

Report ponders: How sensitive is climate to CO₂?

September 26 2013, by Karl Ritter



In this Dec. 3, 2009 file photo smoke billows from chimneys of the cooling towers of a coal-fired power plant in Dadong, Shanxi province, China. Scientists are more confident than ever that pumping carbon dioxide into the air by burning fossil fuels is warming the planet. By how much is something governments and scientists meeting in Stockholm will try to pin down with as much precision as possible Friday Sept. 27, 2013 in a seminal report on global warming. (AP Photo/Andy Wong, File)

Scientists are more confident than ever that pumping carbon dioxide into

the air by burning fossil fuels is warming the planet. The question is, by how much?

It's something that officials and scientists meeting in Stockholm will try to pin down as precisely possible Friday in a seminal report on global [warming](#).

Future global warming levels depend on two major factors. One is how much more carbon dioxide (CO₂) and other greenhouse gases are pumped into the air and how quickly.

The other is the rate at which those gases cause warming, sort of like a revving car engine. With that rate, called "climate sensitivity," scientists are trying to figure out how much warming would happen with different levels of [carbon pollution](#). The higher the climate sensitivity or rate, the higher the warming per ton of [greenhouse gas](#) emitted.

The values adopted by the Intergovernmental Panel on Climate Change are important because they could affect how hard governments try to rein in CO₂ emissions—which are still going up largely due to the rapid expansion of China and other [emerging economies](#).

A lower value may reduce the world's sense of urgency in making a costly energy transformation from oil, coal and gas to renewable sources like solar or wind power—or in halting the destruction of the Earth's forests, which capture CO₂.

"It's a key part of the climate problem," said Chris Field, a Carnegie Institution scientist who is a leader in the IPCC but wasn't involved in the report due Friday.

The [greenhouse effect](#), which explains how CO₂ and other greenhouse gases trap heat in the atmosphere, was discovered in the 19th century but

scientists are still struggling to quantify it.

The IPCC is expected to say Friday that it's 95 percent certain that more than half the surface warming of the Earth that has been observed since 1951 is due to the CO₂ emissions resulting from human activities.

Climate sensitivity is a measure of how much temperatures would go up if the concentration of CO₂ doubled in the atmosphere.

In its third assessment, the IPCC estimated this as a likely range of 1.5-4.5 degrees Celsius (2.7-8.1 Fahrenheit). The fourth report, in 2007, raised the lower end of that range to 2 C (3.6 F), and gave a best estimate of 3 C (5.4 F).

Now, new research has shown that the upward move may have been too hasty, and there's a discussion in Stockholm over whether to bring the lower end back down to 1.5 C (2.7 F).

It may seem like a minor detail, but it makes a difference to governments, which want to know how much CO₂ emissions need to be cut to prevent temperatures from increasing more than 2 C (3.6 F) compared to before humans started [burning fossil fuels](#). That's the limit they have agreed to in U.N. climate talks. Temperatures have already gone up about 0.8 C (1.4 F).

Reducing the lower range of climate sensitivity "would mean that we have a better chance of staying below 2 degrees than we thought before," said Kaisa Kosonen, a Greenpeace climate activist. "But I wouldn't bet on it because they are not lowering the higher end of the range."

In leaked comments on a June draft of the IPCC report, the British government called [climate sensitivity](#) "a key issue of concern" that helps give policy-makers a sense of how big a threat climate change is.

The United States, Australia and Norway have called for the authors to provide a single value as their best estimate in addition to a range, to give policy-makers better guidance.

Meanwhile, EU climate commissioner Connie Hedegaard is downplaying the discussion.

"You don't need to have the last decimal to see that the overall number isn't looking good," she said in a comment emailed by her spokesman.

Some scientists resist giving a single value because it could give the false impression that there's more certainty than there really is about how sensitive the climate is to CO₂. That doesn't mean they doubt that CO₂ serves as an engine of warming—the question is whether it's a four-cylinder or a V8.

"We know a great deal of the mechanism by which CO₂ causes warming," said Field, the Carnegie scientist. "There is still uncertainty about how much a range of feedbacks either amplify or suppress that warming."

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