

# **Estimating the Social Cost of Carbon for the United States Government**

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The climate is a key ingredient in the earth's complex system that sustains human life and well being. According to the United Nation's Intergovernmental Panel on Climate Change (IPCC), the emissions of greenhouse gases (GHG) due to human activity, large the combustion of fossil fuels like coal, is "very likely" altering the earth's climate, most notably by increasing temperatures, precipitation levels and weather variability. Without coordinated policy around the globe, state of the art climate models predict that the mean temperature in the United States will increase by about 10.7° F by the end of the century (Deschenes and Greenstone 2010). Further, the distribution of daily temperatures is projected to increase in ways that pose serious challenges to well being; for example, the number of days per year where the typical American will experience a mean (average of the minimum and maximum) temperature that exceeds 90° F is projected to increase from the current 1.3 days to a 32.2 days (ibid). The especially troubling statistic is that the hottest days pose the greatest threat to human well being.

It appeared that the United States and possibly the major emitters were poised to come together to confront climate change by adopting a coordinated set of policies that could have included linked cap and trade systems. However, the failure of the United States Government to institute such a system and the non-binding commitments from the Copenhagen Accord seem to have placed the all at once solution to climate change out of reach for at least several years.

Instead, the United States and many other countries are likely to pursue a series of smaller policies all of which aim to reduce GHG emissions but individually have a marginal impact on atmospheric concentrations. These policies will appear in a wide variety of domains, ranging from subsidies for the installation of low carbon energy sources to regulations requiring energy efficiency standards in buildings, motor vehicles, and even vending machines to rebates for

home insulation materials. Although many of these policies have other goals, their primary motivation is to reduce GHG emissions. However, these policies reduce GHG emissions at different rates and different costs.

In the presence of this heterogeneity and nearly limitless set of policies that reduce GHG emissions, how is government to set out a rational climate policy? The key step is to determine the monetized damages associated with an incremental increase in carbon emissions, which is referred to as the social cost of carbon (SCC).<sup>1</sup> It is intended to include (but is not limited to) changes in net agricultural productivity, human health, property damages from increased flood risk, and the value of ecosystem services.<sup>2</sup> Monetized estimates of the economic damages associated with carbon dioxide emissions allows the social benefits of regulatory actions that are expected to reduce these emissions to be incorporated into cost-benefit analyses.<sup>3</sup> Indeed as the Environmental Protection Agency begins to regulate greenhouse gases under the Clean Air Act, the SCC can help to identify the regulations where the net benefits are positive.

The United States Government (USG) recently selected four SCC estimates for use in regulatory analyses and has been using them regularly since their release. For 2010, the central value is \$21 per ton of CO<sub>2</sub> equivalent emissions.<sup>4</sup> The USG also announced that it would conduct sensitivity analyses at \$5, \$35, and \$65. The \$21, \$5, and \$35 values are associated with discount rates of 3%, 2.5%, and 5%, reflecting that much of the damages from climate change are in the future. The \$65 value aims to represent the higher-than-expected impacts from temperature change further out in the tails of the SCC distribution. In particular, it is the SCC value for the 95<sup>th</sup> percentile at a 3 percent discount rate. These SCC estimates also grow over time based on rates endogenously determined within each model. For instance, the central value increases to \$24 per ton of CO<sub>2</sub> in 2015 and \$26 per ton of CO<sub>2</sub> in 2020.

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<sup>1</sup> Under Executive Order 12866, agencies in the Executive branch of the U.S. Federal government are required, to the extent permitted by law, “to assess both the costs and the benefits of the intended regulation and, recognizing that some costs and benefits are difficult to quantify, propose or adopt a regulation only upon a reasoned determination that the benefits of the intended regulation justify its costs.”

<sup>2</sup> All values of the SCC are presented as the cost per metric ton of CO<sub>2</sub> emissions.

<sup>3</sup> Most regulatory actions are expected to have small, or “marginal,” impacts on cumulative global emissions, making the use of SCC an appropriate measure.

<sup>4</sup> All dollar values are expressed in 2007 dollars.

I was involved in the interagency process that selected these values for the SCC and this talk summarizes these efforts.<sup>5</sup> The process was initiated in 2009 and completed in February 2010. It aimed to develop a defensible, transparent, and economically rigorous way to value reductions in carbon dioxide emissions that result from actions across the Federal government. Specifically, the goal was to develop a range of SCC values in a way that used a defensible set of input assumptions, was grounded in the existing literature, and allowed key uncertainties and model differences to transparently and consistently inform the range of SCC estimates used in the rulemaking process.

The intent of this lecture is to explain the central role of the social cost of carbon in climate policy, to summarize the methodology and process used by the interagency working group to develop values, and to identify key gaps so that researchers can fill these gaps. Indeed, the interagency working group explicitly aimed the current set of SCC estimates to be updated as scientific and economic understanding advances.

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<sup>5</sup> This process was convened by the Council of Economic Advisers and the Office of Management and Budget, with regular input from other offices within the Executive Office of the President, including the Council on Environmental Quality, National Economic Council, Office of Energy and Climate Change, and Office of Science and Technology Policy. Agencies that actively participated included the Environmental Protection Agency, and the Departments of Agriculture, Commerce, Energy, Transportation, and Treasury.