



An Introduction to Air Pollution History

Pre-civilization

- Air pollution is not a new phenomenon. Geologists tell us that oxygen, the very gas in our atmosphere that gives us life, was an early air pollutant. It snuffed out the lives of sulfur-based life forms when it was introduced into the atmosphere by the newly evolved, photosynthesis-based plant life.
- Frequent eruptions of volcanoes polluted the atmosphere, killing plants and anything that could not escape the emissions of particles and toxic sulfur compounds. These toxic natural pollutants released from the eruptions are responsible for preserving some of our finest fossil discoveries.
- Dust storms in deserts produced particle pollution.
- Forest fires caused by lightning and grass fires produced soot (particle pollution), carbon monoxide, carbon dioxide, and air toxics.
- Some animals released methane into the atmosphere.

Pre-industrial Society

- Early humans joined the ranks as air polluters when fire was introduced to our culture. However, the fire in our caves and at our campsites gave us much needed warmth and made our food more interesting.
- Except for a few isolated areas where geothermal heat was used, most of the heating until the 1900s was from the combustion of locally available fuel. Dried animal dung, wood, and peat were the major sources of fuel during most of the history of the world.
- The Roman philosopher, Seneca, wrote of the “heavy air” of Rome in 61 AD.
- During most of our history, homes have used only a chimney hole for ventilation. Cooking was conducted over or in the central fire. As a result, polluted air in houses often contained the smoke from cooking, as well as that from heating and tobacco use. As long as the population density of an area is low, sources from homes contribute mostly to indoor air pollution.
- Coal was not known as a fuel in Europe until its introduction by Marco Polo, who learned of its uses from the Chinese. The Chinese also shared their knowledge of another material, asbestos.
- Fuel usage was not the only source of air pollutants in the early period. Agricultural practices such as slash and burn, still in use today, contributed to the load of particles and fumes in the air. Because of the lower rate of decay and assimilation of critical nutrients in cooler temperate climates, our ancestors found it necessary to burn crop stubble to release the minerals necessary for proper crop yield.

Early Industry

- Human beings suffered from the pollution of our developing technology. For example, workers in and residents around lead smelting operations suffered and died from the fumes of open fire pits. Copper, a basic material in the manufacture of bronze, was mined and refined to fill the needs of bronze-age warriors and craftsmen.
- Tin, an easily worked material, was prized and used to alloy other metals as well as to produce pipe organs. The fumes from these activities reduced the longevity of not only these workers but the nearby residents as well.
- Glassblowing, dating from the early Egyptian and Greek period, was a highly prized craft. Unfortunately, there was a shortened life expectancy for workers in this industry due to silicosis and lead poisoning.

Growing Cities and Technology

- Cities were particularly bad sources of air pollution since each home had its own inefficient heating plant fueled by wood, coal, peat, or other organic material. The smoke was overpowering in the narrow streets and alleys. Air pollution was a major cause of the shorter life expectancy of city dwellers.
- Concentrated air pollution contributed to other diseases. For example, in London, the high incidence of rickets, which is caused by a vitamin D deficiency, was due in part to the narrow streets and smoke keeping out the sunlight.
- In 1272, King Edward I of England banned the use of sea “coal.” The English Parliament ordered punishment by torturing and hanging of people who sold or burned the outlawed coal.
- The introduction of tobacco in the 1500s to Europe brought a new element to indoor air pollution. Descriptions of inns in the 1600 and 1700s as “smoke filled” rooms with low ceilings give a new perspective of the problems of indoor air pollution. In this country, it is recorded that Martha Washington refused to go to Philadelphia because of the air pollution. She could not tolerate the smoke and odors.
- Many other pollutants were not recognized for their toxic effects because the technology was new or because the effects were cumulative in nature. Matthew Brady, a famous photographer, lost his sight and suffered brain damage from mercury vapor. He developed his photographs by holding the photographic plate over a heated pool of mercury in an enclosed darkroom. Gold miners suffered similar mercury poisoning as they used mercury to refine their gold. The Mad Hatter in *Alice in Wonderland* was said to be suffering from mercury poisoning, used in the production of hats.



- There were occasional periods when attempts were made to get things under control. Benjamin Franklin developed a wood-burning stove that was more efficient and reduced fuel consumption. Today we know this invention as the “Franklin Stove.”

Beginning of Regulations

- In 1859, the city of New Orleans punished a blacksmith for polluting the neighborhood.
- In 1863, the Alkali Act was passed in England to require control of hydrochloric acid fumes from industrial processes that produced raw materials for glass, soap, dyes, and paper. The Act required that 95% of air emissions should be arrested, with the remainder diluted. It also established air inspectors that are still called Alkali Inspectors in England.
- Robert Angus Smith, a nineteenth century Scottish chemist who investigated numerous environmental issues, was appointed Queen Victoria’s first inspector under the Alkali Acts. He is most famous for his 1852 research on air pollution, in the course of which he discovered acid rain and linked it to coal burning as examined in his 1872 book, *Air and Rain: the Beginnings of a Chemical Climatology*. Note that the pH scale had not been created at that time.
- In the 1880s, the first U.S. municipal smoke abatement laws in Chicago, Pittsburgh, and Cincinnati aimed at reducing black smoke and ash from factories, railroads, and ships were enacted. Local boards of health regulated air pollution.
- Maximillian Ringelmann, a Belgian-born, German-trained engineer working in France, developed a method to qualify emissions according to the density of the observed smoke. He developed this system to assist in his studies of combustion efficiency. Using a set of cards with patterns of black ink, he was able to resolve the density of black smoke into 5% increments. In 1899, the American Society of Mechanical Engineers recognized the use of the Ringelmann Chart.
- Numerous lawsuits based upon “nuisance” air pollution, meaning that the air pollution source interfered with the rights of an individual to enjoy the use of their property, were recorded before the 1900s.
- In 1907, the Society for the Prevention of Smoke (the Air Pollution Control Association and later the Air and Waste Management Association) was founded to provide expertise to agencies involved in cleaning up the air.

The Twentieth Century Before 1940

- The increase in industrialization in the major cities gave rise to a dramatic increase in air pollution. Throughout the autumn months, during periods of calm, smoke particles from industrial plumes would mix with fog giving it a yellow-black color. Such smog, as it became known, often settled over cities for many days. Wind speeds would be low at these times causing the smog to stagnate, with pollution levels increasing near ground level. London became quite famous for its smog, and many visitors came to see the capital in the fog.
- During the first part of the twentieth century, tighter industrial controls and the declining importance of coal as a domestic fuel led to a reduction in smog pollution in urban areas. Yet, industrial development increased and with it came additional realization of the health, social, and physical costs of industrialization and city crowding.
- The first successful use of an electrostatic precipitator was in 1907 at an explosives plant in California.
- Acid emissions of sulfur compounds destroyed a part of Georgia.
- In 1930, an event occurred that shook the air pollution world. An inversion that occurred in the highly industrialized Meuse Valley in Belgium left 60 dead and thousands sick.
- In 1938, air sampling stations were set up to measure sulfur dioxide and dust.

Developments after World War II

- Technological advances in air pollution control equipment were made.
- Black smoke from industrial stacks was sometimes seen as a symbol of progress.
- The use of the automobile brought about increases in air pollution, particularly in areas such as Los Angeles.
- In the 1940s, air pollution received greater attention in the United States when photochemical smog was noticed in Los Angeles. Visibility was only three blocks and people suffered from smarting eyes, respiratory discomfort, nausea, and vomiting.
- In 1945, the city of Los Angeles began its air pollution control program. The city established the Bureau of Smoke Control as part of its Health Department.
- There were thousands of deaths attributed to air pollution episodes throughout the world: Donora, Pennsylvania (1948), London (1948, 1952, 1956), and New York City (1953, 1966).
- In 1953, Los Angeles started its “Smoke School” program for black smoke.
- California began its program to control auto exhaust in 1959.

- The first major U.S. air pollution legislation was enacted in 1955 with amendments in 1963.
- Switching from coal to natural gas as a fuel and added controls started to reduce air pollution and black smoke production.
- In 1962, Rachael Carson's book *Silent Spring* alerted the public to the dangers of airborne pesticides such as DDT.
- The automobile was officially recognized by the federal government as a major contributor to air pollution in the 1965 amendments to the Clean Air Act.
- California adopted the first state Ambient Air Quality Standards in 1969.

1970: The Year of the Environment

- The first Earth Day was in 1970 and there was a dramatic increase in environmental awareness.
- The National Environmental Policy Act was passed in 1970.
- In 1970 President Nixon created the U.S. Environmental Protection Agency (EPA) by Executive Order. The EPA was assigned the daunting task of repairing the damage already done to the natural environment and establishing new criteria to guide Americans in making a cleaner environment a reality.
- The U.S. Clean Air Act (CAA) was expanded in 1970. The passage of the amendments of 1970 marked the beginning of modern efforts to control air pollution.
- National Ambient Air Quality Standards (NAAQS) were set in 1971.
- Airborne deposition of toxic chemicals in the Great Lakes was identified in 1972.
- Billions of dollars was spent on air pollution control, especially by power plants.
- Automobile emission control policies became more stringent and air pollution from individual cars decreased.
- Rising fuel costs due to oil embargoes in the late 1970s led to use of smaller, more efficient automobiles, more efficient use of fuel by industry, and increased use of wood burning stoves for home heating.
- Lead was phased out of gasoline and certain pesticides were banned.
- In the late 1970s and early 1980s, the nation became aware of the problems of asbestos in the environment and its potential to cause cancer.
- In 1980, "Superfund" was passed to assist in the clean up of toxic waste dumps.
- By 1980, acid rain became an international issue. It was addressed by environmental regulations such as caps on sulfur dioxide emissions.

- Thousands of people died in Bhopal, India, in 1984 due to a chemical release. This led to the Community Right to Know legislation and planning for emergencies.
- In the late 1980s, The Montreal Protocol addressed ozone depletion in the stratosphere by CFCs.
- EPA established an Office of Indoor Air Quality.
- The first results of the Toxics Release Inventory were published in 1989.

1990 Clean Air Act Amendments and Beyond

- The amendments to the Clean Air Act in 1990 were designed to clean up air pollution as efficiently and inexpensively as possible. The first federal air permits were mandated under these amendments. The new legislation placed renewed emphasis on controlling emissions of hazardous air pollutants and introduced efforts aimed at controlling acid rain and ozone depletion in the atmosphere.
- Areas of the United States that did not achieve air quality standards were designated as nonattainment and had a certain time period to meet the standards.
- Voluntary Ozone Action programs informed the public about what they could do to decrease the potential of ozone formation.
- Secondhand smoke was classified as a cancer-causing agent in 1993.
- At the end of the century, many companies were reducing air pollution through pollution prevention activities. Federal air permits were in place for the larger air pollution sources.
- Global climate change has become a prominent issue. The 1997 Kyoto Protocol was an attempt to address this issue.
- In 2004, most of Michigan was attaining air quality standards except for ozone on the lower peninsula and particle pollution in the Detroit area.

Sources: California Air Resources Board and U.S. Environmental Protection Agency.