Climate Change Reconsidered II: Human Welfare, Energy, and Policies
Climate change, fossil fuels, and human welfare

Presentation given by Dr. Craig D. Idso at
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Good morning. It is a pleasure for me to be here today and to be a participant in this wonderful conference and to speak in this particular session.

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As some of you are aware, the Nongovernmental International Panel on Climate Change, or NIPCC, is once again hard at work preparing yet another contribution to the debate over global warming and its impacts. The topic of its newest volume, however, is quite different from that presented in prior works, in that it focuses more on the economics and policies of climate change. It is expected that this final volume will be completed and released sometime before the end of this year. For my presentation today, I will highlight one key topic discussed in that forthcoming report.

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Invariably, policy discussions over what to do--or not do--about perceived environmental threats associated with CO_2-induced global warming ultimately conclude with a debate over economics, where the calculated costs of legislative actions are weighed against the estimated expenses of inaction. Such a comparison, when formalized, is commonly known as a benefit-cost analysis, or BCA for short.

All in all, BCAs provide policymakers with a fairly robust measure of judging the economic soundness of proposed environmental laws and regulations, and in the United States, such analyses are actually required.

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As per Executive Order 12866, federal agencies must "assess both the costs and the benefits of the intended regulation and, recognizing that some costs and benefits are difficult to quantify, propose or adopt a regulation only upon a reasoned determination that the benefits of the intended regulation justify its costs."

The first official benefit-cost analysis conducted by the United States government to deal with the economics of climate change was completed in 2010 by a federal Interagency Working Group comprised of representatives from twelve government agencies.

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In that report, the group concluded the net economic impacts of climate change, as shown here, are negative, and that they rise in magnitude with time.

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These estimates were revised three years later to the numbers shown here in red, which range from one-and-a-half to two-times the original values calculated in the 2010 report. These newer, higher estimates, known as the *social costs of carbon*, serve as the U.S. Government standard by which proposed policies and regulations designed to mitigate perceived threats of future climate change are evaluated--and even justified--into becoming law.

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However, these estimates are deeply flawed and in no way do they reflect the economic reality of a properly conducted climate change Benefit-Cost analysis. In fact, when certain errors and omissions in the Interagency Working Group's methodology and calculations are rectified, the projected benefits of carbon are found to far outweigh their projected costs.

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One of the most commonly noted flaws inherent to nearly all climate change BCAs is their use of poorly constructed *integrated assessment models*, or IAMs, and the Interagency Working Group's analysis is no exception in this regard. In brief, IAMs are mathematical constructs that provide a framework for combining knowledge from a wide range of disciplines in order to address an interdisciplinary subject like climate change.

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As shown in this schematic, there are four basic steps to an IAM. In simplified terms, the first involves projecting future CO_2 emission scenarios based on various socio-economic conditions. Next, future atmospheric CO_2 concentrations are calculated from these emission streams. Third, future changes in climate and the impacts of those changes on society are projected for a given CO_2 concentration. And fourth, the economic response of all climate-related impacts is determined.

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It is critical to note that at each stage in this four-step process, present day, state-of-the-art IAMs invoke a number of physical assumptions, and, at times, subjective value judgments. This is because, whether due to a lack of sophistication, knowledge, or computing power, the models fail to incorporate all the necessary inputs, processes, factors and feedbacks that are requisite in performing a proper climate change Benefit-Cost Analysis. As a result, multiple errors and uncertainties propagate throughout these models such that even the smallest of variations in model assumptions or user judgments can result in large and significant differences in output, differences that can be so great as to render these IAM-based BCAs useless as policy guides.

But don't just take my word for it, let's look at the words of two respected economists who have long studied and worked on this topic.

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Martin Weitzman (2015), a Professor of Economics at Harvard University, for example, writes:

> *The economics of climate change is a problem from hell. Trying to do a benefit-cost analysis (BCA) of climate change policies bends and stretches the capability of our standard economist's toolkit up to, and perhaps beyond, the breaking point. First and foremost, disconcertingly large uncertainties are everywhere, including the most challenging kinds of deep structural uncertainties. The climate change problem unfolds over centuries and millennia, a long intergenerational human time frame that most people are entirely unaccustomed to thinking about. With such long time frames, discounting becomes ultra-decisive for BCA, and there is much debate and confusion about which long-run discount rate should be chosen...*

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And then there is Professor Robert Pindyck (2013), an economist at the Massachusetts Institute of Technology, who states:

> *[IAMs] have crucial flaws that make them close to useless as tools for policy analysis: certain inputs (e.g., the discount rate) are arbitrary, but have huge effects on the SCC estimates the models produce; the models' descriptions of the impact of climate change are completely ad hoc, with no theoretical or empirical foundation; and the models can tell us nothing about the most important driver of the SCC, the possibility of a catastrophic climate outcome. IAM-based analyses of climate policy create a perception of knowledge and precision, but that perception is illusory and misleading.*

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I suppose it comes as no surprise to those of you who are in attendance here today, that despite these and other resounding facts and criticisms, the present U.S. Administration strongly endorses the Interagency Working Group's Benefit-Cost Analysis and is fast at work in creating and enforcing environmental policies based on their ill-conceived SCC estimates.

This situation is bad enough given the afore-mentioned shortcomings, but there is a second, more serious deficiency in the Interagency Working Group's analysis that makes the government's use of their calculations beyond the pale—no attempt was made by the Interagency Working Group to calculate or even acknowledge the existence of multiple well-established *carbon benefits*.

It should go without saying that in order to be valid, a benefit-cost analysis must examine and include not only the costs of an action, but any benefits as well. As noted previously, federal agencies are *required* under Executive Order to exercise such due diligence. Yet despite decades of scientific research identifying and confirming multiple positive externalities associated with the consumption of fossil fuels and increasing atmospheric CO_2, not one of these benefits was incorporated into the government's analysis. Instead, the Interagency Working Group inserted almost every conceivable carbon "cost" into their climate change BCA—including costs to agriculture, forestry, water resources, forced migration, human health and disease, coastal cities, ecosystems, wetlands, etc. Such negligence and prejudicial imbalance is stunning; it is inexcusable, it is scientifically fraudulent, and it is borderline criminal.

So what are these carbon benefits?

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By far, the greatest benefits derived from the utilization of carbon-based fossil fuels pertain to those associated with the development of our modern technology-based society, which development has fostered unprecedented economic growth, raised the standard of living, increased human life span, and over just the past 20 years, has helped to elevate over a billion persons out of poverty. These benefits, though perhaps more difficult to quantify, cannot be ignored or disregarded in climate change BCAs, as there is more than sufficient evidence linking their origin and continuance to fossil fuel use.

One recent study estimated a first order approximation of the monetary value of these technological benefits, finding they are—at a minimum—more than an order of magnitude larger than the Interagency Working Group's estimates of the social cost of carbon.

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As shown here the ratio of these benefits to costs in 2010 ranged from around 30-to-1 to 200-to-1 depending on the discount rate used. Normally, benefit-cost ratios in the range of 2-to-1 or 3-to-1 are considered very favorable. Similar results are seen in future cost and benefit forecasts, or when computing marginal, as opposed to average, costs and benefits.

Independent of the many scientific and technological welfares that have rippled through society since the dawn of the Industrial Revolution are several important *biological* welfares. These benefits are the product of the ever-increasing CO_2 concentration of the atmosphere, which has already risen some 40 percent in consequence of the combustion of fossil fuels during the modern era.

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Perhaps the best known biological benefit to result from this atmospheric enrichment of CO_2 is an enhancement of plant productivity. This occurs because, at a fundamental level, carbon dioxide is the basis of almost all life on Earth. It is the primary raw material utilized by plants to produce the organic matter out of which they construct their tissues. And, as literally thousands of scientific studies have shown, the more CO_2 there is in the air, the better plants grow. And the better plants grow, the more food there is available to sustain the entire biosphere—not just humans.

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A couple years ago I calculated the monetary impact of this amazing benefit as it pertains to both historic and future global crop production. Results indicated that the annual total monetary value of the increase in the air's CO_2 content (since the inception of the Industrial Revolution) for world crop production grew from about $20 billion in 1961 to over $140 billion by 2011, reaching the staggering sum of *$3.2 trillion* over that 50-year time period. And projecting the monetary value of this positive externality forward in time reveals it will likely bestow an *additional* $9.8 trillion on crop production through 2050. In comparing just this one benefit with the Interagency Working Group's analysis, at a value of around $4 per ton of CO_2, this *one biological benefit alone* is nearly powerful enough to wipe out all the projected welfare damages associated with climate change at the five percent discount rate.

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Another major biological benefit ignored in climate change CBAs is a CO_2-induced enhancement of plant water use efficiency. Numerous studies have confirmed that plants exposed to elevated levels of atmospheric CO_2 lose less water to transpiration; and the amount of carbon they gain per unit of water lost – or *water-use efficiency* – therefore typically rises, greatly increasing their ability to withstand drought.

To date, no attempt has been made to calculate the monetary value of this important benefit. For farmers who rely on irrigation, this is a significant welfare saving, as plants need considerably less water (about half as much) to produce the same—or an even greater—amount of tissue for a doubling of the air's CO_2 content. This CO_2-induced water savings among nature likely instills other economic benefits to society; reducing the competition for water so that more is available for humanity to use in drinking, sanitation, and recreation.

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Time will not permit me to adequately discuss a multitude of other CO_2-induced biologic benefits, but suffice it to say there are indeed many. In fact, a few years ago I coauthored a book detailing fifty-five of them, each of which are listed here. Admittedly, it is difficult to determine the economic value for some of these benefits. For example, how can a price be determined that adequately reflects the benefits of CO_2-induced increases in water use efficiency, which act to reverse the effects of desertification or soil erosion? Or how can a price be estimated for the benefits that accrue from the observed CO_2-induced greening of the planet that is enhancing the growth and vitality of natural and managed ecosystems all across the globe? Such welfares are difficult to quantify, but nonetheless they are *real* and they must be accounted for in climate change CBAs.

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And then there are still *other* benefits afforded humanity that we are unable to discuss, including health-related welfares of reduced morbidity and mortality that result from a warmer climate. Just last month a new paper published in *The Lancet* found that cold temperature excursions kill seventeen times more persons than corresponding warm temperature excursions. Considering that the U.S. EPA places the value of a human life at $9.1 million, a little global warming would not only save a lot of lives, but create economic value in doing so.

Unfortunately, pretty much every benefit I have discussed or alluded to today has been excluded from the many economic analyses of climate change that have been conducted to date.

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This sorry state of affairs, coupled with the equally as grim assessment of the validity of the current social cost of carbon calculations made in present-day state-of-the-art IAMs, makes it clear that when properly incorporated into a climate change BCA, carbon benefits far outweigh any costs by *orders of magnitude*. And that reality signals there is no viable economic justification for restricting fossil fuel use.