Confronting Deep and Persistent Climate Change Uncertainty

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In a world in which three degrees of warming is considered the "most likely" result of a doubling of carbon dioxide concentration in the atmosphere, what should make us worry more: a "likely" temperature impact range of 2.0°-4.5° C, or a "likely" range of 1.5°-4.5°C? The counterintuitive but analytically correct answer is that the wider temperature range of 1.5°-4.5° is more worrisome, even though it includes a lower temperature possibility, according to Gernot Wagner, a Research Associate at Harvard's School of Engineering and Applied Sciences and a Fellow at the Harvard University Center for the Environment, and Richard J. Zeckhauser, Frank P. Ramsey Professor of Political Economy at Harvard Kennedy School. Wagner presented the findings of a paper on problems of "persistent climate uncertainty" co-authored with Zeckhauser in the October 24, 2016, Energy Policy Seminar.

The "likely" range of warming associated with a doubling of carbon dioxide in the atmosphere was first identified in a 1979 National Academy of Sciences report to be 1.5°-4.5°, Wagner said. In 2007, the IPCC tightened the range to 2.0°-4.5°, but then returned in the 2013 report back to the old 1.5°-4.5° "likely" range.

Taking these reported temperature ranges at face value as a starting point for analysis, Wagner and Zeckhauser asked how we should understand the significance of this reversion to greater levels of uncertainty in the predicted temperature effects of carbon dioxide. This revision of the range to expand the lower-end likely range is not good news for the earth, Wagner explained, because it suggests that our estimates of likely temperature impacts are even less reliable than we thought, and that we are not making meaningful progress towards greater precision. Given this persistent uncertainty, Wagner continued, if we're analyzing, for example, the cost per ton of CO_2 of keeping warming below 2°C by 2100, that optimal carbon price increases with the widened "likely" range for climate sensitivity.

The uncertainty of the temperature impact prediction is amplified, Wagner added, by further uncertainties about what the consequences of increased temperatures will be on the environment and the global economy.

Wagner spoke as part of the Kennedy School's Energy Policy Seminar Series, which is sponsored by the Consortium for Energy Policy Research of the Mossavar-Rahmani Center on Business and Government.