

CE 326 Principles of Environmental Engineering

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What is Environmental Engineering?



Environmental engineering is manifest by sound engineering thought and practice in the solution of problems of environmental sanitation, notably in the provision of safe, palatable, and ample public water supplies; the proper disposal of or recycle of wastewater and solid wastes; the adequate drainage of urban and rural areas for proper sanitation; and the control of water, soil, and atmospheric pollution, and the social and environmental impact of these solutions.



Furthermore, it is concerned with engineering problems in the field of public health, such as control of arthropod-borne diseases, the elimination of industrial health hazards, and the provision of adequate sanitation in urban, rural, and recreational areas, and the effect of technological advances on the environment (ASCE, 1977).



Environmental Engineering

- Air pollution
 - Control devices
 - Permitting
 - Modeling
- Water (surface and groundwater):
 - Treatment & disinfection
 - Storage and distribution
 - Dispersion
 - Quality
- Wastewater
- Solid Wastes
- Hazardous Wastes
- Radioactive Wastes
- Integrated Systems
- Pollution Prevention
- Other – noise and light pollution



Air pollution Episodes

- Meuse Valley, Belgium, 1930 – zinc smelters, 60 deaths
- Donora, Pennsylvania, 1948 – 23 deaths over Halloween weekend
- London, England, 1952 –





Primary vs. secondary standards

- **Primary Standards** - to protect public health with an adequate margin of safety
- **Secondary Standards** - to protect public welfare (plants, animals, and property)




Primary vs. secondary pollutants

-  **Primary pollutant** - discharged directly into the atmosphere (e.g., automobile exhaust)
-  **Secondary pollutant** - formed in the atmosphere through a variety of chemical reactions (e.g., photochemical smog)




Stationary vs. mobile sources

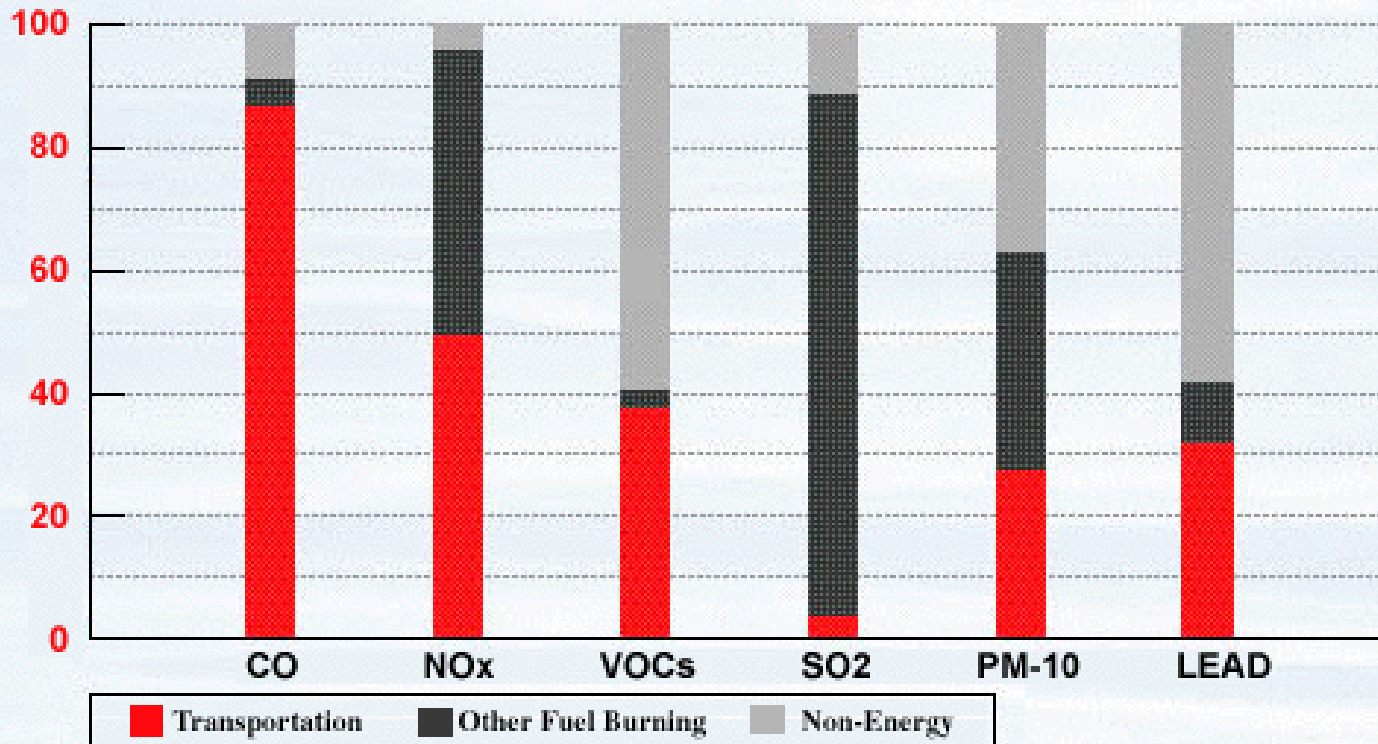
Stationary Sources

-  Contribute approximately 40% of total air pollution (98% of SO_x , 95% of particulates, 56% of total hydrocarbons, 53% of NO_x , and 22% of CO)

Mobile Sources

-  Contribute approximately 60% of total air pollution (78% of CO, 47% of NO_x , 44% of total hydrocarbons, 5% of particulates, and 2% of SO_x)





Source: WRI Estimate Based on Data from "National Air Quality and Emissions Trends Report, 1995," 1996, EPA 454/R-96-005.



Effects of air pollution

- Damage to human health and welfare
- Damage to vegetation and animals
- Damage to materials and structures
 - Abrasion
 - Deposition and removal
 - Direct chemical attack
 - Indirect chemical attack
 - Electrochemical corrosion
- Damage to the atmosphere, soil, and water

