Air Pollution

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Pollution

- Defined as any undesirable change in the physical, chemical, or biological characteristics of any component of the environment, which cause harmful effects to life and property.

Types of pollution

- Air pollution
- Noise pollution
- Water pollution
- Soil pollution
- Thermal pollution
- Marine pollution
- Nuclear hazards


Air pollution

Air Pollution

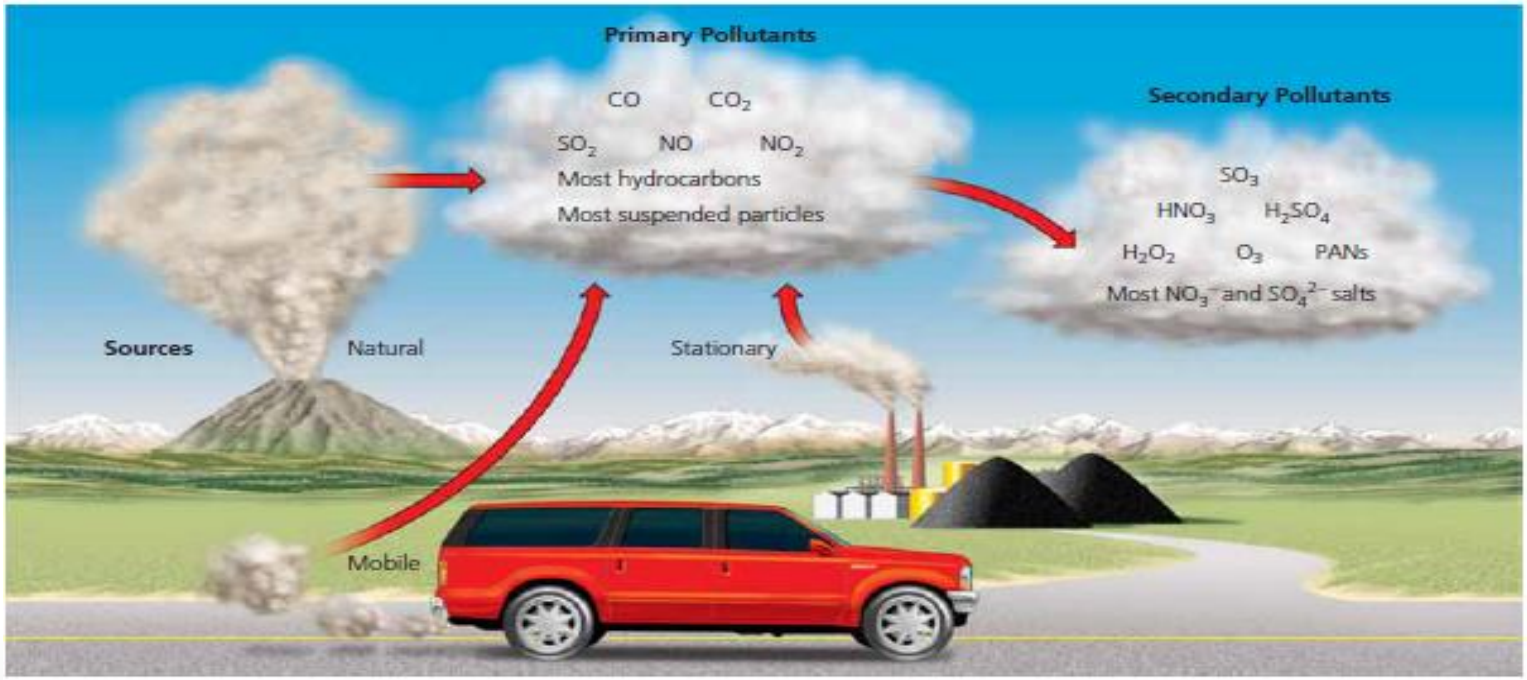
- Substances like gases, particulate matter, radioactive substances etc.
- Gaseous pollutants – oxides of S, N, CO, volatile organic compounds.
- Particulate pollutants: smoke, dust, soot, fumes, aerosols, liquid droplets, pollen grains. Etc…
- Radioactive pollutants: radon-222, iodine-131, strontium-90, plutonium-239.

Types of Air pollution

- Primary pollution
- Secondary pollution

Primary Pollutants

- Emitted directly from point source.
  - Eg. Carbon monoxide (CO)
  - Oxides of sulphur
  - Hydrocarbons
  - Radioactive substances.



Secondary Pollutants

- Formed by interaction of primary pollutants.
  - Eg. Peroxyacetyl nitrate (PAN).
  - Photochemical smog.

Cause of air pollution

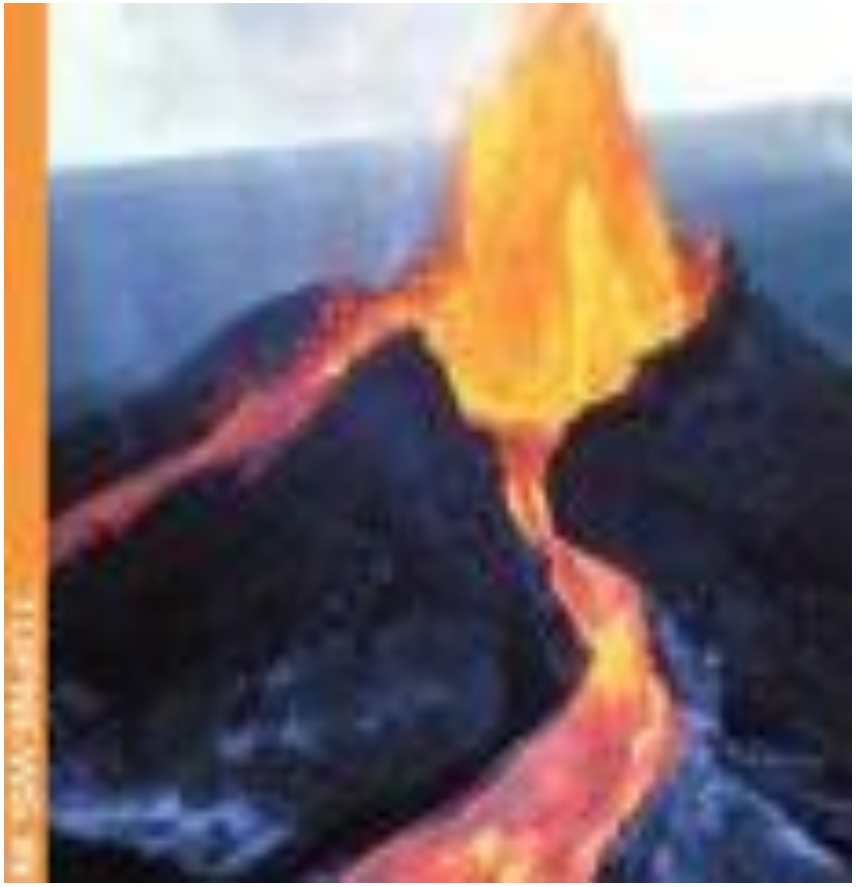
- It is classified into

  Natural sources

  Man-Made

Natural sources

Volcanic eruptions



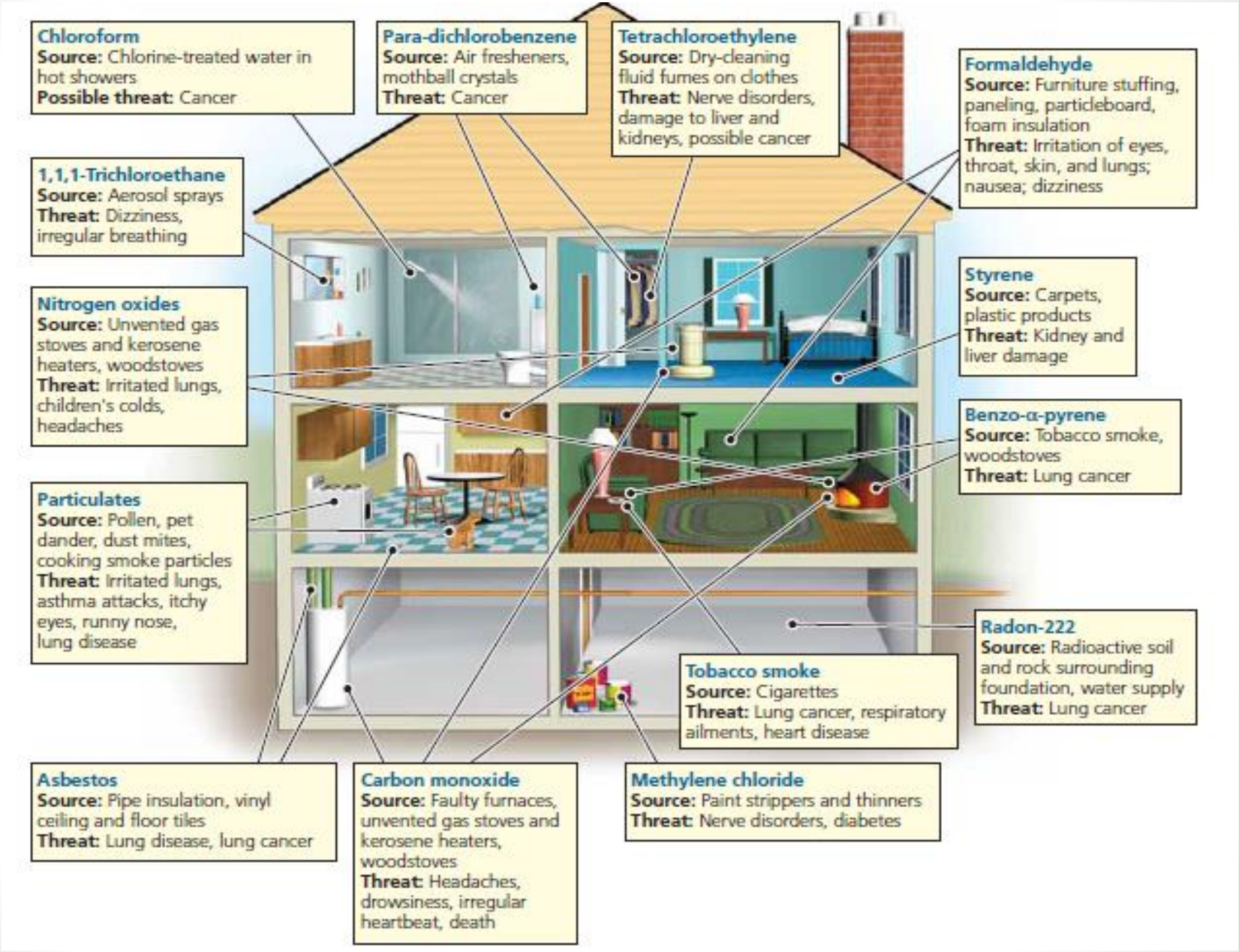
Forest fires

Man-made

- Thermal power plants
- Industrial units
- Fossil fuels
- Agriculture activities
- Automobile exhaust
- Textiles
- Tanneries
- Refineries
- Chemical industries
- Paper and pulp mills

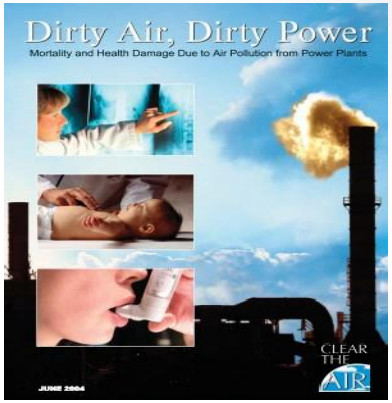
Indoor Pollution

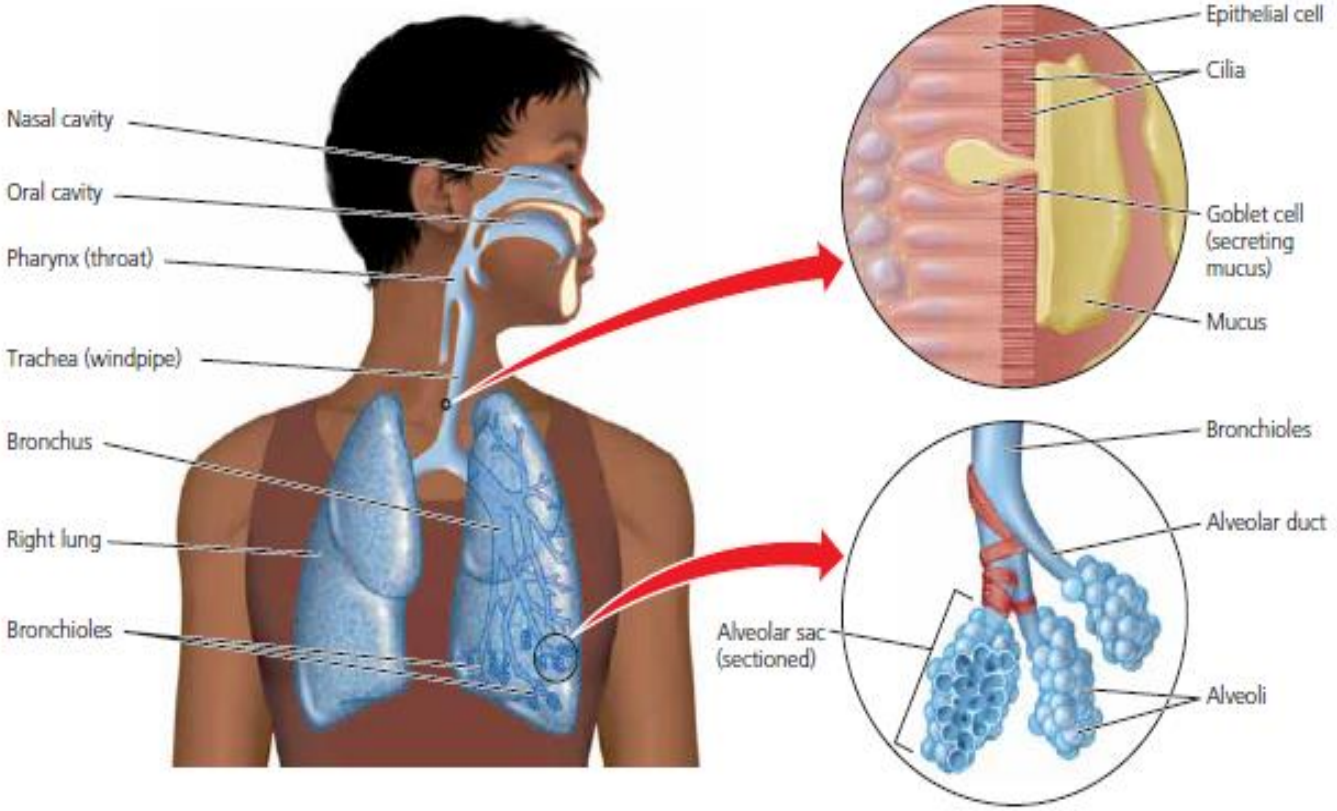
- Radon gas – emitted from buildings materials like bricks, concrete, tiles etc.
- Soil containing radium, also present – ground water and natural gas.
- Fuel purpose – coal, dung cakes, wood, kerosene are used which produces CO.
- Benzo pyrene (BAP) found in cigar smoke- cause cancer.


Chloroform
Source: Chlorine-treated water in hot showers
Possible threat: Cancer
Para-dichlorobenzene
Source: Air fresheners, mothball crystals
Threat: Cancer
Tetrachloroethylene
Source: Dry-cleaning fluid fumes on clothes
Threat: Nerve disorders, damage to liver and kidneys, possible cancer
Formaldehyde
Source: Furniture stuffing, paneling, particleboard, foam insulation
Threat: Irritation of eyes, throat, skin, and lungs; nausea; dizziness
1,1,1-Trichloroethane
Source: Aerosol sprays
Threat: Dizziness, irregular breathing
Styrene
Source: Carpets, plastic products
Threat: Kidney and liver damage
Nitrogen oxides
Source: Unvented gas stoves and kerosene heaters, woodstoves
Threat: Irritated lungs, children's colds, headaches
Benzo-α-pyrene
Source: Tobacco smoke, woodstoves
Threat: Lung cancer
Particulates
Source: Pollen, pet dander, dust mites, cooking smoke particles
Threat: Irritated lungs, asthma attacks, itchy eyes, runny nose, lung disease
Radon-222
Source: Radioactive soil and rock surrounding foundation, water supply
Threat: Lung cancer
Tobacco smoke
Source: Cigarettes
Threat: Lung cancer, respiratory ailments, heart disease
Asbestos
Source: Pipe insulation, vinyl ceiling and floor tiles
Threat: Lung disease, lung cancer
Carbon monoxide
Source: Faulty furnaces, unvented gas stoves and kerosene heaters, woodstoves
Threat: Headaches, drowsiness, irregular heartbeat, death
Methylene chloride
Source: Paint strippers and thinners
Threat: Nerve disorders, diabetes

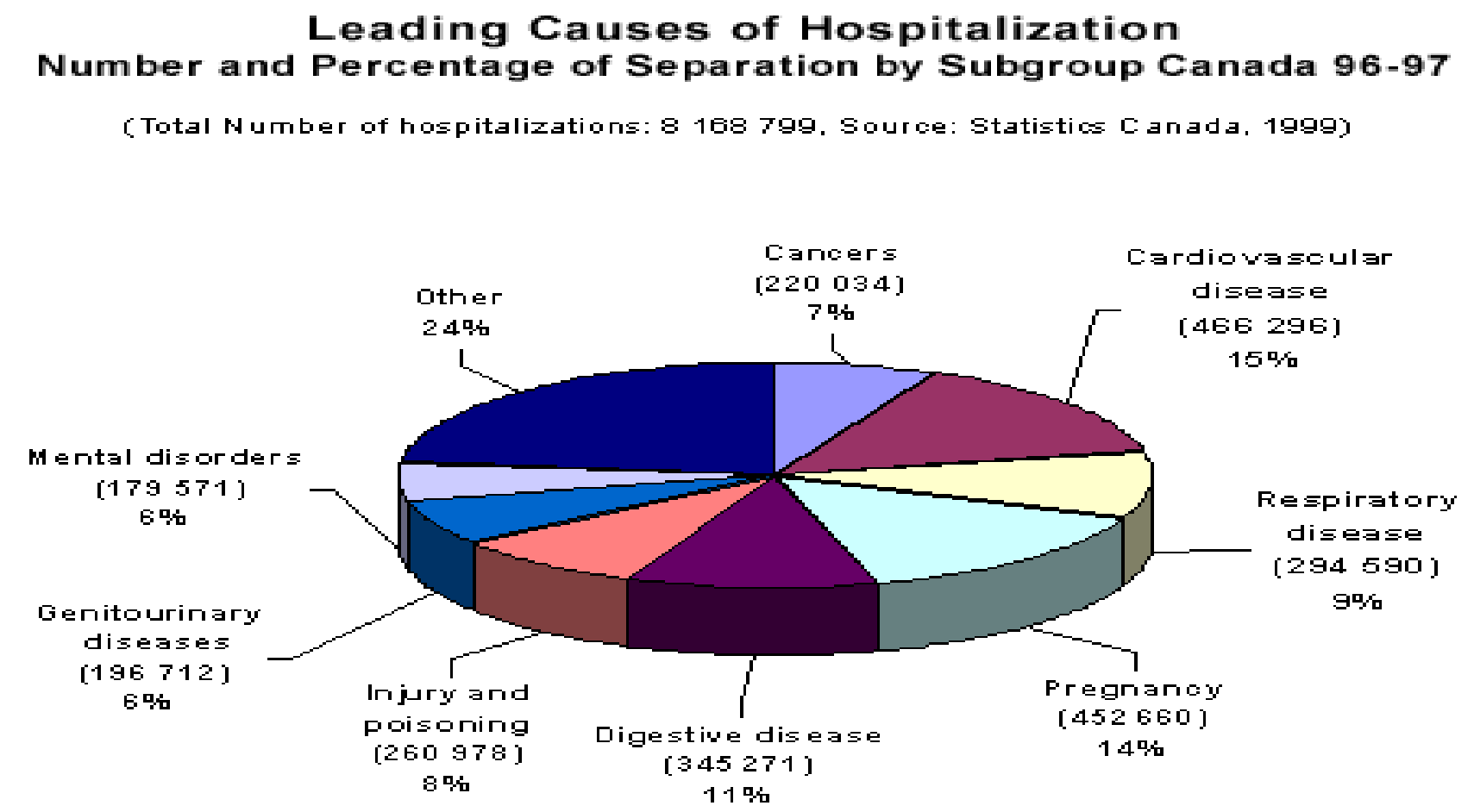
Diseases

- Asthma
- Cancer
- Chronic Bronchitis
- Emphysema
- Lung Disease
- Unconscious
- Death





CAUSES HOSPITALIZATION



Effects on plants

- Necrosis: Damage to leaf structure

- Chlorosis: Loss or reduction of chlorophyll

Effect on plants

- Epinasty: Downward curling of leaf

- Abscission: Dropping of leaves.

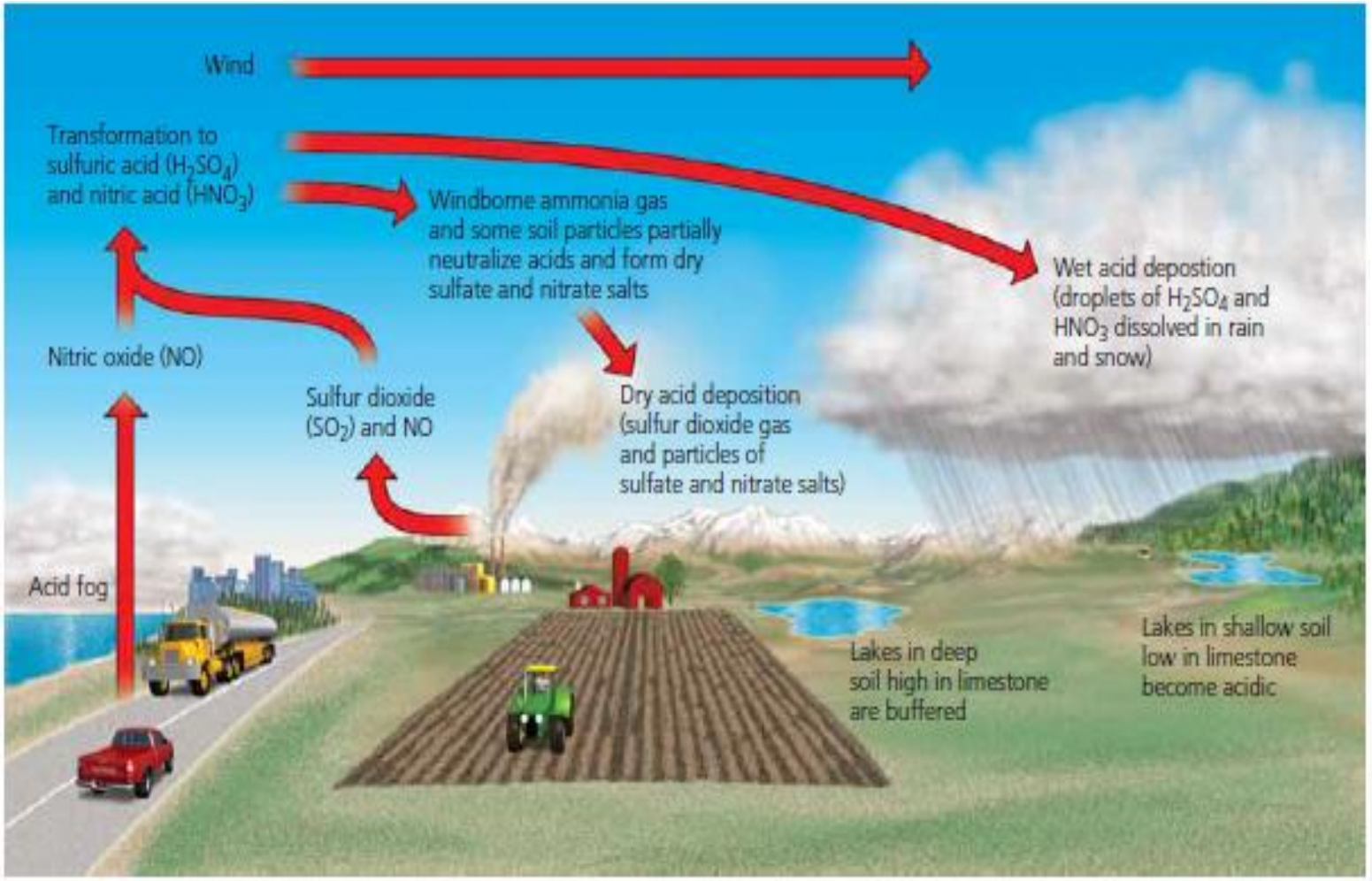
Chemical pollutants- Plants

- Sulphur dioxide- bleaching of leaves, chlorosis, and necrosis.
- Peroxyacetyl nitrate (PAN)- silvering of lower surface of leaf.
- Fluoride – necrosis
- Ethylene- epinasty, leaf abscission, dropping of flower.

- **Effect on Aquatic Life**

- Air pollutants mixing up- rain can cause high acidity in lakes.
  - Total fish – death

Acid Rain – due to air pollution



SOLUTIONS

Acid Deposition

Prevention

Reduce coal use

Burn low-sulfur coal

Increase natural gas use

Increase use of renewable energy resources

Remove SO_2 particulates and NO_x from smokestack gases

Remove NO_x from motor vehicular exhaust

Tax emissions of SO_2

Reduce air pollution by improving energy efficiency

Cleanup

Add lime to neutralize acidified lakes

Add phosphate fertilizer to neutralize acidified lakes

Effect on Materials

- Presence of SO_2 & moisture- cause corrosion of metallic surface (due to formation of sulphuric acid)

- This damages the statues made of marble and lime stone.

- Damage the leather binding of books- pages – brittle.

- Affects fabrics, paint etc.

- Ozone in atmosphere -cracking of rubber.
- Vehicle tyres are damaged.

Control of Air Pollution

- Industries: Environmental Impact Assessment studies.
- Minimize the pollution by transport and energy production.
- Modification of process.
- Use of appropriate material.
- Using low sulphur coal in Industries
- Removing sulphur from coal.

- Shift to less polluting fuels.
- Using biological filters and bio-scrubbers.
- Planting more trees.
- Reduction of pollution at source.

Reduction of air pollution at source

- Gaseous pollutants can be reduced by physical adsorption like activated charcoal, silica gel, fuller's earth.
- Effluents gases can be absorbed in liquid absorbent.
- Cyclone separator.
- Bag house filters.
- Wet scrubbers.
- Electrostatic precipitators.