



August 26, 2019

To: Council on Environmental Quality

Subject: Misstatements of Legal Requirements and the Social Cost of Greenhouse Gases in the Draft Guidance on Consideration of Greenhouse Gas Emissions

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The Council on Environmental Quality (CEQ)'s Draft Guidance on Consideration of Greenhouse Gas Emissions misstates both legal requirements under the National Environmental Policy Act (NEPA) and the nature and usefulness of the social cost of greenhouse gas metrics. Agencies that follow the guidance as drafted could find themselves in violation of NEPA.

The Draft Guidance implies that the social cost of greenhouse gas metrics are not appropriate to inform decisionmaking on individual actions or projects.² As these comments explain, that is incorrect: the social cost of greenhouse gas estimates are just as applicable and useful to NEPA analyses as they are in the regulatory context. The Draft Guidance claims that climate damages need not even be monetized when a NEPA analysis monetizes other costs and benefits.³ As these comments explain, that is incorrect: several courts have held that inconsistent treatment of climate costs as compared to other costs and benefits is arbitrary and capricious.

The Draft Guidance suggests that, instead of using the social cost of greenhouse gases, mere quantification of emissions can be "a proxy for assessing potential climate effects."⁴ The Draft Guidance further suggests that agencies "may also" compare quantitative estimates to regional or sectoral emission totals, and that such comparisons, "together with a qualitative summary" will provide sufficient "context" and "sufficient information to make a reasoned choice."⁵ The Draft Guidance concludes that such analysis absolves agencies of any need for additional analysis of cumulative effects.⁶ As these comments explain, all those statements are incorrect: instead, NEPA requires agencies to assess actual environmental effects, not merely to tally emissions volumes, and to further assess the "significance"⁷ of an action's "incremental impact"⁸ on climate change. Neither a quantitative tally, a

¹ Our organizations may separately and independently submit other comments on other issues raised by CEQ's Draft Guidance.

² 84 Fed. Reg. 30,097, 30,099 (June 26, 2019).

³ *Id.*

⁴ *Id.* at 30,098.

⁵ *Id.*

⁶ *Id.*

⁷ 40 C.F.R. § 1502.16.

⁸ 40 C.F.R. § 1508.7.

regional comparison, nor a generic qualitative description of general climate change effects adequately assesses an action's incremental contributions to actual environmental effects and the significance of those contributions. By comparison, the social cost of greenhouse gas estimates can assess how each additional ton of greenhouse gas emissions contributes incrementally to actual environmental effects like sea-level rise, property damage, and human health outcomes, and allows for a straightforward weighing of significance by translating such environmental effects into monetary terms.

The Draft Guidance also instructs that, if agencies use an estimate of the social cost of greenhouse gases, it must focus solely on impacts that accrue to U.S. citizens and residents.⁹ Again, this is incorrect: when agencies use the social cost of greenhouse gases, the best available estimates are the estimates of global damages as calculated by the Interagency Working Group on the Social Cost of Greenhouse Gases (IWG) in 2016.

These comments expand on each of these points.

I. Agencies Must Monetize the Social Cost of Greenhouse Gases in NEPA Analyses of Actions with Significant Climate Effects

The National Environmental Policy Act (NEPA), the statute under which environmental impact statements and environmental assessments are required, directs agencies to fully and accurately analyze the environmental, public health, and social welfare differences between proposed alternatives, and to contextualize that information for decision-makers and the public. NEPA requires a more searching analysis than merely disclosing the amount of pollution. Rather, agencies must examine the "ecological[,]... economic, [and] social" impacts of those emissions, including an assessment of their "significance."¹⁰ By failing to use available tools, such as the social cost of greenhouse gases, to analyze the significance of emissions, an agency would violate NEPA.

Monetizing Climate Damages Fulfills the Obligations and Goals of NEPA

When a project has climate consequences that must be assessed under NEPA, monetizing the climate damages fulfills an agency's legal obligations under NEPA in ways that simple quantification of tons of greenhouse gas emissions cannot. NEPA requires "hard look" consideration of beneficial and adverse effects of each alternative option for major federal government actions. The U.S. Supreme Court has called the disclosure of impacts the "key requirement of NEPA," and held that agencies must "consider and disclose the *actual environmental effects*" of a proposed project in a way that "brings those effects to bear on [the agency's] decisions."¹¹ Courts have repeatedly concluded that an environmental impact statement must disclose relevant climate effects.¹² NEPA requires "a reasonably thorough discussion of the significant aspects of the probable environmental consequences," to "foster both informed decisionmaking and informed public participation."¹³ In particular, "[t]he impact of greenhouse gas emissions on climate change is precisely the kind of cumulative impact analysis that NEPA requires," and

⁹ 84 Fed. Reg. at 30,099 n.8.

¹⁰ 40 C.F.R. §§ 1508.8(b), 1502.16(a)-(b).

¹¹ *Baltimore Gas & Elec. Co. v. Natural Res. Def. Council*, 462 U.S. 87, 96 (1983) (emphasis added); see also 40 C.F.R. § 1508.8(b) (requiring assessment of the "ecological," "economic," "social," and "health" "effects") (emphasis added).

¹² As the Ninth Circuit has held: "[T]he fact that climate change is largely a global phenomenon that includes actions that are outside of [the agency's] control . . . does not release the agency from the duty of assessing the effects of its actions on global warming within the context of other actions that also affect global warming." *Ctr. for Biological Diversity v. Nat'l Highway Traffic Safety Admin.*, 538 F.3d 1172, 1217 (9th Cir. 2008); see also *Border Power Plant Working Grp. v. U.S. Dep't of Energy*, 260 F. Supp. 2d 997, 1028-29 (S.D. Cal. 2003) (failure to disclose project's indirect carbon dioxide emissions violates NEPA).

¹³ *Ctr. for Biological Diversity*, 538 F.3d at 1194 (citations omitted).

it is arbitrary to fail to “provide the necessary contextual information about the cumulative and incremental environmental impacts.”¹⁴ Furthermore, the analyses included in environmental assessments and impact statements “cannot be misleading.”¹⁵ An agency must provide sufficient informational context to ensure that decisionmakers and the public will not misunderstand or overlook the magnitude of a proposed action’s climate risks compared to the no action alternative. As this section explains, by only quantifying the volume of greenhouse gas emissions, agencies fail to assess and disclose the actual climate consequences of an action and misleadingly present information in ways that will cause decisionmakers and the public to overlook important climate consequences. Using the social cost of greenhouse gas metrics to monetize climate damages fulfills NEPA’s legal obligations in ways that quantification alone cannot.

Agencies Must Assess Actual Incremental Climate Impacts, Not Just the Volume of Emissions

The tons of greenhouse gases emitted by a project are not the “actual environmental effects” under NEPA. Rather, the actual effects and relevant factors are the incremental climate impacts caused by those emissions, including:¹⁶

- property lost or damaged by sea-level rise, coastal storms, flooding, and other extreme weather events, as well as the cost of protecting vulnerable property and the cost of resettlement following property losses;
- changes in energy demand, from temperature-related changes to the demand for cooling and heating;
- lost productivity and other impacts to agriculture, forestry, and fisheries, due to alterations in temperature, precipitation, CO₂ fertilization, and other climate effects;
- human health impacts, including cardiovascular and respiratory mortality from heat-related illnesses, changing disease vectors like malaria and dengue fever, increased diarrhea, and changes in associated pollution;

¹⁴ *Id.* at 1217.

¹⁵ *High Country Conservation Advocates v. U.S. Forest Service*, 52 F. Supp. 3d 1174, 1182 (D. Colo. 2014); accord. *Johnston v. Davis*, 698 F.2d 1088, 1094-95 (10th Cir. 1983) (disapproving of “misleading” statements resulting in “an unreasonable comparison of alternatives”); *Hughes River Watershed Conservancy v. Glickman*, 81 F.3d 437, 446 (4th Cir. 1996) (“For an EIS to serve these functions” of taking a hard look and allowing the public to play a role in decisionmaking, “it is essential that the EIS not be based on misleading economic assumptions”); see also *Sierra Club v. Sigler*, 695 F.2d 957, 979 (5th Cir. 1983) (holding that an agency’s “skewed cost-benefit analysis” was “deficient under NEPA”); see generally *Bus. Roundtable v. SEC*, 647 F.3d 1144, 1148-49 (D.C. Cir. 2011) (criticizing an agency for “inconsistently and opportunistically fram[ing] the costs and benefits of the rule” and for “fail[ing] adequately to quantify the certain costs or toe explain why those costs could not be quantified”).

¹⁶ These impacts are all included to some degree in the three integrated assessment models (IAMs) used by the IWG (namely, the DICE, FUND, and PAGE models), though some impacts are modeled incompletely, and many other important damage categories are currently omitted from these IAMs. Compare Interagency Working Group on the Social Cost of Carbon, *Technical Support Document: Social Cost of Carbon for Regulatory Impact Analysis* at 6-8, 29-33 (2010), <https://obamawhitehouse.archives.gov/sites/default/files/omb/inforeg/for-agencies/Social-Cost-of-Carbon-for-RIA.pdf> [hereinafter 2010 TSD]; with Peter Howard, *Omitted Damages: What’s Missing from the Social Cost of Carbon* (Cost of Carbon Project Report, 2014), http://costofcarbon.org/files/Omitted_Damages_Whats_Missing_From_the_Social_Cost_of_Carbon.pdf. For other lists of actual climate effects, including air quality mortality, extreme temperature mortality, lost labor productivity, harmful algal blooms, spread of west nile virus, damage to roads and other infrastructure, effects on urban drainage, damage to coastal property, electricity demand and supply effects, water supply and quality effects, inland flooding, lost winter recreation, effects on agriculture and fish, lost ecosystem services from coral reefs, and wildfires, see EPA, *Multi-Model Framework for Quantitative Sectoral Impacts Analysis: A Technical Report for the Fourth National Climate Assessment* (2017); U.S. Global Change Research Program, *Climate Science Special Report: Fourth National Climate Assessment* (2017); EPA, *Climate Change in the United States: Benefits of Global Action* (2015); Union of Concerned Scientists, *Underwater: Rising Seas, Chronic Floods, and the Implications for U.S. Coastal Real Estate* (2018).

- changes in fresh water availability;
- ecosystem service impacts;
- impacts to outdoor recreation and other non-market amenities; and
- catastrophic impacts, including potentially rapid sea-level rise, damages at very high temperatures, or unknown events.¹⁷

Even in combination with a general, qualitative discussion of climate change, calculating only the tons of greenhouse gases emitted or a percent comparison to sectoral or national emissions fails to meaningfully assess the actual incremental impacts to property, human health, productivity, and so forth.¹⁸ An agency would therefore fall short of its legal obligations and statutory objectives by focusing just on volume estimates. Similarly, courts have held that just quantifying the acres of timber to be harvested or the miles of road to be constructed does not constitute a “description of *actual* environmental effects,” even when paired with a qualitative “list of environmental concerns such as air quality, water quality, and endangered species,” when the agency fails to assess “the degree that each factor will be impacted.”¹⁹

By monetizing climate damages using the social cost of greenhouse gas metrics, agencies can satisfy the legal obligations and statutory goals to assess the incremental and actual effects bearing on the public interest. The social cost of greenhouse gas methodology calculates how the emission of an additional unit of greenhouse gases affects atmospheric greenhouse concentrations, how that change in atmospheric concentrations changes temperature, and how that change in temperature incrementally contributes to the above list of economic damages, including property damages, energy demand effects, lost agricultural productivity, human mortality and morbidity, lost ecosystem services and non-market amenities, and so forth.²⁰ The social cost of greenhouse gas tool therefore captures the factors that actually affect public welfare and assesses the degree of impact to each factor, in ways that estimating the volume of emissions alone cannot.

Climate Damages Depend on Stock and Flow, But Volume Estimates Only Measure Flow

The climate damage generated by each additional ton of greenhouse gas emissions depends on the background concentration of greenhouse gases in the global atmosphere. Once emitted, greenhouse gases can linger in the atmosphere for centuries, building up the concentration of radiative-forcing pollution and affecting the climate in cumulative, non-linear ways.²¹ As physical and economic systems

¹⁷ 2018 Intergovernmental Panel on Climate Change, Summary for Policymakers, in *Global Warming of 1.5°C: An IPCC Special Report on the Impacts of Global Warming of 1.5°C Above Pre-industrial Levels and Related Global Greenhouse Gas Emission Pathways, in the Context of Strengthening the Global Response to the Threat of Climate Change, Sustainable Development, and Efforts to Eradicate Poverty* 11 (Valérie Masson-Delmotte et al. eds., 2018), available at: https://www.ipcc.ch/site/assets/uploads/sites/2/2018/07/SR15_SPM_version_stand_alone_LR.pdf [hereinafter, Summary of IPCC 1.5°C Report].

¹⁸ See *High Country*, 52 F. Supp. 3d at 1190 (“Beyond quantifying the amount of emissions relative to state and national emissions and giving general discussion to the impacts of global climate change, [the agencies] did not discuss the impacts caused by these emissions.”); *Mont. Env’tl. Info. Ctr. v. U.S. Office of Surface Mining*, 274 F. Supp. 3d 1074, 1096–99 (D. Mont. 2017) (rejecting the argument that the agency “reasonably considered the impact of greenhouse gas emissions by quantifying the emissions which would be released if the [coal] mine expansion is approved, and comparing that amount to the net emissions of the United States”).

¹⁹ *Klamath-Siskiyou Wildlands Ctr. v. Bureau of Land Mgmt.*, 387 F.3d 989, 995 (9th Cir. 2004) (“A calculation of the total number of acres to be harvested in the watershed is . . . not a sufficient description of the actual environmental effects that can be expected from logging those acres.”); see also *Oregon Natural Res. Council v. Bureau of Land Mgmt.*, 470 F.3d 818 (9th Cir. 2006).

²⁰ 2010 TSD, *supra* note 16, at 5.

²¹ Carbon dioxide also has cumulative effects on ocean acidification, in addition to cumulative radiative-forcing effects.

become increasingly stressed by climate change, each marginal additional ton of emissions has a greater, non-linear impact. The climate damages generated by a given amount of greenhouse pollution is therefore a function not just of the pollution's total volume but also the year of emission, and with every passing year an additional ton of emissions inflicts greater damage.²²

As a result, focusing just on the volume or rate of emissions is insufficient to reveal the incremental effect on the climate. The change in the rate of emissions (flow) must be assessed given the background concentration of emissions (stock). A percent comparison to, for example, national emissions is perhaps even more misleading. A project that adds 23 million additional tons per year of carbon dioxide would have contributed to 0.43% of total U.S. carbon dioxide emissions in the year 2012.²³ In the year 2014, that same project with the same carbon pollution would have contributed to just 0.41% of total U.S. carbon dioxide emissions—a seemingly smaller relative effect, since the total amount of U.S. emissions increased from 2012 to 2014.²⁴ However, because of rising background concentrations of global greenhouse gas stock, and because of growing stresses in physical and economic systems, the marginal climate damages per ton of carbon dioxide (as measured by the social cost of carbon) increased from \$33 in 2012 to \$35 in 2014 (in 2007\$).²⁵ Consequently, those 23 million additional tons would have caused marginal climate damages costing \$759 million in the year 2012, but by 2014 that same 23 million tons would have caused \$805 million in climate damages. To summarize: the percent comparison to national emissions misleadingly implied that a project adding 23 million more tons of carbon dioxide would have a relatively less significant effect in 2014 than in 2012, whereas monetizing climate damages would accurately reveal that the emissions in 2014 were much more damaging than the emissions in 2012—almost \$50 million more. Comparing an action's emissions to a state, national, global, or sectoral inventory reveals nothing about the significance of the action's contributions to actual environmental impacts.

Capturing how marginal climate damages change as the background concentration changes is especially important because NEPA requires assessing both present and future impacts.²⁶ Marginal climate damages caused by an action's additional emissions depend not just on the rate of other emissions, but crucially also on how an action adds to the background concentration of greenhouse gases, which may continue to rise even if the national or worldwide rate of emissions decreases in the short term.

By factoring in projections of the increasing global stock of greenhouse gases as well as increasing stresses to physical and economic systems, the social cost of greenhouse gas metrics enable accurate and transparent comparisons of projects with varying greenhouse gas emissions over time.

²² See 2010 TSD, *supra* note 16, at 33 (explaining that the social cost of greenhouse gas estimates grow over time).

²³ Total U.S. carbon dioxide emissions in 2012 were 5,366.7 million metric tons (for all greenhouse gases, emissions were 6,529 MMT CO₂ eq). See EPA, *Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2016* at ES-6, tbl. ES-2 (2018).

²⁴ Total U.S. carbon dioxide emissions in 2014 were 5,568.8 million metric tons (and for all greenhouse gases, 6,763 MMT CO₂ eq.) *Id.*

²⁵ Interagency Working Group on the Social Cost of Greenhouse Gases, *Technical Support Document: Technical Update of the Social Cost of Carbon for Regulatory Impact Analysis* at 25 tbl. A1 (2016) (calculating the central estimate at a 3% discount rate), https://obamawhitehouse.archives.gov/sites/default/files/omb/inforeg/scc_tsd_final_clean_8_26_16.pdf [hereinafter 2016 TSD].

²⁶ NEPA requires agencies to weigh the “relationship between local short-term uses of man’s environment and the maintenance and enhancement of long-term productivity,” as well as “any irreversible and irretrievable commitments of resources.” 42 U.S.C. § 4332(2)(C).

Monetization Provides the Required Informational Context that Volume Estimates Lack

NEPA requires sufficient informational context. Yet without proper context, numbers like X million tons of emissions or Y% of national emissions will be misinterpreted by people as meaningless, as zero. Indeed, in a country of over 300 million people and over 6.5 billion tons of annual greenhouse gas emissions, it is far too easy to make highly significant effects appear relatively trivial.²⁷ For example, presenting all weather-related deaths as less than 0.1% of total U.S. deaths makes the risk of death by weather event sound trivial, but in fact that figure represents over 2,000 premature deaths per year²⁸—hardly an insignificant figure.²⁹ As the U.S. Court of Appeals for the Fifth Circuit recently observed, even a seemingly “very small portion” of a “gargantuan source of [harmful] pollution” may nevertheless “constitute[] a gargantuan source of [harmful] pollution on its own terms.”³⁰ In other words, percentages can be misleading and can be manipulated by the choice of the denominator; what matters is the numerator’s actual contribution to total harm.

Economic theory explains why monetization is a much better tool than volume estimates or percent comparisons to provide the necessary contextual information on climate damages. For example, many decisionmakers and interested citizens would wrongly reduce down to zero the climate risks associated with 0.77% of global emissions,³¹ simply because of the leading zero before the decimal place. As Professor Cass Sunstein has explained—drawing from the work of recent Nobel laureate economist Richard Thaler—a well-documented mental heuristic called “probability neglect” causes people to irrationally reduce small probability risks entirely down to zero.³² People have significant “difficulty understanding a host of numerical concepts, especially risks and probabilities.”³³ Characterizing an annual contribution of nearly 400 million metric tons of carbon dioxide equivalent on average per year from coal production and combustion as just 0.77% of global emissions misleadingly makes the climate impacts appear vanishingly small. By comparison, by applying the social cost of carbon dioxide (about \$51 per ton for year 2020 emissions in 2017\$³⁴), decisionmakers and the public can readily comprehend that 403 million tons of carbon dioxide emitted just in the year 2020 will generate over \$20 billion in climate damages in that year alone.³⁵

²⁷ As California’s CEQA guidance explains, “A project’s incremental contribution may be cumulatively considerable even if it appears relatively small compared to statewide, national or global emissions.” Final Adopted Text for Revisions to the CEQA Guidelines, available at <https://perma.cc/P4S7-XAMF> [http://resources.ca.gov/ceqa/docs/2018_CEQA_FINAL_TEXT_122818.pdf].

²⁸ Compare Nat’l Ctr. for Health Stat., Ctrs. for Disease Control & Prevention, *Death Attributed to Heat, Cold, and Other Weather Events in the United States, 2006-2010* at 1 (2014) (reporting about 2000 weather-related deaths per year) with Nat’l Ctr. for Health Stat., *Deaths and Mortality*, <https://www.cdc.gov/nchs/fastats/deaths.htm> (reporting about 2.7 million U.S. deaths per year total).

²⁹ The public willingness to pay to avoid mortality is typically estimated at around \$9.6 million (in 2016\$). E.g., 83 Fed. Reg. 12,086, 12,098 (Mar. 19, 2018) (U.S. Coast Guard rule using the Department of Transportation’s value of statistical life in a recent analysis of safety regulations). Losing 2,000 lives prematurely to weather-related events is equivalent to a loss of public welfare worth over \$19 billion per year.

³⁰ *Southwestern Elec. Power Co. v. EPA*, No. 15-60821, 2019 WL 1577740 at *22 (5th Cir., Apr. 12, 2019).

³¹ These numerical examples are taken from a recent draft NEPA analysis from the Bureau of Land Management, which tried to trivialize an annual contribution of 400 million metric tons of greenhouse gases by presenting it as 0.77% of global emissions.

³² Cass R. Sunstein, *Probability Neglect: Emotions, Worst Cases, and Law*, 112 Yale L. J. 61, 63, 72 (2002).

³³ Valerie Reyna & Charles Brainerd, *Numeracy, Ratio Bias, and Denominator Neglect in Judgments of Risk and Probability*, 18 Learning & Individual Differences 89 (2007).

³⁴ 2016 TSD, *supra* note 25.

³⁵ This calculation in no way accepts BLM’s quantification of emissions as accurate or complete. In a proper cost-benefit analysis, future costs and benefits would be discounted to present value.

Similarly, many people will be unable to distinguish the significance of project alternatives or scenario analyses with different emissions presented just as quantitative tallies of volumes. As the Environmental Protection Agency's website explains, "abstract measurements" of so many tons of greenhouse gases can be rather inscrutable for the public, unless "translat[ed] . . . into concrete terms you can understand."³⁶ Abstract volume estimates fail to give people the required informational context due to another well-documented mental heuristic called "scope neglect." Scope neglect, as explained by Nobel laureate Daniel Kahneman, among others, causes people to ignore the size of a problem when estimating the value of addressing the problem. For example, in one often-cited study, subjects were unable to meaningfully distinguish between the value of saving 2,000 migratory birds from drowning in uncovered oil ponds, as compared to saving 20,000 birds.³⁷

Scope neglect means many decisionmakers and members of the public would be unable to meaningfully distinguish between the climate risks of, for example, 5.1 million metric tons versus 399 million metric tons.³⁸ While decisionmakers and the public certainly can discern that one number is higher, without any context it may be difficult to weigh the relative magnitude of the climate risks. In contrast, the different climate risks would have been readily discernible through application of the social cost of greenhouse gas metrics. In this example, while the difference between 5.1 million metric tons and 399 million metric tons is obscured when only volumetric tallies are presented, in fact 399 million metric tons will cause almost \$20 billion more in climate damages than 5.1 million metric tons.³⁹

In general, non-monetized effects are often irrationally treated as worthless.⁴⁰ On several occasions, courts have struck down administrative decisions for failing to give weight to non-monetized effects.⁴¹ Most relevantly, in *Center for Biological Diversity v. NHTSA*, the U.S. Court of Appeals for the Ninth Circuit found it arbitrary and capricious to give zero value "to the most significant benefit of more stringent [fuel economy] standards: reduction in carbon emissions."⁴² Monetizing climate damages provides the informational context required by NEPA, whereas a simple tally of emissions volume and rote, qualitative, generic description of climate change are misleading and fail to give the public and decisionmakers the required information about the magnitude of discrete climate effects.⁴³

Climate Effects Must Be Monetized If Other Costs and Benefits Are Monetized

Though NEPA does not always require a full and formal cost-benefit analysis,⁴⁴ agencies' approaches to assessing costs and benefits must be balanced and reasonable. Courts have warned agencies, for

³⁶ EPA, *Greenhouse Gas Equivalencies Calculator*. Available at <https://web.archive.org/web/20180212182940/https://www.epa.gov/energy/greenhouse-gas-equivalencies-calculator> (last updated Sept. 2017) ("Did you ever wonder what reducing carbon dioxide (CO₂) emissions by 1 million metric tons means in everyday terms? The greenhouse gas equivalencies calculator can help you understand just that, translating abstract measurements into concrete terms you can understand.").

³⁷ Daniel Kahneman et al., *Economic Preferences or Attitude Expressions? An Analysis of Dollar Responses to Public Issues*, 19 J. Risk & Uncertainty 203, 212-213 (1999).

³⁸ Again, these numbers are taken from a recent draft NEPA analysis from the Bureau of Land Management.

³⁹ 399 – 5 = 394 million metric tons * \$51 per ton = \$20 billion.

⁴⁰ Richard Revesz, *Quantifying Regulatory Benefits*, 102 Cal. L. Rev. 1424, 1434-35, 1442 (2014).

⁴¹ See *id.* at 1428, 1434.

⁴² 538 F.3d at 1199.

⁴³ See 42 U.S.C. § 4332(2)(B) (requiring agencies to "identify and develop methods and procedures . . . which will insure that presently unquantified environmental amenities and values may be given appropriate consideration in decisionmaking along with economic and technical considerations").

⁴⁴ 40 C.F.R. § 1502.23 ("[T]he weighing of the merits and drawbacks of the various alternatives need not be displayed in a monetary cost-benefit analysis."); but see e.g., *Sierra Club v. Sigler*, 695 F.2d 957, 978-79 (5th Cir. 1983) (holding that NEPA "mandates at least a broad, informal cost-benefit analysis," and so agencies must "fully and accurately" and "objectively" assess environmental, economic, and technical costs); *Chelsea Neighborhood Ass'n v. U.S. Postal Serv.*, 516 F.2d 378, 387 (2d Cir.

example, that “[e]ven though NEPA does not require a cost-benefit analysis,” an agency cannot selectively monetize benefits in support of its decision while refusing to monetize the costs of its action.⁴⁵

In *High Country Conservation Advocates v. Forest Service*, the U.S. District Court of Colorado found that it was “arbitrary and capricious to quantify the *benefits* of the lease modifications and then explain that a similar analysis of the *costs* was impossible when such an analysis was in fact possible.”⁴⁶ The court explained that, to support a decision on coal mining activity, the agencies had “weighed several specific economic benefits—coal recovered, payroll, associated purchases of supplies and services, and royalties,” but arbitrarily failed to monetize climate costs using the readily available social cost of carbon protocol.⁴⁷ Similarly, in *Montana Environmental Information Center v. Office of Surface Mining (MEIC v. OSM)*, the U.S. District Court of Montana followed the lead set by *High Country* and likewise held an environmental assessment to be arbitrary and capricious because it quantified the benefits of action (such as employment payroll, tax revenue, and royalties) while failing to use the social cost of carbon to quantify the costs.⁴⁸

High Country and *MEIC v. OSM* were simply the latest applications of a broader line of case law in which courts find it arbitrary and capricious to apply inconsistent protocols for analyzing some effects compared to others, especially when the inconsistency obscures some of the most significant effects.⁴⁹

1975) (“NEPA, in effect, requires a broadly defined cost-benefit analysis of major federal activities.”); *Calvert Cliffs’ Coordinating Comm. v. U.S. Atomic Energy Comm’n*, 449 F.2d 1109, 1113 (D.C. Cir. 1971) (“NEPA mandates a rather finely tuned and ‘systematic’ balancing analysis” of “environmental costs” against “economic and technical benefits”); *Nat’l Wildlife Fed. v. Marsh*, 568 F. Supp. 985, 1000 (D.D.C. 1983) (“The cost-benefit analysis of NEPA is concerned primarily with environmental costs. . . . A court may examine the cost-benefit analysis only as it bears upon the function of insuring that the agency has examined the environmental consequences of a proposed project.”).

⁴⁵ *High Country Conservation Advocates*, 52 F. Supp. 3d at 1191; *accord. MEIC v. Office of Surface Mining*, 274 F. Supp. 3d at 1094-99 (holding it was arbitrary for the agency to quantify benefits in an EIS while failing to use the social cost of carbon to quantify costs, as well as arbitrary to imply there would be no effects from greenhouse gas emissions).

⁴⁶ 52 F. Supp. 3d at 1191.

⁴⁷ *Id.*

⁴⁸ 274 F. Supp. 3d at 1094-99 (also holding that it was arbitrary to imply that there would be zero effects from greenhouse gas emissions).

⁴⁹ Other cases from different courts that have declined to rule against failures to use the social cost of carbon in NEPA analyses are all distinguishable by the scale of the action or by whether other effects were quantified and monetized in the analysis. See *League of Wilderness Defenders v. Connaughton*, No. 3:12-cv-02271-HZ (D. Ore., Dec. 9, 2014); *EarthReports v. FERC*, 15-1127, (D.C. Cir. July 15, 2016); *WildEarth Guardians v. Zinke*, 1:16-CV-00605-RJ, at 23-24, (D. N.M. Feb. 16, 2017).

In *WildEarth Guardians v. Zinke*, while the U.S. District Court for the District of Columbia stopped short of requiring BLM to use the social cost of carbon, it issued its holding on very narrow grounds. Specifically, the court declined to side with plaintiffs that “it was arbitrary and capricious for BLM to discuss the economic benefits of oil and gas drilling without quantifying their economic costs” by using the social cost of carbon protocol. No. 16-1724, 2019 WL 1273181, *22 (D.D.C. Mar. 19, 2019). However, the court did *not* hold that BLM’s acted consistently in choosing to monetize benefits without monetizing costs; rather, it held that BLM’s treatment of economic benefits was so “sparse[]” and “ cursory” that the precedent established in *High Country Conservation Advocates v. Forest Service* could be differentiated. *Id.* But several important distinguishing arguments apply. First, the inconsistent treatment of costs and benefits is not the only reason why agencies should use the social cost of greenhouse gases to assess climate damages in NEPA reviews. The court never considered whether using the social cost of greenhouse gases was necessary or appropriate to fulfill the obligations and goals of NEPA: to assess a project’s actual real-world impacts, to weigh the intensity and significance of a project’s contributions to such impacts, and to give meaningful context to the information presented. Second, the court’s consideration was incomplete on the issue of inconsistent treatment of costs and benefits. It is not clear why the paltry size of the lease’s economic benefits should excuse BLM from inconsistently treating costs and failing to apply a readily available and easy-to-use tool to monetize the lease’s hugely significant climate costs. *High Country*’s ruling turned not on the size of the monetized benefits but on the inconsistent treatment of costs and benefits. Furthermore, the court overlooked other portions of the original EAs and the tiered EISs that

For example, in *Center for Biological Diversity v. National Highway Traffic Safety Administration*, the U.S. Court of Appeals for the Ninth Circuit ruled that, because the agency had monetized other uncertain costs and benefits of its vehicle fuel efficiency standard—like traffic congestion and noise costs—its “decision not to monetize the benefit of carbon emissions reduction was arbitrary and capricious.”⁵⁰ Specifically, it was arbitrary to “assign[] no value to *the most significant benefit* of more stringent [vehicle fuel efficiency] standards: reduction in carbon emissions.”⁵¹ When an agency bases a decision on cost-benefit analysis, it is arbitrary to “put a thumb on the scale by undervaluing the benefits and overvaluing the costs.”⁵² Similarly, the U.S. Court of Appeals for the District of Columbia Circuit has chastised agencies for “inconsistently and opportunistically fram[ing] the costs and benefits of the rule [and] fail[ing] adequately to quantify certain costs or to explain why those costs could not be quantified”⁵³; and the U.S. Court of Appeals for the Tenth Circuit has remanded an environmental impact statement because “unrealistic” assumptions “misleading[ly]” skewed comparison of the project’s positive and negative effects.⁵⁴

CEQ’s Draft Guidance suggests that certain effects, like employment, are simply “more capable of monetization” than other effects, and so CEQ claims that it is proper to monetize certain “socio-economic” impacts without also monetizing climate damages.⁵⁵ However, despite this attempt to use terminology to distinguish the impacts agencies may want to monetize from those impacts agencies may prefer not to monetize, NEPA regulations group all these impacts under the same category of “effects”: economic and social impacts are listed as “effects” alongside ecological and health impacts, and all these effects must be discussed in as much detail as possible in an adequate NEPA review.⁵⁶ Whether an effect is a cost, benefit, or transfer, if monetization is the best way to assess that effect’s significance and contextualize the precise impacts, then monetization is the best way to comply with NEPA’s obligations. Agencies need not always monetize employment effects in terms of direct, indirect, and induced income; agencies could just as readily only quantify job-year effects, or only discuss employment in qualitative terms. Agencies choose to translate employment effects into monetized income figures because it provides additional context and information that is useful in making decisions under NEPA. But it is arbitrary to choose to give additional context to certain socio-economic effects by monetizing them while refusing to give equal treatment to climate effects. Nor is there any distinction on which effects are most “capable” of monetization. Many assumptions drive the methodologies that agencies rely upon to estimate employment and income effects and to manage the uncertainty around those estimates, but agencies have come to rely on certain generally accepted models to calculate these figures. Similarly, though of course there are certain assumptions and choices built into the

monetized and relied on larger economic benefits to much greater extent. Thus, the court’s attempts to distinguish *High Country* do not hold up. The D.C. District Court also deferred to BLM’s so-called “reasoned explanations,” *id.* at *23, yet failed to recognize that in *High Country*, the District of Colorado also considered and dismissed the post-hoc attempt to argue that the social cost of carbon protocol was too imprecise or controversial to use because of the range of estimates. 52 F. Supp. 3d 1174, 1192 (D. Colo. 2014). Finally, the court in *WildEarth v. Zinke* never discussed other important case law, such as *MEIC v. OSM*. Ultimately, the court instructed BLM on remand to “reassess” whether the social cost of greenhouse gas protocol would “contribute to informed decisionmaking” and ensure more accurate analysis as required by NEPA, *id.* at n.31. The court believed that “the protocol may one day soon be a necessary component of NEPA analyses,” *id.*—and, indeed, that day has already arrived.

⁵⁰ 538 F.3d 1172, 1203 (9th Cir. 2008).

⁵¹ *Id.* at 1199.

⁵² *Id.* at 1198.

⁵³ *Bus. Roundtable v. SCC*, 647 F.3d 1144, 1148-49 (D.C. Cir. 2011)

⁵⁴ *Johnston v. Davis*, 698 F.2d 1088, 1094-95 (10th Cir. 1983)

⁵⁵ 84 Fed. Reg. at 30,099.

⁵⁶ 40 C.F.R. §1508.8.

methodology for estimating the social cost of greenhouse gases, the Interagency Working Group's approach presents a readily available tool based on peer-reviewed inputs and widely accepted assumptions. Agencies are every bit as "capable" of monetizing climate damages as they are of monetizing socio-economic impacts. It would therefore be arbitrary to apply inconsistent protocols for analysis of some effects compared to others, and to monetize some effects but not others that are equally monetizable.

II. The Social Cost of Greenhouse Gas Metric Is Appropriate for Individual Actions and Projects

CEQ's Draft Guidance implies that because the social cost of greenhouse gases was originally developed for rulemakings, it was "not intended" for use in NEPA analyses of individual actions and projects.⁵⁷ This claim is wrong. The social cost of greenhouse gas protocol is exactly such a tool to monetize the incremental climate impacts of specific projects or plans, and its use is not limited to rulemakings. Numerous other agencies have had no trouble applying the manageable range of estimates of the social cost of greenhouse gases to assess the significance of the climate impacts of their actions, including project-level decisions.

Monetization Is Appropriate and Useful in Any Decision with Significant Climate Impacts, Not Just Regulations

Though the federal Interagency Working Group on the Social Cost of Greenhouse Gases originally developed its estimates of the social cost of greenhouse gases to harmonize the metrics used by agencies in their various regulatory impact analyses, there is nothing in the numbers' development that would limit applications to other decisionmaking contexts. The social cost of greenhouse gases measures the marginal cost of any additional unit of greenhouse gases emitted into the atmosphere. The government action that precipitated that unit of emissions— regulations, permit issuances, or project approvals—are irrelevant to the marginal climate damages caused by the emissions. Whether emitted by a leaking pipeline or the extraction process, or because of a regulation or a resource management decision, and whether emitted in Alaska or Maine, the marginal climate damages per unit of emissions remain the same. Indeed, the social cost of greenhouse gases has been used by many federal and state agencies in environmental impact reviews⁵⁸ and in resource management decisions.⁵⁹

The Social Cost of Greenhouse Gas Metrics Provides a Tool to Assess the Significance of Individual Physical Impacts

The social cost of greenhouse gas methodology is well suited to measure the marginal climate damages of individual projects. These protocols were developed to assess the cost of actions with "marginal" impacts on cumulative global emissions, and the metrics estimate the dollar figure of damages for one extra unit of greenhouse gas emissions. This marginal cost is calculated using integrated assessment models. These models translate emissions into changes in atmospheric greenhouse concentrations,

⁵⁷ 84 Fed. Reg. at 30,099.

⁵⁸ For example, in August 2017, the Bureau of Ocean Energy Management called the social cost of carbon "a useful measure to assess the benefits of CO2 reductions and inform agency decisions," and applied the metric in an environmental impact statement to monetize the emissions difference of about 5 million metric tons per year between the proposed oil and gas development project and the no-action baseline, *Draft Environmental Impact Statement—Liberty Development Project in the Beaufort Sea, Alaska* at 3-129, 4-50 (2017). More generally, agencies have used IWG's social cost of greenhouse gas estimates not only in scores of rulemakings but also in NEPA analyses for resource management decisions. See Peter Howard & Jason Schwartz, *Think Global: International Reciprocity as Justification for a Global Social Cost of Carbon*, 42 Columbia J. Envtl. L. 203, 270-84 (2017) (listing all uses by federal agencies through July 2016).

⁵⁹ States have used the social cost of greenhouse gases in decisions about electricity planning. See Iliana Paul et al., *The Social Cost of Greenhouse Gases and State Policy: A Frequently Asked Questions Guide* (Policy Integrity Report, 2017), http://policyintegrity.org/files/publications/SCC_State_Guidance.pdf.

atmospheric concentrations into changes in temperature, and changes in temperature into economic damages. A range of plausible socio-economic and emissions trajectories are used to account for the scope of potential scenarios and circumstances that may actually result in the coming years and decades. The marginal cost is attained by first running the models using a baseline emissions trajectory, and then running the same models again with one additional unit of emissions. The difference in damages between the two runs is the marginal cost of one additional unit. The approach assumes that the marginal damages from increased emissions will remain constant for small emissions increases relative to gross global emissions. In other words, the monetization tools are in fact perfectly suited to measuring the marginal effects of individual projects or other discrete agency actions.

Some of the incremental impacts on the environment that the social cost of greenhouse gas protocol captures include property lost or damaged; impacts to agriculture, forestry, and fisheries; impacts to human health; changes in fresh water availability; ecosystem service impacts; impacts to outdoor recreation and other non-market amenities; and some catastrophic impacts, including potentially rapid sea-level rise, damages at very high temperatures, or unknown events.⁶⁰ A key advantage of using the social cost of greenhouse gas tool is that each physical impact—such as sea-level rise and increasing temperatures—need not be assessed in isolation. Instead, the social cost of greenhouse gas tool conveniently groups together the multitude of climate impacts and, consistent with NEPA regulations,⁶¹ enables agencies to assess whether all those impacts are cumulatively significant and to then compare those impacts with other impacts or alternatives using a common metric.

Monetizing Climate Damages Is Appropriate and Useful Regardless of Whether Every Effect Can Be Monetized in a Full Cost-Benefit Analysis

CEQ's Draft Guidance states that agencies need not use the social cost of greenhouse gas metrics because NEPA regulations do not require a "monetary cost-benefit analysis."⁶² This argument starts with a false premise. Using the social cost of greenhouse gas metrics does not require subtracting an action's monetized climate costs from its monetized economic benefits in a cost-benefit analysis. Rather, agencies should use the social cost of greenhouse gases because NEPA requires agencies to use readily available tools to better contextualize environmental effects, just as agencies often monetized certain economic impacts like labor income and royalties to contextualize an action's alleged upsides.

Monetizing one key impact still provides useful information for decisionmakers and the public even when monetizing other impacts is not feasible. The social cost of greenhouse gases enables a more

⁶⁰ These impacts are all included to some degree in the three integrated assessment models (IAMs) used by the IWG (namely, the DICE, FUND, and PAGE models), though some impacts are modeled incompletely, and many other important damage categories are currently omitted from these IAMs. *Compare* Interagency Working Group on the Social Cost of Carbon, *Technical Support Document: Social Cost of Carbon for Regulatory Impact Analysis* at 6-8, 29-33 (2010), <https://obamawhitehouse.archives.gov/sites/default/files/omb/inforeg/for-agencies/Social-Cost-of-Carbon-for-RIA.pdf> [hereinafter 2010 TSD]; with Peter Howard, *Omitted Damages: What's Missing from the Social Cost of Carbon* (Cost of Carbon Project Report, 2014), http://costofcarbon.org/files/Omitted_Damages_Whats_Missing_From_the_Social_Cost_of_Carbon.pdf. For other lists of actual climate effects, including air quality mortality, extreme temperature mortality, lost labor productivity, harmful algal blooms, spread of west Nile virus, damage to roads and other infrastructure, effects on urban drainage, damage to coastal property, electricity demand and supply effects, water supply and quality effects, inland flooding, lost winter recreation, effects on agriculture and fish, lost ecosystem services from coral reefs, and wildfires, see EPA, *Multi-Model Framework for Quantitative Sectoral Impacts Analysis: A Technical Report for the Fourth National Climate Assessment* (2017); U.S. Global Change Research Program, *Climate Science Special Report: Fourth National Climate Assessment* (2017); EPA, *Climate Change in the United States: Benefits of Global Action* (2015); Union of Concerned Scientists, *Underwater: Rising Seas, Chronic Floods, and the Implications for U.S. Coastal Real Estate* (2018).

⁶¹ 40 C.F.R. § 1508.27(b)(7) (explaining that actions can be significant if related to individually insignificant but cumulatively significant impacts).

⁶² 84 Fed. Reg. at 30,098.

accurate and transparent comparison of alternatives along the dimension of climate impacts even if other costs and benefits cannot be quantified, and “breakeven analysis” could provide a framework for making decisions when some effects but not others are monetized. Climate damages can and should be monetized even if other costs and benefits are harder to quantify or monetize and so must be discussed qualitatively. Many effects can readily be quantified and monetized, and agencies should generally do so when feasible; other effects, like water quality, are notoriously difficult to quantify and monetize, due to the geographically idiosyncratic nature of individual water bodies. Greenhouse gases, by comparison, have the same impact on climate change no matter where they are emitted, and those impacts are readily monetized using the social cost of greenhouse methodology. Regardless of whether all other effects can be monetized, using the social cost of greenhouse gases provides useful and necessary information to the public and decisionmakers. In particular, whether or not other effects are monetized, using the social cost of greenhouse gases will facilitate comparison between alternative options along the dimension of climate change. As discussed above, different alternatives could have varying greenhouse gas consequences over time, and monetization provides the best means of comparing project alternatives along the dimension of climate change.

Moreover, analytical frameworks exist to weigh qualitative effects alongside monetized effects. NEPA regulations, for example, first state that if there are “important qualitative considerations,” then the ultimate “weighing of the merits and drawbacks of the various alternatives” should not be displayed exclusively as a “monetary cost-benefit analysis.” Nevertheless, NEPA regulations further acknowledge that when monetization of costs and benefits is “relevant to the choice among environmentally different alternatives,” “that analysis” can be presented alongside “any analyses of unquantified environmental impacts, values, and amenities.”⁶³ In other words, the monetization of some impacts does not require the monetization of all impacts.

The Office of Management and Budget’s *Circular A-4*⁶⁴ guidance to agencies on conducting economic analysis also provides a framework for weighing monetized and qualitative costs and benefits, called break-even analysis:

It will not always be possible to express in monetary units all of the important benefits and costs. When it is not, the most efficient alternative will not necessarily be the one with the largest quantified and monetized net-benefit estimate. In such cases, you should exercise professional judgment in determining how important the non-quantified benefits or costs may be in the context of the overall analysis. If the non-quantified benefits and costs are likely to be important, you should carry out a “threshold” analysis to evaluate their significance. Threshold or “break-even” analysis answers the question, “How small could the value of the non-quantified benefits be (or how large would the value of the non-quantified costs need to be) before the rule would yield zero net benefits?” In addition to threshold analysis you should indicate, where possible, which non-quantified effects are most important and why.⁶⁵

Even without using something as formal as a break-even analysis, it is clear that monetizing climate damages provides useful information whether or not every effect can be monetized in a full cost-benefit analysis.

⁶³ 40 C.F.R. § 1502.23.

⁶⁴ Though *Circular A-4* focus on agencies’ regulatory analyses under Executive Order 12,866, the document nevertheless more generally has distilled best practices on economic analysis and is a useful guide to all agencies undertaking an assessment of costs and benefits.

⁶⁵ OMB, *CIRCULAR A-4* at 2 (2003).

III. Agencies Should Use the Interagency Working Group’s 2016 Estimates of the Social Cost of Greenhouse Gases

In 2016, the IWG published updated central estimates for the social cost of greenhouse gases: \$50 per ton of carbon dioxide, \$1440 per ton of methane, and \$18,000 per ton of nitrous oxide (in 2017 dollars for year 2020 emissions).⁶⁶ Agencies must continue to use estimates of a similar or higher⁶⁷ value in their analyses and decisionmaking. A recent Executive Order disbanding the IWG does not change the fact that the IWG estimates still reflect the best available data and methodologies.

IWG’s Methodology Is Rigorous, Transparent, and Based on Best Available Data

Beginning in 2009, the IWG assembled experts from a dozen federal agencies and White House offices to “estimate the monetized damages associated with an incremental increase in carbon emissions in a given year” based on “a defensible set of input assumptions that are grounded in the existing scientific and economic literature.”⁶⁸ IWG’s methods combined three frequently used models built to predict the economic costs of the physical impacts of each additional ton of carbon.⁶⁹ The models together incorporate such damage categories as: agricultural and forestry impacts, coastal impacts due to sea level rise, impacts from extreme weather events, impacts to vulnerable market sectors, human health impacts including malaria and pollution, outdoor recreation impacts and other non-market amenities, impacts to human settlements and ecosystems, and some catastrophic impacts.⁷⁰ IWG ran these models using a baseline scenario including inputs and assumptions drawn from the peer-reviewed literature, and then ran the models again with an additional unit of carbon emissions to determine the increased economic damages.⁷¹ IWG’s social cost of carbon estimates were first issued in 2010 and have been updated several times to reflect the latest and best scientific and economic data.⁷²

Following the development of estimates for carbon dioxide, the same basic methodology was used in 2016 to develop the social cost of methane and social cost of nitrous oxide—estimates that captures the distinct heating potential of methane and nitrous oxide emissions.⁷³ These additional metrics used the same economic models, the same treatment of uncertainty, and the same methodological assumptions that IWG applied to the social cost of carbon, and these new estimates underwent rigorous peer-review.⁷⁴

IWG’s methodology has been repeatedly endorsed by reviewers. In 2014, the U.S. Government Accountability Office concluded that IWG had followed a “consensus-based” approach, relied on peer-

⁶⁶ U.S. Interagency Working Group on the Social Cost of Greenhouse Gases, “Technical support document: Technical update of the social cost of carbon for regulatory impact analysis under executive order 12866 & Addendum: Application of the methodology to estimate the social cost of methane and the social cost of nitrous oxide” (2016), available at <https://obamawhitehouse.archives.gov/omb/oira/social-cost-of-carbon>.

⁶⁷ See, e.g., Richard L. Revesz et al., Global Warming: Improve Economic Models of Climate Change, 508 NATURE 173 (2014) (explaining that current estimates omit key damage categories and, therefore, are very likely underestimates).

⁶⁸ IWG, *Technical Support Document: Social Cost of Carbon for Regulatory Impact Analysis Under Executive Order 12866* (2010) (“2010 TSD”). Available at <https://obamawhitehouse.archives.gov/sites/default/files/omb/inforeg/for-agencies/Social-Cost-of-Carbon-for-RIA.pdf>.

⁶⁹ *Id.* at 5. These models are DICE (the Dynamic Integrated Model of Climate and the Economy), FUND (the Climate Framework for Uncertainty, Negotiation, and Distribution), and PAGE (Policy Analysis of the Greenhouse Effect).

⁷⁰ *Id.* at 6-8.

⁷¹ *Id.* at 24-25.

⁷² IWG, *Technical Update of the Social Cost of Carbon* at 5–29 (2016). Available at https://obamawhitehouse.archives.gov/sites/default/files/omb/inforeg/scc_tsd_final_clean_8_26_16.pdf.

⁷³ See 2016 IWG Addendum at 2.

⁷⁴ *Id.* at 3.

reviewed academic literature, disclosed relevant limitations, and adequately planned to incorporate new information through public comments and updated research.⁷⁵ In 2016 and 2017, the National Academies of Sciences issued two reports that, while recommending future improvements to the methodology, supported the continued use of the existing IWG estimates.⁷⁶ And in 2016, the U.S. Court of Appeals for the Seventh Circuit held that the Department of Energy’s reliance on IWG’s social cost of carbon was reasonable.⁷⁷ It is, therefore, unsurprising that leading economists and climate policy experts have endorsed the Working Group’s values as the best available estimates.⁷⁸

Furthermore, uncertainty over the values or range of values included in the IWG’s social costs of greenhouse gases metric is *not* a reason to abandon the social cost of greenhouse gas methodologies;⁷⁹ quite the contrary, uncertainty supports higher estimates of the social cost of greenhouse gases, because most uncertainties regarding climate change entail tipping points, catastrophic risks, and unknown unknowns about the damages of climate change. Because the key uncertainties of climate change include the risk of irreversible catastrophes, applying an options value framework to the regulatory context strengthens the case for ambitious regulatory action to reduce greenhouse gas emissions. Dismissing the social cost of greenhouse gases metric because there is a range of potential estimates has been rejected by the Ninth Circuit in *Center for Biological Diversity*—“while . . . there is a range of values, the value of carbon emissions reduction is certainly not zero”⁸⁰—but the range of values recommended by the Interagency Working Group⁸¹ and endorsed by the National Academies of Sciences⁸² is rather manageable. In 2016, the IWG recommended values at discount rates from 2.5% to 5%, calculated as between \$12 and \$62 for year 2020 emissions.⁸³ Numerous federal agencies have had no difficulty either applying this range in their environmental impact statements or else focusing on the central estimate at a 3% discount rate.⁸⁴ Most recently, in August 2017, the Bureau of Ocean Energy Management applied the IWG’s range of estimates calculated at three discount rates (2.5%, 3%, and 5%)

⁷⁵ Gov’t Accountability Office, *Regulatory Impact Analysis: Development of Social Cost of Carbon Estimates* 12-19 (2014). Available at <http://www.gao.gov/assets/670/665016.pdf>.

⁷⁶ Nat’l Acad. Sci., Engineering & Med., *Valuing Climate Damages: Updating Estimation of the Social Cost of Carbon Dioxide* 3 (2017), <https://www.nap.edu/read/24651/chapter/1>; Nat’l Acad. Sci., Engineering & Med., *Assessment of Approaches to Updating the Social Cost of Carbon: Phase 1 Report on a Near-Term Update* 1–2 (2016); <https://www.nap.edu/read/21898/chapter/1>.

⁷⁷ *Zero Zone*, 832 F.3d at 679.

⁷⁸ See, e.g., Richard Revesz et al., *Best Cost Estimate of Greenhouse Gases*, 357 *Science* 655 (2017); Michael Greenstone et al., *Developing a Social Cost of Carbon for U.S. Regulatory Analysis: A Methodology and Interpretation*, 7 *Rev. Envtl. Econ. & Pol’y* 23, 42 (2013); Richard L. Revesz et al., *Global Warming: Improve Economic Models of Climate Change*, 508 *Nature* 173 (2014) (co-authored with Nobel Laureate Kenneth Arrow, among others).

⁷⁹ *Center for Biological Diversity v. NHTSA*, 538 F.3d 1172, 1200 (9th Cir. 2008) (“[W]hile the record shows that there is a range of values, the value of carbon emissions reductions is certainly not zero.”).

⁸⁰ 538 F.3d at 1200.

⁸¹ See Interagency Working Group on the Social Cost of Greenhouse Gases, *Technical Update* (2016) (hereinafter 2016 TSD).

⁸² See National Academies of Sciences, *Assessment of Approaches to Updating the Social Cost of Carbon* (2016) (hereinafter First NAS Report) (endorsing continued near-term use of the IWG numbers; in 2017, the NAS recommended moving to a declining discount rate, see National Academies of Sciences, *Valuing Climate Damages* (2017) (hereinafter Second NAS Report).

⁸³ 2016 TSD. The values given here are in 2007\$. The IWG also recommended a 95th percentile value of \$123.

⁸⁴ BLM, *Envtl. Assessment—Waste Prevention, Prod. Subject to Royalties, and Res. Conservation* at 52 (2016); BLM, *Final Envtl. Assessment: Little Willow Creek Protective Oil and Gas Lease*, DOI-BLM-ID-B010-2014-0036-EA, at 82 (2015); Office of Surface Mining, *Final Envtl. Impact Statement—Four Corners Power Plant and Navajo Mine Energy Project* at 4.2-26 to 4.2-27 (2015) (explaining the social cost of greenhouse gases “provide[s] further context and enhance[s] the discussion of climate change impacts in the NEPA analysis.”); U.S. Army Corps of Engineers, *Draft Envtl. Impact Statement for the Missouri River Recovery Mgmt. Project* at 3-335 (2016); U.S. Forest Serv., *Rulemaking for Colorado Roadless Areas: Supplemental Final Envtl. Impact Statement* at 120-123 (Nov. 2016) (using both the social cost of carbon and social cost of methane relating to coal leases); NHTSA EIS, Available at http://www.nhtsa.gov/staticfiles/rulemaking/pdf/cafe/FINAL_EIS.pdf at 9-77.

to its environmental impact statement for an offshore oil development plan,⁸⁵ and called this range of estimates “a useful measure to assess the benefits of CO₂ reductions and inform agency decisions.”⁸⁶

A Recent Executive Order Does Not Change the Requirements to Monetize Climate Damages

In March 2017, President Trump disbanded the IWG and withdrew their technical support documents.⁸⁷ Nevertheless, Executive Order 13,783 assumes that federal agencies will continue to “monetiz[e] the value of changes in greenhouse gas emissions” and instructs agencies to ensure such estimates are “consistent with the guidance contained in OMB Circular A-4.”⁸⁸ Consequently, while federal agencies no longer benefit from ongoing technical support from the IWG on use of the social cost of greenhouse gases, by no means does the new Executive Order imply that agencies should not monetize important effects in their environmental impact statements. The Executive Order does not prohibit agencies from relying on the same choice of models as the IWG, the same inputs and assumptions as the IWG, the same statistical methodologies as the IWG, or the same ultimate values as derived by the IWG. To the contrary, because the Executive Order requires consistency with Circular A-4, as agencies follow the Circular’s standards for using the best available data and methodologies, they will necessarily choose similar data, methodologies, and estimates as the IWG, since the IWG’s work continues to represent the best available estimates.⁸⁹ The Executive Order does not preclude agencies from using the same range of estimates as developed by the IWG, so long as the agency explains that the data and methodology that produced those estimates are consistent with Circular A-4 and, more broadly, with standards for rational decisionmaking.

Similarly, the Executive Order’s withdrawal of the Council on Environmental Quality’s guidance on greenhouse gases,⁹⁰ does not—and legally cannot—remove agencies’ statutory requirement to fully disclose the environmental impacts of greenhouse gas emissions. As the Council on Environmental Quality explained in its withdrawal, the “guidance was not a regulation,” and “[t]he withdrawal of the guidance does not change any law, regulation, or other legally binding requirement.”⁹¹ In other words, when the guidance originally recommended the appropriate use of the social cost of greenhouse gases in environmental impact statements,⁹² it was simply explaining that the social cost of greenhouse gases is consistent with longstanding NEPA regulations and case law, all of which are still in effect today.

Notably, some agencies under the Trump administration have continued to use the IWG estimates even following the Executive Order. For example, in August 2017, the Bureau of Ocean Energy Management called the social cost of carbon “a useful measure” and applied it to analyze the consequences of

⁸⁵ BOEM, *Liberty Development Project: Draft Environmental Impact Statement*, at 4-247 (2017).

⁸⁶ *Id.* at 3-129.

⁸⁷ Exec. Order No. 13,783 § 5(b), 82 Fed. Reg. 16,093 (Mar. 28, 2017).

⁸⁸ *Id.* § 5(c).

⁸⁹ See Richard L. Revesz et al., *Best Cost Estimate of Greenhouse Gases*, 357 *SCIENCE* 6352 (2017) (explaining that, even after Trump’s Executive Order, the social cost of greenhouse gas estimate of around \$50 per ton of carbon dioxide is still the best estimate).

⁹⁰ Exec. Order 13,783 § 3(c)

⁹¹ 82 Fed. Reg. 16,576, 16,576 (Apr. 5, 2017).

⁹² See CEQ, *Revised Draft Guidance on Consideration of Greenhouse Gas Emissions and the Effects of Climate Change in National Environmental Policy Act Reviews* at 16 (Dec. 2014), available at https://obamawhitehouse.archives.gov/sites/default/files/docs/nepa_revised_draft_ghg_guidance_searchable.pdf (“[A]lthough developed specifically for regulatory impact analyses, the Federal social cost of carbon, which multiple Federal agencies have developed and used to assess the costs and benefits of alternatives in rulemakings, offers a harmonized, interagency metric that can provide decisionmakers and the public with some context for meaningful NEPA review.”).

offshore oil and gas drilling.⁹³ And in July 2017, the Department of Energy used the IWG’s estimates for carbon and methane emissions to analyze energy efficiency regulation, describing the social cost of methane as having “undergone multiple stages of peer review.”⁹⁴

Two agencies have developed new “interim” values of the social cost of greenhouse gases following the Executive Order. Relying on faulty economic theory, these “interim” estimates drop the social cost of carbon from \$50 per ton in year 2020 down to as little as \$1 per ton, and drop the social cost of methane from \$1420 per ton in year 2020 down to \$58. These “interim” estimates are inconsistent with accepted science and economics; the IWG’s 2016 estimates remain the best available estimates. The IWG’s methodology and estimates have been repeatedly endorsed by reviewers as transparent, consensus-based, and firmly grounded in the academic literature. By contrast, the “interim” estimates ignore the interconnected, global nature of our climate-vulnerable economy, and obscure the devastating effects that climate change will have on younger and future generations. Agencies should not use the “interim” social cost of greenhouse gas estimates because of their methodological flaws, as described more fully in the next subsections.

A Global Estimate of Climate Damages Is Required by NEPA

CEQ’s Draft Guidance wrongly suggests that, if agencies use the social cost of greenhouse gas estimates, any such estimates “should focus on the impacts that accrue to citizens and residents of the United States.”⁹⁵ In fact, NEPA requires a global perspective on climate damages.

NEPA contains a provision on “International and National Coordination of Efforts” that broadly requires that “all agencies of the Federal Government *shall* . . . recognize the worldwide and long-range character of environmental problems.”⁹⁶ Using a global social cost of greenhouse gases to analyze and set policy fulfills these instructions. Furthermore, the Act requires agencies to, “where consistent with the foreign policy of the United States, lend appropriate support to initiatives, resolutions, and programs designed to maximize international cooperation in anticipating and preventing a decline in the quality of mankind’s world environment.”⁹⁷ By continuing to use the global social cost of greenhouse gases to spur reciprocal foreign actions, federal agencies “lend appropriate support” to the NEPA’s goal of “maximize[ing] international cooperation” to protect “mankind’s world environment.” Furthermore, not only is it consistent with Circular A-4 and best economic practices to estimate the global damages of U.S. greenhouse gas emissions in regulatory analyses and environmental impact statements, but no existing methodology for estimating a “domestic-only” value is reliable, complete, or consistent with Circular A-4.

⁹³ *Draft Environmental Impact Statement—Liberty Development Project in the Beaufort Sea, Alaska* at 3-129.

⁹⁴ Energy Conservation Program: Energy Conservation Standards for Walk-In Cooler and Freezer Refrigeration Systems, 82 Fed. Reg. 31,808, 31,811, 31,857 (July 10, 2017).

⁹⁵ 84 Fed. Reg. at 30,099 n.8.

⁹⁶ 42 U.S.C. § 4332(2)(f) (emphasis added).

⁹⁷ *Id.*; see also *Environmental Defense Fund v. Massey*, 986 F.2d 528, 535 (D.C. Cir. 1993) (confirming that Subsection F is mandatory); *Natural Resources Defense Council v. NRC*, 647 F.2d 1345, 1357 (D.C. Cir. 1981) (“This NEPA prescription, I find, looks toward cooperation, not unilateral action, in a manner consistent with our foreign policy.”); cf. COUNCIL ON ENVIRONMENTAL QUALITY, GUIDANCE ON NEPA ANALYSIS FOR TRANSBOUNDARY IMPACTS (1997), available at <http://www.gc.noaa.gov/documents/transguide.pdf>; Exec. Order No. 12,114, *Environmental Effects Abroad of Major Federal Actions*, 44 Fed. Reg. 1957 §§ 1-1, 2-1 (Jan. 4, 1979) (applying to “major Federal actions . . . having significant effects on the environment outside the geographical borders of the United States,” and enabling agency officials “to be informed of pertinent environmental considerations and to take such considerations into account . . . in making decisions regarding such actions”).

From 2010 through 2016, federal agencies based their regulatory decision and NEPA reviews on global estimates of the social cost of greenhouse gases. Though agencies often also disclosed a “highly speculative” range that tried to capture exclusively U.S. climate costs, emphasis on a global value was recognized as more accurate given the science and economics of climate change, as more consistent with best economic practices, and as crucial to advancing U.S. strategic goals.⁹⁸

Opponents of climate regulation challenged the global number in court and other forums, and often attempted to use Circular A-4 as support.⁹⁹ Specifically, opponents have seized on Circular A-4’s instructions to “focus” on effects to “citizens and residents of the United States,” while any significant effects occurring “beyond the borders of the United States . . . should be reported separately.”¹⁰⁰ Importantly, despite this language and such challenges, the U.S. Court of Appeals for the Seventh Circuit had no trouble concluding that a global focus for the social cost of greenhouse gases was reasonable:

AHRI and Zero Zone [the industry petitioners] next contend that DOE [the Department of Energy] arbitrarily considered the global benefits to the environment but only considered the national costs. They emphasize that the [statute] only concerns “national energy and water conservation.” In the New Standards Rule, DOE did not let this submission go unanswered. It explained that climate change “involves a global externality,” meaning that carbon released in the United States affects the climate of the entire world. According to DOE, national energy conservation has global effects, and, therefore, those global effects are an appropriate consideration when looking at a national policy. Further, AHRI and Zero Zone point to no global costs that should have been considered alongside these benefits. Therefore, DOE acted reasonably when it compared global benefits to national costs.¹⁰¹

Circular A-4’s reference to effects “beyond the borders” confirms that it is appropriate for agencies to consider the global effects of U.S. greenhouse gas emissions. While Circular A-4 may suggest that most typical decisions should focus on U.S. effects, the Circular cautions agencies that special cases call for different emphases:

[Y]ou cannot conduct a good regulatory analysis according to a formula. Conducting high-quality analysis requires competent professional judgment. ***Different regulations may call for different emphases*** in the analysis, ***depending on the nature and complexity*** of the regulatory issues and the sensitivity of the benefit and cost estimates to the key assumptions.¹⁰²

In fact, Circular A-4 elsewhere assumes that agencies’ analyses will not always be conducted from purely the perspective of the United States, as one of its instructions only applies “as long as the analysis is conducted from the United States perspective,”¹⁰³ suggesting that in some circumstances it is

⁹⁸ See generally Howard & Schwartz, *supra* note 58.

⁹⁹ Ted Gayer & W. Kip Viscusi, *Determining the Proper Scope of Climate Change Policy Benefits in U.S. Regulatory Analyses: Domestic versus Global Approaches*, 10 Rev. Envtl. Econ. & Pol’y 245 (2016) (citing Circular A-4 to argue against a global perspective on the social cost of carbon); see also, e.g., Petitioners Brief on Procedural and Record-Based Issues at 70, in *West Virginia v. EPA*, case 15-1363, D.C. Cir. (filed February 19, 2016) (challenging EPA’s use of the global social cost of carbon).

¹⁰⁰ Circular A-4 at 15. Note that A-4 slightly conflates “accrue to citizens” with “borders of the United States”: U.S. citizens have financial and other interests tied to effects beyond the borders of the United States, as discussed further below.

¹⁰¹ *Zero Zone v. Dept. of Energy*, 832 F.3d 654, 679 (7th Cir. 2016),

¹⁰² Circular A-4 at 3 (emphasis added).

¹⁰³ *Id.* at 38 (counting international transfers as costs and benefits “as long as the analysis is conducted from the United States perspective”).

appropriate for the analysis to be global. For example, EPA and DOT have adopted a global perspective on the analysis of potential monopsony benefits to U.S. consumers resulting from the reduced price of foreign oil imports following energy efficiency increases, and EPA assesses the global potential for leakage of greenhouse gas emissions owing to U.S. regulation.¹⁰⁴

Perhaps more than any other issue, the nature of the issue of climate change requires precisely such a “different emphasis” from the default domestic-only assumption. To avoid a global “tragedy of the commons” that could irreparably damage all countries, including the United States, every nation should ideally set policy according to the global social cost of greenhouse gases.¹⁰⁵ Climate and clean air are global common resources, meaning they are freely available to all countries, but any one country’s use—i.e., pollution—imposes harms on the polluting country as well as the rest of the world. Because greenhouse pollution does not stay within geographic borders but rather mixes in the atmosphere and affects climate worldwide, each ton emitted by the United States not only creates domestic harms, but also imposes large externalities on the rest of the world. Conversely, each ton of greenhouse gases abated in another country benefits the United States along with the rest of the world.

If all countries set their greenhouse emission levels based on only domestic costs and benefits, ignoring the large global externalities, the aggregate result would be substantially sub-optimal climate protections and significantly increased risks of severe harms to all nations, including the United States. Thus, basic economic principles demonstrate that the United States stands to benefit greatly if all countries apply global social cost of greenhouse gas values in their regulatory decisions and project reviews. Indeed, the United States stands to gain hundreds of billions or even trillions of dollars in direct benefits from efficient foreign action on climate change.¹⁰⁶

In order to ensure that other nations continue to use global social cost of greenhouse gas values, it is important that the United States itself continue to do so.¹⁰⁷ The United States is engaged in a repeated strategic dynamic with several significant players—including the United Kingdom, Germany, Sweden, and others—that have already adopted a global framework for valuing the social cost of greenhouse gases.¹⁰⁸ For example, Canada and Mexico have explicitly borrowed the IWG’s global SCC metric to set their own fuel efficiency standards.¹⁰⁹ For the United States to now depart from this collaborative dynamic by reverting to a domestic-only estimate would undermine the country’s long-term interests and could jeopardize emissions reductions underway in other countries, which are already benefiting the United States.

For these and other reasons, the IWG properly relied on global estimates to develop its SCC metric, and many federal agencies have since relied on this global metric to evaluate and justify their decisions. At the same time, some agencies have, in addition to the global estimate, also disclosed a “highly

¹⁰⁴ See Howard & Schwartz, *supra* note 58, at 268-69.

¹⁰⁵ See Garrett Hardin, *The Tragedy of the Commons*, 162 *Science* 1243 (1968) (“[E]ach pursuing [only its] own best interest . . . in a commons brings ruin to all.”).

¹⁰⁶ Policy Integrity, *Foreign Action, Domestic Windfall: The U.S. Economy Stands to Gain Trillions from Foreign Climate Action* (2015), <http://policyintegrity.org/files/publications/ForeignActionDomesticWindfall.pdf>

¹⁰⁷ See Robert Axelrod, *The Evolution of Cooperation* 10-11 (1984) (on repeated prisoner’s dilemma games).

¹⁰⁸ See Howard & Schwartz, *supra* note 58, at Appendix B.

¹⁰⁹ See Heavy-Duty Vehicle and Engine Greenhouse Gas Emission Regulations, SOR/2013-24, 147 *Can. Gazette* pt. II, 450, 544 (Can.), available at <http://canadagazette.gc.ca/rp-pr/p2/2013/2013-03-13/html/sor-dors24-eng.html> (“The values used by Environment Canada are based on the extensive work of the U.S. Interagency Working Group on the Social Cost of Carbon.”); Jason Furman & Brian Deese, *The Economic Benefits of a 50 Percent Target for Clean Energy Generation by 2025*, White House Blog, June 29, 2016 (summarizing the North American Leader’s Summit announcement that U.S., Canada, and Mexico would “align” their SCC estimates).

speculative” estimate of the domestic-only effects of climate change. In particular, the Department of Energy always includes a chapter on a domestic-only value of carbon emissions in the economic analyses supporting its energy efficiency standards; EPA has also often disclosed similar estimates.¹¹⁰ Such an approach is consistent with Circular A-4’s suggestion that agencies should usually disclose domestic effects separately from global effects. However, as we have discussed, reliance on a domestic-only methodology would be inconsistent with both the inherent nature of climate change and the standards of Circular A-4. Consequently, it is appropriate under Circular A-4 for agencies to continue to rely on global estimates of the social cost of greenhouses to justify their regulatory decisions or their choice of alternatives under NEPA.

Moreover, no current methodology can accurately estimate a “domestic-only” value of the social cost of greenhouse gases. OMB, the National Academies of Sciences, and the economic literature all agree that existing methodologies for calculating a “domestic-only” value of the social cost of greenhouse gases are deeply flawed and result in severe and misleading underestimates. In developing the social cost of carbon, the IWG did offer some such domestic estimates. Using the results of one economic model (FUND) as well as the U.S. share of global gross domestic product (GDP), the group generated an “approximate, provisional, and **highly speculative**” range of 7–23% of the global social cost of carbon as an estimate of the purely direct climate effects to the United States.¹¹¹ Yet, as the IWG itself acknowledged, this range is almost certainly an underestimate because it ignores significant, indirect costs to trade, human health, and security that are likely to “spill over” into the United States as other regions experience climate change damages, among other effects.¹¹²

Neither the existing IAMs nor a share of global GDP are appropriate bases for calculating a domestic-only estimate. The IAMs were never designed to calculate a domestic SCC, since a global SCC is the economic efficient value. FUND, like other IAMs, includes some simplifying assumptions: of relevance, FUND and the other IAMs are not able to capture the adverse effects that the impacts of climate change in other countries will have on the United States through trade linkages, national security, migration, and other forces.¹¹³ This is why the IWG characterized the domestic-only estimate from FUND as a “highly speculative” underestimate. Similarly, a domestic-only estimate based on some rigid conception of geographic borders or U.S. share of world GDP will fail to capture all the climate-related costs and benefits that matter to U.S. citizens.¹¹⁴ U.S. citizens have economic and other interests abroad that are not fully reflected in the U.S. share of global GDP. GDP is a “monetary value of final goods and services—that is, those that are bought by the final user—produced in a country in a given period of time.”¹¹⁵ GDP therefore does not reflect significant U.S. ownership interests in foreign businesses, properties, and other assets, as well as consumption abroad including tourism,¹¹⁶ or even the 8 million

¹¹⁰ Howard & Schwartz, *supra* note 58, at 220-21.

¹¹¹ INTERAGENCY WORKING GROUP ON SOCIAL COST OF CARBON, TECHNICAL SUPPORT DOCUMENT: SOCIAL COST OF CARBON FOR REGULATORY IMPACT ANALYSIS UNDER EXECUTIVE ORDER 12,866 at 11 (2010) (emphasis added).

¹¹² *Id.* (explaining that the IAMs, like FUND, do “not account for how damages in other regions could affect the United States (e.g., global migration, economic and political destabilization”).

¹¹³ See, e.g., Dept. of Defense, *National Security Implications of Climate-Related Risks and a Changing Climate* (2015), available at <http://archive.defense.gov/pubs/150724-congressional-report-on-national-implications-of-climate-change.pdf?source=govdelivery>.

¹¹⁴ A domestic-only SCC would fail to “provide to the public and to OMB a careful and transparent analysis of the anticipated consequences of economically significant regulatory actions.” Office of Information and Regulatory Affairs, *Regulatory Impact Analysis: A Primer 2* (2011).

¹¹⁵ Tim Callen, *Gross Domestic Product: An Economy’s All*, IMF, <http://www.imf.org/external/pubs/ft/fandd/basics/gdp.htm> (last updated Mar. 28, 2012).

¹¹⁶ “U.S. residents spend millions each year on foreign travel, including travel to places that are at substantial risk from climate change, such as European cities like Venice and tropical destinations like the Caribbean islands.” David A. Dana, *Valuing*

Americans living abroad.¹¹⁷ At the same time, GDP is also over-inclusive, counting productive operations in the United States that are owned by foreigners. Gross National Income (GNI), by contrast, defines its scope not by location but by ownership interests.¹¹⁸ However, not only has GNI fallen out of favor as a metric used in international economic policy,¹¹⁹ but using a domestic-only SCC based on GNI would make the SCC metrics incommensurable with other costs in regulatory impact analyses, since most regulatory costs are calculated by U.S. agencies regardless of whether they fall to U.S.-owned entities or to foreign-owned entities operating in the United States.¹²⁰ Furthermore, both GDP and GNI are dependent on what happens in other countries, due to trade and the international flow of capital. The artificial constraints of both metrics counsel against a rigid split based on either U.S. GDP or U.S. GNI.¹²¹

Of course, there already are and will continue to be significant, quantifiable, localized effects of climate change. For example, a peer-reviewed EPA report, *Climate Change in the United States: Benefits of Global Action*, found that by the end of the century, the U.S. economy could face damages of \$110 billion annually in lost labor productivity alone due to extreme temperatures, plus \$11 billion annually in agricultural damages, \$180 billion in losses to key economic sectors due to water shortages, and \$5 trillion in damages U.S. coastal property.¹²² But the existence of those examples of quantifiable estimates of localized damages does not mean that the current IAMs are able to extrapolate a U.S.-only number that accurately reflects total domestic damages—especially since, as already explained, the IAMs do not reflect spill overs.

As a result, in 2015, OMB concluded, along with several other agencies, that “good methodologies for estimating domestic damages do not currently exist.”¹²³ Similarly, the NAS recently concluded that current IAMs cannot accurately estimate the domestic social cost of greenhouse gases, and that estimates based on U.S. share of global GDP would be likewise insufficient.¹²⁴ William Nordhaus, the developer of the DICE model, cautioned earlier this year that “regional damage estimates are both incomplete and poorly understood,” and “there is little agreement on the distribution of the SCC by region.”¹²⁵ In short, any domestic-only estimate will be inaccurate, misleading, and out of step with the best available economic literature, in violation of Circular A-4’s standards for information quality.

Foreign Lives and Civilizations in Cost-Benefit Analysis: The Case of the United States and Climate Change Policy (Northwestern Faculty Working Paper 196, 2009),

<http://scholarlycommons.law.northwestern.edu/cgi/viewcontent.cgi?article=1195&context=facultyworkingpapers>.

¹¹⁷ Assoc. of Americans Resident Overseas, <https://www.aaro.org/about-aaro/6m-americans-abroad>. Admittedly 8 million is only 0.1% of the total population living outside the United States.

¹¹⁸ *GNI, Atlas Method (Current US\$)*, THE WORLD BANK, <http://data.worldbank.org/indicator/NY.GNP.ATLS.CD>.

¹¹⁹ *Id.*

¹²⁰ U.S. Office of Management and Budget & Secretariat General of the European Commission, *Review of Application of EU and US Regulatory Impact Assessment Guidelines on the Analysis of Impacts on International Trade and Development* 13 (2008).

¹²¹ Advanced Notice of Proposed Rulemaking on Regulating Greenhouse Gas Emissions Under the Clean Air Act, 73 Fed. Reg. 44,354, 44,415 (July 30, 2008) (“Furthermore, international effects of climate change may also affect domestic benefits directly and indirectly to the extent U.S. citizens value international impacts (e.g., for tourism reasons, concerns for the existence of ecosystems, and/or concern for others); U.S. international interests are affected (e.g., risks to U.S. national security, or the U.S. economy from potential disruptions in other nations).”).

¹²² EPA, *Climate Change in the United States: Benefits of Global Action* (2015).

¹²³ In November 2013, OMB requested public comments on the social cost of carbon. In 2015, OMB along with the rest of the Interagency Working Group issued a formal response to those comments. Interagency Working Group on the Social Cost of Carbon, *Response to Comments: Social Cost of Carbon for Regulatory Impact Analysis under Executive Order 12,866* at 36 (July 2015) [hereinafter, OMB 2015 Response to Comments].

¹²⁴ Nat’l Acad. Sci., Eng. & Medicine, *Valuing Climate Damages: Updating Estimates of the Social Cost of Carbon Dioxide* 53 (2017) [“NAS Second Report”].

¹²⁵ William Nordhaus, *Revisiting the Social Cost of Carbon*, 114 PNAS 1518, 1522 (2017).

For more details on the justification for a global value of the social cost of greenhouse gases, please see Peter Howard & Jason Schwartz, *Think Global: International Reciprocity as Justification for a Global Social Cost of Carbon*, 42 Columbia J. Envtl. L. 203 (2017). Another strong defense of the global valuation as consistent with best economic practices appears in a letter published in a recent issue of *The Review of Environmental Economics and Policy*, co-authored by the late Nobel laureate economist Kenneth Arrow.¹²⁶

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*No part of this document purports to present New York University School of Law's views, if any.

¹²⁶ Richard Revesz, Kenneth Arrow et al., *The Social Cost of Carbon: A Global Imperative*, 11 REEP 172 (2017).