

POLLUTING of the ENVIRONMENT

**** pollution**: the introduction of harmful substances or products into the environment; to contaminate

Outdoor Air Pollution

**** Air Pollutants**: airborne particles & gases in concentrations which endanger the health of organisms and the environment

Sources:

Non-Human created: volcanoes, sea salt, pollen, fire smoke, dust, bacteria & viruses, etc.

Human created: combustion of fossil fuels, chemical & nuclear processes, refining processes, mining, farming and others

* different chemicals and greater amounts have been created by humans than by the environment without humans

Categories:

Primary: those pollutants emitted directly from an identifiable source; such as a car exhaust pipe or a factory smokestack

EX: * **CO (carbon monoxide):** 2/3 of this pollutant comes from cars;

CO is the most abundant primary pollutant.

****know**

* **SO's (sulfur dioxides)**: from coal & oil combustion; can become acid deposition

* **NO's (nitric oxides)**: from power plants & cars; can also become acid deposition

* **Particulate matter**: solid particles & liquid droplets

* **volatile organic compounds**: also called hydrocarbons, solid, liquid & gases of H & C; in cities primarily from cars

Secondary pollutants: produced in the atmosphere through reactions among primary pollutants and/or other substances in the air

* many are triggered by sunlight in what are called photochemical reactions ****Know****

- * **sulfuric acid:** H_2SO_4 ($SO_2 + H_2O$) one form of acid deposition
- * **Ozone:** harmful near the surface and a component of smog
 - * harms crops and other vegetation
 - * irritates eyes and lungs of many animals, including

humans

- * **Smog:** often found in urban & industrial areas, it is a mixture of different air pollutants, some primary & some secondary

Effects

Human Health: ***tissue damage**, too much CO can lead to death;

NOs linked to **heart disease**;

SOs linked to **respiratory problems**;

some hydrocarbons are carcinogenic (cause cancer)

- * EPA estimates anywhere from 65,000 to 200,000 deaths/year
- * ~ \$50 billion in health care costs & lost productivity

Environmental Health: * Plants: leaf damage, **defoliation**;
reduced photosynthesis leads to reduced growth;
reduced crop yields

- * Animals: similar responses to air pollution as humans

Acid Deposition: * precip which has a pH < 5 to 5.6 (normal pH of unpolluted rain)

* can be rain, snow, fog; may be dry & acidify the water on contact

* May be **sulfuric acid** ($SO_2 + \text{water}$) or **nitric acid** ($NO_2 + \text{water}$)

* low levels of primary pollutants & high levels of secondary pollutants

* **Sensitive & effected areas:** S. Canada & Midwest U.S. to NE U.S.;

areas just east of Appalachians

* N Europe

* some New York lakes increased acidity from 6.5 in 1932 to 4.8 in 1975; numerous cases of fish die-offs

* **forest declines:** interferes with nutrient uptake; changes soil pH; damage leaves

* "eats" away, corrodes, stone structures, statues, etc.

Solutions

* primarily by **governmental intervention: laws** to clean-up the air after it has been polluted; but it is better with **laws that clean emissions before they are released**

* **burn less fossil fuels** or clean them up more before emitting the waste

* **use 'cleaner' energy sources**, electrical or hybrid vehicles, hydropower, solar, wind, biofuels, etc.

* **improve fuel efficiency of fossil fuels**

* **increase & improve mass transit**

Indoor Air Pollution

Types: primarily from **human-made chemicals** and substances/materials;

radon gas

* **air pollution levels may be 2 to 5 times higher inside a home than outside**

* levels may be up to 18 times higher inside a vehicle than outside

Sources: man-made household materials, furniture, building materials, drapes,

upholstery, clothing, cleaning products, etc.

Solutions: **increase/improve ventilation** of the air inside the home by use of

exhaust hoods/fans, changing air more frequently with outside air,

circulate air through greenhouses, use less-polluting materials/chemicals