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Considering the Social Cost of Greenhouse Gases under the Biden Administration

One of the first executive orders signed by President Biden began a process to revise the social cost of greenhouse gas (SC-GHG) estimates used by federal agencies in decision-making and cost-benefit analyses. The SC-GHG estimates, expressed as a dollar amount per metric ton of a GHG, are intended to monetize the comprehensive climate change damages resulting from each ton of GHG emitted. While SC-GHG estimates were developed by a federal interagency working group (IWG) during the Obama Administration, they were withdrawn under President Trump.

Following President Biden's Executive Order 13990,[1] the IWG reconvened to update the SC-GHG estimates and develop recommendations on how the values should be used by federal agencies. The IWG will publish final SC-GHG estimates by no later than January 2022.

This Issue Brief provides an overview of how SC-GHG estimates are developed and how they have been used in the U.S. It also explores key considerations and factors the IWG will likely consider in the development of a new set of estimates.

Defining the Social Cost of GHGs

The social cost of carbon and other greenhouse gases (collectively, SC-GHG) are intended to provide a comprehensive measure of the monetized value of damages from climate change, or, more specifically, "the monetary value of the net harm to society associated with adding a small amount of [a specific] GHG to the atmosphere in a given year."[2] SC-GHG estimates are intended to reflect the value of all climate change impacts, including (but not limited to) market damages, such as changes in agricultural productivity, energy use, and property damaged from increased flood risk and natural disasters, as well as non-market damages, such as those to human health, risk of conflict, environmental migration, and ecosystem services.[3] SC-GHG estimates also represent the societal *benefits* of reducing or avoiding GHG emissions by the same amount in a year. Estimates are expressed as a dollar per metric ton of the relevant GHG. While much focus has been placed on the social cost of carbon (SCC)

1 Executive Order 13990, "Protecting Public Health and the Environment and Restoring Science to Tackle the Climate Crisis" (January 20, 2021), https://www.federalregister.gov/documents/2021/01/25/2021-01765/protecting-public-health-and-the-environment-and-restoring-science-to-tackle-the-climate-crisis.

2 U.S. Government IWG on the Social Cost of GHGs, Technical Support Document (February 2021), https://www.whitehouse.gov/wp-content/uploads/2021/02/TechnicalSupportDocument_SocialCostofCarbonMethaneNitrousOxide.pdf.

3 U.S. Government IWG on the Social Cost of GHGs, February 2021.

as the dominant source of atmospheric GHGs and primary contributor to climate change, there are analogous metrics for methane (SCM) and nitrous oxide (SCN).

The SC-GHG estimates are used as part of regulatory cost-benefit analyses that calculate the net economic costs or benefits of policies or actions that would affect GHG emissions. Since 2008, the U.S. federal government has used estimates of the SCC (and later, the SCM and SCN) in federal rulemakings, such as appliance energy efficiency standards, passenger vehicle fuel economy standards, and power plant regulations, to evaluate the costs and benefits associated with changes in GHG emissions.[4]

Calculating the Social Cost of GHGs

SC-GHG estimates are commonly calculated using economic models known as Integrated Assessment Models (IAMs) to translate a marginal increase in emissions into a future physical climate response, and then into a subsequent economic impact. A discount rate is applied to convert future damages into present-day value. Key considerations in calculating SC-GHG estimates include the geographic scope, discount rate, and IAM used (as well as its assumptions, many of which are user-defined).

IAMs estimate the future economic impact of climate damages by:

1) Projecting future GHG emissions based on projections of population growth, economic growth, technological change, and other factors;
2) Modeling future climate responses (such as temperature, sea level rise, rainfall patterns, and extreme weather events) due to future emissions increases (a core input here is equilibrium climate sensitivity, or ECS, which is defined as a measure of the globally averaged temperature response to increased atmospheric CO_2 concentrations); and
3) Assessing the net economic impact that these climactic changes will have (e.g., changes in agricultural productivity or mortality).

The net economic impacts are evaluated over the long term, e.g., through 2300. The SC-GHG value is then estimated by running scenarios with small changes (additions) in GHG emissions and calculating the resulting difference in total damages or costs. The model is typically run iteratively under different scenarios to evaluate the uncertainty of the estimates. Finally, estimates of future damages are converted into their present-day value by applying a discount rate (e.g., 3 percent).[5]

The social cost of each GHG is calculated separately to account for differences in each GHG's radiative efficiency, or ability to absorb energy, and how long the gases stay in the atmosphere (also known as their lifetime). Global damages are most commonly calculated, although domestic damages (e.g., U.S.-only) can also be calculated.

A number of modeling and data challenges contribute to uncertainty in SC-GHG estimates.[6] Global climate is a result of a myriad of complex, interrelated factors that have many internal feedbacks and are extremely challenging

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4 *See, e.g.*, EPA, Clean Power Plan – Carbon Pollution Emission Guidelines for Existing Stationary Sources, Electric Utility Generating Units (October 2015), https://www.govinfo.gov/content/pkg/FR-2015-10-23/pdf/2015-22842.pdf; EPA and NHTSA, The Safer Affordable Fuel-Efficient (SAFE) Vehicles Rule for Model Year 2021 – 2026 Passenger Cars and Light Trucks (April 2020), https://www.govinfo.gov/content/pkg/FR-2020-04-30/pdf/2020-06967.pdf.

5 Resources for the Future (RFF) and the New York State Energy Research and Development Authority (NYSERDA), Estimating the Value of Carbon: Two Approaches (October 2020), https://media.rff.org/documents/RFF_NYSERDA_Value_of_Carbon_Report.pdf.

6 RFF and NYSERDA, 2020.

to model. Additionally, while SC-GHG estimates are intended to provide a comprehensive measure of the monetized damages of climate change, many of the impacts are difficult to quantify or monetize (for example, ecosystem benefits, increased conflict, or the spread of pathogens). SC-GHG estimates are also influenced by long-term socioeconomic projections that are highly uncertain, such as population, economic growth, and future GHG emissions.[7] As such, SC-GHG estimates are commonly re-calculated and revised, if necessary, every few years in order to incorporate the best available inputs, science, and modeling.

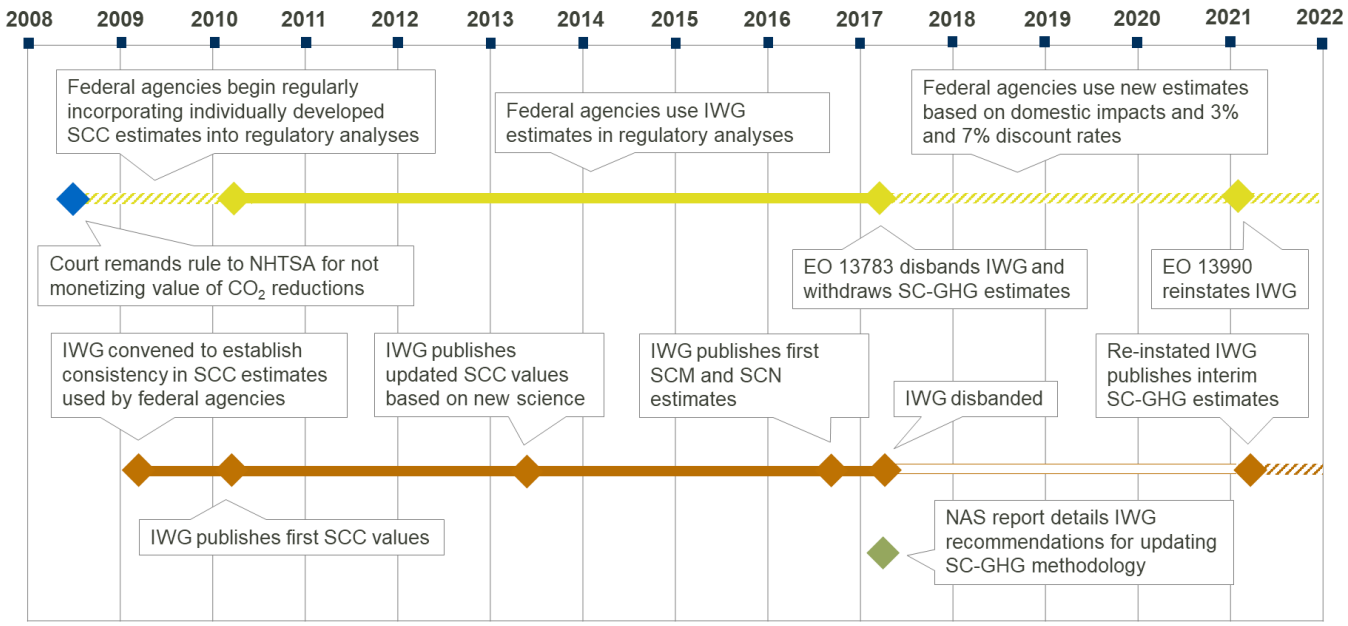
Another challenge is that, while estimates are expressed as a dollar amount per ton of a GHG, the impacts of climate change are likely non-linear due to feedback loops and tipping points in earth cycles. These elements are challenging to represent in models or in the resulting SC-GHG estimates.

Application of the Social Cost of GHGs

Federal Efforts

In 2009, the U.S. federal government convened an IWG to develop SC-GHG estimates to ensure consistency in the values used across federal agencies and that such estimates use the best available science.[8] The IWG published updates to these values from 2010 to 2016.

Figure 1. Development of U.S. Social Cost of GHG Estimates



From 2010 to 2016, the IWG calculated SC-GHG estimates by combining the results of three different IAMs, using five different socioeconomic and emissions projections, a common distribution of ECS, and distributions for other

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7 As later discussed in this Issue Brief, the impacts of climate change are non-linear, with many resulting changes expected to increase more rapidly as global GHG concentrations rise. Thus, estimating the damages that would occur from one additional ton of a GHG relies in part on assumptions about global atmospheric concentrations of GHGs at a future moment in time.

8 First named the "Interagency Working Group on the Social Cost of Carbon," the IWG is now referred to as the "Interagency Working Group on the Social Cost of Greenhouse Gases."

parameters.[9] Four estimates of each SC-GHG were then developed for each emissions year, with three constituting the average values of the three IAMs discounted at rates of 2.5, 3, and 5 percent, and the fourth estimate representing a high-impact estimate (using a 3 percent discount rate).[10]

The U.S. federal government has used SC-GHG estimates in conducting cost-benefit analyses for rulemakings that would affect GHG emissions, such as appliance energy efficiency standards, passenger vehicle fuel economy standards, and power plant regulations, to evaluate the costs and benefits associated with changes in GHG emissions.[11] In addition, National Environmental Policy Act (NEPA) guidance issued in 2016 provided for agency deference in whether to incorporate SC-GHG estimates into agency analysis of the environmental impacts of major proposed federal actions (however, this guidance was later rescinded).[12]

In 2017, President Trump issued Executive Order 13783, which disbanded the IWG and withdrew its SC-GHG estimates and guidance as "no longer representative of government policy," removing the requirement for federal agencies to employ a harmonized set of SC-GHG estimates in their regulatory analysis, though agencies could still use separately calculated SC-GHG values if deemed appropriate. Federal agencies have since relied on a set of interim estimates based on the IWG methodology but with two significant modifications: attempting to calculate domestic damages only and employing discount rates of 3 and 7 percent.[13] These changes have resulted in SC-GHG estimates that are significantly lower than the IWG's prior estimates.[14] For example, Table 1 shows the SCC estimates used in the

Table 1. Social Cost of Carbon, 2019 Estimates used in EPA's ACE Rule (2016$/metric ton CO_2)

Year of Emissions	Average Estimate at 3% Discount Rate	Average Estimate at 7% Discount Rate
2020	$7	$1
2030	8	1
2040	9	2
2050	11	2

Source: Social cost of CO_2 estimates used by EPA in final ACE Rule, in 2016$ per metric ton CO_2 (2019), https://www.epa.gov/sites/production/files/2019-06/documents/utilities_ria_final_cpp_repeal_and_ace_2019-06.pdf

9 The IAMs used were DICE (Dynamic Integrated Climate-Economy model), FUND (Framework for Uncertainty, Negotiation and Distribution model), and PAGE (Policy Analysis of the Greenhouse Effect model).

10 This fourth value represents the 95th-percentile SC-GHG estimate across all three models at a 3 percent discount rate. It was included to capture the damages associated with lower-probability but higher-impact outcomes from climate change that would be particularly harmful to society.

11 EPA, Clean Power Plan: Carbon Pollution Emission Guidelines for Existing Stationary Sources: Electric Utility Generating Units (October 2015), https://www.govinfo.gov/content/pkg/FR-2015-10-23/pdf/2015-22842.pdf; EPA and NHTSA, 2017 and Later Model Year Light-Duty Vehicle GHG Emissions and Corporate Average Fuel Economy Standards (October 2012), https://www.govinfo.gov/content/pkg/FR-2012-10-15/pdf/2012-21972.pdf.

12 "When an agency determines that a monetized assessment of the impacts of greenhouse gas emissions or a monetary cost-benefit analysis is appropriate and relevant to the choice among different alternatives being considered, such analysis may be incorporated by reference or appended to the NEPA document as an aid in evaluating the environmental consequences…. For example, the Federal social cost of carbon (SCC) estimates the marginal damages associated with an increase in carbon dioxide emissions in a given year." See: https://ceq.doe.gov/docs/ceq-regulations-and-guidance/nepa_final_ghg_guidance.pdf.

13 For example, see: EPA and NHTSA, 2017 and Later Model Year Light-Duty Vehicle GHG Emissions and Corporate Average Fuel Economy Standards (October 2012), https://www.govinfo.gov/content/pkg/FR-2012-10-15/pdf/2012-21972.pdf.

14 According to the U.S. Government Accountability Office (GAO), accounting for domestic climate damages only results in SCC estimates that are about 7 times lower than the prior federal estimates that were based on global damages (both using a 3 percent discount rate). See: https://www.gao.gov/assets/gao-20-254.pdf.

Environmental Protection Agency's (EPA) final Affordable Clean Energy (ACE) rulemaking under the Trump Administration. These estimates are only a fraction of the Obama and Biden Administration estimates (see Table 2 below).

State and International Examples

At least 11 state governments use SC-GHG estimates in regulatory contexts and other actions.[15] Some state public utility commissions, for example, use SC-GHG estimates to inform decision-making or direct utilities to use these estimates in developing integrated resource plans.[16] Most of these states use the IWG's most recent central estimates at a 3 percent discount rate, although some states have recommended the use of a lower discount rate (e.g., 2.5 percent or lower).[17] Governments of some foreign countries have also developed and/or used SC-GHG estimates in regulatory contexts. For example, Canada has adopted and used some of the prior U.S. federal government SC-GHG estimates, and Germany has developed and used its own estimates.[18]

Biden Administration Actions and Considerations

On his first day in office, President Biden issued Executive Order 13990 that, among other things, reestablished the IWG and tasked it with publishing interim SC-GHG estimates for use by federal agencies within 30 days.[19] The Executive Order also directed the IWG to review and issue revised SC-GHG estimates by January 2022. The IWG must also provide recommendations regarding areas of federal "decision-making, budgeting, and procurement" where SC-GHG estimates should be used and a process for reviewing and, as appropriate, updating, the SC-GHG estimates to ensure they are based on "the best available economics and science" and adequately account for "climate risk, environmental justice, and intergenerational equity."

On February 26, 2021, in accordance with Executive Order 13990, the re-instated IWG released a Technical Support Document (TSD) that includes interim SC-GHG values that revert to the prior IWG's most recent SC-GHG estimates, adjusted for inflation.[20] These values are shown in Table 2. Consistent with the IWG's prior estimates, these interim values reflect global damages and use discount rates of 2.5, 3, and 5 percent, while being adjusted to 2020 dollars. The IWG recommends that these interim estimates "be used by agencies until a comprehensive review and update is developed in line with requirements in EO 13990."

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15 California, Colorado, Illinois, Maine, Maryland, Minnesota, Nevada, New Jersey, New York, Virginia, and Washington. See: NYU Law Institute for Policy Integrity, https://costofcarbon.org/states/. https://media.rff.org/documents/RFF_NYSERDA_Value_of_Carbon_Report.pdf

16 For example: Colorado SB 19-236 (passed May 3, 2019), https://leg.colorado.gov/sites/default/files/2019a_236_signed.pdf; Minnesota PUC Order E-999/CI-14-643 (issued January 3, 2018), https://minnesotapuc.legistar.com/View.ashx?M=F&ID=5877276&GUID=DC54C92A-FA82-4A11-B577-49813B9D4830; Nevada SB 65 (passed June 5, 2017) and PUC Final Order, Docket Number 17-07020 (issued August 15, 2018), http://pucweb1.state.nv.us/PDF/AxImages/DOCKETS_2015_THRU_PRESENT/2017-7/32153.pdf; Virginia HB 1256 (passed April 11, 2020), https://lis.virginia.gov/cgi-bin/legp604.exe?201+ful+CHAP1193; Washington SB 5116 (passed May 7, 2019) and UTC Order 01, Docket No. U-190730 (issued July 30, 2020), https://apiproxy.utc.wa.gov/cases/GetDocument?docID=7&year=2019&docketNumber=190730.

17 GAO, Social Cost of Carbon: Identifying a Federal Entity to Address the National Academies' Recommendations Could Strengthen Regulatory Analysis (June 2020), https://www.gao.gov/assets/gao-20-254.pdf.

18 GAO, 2020.

19 EO 13990, 2021.

20 IWG, 2021.

Table 2. Social Cost of GHGs, 2021 IWG Interim Estimates (2020$/metric ton GHG)

GHG	Year of Emissions	Average Estimate at 5% Discount Rate	Average Estimate at 3% Discount Rate	Average Estimate at 2.5% Discount Rate	High Impact: 95th Percentile at 3% Discount Rate
CO_2	2020	$14	$51	$76	$152
	2025	17	56	83	169
	2030	19	62	89	187
	2035	22	67	96	206
	2040	25	73	103	225
	2045	28	79	110	242
	2050	32	85	116	260
CH_4	2020	$670	$1,500	$2,000	$3,900
	2025	800	1,700	2,200	4,500
	2030	940	2,000	2,500	5,200
	2035	1,100	2,200	2,800	6,000
	2040	1,300	2,500	3,100	6,700
	2045	1,500	2,800	3,500	7,500
	2050	1,700	3,100	3,800	8,200
N_2O	2020	$5,800	$18,000	$27,000	$48,000
	2025	6,800	21,000	30,000	54,000
	2030	7,800	23,000	33,000	60,000
	2035	9,000	25,000	36,000	67,000
	2040	10,000	28,000	39,000	74,000
	2045	12,000	30,000	42,000	81,000
	2050	13,000	33,000	45,000	88,000

Source: Interim social cost of GHG estimates issued by the IWG in 2021, in 2020$ per metric ton GHG, https://www.whitehouse.gov/wp-content/uploads/2021/02/TechnicalSupportDocument_SocialCostofCarbonMethaneNitrousOxide.pdf.

In his first days in office, President Biden also directed the Office of Management and Budget (OMB) to consider changes to the regulatory review process that could affect how federal agencies use SC-GHG estimates.[21] In the memorandum, President Biden directs OMB to develop recommendations that, among other things, "identify ways to modernize and improve the regulatory review process, including through revisions to OMB's Circular A-4," which is the current blueprint used for federal regulatory analyses, including cost-benefit analyses. These recommendations are meant to "ensure that the review process promotes policies that reflect new developments in scientific and economic understanding, fully accounts for regulatory benefits that are difficult or impossible to

[21] President Biden, Memorandum on Modernizing Regulatory Review (January 20, 2021), https://www.govinfo.gov/content/pkg/FR-2021-01-26/pdf/2021-01866.pdf.

quantify, and does not have harmful anti-regulatory or deregulatory effects." The memorandum also directs OMB to propose changes to the regulatory review process that "take into account the distributional consequences of regulations, including as part of any quantitative or qualitative analysis of the costs and benefits of regulations, to ensure that regulatory initiatives appropriately benefit and do not inappropriately burden disadvantaged, vulnerable, or marginalized communities…".

Key Considerations for Updating the SC-GHG Estimates

In issuing revised SC-GHG estimates, President Biden's Executive Order also directs the IWG to consider relevant scientific literature, stakeholder views, and recommendations of the National Academies of Sciences (NAS) submitted in 2017. Below are some of the expected key considerations as the IWG develops revised SC-GHG estimates.

Domestic vs. Global Impacts

Agencies under the Trump Administration used SC-GHG estimates that reflected only the domestic damages of climate change, representing a departure from the IWG's prior consistent focus on global damages. The Biden Administration has thus far signaled its support for a global accounting of damages, stating that a full global accounting of the costs of GHG emissions "facilitates sound decision-making, recognizes the breadth of climate impacts, and supports the international leadership of the United States on climate issues."[22] Similarly, the reinstated IWG made clear in February 2021 that it "found previously and is restating here that a global perspective is essential for SC-GHG estimates because climate impacts occurring outside U.S. borders can directly and indirectly affect the welfare of U.S. citizens and residents."[23] This change results in estimates that are higher than those used under the Trump Administration.

Discount Rate

The choice of discount rate strongly influences the SC-GHG estimates. It is particularly relevant in the context of climate change, which requires immediate short-term actions (that result in costs) for very long-term (many hundreds of years) benefits. Higher discount rates tend to bias investment and spending choices toward those that yield net benefits in the near-term versus the longer term and can thus cause short-term costs to appear greater than long-term benefits. Conversely, use of a lower discount rate favors actions that may yield small benefits in the near-term, or impose significant costs in the short-term, but that have greater long-term benefits. Some economists argue that a lower discount rate can better address the intergenerational inequity of climate change (climate change is projected to have more severe impacts on future generations). Given the long time horizon over which climate damages are expected to occur, the discount rate has a large influence on the present value of future damages.

While the IWG's interim values published in 2021 use the same discount rates that were used from 2010 to 2016 (e.g., 2.5, 3, and 5 percent), the IWG notes that, based on its initial review, "new data and evidence strongly suggests that the discount rate regarded as appropriate for intergenerational analysis is lower." In the TSD, the IWG cites new information suggesting that the consumption rate of interest is now "notably lower than 3 percent," as well as recent surveys and peer-reviewed research on the appropriate discount rates to use in an intergenerational context. One of these studies, which surveyed over 200 economists, found a "surprising degree of consensus among experts, with more than three-quarters finding the median risk-free social discount rate of 2 percent acceptable."[24] As such,

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22 EO 13990, 2021.
23 IWG, 2021.
24 Drupp et al., 2018.

IWG notes that "agencies may consider conducting additional sensitivity analysis using discount rates below 2.5 percent." This use of lower discount rates would result in higher SC-GHG estimates.

Improving Modeling Framework and Comprehensiveness, Including Representation of Uncertainty

In the TSD, the IWG notes a number of potential improvements it could make to the modeling framework used to estimate SC-GHG values, many of which respond to recommendations from the NAS in 2017.

For example, the IWG has traditionally estimated SC-GHG values by aggregating the results of three separate IAMs. In 2017, NAS noted that transitioning into a single IAM could "improve transparency and consistency of key assumptions with the peer-reviewed science" and "improve control over the uncertainty representation."[25] NAS also recommended that in the long term, the IWG pursue an integrated modular approach to the key components of SC-GHG estimation. Under this approach, each step in estimating SC-GHG values would be developed as one of four separate modules that are then integrated into one IAM: socioeconomic projections, climate science, economic damages, and discounting. NAS found that this change could improve transparency and "provide a mechanism for incorporating new scientific evidence and for facilitating regular improvement of the framework modules."

In the TSD, the IWG also states that it could improve the way that modeling uncertainty is addressed in the analysis and communicated in the final SC-GHG results. The IWG notes that such uncertainty is inherent in a future-looking analysis such as this but is also driven by "current data gaps associated with the complex physical, economic, and behavioral processes that link GHG emissions to human health and well-being." The IWG's current approach uses a multi-model ensemble, probabilistic analysis, and scenario analysis to understand and bound some of this uncertainty. However, the NAS provided numerous recommendations for how the IWG could improve each module of the model to better incorporate and characterize uncertainty about key inputs and outputs, including applying "overarching criteria for the scientific basis, uncertainty characterization, and transparency of each module."

Finally, in the TSD, the IWG lists a series of other modeling limitations inherent to such a complex modeling exercise, including: the incomplete treatment of catastrophic and non-catastrophic impacts in the IAMs; the incomplete treatment of adaptation and technological change; the incomplete way in which interregional and intersectoral linkages are modeled; uncertainty in the extrapolation of damages to high temperatures; and inadequate representation of the relationship between the discount rate and uncertainty in economic growth over long time horizons. Overall, the IWG states that the limitations in the models suggest that the range of the interim SC-GHG estimates "likely underestimate societal damages from GHG emissions." However, the IWG notes that there are newer versions available of each of the IAMs that may offer improvements in modeling that would affect the final SC-GHG estimates.

Use of SC-GHG Estimates

Federal agencies are expected to resume using the IWG's estimates in regulatory analysis. One unknown is if OMB will, in response to President Biden's directive, recommend any changes to the regulatory review process, including to Circular A-4, that would affect how agencies use the SC-GHG estimates in this context. President Biden directed OMB to identify recommendations to "ensure that the review process promotes policies that reflect new developments in scientific and economic understanding, fully accounts for regulatory benefits that are difficult or impossible to quantify, and does not have harmful anti-regulatory or deregulatory effects."

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[25] NAS, Valuing Climate Damages: Updating Estimation of the Social Cost of Carbon Dioxide (2017), https://www.nap.edu/catalog/24651/valuing-climate-damages-updating-estimation-of-the-social-cost-of.

Also unknown is whether federal agencies will seek to use the SC-GHG estimates in new contexts and areas of decision-making, such as federal procurement and budgeting (as mentioned in President Biden's Executive Order) or in the Federal Energy Regulatory Commission's approval process for natural gas pipelines (which has been the subject of litigation in recent years).

Equity and Environmental Justice

Many climate experts have noted that the distribution of many climate change impacts is highly unequal and inequitable.[26] This inequality is not easily reflected in SC-GHG estimates, which do not include an assessment of distributional impacts. One exception is the consideration of intergenerational equity, which can be addressed through the selection of a discount rate.

In line with the Biden Administration's commitment to promote equity and environmental justice, Executive Order 13990 directs the IWG to provide recommendations to, by no later than June 2022, "revise methodologies for calculating [SC-GHG estimates], to the extent that current methodologies do not adequately account for climate risk, environmental justice, and intergenerational equity." Similarly, President Biden has directed OMB to propose changes to the regulatory review process that "take into account the distributional consequences of regulations, including as part of any quantitative or qualitative analysis of the costs and benefits of regulations, to ensure that regulatory initiatives appropriately benefit and do not inappropriately burden disadvantaged, vulnerable, or marginalized communities."

Review Process

While the IWG has issued revisions to its SC-GHG estimates periodically over the years, NAS recommended that the IWG update SC-GHG estimates at regular intervals, suggesting a five-year cycle, and to do so using a standardized process.

Next Steps

On May 7, 2021, the Office of Management and Budget published a notice of availability and request for comments on "Technical Support Document: Social Cost of Carbon, Methane, and Nitrous Oxide Interim Estimates Under Executive Order 13990."[27] Comments are due by June 21, 2021.

Pursuant to Executive Order 13990, the IWG will publish final SC-GHG estimates by no later than January 2022. By September 1, 2021, the IWG must also provide recommendations to the President "regarding areas of decision-making, budgeting, and procurement by the Federal Government where the [SC-GHG estimates] should be applied." By June 1, 2022, the IWG will provide recommendations "regarding a process for reviewing, and, as appropriate, updating, the SCC, SCN, and SCM to ensure that these costs are based on the best available economics and science," as well as for "revis[ing] methodologies for calculating the [SC-GHG estimates], to the extent that current methodologies do not adequately take account of climate risk, environmental justice, and intergenerational equity."

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[26] For example, the Intergovernmental Panel on Climate Change (IPCC) stated in 2014 that "the socially and economically disadvantaged and the marginalized are disproportionately affected by climate change." IPCC, Fifth Assessment Report, Livelihoods and Poverty, Climate Change 2014: Impacts, Adaptation, and Vulnerability, https://www.ipcc.ch/site/assets/uploads/2018/02/WGIIAR5-Chap13_FINAL.pdf.

[27] 86 Federal Register 24,669, *Notice of Availability and Request for Comment on "Technical Support Document: Social Cost of Carbon, Methane, and Nitrous Oxide Interim Estimates Under Executive Order 13990,"* May 7, 2021. https://www.govinfo.gov/content/pkg/FR-2021-05-07/pdf/2021-09679.pdf

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