

Chapter 12, Air
Section 1: What Causes Air Pollution?

What Causes Air Pollution?

- _____ is the contamination of the atmosphere by wastes from sources such as industrial burning and automobile exhausts.
 - Can be _____
- Most air pollution is the results from _____
- Some air pollution is natural
 - _____ from volcanic eruptions.

Primary and Secondary Pollutants

- A _____ is a pollutant that is put directly into the atmosphere by human or natural activity.
 - Ex: _____
- A _____ is a pollutant that forms in the atmosphere by chemical reactions with primary air pollutants, natural components in the air, or both.
 - Ex: _____

Sources of Primary Air Pollutants

- Primary pollutant sources:
 - _____
 - _____
 - Motor vehicles are sources of primary pollutants such as carbon monoxide, nitrogen oxide, sulfur dioxide, and chemicals called volatile organic compounds (VOCs).
- Primary pollutants:
 - _____
 - _____
 - _____
 - _____

Sources of Primary Air Pollutants

- _____ are the major sources of nitrogen oxide emissions.
- _____ contribute much of the sulfur dioxide emissions.
- _____ make up most of the human-made emissions of VOCs.

Sources of Primary Air Pollutants

- Particulate matter can also pollute the air
 - Divided into _____
- _____ enter the air from fuel burned by vehicles and coal-burning power plants.
- Sources of coarse particles
 - _____
 - _____
 - _____
 - _____
 - _____

The History of Air Pollution

- Air pollution is not a new phenomenon.

– History Fact: 1273: King Edward I ordered that burning a particularly dirty kind of coal called _____ was illegal.

- The world's _____ problem is much worse today because modern industrial societies burn large amounts of fossil fuels.
- Most air pollution in urban areas comes from _____.

Motor Vehicle Emissions

- Almost _____ of our air pollution comes from gasoline burned by vehicles.
- According to the U.S. Department of Transportation, Americans drove their vehicles over _____ in 1998.
- Over _____ of that mileage was driven by passenger vehicles. The rest was driven by trucks and buses.

Controlling Vehicle Emissions

- The Clean Air Act, passed in 1970 and strengthened in 1990, gives the Environmental Protection Agency (EPA) the authority to _____ in the United States.
- The EPA required the gradual _____ of lead in gasoline, decreasing lead pollution by more than 90 percent in the United States.
- In addition, _____, required in all automobiles, clean exhaust gases of pollutants before pollutants are able to exit the tail pipe.

California Zero-Emission Vehicle Program

- In 1990, the California Air Resources Board established the zero-emission vehicle _____ program.
- Zero-emission vehicles are vehicles that have no
 - _____
 - _____
 - No _____ that deteriorate over time.
- By 2016, _____ of all vehicles sold in California are required to be zero-emission vehicles, including SUVs and trucks.

Industrial Air Pollution

- Many industries and power plants that generate our electricity must burn fuel, usually _____, to get the energy they need.
- Burning fossil fuels releases huge quantities of _____ into the air.
- Power plants that produce electricity emit at least _____ of all sulfur dioxide and more than one-third of all nitrogen oxides that pollute the air.

Industrial Air Pollution

- Some industries also produce VOCs, which are chemical compounds that form _____.
- Examples:
 - _____
 - _____
 - _____
 - _____
 - _____

Regulating Air Pollution From Industry

- The Clean Air Act requires many industries to use _____ or other pollution-control devices.

- Scrubbers remove some of the more _____ that would otherwise pollute the air.
- A scrubber is a machine that _____ gases through a spray of water that dissolves many pollutants.
 - _____ is an example of a pollutant gas that can be removed from the air by a scrubber.

Regulating Air Pollution From Industry

- Electrostatic precipitators are machines used in cement factories and coal-burning power plants to _____ dust particles from smokestacks.
- In an electrostatic precipitator, gas containing dust particles is _____ through a chamber containing an electrical current.
- An _____ is transferred to the dust particles, causing them to stick together and to the sides of the chamber.

Electrostatic Precipitator

- The clean gas is released from the chamber and the _____ dust particles can then be collected and removed.
- Electrostatic precipitators remove _____ of ash generated by coal-burning power plants from the air each year in the United States.

Smog

- _____ is urban air pollution composed of a mixture of smoke and fog produced from industrial pollutants and burning fuels.
- Smog results from _____ that involve sunlight, air, automobile exhaust, and ozone.

Temperature Inversions

- The _____ of air in the atmosphere usually keeps air pollution from reaching dangerous levels.
- During the day, the sun _____ the surface of the Earth and the air near the Earth.
- A _____ is the atmospheric condition in which warm air traps cooler air near Earth's surface.

Chapter 12, Air Section 2: Air, Nose, and Light Pollution

Air Pollution

- Air pollution adds to the _____ such as _____.

Short-Term Effects of Air Pollution on Health

- The short-term effects of air pollution on people's health include
 - _____
 - _____
 - _____
 - _____
 - _____ in the chest and upper respiratory infections, such as bronchitis and pneumonia.

Long-Term Health Effects of Air Pollution

- Long-term effects on health that have been linked to air pollution include:
 - _____
 - _____
 - _____

Indoor Air Pollution

- Major sources of pollution:
 - _____
 - _____
- These compounds can be found in
 - _____
 - _____
 - _____
 - _____

Indoor Air Pollution

- _____ is a set of symptoms can affect workers in airtight office buildings:
 - _____
 - _____
 - _____
 - _____
- Sick-building syndrome is believed to be caused by _____.
- Sick-building syndrome is most common in _____ where buildings are tightly sealed to keep out the heat.
- _____ the sources of indoor air pollution is the most effective way to maintain good indoor quality.
- _____, or mixing outdoor air with indoor air, is also necessary for good air quality.

Radon Gas

- _____ is colorless, tasteless, odorless, and radioactive.
- _____ is one of the elements produced by the decay of _____, a radioactive element that occurs naturally in the Earth's crust.
- Radon can _____ through cracks and holes in foundations into homes, offices, and schools, where it adheres to dust particles.
- When people inhale the dust, radon enters their lungs. In the lungs, radon can destroy the _____ in cells that line the air passages.
- Such damage can lead to _____, especially among people who smoke.
- Radon is the _____ cause of lung cancer in the United States.

Asbestos

- _____ is any of six silicate minerals that form bundles of minute fibers that are heat resistant, flexible, and durable.
- Asbestos is primarily used as an _____, and it was used extensively in building materials.
- Asbestos fibers can _____ the lungs, causing the disease asbestosis.

Noise Pollution

- A sound of any kind is called a _____. However, some noises are unnecessary and can cause noise pollution.
- Health problems that can be caused by noise pollution include

- _____
- _____
- _____
- Noise can also cause _____, which may lead to decreased productivity at work and in the classroom.
- A _____ is the most common unit used to measure loudness, and is abbreviated dB.
- The quietest sound that a human ear can hear is represented by _____.

Light Pollution

- _____ does not present a direct hazard to human health, but it does negatively affect our environment.
- The use of _____ in urban areas is diminishing our view of the night sky.
- A more important environmental concern of inefficient lighting is _____.
- Energy is wasted when a light is directed upward into the night sky and lost to space.
 - Examples:
 - _____
 - _____
 - _____
- Solutions to this problem:
 - _____ so it is directed downward
 - Using _____ so that light is used only when needed
 - Using _____ sources, which are the most energy-efficient sources of light.

Chapter 12, AirSection 3: Acid Precipitation

What Causes Acid Precipitation?

- _____ is precipitation, such as rain, sleet, or snow that contains a high concentration of acids, often because of the pollution of the atmosphere.
- When fossil fuels are burned, they release _____ of sulfur and nitrogen.
- When these oxides combine with water in the atmosphere they form _____, which falls as acid precipitation.
- Acid precipitation can _____ living things and can result in the decline or loss of some local animal and plant populations.
- A _____ number is a value that is used to express the acidity or alkalinity (basicity) of a system.
- Each whole number on the scale indicates a tenfold change in acidity.
 - A pH of 7 is _____.
 - A pH of less than 7 is _____.
 - A pH of greater than 7 is _____.
- Pure water has a pH of _____, while normal precipitation has a pH of about _____.
- Normal precipitation is _____ because atmospheric carbon dioxide dissolves into the precipitation and forms carbonic acid.

- Precipitation is considered acid precipitation if it has a pH of _____ 5.0.
- The pH of precipitation varies among different geographic areas.
 - Example: The pH of precipitation in the eastern U.S. and Canada ranges from _____.
 - Most acidic precipitation occurring around _____.

How Acid Precipitation Affects Soils and Plants

- Acid precipitation can cause a drop in the pH of soil and water. This increase in the concentration of acid is called _____.
- When the acidity of soil _____, some nutrients are dissolved and washed away by rainwater.
- It also causes _____ and other toxic metals to be released and possibly absorbed by the roots of plants causing root damage.
- _____ in water vapor clogs the openings on the surfaces of plants.

Acid Precipitation and Aquatic Ecosystems

- Aquatic animals are adapted to live in an environment with a _____ pH range.
- In addition, acid precipitation causes _____ to leach out of the soil surrounding a lake.
 - Aluminum accumulates in the _____ and interferes with _____ exchange.
- _____ is the sudden runoff of large amounts of highly acidic water into lakes and streams when snow melts in the spring or when heavy rains follow a drought.
- This phenomenon causes _____ of fish to die, and affects the reproduction of fish and amphibians that remain.
 - Offspring that do survive end up with _____ and cannot reproduce.
- To counteract the effects of acid precipitation on aquatic ecosystems, some states in the U.S. and some countries spray:
 - _____ (calcium carbonate) to help restore their natural pH.
- Because lime has a pH that is _____, the lime raises the pH of the water.

Acid Precipitation and Humans

- Toxic metals:
 - _____
 - _____
- Can be released into the environment when soil acidity _____.
- These toxic metals can find their way into crops, water, and fish. The toxins then _____ the human body.
- Causes of acid precipitation on humans can:
 - _____ the numbers of fish affect commercial fishermen and the sport-fishing industry
 - Trees are _____ by acid precipitation
 - Acid precipitation can dissolve the _____ in common building materials, such as concrete.

International Conflict

- One problem in controlling acid precipitation is that pollutants may be released in _____ hundreds of kilometers away.
- Canada and the United States signed the _____.
- Both countries agreed to _____ acidic emissions that flowed across the Canada-U.S. boundary.