1.5 Humans & Pollution

IB ESS

Read pg 48-53

Learning Objectives

- Outline how pollution is defined
- Identify major sources of pollution and describe their effects
- Identify the difference between point-source & non-point-source pollution & the challenges we face to manage them
- Explain the difference between primary & secondary pollutants
- Describe how pollution management strategies may be applied

Key Questions

1. What types of substance cause pollution?
2. How are humans responsible for pollution?
3. How can pollution be managed?

Pollution

- The addition of any substance or form of energy to the environment at a rate faster than the environment can accommodate it by dispersion, breakdown, recycling or storage in some harmless form
- The contamination of air, water or soil by substances that are harmful to living organisms
  - Gases, liquids, solids or energy
  - Occurs naturally or due to human activity
  - A side-effect of industrialization & economic development
  - Methods of exposure:
    - Breathing it in
    - Drinking or eating it
    - Absorption through the skin

Point-source pollution

- (incidental pollution) can be traced to a single source such as an oil refinery, a power station or a chemical plant
  - Relatively small in scale, but still can be catastrophic
  - Examples:
    - Chernobyl, Bhopal, explosion of petrochemical plant in Harbin (China) in 2005, oil spill in Gulf of Mexico
  - Acute pollution - a single isolated incident such as an oil spill

Non-point-source pollution

(sustained pollution) more dispersed in nature and may come from agricultural runoff, vehicle exhaust, an industrial area with many factories or domestic heating (in less developed communities)

- **Takes longer to have substantial impact**
- **Has much greater long-term effect**
- **Chronic pollution - long term**
- **More difficult to tackle the cause (sources widespread & common)**
- **Governments can (and have) pass(ed) laws to control pollution**
- **Often poorest people in a society exposed to the greatest risks from point & non-point-source pollution**
  - **Ex. USA - geographic distribution of both minorities & poor correlated to distribution of air pollution, municipal landfills & incinerators, abandoned toxic waste dumps, & lead poisoning in children**

Biodegradable Pollution

- Breaks down naturally in the environment
- By the action of microbes over time
  - EX. paper, wood, feces, bones, leather, wool & vegetable waste

VS.

Persistent pollution

- nonbiodegradable - remains in environment for a long time
  - EX. plastics, mercury, lead, other heavy metals, aluminum cans, synthetic fibers, glass, pesticides like DDT.
  - Cannot be broken down naturally...must be physically removed from the environment

Primary Pollutants VS Secondary Pollutants

- **Active as soon as emitted**

Examples: air pollution such as smoke or carbon monoxide

- **Become active after a primary pollutant has been physically or chemically changed**

Examples: water pollution from sulfuric acid (when sulfur dioxide from factories dissolves in water in the atmosphere, then falls as acid rain)

Natural Sources VS Human Sources

- Volcanic eruptions (sulfur, chlorine, ash)
- Wild fires (smoke, carbon monoxide)
- Cattle & other animals (methane)
- Pine trees (VOCs)

- Combustion of fossil fuels from industrial plants, power plants & vehicles (nitrogen oxides, carbon monoxide, carbon dioxide, sulfur dioxide & particulates)
- Combustion of crop waste from incinerators, stoves & farmers (carbon monoxide, carbon dioxide, particulates)
- Agricultural waste (nitrates, pesticides & organic waste)
- Aerosol sprays
- Leaky refrigerators
- Paint, varnish & other solvent fumes

Pollution Management Strategies

- Collaboration & early intervention
- Altering human activity through
  - Education (development of alternatives, adopting new lifestyles, reducing, reusing, recycling)
  - Incentives
  - Penalties
- Regulating & reducing pollutant at point of emission
  - Setting & imposing standards (Clean Air Act)
  - Taking measures for extracting the pollutant from waste emissions
- Cleaning up & restoring ecosystems
  - removing pollutant
  - Replanting & restocking animal populations