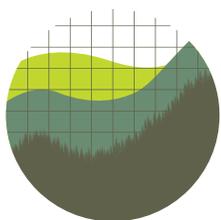




Analytical Clarity

How Updated Climate-Damage Values and Discount Rates Will Affect Regulatory Analysis



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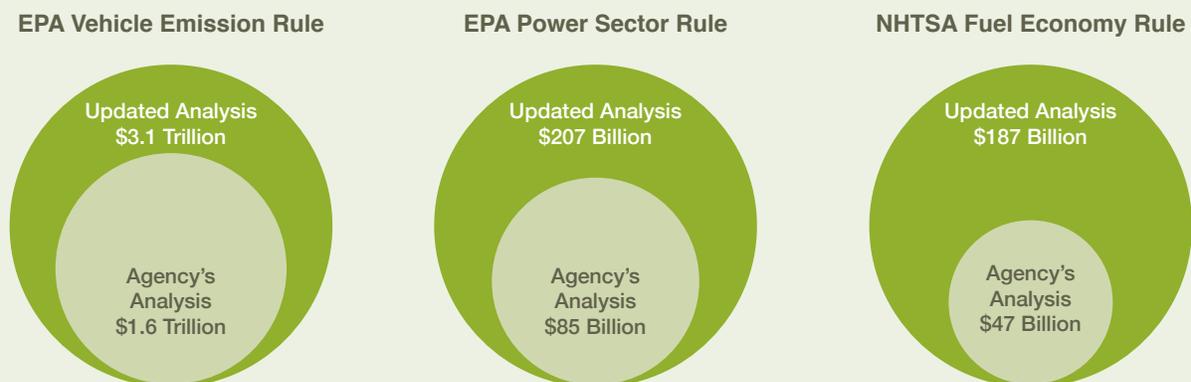
Recently completed guidance is ushering in updated practices for federal benefit-cost analysis. This policy brief examines the impact of two of the most significant upcoming changes: to the discount rate and the social cost of greenhouse gases.

A discount rate translates impacts that occur at different times into a common present value. Since 2003, agencies have used annual discount rates of 3% and 7% in benefit-cost analysis for new regulations. But more recent economic evidence indicates that a substantially lower discount rate is appropriate, meaning that federal regulators have undervalued long-term benefits and costs. In November 2023, the White House Office of Management and Budget (OMB) revised the default discount rate to 2%. This lower rate means that long-term benefits and costs will properly receive greater weight in regulatory analysis, consistent with the latest theory and evidence. However, the update is not mandatory for final rules issued before 2025.

The social cost of greenhouse gases is a set of monetary valuations that capture the harm to society from emitting climate pollution. These valuations have been applied in benefit-cost analysis since 2010 to monetize the social benefit of emissions reductions or the social cost of emissions increases. But they have also grown outdated, with newer evidence indicating that the harm from climate damage is far higher than reflected in the federal numbers. In December 2023, the Environmental Protection Agency (EPA) issued new valuations reflecting the latest available climate science and economics that, unsurprisingly, are substantially greater than the prior federal estimates. However, it is unclear whether agencies aside from EPA will use them.

To assess the effect of these two updates, we updated the benefit-cost analysis for three recent proposed regulations using the updated discount rate and climate-damage valuations. These three illustrations find that agencies are vastly undercounting the benefits—and the net benefits (i.e., benefits minus costs)—of significant regulations under current practice. Updated discount rates and climate-damage valuations reveal that the net benefits of these proposed rules are far higher—approximately two to four times higher, for the three rules we analyzed—than previously recognized.

Net Benefits of Three Proposals: Agency's Analysis vs. Updated Analysis



These updates thus offer strong support for these regulatory proposals. Agencies routinely conduct benefit-cost analysis for proposed and finalized rules and longstanding executive orders instruct agencies to maximize net benefits in their regulatory design. Notably, our updated analysis shows that agencies are particularly underestimating the net benefits for each rule's most stringent alternative. Thus, while these updates to discounting and climate-damage values support the three evaluated proposals, they provide even more support in each case for the more stringent option.

Background on Discounting and the Social Cost of Greenhouse Gases

Discount Rates

In economic analysis, a social discount rate places impacts at different future times into a common present value. Starting in 2003, Circular A-4—the primary federal guidance document on benefit-cost analysis—advised agencies to apply discount rates of 3% and 7% in regulatory impact analysis.¹ The 3% rate, known as the consumption rate, reflected the estimated rate (as of 2003) at which society discounted future consumption relative to present consumption; the 7% rate, known as the capital rate, reflected the then-anticipated rate of return to capital.² These rates, particularly 7%, substantially devalue effects to future generations.³ Experts have increasingly recognized that they are outdated and inappropriately devalue the future.

In November 2023, OMB updated Circular A-4.⁴ Following updated data and extensive economic scholarship, that update lowers the default, risk-free consumption discount rate used in regulatory impact analysis from 3% to 2%.⁵ Also reflecting current economic research, the update eliminates the capital discount rate (7% in the 2003 guidance) and replaces it with the “shadow price of capital” approach.⁶ Lowering the discount rate is consistent with the best available evidence and widely supported by the leading experts. In a recent article in *Science*, for instance, nearly 20 experts voiced their support for the proposed update.⁷

Though very recently finalized, the new Circular A-4 does not take effect for most final rules until 2025 but allows agencies to follow its guidance earlier “to the extent feasible and appropriate.”⁸ Regulations finalized over the coming year are therefore likely to continue using the 3% and 7% discount rates from the 2003 guidance, but may also apply the 2% rate from the 2023 guidance.

Social Cost of Greenhouse Gases

The social cost of greenhouse gases metrics reflect the net cost to society of carbon dioxide emissions (or emissions of other greenhouse gases). In essence, the social cost of greenhouse gases is an estimate of the damage caused by each ton of climate pollution released into the air, in dollars.

The federal Interagency Working Group on the Social Cost of Greenhouse Gases released its first climate-damage estimates in 2010 and updated them twice over the next six years.⁹ But those valuations were recognized as underestimates

¹ OFF. OF MGMT. & BUDGET, CIRCULAR A-4: REGULATORY ANALYSIS 33–34 (2003).

² *Id.*

³ For instance, applying the 7% discount rate to an effect that accrues in 50 years devalues the effect by more than 97%. Applying it to an effect that accrues in 100 years devalues that effect by over 99.9%.

⁴ OFF. OF MGMT. & BUDGET, CIRCULAR NO. A-4 (Nov. 9, 2023).

⁵ *Id.* at 77.

⁶ *Id.* at 77–80.

⁷ Peter H. Howard et al., U.S. *Benefit-Cost Analysis Requires Revision*, 380 SCIENCE 803 (2023). Dr. Howard and Max Sarinsky, the other corresponding author of the Science letter, are on staff at the Institute for Policy Integrity at New York University School of Law.

⁸ CIRCULAR A-4 (2023), *supra* note 4, at 93.

⁹ 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).

from their inception, and this fact has become even clearer as climate science and economics have progressed.¹⁰ Outside experts place substantially higher valuations on the costs of climate change.¹¹ At this point, the Working Group's estimates are widely recognized as outdated and conservative.

In January 2017, the National Academies of Sciences called for a comprehensive update to the social cost of greenhouse gases that incorporated newer research,¹² but that update stalled for four years under the Trump administration. The federal government began this comprehensive update in 2021.¹³ In the meantime, it continues to endorse the values it had developed during the Obama administration, updated for inflation, while recognizing that they are underestimates and endorsing consideration of higher values.¹⁴

In December 2023, EPA published updated estimates applying the latest available research¹⁵ that underwent peer review.¹⁶ Unsurprisingly, given the state of available research, EPA's valuations are substantially higher than the Working Group's estimates.

Updating the Numbers

To assess the impact of these two changes, we updated the benefit-cost analysis of three recently proposed rules using the updated discount rates and climate-damage valuations. Keeping the rest of the agencies' analytical assumptions unchanged, we reanalyzed three pending rules:

- 1) EPA's proposed regulation of pollution from light- and medium-duty vehicles;
- 2) EPA's proposed greenhouse gas emissions standards for power plants; and
- 3) the National Highway Traffic Safety Administration's proposed fuel-economy standards for passenger cars and light trucks.

The results, presented below, show that the updated net benefits of these proposals—and more stringent alternatives under consideration—are far greater than the agencies recognized in their proposals.

¹⁰ 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.

¹¹ 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).

¹² NAT'L ACAD. SCI., ENGINEERING & MED., VALUING CLIMATE DAMAGES: UPDATING ESTIMATION OF THE SOCIAL COST OF CARBON DIOXIDE (2017).

¹³ INTERAGENCY WORKING GRP. (2021), *supra* note 9, at 36 (discussing Exec. Order 13,990 and calling for comments on updating the social cost of greenhouse gases).

¹⁴ *Id.* at 4.

¹⁵ ENV'T PROT. AGENCY, EPA REPORT ON THE SOCIAL COST OF GREENHOUSE GASES: ESTIMATES INCORPORATING RECENT SCIENTIFIC ADVANCES (2023).

¹⁶ FINAL COMMENTS SUMMARY REPORT, EXTERNAL LETTER PEER REVIEW OF TECHNICAL SUPPORT DOCUMENT: SOCIAL COST OF GREENHOUSE GAS (2023).

Illustration 1: EPA’s Vehicle Emission Standards

In May 2023, EPA proposed to strengthen tailpipe emissions standards for greenhouse gas and criteria pollutants for both light-duty and medium-duty vehicles.¹⁷ The standards, issued under Section 202 of the Clean Air Act, apply to vehicle model years beginning in 2027 and would increase in stringency through model year 2032.

According to EPA’s modeling, this proposed rule would produce benefits primarily by reducing greenhouse gas and criteria pollution and saving consumers fuel, repair, and maintenance costs.¹⁸ In total, EPA estimated that the proposal would result in \$85 billion in annualized net benefits for calendar years 2027 through 2055 (when using a 3% discount rate for all regulatory effects and the Working Group’s central estimate for the social cost of greenhouse gases¹⁹). These annualized benefits equate to a total net benefit of \$1.6 trillion.²⁰

In addition to its proposed approach, EPA also considered three regulatory alternatives. Of all the options, the most net beneficial under EPA’s modeling was Alternative 1, the most stringent regulatory option. EPA estimated that Alternative 1 would produce \$93 billion in annualized net benefits using a consistent 3% discount rate with central climate damages²¹ or \$1.8 trillion in total net benefits.²²

Policy Integrity updated EPA’s analysis using the recently updated discounting and social cost of greenhouse gases updates, and holding all other parameters constant.

Table 1: Net Benefits of EPA Vehicle Emissions Rule and More Stringent Alternative, Original and Updated (\$ Trillion²³)

	3% Discount Rate		2% Discount Rate	
	Proposal	Alternative 1	Proposal	Alternative 1
Working Group SC-GHG	1.6	1.8	2.0	2.1
EPA 2023 SC-GHG Update	2.5	2.8	3.1	3.4

As Table 1 illustrates, net benefit estimates nearly double—from \$1.6 trillion to \$3.1 trillion under the proposal, and from \$1.8 trillion to \$3.4 trillion under the more stringent Alternative 1—when applying both the updated discount rates and climate-damage estimates. This difference shows that the net benefits of the proposal are far greater than EPA has estimated.

¹⁷ Multi-Pollutant Emissions Standards for Model Years 2027 and Later Light-Duty and Medium-Duty Vehicles, 88 Fed. Reg. 29,184 (proposed May 5, 2023).

¹⁸ *Id.* at xlvii tbl.5. EPA monetizes PM2.5-related health benefits, but other benefits related to reductions in criteria pollutants and air toxics are unmonetized. See *id.*; *id.* at 7-45 tbl.7-3.

¹⁹ *Id.*

²⁰ *Id.*

²¹ EPA, DRAFT REGULATORY IMPACT ANALYSIS: MULTI-POLLUTANT EMISSIONS STANDARDS FOR MODEL YEARS 2027 AND LATER LIGHT-DUTY AND MEDIUM-DUTY VEHICLES liii tbl.16 (Apr. 2023). The eight estimates that EPA presents range from \$52–130 billion. *Id.*

²² *Id.* The full range of all eight estimates is \$660 billion–2.5 trillion.

²³ Valuations in this table are in 2020\$.

Illustration 2: EPA’s Power Plant Emission Standards

In May 2023, EPA proposed a suite of actions to reduce greenhouse gas emissions from fossil fuel-fired power plants.²⁴ The proposal, issued under Section 111 of the Clean Air Act, would limit greenhouse gas emissions from existing coal-fired units, the largest existing gas-fired units, and new gas-fired units.

As it did for the vehicles rule, EPA calculated the benefits, costs, and net benefits of the proposed standards and alternatives using the outdated discount rates from the 2003 Circular and the Obama-era climate-damage valuations.²⁵ For its proposal, EPA found net benefits of \$85 billion using a consistent 3% discount rate and central climate damages.²⁶ EPA also modeled the regulatory impacts of both a less stringent and a more stringent scenario. Net benefits were highest under the more stringent scenario, at \$89 billion under the same parameters.²⁷

Once again, Policy Integrity updated EPA’s modeling using the 2% discount rate from the updated Circular and EPA’s new climate-damage values, keeping constant all other parameters.

Table 2: Net Benefits of EPA Power Sector Rule and More Stringent Alternative, Original and Updated (\$ Billion²⁸)

	3% Discount Rate		2% Discount Rate	
	Proposal	More Stringent Scenario	Proposal	More Stringent Scenario
Working Group SC-GHG	85	89	116	121
EPA 2023 SC-GHG Update	167	189	207	232

As Table 2 illustrates, the net benefits of EPA’s power-sector rule are far greater than reported in the agency’s analysis. Using the updated discounting and climate-damage valuations, the net benefits of the proposal are \$207 billion compared to \$85 billion under the agency’s calculation. For the more stringent scenario, net benefits are \$232 billion using the updated valuations compared to \$89 billion under the agency’s current analysis. While the net benefits of the final rule may change as the agency continues to shape its regulation, this analysis illustrates that the net benefits of power-sector emissions reductions are far greater than EPA’s current analysis shows.

²⁴ New Source Performance Standards for Greenhouse Gas Emissions from New, Modified, and Reconstructed Fossil Fuel-Fired Electric Generating Units; Emission Guidelines for Greenhouse Gas Emissions from Existing Fossil Fuel-Fired Electric Generating Units; and Repeal of the Affordable Clean Energy Rule, 88 Fed. Reg. 33,240 (proposed May 23, 2023).

²⁵ EPA, REGULATORY IMPACT ANALYSIS FOR THE PROPOSED NEW SOURCE PERFORMANCE STANDARDS FOR GREENHOUSE GAS EMISSIONS FROM NEW, MODIFIED, AND RECONSTRUCTED FOSSIL FUEL-FIRED ELECTRIC GENERATING UNITS; EMISSION GUIDELINES FOR GREENHOUSE GAS EMISSIONS FROM EXISTING FOSSIL FUEL-FIRED ELECTRIC GENERATING UNITS; AND REPEAL OF THE AFFORDABLE CLEAN ENERGY RULE (2023). The original RIA did not model all components of the Proposed Rule, but EPA released updated modeling during the comment period that reflects the full proposal and incorporates some new assumptions regarding natural gas exports. EPA, Integrated Proposal Modeling and Updated Baseline Analysis Memo (July 7, 2023). This analysis presented here uses the numbers from the original RIA rather than the modeling update.

²⁶ *Id.* at ES-21 tbl.ES-5.

²⁷ *Id.*

²⁸ Valuations in this table are in 2019\$.

Illustration 3: NHTSA’s Vehicle Fuel-Economy Rules

In August 2023, NHTSA proposed to strengthen corporate average fuel-economy standards for passenger cars and light trucks.²⁹ (The regulation would also strengthen fuel-economy standards for heavy-duty pickup trucks and vans, but NHTSA conducted a separate analysis for those standards and they are beyond the scope of this policy brief.)

Under the proposal, NHTSA would increase fuel economy standards annually from the 2026 levels by 2% for passenger cars and 4% for light trucks (PC2LT4) over the model years 2027 to 2032. In total, NHTSA concluded (under the agency’s regulatory constraints³⁰) that these standards would result in \$46.5 billion in net benefits for calendar years 2022–2050 when using a 3% discount rate for all regulatory effects and the Working Group’s central climate-damages estimate.³¹ In addition to the proposed standards, NHTSA also considered various regulatory alternatives, including some that are more stringent (PC3LT5 and PC6LT8).³² Of the options evaluated, NHTSA found that its most stringent alternative, PC6LT8, would result in the greatest net benefits, producing \$51.0 billion in monetized net benefits using a consistent 3% discount rate.³³

We updated NHTSA’s analysis using the updated parameters, with results presented in Table 3.

Table 3: Net Benefits of NHTSA Fuel-Economy Rule and More Stringent Alternative, Original and Updated (\$ Billion³⁴)

	3% Discount Rate		2% Discount Rate	
	Proposal	More Stringent Scenario	Proposal	More Stringent Scenario
Working Group SC-GHG	46.5	51.0	54.0	57.0
EPA 2023 SC-GHG Update	179.1	352.0	186.6	357.9

Once again, the estimated net benefits of the proposal (PC2LT4) and most stringent alternative (PC6LT8) both increase significantly with the updated discount rate and climate-damage valuations. For the proposal, estimated net benefits of \$46.5 billion under NHTSA’s methodology jump to \$186.6 billion using the updated valuations. For the most stringent alternative, estimated net benefits rise from \$51.0 billion to \$357.9 billion.

²⁹ Corporate Average Fuel Economy Standards for Passenger Cars and Light Trucks for Model Years 2027–2032 and Fuel Efficiency Standards for Heavy-Duty Pickup Trucks and Vans for Model Years 2030–2035, 88 Fed. Reg. 56,128 (proposed Aug. 17, 2023).

³⁰ For purposes of statutory compliance, NHTSA falsely assumes that no automaker will comply with the regulation using compliance credits or by producing additional electric vehicles. See 49 U.S.C. § 32902(h). The rule’s net benefits are, in reality, likely far greater than estimated under NHTSA’s constrained analysis. See 88 Fed. Reg. at 56,340 n.587

³¹ *Id.* at 56,342 tbl.V-11.

³² See *id.* at 56,133 tbl.I-1; *id.* at 56,133 tbl.I-2.

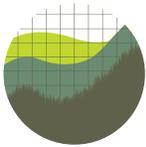
³³ NHTSA, PRELIMINARY REGULATORY IMPACT ANALYSIS: CORPORATE AVERAGE FUEL ECONOMY STANDARDS FOR PASSENGER CARS AND LIGHT TRUCKS FOR MODEL YEARS 2027 AND BEYOND AND FUEL EFFICIENCY STANDARDS FOR HEAVY-DUTY PICKUP TRUCKS AND VANS FOR MODEL YEARS 2030 AND BEYOND 42 to 8-43 tbl.8-14 (July 2023).

³⁴ Valuations in this table are in 2021\$.

Conclusion

The best available data and inputs should guide benefit-cost analysis. Yet as the federal government has recognized, several key inputs used to quantify regulatory effects are no longer consistent with the best data and require updating. This policy brief examines the effect of updates to the discount rate and the social cost of greenhouse gases.

As this brief illustrates, using the recently finalized discount rate of 2% and EPA's updated climate-damage valuations reveals that the federal government has been systemically underestimating the net benefits of recent major regulations that reduce greenhouse gas emissions. Such findings underscore the importance of recalibrating existing regulatory assessment frameworks to reflect the evolving landscape of economics and climate science.



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