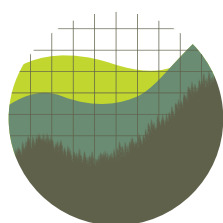


# The Social Cost of Carbon



## Options for Applying a Metric in Flux



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**M**any states and other jurisdictions are grappling with how to value greenhouse gas emission reductions and trying to understand the rapidly developing climate economics and science involved in this task.

Frequently, state governments and other jurisdictions value greenhouse gas emissions (and emission reductions) in policymaking using a tool known as the social cost of carbon.<sup>1</sup> While applying the social cost of carbon is conceptually simple, the appropriate value to place on the metric is in flux. In late 2022, the federal government released new, updated values of the social cost of carbon in draft form which, for now, remain unfinalized.

So what estimates of the social cost of carbon should states and other entities use during this transition period? This policy brief explores the available options.

## Background: The Social Cost of Carbon and Its Evolution

Climate change has had—and increasingly will have—severe consequences for society, including extreme weather, the spread of disease, and decreased food security. The social cost of carbon is a metric used to quantify and monetize climate damages, representing the net economic cost to society of carbon dioxide emissions. In essence, the social cost of carbon is an estimate of the damage caused by each ton of carbon pollution released into the air, in dollars.

The social cost of carbon can be used to evaluate a wide range of policies and decisions affecting carbon dioxide emissions, including regulatory impact analyses and environmental impact statements, utility ratemaking, resource management policy, setting emissions limits in a regulated sector, or establishing a carbon price.<sup>2</sup> The federal government, numerous states,<sup>3</sup> and multiple foreign countries<sup>4</sup> already use the social cost of carbon to aid their decisionmaking.

Monetizing the impacts of climate change is inherently challenging. Moreover, the evolution of climate science and economics necessitates periodic reevaluations to update the social cost of carbon values. The federal Interagency Working Group on the Social Cost of Greenhouse Gases released its first social cost of carbon estimates in 2010 and updated them twice over the next six years.<sup>5</sup> But those valuations were recognized as underestimates from the beginning, and this fact has become even clearer as climate science and economics has progressed.<sup>6</sup> Outside experts have placed substantially higher valuations on the costs of climate change.<sup>7</sup> At this point, the Interagency Working Group's estimates are widely recognized as outdated and very conservative.

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<sup>1</sup> Several other greenhouse gases, including methane and nitrous oxide, have their own social cost estimates. Policymakers should apply the appropriate damage valuation depending on the greenhouse gas at issue. This policy brief refers only to the social cost of carbon for simplicity. However, all of the report's recommendations and guidance apply equally to the damage estimates for other greenhouse gases. All three of the options presented herein have corresponding values for the social cost of methane and the social cost of nitrous oxide.

<sup>2</sup> See Richard L. Revesz & Max Sarinsky, *The Social Cost of Greenhouse Gases: Legal, Economic, and Institutional Perspective*, 39 YALE J. ON REG. 854, 872–92 (2022) (discussing potential uses in federal policy).

<sup>3</sup> See generally States Using the SCC, <https://costofcarbon.org/states>.

<sup>4</sup> Jason Schwartz, Inst. for Pol'y Integrity, *Strategically Estimating Climate Pollution Costs in a Global Environment* 11 (2021).

<sup>5</sup> See INTERAGENCY WORKING GRP. ON THE SOCIAL COST OF GREENHOUSE GASES, TECHNICAL SUPPORT DOCUMENT: SOCIAL COST OF CARBON, METHANE, AND NITROUS OXIDE INTERIM ESTIMATES UNDER EXECUTIVE ORDER 13990 at 2–3 (2021) (describing history).

<sup>6</sup> Ctr. for Climate & Energy Solutions et al., Comments on the EPA External Review Draft of Report on the Social Cost of Greenhouse Gases 4–6 (Feb. 13, 2023), [https://policyintegrity.org/documents/Joint\\_Comments\\_on\\_EPA\\_Draft\\_Update\\_to\\_the\\_Social\\_Cost\\_of\\_Greenhouse\\_Gases.pdf](https://policyintegrity.org/documents/Joint_Comments_on_EPA_Draft_Update_to_the_Social_Cost_of_Greenhouse_Gases.pdf).

<sup>7</sup> E.g., Martin C. Hansel et al., *Climate Economics Support for the UN Climate Targets*, 10 NATURE CLIMATE CHANGE 781 (2020); Robert S. Pindyck, *The Social Cost of Carbon Revisited*, 94 J. ENV'T ECON. & MGMT. 140 (2019); Peter Howard & Derek Sylvan, Inst. for Pol'y Integrity, *Gauging Economic Consensus on Climate Change* (2021).

In January 2017, the National Academies of Sciences called for a comprehensive update to the social cost of carbon that incorporated newer research,<sup>8</sup> but that update stalled for four years under the Trump administration. The federal government began this comprehensive update belatedly in 2021.<sup>9</sup> In the meantime, it continues to endorse the old values it had developed during the Obama administration, updated for inflation, while recognizing that they are underestimates and suggesting that higher values are likely appropriate.<sup>10</sup> In November 2022, the U.S. Environmental Protection Agency (EPA) published draft updated estimates applying the latest available research.<sup>11</sup> Those EPA estimates recently underwent peer review<sup>12</sup> and are expected to be finalized by 2024.

During the federal government’s long delay, some stakeholders developed their own social cost of carbon valuations. Most notably, in December 2020, New York State released new valuations of the social cost of carbon to use in state policymaking.<sup>13</sup> Those valuations mostly apply the Interagency Working Group’s methodology but make key adjustments in accordance with economic evidence.

### Social Cost of Carbon Estimates (2020\$ per metric ton of CO<sub>2</sub>)

Year of Emissions	Interagency Working Group 2016 Estimates (full range of estimates)	New York State 2020 Estimates (central estimate)	EPA 2022 Draft Estimates (central estimate)
2020	14–152	125	190
2025	17–169	134	210
2030	19–187	142	230
2040	25–225	160	270
2050	32–260	178	310

<sup>8</sup> NAT’L ACAD. SCI., ENGINEERING & MED., VALUING CLIMATE DAMAGES: UPDATING ESTIMATION OF THE SOCIAL COST OF CARBON DIOXIDE (2017).

<sup>9</sup> Interagency Working Grp. (2021), *supra* note 5, at 36 (discussing Exec. Order 13,990 and calling for comments on updating the social cost of carbon).

<sup>10</sup> *Id.*

<sup>11</sup> ENV’T PROT. AGENCY, EPA EXTERNAL REVIEW DRAFT OF REPORT ON THE SOCIAL COST OF GREENHOUSE GASES: ESTIMATES INCORPORATING RECENT SCIENTIFIC ADVANCES (2022).

<sup>12</sup> FINAL COMMENTS SUMMARY REPORT: EXTERNAL LETTER PEER REVIEW OF TECHNICAL SUPPORT DOCUMENT: SOCIAL COST OF GREENHOUSE GAS (2023).

<sup>13</sup> This guidance has since undergone several relatively minor updates, most recently in August 2023. N.Y. DEP’T OF ENV’T CONSERVATION, ESTABLISHING A VALUE OF CARBON: GUIDELINES FOR USE BY STATE AGENCIES (revised Aug. 2023), [https://www.dec.ny.gov/docs/administration\\_pdf/vocguide23final.pdf](https://www.dec.ny.gov/docs/administration_pdf/vocguide23final.pdf)

# Applying the Social Cost of Carbon: Three Options

As illustrated above, policymakers applying the social cost of carbon currently have three principal options: EPA’s draft estimates from 2022, New York’s estimates from 2020, and the Interagency Working Group’s estimates last updated in 2016. (In some circumstances, state policymakers may choose to apply a different metric known as a marginal abatement cost, which measures the cost of abating emissions to achieve a particular emissions target.<sup>14</sup> A marginal abatement cost is conceptually and practically distinct from the social cost of carbon as it does not measure the damages caused by climate pollution. It is also outside the scope of this policy brief, which focuses on climate-damage estimates.)

There are benefits and drawbacks to each approach, and policymakers should consider the needs and dynamics of their jurisdiction in assessing which estimate is best to use. Below, we highlight a few benefits and drawbacks of each approach.

## *Option 1: EPA’s 2022 Draft Estimates*

EPA’s draft estimates, which it released in November 2022 for public comment, reflect the most recent update to the social cost of carbon from the U.S. government. The estimates recently underwent peer review and are expected to be finalized by 2024.

EPA’s estimates reflect the latest available climate science and economics, following the roadmap laid out in 2017 by the National Academies of Sciences. The estimates have drawn support from a wide range of experts<sup>15</sup> and were recently adopted by both the State of Minnesota<sup>16</sup> and Canada’s environmental agency.<sup>17</sup> Both in its use of discount rates and climate science, EPA’s draft estimates reflect the most recent data and are broadly consistent with expert opinion. In fact, peer reviewers who assessed EPA’s analysis broadly praised its methodology and work.<sup>18</sup> Because EPA’s estimates have not been finalized as of September 2023, however, they are subject to change and are not in widespread use. Their use has also not yet been subjected to judicial review.

While EPA’s valuations are the highest to date of any U.S.-government estimates, they are still believed to underestimate the true costs of climate change because they omit some key damage categories—such as impacts from wildfires, stronger storms and inland flooding, and ocean acidification—and do not include climate tipping points (like the potential collapse of the Atlantic Ocean current).<sup>19</sup> Nonetheless, because they incorporate the latest science and economics, EPA’s valuations are considered the most reliable of the available options.

EPA provided three valuations—at near-term discount rates of 1.5%, 2%, and 2.5%—annually extending out to 2080. They are rounded to the nearest \$10.

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<sup>14</sup> For a detailed discussion of the marginal abatement cost approach, its potential policymaking application, and its interaction with the social cost of carbon, see Justin Gundlach & Michael A. Livermore, *Costs, Confusion, and Climate Change*, 39 YALE J. ON REG. 564 (2022).

<sup>15</sup> See FINAL COMMENTS SUMMARY REPORT, *supra* note 12.

<sup>16</sup> MINN. STAT. ANN. § 216B.2422 Subd.3(b). Minnesota’s statute requires the state’s Public Utilities Commission to apply EPA’s 2022 draft estimates for now and then to apply EPA’s final estimates when they become available.

<sup>17</sup> SOCIAL COST OF GREENHOUSE GAS EMISSIONS—INTERIM UPDATED GUIDANCE FOR THE GOVERNMENT OF CANADA, Government of Canada, <https://www.canada.ca/en/environment-climate-change/services/climate-change/science-research-data/social-cost-ghg.html> (last modified Apr. 20, 2023).

<sup>18</sup> PEER REVIEW, *supra* note 12.

<sup>19</sup> ENV’T PROT. AGENCY, *supra* note 11, at 73 (listing unquantified impacts).

### EPA Draft Estimates (2020\$ per metric ton of CO<sub>2</sub>)<sup>20</sup>

Year of Emissions	2.5% Discount Rate	2% Discount Rate (central estimate)	1.5% Discount Rate
2020	120	190	340
2025	130	210	360
2030	140	230	380
2040	170	270	430
2050	200	310	480
2060	230	350	530
2070	260	380	570
2080	280	410	600

In short, EPA’s valuations are the most up-to-date among the existing options—and therefore, unsurprisingly, the highest. Yet they remain subject to change and, as of September 2023, are not in widespread use. Additionally, because these estimates use lower discount rates than agencies often use in cost-benefit analysis, using them may require agencies to make concurrent changes to other parts of their analysis to ensure consistency.

#### Pros and Cons of Using EPA’s Valuations

##### Pros

- Most up-to-date and reliable valuations among the existing options
- Likely to be finalized soon by the federal government
- Approach follows the 2017 roadmap from the National Academies of Sciences and was widely praised by expert peer reviewers
- Extends emissions timeline out to 2080—thirty years beyond the other options
- Likely to be updated in an iterative fashion as more damages are added

##### Cons

- Not final and remains subject to change
- Not in widespread use or reviewed judicially
- Could require state agencies to modify existing cost-benefit analysis frameworks to conform with new, lower discount rates

<sup>20</sup> Valuations for each multiple-of-ten year (2020, 2030, etc.) are presented at *id.* at 3 tbl.ES.1. Valuations for the year 2025 are presented at *id.* at 120 tbl.4.2.1 and were rounded to the nearest \$10 for presentation in this report.

## Option 2: New York’s 2020 Estimates

In 2020, New York’s Department of Environmental Conservation established its own valuations of the social cost of carbon for use in state policymaking.<sup>21</sup> Since publishing these estimates, New York has applied them in various contexts.<sup>22</sup> Vermont has also adopted New York’s estimates to use in its own state policymaking.<sup>23</sup>

New York’s valuations apply the same essential methodology used to create the federal Interagency Working Group estimate (discussed below as Option 3). However, New York made one key improvement to the Working Group’s methodology: it adjusted the discount rates used from 2.5%, 3%, and 5% to 3%, 2%, and 1%.<sup>24</sup> New York’s approach to discounting is consistent with the best available science, which supports lower discount rates for measuring climate damages than the Interagency Working Group had used.<sup>25</sup> In fact, New York’s central rate of 2% is identical to what EPA used (see Option 1). Like EPA’s numbers, these lower discount rates may require states to make concurrent changes to other aspects of their analysis.

New York provided all three estimates annually going out to 2050. Those valuations are as follows:

**New York Estimates (2020\$ per metric ton of CO<sub>2</sub>)<sup>26</sup>**

Year of Emissions	3% Discount Rate	2% Discount Rate (central estimate)	1% Discount Rate
2020	53	125	421
2025	59	134	433
2030	64	142	446
2040	76	160	469
2050	88	178	493

In short, New York’s numbers reflect an improvement over the Interagency Working Group valuations but are not as comprehensive or up-to-date as EPA’s draft estimates. And although at least one other state is now relying on New York’s figures, their use outside New York is limited compared to the federal approaches. Moreover, New York’s valuations are considered underestimates—even more so than EPA’s 2022 draft valuations.<sup>27</sup>

<sup>21</sup> N.Y. DEP’T OF ENV’T CONSERVATION, *supra* note 13.

<sup>22</sup> *E.g.*, Notice of Adoption, Advanced Clean Car (ACC) Standards, N.Y. Reg., Aug. 23, 2023, at 4.

<sup>23</sup> See VT. CLIMATE COUNCIL, INITIAL VERMONT CLIMATE ACTION PLAN 52–55 (2021) (adopting New York’s estimates); Vt. Dep’t of Env’t Conservation, Supplemental Information for Vermont’s Low Emission Vehicle and Zero Emission Vehicle Proposed Rules 5–6 (2022) (applying those estimates in rulemaking).

<sup>24</sup> N.Y. DEP’T OF ENV’T CONSERVATION, *supra* note 13, at 20–23. New York also provides valuations at a 0% discount rate but does “not recommend[] its usage by state agencies.” *Id.* at 21.

<sup>25</sup> See INTERAGENCY WORKING GRP. (2021), *supra* note 5, at 21 (endorsing discount rates of “2 percent and lower . . . when discounting intergenerational impacts”); Peter Howard & Jason A. Schwartz, *Valuing the Future: Legal and Economic Considerations for Updating Discount Rates*, 39 YALE J. ON REG. 595, 616–24 (2022).

<sup>26</sup> These valuations are presented at N.Y. DEP’T OF ENV’T CONSERVATION, 2023 Update, NYS Value of Carbon Guidance Appendix: Annual Social Cost Estimates 2 tbl.A1 (2023), [https://www.dec.ny.gov/docs/administration\\_pdf/vocapp23.pdf](https://www.dec.ny.gov/docs/administration_pdf/vocapp23.pdf).

<sup>27</sup> As documented in this brief, New York’s range of social cost of carbon valuations is generally lower than the range in EPA’s draft estimates.

## Pros and Cons of Using New York's Valuations

### Pros

- Updates the discount rates to be consistent with the best available economics, correcting a limitation in the Interagency Working Group's valuations
- Track record of use by New York and elsewhere in state regulatory processes

### Cons

- Limited use outside New York
- Believed to underestimate the true costs of climate change
- Could require state agencies to modify existing cost-benefit analysis frameworks to conform with new, lower discount rates

## Option 3: Interagency Working Group's 2016 Estimates

The federal Interagency Working Group first developed its social cost of carbon estimates in 2010. It updated those estimates in 2013 and, most recently, in 2016.<sup>28</sup> In 2021, the Interagency Working Group readopted its 2016 estimates on an interim basis and adjusted them for inflation to 2020 dollars.<sup>29</sup> (The 2021 update also endorsed the use of higher social cost of carbon valuations, but did not provide such valuations.)

The Interagency Working Group valuations have been widely applied by the federal government and numerous states, serving as the default climate-damage estimates for most of the past 13 years.<sup>30</sup> They have been upheld in federal court<sup>31</sup> and subjected to extensive agency and expert review, including a public comment period.<sup>32</sup>

However, the Interagency Working Group valuations are quite conservative and are now largely considered outdated. In its 2021 update, the Interagency Working Group acknowledged that its valuations were substantial underestimates due to the use of high discount rates and the failure to incorporate the latest climate science and economics.<sup>33</sup> Key stakeholders, including the National Academies of Sciences, have been calling for an update to the Working Group's approach for years.

The Interagency Working Group provided all four estimates annually going out to 2050. It does not endorse any particular estimate as a "central estimate," instead recommending that agencies consider the full range of values (while also endorsing the use of higher valuations using lower discount rates, such as New York's numbers presented above).

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<sup>28</sup> Interagency Working Grp. (2021), *supra* note 5, at 2–3.

<sup>29</sup> *Id.* at 5 n.3.

<sup>30</sup> Peter Howard & Jason A. Schwartz, *Think Global: International Reciprocity as Justification for a Global Social Cost of Carbon*, 42 *COLUM. J. ENV'T L.* 203, 270–84 (2017) (listing all uses at the federal level through mid-2016); States Using the SCC, <https://costofcarbon.org/states> (non-exhaustive list of state uses).

<sup>31</sup> *Zero Zone v. Dep't of Energy*, 832 F.3d 654, 679 (7th Cir. 2016); *see also California v. Bernhardt*, 472 F. Supp. 3d 573 (N.D. Cal. 2020) (rejecting Trump administration valuations that deviated from the Working Group's approach).

<sup>32</sup> Interagency Working Grp. (2021), *supra* note 5, at 3 (noting that Working Group estimates have been "subject to public comment in the context of dozens of proposed rulemakings as well as in a dedicated public comment period in 2013").

<sup>33</sup> *Id.* at 4 (recognizing that the Working Group's estimates "underestimate societal damages from [greenhouse gas] emissions"). Compare *supra* tbl.2 with *supra* tbl.4 (showing that EPA's updated draft estimates are much larger than the Working Group's estimates).

Those values are as follows:

### Interagency Working Group Estimates (2020\$ per metric ton of CO<sub>2</sub>)<sup>34</sup>

Year of Emissions	5% Discount Rate	3% Discount Rate	2.5% Discount Rate	3% Discount Rate, 95% Damages
2020	14	51	76	152
2025	17	56	83	169
2030	19	62	89	187
2040	25	73	103	225
2050	32	85	116	260

In short, the Interagency Working Group's valuations are the most widely adopted and have withstood judicial review. However, they are now widely regarded as outdated and very conservative underestimates. States should therefore be wary of adopting the Working Group's valuations, and any that apply the Interagency Working Group's valuations should follow the practice of several states that place greater weight on the higher end of the range (i.e., the values that use a 2.5% discount rate<sup>35</sup> or a 3% discount rate and 95th percentile damage estimate<sup>36</sup>).

#### Pros and Cons of Using the Interagency Working Group's Valuations

##### Pros

- Widely adopted in federal and state policy since 2010
- Have withstood judicial review and been subjected to peer review
- Represent more climate impacts than EPA's 2022 draft update

##### Cons

- Severely understate total climate damages
- Do not incorporate more recent climate science and economics
- Likely to be replaced soon at the federal level

<sup>34</sup> These valuations are presented at Interagency Working Grp. (2021), *supra* note 5, at 5 tbl.ES-1.

<sup>35</sup> 4 COLO. CODE REGS. § 723-4:4528 (2023) (requiring Colorado Public Utilities Commission to apply a 2.5% or lower discount rate for the social cost of carbon); WASH. ADMIN. CODE. § 194-40-100 (2020) (requiring Washington state utilities to use the Working Group's valuation at 2.5%, or higher values).

<sup>36</sup> Decision Adopting Cost-Effectiveness Analysis Framework Policies for All Distributed Energy Resources at 41–42, Cal. Pub. Utils. Comm'n Docket No. 14-10-003 (May 21, 2019) (using the Interagency Working Group's 3% central estimate and 3% high-damages estimate).



## Conclusion

States and other entities adopting the social cost of carbon have three principal valuation options while the federal government updates its estimates. Each option has pros and cons that generally reflect a tradeoff between accuracy and precedence. EPA's 2022 draft estimates provide the best reflection of the current science and economics, but they remain unfinalized and have not yet been widely adopted. In contrast, the Interagency Working Group's 2016 estimates (adjusted for inflation in 2021) are now considered outdated and very conservative, but they have also been widely adopted and judicially upheld. New York's 2020 estimates reflect a middle ground between these two federal estimates.

As the issue remains in flux, policymakers should consider the needs and dynamics of their jurisdiction in assessing which estimate is best to use. Whichever value is selected, however, policymakers should recognize that this value is likely an underestimate and therefore should provide a floor—not a ceiling—for climate policy. This is particularly true for the Interagency Working Group's estimates.

Furthermore, regardless of which valuation policymakers select now, they should adopt EPA's new valuation once the agency finalizes those estimates (if not sooner). This finalization is expected by 2024.

# Appendix: Additional Resources

## Government Documents

[EPA Draft Report on the Social Cost of Greenhouse Gases: Guidance Documents](#)

N.Y. Dep't of Env't Conservation, Climate Change [Guidance Documents](#)

Interagency Working Group on the Social Cost of Greenhouse Gases, [2021 Technical Support Document](#)

## Reports for Policymakers

The Cost of Climate Pollution, [CostOfCarbon.org](#)

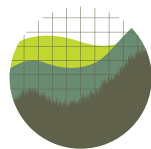
- [States Using the SCC](#)
- [Frequently Asked Questions](#)

Justin Gundlach & Iliana Paul, [The Social Cost of Greenhouse Gases: A Guide for State Officials](#) (2022).

Richard L. Revesz & Max Sarinsky, [The Social Cost of Greenhouse Gases: Legal, Economic, and Institutional Perspective](#), 39 YALE J. ON REG. 854 (2022).

Iliana Paul, Peter Howard, and Jason Schwartz, [The Social Cost of Greenhouse Gases and State Policy: A Frequently Asked Questions Guide](#) (2017)

Inst. for Policy Integrity, [Social Cost of Greenhouse Gases](#) (2017)



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