WORLD BOOK STUDENT DATABASE

Global warming is an increase in the average temperature at Earth's surface. People often use the term *global warming* to refer specifically to the warming observed since the mid-1800's. Scientists estimate that Earth's average surface temperature rose by about 1.4 Fahrenheit degrees (0.76 Celsius degrees) from the mid-1800's to the early 2000's. Researchers have also found that most of the temperature increase occurred from the mid-1900's to the 2000's.

Natural processes have caused Earth's climate to change in the distant past. But scientists have found strong evidence that human activities have caused most of the warming since the mid-1900's.

Scientists predict that Earth's average surface temperature will rise an additional 2.0 to 11.5 Fahrenheit degrees (1.1 to 6.4 Celsius degrees) by 2100. They also predict that, if warming continues unchecked, it will damage human society and the environment. For example, global warming could melt enough of the ice on land near Earth's poles to raise sea level. It could lead to more widespread droughts. It could also risk extinction for any plant and animal species.

Researchers have developed a number of ways to limit global warming. But because the warming is a global problem, many strategies require the cooperation of a diversity of nations, each with its own interests. Nevertheless, many countries are taking action individually and by international agreement to limit future warming.

Causes of global warming

Global surface temperatures have risen chiefly because of a process called the greenhouse effect. In the greenhouse effect, certain gases in the atmosphere trap heat from the sun. They act much like the glass roof and walls of a greenhouse. The heat-trapping gases are called *greenhouse gases.* They include methane (CH_4), nitrous oxide (N_2O), and ozone (O_3). But the gas that has produced the most warming is carbon dioxide (CO_2).

Natural concentrations of greenhouse gases in the atmosphere help keep the planet warm enough to support life. Levels of greenhouse gases in the atmosphere have varied at different times. But they held relatively stable for several thousand years before industry began to grow rapidly in the 1800's.

Since the mid-1800's, however, modern industry has caused significant increases in *emissions* (releases) of greenhouse gases. The increase in CO_2 levels comes chiefly from the burning of fossil fuels. The fossil fuels are coal, oil, and natural gas. They contain carbon, and burning them creates carbon dioxide. CO_2 levels also rise due to the clearing of land. Trees and other green plants remove $CO_2$from the air

during photosynthesis—the process they use to produce their food. Thus, as land is cleared and forests are cut down, more CO_2 remains in the atmosphere.

Not all human activities contribute to global warming. Some things that people do actually cool Earth's surface. For example, many aerosols (suspensions of tiny particles) enter the atmosphere from automobile exhaust and factory smoke. The aerosols encourage the formation of clouds. Both aerosols and clouds reflect the sun's heat back into space. As a result, they exert a cooling influence on Earth's surface. But researchers estimate that overall, human activities have caused far more warming than cooling.

Scientists have also compared the influences of human activities on climate with the influences of natural processes. The only significant natural process was changes in the sun's energy output. The scientists found that human activities—mainly greenhouse gas emissions—produced more than 10 times the warming influence of changes in solar output.

Impact of global warming

Researchers have linked global warming to a number of potentially damaging effects on living things and their *ecosystems.* An ecosystem consists of a community of organisms along with its physical environment. Global warming is raising sea level. In addition, it is rapidly affecting the Arctic region. Global warming may also alter weather patterns and affect human health around the world. Scientists project that these effects will intensify and spread with further warming.

Effect on plant and animal life. Global warming affects many plants and animals by causing seasonal changes in temperature to occur at different times of the year. In many parts of the world, for example, warm spring weather has come earlier in the year. As a result, events that occur in the spring have begun earlier. Such events as flowering, egg laying, migration, and the growth of new leaves happen earlier. For example, lilac bushes have flowered earlier in the spring across much of the United States. Butterflies have appeared earlier in the United Kingdom.

Rising temperatures have also forced many animals to move to cooler areas. These animals may move to higher latitudes —that is, toward Earth's poles. Or they may move to higher elevations. For example, white storks are nesting higher in the mountains in Poland. In Australia, the large bats called flying foxes have migrated toward cooler conditions in the south. Scientists are concerned about organisms that have difficulty spreading to new places. Many land animals and plants cannot easily relocate.

Citation:

Mastrandrea, Michael D. "Global warming." *World Book Student*, World Book, 2017, www.worldbookonline.com/student/article?id=ar226310. Accessed 30 Oct. 2017.