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CLIMATE POLICY

The Case for a New Perspective

Climate Policy:

The Case for a New Perspective

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EXECUTIVE SUMMARY

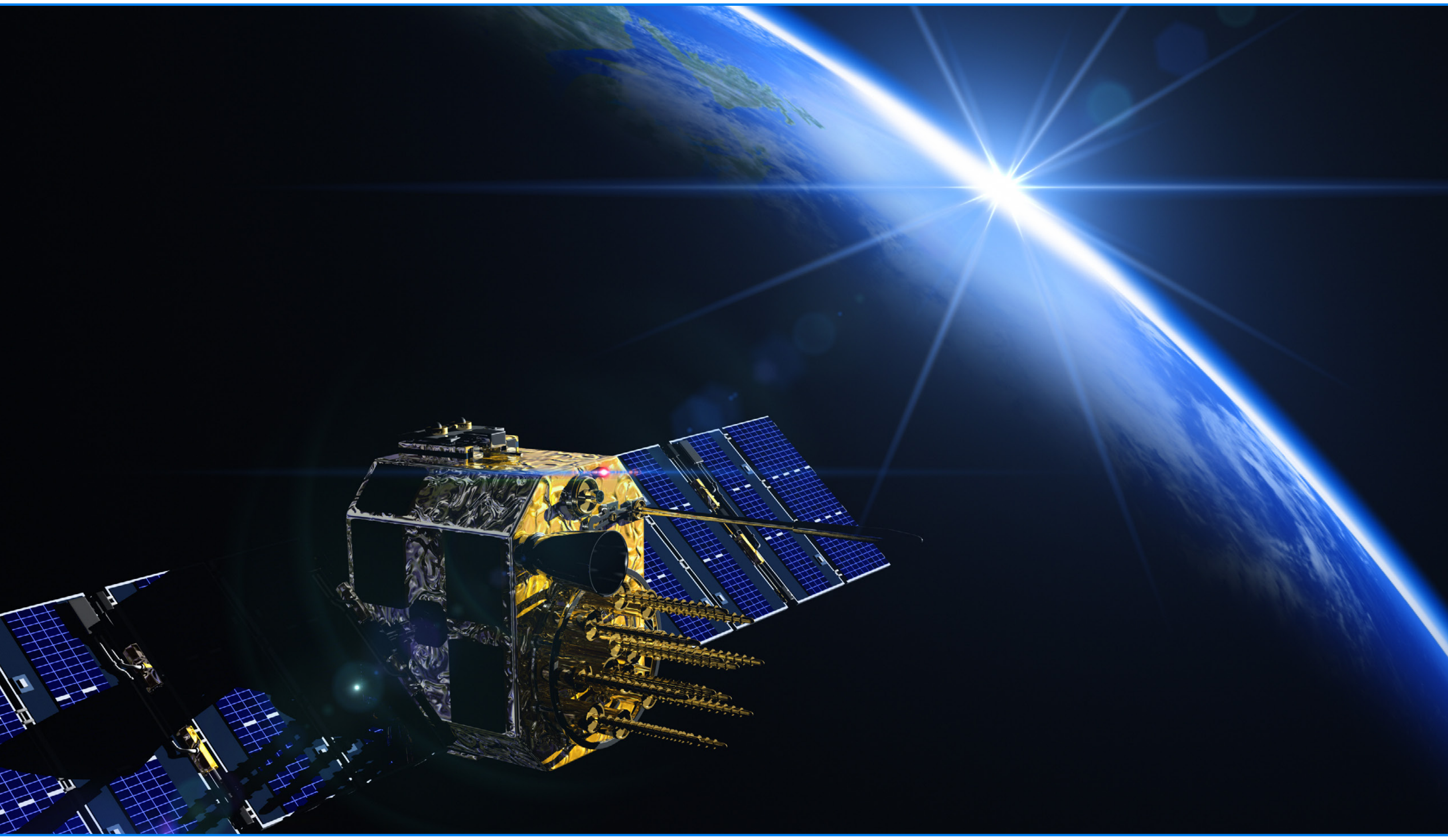
The world is getting warmer and sea levels are rising. What matters is the magnitude of the increases, their impact, and what can be done about them.

The climate debate is often presented as conflict between those who want to do what is right and those who, for reasons of self-interest or ignorance (perhaps willful ignorance) are unwilling to help. However, good intentions do not guarantee good outcomes. Policies based on bad science and bad economics can lead to worse results than those from unmitigated greenhouse gas emissions. In fact, IER has long shown that the peer-reviewed economics literature is at odds with some aggressive types of actions taken in the name of climate change.[1]

Economists look at actions in terms of costs and benefits. Further, they question claims of infinite costs or infinite benefits that come with assertions of existential threats. What, then, should we do about cutting manmade CO_2 emissions?

Pushing back on claims of an impending existential climate crisis is often dismissed as a form of science denial. Therefore, we will briefly review the science first. Then we can look at the economics of climate action.

HAS THE WORLD WARMED?



As far as we can tell, yes, the world has warmed. There is no single thermometer to measure the Earth's temperature. In addition, the thermometers that do exist are not evenly distributed and have not been in place for identical time periods. Therefore, creating historical temperature records requires significant statistical adjustments to get average world temperatures over time. Satellite readings of mid-tropospheric temperatures come closest to having a comprehensive coverage of world temperatures. However, the satellite record only goes back to about 1979 and even satellite readings require adjustments for such things as orbital drift.

Though it is not a universal conclusion, many scientists, including many, if not most, skeptics, agree the Earth has warmed over the past century and at least some of that modest warming is due to anthropogenic CO_2 emissions.[2] However, agreement regarding at least some man-made warming, is not agreement that there is or will be a climate crisis.

IS THE CLIMATE CRISIS ALREADY UPON US?

In recent years, we have heard more and more that we currently are in a climate crisis. For example, on the first day of his presidency, President Biden signed an Executive Order on Protecting Public Health and the Environment and Restoring Science to Tackle the Climate Crisis and one week later, he signed an Executive Order on Tackling the Climate Crisis at Home and Abroad. But it is not clear what the term climate crisis actually means.

The claims of a current "climate crisis" appear to be made by politicians or the media making a political point and not by scientists describing climate science.

It seems virtually every extreme weather event (or any extreme event that can be related to weather) is cited as proof we are already witnessing a climate crisis. Proving a particular weather event is caused by anthropogenic global warming (AGW) is impossible. Even trying to determine some link to increased greenhouse gas emissions and a natural disaster's behavior is extremely difficult. Instead, trends in extreme weather are offered as the needed evidence. The problem with this line of reasoning is that the most worrisome trends are not supported by the data. In particular, there are no significant upward trends for tornadoes, tropical storms (hurricanes), droughts, floods or wildfires.

The Intergovernmental Panel on Climate Change's *Fifth Assessment Report* finds no upward trend for hurricanes over the past century.[3] Here are their words: "In summary, this assessment does not revise the SREX [a special report on extreme events] conclusion of low confidence that any reported long-term (centennial) increases in tropical cyclone activity are robust, after accounting for past changes in observing capabilities. More recent assessments indicate that it is unlikely that annual numbers of tropical storms, hurricanes and major hurricanes counts have increased over the past 100 years in the North Atlantic basin."

Regarding floods, the IPCC authors state, "In summary, there continues to be a lack of evidence and thus low confidence regarding the sign of trend in the magnitude and/or frequency of floods on a global scale." They find a similar lack of trend for droughts, "In summary, the current assessment concludes that there is not enough evidence at present to suggest more than low confidence in a global-scale observed trend in drought or dryness (lack of rainfall) since the middle of the 20th century, owing to lack of direct observations, geographical inconsistencies in the trends, and dependencies of inferred trends on the index choice. Based on updated studies, AR4 conclusions regarding global increasing trends in drought since the 1970s were probably overstated."

Perhaps because of their visual impact and because of the well-covered recent (as of this writing, spring 2021) cases in California and Australia, the link between wildfires and human impact on climate has generated much interest. The data do not bear out a strong link between anthropogenic warming and wildfire destruction.

Doerr and Santin note that the general perception is that wildfires have become worse, but they point out counter trends in the data, "Instead, global area burned appears to have overall declined over past decades, and there is increasing evidence that there is less fire in the global landscape today than centuries ago. Regarding fire severity, limited data are available. For the western USA, they indicate little change overall, and also that area burned at high severity has overall declined compared to pre-European settlement."[4]

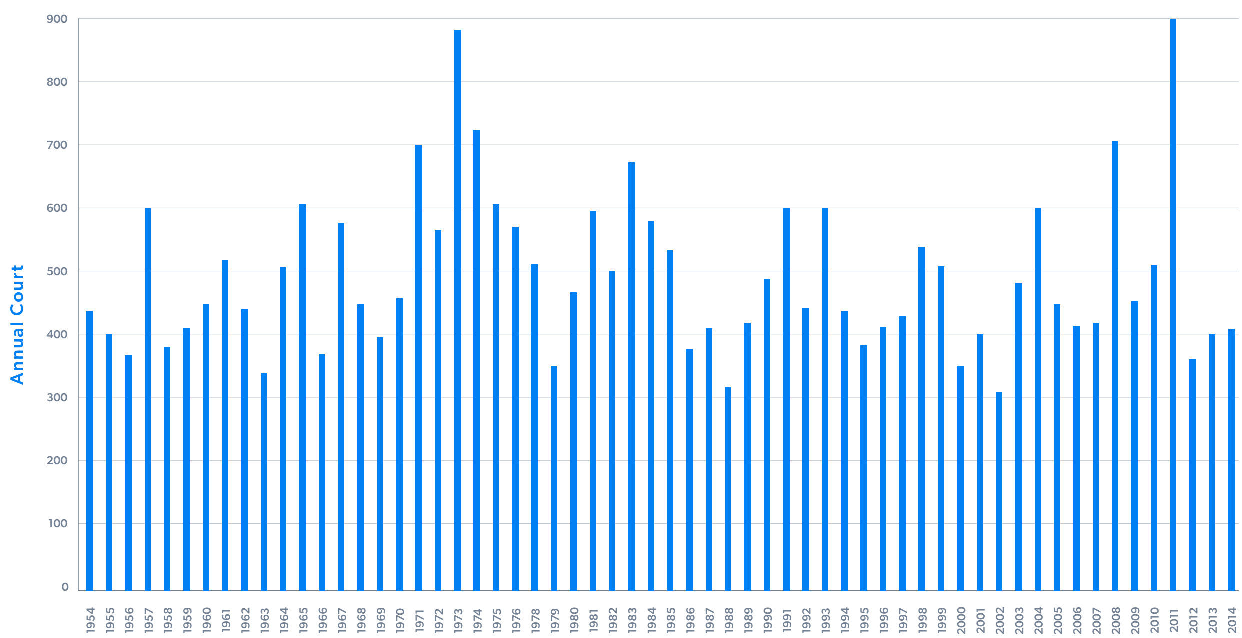
David Bowman asserts the condition for wildfires have become more extreme, but a trend is difficult to tease out.[5] He says, "Without improved mapping and monitoring, we will remain unable to answer the most basic questions about trends in wildfires." He echoes a concern of Doerr and Santin regarding the need for better data.

Human impact on wildfires is complex. Current land use and forest management practices are likely to swamp the impact of anthropogenic global warming on wildfire trends.

In their analysis of tornado activity, the National Centers for Environmental Information say, "The bar charts below indicate there has been little trend in the frequency of the stronger tornadoes over the past 55 years."[6]

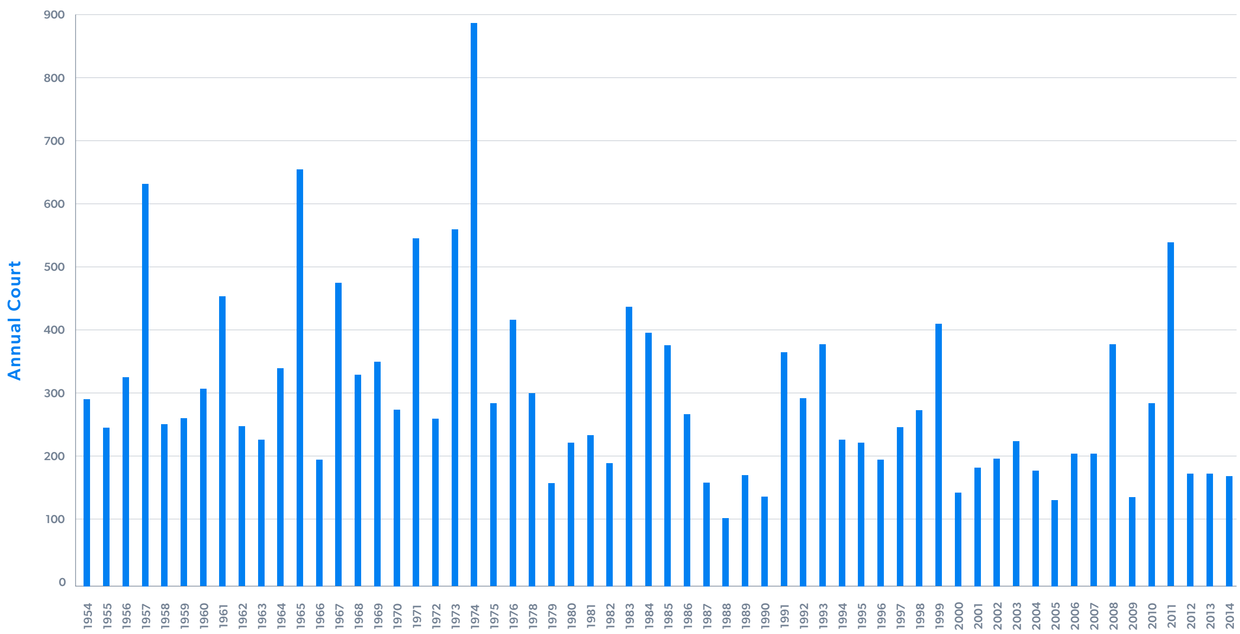
One interesting note is that the United States has not seen an EF-5 tornado since May 2013.[7] This is the second longest "drought" of EF-5 tornadoes on record and it will set a record if no EF-5 tornadoes occur before July 5, 2021.[8]

U.S. ANNUAL COUNT OF EF-1+ TORNADOES, 1954 THROUGH 2014



Data Source: NOAA/NWS Storm Prediction Center

U.S. ANNUAL COUNT OF STRONG TO VIOLENT TORNADOES (F3+), 1954 THROUGH 2014



Data Source: NOAA/NWS Storm Prediction Center

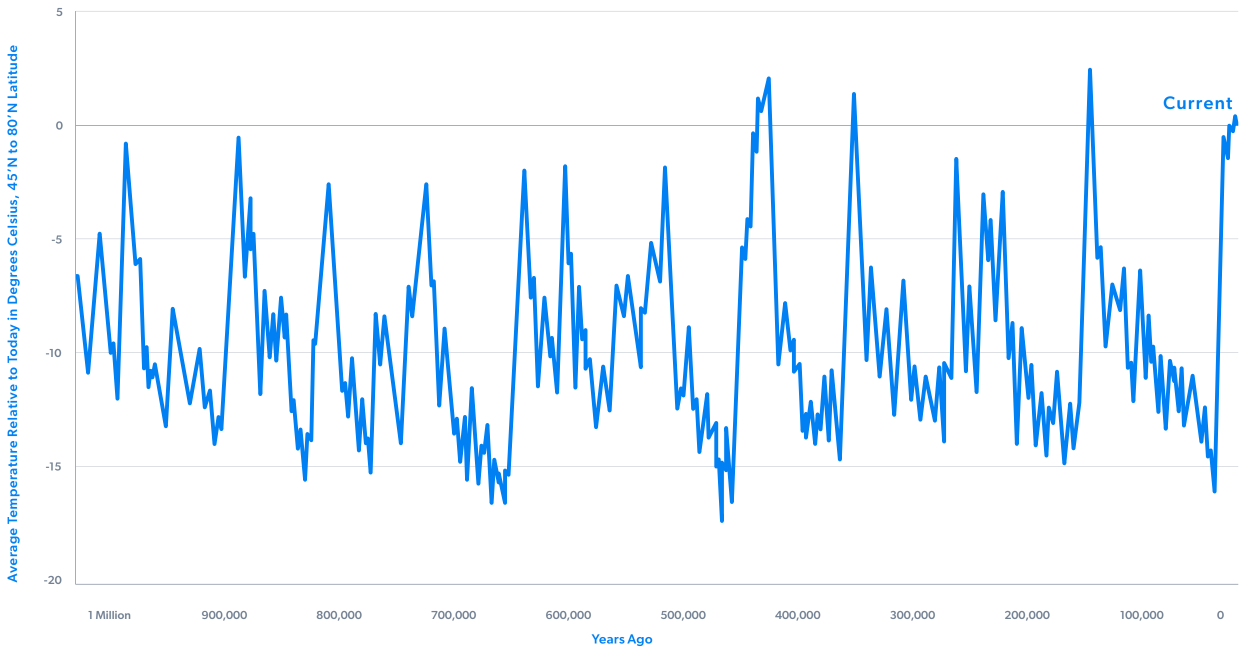
THE FUTURE CLIMATE

Even if there are not demonstrably worrisome trends for anthropogenic climate change at this time, the concern has always been about the accumulating impacts in the future. The main drivers of projected climate impacts are temperature increases and changes in sea level. To gain perspective on projected future climate changes, it is worth looking at past changes—changes that humans and most other existing species have survived.

Though there are problems with measuring average Earth temperature on short time scales (e.g., decades) and to hundredths of a degree, there is overwhelming evidence that the Earth has seen large changes over geologic time scales. The Earth has seen these large temperature and sea-level variations as it cycled into and out of ice ages. In a study of ice-sheet dynamics, Bintanja and van de Wal provide a reconstruction of Northern Hemisphere (45° north to 80° north) temperatures for the past million years.[9] For perspective on current temperature changes, these data are shown in the chart below. Of course, the chart's final spike in temperature has occurred over the last 10,000 to 20,000 years, a period over which anthropogenic CO_2 was trivial.

TEMPERATURE FLUCTUATIONS OVER THE PAST MILLION YEARS

Average Temperature Relative to Today in Degrees Celsius, 45°N to 80°N Latitude



Source: David Kreutzer, et al., "The State of Climate Science: No Justification for Extreme Policies," Heritage Foundation Report, April 22, 2016, The State of Climate Science: No Justification for Extreme Policies | The Heritage Foundation (accessed May 16, 2021).

We see repeated temperature changes of 15-20 degrees centigrade over periods of tens or hundreds of thousands of years. The current temperature is about on par for the interglacial periods of the past half-million years. It is not clear whether anthropogenic carbon-dioxide emissions will push these temperatures beyond those seen in the geologic past or what might be the impact of these such changes.

It is also worth having a geologic perspective on sea-level changes. Though the caveats regarding the ability to measure world temperature precisely and accurately in the distant past hold for sea level as well, the evidence of large sea-level changes is also overwhelming.

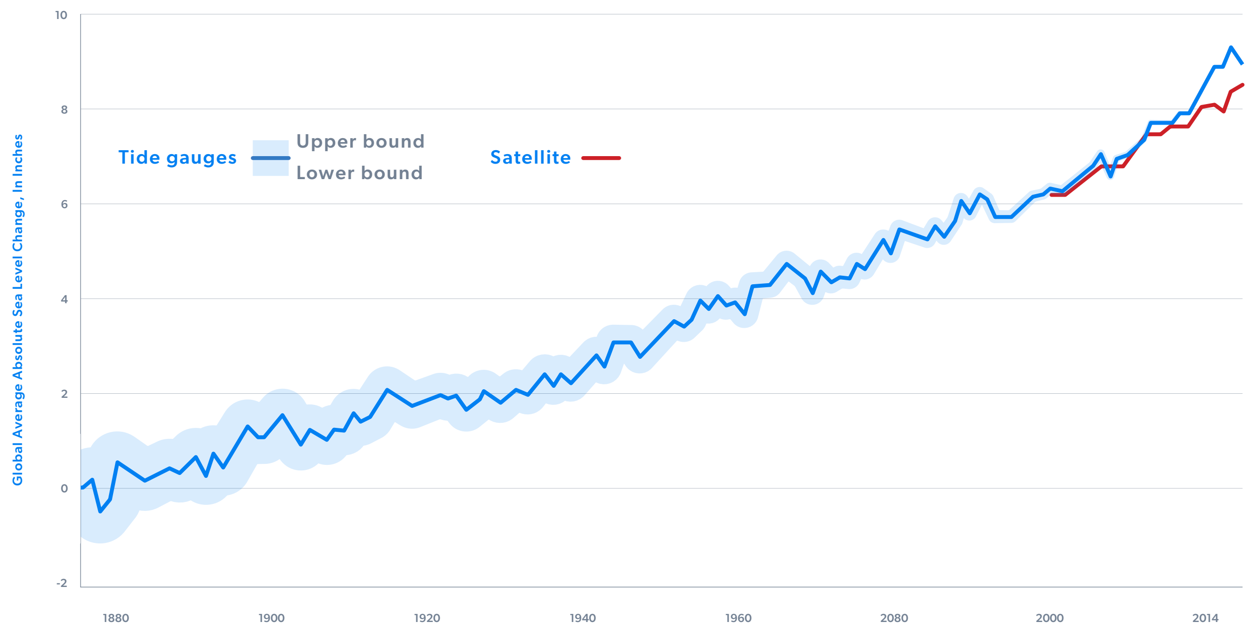
Just as the past million years have seen dramatic changes in temperature, they have seen similarly dramatic changes in sea level. For instance, since the depths of the last ice age, about 20,000 years ago, sea level has risen about 400 feet.[10]

This rise has not been constant. For thousands of years before the dawn of agriculture, sea level rose by more than 5 feet per century and then slowed considerably. During the Little Ice Age (from the early 14th Century until the middle of the 19th Century), sea level dropped.

It might seem easy to accurately measure sea level with tide gauges, but it is not. As NOAA explains, "Sea level rise at specific locations may be more or less than the global average due to local factors such as land subsidence from natural processes and withdrawal of groundwater and fossil fuels, changes in regional ocean currents, and whether the land is still rebounding from the compressive weight of Ice Age glaciers."[11] Further, the gauge dispersion is neither comprehensive nor even. Satellite measurement overcomes many of the problems with the gauges, but the satellite sea-level data have shorter history.

The chart below shows sea-level change since 1880. The blue line and the blue-shaded confidence interval represent data from tide gauges. The red line shows satellite data.

RISING SEA LEVELS: STEADY LONG-TERM TREND



Source: David Kreutzer, et al., "The State of Climate Science: No Justification for Extreme Policies," Heritage Foundation Report, April 22, 2016, The State of Climate Science: No Justification for Extreme Policies | The Heritage Foundation (accessed May 16, 2021).

Until the middle of the last century, the sea-level rise was mostly, if not entirely, due to natural causes—most likely the rebound from the end of the Little Ice Age. The 10 inches of sea-level rise since then could be a mixture of natural causes and the impact of anthropogenic- CO_2-induced warming. The trend of around three millimeters per year is on target for another foot or so of sea-level rise over the rest of this century.[12]

Of course, we should be more concerned with what the future holds. To be sure, the lack of worrisome trends for past temperature or sea-level growth or in extreme weather events does not guarantee no worries for the future. It is also true that scores of existing climate models include many that project increasing trends for temperature, sea-level rise, and extreme weather events. However, the models are highly uncertain and prone to error. Some of the climate models project very worrying changes, while others project milder changes. Many researchers (including many who support strong climate action) have come to realize the most dire projections are unrealistic due the unsupportable carbon-emissions projections in the models that make these dire projections.[13]

CLIMATE COSTS AND BENEFITS—THE SOCIAL COST OF CARBON

In the simplest of terms, the goal of economics is to see that the greatest benefit (broadly defined) is provided at the smallest cost. Markets fall short of this goal when the link between benefits and costs is broken.

The primary source of anthropogenic greenhouse-gas forcing is CO_2 emissions from energy use—the burning of fossil fuels. The consumers of traditional energy pay the costs of extracting, delivering, and converting the fossil fuels into the energy they use. However, to the extent that the CO_2 emissions cause impacts on others, the link between those who pay the costs and those who receive the benefits is broken and fossil-fuel energy consumption is said generate external costs or benefits. The standard economic prescription to rectify this broken link is a tax where the externalities are negative and a subsidy where benefits are extended to others.

The theory is simple, but the implementation is messy as IER has demonstrated numerous times over the years.[14]

Not prominently discussed is the likelihood of benefits. Positive externalities from CO_2 emissions are very real. Growing seasons expand at higher latitudes. Warmer winters see fewer deaths from cold snaps. Carbon dioxide is a potent fertilizer and Zhu, et al. attribute 70 percent of the significant greening observed between 1982 and 2009 to anthropogenic CO_2 emissions.[15] Nevertheless, the focus of most climate policy is on the negative externalities, such as increased mortality from heat waves, increased storm damage from higher sea levels, the impacts of extreme heat on agriculture, etc. To rectify the market failure, economists would, ideally, like to determine the net impact of the incremental emission of CO_2 and impose a tax (or subsidy if the net impact were positive) equal to the incremental net impact.

Economists try to estimate this net impact and have given it the somewhat misleading name "social cost of carbon" or SCC.[16] Unfortunately, this exercise takes all the problems with projecting climate futures and adds all the problems of economic projections.

Modelling the climate to determine the impacts of CO_2 is a complex task. Though the increased forcing of CO_2 (in essence, the insulating power) in a glass jar in a lab may be relatively easy to measure, determining the forcing of added CO_2 in the atmosphere over decades or centuries is not straight-forward. There are positive feedbacks that amplify the effect of added CO_2, such as the reduced albedo (reflectivity) from melting ice caps and glaciers, the release of methane from newly thawed permafrost, and the added water vapor (an important greenhouse gas) that warmer air can hold. There are also negative feedbacks that moderate the temperature impact of added CO_2, such as increased activity of carbon-fixing bacteria in newly thawed permafrost, adsorption of CO_2 by soil and minerals and by ocean water, and by increased amounts of carbon fixed in the expanding biomass. One potentially critical feedback is how cloud cover responds to warming. It is not clear whether the cloud-cover feedback is positive or negative. These are just a small part of the set of uncertain feedbacks that are part of the climate models—and all of this is just to project future average world temperatures.

The next step takes the temperature projections to project the effect on storm activity, seal-level rise, droughts, floods, and other things. This step is also complex and subject to great degrees of uncertainty. There is no single climate model. The 29 climate models used by the IPCC give significantly different projections for temperature and the other factors. Any broad agreement among scientists regarding whether anthropogenic CO_2 causes warming does not extend to projecting future temperatures, storms, sea-levels, etc. In fact, these models have questionable accuracy even doing hindcasts (making projections for years where we already have the data to compare). Simply averaging these 29 models does not eliminate the errors.[17] John Christy, a NASA-award-winning scientist who co-managed the agency's satellite-based temperature sensors, finds the averaged climate-model output has consistently overpredicted warming.[18]

Economists take the knowledge from climate science research to inform their models for estimating the impact of climate change. Of course, these models, too, are fraught with unknowns and uncertainties. For instance, how much more damage will there be from sea-level-rise-amplified storm surges? As these impacts occur over time, how will people and governments adapt? What will be the costs of any adaptation and how much of the damage will be mitigated by adaptation? Another critical question is how much economic growth will there be? The greater the level of wealth, the greater will be the value of buildings, equipment, infrastructure, etc. that will subject to the damaging impacts of weather events.

For instance, a category five hurricane will do considerably less damage passing over an uninhabited barrier island than it would passing over a developed barrier island covered with luxury condominiums.

These hybrid climate/economic models are called integrated assessment models (IAMs). Because the IAMs are complex, they are sensitive to a host of assumptions, estimated coefficients, and inputs. Two critical factors the equilibrium climate sensitivity (ECS) and the discount rate are particularly important to the final estimates and can have a large impact on what policies would make sense.

DISCOUNTING

Conceptually, discounting tells us how much would have to be invested in the present and then compounded at the appropriate interest rate in order to generate a particular value in the future. Discounting is an often confusing, but necessary, tool for estimating the SCC. Discounting takes a dollar value in one period and translates it to an equivalent value in another period. This equivalency is determined by the discount rate (interest rate) and the length of time between the two periods of interest.

For example, if the best rate of return that can be reasonably expected from an investment is seven percent per year, then $2,000 to be received 100 years from now has a present value of $2.30 today.[19] Some look at numbers like that and conclude that any discounting is immoral because it values the wellbeing of one person more than another.[20] Staying with the example above, discounting would seem to imply that a $3.00 benefit for someone today is better than a $2,000 benefit for somebody 100 years from now because the present value of the $2,000 is only $2.30. That is an understandable, but twisted interpretation.

Discounting is a way of measuring opportunity cost. In economics, the definition of opportunity cost is the highest valued option foregone. Again, if seven percent is the appropriate discount rate, that means $2.30 invested starting today and continuing for 100 years would allow us to give that future person $2,000. It would not make sense to spend more than $2.30 today for a future benefit of $2,000, since this greater expenditure, today, would be able to generate more than the $2,000 for the person in 100 years if it were invested elsewhere.

Climate policies are a type of investment. People sacrifice consumption today—using more expensive forms of energy or spending to develop more energy-efficient technologies to cut CO_2 emissions—in order to reduce the impacts of climate change in the future. Discounting helps provide a cost-benefit benchmark as to whether any investment (climate or otherwise) provides the greatest benefit for those in the future. Insisting that the only moral discount rate is zero would justify an expenditure of $2.30 today to provide a benefit of the same $2.30 any number of centuries later. If we really cared about the people 100 years from now, it would be much better to provide them with things worth $2,000 than with things worth only $2.30.

William Nordhaus, who won the Nobel Prize in economics for his work on integrated assessment models, said, "the appropriate price to use in discounting future goods and services would be the real rate of return on investment over the relevant time horizon."[21]

After adjusting for corporate income taxes, the average annual real (that is, inflation-adjusted) return on U.S. stock markets has been over seven percent.[22] The U.S. Office of Management and Budget's (OMB) instructs agencies to use both three percent and seven percent for discounting while doing regulatory analysis.

EQUILIBRIUM CLIMATE SENSITIVITY

The Equilibrium Climate Sensitivity (ECS) is the linchpin of global-warming projections. It compares CO_2 levels and warming. Since the climate impacts of anthropogenic CO_2 are ultimately driven by CO_2-induced warming, the most critical factor in projecting these impacts is the effect of CO_2 on warming. The equilibrium climate sensitivity (ECS) is the amount of warming induced by a doubling of the CO_2 concentration in the atmosphere.

There is no consensus on the size of the ECS. Early ECS estimates were based on model simulations and had average values around 3.5 degrees C.[23] That is, doubling the CO_2 concentration in the atmosphere would raise the average world temperature by 3.5 degrees C. In the past decade, researchers have used actual evidence to make empirical estimates of the ECS.

These newer estimates generally have much lower average values—typically 1.5 to 2.0 degrees C. In addition, these newer empirical estimates have tighter statistical confidence intervals, which significant lowers the probability of extreme global warming.

Dayaratna, et al. (2017) ran two leading IAMs with newer, empirically based ECS distributions as well as the older model-based ECS distributions. They also used a range of discount rates that included the seven percent specified by the OMB.[24] The resulting SCC estimates were so different from previous estimates that they could actually reverse the policy recommendations.

Using William Norhaus's DICE model and swapping in the newer empirical ECS estimates reduces the 2020 SCC from $37.79 to $19.66 when using a three-percent discount rate. Running the model with a seven-percent discount rate and the empirical ECS generates a 2020 SCC of only $3.57—a 90 percent drop from earlier estimates.

Doing a similar set of ECS and discount-rate swaps with Richard Tol's FUND model leads to even more dramatic changes. Using the newer ECS drops the 2020 SCC estimate from $19.33 to $3.33. When the seven-percent discount rate is used, the SCC estimate is actually negative ($1.10).

More recently, Dayaratna et al. (2020) reran the FUND model using recent evidence showing the CO_2-fertilizer effect on agriculture is greater than previously estimated. They found significantly negative SCC estimates even using a three-percent discount rate.[25]

THE 97 PERCENT CONSENSUS

A simple debate of good versus evil is attractive to many. First, it eliminates the necessity for investigating complex scientific and economic questions. Second, it is a more compelling story for the media than a messier one full of grey areas. That is how an academic article of suspect methodology and with an innocuous conclusion evolved into a debate-ender and rhetorical bludgeon. "Ninety-seven percent of scientists agree."

A 2013 paper in Environmental Research Letters by Cook, et al. concluded that 97 percent of scientists agree that anthropogenic CO_2 emissions cause warming of the Earth.[26] Though the methodology was subject to strong criticism, it is the abuse of the conclusion that is the bigger problem—the assertion by many that 97 percent of scientist agree that climate change is so dangerous it requires urgent attention to avoid a crisis.[27]

Without debating the definition of consensus and its place in scientific discussions, it is worth noting what this consensus is about. The Cook, et al. consensus is nothing more than: Adding CO_2 to the atmosphere creates some warming. This conclusion is so bland that many noted climate skeptics also agree.[28] Cook et al. Table 3 is the source of the 97-percent figure. However, the endorsement of AGW needed to reach 97 percent includes three levels of endorsement—implicit, explicit without quantification (no indication of the degree of AGW), and explicit with quantification ("humans are the primary cause of recent global warming").

In short, even Cook et al. do not claim that 97 percent of scientists agree that manmade CO_2 emissions are the primary cause of recent global warming—only that manmade CO_2 emissions cause some of the warming. What is more, Cook et al. do not address whether a consensus exists that AGW is an urgent problem or a looming climate crisis.

NO IMPERATIVE FOR DRAMATIC GOVERNMENT POLICIES

Yes, the world is getting warmer and sea-levels are rising. Some, perhaps most, of these increases are due to human emissions of greenhouse gasses (particularly CO_2). Despite heated assertions and public perception, this warming has not been associated with a long-term increasing trend of hurricanes, tornadoes, floods, droughts or wildfires. The climate models predicting the scariest increases in world temperature have poor records, so far. Estimates of the net impact of current CO_2 emissions give sketchy support at best for costly remedies at this time.

With or without climate policies, there will be weather disasters and some of them will break records. In addition, even without more frequent extreme weather events, increasing wealth alone would justify greater measures to protect exposed infrastructure. The world will likely be much richer in the next century—some predict income will grow by more than seven-fold before 2100.[29] A richer world is a better, more adaptable world.

We will never have perfect models or ideal data, but what we have argues against dramatic government driven climate policies. Hobbling our (and our children's) economy by limiting access to the most affordable and reliable energy could cost the U.S. hundreds of trillions of dollars by the end of this century—regardless of what other countries choose to do.[30] These unwise policies risk damaging the economy for future generations while providing little or no net climate benefit.

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