GLOBAL WARMING

Unit Overview

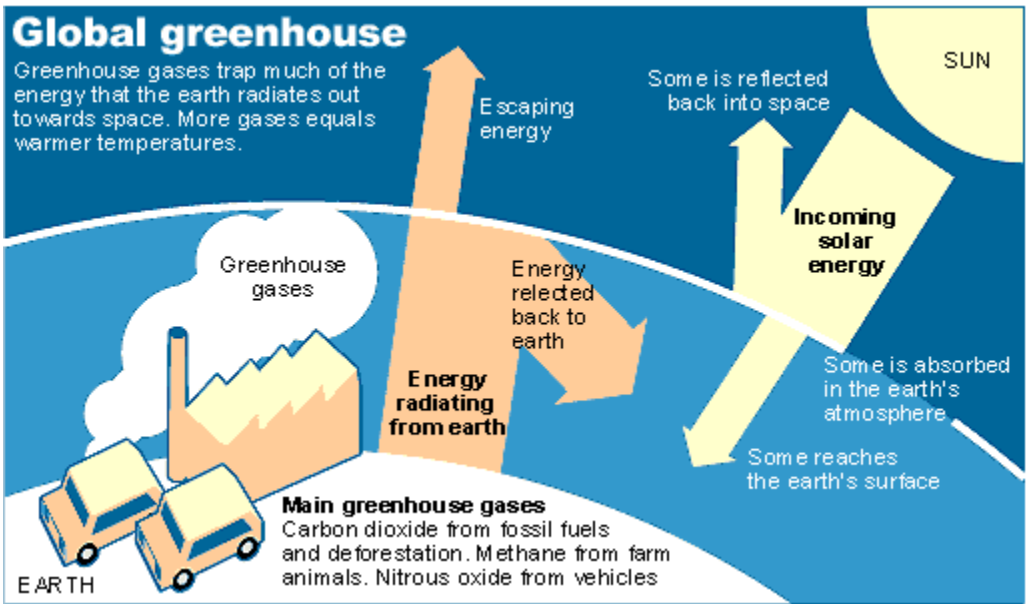
In this unit we will about how greenhouse gases and other pollutants contribute to global warming and other environmental changes.

Global Warming

Scientists who study the average weather conditions of a region or the weather patterns that occur over many years are referred to as **CLIMATOLOGISTS**. In the unit, ***Climate,*** you learned that there were three factors that affected the climate of a region: 1) latitude (distance from the equator); 2) topography (shape of the land); and 3) heat absorption and release. You also learned in the unit, ***The Atmosphere,*** carbon dioxide makes up less than 1% of the atmosphere by volume. The amount is actually

only 0.03%, but CO_2 is still a very important component, and important in the process of keeping some of the sun's energy in the atmosphere.

About 50% of the incoming solar energy reaches the earth's surface, and about 15% of that is reflected back into space. These reflected infrared rays are naturally absorbed by certain components of the atmosphere. Some are particles like soot, dust, and water droplets. Some are gases including water vapor, methane, ozone, and carbon dioxide. This natural process traps heat in the atmosphere and is commonly known as the **GREENHOUSE EFFECT** because the atmosphere has the heat trapping effect like the glass walls and roof of a greenhouse. Without the natural greenhouse effect, the average temperature of the earth's surface would be nearly sixty degrees Fahrenheit colder than it is now!



Temperature records show that the average temperature of the earth's surface has increased between one and two degrees Fahrenheit since the late 1800's and the advent of the Industrial Revolution. There has also been an increase of about 25% in the amount of carbon dioxide and of about 150% in the amount of methane in the atmosphere since the mid-1800's. Scientists attribute these increases to two factors: 1) the increased burning of fossil fuels (coal, oil, & natural gas); and 2) the increased clearing of land and the

destruction of trees and plant life. Some scientists propose that the increase in surface temperature, called **GLOBAL WARMING**, is connected to the increase in these greenhouse gases. Computerized mathematical models are being used to study that data and make any relationships that can be applied to current trends.

Climatologists do not all agree on what the future may hold in light of this data. Some predict a change in rainfall patterns, the melting of polar ice caps, and the increase in sea level and the severity of tropical storms. This would cause a dramatic change in the climate and shifts in animal and plant populations possibly causing a more tropical climate in the United States. Another group of scientists predict a warming of northern regions will result in more snowfall and increase the size of polar ice caps. Still others are not convinced that this is the precursor to a large climatic change but point to data from ice core samples that this is part of a climatic cycle the earth goes through periodically.

Efforts in the scientific community as well as in the political realm are being put forth to slow global warming. Technology has produced many devices to more efficiently burn fossil fuels in order to reduce greenhouse gas emissions. In the unit, ***Energy Alternatives,*** you studied nontraditional energy sources that don't emit greenhouse gases and their pros and cons. Governments are being encouraged to end the massive deforestation of tropical rain forest and to re-forest those areas. Increased quantities of vegetation increase the recycling of carbon dioxide into oxygen through photosynthesis.

Scientists may not agree on the eventual effects of global warming but they do agree on one thing: global warming is a **global** problem and it will take international teamwork, not just the United States, to slow it down.

For additional information on global warming click on the following web site: http://www.esa.int/esaCP/SEMRLH12Z0F_index_0.html

Air Pollution

While the Greenhouse Effect is largely responsible for Global Warming, other air pollutants also add to it. Much like water pollution, air pollution can be grouped into two categories. There are stationary sources, sources of pollution that have a fixed location, like factories. There are also mobile

sources like cars, trucks, air planes, and trains that emitted pollutants as the move. Carbon monoxide, sulfur dioxide, and nitrogen dioxide are all examples of primary pollutants because they are released directly to the atmosphere through combustion of engines and other machines. These not only harm the atmosphere, they can harm plant and animal life as well as our health. Secondary pollutants are when primary pollutants react with naturally occurring compounds. When these pollutants attach to water particles in the air it can come back to Earth as acid rain. Acid rain can kill plant life, aide in erosion, and change the chemistry of the soil.

Six Criteria Pollutants

The six most common air pollutants are sulfur dioxide, nitrogen oxides, carbon monoxide, ozone, lead, and particulates.

1. **Sulfur dioxide** (SO2) is a colorless, odorless gas is released form many coal plants and industrial processes. This can cause major health issues in animals and plants and corrode metal and paint.
2. **Nitrogen oxides** can occur in many forms in the atmosphere but largely emitted in two forms: nitric oxide (NO) or nitrogen dioxide (NO2), both a yellow-brown to reddish-brown gas. Nitrogen oxides heavily contribute to smog and can stunt plant growth. These pollutants are emitted mostly more the burning of fossil fuels.
3. **Carbon monoxide** (CO) is another colorless, odorless gas. This gas attaches to the hemoglobin in your blood. Hemoglobin is what transports the oxygen throughout the body. If there is more CO than oxygen in your blood, it could lead to death. The majority of the carbon monoxide in the atmosphere is natural occurring. The man made CO pollution is from fires, vehicles, and the incomplete burning of organic compounds.
4. **Ozone** (O3) is a colorless gas with a semi sweet smell. While ozone is a very important component of the atmosphere, too much can cause damage on Earth. Ozone can kill leaf tissue in plants and cause eye and respiratory health problems in humans.
5. **Lead** a blueish grey heavy metal. It used to be in paint and gasoline. Lead can cause major health problems like cancer. Since discovering this, lead has been heavily reduced.

6. **Particulate Matter** (PM) is all the solid and liquid particles suspended in the air. Some particles are so small they cannot be seen, but many like soot, smoke, soot, or dust. Other examples of particulate matter are asbestos and heavy metals. PM can cause respiratory issues and block sunlight, which could lead to climate changes.

The Clean Air Act created by the U.S. Congress to regulate air pollution and set goals of better air quality numbers. This act was amended in 1977 and 1990 to set new goals. Industries are usually fined when they are not cleaning their waste properly.

The following video highlights four categories of air pollution: particulate pollution, chemical air pollution, ozone pollution, and greenhouse gas pollution.

Air Pollution (05:45)

Now answer questions 1 through 20.