


ENVIR 202: Lesson No. 14



Air Quality & Health


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Chuck Treser
University of Washington
Program on the Environment

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Our Atmosphere

- ❖ Spaceship Earth Protects Us
 - > Loss of heat
 - > Cosmic Debris
 - > Ultraviolet Radiation



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What is Air Pollution?

- ❖ EPA Legal Definition:
 - > presence in outdoor atmosphere
 - > of any air contaminant
 - > in sufficient quantities and of such characteristics and duration,
 - > that is, or likely to be, injurious to human health, plant or animal life
 - > or which unreasonably interferes with enjoyment of life and property



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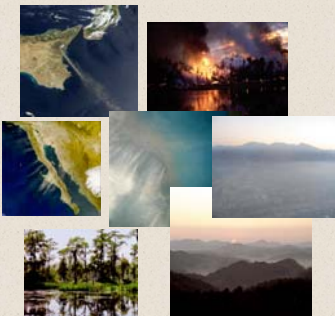
Human Consumption of Air

- ❖ Composition:
 - > Nitrogen 78%
 - > Oxygen 21%
- ❖ We breath about 16 times /minute
 - > Intake 2000 gallons of air/ day
- ❖ 3 of 5 Americans live in areas not meeting federal standards
- ❖ Daily Intake
 - > Food (dry) 1.5 lbs.
 - > Water 3-5 lbs.
 - > Air 35 lbs.

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Types of Air Pollution


- ❖ Natural
 - > Volcanoes- particles, gases
 - > Forest Fires- CO, ash
 - > Dust Storms- particles
 - > Decaying plants- global warming
 - > Plants and trees- haze



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Types of Air Pollution


- ❖ Man-Made
 - > Cars - ozone, smog
 - > Trucks- particles, toxics
 - > Industry- particles, chemicals
 - > Woodstoves- particles, toxics, CO
 - > Outdoor burning- CO, ash
 - > Asbestos- toxics



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Air Pollution Effects

- ❖ History
 - > Prehistoric man
 - > Growth of industry
 - > Combustion Engine
 - > Population growth



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Air Pollution Effects

- ❖ Health Effects
 - > Asthma
 - > Bronchitis
 - > Cancer
- ❖ Nuisance
- ❖ Property



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Air Pollution Sources



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Air Pollution Sources



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Air Pollution Sources



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Ozone

- ❖ Low level and atmospheric
- ❖ Source:
 - Results from the action of sunlight on hydrocarbons and NOx emitted from fuel combustion
- ❖ Effects:
 - Decrease in lung function
 - Respiratory & eye irritation, chest pain

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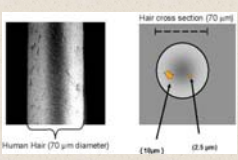
Depletion of Ozone Layer

- ❖ Chlorofluorocarbons (CFCs) - e.g. freons
 - CFCs are stable
 - UV radiation breaks down CFCs into chlorine atoms
 - Chlorine atoms react with and destroy ozone
 - Chlorine can persist over 100 years in stratosphere
- ❖ A 1% decrease in ozone layer → increase UV radiation reaching earth by 2% → 2-10% increase in skin cancer

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Airborne Particles

- ❖ Source:
 - Combustion, dust, aerosols
- ❖ Effects:
 - Trigger asthma attacks in sensitive individuals
 - Severe reactions in individuals with emphysema, bronchitis and heart disease
 - Suppress lung growth
 - PM 2.5 - fine particles easily inhaled and absorbed - smallest particles can enter directly into bloodstream



Human Hair (70 µm diameter)
Hair cross section (70 µm)
(10µm) (2.5 µm)

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Clean Air Act

- ❖ Goal is to protect our environment by reducing air pollution
 - Clean Air Agency has responsibility to control air pollution
 - Emission inventory
 - Sets pollution limits
 - Requires permission (permits) to pollute
 - Requires pollution controls
 - Conduct inspections
 - Education
 - Issues penalties

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Compliance Strategies

- ❖ Federal Programs
 - National Ambient Air Quality Standards
 - New Source Performance Standards
 - National Emission Standards for Hazardous Air Pollutants
 - Prevention of Significant Deterioration
 - Air Operating Permits

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Compliance Strategies

- ❖ State Programs
 - Washington Clean Air Act
 - vehicle emissions
 - regulate areas with no active local agency
 - outdoor burning

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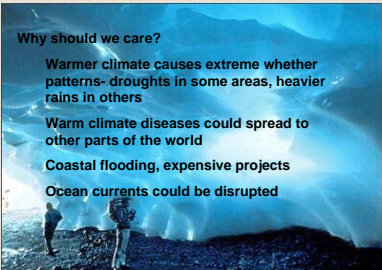
Climate Change

Global warming occurs when certain gases accumulate in our atmosphere

- CO2
- Methane
- NO2
- HFC's

Why should we care?

- Warmer climate causes extreme weather patterns- droughts in some areas, heavier rains in others
- Warm climate diseases could spread to other parts of the world
- Coastal flooding, expensive projects
- Ocean currents could be disrupted



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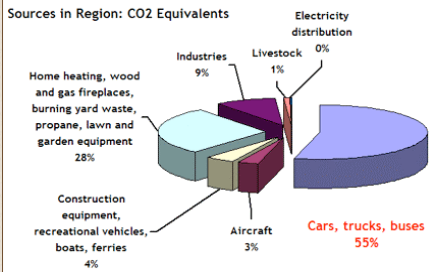
Climate Change



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Climate Change

Sources in Region: CO2 Equivalents



Source	Percentage
Cars, trucks, buses	55%
Home heating, wood and gas fireplaces, burning yard waste, propane, lawn and garden equipment	28%
Industries	9%
Construction equipment, recreational vehicles, boats, ferries	4%
Aircraft	3%
Livestock	1%
Electricity distribution	0%

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Air Toxics

- ❖ Diesel emissions contain more than 40 known substances listed as Hazardous Air Pollutants
- ❖ Diesel particles enter into the deepest part of lungs
- ❖ Diesel exhaust contain irritants and cancer causing compounds
 - > Benzene and Dioxin
- ❖ Studies show higher rates of asthma problems near heavy vehicle traffic

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Air Toxics

- ❖ EPA's Voluntary Retrofit Program
- ❖ Addresses diesel vehicles now on the road
- ❖ Promotes a range of solutions
 - > Retrofit Devices Like Particle Traps And Oxidation Catalysts
 - > Ultra-Low Sulfur Diesel Fuels
 - > Biodiesel
- ❖ Focused on government & large private fleets
- ❖ School bus project -



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Diesel Solutions - Retrofit





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Reducing Air Pollution



- ❖ Many new homes and buildings use 30 % less energy than more standard designs.
- ❖ Wind power already provides enough electricity for one million Americans.



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Reducing Air Pollution

- ❖ Average new vehicle gets double the number of miles per gallon that cars got in 1973. Today, trying to produce automobiles that are three times more fuel efficient.
- ❖ Many consumers and businesses rely on vehicles that run efficiently on electricity or natural gas.



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What can we do?



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