

II. Effects of Air Pollution

A. ACUTE EFFECTS ON PEOPLE

The effect of air pollution upon health has been of concern to the people since its inception. As mentioned above, the first air-pollution law was passed in an attempt to curb air pollutants because of their detrimental health effects. Since that time four major occurrences have justified those fears. The four major recorded air-pollution disasters are: (1) Meuse Valley, Belgium, 1930; (2) Donora, Pennsylvania, 1948; (3) Poza Rica, Mexico, 1950; and (4) London, England, 1952. These dates reveal that the disasters are becoming increasingly frequent, which is probably due in part to the ever-increasing size of our urban areas.

Meuse Valley.² The first well-known air-pollution disaster occurred between Seraning and Hug, in the Meuse Valley, Belgium. During the period December 1-5, 1930, a large number of persons were taken ill, and more than 60 died. Older persons with previously known disease of the heart or lungs accounted for the majority of the fatalities. The signs and symptoms were primarily those caused by a respiratory irritant. They included chest pain, cough, shortness of breath, and irritation of the mucous membranes and of the eyes. The area of the Meuse Valley where the episode occurred is approximately 15 miles long and 1½ miles wide and is surrounded by hills 330 feet high. Within this area there were, at the time of the disaster, the following types of industries:

1. Four very large steel plants, each having coking installations, blast furnaces, rolling mills, welding furnaces, boilers, and other operations compatible with large steel plants.
 2. Three large metallurgical works.
 3. Four electric power generating plants.
 4. Six glass works, ceramic plants, or brick works, which were equipped with coal or producer-gas heating furnaces.
 5. Three groups of lime kilns.
 6. Three zinc plants, each equipped with reduction furnaces, retort, drying ovens, and other operations compatible with zinc plants.
 7. One coking plant (other than those associated with steel plants).
 8. One sulfuric acid plant with roasting ovens.
 9. One concentrated fertilizer plant, with concentration and drying ovens.
- In addition to these industries discharging pollutants into the atmosphere, most of the homes and communities burned coal, thus adding considerably to the pollution load. Other sources of pollution at the time of the episode were railroads and automobiles.

The investigators considered the sources of pollution and drew up the

² *Meuse Valley Air Pollution*. Royal Academy of Medicine of Belgium, December 10, 1931, pp. 683-732.

following list of substances that could have been, and probably were, present in the atmosphere at the time of the disaster:

hydrogen	odor of organic products (not identified)
silica	from phosphate plants
sulfur dioxide (sulfuric acid)	drops of tar, phenol, naphthalene, and so forth
hydrochloric acid	soot
nitric acid and its salts, ammonium	cement dust
fluoride, and zinc fluoride	lime dust
carbon monoxide	metal dust
carbon dioxide	zinc oxide
hydrocyanic acid	lead
nitric oxide	arsenous acid anhydride
nitrogen dioxide (NO ₂)	arsine
nitrous acid (HNO ₂)	methyl alcohol
nitric acid (HNO ₃)	ethyl alcohol
ammonia and ammonium salts (thiocyanates, sulfides)	formaldehyde
ammonium sulfide	zinc chloride
aromatic and unsaturated hydrocarbons, including natural gas and gasoline vapors	silica from Bessemer Steel Works

The meteorological investigators found the meteorological conditions for Monday, December 1 through Friday, December 5, 1930 to have been anti-cyclonic in nature, characterized by high atmospheric pressures and mild winds of a general easterly direction. During this period the fog became increasingly worse. There was considerable cooling during the night, often as much as 10° C. The wind was a very mild east wind, not exceeding 5 miles per hour and often dropping during the days of December 2, 3, and 4 to 1.6 miles per hour.

After the investigators had checked all the available data on the medical, meteorological, and environmental factors, efforts were made to determine the cause of the disaster. Many of the contaminants could be eliminated immediately because their known toxicological action was not compatible with the medical findings. Other contaminants were eliminated because it was decided that the concentrations could not have been sufficient to cause the damage found. From all the findings the investigators concluded the contaminants most likely to have caused the symptoms were sulfur compounds; however, they added that the synergistic effect of the other contaminants may have played an important part.

Donora. The second well-known air-pollution disaster occurred in Donora, Pennsylvania, during the period of Wednesday, October 27, to Sunday, October 31, 1948. Within this period 20 people died and 6,000 became ill.

In Donora at the time the investigation was being conducted, there were the following industries:

1. One large steel plant having blast furnaces, looping rod mills, wire drawing department, and wire finishing department.

³ H. H. Schenck, H. Heimann, G. D. Clayton, and W. N. Gafafer, Air pollution in Donora, Pennsylvania, *U.S. Pub. Health Bull.* No. 306.