

Climate Change – Part 7

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Greenhouse gases are usually mentioned in discussions about climate change. These are the gases in our atmosphere that behave in a way that is similar to a greenhouse. A greenhouse uses glass to easily let in the shortwave radiation from the sun, in the form of heat. Once inside the greenhouse though, a different radiation process keeps the heat from leaving the same easy way it came in.

Although the physical processes are not the same, our atmosphere of invisible gases, acts to trap heat within it, much as a greenhouse would. Greenhouse gases in our atmosphere are necessary for life and have always existed. They keep the average temperature of the Earth around 59 degrees. Without these gases, the Earth would only average around 0 degrees. Interestingly, only about half of the sun's energy heats the Earth directly. The rest is either absorbed by the atmosphere, or reflected back to space.

Although nitrogen and oxygen make up most of our atmosphere, (what we call "air,") they are not greenhouse gases due to their chemical structure. There are many other gases in our air, most of them in very small quantities. Among these, are four of our most important greenhouse gases: water vapor, carbon dioxide, methane, and ozone. These are all natural gases that have changed throughout the entire history of the Earth as the climate, geology, and lifeforms have changed. The first greenhouse gases in the Earth's atmosphere were probably created by the widespread violent volcanic eruptions that marked the Earth's early history.

Carbon dioxide gas is up only 0.04% of the atmosphere by volume, but it makes up 96% of the density of the atmosphere. This is why, despite its' small quantity, it is the gas of primary concern when it comes to climate change, and due to its' human influence.

Vegetation both absorbs and emits carbon dioxide. What is not absorbed remains in the atmosphere, or is absorbed by the oceans. Any human influence in the process was negligible until the early 1800s when the industrial revolution began. Since then, emissions of carbon dioxide into our atmosphere have steadily and rapidly increased. We know that from ice core samples, that carbon dioxide in our atmosphere is at its' highest level in at least 800,000 years. Direct measurements though have a rather short history, but they also show a rapid and steady increase over the past 50 years, and are now up to 380 parts per million. Most of this comes from the burning of wood, coal, and oil products, often referred to as "fossil fuels." Industry, buildings, and transportation are the main contributors to this increase in carbon dioxide. A steadily growing world population, the industrialization of former poor or third world nations, and an increasingly mobile society are also responsible.

Recently, China passed the United States in having the highest total greenhouse gas emissions per nation. However, the United States, with only 5% of the world's population, still emits 30 percent of the world's greenhouse gases; therefore a much higher rate per person. While ours is one of the highest rates in the world, there are a few middle eastern oil exporting nations that have an even higher per capita rate.

This is the heart of the "Global Warming" concern; the greenhouse gases, in particular carbon dioxide, from human activities that enter our atmosphere. Closely tied to this is the loss of vegetation, including deforestation, also caused by human expansion and industrialization on a world-wide basis. Vegetation is a significant part of the carbon dioxide gas process, and a continued loss will compound the greenhouse gas problem.