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Global CLIMATE CHANGE

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[redacted]

March 31, 2009

Mr. Kevin Nyland
Acting Administrator
Office of Information and Regulatory Affairs
Office of Management and Budget
Executive Office of the President

Dear Mr. Nyland:

We are pleased to submit the attached recommendations in response to OMB's request for comments on its regulatory review process. Our comments focus on suggested changes to existing OMB guidance in the use of benefit-cost analysis as it applies to pending and future regulations that reduce greenhouse gas emissions.

These comments are informed by a recent workshop organized by the Pew Center which brought together 75 of the world's leading experts on the issues related to quantifying the benefits of reducing greenhouse gas emissions. Information on the workshop is available at: http://www.pewclimate.org/benefitswworkshop-March09.

Given the need to consider the benefits from reducing greenhouse gas emissions as part of rulemakings across the government, we believe this review is both timely and critical. We would be happy to meet with your staff to discuss our comments if that would be useful.

Sincerely,

Jay Gulledge, Senior Scientist and Program Manager for Science and Impacts

Janet Peace, VP for Markets and Business Strategy

Jeremy Richardson, Senior Fellow for Science Policy

Steve Seidel, VP for Policy Analysis

In Brief

As the Office of Management and Budget undertakes a 100-day review of its role in the federal regulatory review process, the Pew Center on Global Climate Change offers the following recommendations regarding the use of benefit-cost analysis (BCA) as a tool to assess economically efficient policies to mitigate climate change.

1) If performed according to best practices, traditional benefit-cost analysis (BCA) can be an appropriate tool for making policy recommendations that concern incremental changes in greenhouse gas emissions and climate impacts (e.g., for regulatory decisions like CAFE, or appliance efficiency standards). It should not be used for decisions that are non-incremental, for example long-term decisions concerning decarbonization of the energy sector.

2) To ensure a globally efficient outcome, global, rather than only domestic, benefits of climate policy should be considered when using BCA to evaluate domestic climate policy.

3) Use of a constant 7 percent discount rate is inappropriate for the analysis of climate policies for a variety of reasons including the widely recognized potential for very large and irreversible damages on future generations. A much lower discount rate of 3 percent or lower should be used to account for the intergenerational nature of the issue and the analysis should take into account the uncertainty over time associated with any long term discount rate.

4) The benefits calculated in BCA are derived from integrated assessment models that omit a large number of potentially significant impacts. Analysts must compensate for this underestimation of benefits.

5) BCA should evaluate and communicate the sensitivity of results to uncertainty in key model parameters and future outcomes, such as climate sensitivity, the rate of climate change, carbon cycle feedbacks, the magnitude and timing of impacts, the efficacy of adaptation, and potentially catastrophic outcomes with unknown but non-zero probabilities.

6) Climate policy is unlike other regulatory issues that fall squarely within existing OMB guidance. Because of the unique characteristics of climate change, OMB should develop separate guidelines specific to analyzing climate policy.

7) Over the longer term, BCA alone should not serve as the primary metric for setting or evaluating climate-related policies and new methods must be developed and implemented to provide a more complete assessment of benefits.

Recommendations for the Office of Management and Budget

Pew Center on Global Climate Change

March 31, 2009

The Pew Center on Global Climate Change recognizes the importance of the regulatory review process in establishing a framework for facilitating informed decision making concerning future regulatory actions to reduce greenhouse gas (GHG) emissions. While the Obama Administration and key members of Congress intend to make climate legislation a top priority this year, the earliest action may come from federal agencies' near-term actions limiting greenhouse gas emissions under existing legislative authorities.

The Pew Center on Global Climate Change recently held an expert workshop bringing together more than 75 thought leaders in the environmental economics, impacts, vulnerability, and risk assessment communities to provide insights about quantifying the benefits of reducing greenhouse gas emissions, to develop recommendations on the use of benefit-cost analysis (BCA) for climate policy, and to outline a research path to improve decision making tools over time. Input from participants of the workshop has shaped the recommendations presented here, which nonetheless represent only the views of the Pew Center. More information on the workshop can be found on our website.[1]

BCA has long been a cornerstone of regulatory decision making. The Pew Center believes that BCA has a legitimate role in assessing individual energy and environmental regulations. As acknowledged in current OMB guidelines (cf. Circular A-4 and A-94), the utility of BCA declines with longer time scales, which is a serious limitation with regard to climate policy. It is also subject to misuse when non-incremental changes are involved, when damage estimates fail to include or quantify significant impacts, and when global commons are affected. In the case of climate policy, therefore, BCA faces several challenges that can lead to misguided decisions if not addressed effectively.

Given that the courts have ordered regulatory agencies to include the benefits from climate change in their decisions and that a number of such regulations are in the pipeline (e.g., CAFE standards, appliance efficiency standards, and possible EPA greenhouse gas regulations), this review by OMB is both timely and necessary. Though much work remains to be done, the environmental economics community has generated some important recent innovations in analyzing the benefits of climate policy. OMB's review of this progress should provide new insights and inform its revised guidance to federal regulators. The recommendations here focus on the benefits side of the BCA approach.

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[1] http://www.pewclimate.org/benefitsworkshop-March09

1) **If performed according to best practices, traditional benefit-cost analysis (BCA) can be an appropriate tool for making policy recommendations that concern incremental changes in greenhouse gas emissions and climate impacts (e.g., for regulatory decisions like CAFE, or appliance efficiency standards). It should not be used for decisions that are non-incremental, for example long-term decisions concerning decarbonization of the energy sector.**

BCA can be an effective tool in evaluating the efficacy of proposed and existing regulations that concern incremental changes in greenhouse gas emissions. Used correctly, with an adequate accounting of the benefits of regulations (see #2), BCA can help inform decision makers about costs and benefits of rules governing, for example, improved CAFE standards and appliance efficiency standards. Policies that involve non-incremental changes in emissions, however, such as the long-term decarbonization of the economy over the 21st century, are difficult if not impossible to evaluate within a BCA framework. These policies are expected to bring about significant changes in and interactions between economic and biophysical systems, which no current modeling framework is remotely capable of capturing. Thus, estimates emerging from such analyses are not robust enough to guide the design of policies that will significantly alter climate projections from the no-policy baseline. It is important to understand the limitations of existing tools used to evaluate climate policies. Recommendations 2-6 address best practices for BCA when analyzing incremental climate policies.

2) **To ensure a globally efficient outcome, global, rather than only domestic, benefits of climate policy should be considered when using BCA to evaluate domestic climate policy.**

Global climate change represents a market failure—emitters of greenhouse gases do not account for the damages they impose on others, leading to an inefficient use of resources and excessive emissions from a societal perspective. GHGs are global pollutants that mix uniformly in the atmosphere. As a result, the damages from any one country's emissions are borne not only by the country itself, but by all other countries as well. Furthermore, because no single country emits the majority of all GHGs, the majority of climate change damages in any country are the result of the combined GHGs from all other emitters. Because no single country can achieve the emissions reductions it needs on its own, all major emitters must cooperate by internalizing all damages caused by their GHGs, including those outside their own borders. Only through such international cooperation can the market failure be fully corrected. Both the United Kingdom and the European Commission have decided to account for global benefits when contemplating GHG emission reductions in regulatory impact assessments and cost-benefit analyses.[2]

Although current OMB guidance permits consideration of international impacts of domestic emissions (Circular A-4, p. 15), it encourages agencies to emphasize the domestic benefits of regulatory actions (Circular A-94, p. 5). In the case of climate change, this approach is misguided for multiple reasons. If the United States, as a large world emitter in both historic and per capita terms, were to consider only domestic benefits in crafting its climate policy, it

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[2] Watkiss, P., D. Anthoff, T. Downing, C. Hepburn, C. Hope, A. Hunt, and R.S.J. Tol, The social costs of carbon (SCC) review—methodological approaches for using SCC estimates in policy assessment, Final report to DEFRA, 2006.

would create a strong incentive for other countries to behave similarly. The net effect would be that all countries would make fewer reductions, ensuring an outcome that is globally suboptimal and less beneficial to the U.S. because only a minority fraction of domestic damages would be avoided compared to the cooperative outcome. In addition, accounting for domestic benefits within U.S. borders alone will likely miss important spillover effects that stem from damages abroad, including climate-related destabilization of societies and human populations that could present serious national security risks to the U.S.

The current OMB guidelines should be revised to require that global benefits be considered when addressing issues related to climate policy.

3) **Use of a constant 7 percent discount rate is inappropriate for the analysis of climate policies for a variety of reasons including the widely recognized potential for very large and irreversible damages on future generations. A much lower discount rate of 3 percent or lower should be used to account for intergenerational nature of the issue and the analysis should take into account the uncertainty over time associated with any long term discount rate.**

A serious risk exists that without actions to prevent climate change, the impacts to the global economy will be large, widespread and in many cases irreversible. However, the benefits of avoiding these impacts will accrue largely to future generations, whereas the costs of mitigation will largely be borne by current generations. As is the case for any BCA of long-run policies, the prescriptions for climate policy will be extremely sensitive to the discount rate used in the analysis. Which discount rate to use when facing serious climate impacts however, largely falls in the realm of discussions about equity, intergenerational welfare, and ethics, leading us to conclude that a lower discount rate is more appropriate.

Current OMB guidelines on discounting (as described in Circular A-4 with reference to Circular A-94) mandate using real discount rates of both 3 percent and 7 percent. However, the guidelines acknowledge that special considerations arise when comparing benefits and costs across generations. Circular A-4 recommends that if a rule has important intergenerational benefits or costs, then further sensitivity analysis would be appropriate to calculate net benefits using a lower but positive discount rate in the range of 1-3 percent (p. 35-36). Climate change, without question clearly requires special consideration and we absolutely support the use of lower discount rates.

OMB's 7 percent discount rate (based on the average before-tax rate of return to private capital in the U.S. economy) is inappropriate for evaluating climate policy for a number of reasons. First, it raises serious ethical concerns about intergenerational weighting. Second, market interest rates simply do not exist for the long intergenerational time horizons involved in climate change. Third, the rationale for setting of the social discount rate equal to the market interest rate, which stems from optimal growth modeling, is contingent on there being no market failures or distortions in the economy, which do not characterize real-world conditions.

In addition to requiring the use of a lower interest rate, OMB should also establish guidelines to account for uncertainty in the discount rate over time. Analysts typically consider the discount rate to be constant, but historical records suggest there is uncertainty in the discount rate itself. The interest rate for U.S. long-term government bonds has declined by about 3 percent over the past two centuries. Uncertainty in the discount rate can have a large effect on the valuation of

future benefits. For example, Newell and Pizer (2001)[3] find that applying variable discount factors that account for uncertainty would raise the expected value of damages from CO_2 emissions by more than 80 percent, compared to a constant 4 percent discount rate. Thus, by including a realistic treatment of the uncertainty in future discount rates, the valuation of future benefits is less sensitive to the choice of the initial discount rate. OMB should establish guidelines for including uncertainty in the future discount rate, particularly as applied to climate policy, where the benefits will be experienced further in the future.

4) The benefits calculated in BCA are derived from integrated assessment models that omit a large number of potentially significant impacts.[4] Analysts must compensate for this substantial underestimation of benefits.

Omitted impacts can be grouped into three categories: i) market impacts that have not as yet been included in models; ii) non-market impacts that are much more difficult to put in monetary units but which can be quantified in physical units and iii) socially contingent impacts which are important to society but even more difficult to quantify.

i. Market impacts. The vast majority of the economic impacts considered in BCA studies focus on the effects of projected mean climate change on market sectors, such as the impacts of mean sea level rise on infrastructure and effects of higher temperatures on energy consumption for heating and cooling (See region I of the matrix in Figure 1). However, not all impacts that can be monetized are yet included in most models used as the basis for benefits estimates. The climate impacts on agriculture, water variability (drought, flood, storms), even tourism are but a few examples of impacts with specific market values that are typically not included in BCA assessments (regions II and III of Figure 1). For the most part, government agencies have been relying on models that have yet to include impacts beyond Region I of the matrix, because assessments of other impacts are relatively recent and difficult to aggregate. Nevertheless, they are extremely important and should be considered.

ii. Nonmarket impacts. Even if models were able to monetize all of the impacts identified above, many omitted impacts do not have market values, even though some can be quantified in physical units (regions IV-VI of Figure 1). These include, for example, the extinction of individual species, and an overall decrease in biodiversity. For example, with 1.5 – 2.5 °C warming above the 1990 global average temperature, the IPCC projects that 30

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[3] Newell, R. and W. Pizer. Discounting the Benefits of Climate Change Mitigation: How Much Do Uncertain Rates Increase Valuations? Pew Center on Global Climate Change, Arlington, VA, 2003. (Available online at: http://www.pewclimate.org/global-warming-in-depth/all_reports/discounting_the_benefits/)

[4] Yohe, G.W., R.D. Lasco, Q.K. Ahmad, et al. Perspectives on climate change and sustainability, p. 823, In (M.L. Parry, O.F. Canziani, J.P. Palutikof, P.J. van der Linden and C.E. Hanson, Eds.) *Climate Change 2007: Impacts, Adaptation and Vulnerability. Contribution of Working Group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change*, Cambridge University Press, Cambridge, UK, 2007; Yohe, G. and D. Tirpak. "A Research Agenda to Improve Economic Estimates of the Benefits of Climate Change Policies", *Integrated Assessment Journal*, **8**: 1-17, 2008.

percent of species will be at increased risk of extinction.[5] While environmental economists have developed many tools to approximate the value of these impacts (e.g., contingent valuation assessment, shadow pricing, hedonic valuation, travel-cost, etc.) specific damage estimates are difficult to aggregate, time intensive and in many cases are very controversial. For example, while a monetary value can be assigned to physical costs of moving a coastal Alaskan village, many will dispute the idea that a dollar value can be placed on the loss of the ancient cultural practices associated with living by the coast.

Figure 1. Categories of impacts. Darker shading depicts categories for which impacts are generally included in damage functions. Lighter shading depicts categories that are largely or entirely omitted.[6]

		Uncertainty in Valuation of Impacts →		
		Market	**Non-Market**	**Socially Contingent**
Uncertainty in Predicting Climate Change ↓	**Projection** (e.g., mean sea level Rise; mean temperature change)	I • Coastal protection • Loss of dryland • Energy for heating and cooling	IV • Heat stress • Wetland loss	VII • Regional costs • Investment
	Bounded Risks (e.g. droughts, floods, storms)	II • Agriculture • Water Variability	V • Ecosystem change • Biodiversity • Loss of life • Secondary social effects	VIII • Comparative advantage • Market structures
	System change & surprises (e.g. major events)	III • Above, plus • Significant loss of land and resources • Non-marginal effects	VI • Higher order • Social effects • Regional collapse	IX • Regional collapse

[5] Climate Change 2007: Synthesis Report. Contribution of Working Groups I, II and III to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change, Summary for Policymakers, p. 10. (Core Writing Team, Parchauri, R.K. and A. Reisinger, Eds.) IPCC, Geneva, Switzerland, 2007.

[6] Yohe, G. and D. Tirpak. "A Research Agenda to Improve Economic Estimates of the Benefits of Climate Change Policies", *Integrated Assessment Journal*, **8**: 1-17, 2008; Downing, T., and P. Watkiss. "The Marginal Social Costs of Carbon in Policy Making: Applications, Uncertainty and a Possible Risk Based Approach", paper presented at the DEFRA International Seminar on the Social Costs of Carbon, July 2003.

iii. Socially contingent impacts. Yet another type of impact can be described as socially contingent, where first order impacts have substantial indirect effects. (see Region VII and VIII in Figure 1). An example of this type of impact is the potential loss of diplomatic influence as a result of climate change damages in other countries. Americans value their nation's ability to project power and to influence international developments, but it is not possible to quantify the damage if this ability erodes. Again, while such impacts cannot be assessed in monetary terms, they should nonetheless be identified.

Perceptively, Circular A-4 acknowledges that when benefits cannot be monetized, BCA can be misleading (p.10). We believe that this will be the case for BCA assessments of climate policies derived from integrated assessment models (IAMs) because the omitted impacts are numerous and significant. Because significant impacts are omitted from traditional BCA—the benefit of avoiding these impacts is effectively set to zero, which is unreasonable.[7]

Circular A-4 addresses non-monetized benefits by directing analysts to provide a summary table of these benefits and costs and to use "professional judgment" to highlight the most important ones affecting the policy decision (p.27). In practice, however, we are concerned that decisions are based on the "BCA number" and not the ancillary information on non-monetized impacts. The only way around this problem within the BCA framework is to put a value on all impacts. We advise developing new damage estimates for as many omitted impacts as possible, and then compensating for the remaining omitted impacts through some type of risk premium. One option is to make a post hoc adjustment to estimated damages. An example is offered by Yohe and Tol (2008),[8] who note that a 50% risk premium added to modeled damage estimates is "not out of the question given that the downside risks of climate change are not well understood."

Adjusting impact estimates that we know are too low through the use of a risk premium has intuitive appeal. We often address large personal risk by paying a premium for insurance. Figures from the global reinsurance company Swiss Re, for example, show that current worldwide spending on non-life insurance is 3.1 percent of global GDP.[9] This behavior suggests that individuals value the ability to minimize risk and from a societal perspective may be willing to spend some percent of aggregate income to insure against future unacceptable climate risks if the impacts are potentially large.

Until we are better able to value omitted impacts, their value should be accounted for (and not ignored) by some method of scaling up current estimates.

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[7] Yohe, G. and R.S.J. Tol. "The Stern Review and the economics of climate change: an editorial essay" *Climate Change*, 89: 231-240, 2008.

[8] Ibid

[9] Chichilnisky, G. and K. Sheeran. *Saving Kyoto*. New Holland Publishers, London, UK, forthcoming fall 2009.

5) **BCA should evaluate and communicate the sensitivity of results to uncertainty in key model parameters and future outcomes, such as climate sensitivity, the rate of climate change, carbon cycle feedbacks, the efficacy of adaptation, and potentially catastrophic outcomes with low or unknown but non-zero probabilities.**

Circular A-4 provides specific guidance on the consideration of uncertainty in BCA, stating that one of the fundamental components of regulatory analysis is "a quantitative analysis of the probabilities of the relevant outcomes" (p.40). It specifically suggests the use of sensitivity analysis and formal probabilistic analysis of uncertainties, and it even notes that these suggestions are not intended to preclude new research tools in the future. We concur that a transparent consideration of uncertainties is essential and recommend that it be more specific for analyses of climate change policy. Key uncertainties that should always be examined include climate sensitivity, the shape of the damage fuanction, and the rate of climate change. These uncertainties can be examined using either sensitivity or probabilistic analyses. Where probability distributions are skewed, however, probabilistic analyses are preferable. In the event that sensitivity analysis is used, however, analysts should take care to capture the long tails of the distribution in the choice of values to include in the analysis.

An important element of uncertainty is the possibility of extreme outcomes of unknown but nonzero probability.[10] To account for such risks, analysts should estimate willingness to pay to reduce such risks. One approach would quantify uncertainty explicitly within an IAM and then estimate society's risk-adjusted willingness to pay to reduce the likelihood of unacceptable outcomes on the tails of the distribution for key parameters, such as climate sensitivity. Research is ongoing to develop such methods.[11]

6) **Climate policy is unlike other regulatory issues that fall squarely within existing OMB guidance. Because of the unique characteristics of climate change, as described in the sections above, OMB should develop separate guidelines specific to analyzing climate policy.**

As the above recommendations indicate, the analytical parameters required for effective analysis of climate policy differ from those typical of conventional environmental pollutants. The long time scales involved, the contentious issue of intergenerational discounting, the inability to quantify many of the significant impacts, and the unique uncertainties involved limit the utility of current analytical tools. Although analysts must exercise judgment, climate policy is a new and unique realm of regulatory analysis. The current one-size-fits-all approach to guiding BCA review of regulatory decisions allows analysts familiar with traditional environmental policies excessive leeway to make inappropriate choices for analyzing climate policy. OMB should, therefore, develop separate guidelines specific to climate policy to ensure that BCA, when it is appropriate, is used to its best effect.

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[10] Weitzman, M.L. On modeling and interpreting the economics of catastrophic climate change. *The Review of Economics and Statistics* 91:1–19, 2009.

[11] For example, http://www.pewclimate.org/docUploads/Newbold.pdf

7) BCA alone should not serve as the only metric for evaluating climate policy, and new methods must be developed and implemented to provide a realistic assessment of benefits.

We have provided here some recommendations for improving the use of BCA for evaluating regulatory decisions related to climate policy. However, traditional BCA suffers from several inherent flaws that render it inappropriate as the only method for evaluating climate policy. We have highlighted some of the major shortcomings above. Circular A-4 already draws attention to one:

> ***"When important benefits and costs cannot be expressed in monetary units, BCA is less useful, and it can even be misleading, because the calculation of net benefits in such cases does not provide a full evaluation of all relevant benefits and costs."*** (p.10)

Climate change clearly falls into this category. New (or at least supplemental) methods are needed to accurately assess the benefits of climate policy compared to the costs.

In the case of non-incremental policy decisions, a new approach is even more critical. The IPCC states that "Responding to climate change involves an iterative risk management process that includes both adaptation and mitigation and takes into account climate change damages, co-benefits, sustainability, equity, and attitudes to risk." [12] This is a taller order than BCA alone can fill. Ultimately, decisions about climate change will require setting non-incremental climate policies designed to contribute to global climate stabilization that should be informed by scientific assessments of risk and implemented through domestic action and international cooperation. Once the overarching domestic goals are established, the role of economic analysis may more appropriately shift to focusing on identifying cost effective pathways to achieving those goals.

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[12] Climate Change 2007: Synthesis Report. Contribution of Working Groups I, II and III to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change, Summary for Policymakers, p. 22. (Core Writing Team, R.K. Parchauri and A. Reisinger, Eds.) IPCC, Geneva, Switzerland, 2007.