Gasping for Clean Air

Student Reading

The sky's the limit for the billions of tons of pollutants people pump out of factories, homes and cars each year. These pollutants create problems such as urban smog, acid rain and toxic gases. Increased global industrialization and rapid population growth are combining to create more of these pollutants, threatening the very air we breathe. The health of humans and that of our ecosystem are suffering as a result of the largely preventable amounts of pollution with which we poison our air.

In many cities, it is actually hazardous to breathe. In 1996, around 47 million people in the United States and 1.5 billion people worldwide had to breathe air contaminated by dangerous levels of air pollution.[1] Breathing the air in Bombay, India, is equivalent to smoking ten cigarettes a day. And in Mexico City, the world's most polluted and populated city, infectious diseases like salmonella and hepatitis can be contracted simply by inhaling bacteria suspended in the air.

Smog Alert

The most common urban air-quality problem in the United States is **ozone**. High in the atmosphere, ozone forms a layer that filters out harmful ultraviolet radiation, thus protecting life on Earth. But ozone is also formed at the Earth's surface under certain conditions when sunlight reacts with high concentrations of nitrogen oxides and volatile organic compounds in the air. There are thousands of sources of these gases, the two most common are power plants that burn fossil fuels, and combustion of gasoline in the engines of cars, buses and trucks. Other sources include paint solvents, wood fires like those we have in our fireplaces, and coal-fired boilers; some emissions even come from trees.

Although concentrations of many air pollutants have fallen significantly in the United States in recent years (due to Clean Air Act regulations), elevated ozone levels continue to be a pervasive and damaging problem in many large and smaller cities and some rural areas as well. According to the U.S. Environmental Protection Agency (EPA), in 1996, around 47 million Americans lived in areas that exceeded EPA's ozone standard.[2] In Canada, the annual average ozone concentration increased 20 percent between 1981 and 1990.[3]

Adverse health effects of ozone pollution include shortness of breath, chest pain when inhaling deeply, wheezing and coughing. Long-term exposure may lead to permanent lung tissue damage.[4] A 1996 American Lung Association report estimated that in the 13 metropolitan areas studied, ozone was linked to 10,000 to 15,000 hospital admissions and an estimated 30,000 to 50,000 emergency room visits per year.[5]

Ozone can affect the health of trees, crops and other plants at concentrations even lower than those that harm humans. Ozone has been shown to reduce plant growth by interfering with the plant's ability to produce and store food, and it can make plants more susceptible to disease, insect attacks and harsh weather.[6] Forest declines in several parts of the country have been attributed to ozone and other pollutants. Ozone causes an estimated 1 to 2 billion dollars worth of loss to crop yields in the United States each year.[7]

The second most common vehicle-related pollutant, behind ozone, is **carbon monoxide** (CO). Motor vehicle exhaust is responsible for 60 percent of CO emissions nationwide, and in cities, vehicle exhaust can create as much as 95 percent of all CO emissions. CO concentrations in the air dropped 37 percent in the United States over the last ten years, and 45 percent in Canada between 1981 and 1990, largely due to the addition of car pollution control devices called **catalytic converters** which help remove CO from car exhaust.[8] However, in the United States in 1996, almost 13 million people lived in areas which failed to meet the EPA's health standard for CO emissions.[9]

Carbon monoxide is absorbed into the bloodstream more quickly than oxygen, creating numerous health risks. Exposure to even low levels of CO reduces the body's delivery of oxygen to its organs and tissues, producing impaired perception and thinking, slowed reflexes and drowsiness. Long-term exposure to CO is believed to aggravate arteriosclerosis and cardiovascular disease.

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Coal Toll

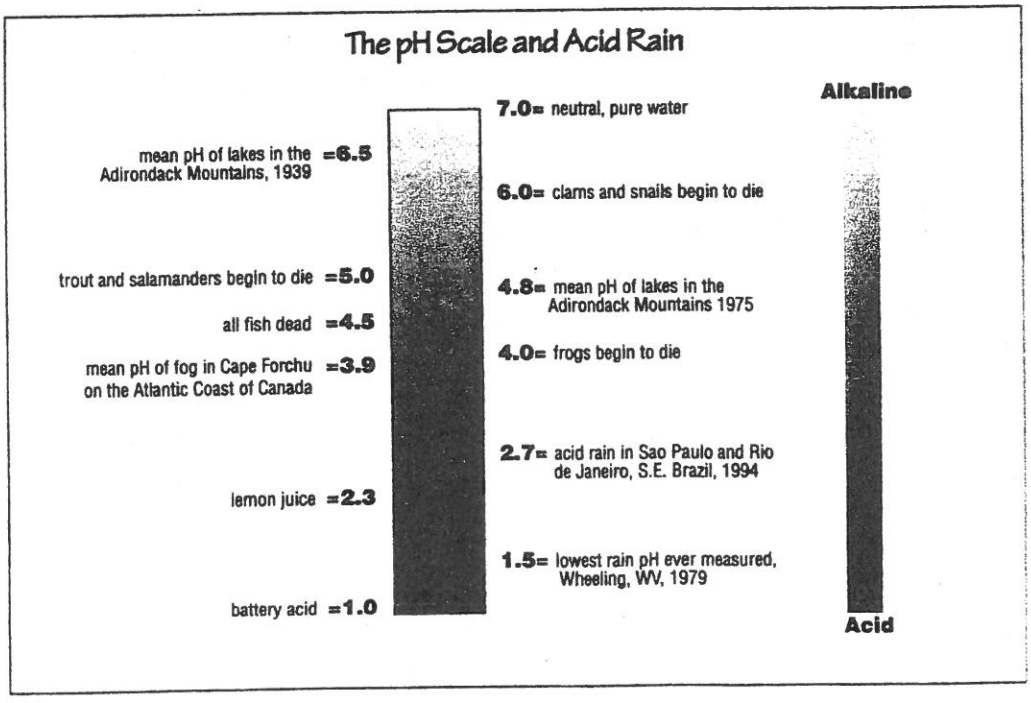
Other dangerous elements that pollute our air and threaten our well-being include **sulfur dioxide** (SO_2), **particulate matter** (suspended particles of soot, ash, dust and chemicals), **nitrogen dioxide** and **lead**. Emissions of these elements have been greatly reduced in industrialized countries with the aid of pollution control equipment and improvements in energy efficiency. In much of the world, however, these elements pose dire threats to human and environmental health. In Eastern Europe and the former Soviet Union, hasty industrialization after World War II, powered by high-sulfur, brown coal, has led to widespread environmental degradation and human illness. In India, SO_2 emissions from coal and oil have nearly tripled since the early 1960s.

The World Health Organization (WHO) estimates that around three million people die every year from exposure to particulate matter. The vast majority of deaths occur in developing countries where indoor air pollution results from burning **biomass fuel** (including firewood and cow dung) and coal for heating and cooking.[10] Particulate matter causes problems in the industrialized world as well. The National Resources Defense Council and the Harvard School of Public Health estimate that about 60,000 deaths occur every year in the United States from particulate pollution caused by fuel combustion and vehicle exhaust. That's more fatalities than are caused by car accidents and homicides combined.[11]

Acid Attack

Excessive levels of pollutants are just as damaging to the planet's health as they are to its inhabitants, especially in the form of **acid rain**. When sulfur and nitrogen oxides combine with oxygen and moisture in the atmosphere, they become sulfuric and nitric acids. These acidic pollutants fall to the ground, often hundreds of miles from their origins, as dry particles or in rain, snow, frost, fog and dew.

Acid rain damages wildlife through direct contact and by leaching or dissolving minerals in the soil. Acid rain leaches away nutrients and, at the same time, releases toxic elements such as aluminum into the soil where they can be harmful to plants and animals. In areas severely affected by acid rain, trees decline in growth and die prematurely, plants and



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microorganisms crucial to the wildlife food chain die, and lakes become too acidic to support fish and birds. Acid precipitation is believed to be responsible for dieback and deterioration of white birch trees in southeastern New Brunswick, Canada, and of red spruce in higher-elevation areas of the United States.[12]

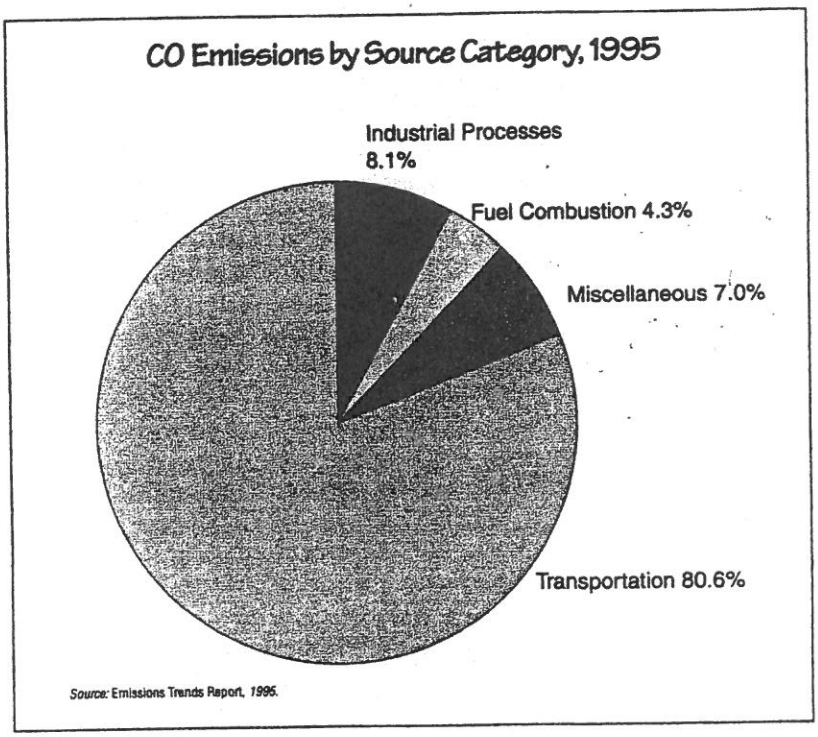
In Canada, 150,000 lakes are severely affected by acid rain originating from metal smelting in eastern Canada, coal-burning utilities in Canada and the United States and vehicle emissions on both sides of the border.[13] In the Netherlands, acid rain has caused the decline of species of songbirds by depleting the soils of calcium, which is essential for the snails that the birds eat.[14]

Acid rain can also take its toll on the human body. Sulfuric and nitrogen oxide emissions have been linked to increased frequency of asthma, heart disease and lung disease, especially among children and the elderly. The water you drink may be tainted. Acid rain can cause a leaching of toxic substances both out of the soil and out of pipes that carry drinking water to millions of people.

Acid rain corrodes our bridges, buildings and monuments, and destroys priceless works of art. It is estimated that ancient monuments in Athens, Greece, have deteriorated more in the past 20 to 25 years from pollution than in the previous 2,400 years. Because the effects of acid rain are not necessarily felt in the same places where contributing chemicals are released, it has been difficult to enforce certain air quality policies. Clearly, individual states and countries cannot solve their problems alone.

Changing Fuel-ish Ways

The Clean Air Act of 1970 and the strengthening amendments of 1977 directed the EPA to establish air quality standards for six of the most common and widespread air pollutants. Under the Act, state governments were directed to develop and implement strategies to meet and maintain these air quality standards. Considerable progress was made in cutting urban air pollution, especially with the development of the catalytic converter and the shift to unleaded gas for motor vehicles. The EPA points out that because of the Clean Air Act, air quality in the United States is better today than it was in 1970 despite the fact that the total U.S. population has increased 29 percent, the vehicle miles traveled every year have increased 121 percent, and the size of the economy has doubled.[15] While it is frightening to think how bad the air quality could be without federal and state imposed restrictions on pollutants and emission rates, concentrations still remain quite high.



In 1990, Congress amended the Clean Air Act. The new amendments call for enhanced car inspection and maintenance programs, tougher regulations on vehicle exhaust, and development of cleaner-burning fuels. Congress also established an "emissions trading" system which assigned allowances (one allowance = one ton of sulfur dioxide per year) to electric utilities and other industries that produce sulfur dioxide. The system lets each utility or factory decide what is the most cost-effective way to reduce its emissions; then it may sell the allowances it no longer needs after the reductions. In the year 2000, emissions will be

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limited to 895 million tons per year. Also that year, the EPA will begin to regulate less-polluting industries, so that a greater number of businesses will have to divide a set number of allowances. This cap on emissions plus more competition for allowances will provide an incentive for further reductions and ensure that the level of sulfur dioxide from industry sources will not increase. In addition, the amendments give the EPA greater power to enforce air quality standards and punish those who fail to comply. In 1997, the EPA re-evaluated and strengthened their national air quality standards for ozone and particulate matter.

Although these measures may allow us to breathe a little easier, the economy continues to grow, and the number of air-polluting cars on the road is expected to increase. Since 1960, the United States has added 87 million people to its population who, in turn, have almost tripled the number of vehicles on the road. Spurred by population growth, vehicle miles traveled in the United States are growing on average by more than 50 billion miles per year![16] As the population of our country continues to grow, and our urban areas sprawl out farther and farther, the number of cars on the road and the number of miles traveled will continue to grow. This growth is being accompanied by an increase in the demand for electric power from the growing population. These increases will continue to compromise the improvements in air quality made by technological advances which allow cars to burn fuel more efficiently and with less emissions and enable cleaner electric power generation.

Air pollution is undoubtedly a complex problem with no easy, inexpensive short-term solutions. Development of cleaner fuels, better emission-control technology, strengthened federal fuel economy standards for motor vehicles, and a more efficient mix of transportation alternatives, such as mass transit systems, could all play a significant role in achieving clean air in cities. If current population trends continue, however, it will become increasingly more difficult for Americans to clear the air.

Endnotes

[1] *National Air Quality and Emissions Trends Report, 1996.* U.S. Environmental Protection Agency, Office of Air Quality and Planning Standards, 1997. World Health Organization homepage: www.who.org.

[2] *National Air Quality and Emissions Trends Report, 1996.* U.S. Environmental Protection Agency, Office of Air Quality and Planning Standards, 1997.

[3] Tom Furmanczyk. *National Urban Air Quality Report, 1981-1990.* Pollution Data Branch, Response Assessment Directorate, Environmental Protection Service, Environment Canada.

[4] American Lung Association homepage: www.lungusa.org

[5] Ibid.

[6] Op. cit. note 2.

[7] *National Air Quality and Emissions Trends Report, 1995.* U.S. Environmental Protection Agency, Office of Air Quality and Planning Standards, 1996, p. 21.

[8] U.S. statistics: op. cit. note 2; Canada Statistics: Op. cit. note 3.

[9] Op. cit. note 2.

[10] World Health Organization homepage: www.who.org.

[11] Op. cit. note 4.

[12] Environment Canada hopepage: www.doe.ca.

[13] *Environmental Almanac 1993.* Boston: Houghton Mifflin.

[14] J. Graveland et al. "Poor Reproduction in Forest Passerines from Decline of Snail Abundance on Acidified Soils." *Nature*, vol. 368. March 31, 1994.

[15] Op. cit. note 2.

[16] U.S. Bureau of Transportation homepage: www.bts.gov.