

I. Indoor Air Pollution

A. Tobacco smoke

1. EPA group A carcinogen
2. 4000 chemicals included
3. Second hand smoke:
 - a) burns at lower temp than for the smoker, no incineration
 - b) smoker breathes through filter
 - c) electrostatic charge on smoker, repels SH smoke
 - d) Kills
 - (1) 40K per year Heart disease
 - (2) 3K per year Lung cancer
 - e) Damages 300K kids under 18 months with:
 - (1) asthma
 - (2) infections

B. Radon

1. Dense gas, seeks lowest level (e.g. basements)
2. second leading cause of lung cancer
3. all basements after 1990 must have fans to clear radon
4. atomic mass is 226, vs. 30 for air
5. See smoke demo: lungs

C. Living pollutants

1. tiny insects
2. fungi
3. bacteria
4. mold spores
5. mites (eat dust)
6. dander (dead skin)
7. e.g. bacillus (legionnaire's disease)

D. Sick Building syndrome

1. majority of occupants experience symptoms that vary with exposure
2. building related illness-often a specific organism
3. symptoms:
 - a) eye, nose, throat irritation
 - b) neuro symptoms
 - c) skin irritation
 - d) nausea/vomiting
 - e) changes in taste sensitivity
 - f) Steps: limit exposure to synergistic pollutants, ventilation

E. Climate change

1. 1998, 2002, 2003 warmest on record
2. decrease in ice sheets, glaciers, ocean levels
3. increase in global temp, severe storms
4. IPCC: international panel on climate change (Nobel prize)
5. 3 gases:
 - a) CO₂ 280 ppm to 380 ppm (1700 to 2003)
 - b) CH₄ 715 ppb to 1774 ppb

- c) NO 270 ppb to 319 ppb
 - d) Also water vapor
- 6. Biota changes
 - a) increase in crops for siberia, canada
 - b) decrease in crops for africa, asia, droughts there
 - c) increase in mosquito and other disease vectors (asian horror films)
 - d) increase in heat spells (e.g. Europe 2005)
 - e) relocation of populations
 - f) water loss in asia, rivers due to Himalayan ice sheets
- 7. Carbon sequestration: why dangerous?
- 8. Kyoto Accord: US blocked
- F. Thermal pollution
 - 1. Urban heat island effect, 20° hotter than normal
 - 2. photochemical reactions (e.g. smog)
 - 3. increase in roofs, roads, asphalt
 - 4. decrease in green spaces
 - 5. increases erosion, runoff
 - 6. See also thermal inversion
- II. Water Pollution
 - A. 1969 Cuyahoga river caught fire
 - B. Clean water act 1972
 - 1. by 1992 79% better
 - 2. by 2002 94% of community water systems met FEd standards (not waimea)
 - 3. 2002: 60% of streams clean enough for fishing (36% in 1972)
 - 4. Wetland loss: down by 80% 1972 to 2002
 - 5. Runoff issues:
 - a) excess nutrients and pollutants create dead zones
 - b) 5000 sq miles off Gulf of Mexico
 - c) warm nutrient water: top layer
 - d) cool seawater: lower
 - (1) eutrophication:
 - (a) phytoplankton increase tf.zooplankton increase then die
 - (b) fall to bottom, bacteria increase, ++ BOD, then hypoxia, -- DO
 - (2) congress says dead zone must decrease 50% by 2015
 - C. Sources:
 - 1. point sources e.g. paper mill
 - 2. non point: feed lots
 - 3. ag, industry, mining
 - D. standing water: recovers slowly
 - 1. poor dilution
 - 2. no flushing or mixing
 - 3. biomagnification
 - 4. same for groundwater
 - 5. --temp and --DO so recovery is slower
 - 6. flowing streams are better
 - E. Recovery:

1. reduce or remove the source
2. water treatment

F. Pollutants

1. excess nutrients (N PO₄)
2. organic waste
3. toxic waste (HC, pesticides, acids, heavy metals)
4. hot water (power plants)
5. cool water (dam releases)
6. sediments-runoff
7. fecal coliform

G. Water quality tests

1. pH
2. Hardness
3. DO
4. Turbidity

H. Wastewater: any water used by humans

1. diseases: cholera, typhoid fever
2. main reason for ++ lifespan is clean water worldwide
 - a) physical treatment-debris removal
 - b) primary treatment-removes suspended solids
 - c) secondary treatment-biological treatment: aerobic bacteria, trickling ponds
 - d) Result: sludge-later degraded by anaerobic bacteria, treated with chlorine then into rivers (bad bc chlorinated HC)
 - e) tertiary treatment: sand filtration then "reclaimed water"