

Particle Pollution: A Microscopic Problem at a Global Scale

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According to the World Health Organization (WHO), [air pollution kills nearly 7 million people a year](#), and 9 out of every 10 people globally are breathing in air that contains harmful pollutants. While advancements have been made as far as regulating and monitoring air pollution, the stringency of these rules has not fully created a utopian environment.

Ozone damage and particle pollution have become the forefront of this growing issue, affecting each area of the globe differently. Now, researchers are exploring how to combat this problem, in hopes of reversing the significant damage that has been inflicted on our air quality.

What is Particle Pollution?

Particle pollution, also known as particulate matter, is used to classify the mixture of solid and liquid droplets suspended in the air. These particles range in a variety of sizes and are released directly from a specific source, or formed through chemical reactions in the atmosphere. Constructed of different components, particles can be made up of acids, inorganic compounds, soots, metals, soil or dust, and biological materials. Particulate matter poses a threat to human health and the environment depending on the size and components of the particles.

There is always particle pollution in the air, indoors and outdoors. Larger particles, known as coarse particles, can be seen with the naked eye and can irritate the eyes, nose, and throat. Smaller particles, referred to as fine particles, are more dangerous due to their ability to enter the body and cause asthma attacks, heart and lung disease, and even premature death.

Particle pollution is found globally and can remain in the atmosphere for days to weeks at a time. Often found in and near many major cities, these airborne particles can travel hundreds of miles and have a severe impact on the air quality of other regions. Particle pollution is typically found near busy roads, industrial areas, and in the smoke from homes, stoves, and wildfires. Depending on the weather, air pollution can build up as well as have higher particle concentrations.

Environmental Damage and Threats to Human Health

Since the evolution of the [Clean Air Act of 1970](#), the U.S. has taken strides towards cleaning its air quality. Over the past 30 years, particle pollution from wildfire smoke has created an ongoing concern for environmental damage and health risks. As the climate changes, temperatures continue to climb and increase the chances of more wildfire outbreaks. These wildfires put people at risk of becoming exposed to smoke and harmful particles transported in the air.

The smoke from wildfires contains dangerous particles that are four times smaller than dust, pollen, and mold. If ingested, these particles enter the bloodstream and can lead to heart and lung disease. In addition to the dangers of smoke, wildfires often destroy homes and expose harmful substances like asbestos. Asbestos can wreak havoc on the linings of our internal organs and is the [only known cause of peritoneal mesothelioma](#), a cancer that affects the abdomen. Improper clean up of debris poses a serious health risk as well as the possibility of disturbing and spreading more particle pollution.

How Toxic Particles Are Affecting Unborn Babies in U.K.

Scientists in the U.K. have recently discovered examples of [air pollution traveling through the lungs of pregnant women and into their placentas](#), potentially harming their fetuses. Examining the placentas of five pregnant women, scientists were surprised to find that sooty particles had made their way into their placentas. These particles could potentially have a direct effect on the placenta, which ultimately would have an effect on the fetuses.

The placenta allows oxygen and nutrients to be passed through the mother's blood to the fetus. Located within the placenta are placental macrophages, which are cells that work as part of the body's immune system to destroy harmful particles such as bacteria or pollution. Within the findings of their study, scientists discovered the pregnant women had placentas containing dark areas that they believed were caused by carbon particles. This study concluded that children are potentially affected by pollution while still in the womb. Although this data is still in the early stages, researchers believe air pollution can be linked to infant mortality, premature birth, and low birth weights. Looking at these findings, the U.K. has been challenged to address its air pollution levels and find a solution.

China Fixing Particle Pollution Problem, Ozone Damage Continues

Realizing the dangers of particle pollution, the Chinese government established laws to reduce harmful pollutants. From limiting the number of cars on the road to replacing emissions from coal-fired power plants with natural gas, the air particle pollution of China has fallen nearly 40 percent in four years. Although these efforts have significantly decreased particle pollution, [China now faces threats from ground-level ozone pollution](#).

The ozone layer is located high in the atmosphere and primarily protects us from ultraviolet rays. This layer is a collection of inorganic molecules created by chemical reactions between nitrogen oxides and volatile organic compounds (VOCs). High concentration of the ozone near the ground level is responsible for pollutants like smog and can be harmful to people, animals, and the environment. As particle pollution in China steadily decreased, ozone levels in major urban areas rose by 5 to 10%.

Through the use of computer modeling, researchers found that air particles act like sponges and soak up chemical radicals within the air. With pollution regulations in place, China successfully purified the air, but lowered the number of particles necessary to help control the chemical reactions creating a colorless unstable toxic gas, otherwise known as ozone. Breathing air with high levels of ozone can aggravate asthma and inflame as well as damage cells that line your lungs.

Despite the progress to purify the air since 1980, air pollution continues to have an effect on people's health as well as the environment across the globe. There needs to be a serious focus on revisiting past regulations and understanding how to reverse the years of damage that have already occurred. Through reducing our carbon footprints and developing sustainable alternatives, together we can ensure a safer and cleaner future for generations to come.

The process of reducing particle pollution starts on an individual level with [identifying your individual carbon footprint](#). These steps, although small, are influential and can ultimately lead to a global impact. The first step in reducing air particle pollution is analyzing and improving your home's air quality. Opening windows and installing quality air filtration systems in your home is an easy and efficient way of reducing the current concentration of particle pollution. If your home operates with a wood-burning heating source, use appropriate ventilation and burn less wood to minimize the damaging impacts. Making these undemanding and effortless changes helps reduce particle pollution that could be damaging to your health inside your home.

In addition to making improvements to your home, changes in your daily habits can have a resounding impact on particle pollution. Use public transportation, or if possible, walk or bike to work to cut back on the number of fumes emitted into the air from your vehicle. Giving up smoking is not only a health benefit for you but also the environment. Cigarette smoke is extremely carcinogenic and has lasting effects on the population's health, as well as the environment. Additionally, look for opportunities to prevent or combat forest fires. Reducing wood burning, abiding by fire laws, and making decisions with fire prevention in mind, helps decrease the risk of forest fires.

Particle pollution has a significant impact on population health as well as environmentally. Through taking small and individual steps to combat this issue, we can have a significant impact globally. Analyzing current air quality laws and making adjustments on an individual basis, will ultimately lead to air purification for the environment as well as improvement of health risks.

The [MAHB Blog](#) is a venture of the Millennium Alliance for Humanity and the Biosphere. Questions should be directed to joan@mahbonline.org