



Warming 101

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Adapted from: 2011. *The View From Lazy Point*. Henry Holt Co. New York.

Learning how to start and control fire changed human evolution. But humanity did not change fire until the Industrial Revolution.

For hundreds of thousands of years, using fire always meant an open flame. Much later, someone realized that the steam from boiling water—if confined—had power to make things *move*. With steam engines we *harnessed* fire's power to work for us. Then, when we placed the combustion directly inside an engine, we almost literally set the world on fire.

Fire-power vastly extended our reach into the soils, the forests, the skies, and the seas. It allowed us to literally move mountains (or chop their tops off) to get at more fuel or minerals locked deep within the earth, slice down gigantic trees in a few minutes, and to send the nets of fishing fleets deep within the seas. Harnessed fire allowed construction, destruction, and transport at a scale and speed unimagined before 1800.

Since first becoming human, we have mainly been burning things to harness energy. To become fully human we'll have to fully come out of the cave, quench the fires, and harness non-burning energy. But until then there is this problem: burning things—like coal, gas, oil, and wood—releases carbon dioxide.

Back in 1956, Roger Revelle and Hans Suess started measuring the air's carbon dioxide to get "a clearer understanding of the probable climatic effects." And that's what they got.

Just to clarify, the greenhouse effect—caused mainly by the heat-blanket properties of water vapor, with an assist from carbon dioxide and other "greenhouse" gases—is natural and crucial; it prevents Earth from looking like a snowball. The concern is over how much additional heat-trapping gases will trap. Human-caused greenhouse gases have actually reversed a long, slow natural cooling. But we now have too much of a good thing.

There's a third more carbon dioxide in the air than at the start of the Industrial Revolution. That's an incredible change to the atmosphere. We did that, and we continue doing that every moment. The current carbon dioxide concentration is higher than it's been for several million years; it's rising 100 times faster than any time in the past 650,000 years. The *planet* has survived much higher greenhouse gas concentrations. Civilization hasn't.

Our species invented agriculture about 10,000 years ago; writing and towns are about 5,000 years old. All of civilization and agriculture developed have existed

Five degree F. warming, and doubling by mid-century: Sachs, J. 2009, *Common Wealth; Economics For A Crowded Planet*, Penguin Group, U.S.A., pp 91-93. See also,

A different planet: Hansen, J. et al., 2007, "Dangerous Human-Made Interference With Climate: A Giss Model," *Atmospheric Chemistry and Physics* 7: 2287-2312.



Read more about and from Carl Safina at blueocean.org and carlsafina.org

