Welcome to AIR POLLUTION

Industry

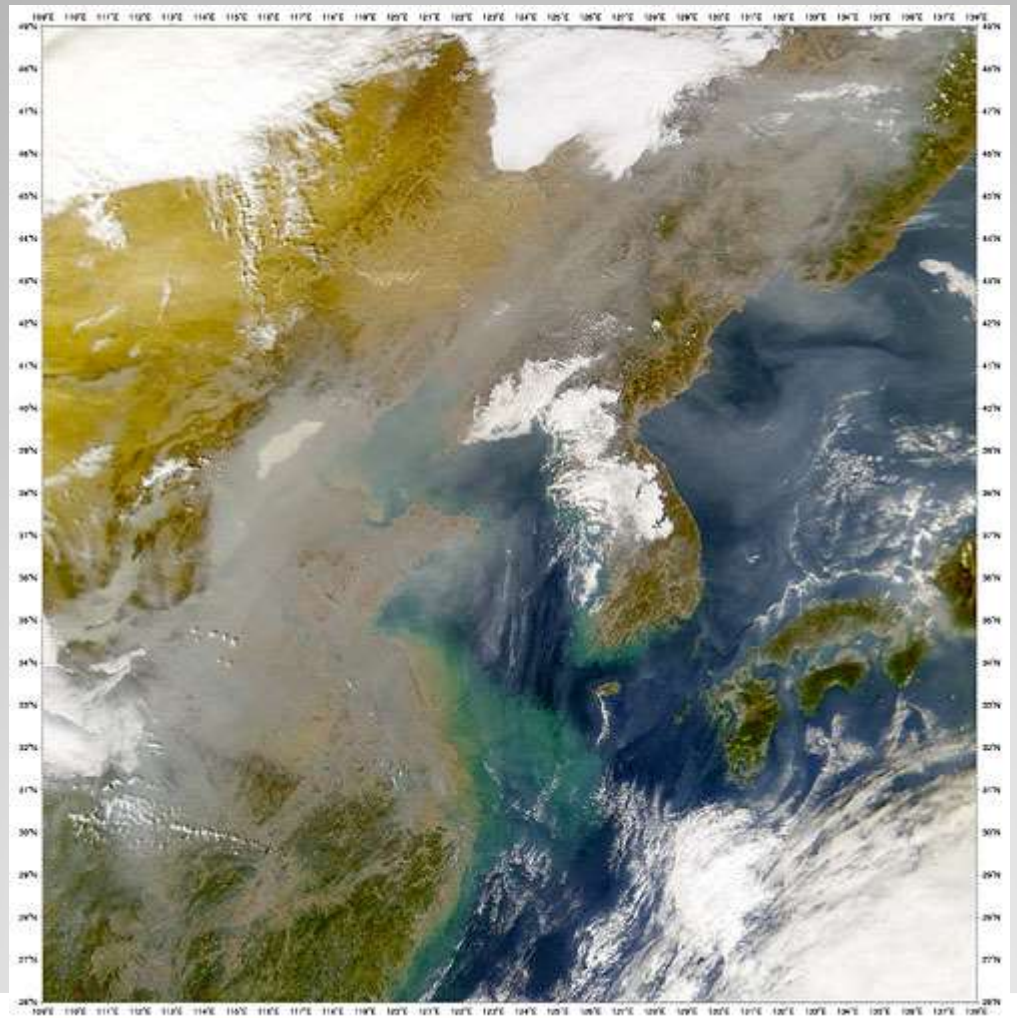
Industry II

Transportation related causes of air pollution

Natural sources

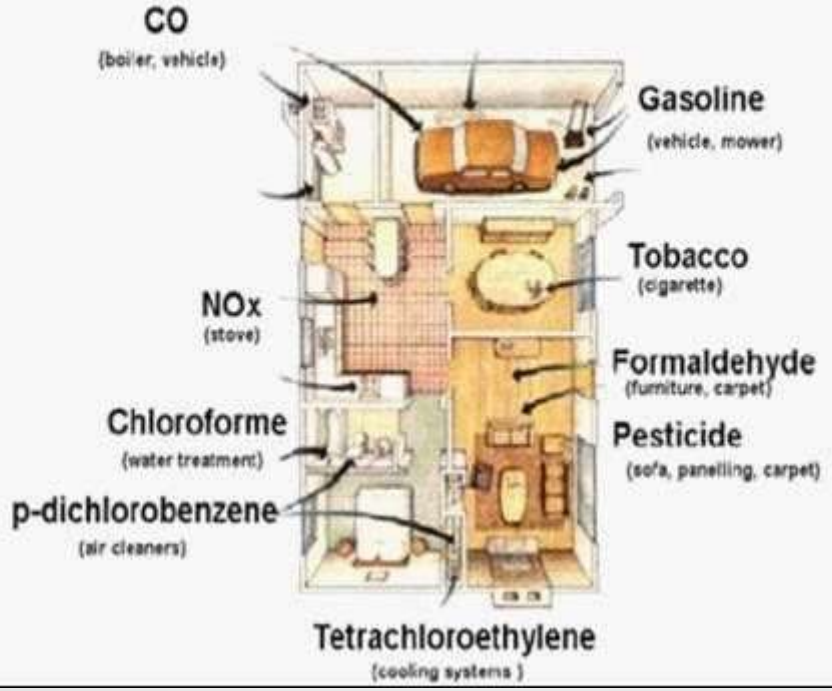
Smog over Los Angeles

Smog over the Sea of Japan



Indoor Air Pollution

Sources of Indoor Air Pollutants



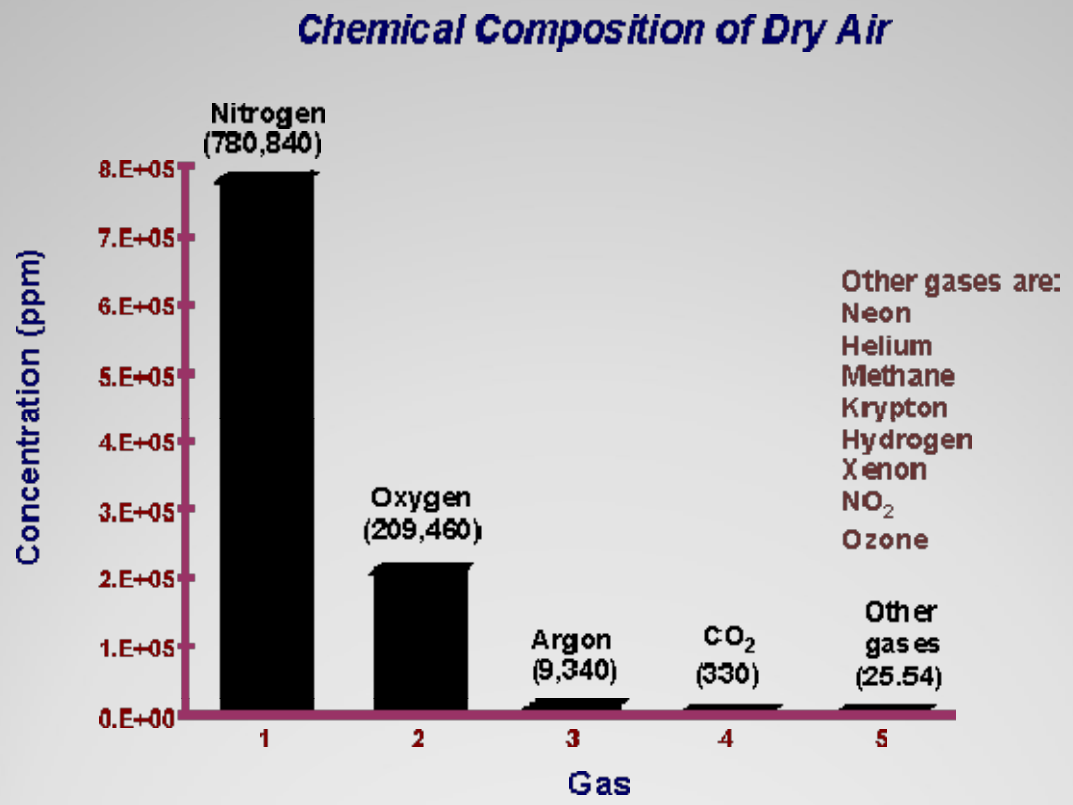
What is Air Pollutant ?

- Air pollution may be described as contamination of the atmosphere by gaseous, liquid, solid wastes or by-products that can endanger life, attack materials and reduce visibility.
- Air pollution worldwide is a threat to human health and the natural environment.
- It may also be defined as the presence of matter in atmosphere at concentrations, durations, and frequencies that adversely affect human health and environment.

How to Define an Air Pollutant?

- Basis: Chemicals present in the environment
- Process:
  - Use composition of the clean air as a bench mark.
  - When the concentration of a chemical in air is above the bench mark, it is termed as an air pollutant .

Chemical Composition of Dry Air



Common Air Pollutants

The air pollution problem is encountered in both indoor as well as outdoor.

→ **Indoor**

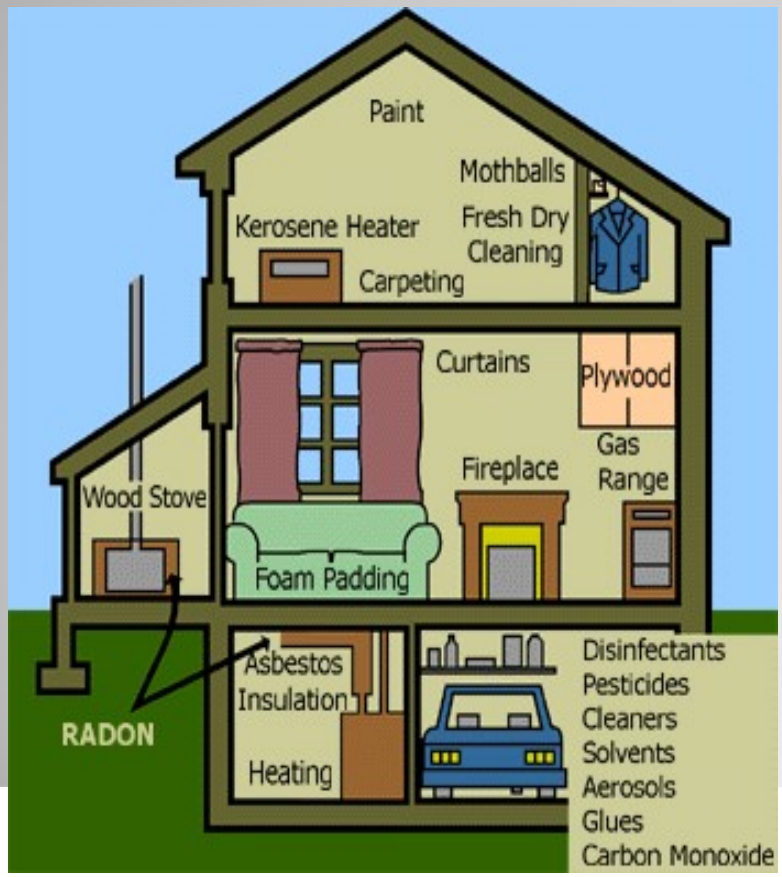
- Radon
- Combustion by-products
- CO, CO2, SO2, Hydrocarbons, NOx
- Particulates, Polyaromatic hydrocarbons
- Environmental Tobacco Smoke (ETS)
- Volatile organic compounds
- Asbestos
- Formaldehyde
- Biological contaminants
- Pesticides

→ **Outdoor**

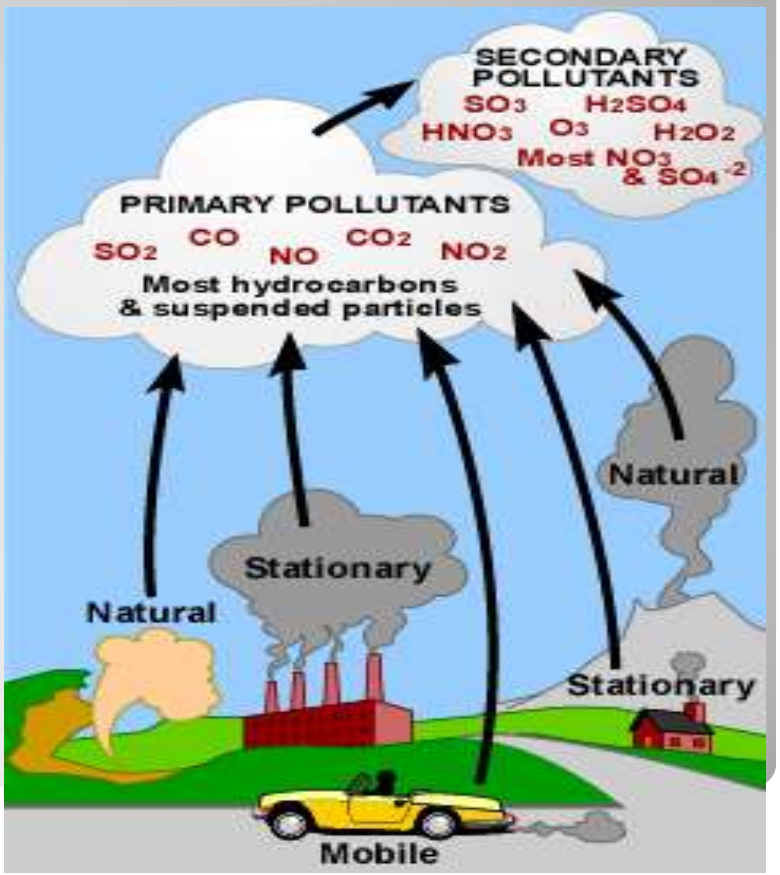
- SO2
- CO, CO2
- Oxides of Nitrogen
- Ozone
- Total Suspended particles
- Lead
- Particulates
- Volatile organic compounds
- Toxic Air pollutants

Sources of Air Pollutants

- Indoor



- Outdoor



Physical Forms of an Air Pollutant

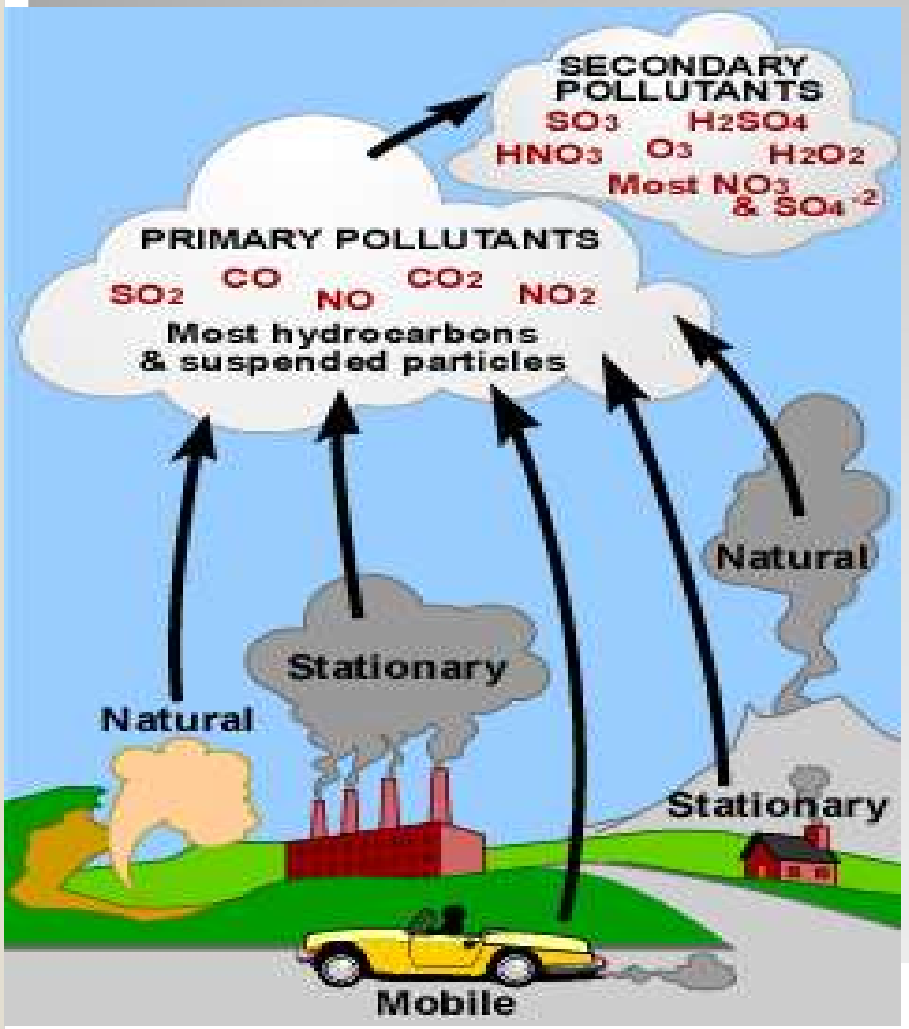
- Gaseous form
  - Sulfur dioxide
  - Ozone
  - Hydro-carbon vapors
- Particulate form
  - Smoke
  - Dust
  - Fly ash
  - Mists

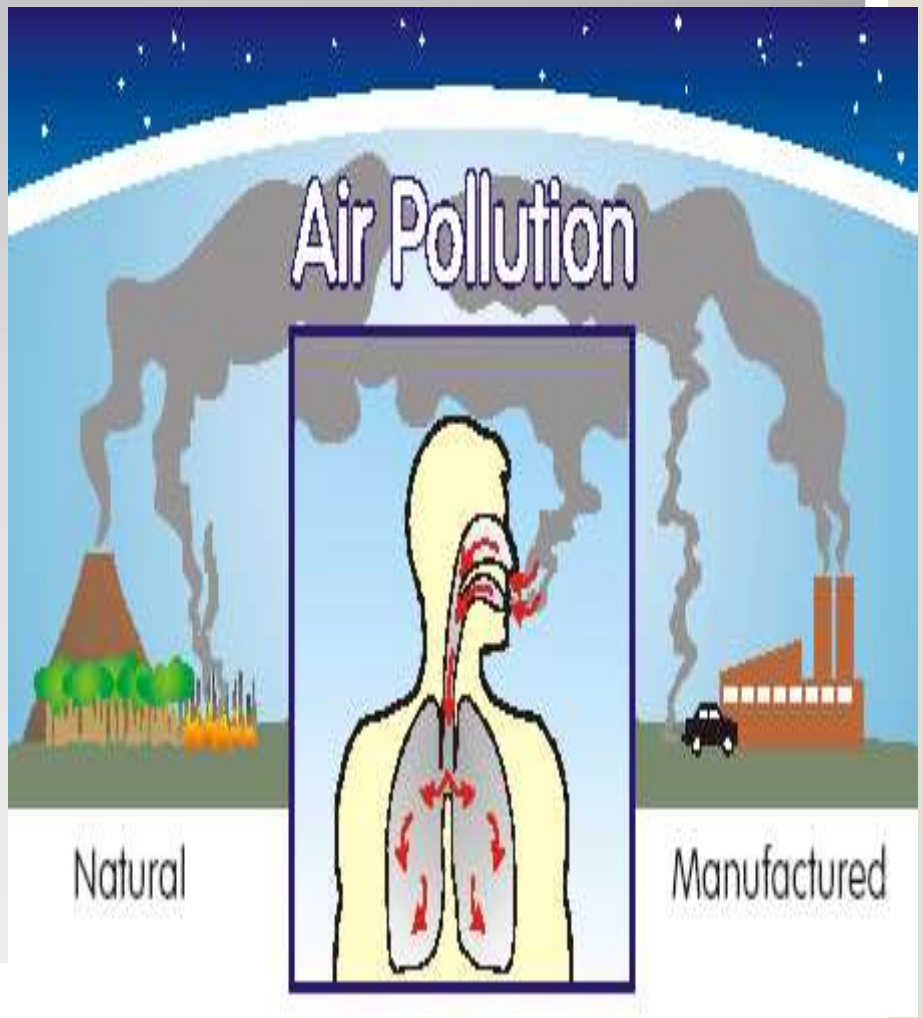
Toxic Air Pollutants

- Toxic air pollutants may originate from natural sources as well as from manmade sources such as stationary and mobile sources.
- The stationary sources like factories and refineries serve as major contributors to air pollution.
- The Clean Air Act of 1990 provides a list of 189 chemicals to be regulated under the hazardous air pollutant provisions of the act.
- The list of hazardous air pollutants can be found in the EPA website.

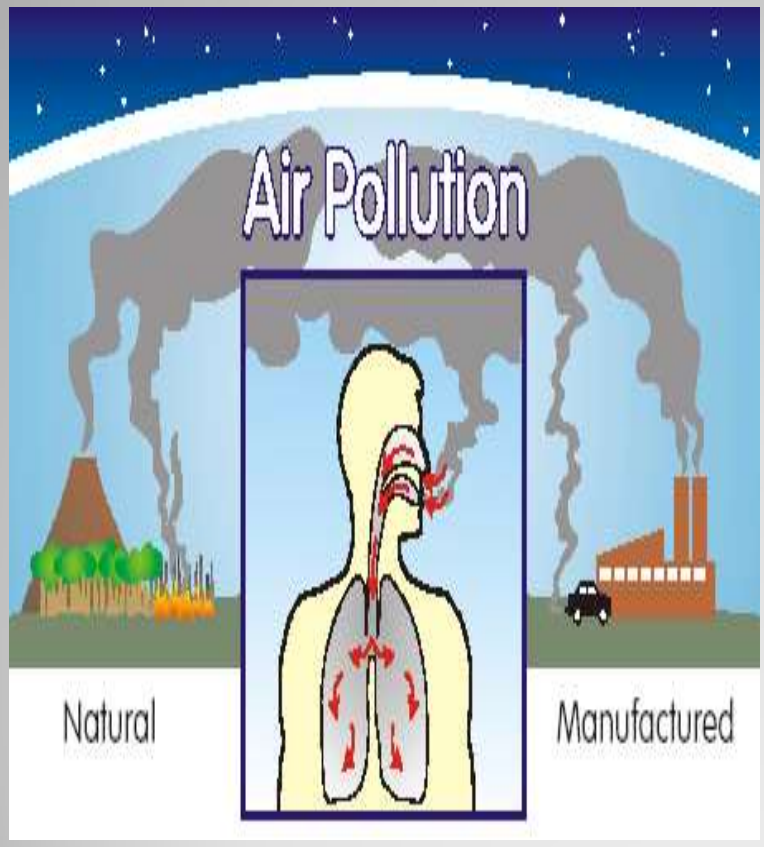
  (http://www.epa.gov/ttn/atw/188polls.html)

Sources of Toxic Air Pollutants





Sources of Air Pollution



Natural Sources

- Volcanoes
- Coniferous forests
- Forest fires
- Pollens
- Spores
- Dust storms
- Hot springs

Man-made Sources

- Fuel combustion - Largest contributor
- Chemical plants
- Motor vehicles
- Power and heat generators
- Waste disposal sites
- Operation of internal-combustion engines

Source Classification

Sources may be classified as:

(A) Primary

Secondary

(B) Combustion

Non-combustion

(C) Stationary

Mobile

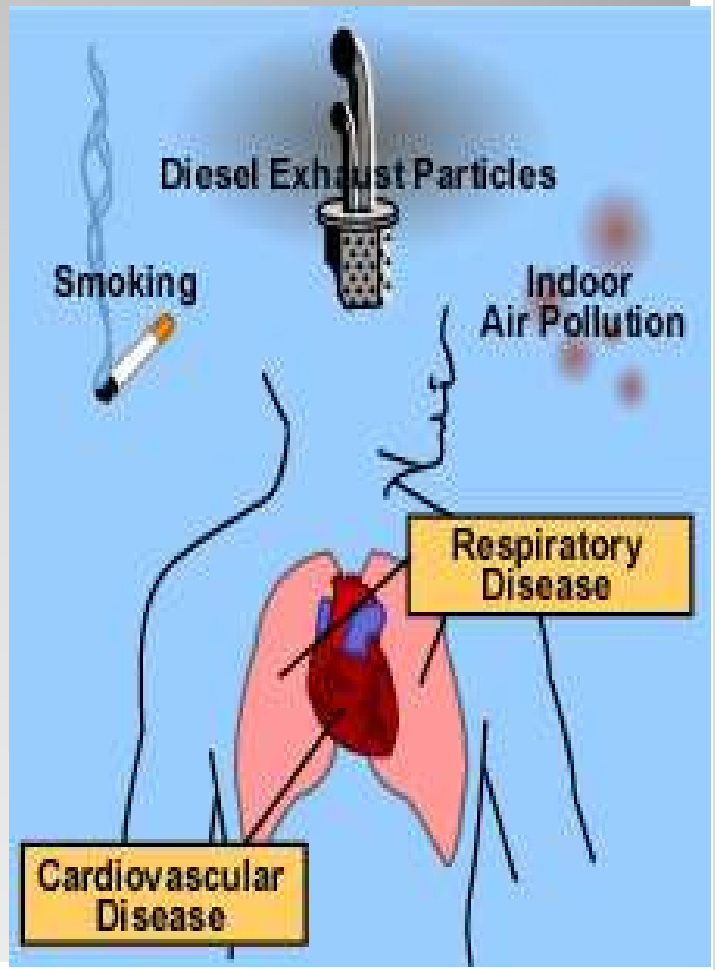
(D) Point: These sources include facilities that emit sufficient amounts of pollutants worth listing

Area: all other point sources that individually emit a small

amount of pollutants are considered as area sources.

Human Health Effects

- Exposure to air pollution is associated with numerous effects on human health, including pulmonary, cardiac, vascular, and neurological impairments.
- The health effects vary greatly from person to person. High-risk groups such as the elderly, infants, pregnant women, and sufferers from chronic heart and lung diseases are more susceptible to air pollution.
- Children are at greater risk because they are generally more active outdoors and their lungs are still developing.



Exposure to air pollution can cause both acute (short-term) and chronic (long-term) health effects.

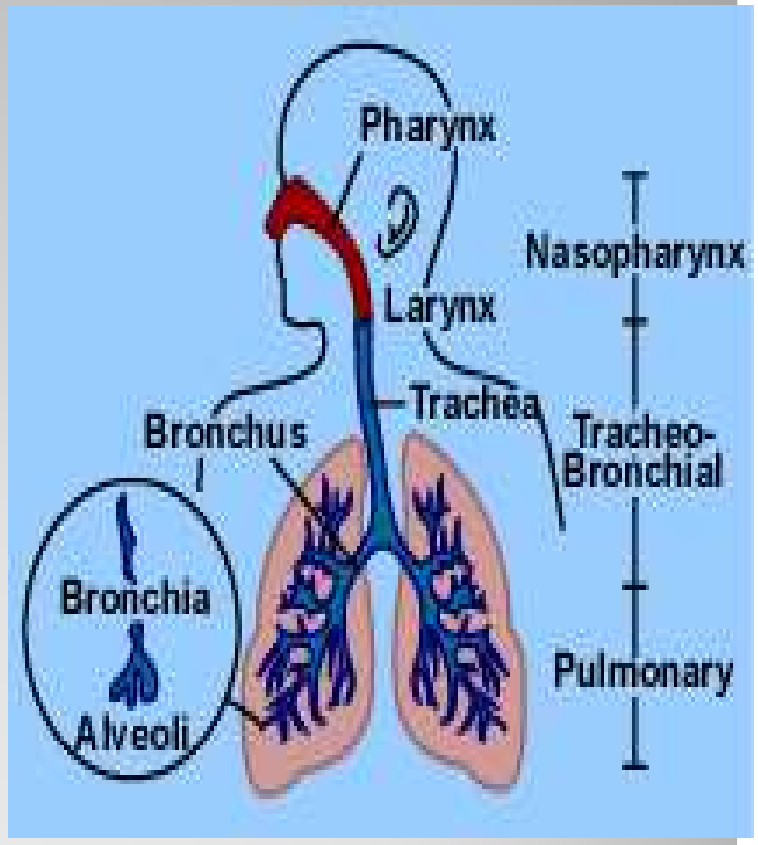
Acute effects are usually immediate and often reversible when exposure to the pollutant ends. Some acute health effects include eye irritation, headaches, and nausea.

Chronic effects are usually not immediate and tend not to be reversible when exposure to the pollutant ends.

- Some chronic health effects include decreased lung capacity and lung cancer resulting from long-term exposure to toxic air pollutants.

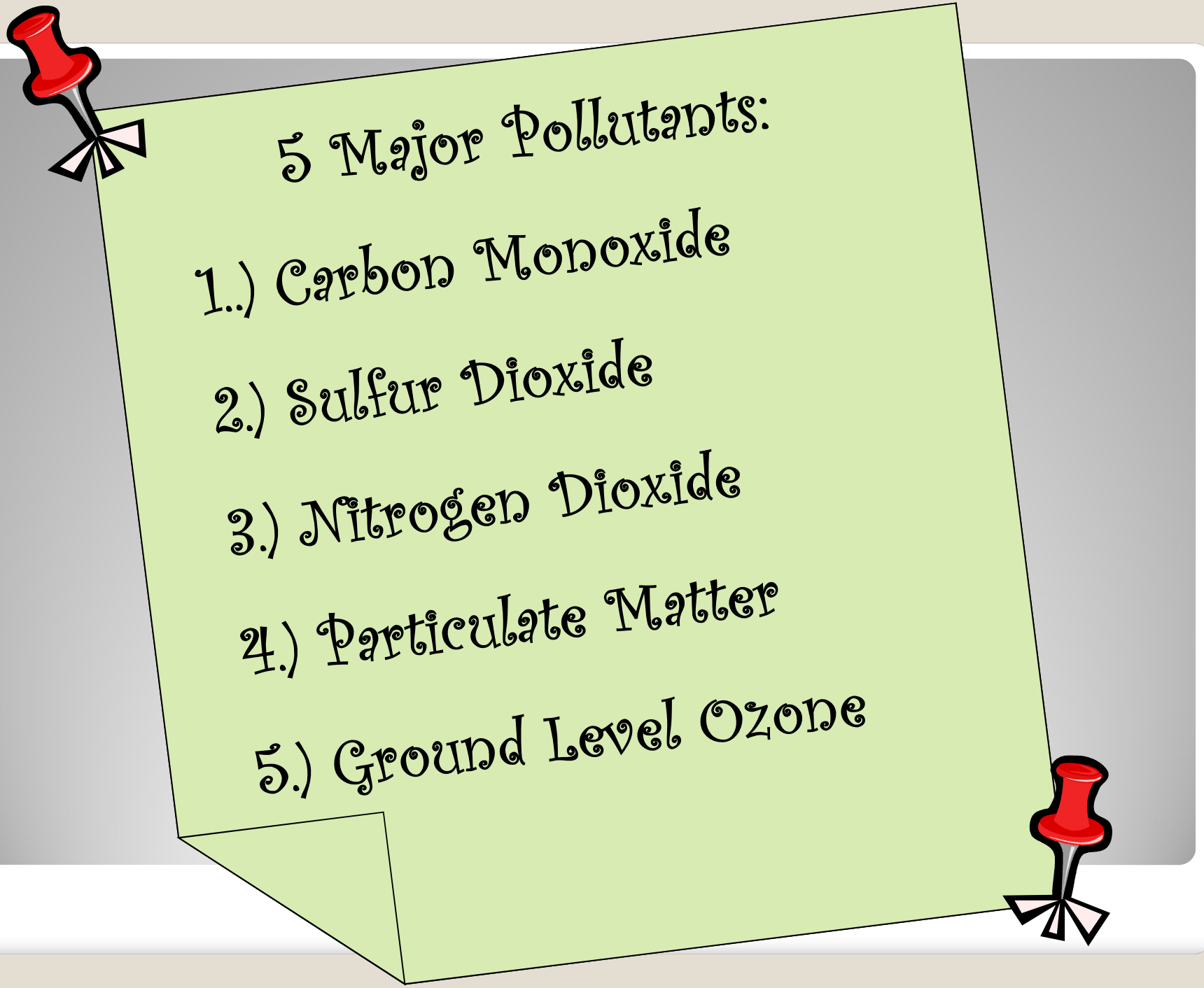
Effects on Human respiratory system

- Both gaseous and particulate air pollutants can have negative effects on the lungs.
- Solid particles can settle on the walls of the trachea, bronchi, and bronchioles.
- Continuous breathing of polluted air can slow the normal cleansing action of the lungs and result in more particles reaching the lower portions of the lung.
- Damage to the lungs from air pollution can inhibit this process and contribute to the occurrence of respiratory diseases such as bronchitis, emphysema, and cancer.



Lungs exposed to tobacco and to Indoor air pollution

Pathology slides - Courtesy Prof. Saldiva, São Paulo, Brazil


5 Major Pollutants:
1..) Carbon Monoxide
2.) Sulfur Dioxide
3.) Nitrogen Dioxide
4.) Particulate Matter
5.) Ground Level Ozone