Target 350 for Greenhouse Gas

Understanding Global Climate Change Science

Dec 8, 2009 Holly Anderson

With climate change often featured in news headlines, it is important to understand the scientific terms and research behind the policy debate.

What is Greenhouse Gas?"Greenhouse gas" is a term that applies to many gases that exist in the Earth's atmosphere and affect the planet's surface temperature. Carbon dioxide (CO_2) is the greenhouse gas most commonly discussed. Because CO_2 is a natural component of the air we exhale and an important requirement for photosynthesis, it can be confusing to hear CO_2 emissions discussed in a negative way.

It is true that animals exhale CO_2 and plants absorb it as a necessary raw material for the reaction known as photosynthesis. In photosynthesis, plants use sunlight, CO_2, and water to create the sugars they use as food while producing oxygen as a by-product. In a totally natural world, the cycle of carbon dioxide and oxygen production and uptake balance to provide the materials necessary for animal respiration and plant photosynthesis with gases left over in the appropriate quantity to effectively insulate the Earth's surface. This ability to keep heat from dissipating is where the term "greenhouse" originated.

However, with the advent of the industrial age and particularly, the widespread use of fossil fuels, concentrations of CO_2 and other greenhouse gases (such as volatile organic carbon or VOCs) have increased. Scientists believe the artificial, human-induced (anthropogenic) greenhouse gas emissions have affected the natural balance, increasing atmospheric concentrations of the gases to the point that the Earth's temperature is increasing.

The Statistics of Climate Change Greenhouse gas concentrations are depicted by the unit of measurement CO_2eq, a measurement taking into account the effects of all greenhouse gases, not just carbon dioxide. The measurement is expressed in parts per million (ppm). Parts per million is best visualized by first imagining a huge glass jar filled with a million white balls. When one white ball is removed and replaced by a black ball, that black ball now represents 1ppm.

Scientific research indicates that the "pre-industrial" greenhouse gases concentration was 280 ppmCO_2eq. This reflects a concentration free of anthropogenic sources. Over the last one hundred years, the concentration has increased to 385 ppmCO_2eq.

This increase in atmospheric greenhouse gas concentration is causing the Earth's temperature to increase as more heat is trapped at the surface and less is allowed to dissipate. The annual mean global temperature has increased by 0.76 degrees C over the same one hundred years and is now increasing at a rate of 0.17 degrees C per decade.

Climate change issues and debate arose when scientists identified that increased global temperatures of even less than 1degree C in one hundred years have caused increased sea level, increased ocean acidity, and retreating glaciers. Scientists fear these changes will significantly affect natural habitats and climate patterns which could cause species extinction, agricultural production disruptions, and destruction of shoreline population centers.

What is Target 350?A worldwide publicity campaign currently exists calling for a target greenhouse gas concentration of 350 ppmCO2eq, a reduction of 35 ppmCO2eq compared to current levels. This campaign has included grassroots demonstrations as well as the efforts of noted scientists such as NASA's James Hansen and Rajendra Pachauri of the United Nations, and scientific and activist organizations including the Center for Biological Diversity, Greenpeace, Union of Concerned Scientists, and 350.org.

350 activists claim that greenhouse gas concentration reductions must happen and happen quickly to preserve the Earth as we currently know it. They recommend a complete phase-out of coal-fired power plants, the adoption of specific agricultural and forestry practices which trap CO2, and implementation of regulatory practices that reduce the emission of greenhouse gases other than CO2.

The science behind the 350 target involves setting a future global temperature increase that protects the Earth's ecosystem and tying a concentration of gas to that temperature increase. Climatologists, including James Hansen, believe that a 1.5 to 2.0 degrees C increase in global temperature over pre-industrial levels will cause irreparable harm and that increases must be kept significantly below that level. At the current rate of greenhouse gas emissions, these scientists believe there will be a 4 to 6 degrees C increase by the end of this century.

By reducing emissions to reach the 350 target, climate change activists believe we would achieve a 7 percent mean probability of exceeding a 2.0 degree change; a low-enough "chance" that could protect Earth's ecosystems and our current way of life. As the atmospheric concentration increases, the probability of exceeding a 2 degree increase also increases. At 400 ppmCO2eq it increases to 28 percent and at 450 ppmCO2eq it increases to 54 percent.

The Climate Change Debate

Policy-makers, both in the U.S. and around the globe, continue to debate the accuracy of scientific climate change predictions. Scientists admit climate sensitivity is not an exact science; they cannot predict exactly how the Earth's physical processes will react to increasing climate change. However, they claim the 350 target accounts for these inherent inaccuracies and is the greatest level that can be considered protective. Policy-makers have not yet agreed.

Article 2 of the United Nations Framework Convention on Climate Change, issued in 1992, stopped short of recommending a specific concentration, but called for stabilization at levels that would prevent dangerous anthropogenic interferences. The European Union's current climate objective is set at a maximum 2 degree increase and the United States is currently debating legislation that would set the policy at 450 ppmCO2eq with a corresponding acceptable temperature increase at 2 to 3 degrees C.

Meanwhile, estimates indicate that anthropogenic greenhouse gas emissions are growing at a rate about four times faster than that documented for the year 2000.

Sources

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