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Is 350 the right number to stop climate change? (Hint: Think greenhouse gases)

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6-7 minutes

What is the "right" level of carbon dioxide concentrations in the atmosphere to prevent "dangerous" interference with the climate? In the last two centuries, concentrations have risen to roughly 387 parts per million—and are rising by roughly 2 ppm per year thanks to the more than 30 billion metric tons of CO_2 humans put into the atmosphere annually through things like burning fossil fuels and cutting down trees. (That's up from 280 ppm for all of recorded history before the Industrial Revolution.)

Climatologist James Hansen, for one, thinks the answer is 350 ppm. While recent changes are small compared to the massive climate shifts in the Earth's history—as much as 10 degrees Celsius warmer—the reasons for today's shift is different (humans) as is the speed. "Humans are now 10,000 times more powerful than natural geologic changes," Hansen said at a conference this past Saturday organized by students of Columbia University's masters program in climate and society to examine whether (and why) 350 ppm might be the right number. "We're now, unfortunately, in charge of future changes."

Hansen's prescription to get down to 350 and avoid most of the unpleasant side effects of climate change, such as sea level rise: Stop burning coal and reforest marginal land, the former to stop putting tons of CO_2 into the atmosphere and the latter to soak some of it back up. To do that will require a hefty price on CO_2 emissions (ameliorated somewhat, in his opinion, by a dividend back to every American taxpayer). "I hope cap-and-trade doesn't pass because we need to have a more effective approach than that."

Others had different ideas. Environmental scientist Daniel Hillel noted that the mauling of global soils by modern agriculture had resulted in the emission of 20 tons of carbon per hectare per year but that this actually represented an opportunity, through good soil management, to put back into the soil some 600 to 900 megatonnes of carbon per year for the next several decades. "Our task is to reverse this process of degradation and spewing of CO_2," he said, "and restore carbon to the soil."

One important possibility for that is so-called biochar—blackened biomass (read: charcoal) that can improve the fertility of soils and trap carbon at the same time. The anomalously fertile soils found in parts of the Amazon can be traced to such biochar, known locally as terra preta, created hundreds of years ago by its pre-Columbian inhabitants. Doing that on a broader scale could help the climate change problem, argued biogeochemist Johannes Lehmann of Cornell University.

Activist Majora Carter similarly argued for a "horticultural infrastructure"—large-scale urban forestry, green roofs, local agriculture, even wetlands restoration—to replace the concrete infrastructure that currently exists as well as a national grid to move

renewable electricity from the middle of the country to the coasts, perhaps built along the current interstate system. "We would not have a dire climate crisis if we actually cared about poor people," she said, noting that mountaintop removal mining, power plants, incinerators, industrial hog farms and the like—the point sources for greenhouse gas emissions—are only found in impoverished communities. "The promised land is not black or white or brown or even yellow. The promised land is green."

At the same time, it is unlikely that industries such as coal will be simply shut down, argued Columbia law professor Michael Gerrard. "The last time the U.S. government shut down a lawful industry required a constitutional amendment, had all kinds of collateral effects and didn't last very long," he noted of Prohibition for alcohol in the early 20th century. That said "today, every new coal plant has a smokestack, a boiler and a lawsuit."

The real key to moving away from coal will be creating a carbon market that puts a punitive price on CO_2-creating fossil fuel burning, said economist Gernot Wagner of the Environmental Defense Fund. Given existing technologies, he estimated the cost of combating climate change globally at $400 billion per year for the next five years. "This is AIG territory," he admitted, referring to the price tag of the bailout to the insurance giant. The "only way" to pay for that now that government coffers have been emptied by the financial crisis would be a robust market in trading the right to emit CO_2.

Of course, maybe the problem will solve itself—at least that's what folks who believe in peak oil, peak fossil fuels or "peak everything" would argue, such as peak oil educator and author Richard

Heinberg. Peak anything, simply put, is the point at which producers are pulling as much as will ever be possible of a given fossil fuel, say, as will ever be possible, ushering in potentially catastrophic shortages if demand for said fossil fuel continues to grow. His estimates of true coal reserves argue that "the worst of IPCC emission scenarios won't happen," he said of the possible pathways for CO_2 emissions over the next century put out by the United Nations' Intergovernmental Panel on Climate Change (IPCC). "The amount of coal and other fossil fuels actually extractable corresponds to the lowest IPCC scenarios." That isn't an excuse for inaction, however, he added.

And probably one of the most significant and easiest actions that could be taken is to simply stop cutting down trees. Such activity contributes one-fifth of human CO_2 emissions, or "more CO2 emissions than all the world's planes, trains and automobiles," according to Papua New Guinea's climate negotiator (and YouTube phenomenon) Kevin Conrad. "Forests could provide time for us to implement other new technologies," he noted. "What we're talking about here is a technology that everyone already understands: how not to cut a tree."

Editor's Note: We live-Twittered the conference. See tweets here or follow me at dbiello or us at sciam.