The True Cost of Atmospheric Pollution

Testimony delivered to the House Subcommittee on Energy and Mineral Resources in regard to a hearing on H. R. 3117, "A bill to prohibit the Secretary of Energy, the Administrator of the Environmental Protection Agency, the Secretary of the Interior, and the Chair of the Council on Environmental Quality from considering the social cost of carbon, the social cost of methane, or the social cost of nitrous oxide, in taking any action, and for other purposes",
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Cost-benefit analyses have been a valuable feature of American policy for many decades. Such analyses are most useful when they include the full range of costs and benefits associated with particular policies. Environmental impacts resulting from emissions to the atmosphere are now routinely included in US Government policy analyses. This is sensible since only by including environmental impacts on the health and well being of citizens can we have the information needed to make policies that are in the best interests of the American people. It is therefore critical to appropriately value environmental impacts, the question addressed in H. R. 3117.

The US Government currently analyzes the monetized impacts on climate change resulting from emissions of three gases: carbon dioxide (via the social cost of carbon), methane and nitrous oxide (via their respective social costs). These social costs are "*intended to include (but not limited to) changes in net agricultural productivity, human health, property damages from increased flood risk, and the value of ecosystem services due to climate change*". Very recent estimates of social costs for the US have been calculated by summing the damages associated with individual impacts based on empirical studies. These find values consistent with those derived by the more idealized cost-benefit modeling approaches used in past US Government evaluations, indicating that those values capture damages reasonably well (at least for the US).

There are several important choices to be made when determining social costs. Foremost among these are deciding which effects of the emissions should be included, and how impacts occurring in the more distant future should be accounted

for. Beginning with the determination of which impacts should be included, the social costs currently in use account for impacts around the world, whereas the proposal would limit costs to those that occur within the US alone. Although it may appear logical at a first glance to include only domestic impacts in domestic policy making, climate change is a global problem and the atmosphere does not respect political boundaries: emissions of these gases from any country on Earth affect all countries on Earth.

To see the economic implications of the fact that humanity shares a single atmosphere, think of a simple case in which there are 100 countries with equal emissions. Let's imagine the total impact of these emissions is $100 billion in damages, and it would cost any country $10 billion to eliminate their emissions. If a country considers the impact of its emissions only on itself, it would compare the $10 billion cost with the benefit of decreasing planetary and domestic damages by 1% (as 1 country out of 100 is acting), or $1 billion. If every country followed this logic, all would decide the $10 billion cost outweighs the $1 billion national gain, and so in the end all would not act and all would suffer $100 billion in losses by failing to spend $10 billion. In other words, in the case of a globally shared resource, if all nations consider only their own self-interest, everyone loses. The US needs to account for our impacts on other countries if we want other countries to account for their impacts on us. The sole situation in which the US would come out ahead by considering only national effects would be if we were one of a small minority of countries taking action, while the rest of the world stood by. The current situation is precisely the opposite, however, as the US is the only large emitter in the world that is reneging on its commitment to reduce greenhouse gas emissions. Particularly as we are no longer the world's top emitter, we cannot hope to avert the damages to the US from climate change without international cooperation, making inclusion of damages that occur only within our borders an untenable position.

In the case of climate change, social costs require a second important choice about how to account for damages that occur in the far future. The value given to distant damages is sensitive to the choice of the discount rate, that is, the decrease in the relative value of money over time. US government analyses to date recognize that placing a value on the well being of future generations is an ethical choice with no single 'right' answer, and hence use multiple discount rates of 2.5%, 3% and 5% per year. Private investment decisions and most other government analyses include higher rates, typically around 7%. Such high rates are similar to historical rates of return on investment in the US economy, and are thus appropriate for cost-benefit comparisons of various investment choices. In the case of avoiding climate change, however, investments are made not simply to maximize short-term returns but to avoid disastrous consequences for future generations, something not captured by high discount rates. To appropriately account for intergenerational damages, most researchers and governments recommend using much lower discount rates than even the lowest used in current US government analyses, for example 1.4% has been used by the UK Treasury. Use of such a low discount rate would be consistent with many other long-term government investments, such as health care, education and

public safety (e.g. aircraft inspections) that are not justified by their ability to yield greater return on investment than equivalent spending on profitable business but rather are judged by their long-term contribution to societal well being. Use of a lower discount rate that better accounts for intergenerational equity would lead to higher values for social costs. Similarly, consideration of equity, that is accounting for who feels the damages from climate change, would also increase social costs as the damages fall disproportionately on poorer populations for whom the value of a lost dollar is greater. As current estimates do not include equity considerations, they can be argued to be underestimates.

The bill raises a third issue, calling on social cost estimates to rely on "the most up to date and empirically estimated equilibrium climate sensitivity distributions". Relying on estimates using the most up to date assessments is quite sensible, and in line with a recent recommendation by the National Academies, but it seems inappropriate for legislation to select a particular type of scientific information and exclude others. Science has for centuries served society well by resting upon theory, experiment and observations, with conclusions strongest when supported by all three pillars. Understanding of climate change is in fact extremely strong precisely because we have the support of multiple, independent lines of evidence that reinforce one another and allow us to draw conclusions with greater confidence than could be obtained by relying upon a single type of evidence. The Earth's history and the combination of modern measurements with models both provide compelling information about climate sensitivity, and should be incorporated into assessments along with empirical studies to provide the most robust results. A good example of the pitfalls of relying on a single type of analysis are several empirical studies from a few years ago that relied on the slow rate of observed global warming at that time to arrive at values of climate sensitivity lower than other types of analyses. With the very strong measured global warming over the past few years, those empirical studies now appear to be anomalously low and updated empirical studies would again be consistent with results based on Earth history and on models validated against observations.

In addition to factors addressed in the bill, there is another aspect of determining which damages resulting from emissions to include that is not explicitly mentioned but also substantially affects results. Current social costs are misleading because they ignore the degraded air quality caused by both the greenhouse gases themselves and co-emitted pollution. Medical studies show unequivocally that inhaled air pollution leads to cardiovascular and respiratory diseases, with especially pronounced effects on children, the elderly and the infirm. The World Health Organization and Global Burden of Disease studies estimate that poor air quality kills around 8 million people per year, making it the leading environmental cause of premature death. Air pollution kills about 130,000 Americans annually, and sends roughly another 150,000 to the hospital for respiratory and cardiovascular diseases, with a further 180,000 suffering non-fatal heart attacks.

In social cost analyses the majority of monetized impacts often stem from human health consequences, including the spread of tropical diseases and greater risk of heatwaves and fires. Hence leaving out the portion of the health impacts related to air quality can lead to substantial underestimates of social costs. For methane, air quality-related health impacts arise from the fact that methane itself leads to formation of surface level ozone, a main component of smog. Surface ozone is toxic to both humans and plants, leading to premature deaths from respiratory and cardiovascular diseases and substantial decreases in crop yields. Logically we need to be concerned with these societal impacts regardless of the particular pathway, climate change or air pollution in this case, by which they take place. Hence the social cost of methane is in fact underestimated when climate impacts alone are included. For other gases, the co-emissions can be most important, for example the traditional air pollutants coming from coal-fired power plants or motor vehicles.

Accounting for the full costs of damages due to climate change and air quality, a clear picture of the true costs of fossil fuels emerges. The real cost of electricity from natural gas or coal is 2 ½ to 4 times the current price. We often think it'd be great to use solar or wind power if only it wasn't so expensive compared with fossil fuels, but in reality, it's the opposite. Fossil fuels only seem inexpensive because the environmental damages are paid for by society, rather than by the electricity generator. This parallels the economic crisis when banks made huge profits while society assumed the risks, but here the damages are far more certain. How could the true costs possibly be so high? Consider this: emissions from US coal-fired power plants cause about 47,000 premature deaths annually from air pollution alone. That's as many deaths each year as were caused by hostile action during the Vietnam War. Hence although we hear frequently about the so-called "War on Coal", we should really be talking much more about "Coal's War on Us".

Another example is the true cost of driving. We may pay only $2 for a gallon of gas at the pump, but the real costs of that gas to society are about three times that. For a typical, mid-range gasoline vehicle, the health and climate damages due to emissions are around $2000 per year. In contrast, damages associated with an electric vehicle are around $1000 if the power comes exclusively from coal, about $300 for electricity generated using natural gas, and minimal for electricity from wind and solar power. Again the damages are so high from gasoline-powered vehicles primarily because the human health toll is very large.

Who pays these costs? The people of America do, with our health, our health care dollars, our insurance premiums and our tax dollars. When Hurricane Sandy wreaked $70 billion dollars in damages, the bill went to the US Treasury even though climate change clearly increased the costs. When more frequent fires plague the West, heatwaves hit the South and Southwest more often, and elderly people and children go to the hospital more with asthma attacks, the bills come to the taxpayer rather than the polluters. Hence we are effectively subsidizing an extremely profitable industry, and in doing so, are paying for our own ill-health.

Ignoring a portion of the actual costs or using inappropriately low values leads to economically inefficient decision-making. Emitting industries might be helped by not having to pay for the full costs of their actions, but those costs are passed on to the rest of the nation including other US businesses. For example, given the option to generate power for $100 million by burning coal or the same amount of power for $110 million using wind, a utility would logically choose coal. As my retirement savings include utilities, in fact I could be justifiably angry if they made any other choice than what was in their financial best interest. However, the climate and air pollution damages stemming from the coal-fired power plant might cause damages to the rest of the economy of $30 million dollars due to lost labor productivity, additional health care spending and additional costs for air conditioning and infrastructure damage. This is a hypothetical example, but these costs are very real: the health effects of air pollution alone are estimated to cause more than 10 million lost US work days and more than 100,000 emergency room visits annually, reducing the performance and increasing expenses for all US businesses. Like most Americans, my retirement savings is invested in a broad portfolio of the US economy, and so we should in fact be angry at anyone wanting to downplay these economic losses and permit the economy as a whole to be dragged down. Even if the fossil fuel sector comes out ahead by not accounting for environmental damages, the US economy and the American people do not.

When considering the costs of addressing climate change, it is also important to recognize that mitigation costs increase the longer we wait to act. In addition, the damages from climate change outweigh the costs of stopping it in the long-term. Hence the earlier we act, the better off for our economy in the long-term. Taking into account air quality makes the case for early action even stronger. In a recent analysis from my research group, we showed that the domestic benefits due to air quality improvements alone more than offset the costs of a transition to a very low carbon economy in the US. As the bulk of the air quality benefits are realized almost immediately following emissions reductions, these results are unaffected by the choice of discount rate or time horizon (and of course not sensitive to assumptions about climate sensitivity either). Adding in the additional effects of avoided climate change makes the benefits grow to many times the mitigation costs. Of course even if the US as a whole comes out far ahead economically by transitioning to a low carbon economy, this does not mean every sector within the economy comes out ahead. Virtually all analyses indicate that the transition to a low carbon economy requires greatly increased investment in energy efficiency and renewable energy with concomitant decreases in investment in fossil fuels. A promising strategy is to enlist the growing number of large, multi-national fossil fuel companies taking an interest in renewables in bringing about the needed energy transition, which could greatly benefit from their technical, managerial and financial resources and expertise.

Including social costs in regulatory analyses is a step that encourages economically efficient decisions, with both addition of the costs of air quality and incorporation of social costs into the market being needed next steps to optimize economic

outcomes. The goals of limiting emissions to reduce damages from climate change and improve air quality can either be accomplished by using the market via inclusion of social costs, or by regulation. Economic studies tell us that making use of the market is a more efficient method. Accounting for environmental impacts does cost American families money, as mentioned in the bill, since these costs are passed on to them. That is only part of the story, however, as the use of social costs in regulations leads to reduced damages, and in the net would provide overall savings to most American families.

Note: This testimony is based on peer-reviewed scientific studies, primarily those listed below.

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