7. Human Activity

**Identify some human activities that can alter the environment, and describe how they affect the climate and people.**

Human Impacts on Climate

As long as Earth has been in existence, its climate has varied. This has been caused by complicated interactions among many factors such as the amount of energy available from the sun, ocean circulations, ocean temperatures, plant life, natural changes to the landscape, and natural changes in the atmosphere. Warming and cooling cycles, along with wet and dry periods, have occurred in different places at different times throughout Earth's history. An important thing to think about is the effect present human activities can have on future climatic conditions.

In some areas of the world, human actions have had a clearly negative impact on the local climate.

Desertification

The work of archaeologists has shown that many areas that now are deserts once were fertile and productive. In such places, overgrazing, unsound farming methods, or mining have stripped the land of its protective plant cover and caused desertification of the land.

Desertification has occurred in many countries near the Mediterranean Sea and the Arabian Desert. For example, the region north of Egypt and Egypt itself once had lush fields, orchards, and gardens, but over many years human activities resulted in the erosion of fertile topsoil and the loss of plant cover. A cycle began that produced parched soil, sand dunes, and scant rainfall. Similar events have occurred in the United States, such as during the "Dust Bowl" era of the 1930s, but changes in agricultural methods may have kept the effects from becoming permanent.

Acid Rain

Acid rain is another result of the effect human activities can have on weather and climate, some scientists believe. Rain becomes acidic when it is polluted by acidic substances emitted into the atmosphere by vehicles, power plants, and factories. Pollutants in the atmosphere contaminate the precipitation that later falls back to the ground. Scientists say acid rain can destroy life in lakes and rivers, which results in damage to the water cycle, crops, forests, outdoor statues, and buildings.

Other Threats to Climate

People worldwide have become aware of the possible threat of greenhouse gases. The most notable greenhouse gas is carbon dioxide, given off when fossil fuels such as coal, gas, and oil are burned. Other
greenhouse gases include water vapor, methane, tropospheric ozone, nitrous oxide, and carbon monoxide.

Although meteorologists and climatologists do not know exactly what effect the greenhouse gases will have, it appears that excess carbon dioxide and other gases might trap more of the sun's heat and cause the climate over much of the globe to warm up. Some scientists believe global warming could have disastrous effects. For instance, the polar ice caps reflect the sun's rays and are essential in keeping Earth's climate as it is. If the ice caps melt, even a small amount, these scientists say Earth's temperature, weather patterns, and the amount of water in the oceans may change. Many islands and seacoasts could be flooded permanently.

Another concern is the loss of the ozone layer, which is 12 to 15 miles above Earth in the stratosphere. Ozone is a pale blue gas that plays an important role in the stratosphere, where it acts to shield all forms of life on Earth from the sun's harmful ultraviolet radiation. Damage to the ozone layer appears to be the result of chemicals called chlorofluorocarbons (CFCs), once used as propellant in aerosol cans, as refrigerants in air conditioners, and as solvents in certain industrial processes. Most of the ozone loss occurs over the Antarctic because of the very, very low upper atmosphere temperatures in the winter. Polar stratospheric clouds form and participate in chemical reactions involving ultraviolet radiation and CFCs. The eventual result of the reactions is the destruction of ozone molecules. Although recent laws have greatly reduced the use of CFCs, scientists are not certain when the ozone layer will recover. Substantial improvement is possible near the middle of the 21st century, but that depends on continued decrease of CFCs and the influence of changes in climate. Deforestation, the removal of extensive areas of trees, is another human-related factor that can influence climate. When forests are replaced by open land or brush, changes occur in the way the sun's energy is received at Earth's surface. An extensive loss of trees also affects how moisture is exchanged between the atmosphere and the ground. The burning of trees that have been cut down releases carbon dioxide into the atmosphere. Aerosols, which are tiny particles in the air such as dust, smoke, or air pollution, are able to affect the sun's energy in the atmosphere. Scientists are studying how aerosols can modify clouds, which are a major part of Earth's climate system. In general, conservation of resources, such as fossil fuels and the world's forests, can be of long-term benefit by lessening the effects of human activities on the global climate.