AIR POLLUTION

The contamination of the air present in the atmosphere is known as “**Air pollution**”. Respiration is an important life process of all living things. We breathe in the air present in the atmosphere. Therefore if the air around us is contaminated with poisonous gases, it would have a fatal effect on us.

The air naturally comprises of 78% of nitrogen, 21% of oxygen, 0.9% of oxide gases and 0.1% of inert gases. When this balance is changed, it causes disruptions of severe proportions.

 **Air pollution**: is the introduction of particulates, biological molecules, or other harmful materials into the Earth's atmosphere, possibly causing disease, death to humans, damage to other living organisms such as food crops, or the natural or built environment.

 Air pollution occurs in many forms but can generally be thought of as gaseous and particulate contaminants that are present in the earth's atmosphere. **Gaseous pollutants** include sulfur dioxide (SO2), nitrogen oxides (NOx), ozone (O3), carbon monoxide (CO), volatile organic compounds (VOC), hydrogen sulfide (H2S), hydrogen fluoride (HF), and various gaseous forms of metals. These pollutants are emitted from large stationary sources such as fossil fuel fired power plants, smelters, industrial boilers, petroleum refineries, and manufacturing facilities as well as from area and mobile sources. They are corrosive to various materials which causes damage to cultural resources, can cause injury to ecosystems and organisms, aggravate respiratory diseases, and reduce visibility.

**Particulates** come in both large and small or "fine" solid forms. Large particulates include substances such as dust, asbestos fibers, and lead. Fine particulates include sulfates (SO4) and nitrates (NO3). Important sources of particulates are power plants, smelters, mining operations, and automobiles. Asbestos and lead affect organisms, while sulfates and nitrates not only cause health problems, but also contribute to acid rain or acid deposition and a reduction in visibility. Particulate matter, a term sometimes used instead of particulates, refers to the mixture of solid particles and liquid droplets found in the air.

**What Causes Air Pollution?**

**1.Mobile Sources** In general, mobile sources imply "on-road" transportation, which includes vehicles such as cars, sport utility vehicles, and buses. In addition, there is also a "non-road" or "off-road" category that includes farm and construction equipment, boats, planes, and trains.

**2.Agricultural Sources**
 In crop production, the misapplication of fertilizers, herbicides, and pesticides can potentially result in aerial drift of these materials and harm may be caused.

**3.NATURAL RESOURCES**

 Wild land fires, dust storms, and volcanic activity also contribute gases and particulates to our atmosphere.

4. Industrial Sources( **Emissions from industries and manufacturing activities**)

 such as power plants, oil refineries, industrial facilities, and factories

Consider a typical manufacturing plant: You will notice that there are long tubes (called chimneys) erected high into the air, with lots of smoke and fumes coming out of it. Waste incinerators, manufacturing industries and power plants emit high levels of carbon monoxide, organic compounds, and chemicals into the air. This happens almost everywhere that people live. Petroleum refineries also release lots of hydrocarbons into the air.

**5.Household and Farming Chemicals**(human activities at home)

 Crop dusting, fumigating homes, household cleaning products or painting supplies, over the counter insect/pest killers, fertilizer dust emit harmful chemicals into the air and cause pollution. In many case, when we use these chemicals at home or offices with no or little ventilation, we may fall ill if we breathe them.

Major air pollutants include:

[Sulfur oxides](http://en.wikipedia.org/wiki/Sulfur_oxide) (SOx) - particularly sulfur dioxide, a chemical compound with the formula SO2. SO2 is produced by volcanoes and in various industrial processes. Coal and petroleum often contain sulfur compounds, and their combustion generates sulfur dioxide. Further oxidation of SO2, usually in the presence of a catalyst such as NO2, forms H2SO4, and thus [acid rain](http://en.wikipedia.org/wiki/Acid_rain). This is one of the causes for concern over the environmental impact of the use of these fuels as power sources. **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](http://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

[Nitrogen oxides](http://en.wikipedia.org/wiki/Nitrogen_oxide) (NOx) - Nitrogen oxides, particularly [nitrogen dioxide](http://en.wikipedia.org/wiki/Nitrogen_dioxide), are expelled from high temperature combustion, and are also produced during [thunderstorms](http://en.wikipedia.org/wiki/Thunderstorms) by [electric discharge](http://en.wikipedia.org/wiki/Electric_discharge). Nitrogen dioxide is a chemical compound with the formula NO2. It is one of several nitrogen oxides.  **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](http://www.explainthatstuff.com/carengines.html) and power plants, and plays an important role in the formation of acid rain, ozone and smog. Like carbon dioxide, nitrogen oxides are also greenhouse gases (ones that contribute to global warming).

[Carbon monoxide](http://en.wikipedia.org/wiki/Carbon_monoxide) (CO) - CO is a colorless, odorless, toxic yet non-irritating gas. It is a product by [incomplete combustion](http://en.wikipedia.org/wiki/Incomplete_combustion) of fuel such as natural gas, coal or wood. Vehicular exhaust is a major source of carbon monoxide. **Carbon monoxide**: This highly dangerous gas forms when fuels have too little oxygen to burn completely.

**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](http://www.explainthatstuff.com/globalwarmingforkids.html).

[Volatile organic compounds](http://en.wikipedia.org/wiki/Volatile_organic_compounds) - VOCs are a well-known outdoor air pollutant. They are categorized as either methane (CH4) or non-methane (NMVOCs). Methane is an extremely efficient greenhouse gas which contributes to enhanced [global warming](http://en.wikipedia.org/wiki/Global_warming). Other hydrocarbon VOCs are also significant greenhouse gases because of their role in creating ozone and prolonging the life of methane in the atmosphere. This effect varies depending on local air quality. The aromatic NMVOCs benzene, toluene and xylene are suspected carcinogens and may lead to leukemia with prolonged exposure. 1,3-butadiene is another dangerous compound often associated with industrial use. **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](http://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 also play a role in the formation of ozone and smog.

[Particulates](http://en.wikipedia.org/wiki/Particulates), alternatively referred to as particulate matter (PM), atmospheric particulate matter, or fine particles, are tiny particles of solid or liquid suspended in a gas. In contrast, aerosol refers to combined particles and gas. Some particulates occur naturally, originating from volcanoes, dust storms, forest and grassland fires, living vegetation, and sea spray. Human activities, such as the burning of fossil fuels in vehicles, power plants and various industrial processes also generate significant amounts of aerosols. Averaged worldwide, anthropogenic aerosols—those made by human activities—currently account for approximately 10 percent of our atmosphere. Increased levels of fine particles in the air are linked to health hazards such as heart disease,[[3]](http://en.wikipedia.org/wiki/Air_pollution#cite_note-3) altered lung function and lung cancer. **Particulates**: These are the sooty deposits in air pollution that blacken buildings and cause breathing difficulties. 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). In cities, most particulates come from traffic fumes.

Toxic [metals](http://en.wikipedia.org/wiki/Metal), such as [lead](http://en.wikipedia.org/wiki/Lead) and [mercury](http://en.wikipedia.org/wiki/Mercury_%28element%29), especially their compounds. **Lead and heavy metals**: [Lead](http://www.explainthatstuff.com/lead.html) and other toxic "heavy metals" can be spread into the air either as toxic compounds or as [aerosols](http://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](http://en.wikipedia.org/wiki/Fly_ash) (contaminated waste dust) from incinerator smokestacks.

[Chlorofluorocarbons](http://en.wikipedia.org/wiki/Chlorofluorocarbons) (CFCs) - harmful to the [ozone layer](http://en.wikipedia.org/wiki/Ozone_layer); emitted from products are currently banned from use. These are gases which are released from air conditioners, refrigerators, aerosol sprays, etc. CFC's on being released into the air rises to [stratosphere](http://en.wikipedia.org/wiki/Stratosphere). Here they come in contact with other gases and damage the [ozone layer](http://en.wikipedia.org/wiki/Ozone_layer). This allows harmful ultraviolet rays to reach the earth's surface. This can lead to skin cancer, disease to eye and can even cause damage to plants. **Chlorofluorocarbons (CFCs)**: Once thought to be harmless, these gases were widely used in [refrigerators](http://www.explainthatstuff.com/refrigerator.html) and [aerosol cans](http://www.explainthatstuff.com/aerosolcans.html) until it was discovered that they damaged Earth's ozone layer.

**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](http://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.

**Ozone**: Also called trioxygen, this is a type of oxygen gas whose molecules are made from three oxygen [atoms](http://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](http://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 .

**Effects of Air pollution**

**1. Respiratory and heart problems:** The effects of Air pollution are alarming. They are known to create several respiratory and heart conditions along with Cancer, among other threats to the body. Several millions are known to have died due to direct or indirect effects of Air pollution. Children in areas exposed to air pollutants are said to commonly suffer from pneumonia and asthma.

**2. Global warming:** Another direct effect is the immediate alterations that the world is witnessing due to [Global warming](http://www.conserve-energy-future.com/GlobalWarmingCauses.php). With increased temperatures world wide, increase in sea levels and melting of ice from colder regions and icebergs, displacement and loss of habitat have already signaled an impending disaster if actions for preservation and normalization aren’t undertaken soon.

**3. Acid Rain:** Harmful gases like nitrogen oxides and sulfur oxides are released into the atmosphere during the burning of [fossil fuels](http://www.conserve-energy-future.com/FossilFuels.php). When it rains, the water droplets combines with these air pollutants, becomes acidic and then falls on the ground in the form of acid rain. [Acid rain](http://www.conserve-energy-future.com/causes-and-effects-of-acid-rain.php) can cause great damage to human, animals and crops.

**4. Effect on Wildlife:** Just like humans, animals also face some devastating affects of air pollution. Toxic chemicals present in the air can force wildlife species to move to new place and change their habitat. The toxic pollutants deposit over the surface of the water and can also affect sea animals.

**5. Depletion of Ozone layer:** Ozone exists in earth’s stratosphere and is responsible for protecting humans from harmful ultraviolet (UV) rays. Earth’s ozone layer is depleting due to the presence of chlorofluorocarbons, hydro chlorofluorocarbons in the atmosphere. As ozone layer will go thin, it will emit harmful rays back on earth and can cause skin and eye related problems. UV rays also have the capability to affect crops.

**Solutions for Air Pollution**

**1. Use public mode of transportation:** Encourage people to use more and more [public modes of transportation](http://www.conserve-energy-future.com/Benefits_of_Public_Transportation.php) to reduce pollution. Also, try to make use of car pooling. If you and your colleagues come from the same locality and have same timings you can explore this option to save energy and money.

**2. Conserve energy:** Switch off fans and lights when you are going out. Large amount of fossil fuels are burnt to produce electricity. You can save the environment from degradation by reducing the amount of fossil fuels to be burned.

**3. Understand the concept of Reduce, Reuse and Recycle:** Do not throw away items that are of no use to you. In-fact reuse them for some other purpose. For e.g. you can use old jars to store cereals or pulses.

**4. Emphasis on clean energy resources:** [Clean energy](http://conserve-energy-future.com/) technologies like[solar](http://www.conserve-energy-future.com/SolarPanelBenefits.php), [wind](http://www.conserve-energy-future.com/Wind_Into_Energy.php) and [geothermal](http://www.conserve-energy-future.com/GeothermalEnergy.php) are on high these days. Governments of various countries have been providing grants to consumers who are interested in installing [solar panels](http://www.conserve-energy-future.com/BuildSolarPowerPanel.php) for their home. This will go a long way to curb air pollution.

**5. Use energy efficient devices:** CFL lights consume [less electricity](http://www.conserve-energy-future.com/SaveElectricity.php) as against their counterparts. They live longer, consume less electricity, lower electricity bills and also help you to reduce pollution by consuming less energy.

SMOG

 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](http://www.explainthatstuff.com/energy.html) in [light](http://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.

 **Photochemical smog** is a type of [smog](https://energyeducation.ca/encyclopedia/Smog) produced when [ultraviolet](https://energyeducation.ca/encyclopedia/Ultraviolet) light from the [sun](https://energyeducation.ca/encyclopedia/Sun) reacts with [nitrogen oxides](https://energyeducation.ca/encyclopedia/NOx) in the [atmosphere](https://energyeducation.ca/encyclopedia/Atmosphere). It is visible as a brown haze, and is most prominent during the morning and afternoon, especially in densely populated, warm cities.[[2]](https://energyeducation.ca/encyclopedia/Photochemical_smog#cite_note-boyle-2) Cities that experience this smog daily include Los Angeles, Sydney, Mexico City, Beijing, and many more. Photochemical smog forms from a complex process, however the source of it is quite apparent. The largest contributor is automobiles, while [coal-fired power plants](https://energyeducation.ca/encyclopedia/Coal-fired_power_plant) and some other power plants also produce the necessary [pollutants](https://energyeducation.ca/encyclopedia/Pollutant) to facilitate its production. Due to its abundance in areas of warmer [temperatures](https://energyeducation.ca/encyclopedia/Temperature), photochemical smog is most common in the summer.[[3]](https://energyeducation.ca/encyclopedia/Photochemical_smog#cite_note-hinrichs-3)

It forms in the morning when a tremendous number people are driving their vehicles to work. Nitrogen oxides produced in the car [engine](https://energyeducation.ca/encyclopedia/Engine) are introduced into the atmosphere, which may combine with [water](https://energyeducation.ca/encyclopedia/Water) to form nitric acid or react with sunlight to produce singular [oxygen](https://energyeducation.ca/encyclopedia/Oxygen) atoms, which then combine with [molecular oxygen](https://energyeducation.ca/encyclopedia/Molecular_oxygen) to produce [ozone](https://energyeducation.ca/encyclopedia/Ozone).[[2]](https://energyeducation.ca/encyclopedia/Photochemical_smog#cite_note-boyle-2) The nitric acid may precipitate to the Earth resulting in [acid rain](https://energyeducation.ca/encyclopedia/Acid_rain), or remain in the smog. Due to the direct production of it by vehicles, the smog forms over cities where many people may encounter its adverse health effects.

Hotter days mean more photochemical smog, especially in the densely populated cities such as those mentioned above. As more and more [urban populations](https://energyeducation.ca/encyclopedia/Urban_population) arise around the globe, this problem is only expected to increase.[[4]](https://energyeducation.ca/encyclopedia/Photochemical_smog#cite_note-hackett-4)

**Composition**

Nitric oxide (NO) and nitrogen dioxide (NO2) are emitted from the combustion of [fossil fuels](https://energyeducation.ca/encyclopedia/Fossil_fuel), along with being naturally emitted from things such as volcanos and forest fires (it is the *immense concentration* of these pollutants within cities that is of the most concern however, as natural emissions tend to spread out over larger areas). When exposed to ultraviolet radiation, NO2 goes through a complex series of reactions with [hydrocarbons](https://energyeducation.ca/encyclopedia/Hydrocarbon) to produce the components of photochemical smog—a mixture of [**ozone**](https://energyeducation.ca/encyclopedia/Ozone), **nitric acid**, **aldehydes**, [**peroxyacyl nitrates**](https://energyeducation.ca/encyclopedia/Peroxyacyl_nitrate) (**PANs**) and other [secondary pollutants](https://energyeducation.ca/encyclopedia/Secondary_pollutant).

NO2, ozone and PANs are called **photochemical oxidants** because they can react and oxidize certain compounds in the atmosphere or within a person's lungs that are not normally oxidized. Even small traces of these chemicals can affect the respiratory tract of humans and animals, and damage crops and trees.

**Acid rain**

When rain falls through polluted air, it can pick up some of the pollution and turn more acidic—producing what's known as **acid rain**. Simply speaking, the air pollution converts the rain into a weak acid.

  **Acid rain** is a [rain](https://en.wikipedia.org/wiki/Rain) or any other form of [precipitation](https://en.wikipedia.org/wiki/Precipitation_%28meteorology%29) that is unusually [acidic](https://en.wikipedia.org/wiki/Acid), meaning that it has elevated levels of hydrogen ions (low [pH](https://en.wikipedia.org/wiki/PH)). It can have harmful effects on plants, aquatic animals and infrastructure. Acid rain is caused by emissions of [sulphur dioxide](https://en.wikipedia.org/wiki/Sulfur_dioxide) and [nitrogen oxide](https://en.wikipedia.org/wiki/Nitrogen_oxide), which react with the [water molecules](https://en.wikipedia.org/wiki/Properties_of_water) in the [atmosphere](https://en.wikipedia.org/wiki/Atmosphere) to produce acids. Some governments have made efforts since the 1970s to reduce the release of sulphur dioxide and nitrogen oxide into the atmosphere with positive results. Nitrogen oxides can also be produced naturally by [lightning](https://en.wikipedia.org/wiki/Lightning)strikes, and sulphur dioxide is produced by [volcanic eruptions](https://en.wikipedia.org/wiki/Types_of_volcanic_eruptions). Acid rain has been shown to have adverse impacts on forests, freshwaters and soils, killing insect and aquatic life-forms, causing paint to peel, [corrosion](https://en.wikipedia.org/wiki/Corrosion) of steel structures such as bridges, and [weathering](https://en.wikipedia.org/wiki/Weathering) of stone buildings and statues as well as having impacts on human health.

**Global warming**

Every time you ride in a car, turn on the lights, switch on your [TV](http://www.explainthatstuff.com/television.html), take a shower, [microwave](http://www.explainthatstuff.com/microwaveovens.html) a meal, or use [energy](http://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.

 **Global warming** and **climate change** both refer to the observed century-scale rise in the average temperature of the Earth's [climate system](http://en.wikipedia.org/wiki/Climate) and its related effects. Multiple lines of scientific evidence show that the climate system is warming. More than 90% of the additional energy stored in the climate system since 1970 has gone into ocean warming; the remainder has melted ice, and warmed the continents and atmosphere. The observed increases in global average surface temperature and atmospheric carbon dioxide have been much faster in recent decades than the natural changes of previous millennia, and levels are now higher than at any time for hundreds of thousands of years prior

Global warming is primarily a problem of too much carbon dioxide (CO2) in the atmosphere—which acts as a blanket, trapping heat and warming the planet. As we burn fossil fuels like coal, oil and natural gas for energy or cut down and burn forests to create pastures and plantations, carbon accumulates and overloads our atmosphere. Global warming will have catastrophic effects such as accelerating sea level rise, droughts, floods, storms and heat waves. These will impact some of the world's poorest and most vulnerable people, disrupting food production, and threatening vitally important species, habitats and ecosystems.

Ozone depletion

**The Different Levels of the Atmosphere are:**

**Troposphere**: This is the lowest atmospheric layer and is about seven miles (11 km) thick. Most clouds and weather are found in the troposphere. The troposphere is thinner at the poles (averaging about 8km thick) and thicker at the equator (averaging about 16km thick). The temperature decreases with altitude.

**Stratosphere**: The stratosphere is found from about 7 to 30 miles (11-48 kilometers) above the Earth’s surface. In this region of the atmosphere is the ozone layer, which absorbs most of the harmful ultraviolet radiation from the Sun. The temperature increases slightly with altitude in the stratosphere. The highest temperature in this region is about 32 degrees Fahrenheit or 0 degrees Celsius.

**Mesosphere**: The mesosphere is above the stratosphere. Here the atmosphere is very rarefied, that is, thin, and the temperature is decreasing with altitude, about –130 Fahrenheit (-90 Celsius) at the top.

**Thermosphere**: The thermosphere starts at about 55 kilometers. The temperature is quite hot; here temperature is not measured using a thermometer, but by looking at the motion and speed of the rarefied gases in this region, which are very energetic but would not affect a thermometer. Temperatures in this region may be as high as thousands of degrees.

**Exosphere**: The exosphere is the region beyond the thermosphere.

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| **Ionosphere**: The ionosphere overlaps the other atmospheric layers, from above the Earth. The air is ionized by the Sun’s ultraviolet light. These ionized layers affect the transmittance and reflectance of radio waves. Different ioniosphere layers are https://encrypted-tbn1.gstatic.com/images?q=tbn:ANd9GcQXrXlZ61Wfy_hCQl7Cdidbgsx5vjd3ZIVAWyjA_ci7-ZehYWsS |
|  |

 The damage to a part of the atmosphere called the **ozone layer**. At ground level, ozone is an air pollutant—but the ozone that exists in the stratosphere (high up in the atmosphere), is exactly the opposite: it's a perfectly natural chemical that protects us like [sunscreen](http://www.explainthatstuff.com/sunscreen.html), blocking out some of the Sun's harmful [ultraviolet](http://www.explainthatstuff.com/electromagnetic-spectrum.html)radiation. During the 20th century, people started using large quantities of chemicals called**chlorofluorocarbons** (CFCs), because they worked very well as cooling chemicals in [refrigerators](http://www.explainthatstuff.com/refrigerator.html) and propellant gases in [aerosol cans](http://www.explainthatstuff.com/aerosolcans.html) (propellants are the gases that help to fire out air freshener, hair spray, or whatever else the can contains). In 1974, scientists [Mario Molina and Sherwood Rowland](http://nobelprize.org/nobel_prizes/chemistry/laureates/1995/press.html) suggested that chlorofluorocarbons attacked and destroyed the ozone layer, producing holes that would allow dangerous ultraviolet light to stream through. In the 1980s, huge "ozone holes" started to appear over Antarctica, prompting many countries to unite and sign an international agreement called the Montreal Protocol, which rapidly phased out the use of CFCs. As a result, the ozone layer—though still damaged—is expected to recover by the end of the21th century.

Ozone is a highly reactive molecule that contains three oxygen atoms. It is constantly being formed and broken down in the high atmosphere, 6.2 to 31 miles (10 to 50 kilometers) above Earth, in the region called the stratosphere.

The ozone layer is a belt of naturally occurring ozone gas that sits 9.3 to 18.6 miles (15 to 30 kilometers) above Earth and serves as a shield from the harmful ultraviolet B radiation emitted by the sun.

Today, there is widespread concern that the ozone layer is deteriorating due to the release of pollution containing the chemicals chlorine and bromine. Such deterioration allows large amounts of ultraviolet B rays to reach Earth, which can cause skin cancer and cataracts in humans and harm animals as well.

Extra ultraviolet B radiation reaching Earth also inhibits the reproductive cycle of phytoplankton, single-celled organisms such as algae that make up the bottom rung of the food chain. Biologists fear that reductions in phytoplankton populations will in turn lower the populations of other animals. Researchers also have documented changes in the reproductive rates of young fish, shrimp, and crabs as well as frogs and salamanders exposed to excess ultraviolet B.

Chlorofluorocarbons (CFCs), chemicals found mainly in spray aerosols heavily used by industrialized nations for much of the past 50 years, are the primary culprits in ozone layer breakdown. When CFCs reach the upper atmosphere, they are exposed to ultraviolet rays, which causes them to break down into substances that include chlorine. The chlorine reacts with the oxygen atoms in ozone and rips apart the ozone molecule.

One atom of chlorine can destroy more than a hundred thousand ozone molecules.

The ozone layer above the Antarctic has been particularly impacted by pollution since the mid-1980s. This region’s low temperatures speed up the conversion of CFCs to chlorine. In the southern spring and summer, when the sun shines for long periods of the day, chlorine reacts with ultraviolet rays, destroying ozone on a massive scale, up to 65 percent. This is what some people erroneously refer to as the "ozone hole." In other regions, the ozone layer has deteriorated by about 20 percent.