Background Essay: Air Quality Index

Air pollution is nothing new. Humans have been polluting the very air we breathe since at least the Middle Ages. The first official complaints—of thick, smoky air—were recorded in London in the 1300s. Over the centuries, as residents used coal to heat their homes and fuel their industry, air pollution became linked with population and economic growth. But today, air pollution is being treated as more than an unavoidable nuisance; it is a public health threat. Emissions from car exhaust pipes, factory smokestacks, residential heating systems, and other sources can compromise our respiratory and cardiovascular systems, resulting in some very serious health effects: asthma, bronchitis, emphysema, chest pain, and lung cancer.

The Air Quality Index, or AQI, was developed by the Environmental Protection Agency (EPA) as a gauge of daily air quality. It indicates how clean or unhealthy local air is with respect to four major air pollutants: ground-level ozone, particle pollution, carbon monoxide (CO), and sulfur dioxide (SO_2). Local air quality is always changing—daily and even hourly. This is because certain pollutants in the air respond to changing environmental conditions. For example, variations in the weather influence ozone levels. Because ozone forms more readily on warm and sunny days, when the air tends to be stagnant, ozone levels often peak in the afternoon and early evening. In contrast, ozone production is suppressed on cloudy, cool, rainy, and windy days. Certain AQI values may also vary seasonally. Carbon monoxide emissions are linked to cars and other fossil-fuel-burning vehicles. While you might expect values to be high during morning or evening rush hours, those numbers are even higher in winter. This is because car emission control systems do not operate as well in colder weather.

Historical AQI data suggest a recent trend toward lower levels of pollutants in the outside air. Nationally, average ozone, particle pollution, CO, and SO_2 levels have all decreased substantially since the 1980s and 1990s. Just as pollutants measured in the AQI respond to different weather and climate conditions, they also appear to respond to changes in human activities. By enforcing higher air quality standards, especially with respect to automobile emissions and industrial pollution, and by making practical changes in lifestyle and habits, humans have demonstrated they can reduce air pollution and improve air quality.

The city of Denver offers one success story. In the 1970s and early 1980s, Denver air quality was poor, exceeding EPA air quality standards around 200 days each year. The Denver area had the highest carbon monoxide levels in the country, and an infamous “brown cloud”—formed of fine-particle pollution—regularly hung over the city. In the late 1980s, the city began implementing a blueprint for clean air. To lower carbon monoxide emissions, buses were retrofitted with pollution-control devices and residential wood burning was restricted. To lower sulfur dioxide emissions, power plants voluntarily installed emission reduction equipment. And to decrease particulate matter, street sanding activities (to combat slippery road conditions) were substantially reduced. While the “brown cloud” is still visible at times, it has lost much of its menacing presence.