrogen dioxide (NO2) and nitrogen oxide (NO) are pollutants produced as an indirect result of combustion, when nitrogen and oxygen from the air react together. Nitrogen oxide pollution comes from [vehicle engines](https://www.explainthatstuff.com/carengines.html) and power plants, and plays an important role in the formation of acid rain, ozone and smog. Nitrogen oxides are also "indirect greenhouse gases" (they contribute to global warming by producing ozone, which is a greenhouse gas).

**Volatile organic compounds (VOCs):** These carbon-based (organic) chemicals evaporate easily at ordinary temperatures and pressures, so they readily become gases. That's precisely why they're used as solvents in many different household chemicals such as [paints](https://www.explainthatstuff.com/howpaintworks.html), waxes, and varnishes. Unfortunately, they're also a form of air pollution: they're believed to have long-term (chronic) effects on people's health and they play a role in the formation of ozone and smog. VOCs are also released by tobacco smoke and wildfires.

**Particulates:** There are many different kinds of particulates, from black soot in diesel exhaust to dust and organic matter from the desert. Airborne liquid droplets from farm pollution also count as particulates. Particulates of different sizes are often referred to by the letters PM followed by a number, so PM10 means soot particles of less than 10 microns (10 millionths of a meter or 10µm in diameter, roughly 10 times thinner than a thick human hair). The smaller ("finer") the particulates, the deeper they travel into our lungs and the more dangerous they are. PM2.5 particulates are much more dangerous (they're less than 2.5 millionths of a meter or about 40 times thinner than a typical hair). In cities, most particulates come from traffic fumes.

**Ozone**: Also called trioxygen, this is a type of oxygen gas whose molecules are made from three oxygen [atoms](https://www.explainthatstuff.com/atoms.html) joined together (so it has the chemical formula O3), instead of just the two atoms in conventional oxygen (O2). In the stratosphere (upper atmosphere), a band of ozone ("the ozone layer") protects us by screening out harmful [ultraviolet](https://www.explainthatstuff.com/electromagnetic-spectrum.html) radiation (high-energy blue light) beaming down from the Sun. At ground level, it's a toxic pollutant that can damage health. It forms when sunlight strikes a cocktail of other pollution and is a key ingredient of smog (see box below).

**Chlorofluorocarbons (CFCs):** Once thought to be harmless, these gases were widely used in [refrigerators](https://www.explainthatstuff.com/refrigerator.html) and [aerosol cans](https://www.explainthatstuff.com/aerosolcans.html) until it was discovered that they damaged Earth's ozone layer. We discuss this in more detail down below.

**Unburned hydrocarbons:** Petroleum and other fuels are made of organic compounds based on chains of carbon and hydrogen atoms. When they burn properly, they're completely converted into harmless carbon dioxide and [water](https://www.explainthatstuff.com/water.html); when they burn incompletely, they can release carbon monoxide or float into the air in their unburned form, contributing to smog.

**Lead and heavy metals**: [Lead](https://www.explainthatstuff.com/lead.html) and other toxic "heavy metals" can be spread into the air either as toxic compounds or as [aerosols](https://www.explainthatstuff.com/aerosolcans.html) (when solids or liquids are dispersed through gases and carried through the air by them) in such things as exhaust fumes and the [fly ash](https://en.wikipedia.org/wiki/Fly_ash) (contaminated waste dust) from incinerator smokestacks.

**Smog** (a combination of the words "smoke" and "fog") forms when sunlight acts on a cocktail of pollutant gases such as nitrogen and sulfur oxides, unburned hydrocarbons, and carbon monoxide; that's why it's sometimes called photochemical smog (the [energy](https://www.explainthatstuff.com/energy.html) in [light](https://www.explainthatstuff.com/light.html) causes the chemical reaction that makes smog). One of the most harmful constituents of smog is a toxic form of oxygen called ozone, which can cause serious breathing difficulties and even, sometimes, death. When smog is rich in ozone, it tends to be a blueish color, otherwise it's more likely to be brown. Normally, air gets colder the higher up you go but in a temperature inversion the opposite happens: a layer of warm air traps a layer of cold air nearer the ground. This acts like a lid over a cloud of smog and stops it from rising and drifting away. Largely because of their traffic levels, smog afflicts many of the world's busiest cities, including [Athens](https://www.eea.europa.eu/publications/2599XXX/page018.html), [Beijing](https://www.theguardian.com/world/2016/dec/17/beijing-smog-pollution-red-alert-declared-in-china-capital-and-21-other-cities), [Delhi](https://www.theguardian.com/world/2017/dec/03/pollution-stops-play-at-delhi-test-match-as-bowlers-struggle-to-breathe), [Madrid](https://www.theguardian.com/world/2016/dec/29/madrid-bans-half-of-cars-from-roads-to-fight-air-pollution), [Mexico City](https://www.theguardian.com/world/2016/mar/16/choked-mexico-city-bans-1m-cars-in-air-pollution-alert), [Milan](https://www.nytimes.com/2015/12/25/world/europe/italy-air-pollution.html), [Paris](https://www.theguardian.com/environment/2015/mar/18/eiffel-tower-shrouded-in-smog-as-paris-pollution-spikes), and [Tokyo](https://www.bloomberg.com/news/articles/2014-02-27/tokyo-air-pollution-climbs-approaches-government-alert-levels).



**Power plants**

[Renewable energy](https://www.explainthatstuff.com/renewableenergy.html) sources such as [solar panels](https://www.explainthatstuff.com/solarcells.html) and [wind turbines](https://www.explainthatstuff.com/windturbines.html) are helping us generate a bigger proportion of our power every year, but the overwhelming majority of [electricity](https://www.explainthatstuff.com/electricity.html) (about [two thirds](https://www.eia.gov/tools/faqs/faq.php?id=427&t=3) in the United States) is still produced by burning fossil fuels such as coal, gas, and oil, mostly in conventional [power plants](https://www.explainthatstuff.com/powerplants.html). Just like car engines, power plants should theoretically produce nothing worse than carbon dioxide and water; in practice, fuels are dirty and they don't burn cleanly, so power plants produce a range of air pollutants, notably sulfur dioxide, nitrogen oxides, and particulates. (They also release huge amounts of carbon dioxide, a key cause of [global warming and climate change](https://www.explainthatstuff.com/globalwarmingforkids.html) when it rises and accumulates in the atmosphere. We discuss this a bit more down below.)

**Industrial plants and factories**

Plants that produce the goods we all rely on often release small but significant quantities of pollution into the air. Industrial plants that produce metals such as [aluminum](https://www.explainthatstuff.com/aluminum.html) and [steel](https://www.explainthatstuff.com/ironsteel.html), refine petroleum, produce cement, synthesize [plastic](https://www.explainthatstuff.com/plastics.html), or make other chemicals are among those that can produce harmful air pollution. Most plants that pollute release small amounts of pollution continually over a long period of time, though the effects can be cumulative (gradually building up). Sometimes industrial plants release huge of amounts of air pollution accidentally in a very short space of time. One notable case happened in Bhopal, India in December 1984, when a large chemical plant run by the Union Carbide company released a poisonous gas (methyl isocyanate) that hung over the local area, killing around 3000 people and injuring thousands more. (Wikipedia's article on the [Bhopal Disaster](https://en.wikipedia.org/wiki/Bhopal_disaster) gives a comprehensive account of what happened.)

**Human health**

We know air pollution is a bad thing without even thinking about it. Have you ever coughed when a truck drove past belching out its sooty exhaust? Instinctively, you cough to clear your lungs and protect your body and you might even cover your face with your handkerchief or sleeve to filter the air until it feels safe to breathe deeply again. You don't have to be told that pollution like this might harm your health to want to steer clear of it: your body acts automatically. The only trouble is, we can't always see or smell air pollution, tell when it's affecting us, or know how it might harm us days, months, or even years in the future.

It's no big surprise that air pollution is linked to respiratory (breathing) problems such as asthma and pneumonia. But medical research has now connected it to a huge range of other health problems, including heart disease, strokes, high blood pressure, diabetes, dementia, fertility problems, various cancers, cataracts, and all sorts of birth-related problems (including miscarriages and low-birth weight).

**Acid rain—a closer look**

When acid rain accumulates in lakes or rivers, it gradually turns the entire water more acidic. That's a real problem because fish thrive only in water that is neutral or slightly acidic (typically with a pH of 6.5–7.0). Once the acidity drops below about pH 6.0, fish soon start to die—and if the pH drops to about 4.0 or less, all the fish will be killed.

Acid rain has caused major problems in lakes throughout North America and Europe. It also causes the death of forests, reduces the fertility of soil, and damages buildings by eating away stonework (the marble on the [US Capitol](https://pubs.usgs.gov/gip/stones/acid-rain.html) in Washington, DC has been eroded by acid-rain, for example).

**Global warming**

Every time you ride in a car, turn on the lights, switch on your [TV](https://www.explainthatstuff.com/television.html), take a shower, [microwave](https://www.explainthatstuff.com/microwaveovens.html) a meal, or use [energy](https://www.explainthatstuff.com/energy.html) that's come from burning a fossil fuel such as oil, coal, or natural gas, you're almost certainly adding to the problem of global warming and climate change: unless it's been produced in some environmentally friendly way, the energy you're using has most likely released carbon dioxide gas into the air. While it's not an obvious pollutant, carbon dioxide has gradually built up in the atmosphere, along with other chemicals known as greenhouse gases. Together, these gases act a bit like a blanket surrounding our planet that is slowly making the mean global temperature rise, causing the climate (the long-term pattern of our weather) to change, and producing a variety of different effects on the natural world, including rising sea levels. Read more in our main article about [global warming and climate change](https://www.explainthatstuff.com/globalwarmingforkids.html).

**What is the air pollution index?**

The Air Quality Index (AQI) is an index for reporting daily air quality. It measures how clean or polluted air is and informs the public to be aware of associated health concerns.

Browse the world map showing the air quality using the web address given below

https://waqi.info/#/c/51.649/21.882/5.5z

To check Air Quality in City closer to you “Let us locate the nearest station” tab. A drop menu gives you list cities closer to you. Then choose the city you like to get information –

 Example: - if you have selected Tracy,CA from the list, a page opens up describing the Air Quality in Tracy, CA

**What pollutants affect air quality?**

A few air pollutants, called criteria air pollutants, are common throughout the United States. These pollutants can injure health, harm the environment and cause property damage. The current criteria pollutants are: Carbon Monoxide, Lead, Nitrogen Dioxide, Ozone, Particulate matter with aerodynamic size less than or equal to 10 micrometers, and Sulfur Dioxide.

**What can be done to prevent pollution?**

Your home and office can actually contribute to the greenhouse effect. Energy used in everyday activities -- turning on electrical appliances, driving cars, and heating and cooling our homes -- is responsible for air pollution that contributes to climate change. You can cut down on pollution by:

 Making sure your computer and monitor power management settings are optimized, so they go into sleep mode when you're away from your desk.

 Making sure someone in your office turns off the printer and copier at the end of the day.

 Setting your printers and copiers to automatically print on both sides -- it takes more energy to make a sheet of paper than to copy an image onto it.

**Laws and regulations**

Clean Air Act of 1956, which restricted how and where coal could be burned .The 1990 Pollution Prevention Act went even further, shifting the emphasis from cleaning up pollution to preventing it ever happening in the first place.

If you are seeing an environmental event that may lead to an immediate threat to human health or the environment, call 911, then report it to the [National Response Center](https://www.epa.gov/pesticide-incidents/how-report-spills-and-environmental-violations#who) at: 1-800-424-8802.

Online reporting through the website <https://echo.epa.gov/report-environmental-violations>. Or

<https://www.epa.gov/enforcement/report-environmental-violation-general-information>

Reference material

<https://www.conserve-energy-future.com/causes-effects-solutions-of-air-pollution.php>[ENVIRONMENT](https://www.renewableresourcescoalition.org/category/environment/)

<https://sciencing.com/short-term-effects-air-pollution-5325756.html>

<https://www.nationalgeographic.org/encyclopedia/air-pollution/>