

The effects of air pollution

By Gale/Cengage Learning, adapted by Newsela staff on 04.20.18

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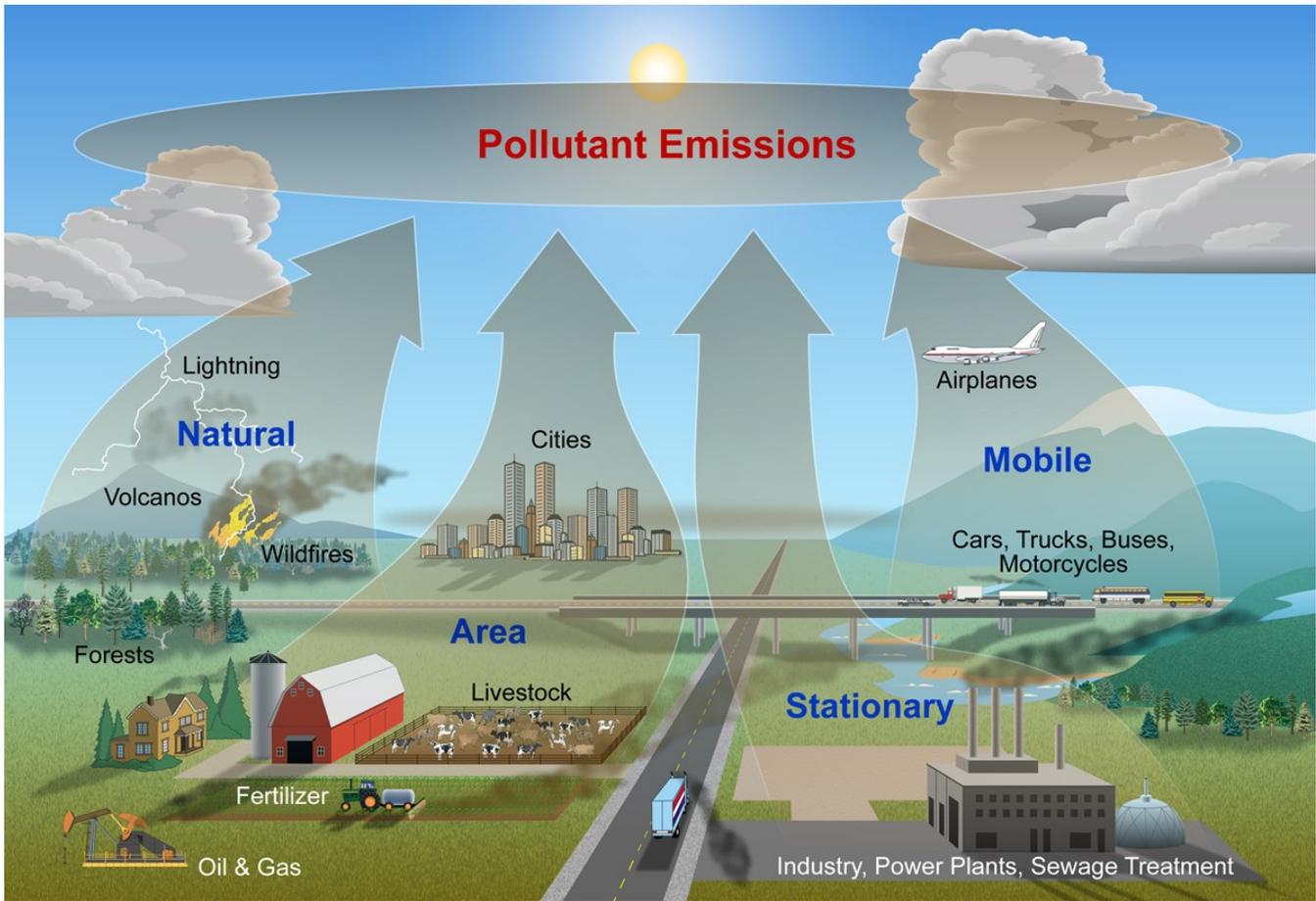
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Image 1. Heavy smog on January 30, 2018, in Shanghai, China. Smog comes from ozone that is close to the Earth's surface. Ozone occurs naturally in the Earth's lower atmosphere, but near ground level, ozone is formed when pollutants emitted by cars, power plants and factories react chemically in the presence of sunlight. Photo: VCG/VCG via Getty Images.

Air pollution refers to matter in the Earth's atmosphere that is dangerous to human health or the environment. It causes serious problems, including respiratory illnesses, climate change, ozone depletion and acid rain. This pollution is usually considered to be caused by humans. Some pollutants come from natural sources. However, most come from humans using fossil fuels for energy. Fossil fuels, such as coal, oil and natural gas, are formed when dead plants are buried in the Earth for millions of years.

The Earth's atmosphere contains several gases. It is made of 78 percent nitrogen, 21 percent oxygen, and 0.4 percent water vapor. Before the widespread use of fossil fuels, the atmosphere was also 0.027 percent carbon dioxide. Burning fossil fuels releases the most carbon dioxide, but so do cooking fires and slash-and-burn agriculture. Human actions increased the amount of carbon dioxide in the atmosphere to 0.04 percent in 2015. This increase is causing climate change.



The Greenhouse Effect

Understanding climate change requires understanding the greenhouse effect. This natural process happens when radiation from the sun enters the Earth's atmosphere. Half of this radiation is absorbed by the Earth's surface, while the other is converted to infrared radiation or heat energy. Some radiation bounces back up into space, but some gets trapped by greenhouse gases (GHGs). The main GHGs are carbon dioxide, methane, nitrous oxide and ozone. The more GHGs in the atmosphere, the more heat is trapped.

In addition to causing climate change, air pollution leads to health problems. The World Health Organization (WHO) estimated that in 2012 air pollution caused 7 million deaths worldwide from respiratory diseases. They called it "the world's largest single environmental health risk." City residents in poorer, developing countries often suffer the most from air pollution.

Ozone Depletion

Ozone is a molecule made up of three atoms of oxygen. The ozone layer is 6 miles above the Earth and made of ozone molecules. This layer prevents some of the sun's harmful radiation from reaching the Earth. However, air pollution has damaged these protective ozone molecules, so now more dangerous radiation reaches the planet.

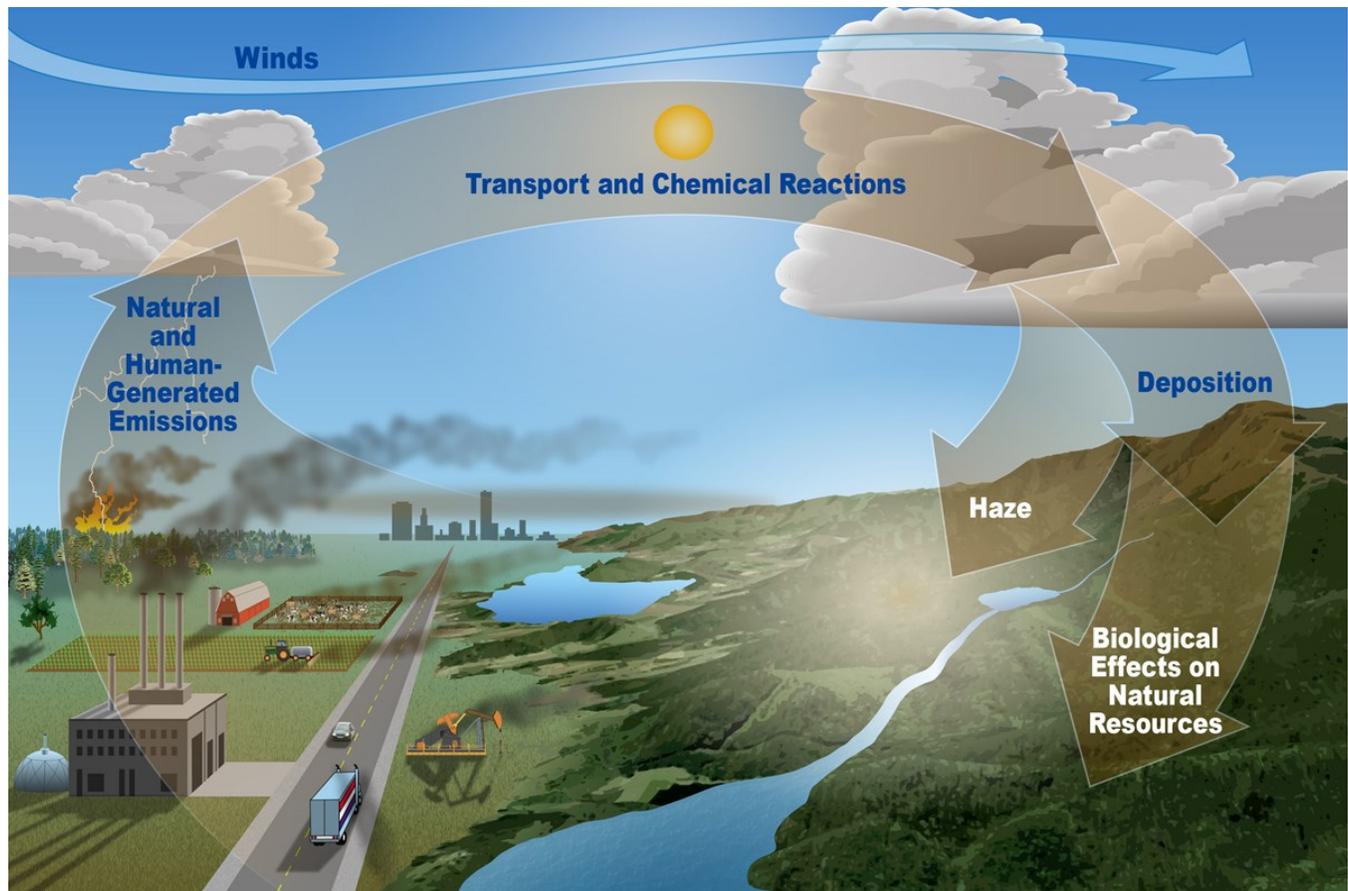
Aerosol spray bottles, air conditioners and refrigerators used to contain CFCs and halogens. These molecules harmed the ozone layer. Drifting up into the atmosphere, they destroyed ozone molecules and created two large holes at the North and South Poles. However, most ozone-depleting substances are now banned.

Acid Rain

Acid rain is rain, snow or fog that is acidic. Acid rain forms when sulfur dioxide and nitrogen dioxide, released from burning fossil fuels, mixes with water, oxygen and other chemicals to form sulfuric and nitric acids in the atmosphere. These then mix with water and fall to the ground.

Acid rain harms both the natural environment and man-made things. It wears away buildings and cars. If lakes and rivers become too acidic, fish eggs might not hatch and some fish could die. Soils that are too acidic make it hard for plants to absorb essential nutrients. Trees at high altitudes are often harmed by acid rain, which damages their leaves and stunts tree growth.

Climate Change



According to the U.S. Environmental Protection Agency (EPA), changes to the Earth's climate are linked to more GHGs in the atmosphere. Usually, radiation from the sun hits the Earth and bounces back into space, but GHGs absorb sunlight and trap heat in the atmosphere. When GHG particles fall on snow and ice, they melt faster, which creates a cycle. Average global temperatures go up, which then melts more snow and ice. With temperatures rising, the planet's glaciers and polar ice caps are dissolving, increasing sea levels worldwide.

Indoor Air Pollution

Most people think of air pollution as an outdoor problem, but indoor air pollution can also be harmful. Indoor air pollution is caused by cigarette smoke, cooking fires and old lead paint. It also comes from chemicals in objects like carpeting, electronics and plastics. Mold, dust mites and other allergens spread through air conditioners and heating vents.

Indoor air pollution tends to be especially bad in developing countries. Many people cook with a fire indoors and create pollution called "particulate" pollution because it is made up of tiny particles. According to the WHO, 3.8 million people worldwide die each year from health conditions caused by household air pollution.

Stopping Air Pollution

Air pollution causes heart disease, lung cancer, respiratory infections, and more. In the 1970s, many countries created laws to limit air pollution.

In the United States, the Clean Air Act of 1963 was the first law to limit air pollution. It was expanded later to address acid rain and ozone depletion. The laws established air-quality standards. The Clean Air Act regulates ozone, particulates, carbon monoxide, sulfur dioxide and lead. The EPA estimates that between 2010 and 2020, the Act will prevent 230,000 early deaths. The Acid Rain Program has also been successful. Between 1995 and 2011, sulfur dioxide emissions fell 64 percent, and nitrogen oxide emissions fell 67 percent.

Internationally, the most successful treaty dealing with air pollution was the United Nations' 1987 Montreal Protocol on Substances That Deplete the Ozone Layer. It was the first treaty in U.N. history signed by every nation on Earth. The agreement phased out ozone-depleting pollutants worldwide. The hole in the ozone layer at the South Pole is now much smaller than it was before.