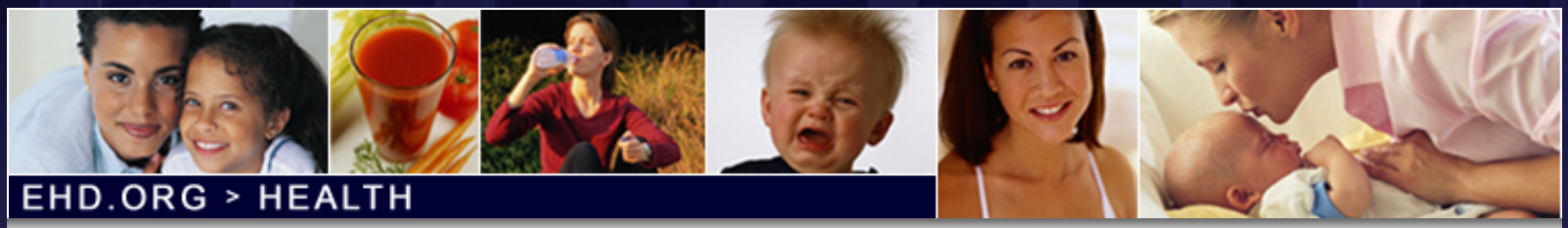

Air Pollution

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Table of Contents (TOC)

Introduction
Chapter 1: Common Types of Air Pollution
Conclusion
Footnotes

TOC

Introduction

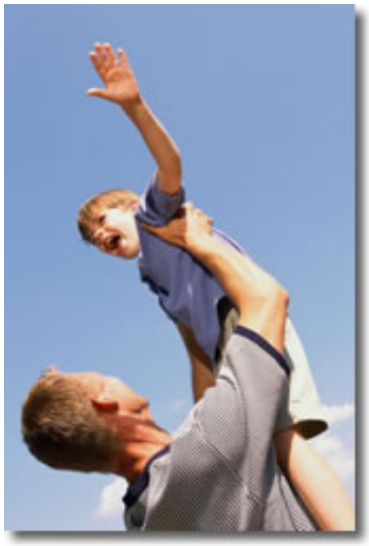
Back to Top

Air pollution in the United States is a pervasive public health and environmental issue that costs the country billions of dollars annually in increased health care costs and environmental damage. This pollution also has significant potential to impact tourism (impaired visibility, regional haze) and other sectors (recreation, agriculture) due to impacts associated with anthropogenic (caused by human activity) -related global climate change.[1]

TOC

Chapter 1: Common Types of Air Pollution

Back to Top



There are several recognized categories of air pollutants that are currently regulated by the federal and state governments, or are of concern to environmental and health scientists. The most important class of pollutants are those regulated by the United States Environmental protection Agency (EPA) under the Clean Air Act (CAA) as primary air pollutants,[2] for which EPA is required to set a National Ambient Air Quality Standard (NAAQS). To date these include sulfur dioxide (SOx), oxides of nitrogen (NOx), lead (Pb), carbon monoxide (CO), ozone, and particulate matter (PM). While ozone is not emitted directly as a pollutant, it is formed in the atmosphere (during particularly hot weather) as the result of a reaction between volatile organic compounds (VOCs) and NOx, (known as ozone “precursors”) in the presence of sunlight.

Pollutants for which the EPA has established a NAAQS represent chemicals and compounds whose emissions are pervasive national health problems, with ambient air concentrations exceeding health-based standards in many areas of the country. These pollutants may also cause severe environmental damage, such as water body eutrophication[3] and deforestation due to acid rain (associated with SOx and NOx emissions, primarily from large power plants, that combine with moisture in the air to form atmospheric nitric and sulfuric acid). Areas of the country which exceed the NAAQS for any primary pollutant are designated as in “nonattainment” with the standard, and must undertake certain CAA-mandated emissions control measures, depending on the severity of the exceedance. EPA is required to review the latest scientific information and, if necessary, revise these standards. New, more protective standards for ozone and fine particulate matter just took effect in 2004.

Other significant pollutants of public health and environmental concern include:

- Toxic compounds (EPA maintains a list of more than 100 toxics,[4] officially referred to as hazardous air pollutants, or HAPs),
- Mercury (Hg), dioxin, polychlorinated biphenyls (PCBs), and other compounds known as persistent bioaccumulators, whose presence builds up in the body due to prolonged exposure, and
- Greenhouse gases, a class of compounds such as carbon dioxide (CO2) and methane, that result in global climate change.

While air pollution comes from many sources, much of it is generated from processes related to energy use, transportation, and consumer products and equipment.

Broad source categories of air pollution emissions include:

- Industrial and commercial sources such as power plants and factories (referred to as stationary sources),
- Area sources, or smaller commercial facilities and operations, such as gas stations, dry cleaners, commercial and residential boilers (Area sources also include emissions from the use of consumer products, paint, and other products that release small amounts of pollutants during use or application), and

- Transportation and equipment sources (such as cars, trucks, buses, airplanes, trains, etc., and associated refueling activities; construction equipment; marine and recreational vehicles; industrial equipment including forklifts, air compressors, and airport equipment etc.; lawn and garden equipment; diesel generators; and diesel particulate).

Power plants, building heat boilers, and air conditioning are significant contributors to NOx, SOx, carbon dioxide (CO2), fine particles, and mercury emissions.

Area sources individually have relatively small quantities of emissions. In the aggregate, however, they generate significant quantities of emissions due to the large number of such sources. Many consumer products including paints and personal products (such as hairspray, deodorant, etc.) release significant quantities of VOCs during application, drying, or curing.

The transportation sector is responsible for significant quantities of VOCs, NOx, CO, CO2, fine particles and toxics. (For example, the EPA has determined that diesel exhaust is a probable human carcinogen.)

Reducing our energy consumption reduces pollution emissions and the demand for imported energy, particularly petroleum. How can we reduce energy use and air pollution?

- Drive more energy-efficient cars with low pollution engines
- Choose energy-efficient appliances, such as those with the Energy Star label[5]
- Purchase new, low pollution fuel-injected 2-stroke or 4-stroke recreational vehicles (snowmobiles, ATVs, motorcycles/dirt bikes, recreational marine engines, etc.)
- Lower thermostats in the winter and raise them in the summer
- Commute via car pool, public transit, bicycle, or walking
- Maintain vehicles according to manufacturer recommendations (a well-tuned engine burns cleaner and pollutes less) and keep proper tire pressure
- Use energy-efficient lighting and light bulbs
- Shut off lights and other electronic devices when not in use
- Recreational vehicles, marine engines

Another issue is the impact of transported air pollution, particularly in the northeast United States. Air pollution generated hundreds of miles away (particularly from tall smokestacks or large urban areas with great numbers of vehicles and high power consumption) can be transported on the prevailing winds and be deposited (in the case of particles) or react to form other pollutants (such as ozone from transported NOx and VOCs) far downwind from where the pollution was actually emitted. Thus certain regions can take steps to reduce emissions yet still find that transported pollution causes the area to exceed air quality standards. For example, smoke particles from large forest fires, can often be measured hundreds or even

thousands of miles downwind several days after the fire emissions are released. Scientist can track pollution from one area of the country to another, or even across continents (for example, smoke from the volcanic explosion from Mt. St. Helen or nuclear fallout from the Chernobyl accident were detected throughout much of Eastern Europe and in other parts of the globe for many weeks after the events).

TOC

Conclusion

Back to Top

So while the traditional viewpoint is that industry and commercial operations account for most pollution, in reality it is you and I in our daily activities that are responsible for most pollution! In fact, nearly one third to one half of many of the major pollutants comes from the transportation sector. In the words of the cartoon character Pogo “We have met the enemy, and they is us…”.

TOC

Footnotes

Back to Top

[1] EPA, 2002

[2] EPA, 2004

[3] EPA, 2003a “Eutrophication is a condition in an aquatic ecosystem where high nutrient concentrations stimulate blooms of algae (e.g., phytoplankton). Although eutrophication is a natural process in the aging of lakes and some estuaries, human activities can greatly accelerate eutrophication by increasing the rate at which nutrients and organic substances enter aquatic ecosystems from their surrounding watersheds. Agricultural runoff, urban runoff, leaking septic systems, sewage discharges, eroded streambanks, and similar sources can increase the flow of nutrients and organic substances into aquatic systems. These substances can overstimulate the growth of algae, creating conditions that interfere with the recreational use of lakes and estuaries, and the health and diversity of indigenous fish, plant, and animal populations. Algal blooms hurt the system in two ways. First, they cloud the water and block sunlight, causing underwater grasses to die. Because these grasses provide food and shelter for aquatic creatures (such as the blue crab and summer flounder), spawning and nursery habitat is destroyed and waterfowl have less to eat when grasses die off. Second, when the algae die and decompose, oxygen is used up. Dissolved oxygen in the water is essential to most organisms living in the water, such as fish and crabs. Increased eutrophication from nutrient enrichment due to human activities is one of the leading problems facing some estuaries in the mid-Atlantic.”

[4] EPA, 2003b

[5] ENERGY STAR, 2005