Public Comment on the International Foundation for Valuing Impacts' Greenhouse Gas Emissions Methodology

Brian C. Prest

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Resources for the Future Public Comment on the International Foundation for Valuing Impacts' Greenhouse Gas Emissions Methodology

Brian C. Prest
Fellow and Social Cost of Carbon Initiative Director, Resources for the Future
202.328.5109 | prest@rff.org

On behalf of Resources for the Future (RFF), I am pleased to share the accompanying comments to the International Foundation for Valuing Impacts (IFVI) on greenhouse gas emissions methodology.

RFF is an independent, nonprofit research institution in Washington, DC. Its mission is to improve environmental, energy, and natural resource decisions through impartial economic research and policy engagement. RFF is committed to being the most widely trusted source of research insights and policy solutions leading to a healthy environment and a thriving economy.

While RFF researchers are encouraged to offer their expertise to inform policy decisions, the views expressed here are those of the individual authors and may differ from those of other RFF experts, its officers, or its directors. RFF does not take positions on specific policy proposals.

In February 2024, the International Foundation for Valuing Impacts released a draft methodology for corporations, investors, and other stakeholders to quantify in economic terms the greenhouse gas (GHG) impacts of their Scope 1, 2, and 3 emissions (IFVI 2024), upon which IFVI has solicited public comment. The methodology proposes a "value factor" for greenhouse gas emissions of $236 per metric ton of CO_2-equivalent in 2023, which rises over time. This value factor is conceptually equivalent to the social cost of carbon dioxide (abbreviated SC-CO_2, or SCC for short) and is derived from recent updates in the SCC literature (Climate Impact Lab 2023, EPA 2023, Rennert et al. 2022) that were responsive to a landmark 2017 report from the National Academies of Sciences, Engineering, and Medicine (NASEM 2017) containing a suite of recommendations for improving SCC estimates. Those estimates from the literature (specifically, the Climate Impact Lab's DSCIM model and RFF's GIVE model) were then adjusted for inflation and the time of release of the pulse of CO_2 modeled in the literature (i.e., 2023 versus 2020).

In context of the methodology underlying the calculation of the value factor, IFVI has requested public comment on the following questions:

> *"1a. Do you agree with the approach taken in establishing the Social Cost of Carbon within the methodology, including the averaging of GIVE and DSCIM to determine the value factor? Why or why not?*
>
> *1b. Do you agree with the choice of a 2% dynamic discount rate that estimates damages to the year 2300? Is the reasoning for how this discount rate was chosen rate clear enough? Why or why not?*
>
> *1c. Is the description of a dynamic price that changes over time clearly presented? If not, how would you enhance the clarity of this section?"*

IFVI also welcomes additional feedback on other topics:

> "*5. Do you disagree or have concern with any additional proposal(s) in the Exposure Draft? For example, this could include feedback on the framing of the overall purpose and structure of the Methodology, references used, and definitions, among other areas. If so, what are they and what do you see as viable alternative approaches?*"

Please find below my comments in response to the questions in turn.

"1a. Do you agree with the approach taken in establishing the Social Cost of Carbon within the methodology, including the averaging of GIVE and DSCIM to determine the value factor? Why or why not?"

I agree with the approach. However, the approach averages two of the three damage functions (GIVE and DSCIM) used in a recent update by the US Environmental Protection Agency (EPA) (2023) for their official estimates, while excluding the third one based on Howard and Sterner (2017). This may be reasonably justified, but it is not clear why this approach was taken by IFVI as no reason is given in the methodology for its departure from the federal government's recent comprehensive update.

"1b. Do you agree with the choice of a 2% dynamic discount rate that estimates damages to the year 2300? Is the reasoning for how this discount rate was chosen rate clear enough? Why or why not?"

I agree. The update to a 2% social discount rate is supported by both by the economic literature (Giglio et al. 2015, Bauer 2020, Bauer and Rudebusch 2023, Del Negro et al. 2017, CEA 2017, Drupp et al. 2018), and the federal government recently updated guidelines for conducting benefit-cost analysis (Circular A-4, US OMB 2023). The use of a "dynamic" discount rate—meaning a discount rate that varies with the rate of economic growth is also justified by standard economic theory (Ramsey 1928, Gollier 2013, Gollier 2014, Newell et al.2022, Nordhaus 2017, Barrage and Nordhaus 2024) and is particularly important when valuing impacts with long-run consequences like the social cost of carbon.

"1c. Is the description of a dynamic price that changes over time clearly presented? If not, how would you enhance the clarity of this section?"

The description of the SCC ("dynamic price") rising over time is clear from Table C1. However, it is not correct that the damages grow because they are discounted less (as implied by "As the model approaches each year where those impacts occur, the damages are discounted less because they are closer to present day."). An impact one year into the future is always discounted by one year; an impact two years into the future is always discounted by two years, and so on. The reasons for the rising SCC are complex, but a key factor is economic growth, which exposes more dollar-denominated categories of impacts to climate damage.

"5. Do you disagree or have concern with any additional proposal(s) in the Exposure Draft? For example, this could include feedback on the framing of the overall purpose and structure of the Methodology, references used, and definitions, among other areas. If so, what are they and what do you see as viable alternative approaches?"

In response to the general request for comment, I have one further important comment regarding the treatment of non-CO_2 gases, primarily methane. Section 3.1 of the guidance advises users as follows:

> *"To normalize the potential impacts of different GHGs, all GHGs should be converted to CO_2 equivalents (CO_2e) using Global Warming Potential (GWP). GWP values reflect the warming period over a 100-year time horizon and should come from the most recent assessment from the IPCC[23]."*

The methodology then calls for these CO_2-equivalent emissions to then be valued using the social cost of CO_2. For example, methane has a 100-year GWP of approximately 30 (for example, **see here**), and therefore the value of 10 tons of methane emissions in 2023 would be calculated as

$$\text{GHG Value} = 10 \text{ tons methane} \times 30 \times \$236 \text{ per ton of CO2} = \$70{,}800.$$

While the use of GWPs is widespread, in the context of economic valuation, GWPs do not comprehensively account for the differences in the social costs of different greenhouse gases. GWPs are purely based on physics, whereas the social costs of greenhouse gases also depend on economic factors such as the discount rate, which affects the social cost of carbon more than it affects the social cost of methane (SCM).

In particular, IFVI's proposed GWP-based approach effectively assumes that the social cost of methane (in dollars per ton of methane) is 30 times larger than the SCC (in dollars per ton of CO_2). However, this is at odds with the models upon which the \$236/tCO_2 value is based. EPA (2023) Tables 3.1.1 and 3.1.2 report these values. For a 2020 pulse of emissions, both GIVE and DSCIM yield SCC values of \$190, but their SCM estimates for that year are \$850 and \$1900, respectively, implying a ratio of 4.5 and 10, respectively. If we average these two SCM values as IFVI has done, we find a value of \$1,375, which is 7.2 times larger than the SCC. Thus, a slightly more appropriate (but nonetheless imperfect[1]) calculation would imply that the value of 10 tons of methane emissions in 2023 would instead replace the factor of 30 in the equation above with 7.2:

$$\text{GHG Value} = 10 \text{ tons methane} \times 7.2 \times \$236 \text{ per ton of CO2} \approx \$17{,}000$$

Thus, the proposed methodology could overstate the value of methane emissions by a factor of more than four: \$70,800/\$17,000, or equivalently 30/7.2, which is the GWP divided by the SCM-to-SCC ratio. More generally, the SCM-to-SCC ratio varies over time, which is why the above calculation is imperfect. Averaging the DSCIM and GIVE SCC and SCM estimates for each year from Tables 3.1.1 and 3.1.2 in EPA (2023) and taking their ratio yields SCM-to-SCC ratios ranging between 7.2 and 16.4 from 2020 through 2080, implying an overvaluation could range from a factor of approximately two to four (30/16.4 versus 30/7.2), depending on the year of emission.

Rather than using a GWP or other conversion ratio, the preferred way to value non-CO_2 gas is to directly multiply it by the social cost of that gas. Social cost estimates for CO_2, methane, and N_2O have been provided by EPA (2023). The social costs of hydrofluorocarbons have also recently been estimated using GIVE (Tan, Rennels, and Parthum 2024). This offers a more appropriate pathway for directly valuing non-CO_2 gases without risk of over- (or under-) valuation.

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[1] That is, it is based on the SCM-to-SCC ratio for 2020, rather than the one for 2023, which would be the necessary one for comparison with the \$236/tCO_2 value.

As we have seen, the potential over-valuation of methane under the proposed approach can be quite large. The ratio of the social cost of a non-CO_2 gas to that of CO_2 determines the degree of error from the use of the GWP approach. That ratio will largely be driven by the time profile of the response of global temperatures to a pulse emission of that gas. Because methane is a relatively short-lived greenhouse gas, these time profiles differ strongly between CO_2 and methane (compare Figure 2.2.3 and A.6.8 in EPA 2023), leading to a major divergence between the 100-year GWP and the SCM-to-SCC ratio. This difference is less stark when comparing CO_2 to other long-lived gases like N_2O (compare Figure 2.2.3 to A.6.9 in EPA 2023). As a result, the DSCIM-GIVE average social cost of N_2O for pulse year 2020 is $52,000, which is 273 times larger than the social cost of CO_2 of $190 that year, although this ratio increases to 289 by 2030. It turns out that the 100-year N_2O GWP is also 273, suggesting much less error when applying IFVI's proposed approach for long-lived gases. Thus, if valuing all non-CO_2 gases using gas-specific social cost estimates is deemed infeasible, a compromise could be to use the SCM for methane while continuing the use of the CO_2e equivalent approach for other gases.

I close with two minor comments, which appear to be minor oversights:

1. The reference to "EPA (2022) Report on the Social Cost of Greenhouse Gases: Estimates Incorporating Recent Science Advances" should be replaced by the finalized version of that report issued in December 2023.
2. Appendix B, Figure B1, "Energy Expenditures via Global Change Analysis Model".
    - The citation to Clarke et al. (2018) is omitted here, but all other damage functions include citations.

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