

Carbon Counts



INCORPORATING THE BENEFITS OF CLIMATE PROTECTION INTO FEDERAL RULEMAKING

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finding the ways that work

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Our mission

Environmental Defense Fund is dedicated to protecting the environmental rights of all people, including the right to clean air, clean water, healthy food and flourishing ecosystems. Guided by science, we work to create practical solutions that win lasting political, economic and social support because they are nonpartisan, cost-effective and fair.

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Executive Summary



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The United States is developing national climate legislation. While the nation debates and assembles a comprehensive policy, federal agencies are issuing important policies – from clean energy codes to air pollution standards – that affect greenhouse gas emissions today. For these policies, the final choice among different regulatory alternatives can have significant consequences for global warming pollution. Ensuring that “carbon counts” in the development of federal rules is critical to identify and implement cost-effective opportunities for greenhouse gas reductions.

Recent economic analyses in California and Florida examined the economic benefits and job growth associated with clean energy solutions. In both states, the studies found that climate-friendly policies would yield considerable economic dividends. As the nation faces serious economic challenges, these studies show that well-designed policies can maximize societal benefits by reducing a host of air pollutants including heat-trapping gases. And, as Florida policymakers found, these policies can hasten economic revitalization by “creating new job opportunities, and positioning Florida’s ‘green tech’ sector as an economic engine for growth.”¹

Executive Branch directives govern the federal regulatory planning and review process. Executive Order 12,291, Executive Order 12,866, and their progeny provide for Executive Branch coordination and centralized review of federal regulations. These directives instruct federal agencies to assess the benefits and costs of each significant regulatory action where legally permitted. The resulting economic assessments accompany the development and issuance of these regulations. And, under Executive Branch policies currently in effect, federal agencies are admonished to select the approaches that maximize net societal benefits:

“...the Action Team [on Energy and Climate Change] firmly believes that current economic conditions precisely sharpen the ‘call to action’ first issued by Governor Crist in 2007. Now is the time for strategic investment in Florida’s low-carbon energy infrastructure if we are to be successful in diversifying the state’s economy, creating new job opportunities, and positioning Florida’s ‘green tech’ sector as an economic engine for growth.” – Florida Energy and Climate Change Action Plan, Executive Summary²

[I]n choosing among alternative regulatory approaches, agencies should select those approaches that maximize net benefits (including potential economic, environmental, public health and safety, and other advantages; distributive impacts; and equity), unless a statute requires another regulatory approach.³

All too often, however, the White House Office of Management and Budget has leveraged its review to weaken health protective standards and has declined to provide a complete and transparent accounting of societal benefits.

The White House Office of Management and Budget's myopic approach is manifest in the area of global warming. The benefits of greenhouse gas emissions reductions have been neglected or altogether omitted in policy development, despite an important body of economic research that monetizes the considerable societal benefits of global warming pollution reductions. The U.S. Environmental Protection Agency recently released an analysis of this body of research. The Agency's review further demonstrates that if benefit cost analysis is to be rigorous and complete, it must take carbon into account.

The White House Office of Management and Budget's myopic approach is manifest in the area of global warming.

Our research finds that, across a wide range of federal agencies, ongoing rulemakings fail to account for the societal benefits of reducing global warming pollution:

- The U.S. Department of Transportation's Corporate Average Fuel Economy standards for sport utility vehicles, minivans and pickup trucks, finalized in 2006, were deemed inadequate by a federal court of appeals because the Agency refused to consider the benefits of carbon dioxide reductions. The Agency's subsequent proposed fuel economy standards, announced in April 2008, include only a cursory, flawed analysis of carbon dioxide mitigation benefits.
- The U.S. Department of Energy's 2007 furnace efficiency standards failed to include the benefit of reduced greenhouse gas emissions in its benefit cost analysis, despite prominently touting those reductions in press outreach.
- In September 2008, the U.S. Environmental Protection Agency issued emission standards for high-emitting gasoline engines, including those used in lawnmowers and personal watercraft. The standards failed to account for the climate benefits of reducing ground-level ozone, identified by the Intergovernmental Panel on Climate Change as the third largest contributor to global warming of all air pollution caused by human activities.⁵

"Even if [the Department of Transportation] may use a cost-benefit analysis to determine the 'maximum feasible' fuel economy standard, it cannot put a thumb on the scale by undervaluing the benefits and overvaluing the costs of more stringent standards. [The agency] fails to include in its analysis the benefit of carbon emissions reductions in either quantitative or qualitative form." – U.S. Court of Appeals in rejecting the Department of Transportation's 2006 fuel economy standards.⁴

The results of benefit cost analysis can heavily influence policy development. By giving global warming short shrift in benefit cost analysis, the nation is missing important, cost-effective opportunities to achieve emissions reductions. While America continues to work toward comprehensive federal climate change legislation, incorporating the social cost of carbon into the federal rulemaking process is a common sense opportunity to craft policies that secure the benefits of greenhouse gas reductions today.

1. Defining the Social Cost of Carbon



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The costs of climate change

Current scientific understanding shows definitively that anthropogenic emissions of greenhouse gases are driving significant changes in the global climate. The Intergovernmental Panel on Climate Change's (IPCC) most recent compilation and assessment of climate change science, the *Fourth Assessment Report*, found that evidence of global warming is "unequivocal,"⁶ and that "[m]ost of the observed increase in global average temperatures since the mid-20th century is *very likely* due to the observed increase in anthropogenic greenhouse gas concentrations."⁷

These increases in temperature have already led to a variety of physical manifestations of warming that have important consequences for the United States and the globe.⁸ Worldwide, the IPCC reported that ongoing and predicted impacts include increased frequency of extreme weather events, sea level rise and species extinction, among many others.⁹ In North America, the IPCC reviewed the findings of hundreds of studies that predicted decreases in winter snowpack and earlier snowmelt in the West, with serious potential ramifications for water supply systems; increasing severity of coastal flooding and erosion hazards due to rising sea levels; and heightened health risks due to increased ozone pollution and increased frequency of heat waves.¹⁰

A particular source of concern is the dramatic impact that climate change is predicted to have on human health. The IPCC report outlined a wide range of expected impacts, from changing the range of malaria and other infectious diseases, to higher levels of ground-level ozone ("smog") and increasing death and disease associated with natural disasters.¹¹ A recent report on the U.S. health and welfare consequences of climate change predicted increased heat-related morbidity and mortality, increased spread of pathogens and increased health risks stemming from extreme weather events.¹² Research by the National Aeronautics and Space Administration's Goddard Institute for Space Studies on 85 major U.S. cities found that continued warming would produce higher ambient ozone levels, leading to more

frequent and widespread exceedances of health-based regulatory standards and higher daily mortality levels.¹³

Another profound risk from climate change is the potential for catastrophic impacts that could be irreversible on time scales relevant to society. Increasing evidence suggests that even relatively low increases in temperature may trigger a range of devastating impacts across the globe. To take just one example, science indicates that there may be a relatively low temperature threshold, between 1.7 and 3.7°C of warming above today's temperatures, beyond which the Greenland ice sheet could begin irreversible meltdowns.¹⁴ This would eventually raise sea levels as much as 7 meters (23 feet).¹⁵

Scientists have identified many other examples of key vulnerabilities to even low levels of global warming, including irreversible changes such as a long-term shift in ocean circulation¹⁶ and widespread species extinction.¹⁷ Average global temperature has already increased 0.74°C over the past one hundred years, and the current concentration of greenhouse gases in the atmosphere commits the globe to approximately 0.6°C of further warming.¹⁸ Thus, the existing atmospheric concentration of greenhouse gases has already put us on the path of increasingly perilous risk of some of these catastrophic, irreversible impacts of climate change.

Monetizing the social cost of carbon

Observed and predicted impacts from unmitigated climate change have profound implications for the global and U.S. economy. In an effort to gauge the scale of these impacts, economists have been evaluating the potential impact of climate change on economic growth, monetizing its overall cost and estimating a value of the social cost associated with emission of one metric ton of carbon dioxide, or the "social cost of carbon." The IPCC defines the social cost of carbon as:

...an estimate of the economic value of the extra (or marginal) impact caused by the emission of one more tonne of carbon (in the form of carbon dioxide) at any point in time; it can, as well, be interpreted as the marginal benefit of reducing carbon emissions by one tonne.¹⁹

Economic estimates of the impact of climate change are typically based on the results of integrated assessment models, which pair a scientific model of the predicted physical impacts of climate change with a socioeconomic model that evaluates the economic impact of these effects.²⁰ The models predict likely impacts of climate change at different points in the future, estimate their value and discount the values back to the present. In recent years, a number of analyses have created new social cost of carbon estimates, either by using the results of new runs of integrated assessment models, or by using a meta-analysis to generate social cost of carbon estimates based on a variety of model runs with an assortment of underlying assumptions.

The U.S. Environmental Protection Agency (EPA) recently released an assessment of the social cost of carbon that integrates the most recent work in this field. EPA's June 2008 analysis, "Technical Support Document on Benefits of Reducing GHG Emissions," outlines key concepts and strategies for estimating social cost of carbon values, as well as EPA's own proposed social cost of carbon estimates.²¹ EPA's document offers an important starting point for federal agencies to incorporate social cost of carbon into their analyses of rules that affect greenhouse gas emissions.

Based on a meta-analysis of recent peer-reviewed studies, EPA's preliminary mean estimate of the marginal benefit of reducing emissions of carbon dioxide was \$40/tCO₂ (3% discount rate) or \$68/tCO₂ (2% discount rate).²² These figures represent the cost of 2007 emissions, in 2006 dollars.²³ For

emissions in the future, the estimates are larger because emissions produce larger incremental damages as the magnitude of climate change increases. For example, the mean estimates for emissions in 2040 rise to \$105/tCO₂ (3% discount rate) or \$179/tCO₂ (2% discount rate).²⁴ The EPA meta-analysis was built on the methods used by Professor Richard Tol in his two peer-reviewed, published meta-analyses of social cost of carbon research, but the Agency included only recent peer-reviewed studies that met a range of quality criteria in its evaluation.

EPA found that existing analyses, including its own, likely underestimate the social cost of carbon

EPA acknowledged that studies used in the meta-analysis omitted a number of important impact categories. Climatic change presents profound ethical issues that economic tools are often poorly suited to address, particularly the risk of irreversible or catastrophic impacts to future generations.²⁵ The research of Professor Martin Weitzman at Harvard University has shown that the risk of catastrophic climate change fundamentally affects the usual economic calculus of costs and benefits.²⁶ Professor Weitzman's work indicates that the expected damages of climate change may be dominated by the existence of calamitous impacts that have low probability but very high damages (such as double-digit increases in mean global temperature). In contrast, most economic analyses to date have put very little weight on such events because of their low probability.

EPA also acknowledged that existing economic tools do a poor job of accounting for “nonmarket” impacts of climate change. Nonmarket impacts refer to damages that are not traded explicitly in markets. These effects include many of the most serious potential impacts of climate change: increased risks from extreme weather events, increased potential for violent conflict, and disruption of coastal and agriculture-dependent communities.²⁷ But because the economic value of nonmarket impacts is not revealed through market prices, these impacts can only be approximated through a range of imperfect economic techniques and many of these impacts are not currently included in estimates of the social cost of carbon. As a result, according to the IPCC, “[i]t is very likely that globally aggregated figures underestimate the damage costs because they cannot include many non-quantifiable impacts.”²⁸

In addition, EPA highlighted that existing studies fail to incorporate findings that climate change is occurring faster than expected and that populations may be more vulnerable than expected.²⁹ Together, all of these omissions indicate that existing estimates of the social cost of carbon, including the recent EPA estimates, may significantly underestimate the value of climate protection.

EPA recommended the use of a global social cost of carbon estimate

Climate change has far-reaching global consequences. EPA emphasized that because of the long lifetimes and global mixing that are characteristic of greenhouse gases, emissions from one country have worldwide effects.³¹ Moreover, social cost of carbon estimates that reflect only direct domestic U.S. effects will miss the effects that international feedback impacts, like economic disruption or national security concerns, can have on the United States.³² For example, recent testimony before the U.S. House Intelligence Committee and Select Committee on Energy Independence and Global Warming by Dr. Tom Fingar, Deputy Director of National Intelligence for Analysis and Chairman of

“We judge global climate change will have wide-ranging implications for US national security interests over the next 20 years...We judge that the most significant impact for the United States will be indirect and result from climate-driven effects on many other countries and their potential to seriously affect US national security interests.” – Dr. Tom Fingar, Deputy Director of National Intelligence for Analysis³⁰

the National Intelligence Council, highlighted the findings of a National Intelligence Assessment on the security implications of climate change:

We judge global climate change will have wide-ranging implications for US national security interests over the next 20 years...We judge that the most significant impact for the United States will be indirect and result from climate-driven effects on many other countries and their potential to seriously affect US national security interests.³³

Considering the serious global effects of greenhouse gases, EPA found strong justifications for use of a global social cost of carbon estimate.³⁴

*EPA advised that using a low discount rate
is most appropriate for estimating the social cost of carbon*

The discount rate represents the assumed rate at which society is willing to trade off present for future benefits and thus is a policy choice for decision-makers, rather than a figure dictated by the economic literature. A lower discount rate effectively places a higher value on the welfare of future generations, which translates into a larger present value of the damages from climate change. Many significant climate impacts are predicted to occur more than 50 years in the future, and therefore the choice of discount rate strongly affects the present value of these impacts.³⁵ Application of different discount rates is one of the major sources of variation among social cost of carbon estimates.³⁶

EPA recommended that discount rates of 3% or lower are most consistent with the intergenerational nature of many of climate change's effects.³⁷ The White House Office of Management and Budget's (OMB) Circular A-4 general analytical guidance allows for the use of low discount rates (e.g., 1-3% by OMB, 0.5-3% by EPA) in cases with significant intergenerational implications.³⁸ Economic literature also indicates that discount rates of 3% or lower are appropriate to reflect the primarily consumption-based impacts, the risks of disastrous impacts to future generations and uncertainty in economic growth and interest rates far into the future.³⁹

* * *

It is difficult to assign a monetary value to many of the predicted or potential impacts of climate change, or to the social and ethical dimensions of putting generations and societies at risk of disaster when they have not materially contributed to global warming. But it is precisely because of the grim impacts of climate change that there is an immediate urgency to incorporate the social cost of carbon throughout federal decision making, even given remaining uncertainty. Uncertainties about matters such as intergenerational equity and the risks of catastrophic impacts do not justify failing to assess the societal benefits of greenhouse gas mitigation in relevant rulemakings; instead they underscore the need for rigorous and transparent analysis that maximizes net societal benefits.

2. Analyzing Economic Benefits and Costs in Federal Rulemaking



Since 1981, executive orders have called for federal agencies to prepare economic analyses to accompany major regulatory actions. The assessments include the benefits and costs anticipated from the regulatory action and potential alternatives. Within the White House, the Office of Management Budget has carried out the coordinated review of regulatory actions across federal agencies.

There is ongoing debate about the role of benefit cost analysis in federal rulemakings, particularly those dealing with human health and the environment.⁴⁰ Further, some health and safety laws properly proscribe the consideration of economic issues in standard-setting and carrying out other core statutory responsibilities. This discussion assumes that, in instances where it is permitted by law, analysis of societal benefits and costs will remain a central component of the federal rulemaking process. It focuses on the steps necessary to assure that economic assessments most accurately and consistently reflect the true costs and benefits of rules that affect greenhouse gas emissions, a matter of enormous societal consequence.

In 1981, President Ronald Reagan issued Executive Order 12,291, which called for agencies to conduct a “Regulatory Impact Analysis” (RIA) for “major” rules likely to result in an annual effect on the economy of \$100 million or more.⁴¹ Under this executive order, each RIA contained an explicit analysis of the rule’s potential economic benefits and costs. With this action, President Reagan elaborated on earlier Presidents’ policies providing for executive branch coordination of the rulemaking process.⁴²

In 1993, President William Clinton revoked Reagan’s executive order and replaced it with Executive Order 12,866, which called for agencies to prepare “[a]n assessment of the potential costs and benefits” of “significant regulatory action.”⁴³ Executive Order 12,866 declared the following objectives:

The objectives of this Executive order are to enhance planning and coordination with respect to both new and existing regulations; to reaffirm the primacy of Federal agencies

in the regulatory decision-making process; to restore the integrity and legitimacy of regulatory review and oversight; and to make the process more accessible and open to the public.⁴⁴

President George W. Bush amended Executive Order 12,866 with Executive Order 13,258 in 2002 and Executive Order 13,422 in 2007. These revisions made some adjustments to Executive Order 12,866 while retaining major components.⁴⁵ In practice, however, the Office of Management Budget has all too often exercised sweeping and damaging oversight by relying on its review role to preclude or weaken health-protective policies.

Executive Order 12,866 addresses the importance of quantifying the full range of costs and benefits of regulatory alternatives. Section 1(a) states that:

In deciding whether and how to regulate, agencies should assess all costs and benefits of available regulatory alternatives, including the alternative of not regulating. Costs and benefits shall be understood to include both quantifiable measures (to the fullest extent that these can be usefully estimated) and qualitative measures of costs and benefits that are difficult to quantify, but nevertheless essential to consider.⁴⁶

Thus, costs and benefits that are difficult to monetize must still be factored into the analysis.

Executive Order 12,866 does not require a showing that the benefits outweigh the costs. Section 1(b)(6) of Executive Order 12,866 states that agencies “shall 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.”⁴⁷

The Office of Management and Budget has published a series of guidelines for preparing regulatory analysis. Its 2003 Circular A-4, “Regulatory Analysis,” addresses at least four substantive issues relevant to monetizing greenhouse gas emissions.⁴⁸ It calls for agencies to: monetize nonmarket benefits through methods including stated preference and benefit-transfer; use multiple discount rates to calculate the present value of future benefits; consider international effects; and employ a rigorous quantitative analysis of uncertainty in key elements underlying the estimate of costs and benefits, such as uncertainty regarding “how some economic activities might affect future climate change.”⁴⁹

Greenhouse gas emissions carry with them great societal costs because they cause global climate change and its host of associated ill effects. Omitting the significant benefits of reducing greenhouse gases from economic assessments for major rules contravenes one of the fundamental precepts of economic analysis by failing to account for all of the societal benefits.⁵⁰ Executive Order 12,866 provides a framework for incorporating the social benefits of ameliorating these impacts into federal rulemaking across all agencies. Under Executive Order 12,866, federal agencies are called upon to craft policies that maximize societal benefits. By neglecting the benefits of reduced global warming pollution, federal policies fundamentally fail to maximize critical benefits to society.

3. Federal Fuel Economy Standards Were Recently Overturned for Failing to Value Carbon Dioxide Reductions



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Recently, a federal court of appeals found that the U.S. Department of Transportation erred in issuing the national Corporate Average Fuel Economy (CAFE) standards for light-duty trucks by failing to account for the benefits of reducing carbon dioxide emissions.⁵¹ The federal fuel economy standards are issued by National Highway Traffic and Safety Administration (NHTSA) under the Energy Policy and Conservation Act of 1975, which was enacted to decrease dependence on foreign oil and to conserve fuel in the aftermath of the 1973 Mideast oil embargo.

In 2006, NHTSA issued final fuel economy standards addressing many sport utility vehicles, minivans, and pickup trucks for Model Years 2008-2011. The statute calls for NHTSA to establish fuel economy standards reflecting the “maximum feasible average fuel economy level” considering the “technological feasibility, economic practicability, the effect of other motor vehicle standards of the Government on fuel economy, and the need of the United States to conserve energy.”⁵²

NHTSA relied on benefit cost analysis in establishing the fuel economy standards for light-duty trucks. In its benefit cost analysis, however, the Agency refused to consider the benefits of reducing carbon dioxide emissions despite a 2002 report by the National Academy of Sciences and extensive public comments documenting the monetary benefits of carbon dioxide emissions cuts.⁵³

The U.S. Court of Appeals for the Ninth Circuit held that NHTSA’s refusal to consider these benefits was arbitrary and capricious. The court pointedly focused on the paradox of NHTSA’s approach. NHTSA was employing benefit cost methodology to develop its fuel economy standards while assigning no value at all to the considerable benefit of reducing carbon dioxide emissions:

Under this methodology, the values that NHTSA assigns to benefits are critical. Yet, NHTSA assigned no value to *the most significant benefit* of more stringent CAFE standards: reduction in carbon emissions.⁵⁴

The court reviewed and rejected several arguments the government made to justify its omission of carbon emissions from the benefit cost analysis. NHTSA argued that no value could be assigned to carbon emissions because of uncertainty about valuation. The court rejected this approach and held that evolving methodologies for valuing carbon emissions provided a sufficient, and indeed necessary, framework for benefit cost analysis:

[W]hile the record shows that there is a range of values, the value of carbon emissions is certainly not zero. . . . By presenting a scientifically-supported range of values that does not begin at zero, Petitioners have shown that it is possible to monetize the benefit of carbon emissions reduction.⁵⁵

The court similarly rejected NHTSA's argument that the range of values was too wide to monetize the benefits of carbon dioxide emissions reductions in benefit cost analysis.⁵⁶ Further, the court pointed out that NHTSA monetized other benefits with significant uncertainties: the reduction of criteria pollutants (including particulate matter, sulfur oxides and nitrogen oxides), reduction of crashes, noise, congestion, and energy security.⁵⁷ Finally, the court rejected NHTSA's argument that even if it could assign a value to greenhouse gas emissions, there was no evidence that this value would have affected the stringency of the fuel economy standards. The court pointed to information in the administrative record showing that NHTSA's argument "runs counter to the evidence before it."⁵⁸

In holding that NHTSA's failure to consider the monetary benefits of carbon mitigation was arbitrary and capricious, the Ninth Circuit provided a framework for federal agencies to employ reasoned decision-making when carrying out delegated statutory authority or examining the economic implications of rulemaking pursuant to executive branch directives. Under the court's framework, federal agencies should exercise sensible judgment in determining the value of greenhouse gas reductions despite varying estimates, and should be complete and transparent in analyzing the societal benefits. Conversely, the court's holding cautions against pre-ordaining the policy outcome by neglecting or shunting aside the potentially considerable benefits of greenhouse gas mitigation.

More recently, NHTSA itself had an opportunity for corrective action. In April 2008, NHTSA purported to examine the social cost of carbon in its benefit cost analysis when it issued its Notice of Proposed Rulemaking on "Average Fuel Economy Standards, Passenger Cars and Light Trucks, Model Years 2011–2015."⁵⁹ While NHTSA's incorporation of a value greater than zero for the social cost of carbon was at least a modest improvement over its past refusal to assign any value for greenhouse gas emissions abatement, NHTSA's analysis still falls far short of reasoned decision-making.

NHTSA mishandled at least the following three central issues in its new analysis of the social cost of carbon:

- 1) How to discount the costs and benefits of greenhouse gas emissions reductions;
- 2) Whether to use a global or domestic value for the economic benefit of reducing greenhouse gas emissions; and
- 3) What methodology to use to estimate the social cost of carbon.

In considering how to approach each of these critical issues, NHTSA employed misguided choices to come up with an estimate of the social cost of carbon that consistently and significantly underestimated the benefits of reducing global warming pollution. NHTSA's analysis included discount rates far above those appropriate for intergenerational discounting;⁶⁰ NHTSA used an estimate of the domestic social cost of carbon, despite clear evidence of the importance of the global impacts of climate change and Office of Management and Budget policy that allows such impacts to be incorporated;⁶¹ and NHTSA also arbitrarily selected some of its estimates.⁶²

Together, these choices generated markedly low social cost of carbon estimates. NHTSA employed these misguided figures in the benefit cost analysis used to select the new proposed CAFE standards. As a result, NHTSA underestimated the benefits of strong fuel economy standards. Despite using a deeply flawed estimate of the value of reducing global warming pollution in its economic analysis, NHTSA's press release highlighted the greenhouse gas benefits of the standards, praising them for saving "nearly 55 billion gallons of fuel and a reduction in carbon dioxide emissions estimated at 521 million metric tons."⁶³

On October 10th, NHTSA issued revised but still seriously flawed social cost of carbon estimates in its Final Environmental Impact Statement for the proposed CAFE standards.⁶⁴ NHTSA used a domestic social cost of carbon estimate of \$2/ton of CO₂ in the analysis' reference case scenario.⁶⁵ This estimate is based on similarly flawed assumptions and reasoning regarding methodology, discount rates and global versus domestic estimates that plagued NHTSA's earlier estimates in its proposed standards.⁶⁶ While NHTSA performed sensitivity analysis that included social cost of carbon figures based on global estimates, these global figures were still based on problematic assumptions.⁶⁷ Moreover, NHTSA's analysis is fundamentally flawed by the arbitrarily low estimate used in its base case scenario. If NHTSA were to use this unsound domestic social cost of carbon figure as the basis of its final standards, NHTSA would again utterly fail to secure the full benefits of stronger fuel efficiency standards for energy and climate security.

NHTSA's CAFE rulemaking is the most recent example of the pitfalls of an inadequate consideration of the social cost of carbon. The resulting flaws are precisely the deficiencies that the Ninth Circuit endeavored to correct by removing "a thumb on the scale" and restoring a balanced application of benefit cost analysis:

Even if NHTSA may use a cost-benefit analysis to determine the 'maximum feasible' fuel economy standard, it cannot put a thumb on the scale by undervaluing the benefits and overvaluing the costs of more stringent standards.⁶⁸

4. Missed Opportunities: Federal Rulemakings Have Neglected the Benefits of Global Warming Pollution Cuts



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Executive Order 12,866 provides for centralized review of significant regulatory actions and for an assessment of the anticipated benefits and costs, to the extent authorized by the substantive law being administered by the agency. In choosing among alternative approaches, it calls for federal agencies to “select those approaches that maximize net benefits (including potential economic, environmental, public health and safety, and other advantages; distributive impacts; and equity), unless a statute requires another regulatory approach.”⁶⁹ The social cost of carbon should be fully considered in the analysis of the benefits and costs for rules subject to this review. Our research has found, however, that federal agencies issue rules affecting greenhouse gas emissions without including the social cost of carbon in their analysis of benefit and costs. By ensuring that “carbon counts,” federal agencies can help craft policies that secure the benefits of greenhouse gas mitigation and maximize overall societal benefits.

Department of Energy furnace energy efficiency standards

The Energy Policy and Conservation Act (EPCA) established energy efficiency standards for many types of major residential appliances and commercial equipment. EPCA directs the Department of Energy (DOE) to set new or amended efficiency standards that “achieve the maximum improvement in energy efficiency . . . which the Secretary determines is technologically feasible and economically justified.”⁷⁰ A number of pieces of legislation require DOE to periodically review those statutory efficiency standards to determine whether they should be amended.⁷¹ DOE is currently conducting a multiyear review of the EPCA energy efficiency standards under court order. Over the next two years, DOE is scheduled to set energy efficiency standards that will apply to the manufacture and import of air conditioners, refrigerators, ovens, lamps and many other types of appliances.⁷² As DOE carries out its statutory responsibility to enhance the energy efficiency of appliances, each of these new standards will affect the level of greenhouse gases emitted by the equipment they cover.

In November 2007, DOE reviewed and revised the energy efficiency standard for residential furnaces and boilers.⁷³ The furnace rule was economically significant and subject to the requirement to conduct an assessment of the potential costs and benefits of the regulatory action, as well as the alternatives DOE considered. Gas furnaces emit greenhouse gases directly when they burn natural gas, and electrical furnaces are powered by electricity produced at power plants that produce greenhouse gases. Consequently, one of the major benefits of adoption of a more protective efficiency standard for gas and electric furnaces is the resulting significant reductions in the amount of greenhouse gases produced in the course of heating homes.

But DOE neglected any meaningful analysis of the greenhouse gas reduction benefits. The excerpts below are from DOE’s final rule, which mentions carbon dioxide emissions only in passing:

E. National Benefits	F. Need of the Nation to Conserve Energy
<p>...These energy savings are projected to result in cumulative greenhouse gas emission reductions of approximately 7.8 million tons (Mt) of carbon dioxide (CO₂). Additionally, the standards will help alleviate air pollution by resulting in approximately 9.2 thousand tons (kt) of nitrogen oxides (NO_x) emission reductions from 2015 through 2038, or a similar amount of NO_x emissions allowance credits in areas where such emissions are subject to emissions caps, and approximately 1.8 kt of household emission reductions of sulfur dioxide (SO₂).⁷⁴</p>	<p>In considering standards for furnaces and boilers, the Secretary must consider the need of the Nation to conserve energy. (42 U.S.C. 6295[o][2][B][i][VI]) The Secretary recognizes that energy conservation benefits the Nation in several important ways, including slowing the depletion of domestic natural gas resources, improving the security of the Nation’s energy system, and reducing greenhouse gas emissions.⁷⁵</p>

DOE also quantified the volume of emission reductions in carbon dioxide (CO₂), oxides of nitrogen (NO_x) and sulfur oxides (SO_x) that would result from each of the alternative standards (Trial Standard Levels, or TSLs) it considered (see Table 1). But DOE did not assign any specific dollar value to the reduction of carbon dioxide or other pollutant emissions in its economic analysis of benefits and costs. Instead, its economic analysis focused narrowly on the expenditures such as installation and fuel costs experienced by individual consumers that install new furnaces and boilers and the costs of new standards to equipment manufacturers. DOE’s economic analysis, in other words, wholly ignored the societal benefits of reducing carbon dioxide emissions or harmful pollutants such as NO_x and SO_x.

TABLE 1. **Summary of Emissions Reductions for Residential Furnaces and Boilers**

[Cumulative reductions for units sold from 2015 to 2038]⁷⁶

Emission	TSL 1	TSL A	TSL 2	TSL B	TSL 4	TSL 5
CO ₂ (Mt)	-6.1	-7.8	-20.0	-137.1	-141.3	-322.0
NO _x (kt)	-7.3	-9.2	-23.9	-164.6	-169.2	-373.1
SO ₂ (kt)	-0.0	-1.8	-2.0	-6.2	-10.5	-63.9

Despite this considerable omission, DOE stated that its economic analysis of the competing standards was the deciding factor in its selection of which standard to adopt:

In selecting energy conservation standards for residential furnaces and boilers for

consideration in the October 2006 proposed rule as well as this final rule, DOE started by examining the maximum technologically feasible levels, and determined whether those levels were economically justified. Upon finding the maximum technologically feasible levels not to be justified, DOE analyzed the next lower TSL [Trial Standard Level] to determine whether that level was economically justified. DOE repeated this procedure until it identified a TSL that was economically justified.⁷⁷

In the end, DOE selected TSL A for its final standard, finding that more stringent standards with greater emissions reductions were not economically justified. However, because DOE did not incorporate the value of the significant emissions reductions associated with stronger standards, its assessment of economic justification was incomplete and flawed.

An analysis of benefits that incorporated these values may very likely have found that stronger standards were indeed economically justified.

While the Department of Energy failed to consider the economic benefits of reducing global warming pollution during the rulemaking process to determine the furnace efficiency standards, the Agency's press office nonetheless heralded greenhouse gas reductions as one of the principal benefits of its new furnace standards.

While DOE failed to consider the economic benefits of reducing global warming pollution during the rulemaking process to determine the furnace efficiency standards, the Agency's press office nonetheless heralded greenhouse gas reductions as one of the principal benefits of its new furnace standards:

These amended standards will not only cut down on greenhouse gas emissions, but they also allow consumers to make smarter energy choices that will save energy and money . . . The total energy savings are estimated to result in cumulative greenhouse gas emission reductions of approximately 7.8 million tons (Mt) of carbon dioxide—an amount equal to the emissions produced by 2.6 percent of all light truck vehicles on U.S. roads in one year.⁷⁸

DOE's determination of the appropriate efficiency standard is plainly incomplete without including the value of abating greenhouse gas emissions and the host of pollutants affected in its economic assessment of monetary benefits. The fact that DOE selected among competing technologically feasible standards on the basis of an incomplete evaluation of economic factors makes it likely that the agency would have made a different selection if greenhouse gas emissions and other airborne contaminants had been monetized. Inclusion of the considerable benefits of these reductions is essential for meaningful and transparent analysis of the costs and benefits of this or other energy efficiency standards.

Environmental Protection Agency emission standards for small spark ignition engines

In September, EPA published final emission standards for small gasoline-powered engines used in non-road applications such as lawn and garden equipment and personal watercraft.⁷⁹ EPA's final economic assessment mentioned the benefits of reducing greenhouse gas emissions from these small engines, but neither quantified nor monetized the climate benefits associated with the various emission standards EPA considered.

Small engines, such as those found in lawn equipment and small boats, contribute significantly to unhealthy air quality and to global warming pollution. These engines account for about 25% of mobile source hydrocarbon emissions, an essential ingredient of ground-level ozone ("smog").⁸⁰ The large quantities of ozone precursors released by these engines not only pose serious threats to human health, but also contribute significantly to global warming.⁸¹

EPA's final regulatory assessment for the small engine standards did briefly acknowledge the climate benefits of reducing ground-level ozone pollution. EPA stated that ozone "is a major greenhouse gas,"⁸² and "is (after CO₂ and CH₄) the third most important contributor to greenhouse gas warming."⁸³ EPA also highlighted a recent statement by the National Academy of Sciences that "regulations targeting ozone precursors would have combined benefits for public health and climate."⁸⁴

However, these climate benefits were not incorporated into the assessment of monetary benefits for significant regulatory actions performed under Executive Order 12,866. EPA's economic assessment accompanying the final standards did analyze and quantify the health benefits associated with the direct air quality impacts of reducing ozone and particulate matter pollution. EPA estimated that the improvements in air quality spurred by the final standards would result in \$1.8 billion to \$4.4 billion in annual benefits by 2030 from avoided deaths, hospitalizations and sick days, assuming a 3% discount rate.⁸⁵ However, this benefits analysis failed to monetize the climate benefits of reducing ozone pollution.

Because EPA's benefit cost analysis was incomplete, EPA's analysis may not have resulted in emission standards that maximize full societal benefits. The final regulatory analysis set forth a range of both stronger and weaker alternative standards considered by EPA.⁸⁶ In some instances, EPA rejected stronger alternatives in part because it judged that they were not cost effective.⁸⁷ Yet these conclusions were based on incomplete information without full consideration of the societal benefits of reducing global warming pollution. Had EPA monetized the social cost of climate change when calculating the benefits of stronger standards, the agency would have had more rigorous and complete information for evaluating the range of alternatives.

Strong emissions standards for small engines create significant societal benefits by protecting human health from harmful air pollutants as well as mitigating climate change. To weigh the full benefits of new standards, EPA should have quantified the climate benefits of reducing small engine emissions in its final regulatory assessment for small engine standards together with the significant health benefits from reducing ozone and particulate pollution. The resulting calculation would generate a more accurate portrait of the different standards, helping to inform EPA's choice of standards that maximize societal benefits.

Conclusion: Carbon Counts



Federal agencies are taking regulatory actions under existing laws that affect the level of greenhouse gas emissions released to the air. A broad range of federal agencies, beyond EPA, issue rules that affect the level of greenhouse gases.

Executive Order 12,866 calls for federal agencies to assess the costs and benefits anticipated from the regulatory action including “the enhancement of health and safety” and “the protection of the natural environment” “together with, to the extent feasible, a quantification of those benefits.”⁸⁸ Agencies are admonished to select those regulatory approaches that “maximize net benefits” including “environmental, public health and safety, and other advantages.”

As climate scientists have documented the grim worldwide effects of climate change, economists studying its potential impacts have developed the social cost of carbon as an economic measure of the societal effects associated with greenhouse gas emissions. EPA’s recent review of the social cost of carbon literature shows that, despite remaining uncertainty, this body of research can provide an important basis for monetizing the benefits of greenhouse gas emission reductions. The social cost of carbon can be incorporated into an economic assessment of benefits and costs in much the same way that the social cost of particulate pollution or ozone pollution is already considered when agencies evaluate regulatory action.

Unfortunately, most rulemakings have not addressed greenhouse gas emissions in their analysis at all, even though different policy choices may have significant consequences for global warming pollution. Even after having its refusal to consider the social costs of carbon overturned on judicial review, NHTSA’s proposed new fuel economy standards continue to neglect meaningful consideration of greenhouse gas emissions reductions.

In many regulatory actions affecting the emissions of greenhouse gas emissions, the social costs of carbon may be a central societal benefit. By failing to monetize the benefits of greenhouse gas emission reductions in such rulemaking actions, federal agencies are missing important, cost-effective opportunities to protect human health and the environment from global warming pollution. In conducting analyses that are rigorous and transparent in maximizing societal benefits, carbon counts.

Endnotes

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