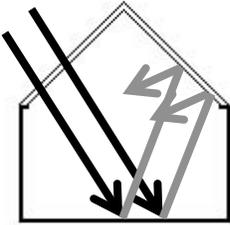


THE GREENHOUSE EFFECT

Greenhouse Gases

The Earth's average temperature is much warmer than it would be without an **atmosphere**. This is because special gases in the atmosphere trap the Sun's energy. These gases are known as greenhouse gases. **In order, the most abundant greenhouse gases in the atmosphere are water vapor (H₂O), carbon dioxide (CO₂), methane (CH₄), nitrous oxide (N₂O), ozone (O₃) and chlorofluorocarbons (CFCs).**

How The Greenhouse Effect Works

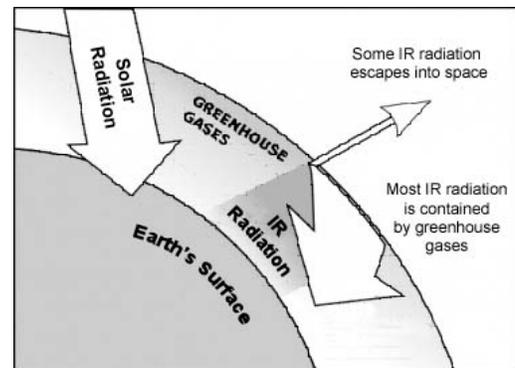


Real greenhouses allow farmers to grow plants in a consistently warm environment, even in the winter. How they work is quite simple: the glass panes of the greenhouse let solar radiation (in the form of visible light and UV waves) pass through easily. However, once these high energy waves hit the plants inside, they are reflected as lower-energy infrared waves. While the glass panes let in light and UV waves, they prevent the low energy IR waves from escaping. This traps heat inside, causing the greenhouse to warm up.

Greenhouse gases in the atmosphere act similar to the glass of a greenhouse.

The Sun radiates electromagnetic (EM) radiation into space in all directions. Most of this radiation is high-energy shortwave radiation, like UV and visible light. When this incoming shortwave radiation reaches Earth, several things can happen to it. Roughly 30% of the radiation is reflected off the atmosphere and back into space, 20% is absorbed by the gases in the atmosphere, and 50% passes through the atmosphere and reaches Earth's surface.

When the Sun's energy hits the Earth's surface, it changes into heat energy in the form of longwave infrared (IR) radiation. This IR radiation bounces into the atmosphere again. Greenhouse gases in the atmosphere absorb some of the IR radiation, preventing it from escaping into space. This traps the heat energy. **The condition where longwave IR radiation is trapped by gases in the atmosphere is known as the greenhouse effect.**



Why Is The Greenhouse Effect Important?

Without the greenhouse effect, much of Earth's heat energy would be reflected and lost into space. **In fact, without the greenhouse effect, the average surface temperature of Earth would be about 33°C cooler than it is now.** This change would kill most living things on our planet. Therefore, the greenhouse effect has actually helped Earth to thrive as a planet.

The Greenhouse Effect and Climate Change



Since the industrial revolution, human activities have rapidly increased the levels of CO₂ and other greenhouse gases. These activities include burning fossil fuels, deforestation, and urbanization. Many scientists believe that the greenhouse effect is intensifying because more gases mean more heat is trapped.

A theory called climate change (also known as global warming) predicts that an increase in carbon dioxide will cause Earth's average temperature to rise.