PBS NewsHour

What we know — and what we don't — about global warming

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Making Sen$e with Paul Solman

By Gernot Wagner and Martin L. Weitzman:

Two quick questions:

Do you think climate change is an urgent problem?

Do you think getting the world off fossil fuels is difficult?

This is how our book "Climate Shock" begins.

In fact, it's not our quiz. Robert Socolow from Princeton has posed versions of these questions for a while. The result is usually the same: most people answer "Yes" to one or the other question, but not to both. You are either one or the other: an "environmentalist" or perhaps, a self-described "realist."

Such answers are somewhat understandable, especially when looking at the polarized politics around global warming. They are also both wrong. Climate change is incredibly urgent and difficult to solve.

What we know is bad

Last time concentrations of carbon dioxide were as high as they are today — 400 parts per million — we had sea levels that were between 20 to at least 66 feet higher than today.

It doesn't take much to imagine what another foot or two will do. And sea levels at least 20 feet above where they are today? That's largely outside our imagination.

This won't happen overnight. Sea levels will rise over decades, centuries and perhaps even millennia. That's precisely what makes climate change such an immense challenge. It's more long-term, more global, more irreversible and also more uncertain than most other problems facing us. The combination of all of these things make climate change uniquely problematic.

What we don't know makes it potentially much worse

Climate change is beset with deep-seated uncertainties on top of deep-seated uncertainties on top of still more deep-seated uncertainties. And that's just if you consider the links between carbon dioxide concentrations in the atmosphere, eventual temperature increases and economic damages.

Increasing concentrations of carbon dioxide are bound to lead to an increase in temperatures. That much is clear. The question is how much.

The parameter that gives us the answer to this all-important question is "climate sensitivity." That describes what happens to eventual global average temperatures as concentrations of carbon dioxide

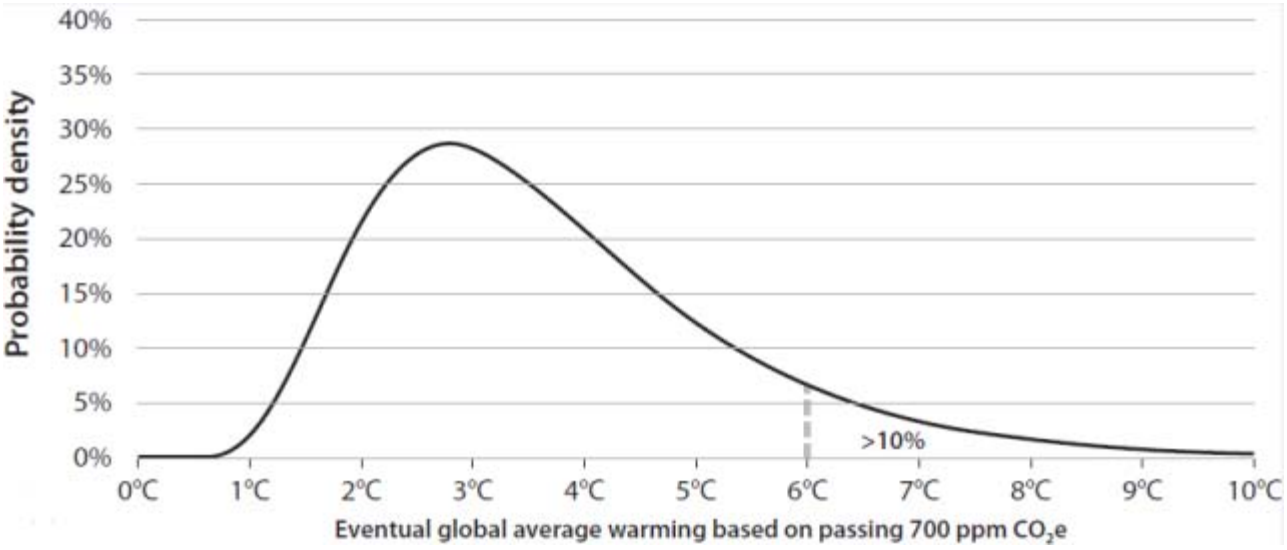
in the atmosphere double. Nailing down that parameter has been an epic challenge.

Ever since the late 1970s, we've had estimates hovering at around 5.5 degrees Fahrenheit. In fact, the "likely" range is around 5.5 degrees plus-minus almost three degrees.

What's worrisome here is that since the late 1970s that range hasn't narrowed. In the past 35 years, we've seen dramatic improvements in many aspects of climate science, but the all-important link between concentrations and temperatures is still the same.

What's more worrisome still is that we can't be sure we won't end up outside the range. The Intergovernmental Panel on Climate Change calls the range "likely." So by definition, anything outside it is "unlikely." But that doesn't make it zero probability.

In fact, we have around a 10 percent chance that eventual global average temperature increases will exceed 11 degrees Fahrenheit, given where the world is heading in terms of carbon dioxide emissions. That's huge, to put it mildly, both in probability and in temperature increases.



Climate Shock graph. There's at least about a 10 percent chance of global average temperatures increasing 11 degrees Fahrenheit or more. Source: Climate Shock (Princeton 2015), reprinted with permission.

We take out car, fire and property insurances for much lower probabilities. Here we are talking about the whole planet, and we haven't shown willingness to insure ourselves. Meanwhile, we can, in fact, look at 11 degrees Fahrenheit and liken it to the planet 'burning'. Think of it as your body temperature: 98.6 degrees Fahrenheit is normal. Anything above 99.5 degrees Fahrenheit is a fever. Above 104 degrees Fahrenheit is life-threatening. Above 109.4 degrees Fahrenheit and you are dead or at least unconscious.

In planetary dimensions, warming of 3.6 degrees Fahrenheit is so bad as to have been enshrined as a political threshold not to be crossed. Going to 11 degrees Fahrenheit is so far outside the realm of anything imaginable, we can simply call it a planetary catastrophe. It would surely be a planet none of us would recognize. Go back to sea levels somewhere between 20 and at least 66 feet higher than today, at today's concentrations of carbon dioxide. How much worse can it get?

Do we know for sure that we are facing a 1-in-10 chance unless the world changes its course? No, we don't, and we can't. One thing though is clear: because the extreme downside is so threatening, the burden of proof ought to be on those who argue that these extreme scenarios don't matter and that any possible damages are low. So how then can we guide policy with all this talk about "not knowing"?

What's your number?

We can begin to insure ourselves from climate change by pricing emissions. How? By charging at least $40 per ton of carbon dioxide pollution. That's the U.S. government's current value and central estimate of the costs caused by one ton of carbon dioxide pollution emitted today.

We know that $40 per ton is an imperfect number. We are pretty sure it's an underestimate; we are confident it's not an overestimate. But it's also all we have. (And it's a lot higher than the prevailing price in most places that do have a carbon price right now—from California to the European Union. The sole exception is Sweden, where the price is upward of $130. And even there, key sectors are exempt.)

How then do we decide on the proper climate policy? The answer is more complex than our rough cost-benefit analysis suggests. Pricing carbon at $40 a ton is a start, but it's only that. Any cost-benefit analysis relies on a number of assumptions — perhaps too many — to come up with one single dollar estimate based on one representative model. And with something as large and uncertain as climate change, such assumptions are intrinsically flawed.

Since we know that the extreme possibilities can dominate the final outcome, the decision criterion ought to focus on avoiding these kinds of catastrophic damages in the first place. Some call this a "precautionary principle"— better to be safe than sorry. Others call it a variant of "Pascal's Wager" — why should we risk it if the punishment is eternal damnation? We call it a "Dismal Dilemma." While

extremes can dominate the analysis, how can we know the relevant probabilities of rare extreme scenarios that we have not previously observed and whose dynamics we only crudely understand at best? The true numbers are largely unknown and may simply be unknowable.

Planetary risk management

In the end, this is all about risk management—existential risk management. Precaution is a prudent stance when uncertainties about catastrophic risks are as dominant as they are here. Cost-benefit analysis is important, but it alone may be inadequate, simply because of the fuzziness involved with analyzing high-temperature impacts.

Climate change belongs to a rare category of situations where it's extraordinarily difficult to put meaningful boundaries on the extent of possible planetary damages. Focusing on getting precise estimates of the damages associated with eventual global average warming of 7, 9 or 11 degrees Fahrenheit misses the point.

The appropriate price on carbon dioxide is one that will make us comfortable that the world will never heat up another 11 degrees and that we won't see its accompanying catastrophes. Never, of course, is a strong word, since even today's atmospheric concentrations have a small chance of causing eventual extreme temperature rise.

One thing we know for sure is that a greater than 10 percent chance of the earth's eventual warming of 11 degrees Fahrenheit or more — the end of the human adventure on this planet as we now know it — is too high. And that's the path the planet is on at the moment. With the immense longevity of atmospheric carbon dioxide, continuing to "wait and see" would amount to nothing else than willful blindness.

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