THE OTHER HALF OF THE CO_2 EQUATION

By Norm Kalmanovitch
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In their headlong rush to have science conform to a political agenda the authors of the Kyoto Accord have ignored the most significant portion of the equation relating fossil fuel consumption to global warming.

A liter of gasoline may produce 1.87 kg of CO_2, but it also produces 8,150 kcal of heat. enough energy to heat a whole metric tonne of water over 8 degrees C.

The total heat energy produced from fossil fuels in 2004 was 8.804 X 10^{16} kcal and the total heat trapped by the contribution human generated CO_2 to the greenhouse effect that year was approximately 0.389 X 10^{16} kcal.

On a global scale, if the burning of fossil fuels is the human activity responsible for global warming, then it is the heat generated and not the CO_2 that is the primary cause, since the heat has over 20 times the impact on global temperature than the changes to atmospheric CO_2.

If the Earth is looked at as a simple system of "energy in", "energy used", "energy out" and the global temperature is defined as the equilibrium temperature at which the "energy in" minus the "energy used" is equal to the "energy out" this misdirection to the importance of CO_2 can be easily demonstrated.

(Even without quantifying the processes it should be intuitively obvious that the variability of the natural factors are orders of magnitude more significant than the small contribution from anthropogenic CO_2. The solar "constant" has been shown to change significantly. About 30% of the sun's energy is reflected back from clouds with cloud cover being a highly variable factor.

About 50% of the transmitted energy is incorporated into the Earth's energy system and this is only a gross estimate that incorporates plant energy usage, the variations in the heat absorption by the land masses, and the entire climate system with all its variability. On the "energy out" side there is only one variable component, the green house effect and the only component of this with significant variability is clouds and water vapour.

The total energy reaching the Earth is approximately 92,400 X 10^{16} kcal/year and the total greenhouse effect is approximately 7,392 X 10^{16} kcal/year. Since the energy "in" is 12.5 times greater than the energy "out" is it not intuitively obvious that variations on the "energy in" side are at least an order of magnitude more significant than variations on the "energy out" side?

With 92,400 X 10^{16} kcal/year as the backdrop, the 8.80 X 10^{16} kcal/year contribution from fossil fuel usage is very small, and whether or not it is significant has yet to be demonstrated. However significant the heat from fossil fuel usage is, CO_2 only represents less than 5% of its impact on global temperature.)

One of the reasons that it is so easy to confuse the public is that every component is expressed with different units. CO_2 is expressed in tonnes (often in tonnes of carbon) warming is expressed in degrees C per decade, solar energy is expressed in watts/m^2 and panic is expressed as mm rises in sea level. If we are dealing with heat energy then everything should be converted to appropriate heat energy units and kcal x 10^{16} works quite well for this comparison.

The fact that all of the factors that control the amount of solar energy that reaches the Earth and is incorporated into the Earth's systems are all approximations should point out clearly that the main driving forces for global temperature changes are natural. In order to demonstrate the relative importance of the heat generated from fossil fuel usage compared to the effects from the CO_2 generated all of these factors will be assumed to be constants.

The annual energy from the sun is computed from the approximation for the solar constant times the cross sectional area of the earth over a period of one year. The value is 132,000 X 10^{16} kcal/year. Clouds reflect back about 30% of this reducing the energy reaching the Earth to 92,400 X 10^{16} kcal/year.

About 50% of this energy is taken up by the Earth by processes such as plant growth and energy used to drive climate. This leaves 46,200 X 10^{16} kcal/year to be reflected back into space.

The greenhouse effect traps about 16% of this which is 7,390 X 10^{16} kcal/year.

The total contribution of CO_2, both natural and anthropogenic to the greenhouse effect is about 2%. This is only 148 X 10^{16} kcal/year.

Carbon dioxide levels are reported to have risen from 280 ppm to 380 ppm in the last 100 years, or about 1 ppm/year. If one assumes that this is all from anthropogenic sources annual human CO_2 contributions from fossil fuels represents 1/380 of the greenhouse effect attributed to CO_2.

This number is 0.389 X 10^{16} kcal/year.

If the heat generated is 8.804 X 10^{16} kcal/year and the greenhouse effect is only 0.389 X 10^{16} kcal/year, how can we assume that the same energy production with reduced CO_2 emissions will affect global temperatures? The heat generated by fossil fuels has 22.63 times more effect on the global temperature than from the greenhouse effect of the CO_2 that is produced.

The real question is how does the anthropogenic CO_2 greenhouse contribution compare in magnitude to natural variations.

Variance in solar output of 1% equates to 1,320 X 10^{16} kcal/year or 3393 times more than the anthropogenic CO_2 contribution. The energy reflected back by clouds is generalized as about 1/3 or 30%. The difference between these two approximations is 10% representing a difference of 4,400 X 10^{16} kcal/year and this equates to 11,311 times the effect of the anthropogenic CO_2 contribution. There are so many variables in the mechanisms that use the incoming solar energy that the number 50% is at best only a reasonable approximation. If these factors cause a change of only 1% it would represent 4,620 X 10^{16} kcal/year or 11,876 times the effect of anthropogenic CO_2 contribution.

In 1991 the world had a clear demonstration of a naturally occurring change that altered the global temperature. The eruption of Mount Pinatubo poured so much ash into the atmosphere that the reduction of solar energy reaching the Earth resulted in a two year drop in global temperature of a magnitude that is equal to the amount of warming cited by Kyoto for the last hundred years.

When global temperature changes are viewed from an energy balance perspective even the favorite alternative energy source comes into question.

Passive solar energy is free and has zero pollution, but it does take in energy that would otherwise be reflected back into space. In effect it acts the same way as the greenhouse effect.

If we were to immediately stop using fossil fuels and replaced it with solar energy we could possibly reduce the change in global temperature rise by only 4.4%. If we are to believe the temperature prediction of 5 degrees C in the next 100 years of the climate alarmists, we should be just as concerned if that rise is only reduced to 4.78 degrees C.

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