

The State of Climate Science: No Justification for Extreme Policies

April 22, 2016 26 min read [Download Report](#)

Authors: David Kreutzer, [Nicolas Loris](#), [Katie Tubb](#) and [Kevin Dayaratna](#)

Hysteria over global warming is now pervasive in the federal government, driving not just the Obama Administration's energy and environmental policies, but also those of nearly every federal department and agency.^[1] Throughout his term in office, President Obama consistently has said that policy action to combat man-made global warming is imperative and urgent. On the premise of fighting climate change, the Obama Administration has positioned the federal government to regulate greenhouse gas emissions from power plants, vehicles, and oil exploration, and taxpayers are being forced to spend billions of extra dollars in an attempt to transition to a carbon-free economy. The Pentagon has been ordered to incorporate climate change in weapons testing and training, on the dubious notion that climate change is one of the world's biggest security threats, thus diverting resources to the point that actions to combat the theoretical threat of climate change are undermining the U.S.'s ability to respond to the real threats of terrorism and global conflict.

Beyond the waste and misallocation of taxpayer dollars, these policies enable cronyism, favoring elites and undermining the fairness of our economic system.

Importantly, whether one thinks global warming poses little or no threat or that the planet is on a path toward catastrophe, the cumulative climate effect of these policies, if implemented, would be a change in the earth's temperature almost too small to measure. It is important that policymakers understand the historical context of the global warming debate, what the data does—and does not—tell us about global warming, where there is consensus in the scientific community and where there is not, and what impacts global warming regulations can realistically be expected to have on the environment.

The Consensus

The Myth of the 97 Percent. There are profound uncertainties in nascent climate science. Nevertheless, global warming hypotheses have been narrowed in the press and public debate to a “consensus” view of catastrophic global warming in a political world that prizes agreement and confidence over exploration, and a media that thrives on crisis. This advances neither science nor sound public policy.

A common claim among proponents of action on climate change is that the overwhelming majority of climatologists agree on global warming science. One commonly cited statistic is that 97 percent of climatologists agree on global warming. This 97 percent number is recited and embellished by politicians and environmental activist organizations pushing to decarbonize America and the world's energy sector. In a 2014 commencement speech at Boston College, Secretary of State John Kerry said, "Ninety-seven percent of the world's scientists tell us this is urgent."[\[2\]](#) This is, in fact, not the case.

The figure comes from a 2013 Cook et al. study in *Environmental Research Letters* that examines the abstracts of nearly 12,000 academic papers on climate change and global warming between 1991–2011. Of those papers, 66.4 percent expressed no opinion on anthropogenic warming, 32.6 percent "endorsed" anthropogenic warming, 0.7 percent rejected anthropogenic warming, and 0.3 percent were unsure of the cause.[\[3\]](#) Of the 33.6 percent expressing an opinion on man-made global warming, "97.1 percent endorsed the consensus position that humans are causing global warming."[\[4\]](#) Importantly, the claim says nothing about urgency or danger.

Cook's paper was the subject of much criticism. Richard Tol, a professor at the University of Sussex, warned that "[t]his claim, frequently repeated in debates about climate policy, does not stand. A trend in composition is mistaken for a trend in endorsement. Reported results are inconsistent and biased. The sample is not representative and contains many irrelevant papers. Overall, data quality is low."[\[5\]](#) David R. Legates, former director of University of Delaware's Center for Climatic Research, along with three other researchers, analyzed the same set of papers in the Cook study. They found that a mere 0.3 percent of all papers, or 1 percent of the 4,014 papers expressing an opinion on the matter, claim that the majority of warming since 1950 is man-made.[\[6\]](#)

Further, the Cook et al. study is misleading as to what there is consensus on and glosses over major points of uncertainty and disagreement in the scientific community. To be clear, Cook et al. do not attempt to quantify how much global warming is man-made, or even say that man-made emissions contribute to the majority of global warming. The specific or even generalized amount of warming caused by anthropogenic emissions, according to Cook's study, is undetermined. Furthermore, the search terms Cook used to aggregate the climate papers exclude research papers from climate "skeptics," such as MIT atmospheric physicist and former Intergovernmental Panel on Climate Change (IPCC) contributor Dr. Richard Lindzen.[\[7\]](#)

The 97 percent statistic is nothing more than a false talking point; no overwhelming consensus exists among climatologists on the magnitude of future warming or on the urgency to reduce greenhouse gas emissions.

Biases in Climate Research. There is increasing concern that climate science and scientific reviews are no longer truly independent. The state of climate science should be concerning to everyone, regardless of where scientific evidence leads and how policymakers choose to act on scientific knowledge.

The IPCC has had a powerful role in defining the scientific and political conversation and conclusions about global warming, especially through its guide for policymakers. Its prematurely declared “consensus” that global warming is dangerous, accelerating, and instigated by carbon dioxide (CO₂) has had a far-reaching influence, conflating scientific research with certain economic, energy, agricultural, and social policies. Many scientists and scientific institutions consequently have become quasi-political lobbies.[\[8\]](#)

The U.S. is not insulated from the political biasing of climate science; in fact, it actively contributes to it. U.S. taxpayers help fund the IPCC, having contributed \$10 million in 2015,[\[9\]](#) in addition to the \$22 billion spent within federal agencies.[\[10\]](#) Rather than fostering scientific discovery in a field that is a mere few decades old, the U.S. government instead appears to express bias in funding science that supports federal climate policies.[\[11\]](#) And while there has been relatively little comprehensive study into the government’s potential conflict of interest, there have been numerous personal reports of government bias in climate research. As Dr. Judith Curry, climatologist and former chair of the School of Earth and Atmospheric Sciences of the Georgia Institute of Technology, recently testified before Congress:

I recently received [an e-mail] from a scientist employed at NASA: “I was at a small meeting of NASA-affiliated scientists and was told by our top manager that he was told by his NASA boss that we should not try to publish papers contrary to the current global warming claims, because he (the NASA boss) would then have a headache countering the ‘undesirable’ publicity.”[\[12\]](#)

In addition, there have been high profile efforts to stifle non-government research that challenges global-warming catastrophism. For instance, Senator Sheldon Whitehouse (D–RI) proposed criminal investigations into scientists and funding organizations for what he and others deemed “a massive and sophisticated campaign to mislead the American people” on climate science.[\[13\]](#)

Frequently avoiding discussion on the merits of the science, critics of skeptics attempt, instead, to discredit the speaker.[\[14\]](#) Some scientists who were otherwise

well-respected in the international scientific community have faced incredible pressure directed at their character rather than the quality of their science. For instance, Professor Lennart Bengtsson, acclaimed Swedish meteorologist, gave some concerning reasons for his resignation just weeks after joining the Academic Advisory Council of the Global Warming Policy Forum (GWPF):

I have been put under such an enormous group pressure in recent days from all over the world that has become virtually unbearable to me. If this is going to continue I will be unable to conduct my normal work and will even start to worry about my health and safety. I see therefore no other way out therefore [sic] than resigning from GWPF. I had not [been] expecting such an enormous world-wide pressure put at me from a community that I have been close to all my active life. Colleagues are withdrawing their support, other colleagues are withdrawing from joint authorship etc.... I would never have expect[ed] anything similar in such an original[ly] peaceful community as meteorology. Apparently it has been transformed in recent years.[\[15\]](#)

More broadly, differing hypotheses and healthy scientific debate are shut down or discounted on the pretext that further scientific exploration and debate are dangerous, because our children and the future allegedly are at stake. President Obama has contributed to this by making anti-science statements, for example, castigating those with different opinions as part of the “flat earth society” with their “heads in the sand,” and encouraging people to “find the deniers near you—and call them out today.”[\[16\]](#)

Conversely, politicians using catastrophic global warming as the basis for legislation have “camouflaged controversial policy decisions as science,” a trend that George Washington University’s Susan Dudley calls the “scientization” of politics.[\[17\]](#) There are numerous examples of this in the Environmental Protection Agency’s (EPA) defense of its Clean Power Plan (CPP).

For example, while the EPA is quick to tout the number of lives saved according to its models, giving the rule a tone of scientific weight, the EPA has never clearly stated the most pertinent piece of information: What would be the impact on global temperatures—the supposed mechanism by which lives would be saved? Instead, EPA Administrator Gina McCarthy claimed that the CPP was about “an investment opportunity”[\[18\]](#) and “the tone and tenor”[\[19\]](#) of the Paris climate negotiations. Another example is the President’s rejection of the permit application of the Keystone XL pipeline.[\[20\]](#) Despite the State Department concluding that the project would not contribute significantly to climate change, the President rejected the application, citing climate concerns as a major reason.

A Brief History on Global Climate Change and Where We Are Today

Climate change has been occurring ever since the earth's formation 4.5 billion years ago. Long before any industrial activity, the earth's average temperature increased and decreased for centuries.[\[21\]](#) The Medieval Warm Period (c. 950–1250) and earlier periods may very well have been as warm as or warmer than the present.[\[22\]](#) Since 1860, the planet has been recovering from the Little Ice Age (1300–1850) and has gradually warmed.[\[23\]](#) Climate research offers many theories to explain the cause and magnitude of changes in the earth's temperature. Natural variations in climate such as fluctuations in solar activity, volcanic activity, or ocean oscillations like El Niño have all contributed to global warming and global cooling.[\[24\]](#)

Chart 1 shows estimates of average world temperature variation for the past 1,000,000 years. As there were no appreciable human CO₂ emissions over that span, the very significant changes were all due to natural causes.

More recently, the focus of the climate debate has centered on man-made or anthropogenic warming, particularly as a consequence of the burning of natural resources like coal, oil, and natural gas and the associated carbon dioxide emissions. Looking only at a very narrow window of the Earth's climate history, many climatologists and politicians claim the recent period of warming is evidence of a dangerous human-induced warming.

While much is known about basic atmospheric physics, the gaps in our knowledge are significant.[\[25\]](#) However, a discussion of these large gaps in scientific knowledge is largely missing in the media and policy arena.

Broad agreement does exist, even among those labeled as skeptics, that the earth has warmed moderately over the past 60 years and that some portion of that warming can be attributed to carbon dioxide emissions.[\[26\]](#) There are some credible scientists who also believe man-made carbon dioxide emissions have played almost no role in warming.[\[27\]](#) However, no consensus exists that man-made emissions are the primary driver of global warming or, more importantly, that global warming is accelerating and dangerous. Climatologists differ on the various causes of climate change, the rate at which the earth is warming, the effect of man-made emissions on warming, the most accurate climate data and temperature sets to use, and the accuracy of climate models projecting decades and centuries into the future.[\[28\]](#)

The idea that the science of climate change is “settled” is an absurdity, contrary to the very spirit of scientific enquiry. Climate science is in its infancy, and if its development follows anything resembling the normal path of scientific advancement, we will see in the years ahead significant increases in our knowledge, data availability, and our theoretical understanding of the causes of various climate phenomena. Will future progress confirm the fears of those currently most alarmed

about global warming? Perhaps. Just 45 years ago, however, some climate experts and environmental activists feared a coming ice age. C. C. Wallen of the World Meteorological Organization said, “The cooling since 1940 has been large enough and consistent enough that it will not soon be reversed.”[\[29\]](#)

Dire predictions for both global cooling and global warming have been found to be grossly inaccurate. The science may be settled that man-made emissions have had some impact on the earth’s temperature, but the consensus stops there.

What the Scientific Data Tells Us About Climate

Taking the World’s Temperature. The use of different data temperature sets, whether it is global surface temperatures or satellite measurements, is one of the major points of contention in the climate debate. There is no perfect dataset for world temperature and no single thermometer that measures average annual world temperature. The NASA dataset, which declared 2015 as the warmest year on record, takes measurements from thousands of sites around the world. However, these sites do not provide even or comprehensive coverage of the Earth’s surface, nor are the sites immune to contamination from land-use changes—all of which add noise and uncertainty to the world temperature measurements.[\[30\]](#) Even the weather stations in the U.S., arguably the best of any country, have serious problems with data quality.[\[31\]](#)

Because of these quality and measurement issues, the keepers of these data employ a set of adjustments to address their many problems. However, such adjustments can introduce biases. A researcher that comes to the data compilations process with a preconceived notion that the world is warming may be eager to explain why the raw data shows no such temperature trend, and quick to accept a rationale for adjusting older temperatures down and more recent temperatures up. These are exactly the adjustments that have been made. Indeed, one investigator found that results from even the very best data stations (which should need the least adjustment) were adjusted to show greater warming.[\[32\]](#)

In recent years, the perceived need by global warming alarmists to adjust the data has increased dramatically. The leveling off of world temperatures in the unadjusted temperature record is in stark contrast to the accelerating warming forecast by the IPCC climate models. This hiatus in global warming has been an embarrassment to those who base their dire climate predictions on these poorly performing computer models.

So, perhaps, it should be no surprise that in a June 2015 article in *Science* magazine, National Oceanic and Atmospheric Administration (NOAA) authors attempted to

eliminate the pause in warming by ignoring their own satellite data and introducing new global ocean surface temperature sets whose readings are taken from buoys and engine-intakes on vessels.[\[33\]](#) Intended or not, the adjustment process again seems to have inserted an upward bias to the temperature trend.

Thus, there are serious questions about NOAA's new data set. That this has become the data set for official proclamations is troubling, especially since there are other data sets that appear to be superior.

Dr. Judith Curry recently compared five data sets of global temperatures and found that all but one show the warming trend has been essentially flat for various periods exceeding 10 years in length during the past 18 years.[\[34\]](#) More specifically, the observed climate data show a significant moderation of the warming trend over the past two decades. In fact, depending on the endpoints chosen, recent warming has been modest or even negative (slight cooling).

No one knows how long the temperature trend will stay near zero. Climatologists have different theories as to where temperature trends will head and what will drive climate change. The Earth has been recovering from the Little Ice Age for a couple of centuries and recovering from a real ice age for thousands of years; it is simply impossible to know whether any observed current warming is a continuation of this natural trend or represents some new man-made phenomenon. Regardless of what fraction of the observed warming is due to anthropogenic carbon dioxide, the actual temperature trends are not troubling.

Climate Models Versus Reality. With observed temperatures rising much more slowly than anticipated, the Administration's claim that urgent action is required to head off dire consequences of global warming is based on the predictions of climate models—elaborate mathematical representations of various causes and effects related to global temperature. Regrettably, even the best model can hope to be no more than a rough approximation of the real world. The more complex the system, the more likely a model will miss important details. Climate is among the most complex phenomena ever attempted to be modeled, and a comparison of actual temperatures to predictions made by climate models shows how imprecise and imperfect the current models are.

None of the major data sets (including the adjusted NOAA/NASA data set) shows the accelerating warming projected by the IPCC models.[\[35\]](#) Award-winning NASA scientists Dr. John Christy and Dr. Roy Spencer have shown that the IPCC models project warming that is twice as much as has been observed in both satellite and surface data sets.[\[36\]](#)

The chart above compares actual temperatures from the earth's bulk atmosphere as measured by satellites and weather balloons, to average theoretical temperatures from 102 model runs.[\[37\]](#) The results are striking—the models fail to do a reasonable job at predicting the past 30 years of temperatures, yet alarmists attempt to use them to forecast temperatures centuries from now.

Many errors could account for the failure of the models to predict actual temperatures accurately. One that is widely suspect—equilibrium climate sensitivity (ECS)—lies at the heart of the process. ECS is an attempt to quantify the earth's temperature response to CO₂ emissions, answering the question: How does the earth's temperature change from a doubling of CO₂ in the atmosphere? Recent peer-reviewed literature estimates that the equilibrium climate sensitivity is about two degrees Celsius, much lower than the IPCC's assumed ECS of 3.0 degrees.[\[38\]](#)

No Trends for More Extreme and Frequent Natural Disasters. Nearly every severe weather event is said to be caused by global warming, and individuals on both sides of the global warming debate claim the latest weather news as “proof” of their position. Even institutions deemed reputable mislead when it comes to the connection (or lack thereof) between extreme weather events and global warming.[\[39\]](#) Regrettably, it is precisely this kind of bluster that fuels and expedites political action.

In fact, well-respected scientists have diverse views of the connection between global warming and extreme weather events.[\[40\]](#) The IPCC itself is inconclusive at best as to how to define, let alone measure, “extreme” weather.[\[41\]](#) Extreme weather events are a poor metric for measuring global warming given the limited data, since extreme events are exactly that—out of the ordinary. Data sets are often far too short to make many meaningful conclusions, data going back only as far as the late 1800s with earlier records often being less sophisticated and less thorough.[\[42\]](#)

Nevertheless, some argue that even if an individual event cannot be linked directly to global warming, the collection of “extreme” weather events can. However, the most frightening weather events do not show significant trends, even as concentrations of atmospheric carbon dioxide have breached what was reported as a milestone 400 parts per million in 2015.

Hurricanes are not becoming more frequent. The IPCC notes in its most recent scientific assessment that there are “[n]o robust trends in annual numbers of tropical storms, hurricanes and major hurricanes counts have been identified over the past 100 years in the North Atlantic basin,” and that there are “no significant observed trends in global tropical cyclone frequency.” Further, “confidence in large scale changes in the

intensity of extreme extratropical cyclones [such as “Superstorm” Sandy] since 1900 is low.”[\[43\]](#)

The IPCC found evidence for increases, decreases, and no trend at all in flood activity or severity.[\[44\]](#) Trends in local events like hail and thunderstorms were also inconclusive.[\[45\]](#) As for droughts, the IPCC noted that its previous conclusions about increasing trends were overstated and that “the compelling arguments both for and against a significant increase in the land area experiencing drought has hampered global assessment.”[\[46\]](#) Data for tornado activity in the U.S. shows tornadoes occur no more frequently now than in the past and that the number of strong tornadoes (F3 and above) has actually decreased.[\[47\]](#)

Sea Ice, Glaciers, and Ocean Acidification. Another mainstay of the climate change alarmism movement is that glaciers are melting, sea levels are rising, and the oceans are acidifying, which will disrupt ocean life and the food chain. Again, the data does not support such doomsday scenarios.

Sea Ice and Glaciers. Only since the beginning of the era of satellite measurement (1979) have we had comprehensive, accurate data on sea-ice extent at the poles. Although there is significant season-to-season and year-to-year variability of world sea-ice coverage, there is no dramatic trend in global sea-ice loss. In general, the much-hyped downward trend in Arctic sea ice has been offset by a similar increase in Antarctic sea ice. The peak sea-ice area in 1979 was about 22 million square kilometers.[\[48\]](#) The peak sea ice in 2015 was a little over 21 million square kilometers, with the intervening period having some years with peaks above that of 1979 and some with dips below that of 2015.

In any event, it would not be surprising to find a slight downward trend for sea ice as the late 1970s came at the end of a decades-long period of slight global cooling. While we do not have satellite records for that earlier period, it is likely that sea-ice extent was greater in 1979 than it had been decades earlier. It is also worth noting that sea ice is floating ice. The 23-century-old Archimedes Principle holds that when floating ice melts, it will not appreciably affect sea level.

Permanent land ice is the defining feature of an ice age. Glaciers, the remnants of the ice ages, still persist at high elevations and high latitudes. Glaciation has retreated dramatically since the last ice age, though the retreat has not been at a constant rate and sometimes goes in reverse (sometimes for thousands of years).[\[49\]](#) These rates and reversals vary by time and by region. In addition, it should be noted that factors other than average world temperature can change the size of glaciers.[\[50\]](#)

Sea Levels. Though every year seems to bring on a prediction of imminent sea-level rise more dire than the last, the observed reality does not reflect this. Corresponding to the recovery from the Little Ice Age, sea level has risen about eight inches in the past 130 years. During this period, the rate of this rise has varied on multidecadal time scales making identifying exact reasons behind upswings, such as has been observed over the past few decades, difficult. But whatever the cause, the current rate of sea-level rise (about 12–13 inches per century) lies far beneath alarmist projections of several feet or more by the year 2100.

Chart 4 shows that since the last ice age, sea level has risen over 400 feet. Even the high end predictions of sea-level rise for the next century are on the order of 1 percent of the change since the last ice age.

Ocean Acidification. The oceans are not currently acidic, nor do any projections show them likely to become acidic. Acidity is measured by pH level where seven is neutral, above seven is basic, and below seven is acidic. At this time the pH of the oceans is a little over eight.

Changes in the ocean's acidity could have both positive and negative effects. According to NOAA, photosynthetic algae and seagrasses may benefit from higher CO₂ levels. On the other hand, some shelled organisms, including oysters, clams, sea urchins, corals, and calcareous plankton could be at risk if a more acid environment interferes with the calcification process.[\[51\]](#)

Studies show that estimated changes in ocean pH levels are within the ranges experienced in the past. The IPCC says that the ocean pH level has declined 0.1 since the beginning of the industrial era. To put that in perspective, the current pH difference between the Arctic Ocean and the Indian Ocean is about 0.16.[\[52\]](#) In fact, some places have daily pH changes well in excess of those projected from rising CO₂ levels.[\[53\]](#)

Oceans both absorb CO₂ from and release CO₂ to the atmosphere. As atmospheric concentrations of CO₂ rise, so will the equilibrium levels in the ocean. This higher level of CO₂ will in turn reduce the pH level, but the levels are not projected to get anywhere close to acidic (less than 7.0). The oceans will remain basic.[\[54\]](#)

The High Costs and Negligible Benefits of Climate Policy

Despite trends in the actual climate data and the failure of models to accurately depict reality, many alarmists still argue that carbon mitigation policies are necessary to combat damages caused by future climate change. Heritage Foundation research has found that any sort of carbon tax, cap and trade, or other combination of carbon

regulations such as the regulations on new power plants and existing ones (the Clean Power Plan) will only kill jobs and cut income, all without having any meaningful impact on global temperatures, now or in the future.

Higher Energy Bills, Less Economic Growth. A Heritage Foundation analysis^[55] estimates that, by 2035, the costs of the Obama Administration’s climate agenda to be:

- An average employment shortfall of nearly 400,000 jobs;
- Average employment shortfall in manufacturing of 200,000 jobs;
- An aggregate gross domestic product (GDP) loss of more than \$2.5 trillion (inflation-adjusted); and
- A total income loss of more than \$20,000 per family of four (inflation-adjusted).

Higher energy costs hurt low-income families the most as they spend a disproportionate percentage of their budget on energy bills. In fact, EPA Administrator McCarthy admitted that the Clean Power Plan would do as much, saying, “We know that low-income, minority communities would be hardest hit.”^[56]

No Climate Benefit. The climate return, if any, is negligible as the President’s climate policies will have next to no impact on global temperatures. The same climate sensitivity modeling as used by the EPA shows that totally eliminating all CO₂ emissions from the U.S. would moderate any warming by only 0.137 degree Celsius by 2100.^[57] If the entire industrialized world totally eliminated all CO₂ emissions, only 0.278 degree Celsius of warming would be averted by the end of the century.^[58]

Even supporters of the Obama Administration who believe global warming is a crisis have complained the Administration’s efforts fall pathetically short of what is needed.^[59] EPA Administrator McCarthy has admitted in congressional testimony that the benefits of the Clean Power Plan cannot be characterized in terms of global temperature reductions.^[60] Secretary of State John Kerry perhaps put it most clearly while speaking at the United Nations Framework Convention on Climate Change (UNFCCC):

The fact is that even if every American citizen biked to work, carpooled to school, used only solar panels to power their homes, if we each planted a dozen trees, if we somehow eliminated all of our domestic greenhouse gas emissions, guess what—that still wouldn’t be enough to offset the carbon pollution coming from the rest of the world.

If all the industrial nations went down to zero emissions—remember what I just said, all the industrial emissions went down to zero emissions—it wouldn't be enough, not when more than 65 percent of the world's carbon pollution comes from the developing world.[\[61\]](#)

Even the benefits of the Obama Administration's climate policies need to be qualified. For example, the EPA claims that the Clean Power Plan, which is only one of a suite of the Obama Administration's climate regulations,[\[62\]](#) will prevent up to 90,000 asthma attacks, 300,000 lost days of school and work, and 3,600 premature deaths. What the EPA does not communicate clearly to the public, however, is that none of these health benefits come from decreasing carbon dioxide emissions to avoid global warming, but from coincidental benefits (or “co-benefits”) from reducing other air pollutants which the EPA already heavily regulates. In essence, the few health benefits the EPA claims from this one rule are actually double counted from other regulations.[\[63\]](#) And virtually none are the result from climate change mitigation. In addition, the EPA's health claims do not square with the data that show asthma rates rising even as levels of these very same pollutants fall.[\[64\]](#)

Social Cost of Carbon Deceptively Inflates Costs and Benefits. Underpinning the EPA's proposed regulations and theoretically determining the degree of regulation is a cost-benefit analysis that uses the social cost of carbon (SCC). At least as it is currently calculated, the social cost of carbon is fundamentally unsuited for regulatory use. It purports to show the economic damage that one ton of carbon dioxide emitted in a given year will cause over the next 300 years. However, many of the factors used to calculate the SCC are arbitrary or imprecise.

The higher the SCC, the greater the alleged benefits of carbon-cutting regulations. The SCC as calculated by the federal government has created a way to make more expensive global warming rules seem like a good deal.

The EPA uses statistical models of the environment and economy (called integrated assessment models), to determine the value of the SCC. Regulatory use of the SCC is disturbing, because the method for determining the value of the SCC is fundamentally arbitrary. Even some proponents of policies to cut carbon dioxide emissions have pointed out the fatal flaws, particularly in the way the statistical models calculate damages from CO₂ in estimating the SCC.[\[65\]](#)

The EPA's Equilibrium Climate Sensitivity (ECS) distribution is also outdated and no longer considered scientifically defensible.[\[66\]](#) It was specified by Gerard Roe and Marcia Baker in the peer-reviewed journal *Science* in 2007. During the past few years, many more ECS distributions have been published in peer-reviewed literature, suggesting lower probabilities of extreme global warming.[\[67\]](#)

Heritage Foundation research has illustrated that the statistical models used to estimate the SCC are “flawed beyond use for policymaking,” noting that the models can be easily manipulated by user-selected assumptions. In fact, under reasonable alternative assumptions, one of the models used to estimate the SCC provides a negative estimate of the SCC—implying that there are *netbenefits* to global warming, which would argue for subsidizing, not taxing, CO2 emissions.[\[68\]](#)

Ultimately, these models mislead the public and misinform politicians. Politicians should not base policy actions on models which have yet to accurately describe data from observed reality.

Green Handouts Have Economic and Real Environmental Costs. Among the supposed benefits is that the Obama Administration’s climate actions stimulate investment in renewable energy technologies like wind, solar, and bioenergy with federal tax credits, grants, loans and guarantees, worker training programs, and RD&D. Bloomberg New Energy Finance and Ceres estimate that \$12.1 trillion in renewable energy investments globally must be made in the next 25 years to keep global warming to two degrees Celsius.[\[69\]](#)

Setting aside the harms federal subsidies do to the very industries they intend to help,[\[70\]](#) renewable energy sources have their own negative environmental impacts, like other energy choices, despite their “green” image. By one calculation, roughly 310 square miles are required on average for a wind facility to generate 1,000 megawatts of electricity and 60 square miles for a solar facility. By comparison, a 1,000 megawatt nuclear power plant requires 1.3 square miles on average.[\[71\]](#) Yet so many federal subsidies and regulations are geared toward replacing energy-dense (and therefore space-efficient) resources like coal with surface-hogging, intermittent renewables.[\[72\]](#)

Preventing a Better Standard of Living, Here and Abroad. Speaking at a preliminary climate meeting, the environmental minister of India, Prakash Javadekar, said: “Unless we tackle poverty, unless we eradicate poverty, we cannot really address the climate change.”[\[73\]](#) As a measure of general economic wellbeing, America’s GDP per capita was \$54,629 in 2014. China’s was \$7,590 and India’s was \$1,581.[\[74\]](#) A mere 25 years ago, China and India’s GDP per capita were a few hundred dollars per person.

Developing nations like India and China argue they should not have to forgo economic growth simply because past growth by developed nations raised world CO2 levels. The developing countries also need economic growth powered by affordable energy. While China does have serious air and water quality problems, they are not from carbon dioxide. Carbon dioxide is a colorless, odorless, non-toxic gas. However,

the Obama Administration's climate regulations and international leadership at global warming venues like the UNFCCC run directly counter to allowing the affordable, reliable, and widely available energy essential for combating poverty. Energy heats homes and meals; powers schools, hospitals, and factories; and creates products and opportunities that help lift people out of poverty.

Eighty percent of the world's energy needs are met through carbon dioxide emitting natural resources like coal, oil, and natural gas. Preventing and significantly restricting their use is a huge barrier on the road out of poverty for billions of the world's poorest.

Conclusion

President Obama has made global warming a legacy issue for his Administration. The green stimulus, the Clean Power Plan, the regulations on new power plants, the rejection of Keystone XL, more stringent regulations on vehicles, reliance on the social cost of carbon and the Paris Protocol, these have all been done in the name of global warming. There is, however, little in real climate science to argue for the urgency and magnitude of these policies. The expensive and invasive climate policies are a non-solution to an unlikely problem. Congress and the next Administration should reverse course on climate policy in order to unchain economic potential and allow for the world to adapt to the real problems the future may bring.

—David W. Kreutzer, PhD, is Senior Research Fellow for Energy Economics and Climate Change in the Center for Data Analysis, of the Institute for Economic Freedom and Opportunity, at The Heritage Foundation. Nicolas D. Loris is Herbert and Joyce Morgan Fellow in the Thomas A. Roe Institute for Economic Policy Studies, of the Institute for Economic Freedom and Opportunity. Katie Tubb is a Policy Analyst for the Roe Institute. Kevin D. Dayaratna, PhD, is Senior Statistician and Research Programmer in the Center for Data Analysis. The authors would like to thank Paul C. “Chip” Knappenberger for his very helpful comments.

Show References

[1] For example, the Security and Exchange Commission, which is utterly unrelated to climate policies, released guidance in 2010 requiring some companies to disclose climate impacts. News release, “SEC Issues Interpretive Guidance on Disclosure Related to Business or Legal Development Regarding Climate Change,” U.S. Securities and Exchange Council, January 27, 2010, <https://www.sec.gov/news/press/2010/2010-15.htm> (accessed March 4, 2016).

[2] John Kerry, Remarks at Boston College's 138th Commencement Ceremony, Chestnut Hill, MA, May 19, 2014, <http://www.state.gov/secretary/remarks/2014/05/226291.htm> (accessed March 7, 2016).

[3] John Cook, Dana Nuccitelli, Sara Green, Mark Richardson, Barbel Winkler, Rob Painting, Robert Way, Peter Jacobs, and Andrew Skuce, *Environmental Research Letters*, Vol. 8 No. 2 (May 15, 2013), <http://iopscience.iop.org/article/10.1088/1748-9326/8/2/024024> (accessed March 7, 2016).

[4] Ibid.

[5] Richard Tol, "Quantifying the Consensus on Anthropogenic Global Warming in the Literature: A Re-Analysis," *Energy Policy*, Vol. 73 (October 2014), pp. 701–705, <http://www.sciencedirect.com/science/article/pii/S0301421514002821> (accessed March 7, 2016).

[6] David Legates, Willie Soon, William Briggs, and Christopher Monckton of Brenchley, "Climate Consensus and 'Misinformation': A Rejoinder to *Agnotology, Scientific Consensus, and the Teaching and Learning of Climate Change*," *Science & Education*, Vol. 24, No. 3 (April 2015), pp. 299–318, <http://link.springer.com/article/10.1007/s11191-013-9647-9#page-1> (accessed March 7, 2016).

[7] Frank Hobbs, "What Is There a 97% Consensus About?" *Climate Etc.*, December 20, 2015, <https://judithcurry.com/2015/12/20/what-is-there-a-97-consensus-about/> (accessed March 7, 2016).

[8] William Happer, "Data or Dogma? Promoting Open Inquiry in the Debate over the Magnitude of Human Impact on Earth's Climate," testimony before the Subcommittee on Space, Science, and Competitiveness, Committee on Commerce, Science, and Transportation, U.S. Senate, December 8, 2015, p. 8, <http://www.commerce.senate.gov/public/cache/files/c8c53b68-253b-4234-a7cb-e4355a6edfa2/FA9830F15064FED0A5B28BA737D9985D.dr.-william-happer-testimony.pdf> (accessed March 7, 2016). See also Judith Curry, "Data or Dogma? Promoting Open Inquiry in the Debate over the Magnitude of Human Impact on Earth's Climate," testimony before the Subcommittee on Space, Science, and Competitiveness, Committee on Commerce, Science, and Transportation, U.S. Senate, December 8, 2015, p. 17, <http://www.commerce.senate.gov/public/cache/files/f739759e-3f1b-447e-a1eb-d42bbe70454e/FBA0C80EBB0D0B6545922F1D45D18C75.dr.-judith-curry-testimony.pdf> (accessed March 7, 2016).

[9] U.S. Department of State, “Fiscal Year 2017 Congressional Budget Justification,” February 9, 2016, p. 196, <http://www.state.gov/documents/organization/252179.pdf> (accessed March 7, 2016).

[10] White House, “Federal Climate Change Expenditures Report to Congress,” August 2013, https://www.whitehouse.gov/sites/default/files/omb/assets/legislative_reports/fcce-report-to-congress.pdf (accessed March 7, 2016).

[11] A Cato Institute study has attempted to begin a broader conversation on federal bias in research, for example, in agency research plans, defining research questions, peer review, immunity from data scrutiny, and exaggerated results and confidence in results. David Wojick and Patrick Michaels, “Is the Government Buying Science or Support? A Framework Analysis of Federal Funding-Induced Biases,” Cato Institute *Working Paper* No. 29, April 30, 2015, <http://object.cato.org/sites/cato.org/files/pubs/pdf/working-paper-29.pdf> (accessed March 7, 2016).

[12] Curry, “Data or Dogma?” p. 19.

[13] Sheldon Whitehouse, “The Fossil-Fuel Industry’s Campaign to Mislead the American People,” *The Washington Post*, May 29, 2015, https://www.washingtonpost.com/opinions/the-fossil-fuel-industrys-campaign-to-mislead-the-american-people/2015/05/29/04a2c448-0574-11e5-8bda-c7b4e9a8f7ac_story.html (accessed March 7, 2016).

[14] As aptly put by Australian rap musician Kilez Moore. See Judith Curry, “In Defense of Free Speech,” *Climate Etc.*, April 19, 2014, <http://judithcurry.com/2014/04/19/in-defense-of-free-speech/> (accessed March 7, 2016).

[15] The Global Warming Policy Foundation, “Lennart Bengtsson Resigns: GWPF Voices Shock and Concern at the Extent of Intolerance Within the Climate Science Community,” May 14, 2014, <http://www.thegwpf.com/lennart-bengtsson-resigns-gwpf-voices-shock-and-concern-at-the-extent-of-intolerance-within-the-climate-science-community/#sthash.eZq0YD6j.dpuf> (accessed March 7, 2016).

[16] President Barack Obama, Remarks by the President on Climate Change, Georgetown University, Washington, DC, June 25, 2013, <https://www.whitehouse.gov/the-press-office/2013/06/25/remarks-president-climate-change> (accessed March 7, 2016). See also BarackObama.com, “Call Out the Climate

Change Deniers,” Organization for Action, 2016, <https://www.barackobama.com/climate-change-deniers/#/> (accessed March 7, 2016).

[17] Susan Dudley, “Regulatory Science and Policy: A Case Study of the National Ambient Air Quality Standards,” George Washington University, Regulatory Studies Center, September 9, 2015, <https://regulatorystudies.columbian.gwu.edu/regulatory-science-and-policy-case-study-national-ambient-air-quality-standards> (accessed March 8, 2016).

[18] Gina McCarthy, “Oversight Hearing: EPA’s Proposed Carbon Pollution Standards for Existing Power Plants,” testimony before the Committee on Environment and Public Works, U.S. Senate, June 23, 2014, <https://www.youtube.com/watch?v=RNO-IRrYqf8> (accessed March 8, 2016).

[19] *Ibid.*, starting at 2:31:47.

[20] President Barack Obama, “Statement by the President on the Keystone XL Pipeline,” The White House, Washington, DC, November 6, 2015, <https://www.whitehouse.gov/the-press-office/2015/11/06/statement-president-keystone-xl-pipeline> (accessed March 8, 2016).

[21] Roy Spencer, “Some Global Warming Q&A to Consider in Light of the EPA Ruling,” April 19, 2009, <http://www.drroyspencer.com/2009/04/some-global-warming-qa-to-consider-in-light-of-the-epa-ruling/> (accessed March 4, 2016).

[22] *Ibid.*

[23] American Geophysical Union, “Unusual Volcanic Episode Rapidly Triggered Little Ice Age, Researchers Find,” January 30, 2012, <http://news.agu.org/press-release/unusual-volcanic-episode-rapidly-triggered-little-ice-age-researchers-find/> (accessed March 4, 2016).

[24] Philip Lloyd, “An Estimate of the Centennial Variability of Global Temperatures,” *Energy & Environment*, Vol. 26, No. 3 (May 11, 2015), <http://multiscience.atypon.com/doi/abs/10.1260/0958-305X.26.3.417> (accessed March 8, 2016).

[25] John Christy, testimony before the Committee on Science, Space and Technology, U.S. House of Representatives, February 2, 2016, pp. 10–14, <https://science.house.gov/sites/republicans.science.house.gov/files/documents/HHRG-114-SY-WState-JChristy-20160202.pdf> (accessed March 4, 2016).

[26] Bart Strengers, Bart Verheggen, and Kees Vringer, “Climate Science Survey: Questions and Answers,” PBL Netherlands Environmental Assessment Agency,”

April 10, 2015, http://www.pbl.nl/sites/default/files/cms/publicaties/pbl-2015-climate-science-survey-questions-and-responses_01731.pdf (accessed March 15, 2016).

[27] See, for instance, Patrick Moore, “Natural Resource Adaptation: Protecting Ecosystems and Economies,” testimony before the Subcommittee on Oversight, Environment and Public Works Committee, U.S. Senate, February 25, 2014, http://www.epw.senate.gov/public/_cache/files/415b9cde-e664-4628-8fb5-ae3951197d03/22514hearingwitness testimony moore.pdf (accessed March 15, 2016), and Strengers, Verheggen, and Vringer, “Climate Science Survey: Questions and Answers.”

[28] Claude Allegre et al., “Concerned Scientists Reply on Global Warming: The Authors of the Jan. 27 *Wall Street Journal* op-ed, ‘No Need to Panic about Global Warming,’ Respond to Their Critics,” *The Wall Street Journal*, February 21, 2012, <http://www.wsj.com/articles/SB10001424052970203646004577213244084429540> (accessed March 15, 2016).

[29] House of Lords Select Committee on Economic Affairs, *The Economics of Renewable Energy*, Vol. 2: Evidence (London: The Stationary Office Limited, 2008), p. 234.

[30] Christy, testimony before the Committee on Science, Space and Technology, U.S. House of Representatives.

[31] Surface Stations, <http://www.surfacestations.org/> (accessed March 16, 2016).

[32] Rud Istvan, “How Good is the NASA GISS Global Temperature Dataset,” *Watts Up With That?*, August 3, 2015, <http://wattsupwiththat.com/2015/08/03/how-good-is-the-nasa-giss-global-temperature-dataset/> (accessed April 11, 2016).

[33] Thomas Karl, Anthony Arguez, Boyin Huang, Jah Lawrimore, James McMahon, Matthew Menne, Thomas Peterson, Russell Vose, and Huai-Min Zhang, “Possible Artifacts of Data Biases in the Recent Global Surface Warming Hiatus,” *Science*, June 4, 2015, <http://science.sciencemag.org/content/early/2015/06/03/science.aaa5632.full> (accessed March 4, 2016).

[34] Judith Curry, “Hiatus Controversy: Show Me the Data,” *Climate Etc.*, November 6, 2015, <https://judithcurry.com/2015/11/06/hiatus-controversy-show-me-the-data/> (accessed March 4, 2016).

[35] Patrick Michaels and Chip Knappenberger, “Climate Models Versus Climate Reality,” *Climate Etc.*, December 17, 2015, <https://judithcurry.com/2015/12/17/climate-models-versus-climate-reality/> (accessed March 4, 2016).

[36] John Christy, testimony before the Subcommittee on Space, Science, and Competitiveness, Committee on Commerce, Science, and Transportation, U.S. Senate, December 8, 2015, https://www.heartland.org/sites/default/files/christy_testimony.pdf (accessed March 4, 2016). See also Roy Spencer, “95% of Climate Models Agree: The Observations Must be Wrong,” February 7, 2014, <http://www.drroyspencer.com/2014/02/95-of-climate-models-agree-the-observations-must-be-wrong/> (accessed March 4, 2016).

[37] John Christy, “A Factual Look at the Relationship Between Climate and Weather,” testimony before the Subcommittee on Environment, Committee on Science, Space, and Technology, U.S. House of Representatives, December 11, 2013, <http://science.house.gov/sites/republicans.science.house.gov/files/documents/HHRG-113-SY18-WState-JChristy-20131211.pdf> (accessed March 4, 2016). Patrick Michaels, “Warmest Year on Record Is Still Bad News for Climate Models,” *Cato at Liberty*, January 16, 2015, <http://www.cato.org/blog/warmest-year-record-still-bad-news-climate-models> (accessed March 4, 2016).

[38] Paul Knappenberger and Patrick Michaels, “Climate Models’ Tendency to Simulate Too Much Warming and the IPCC’s Attempt to Cover That Up,” *Cato Institute*, October 10, 2013, <http://www.cato.org/blog/climate-models-tendency-simulate-too-much-warming-ipccs-attempt-cover> (accessed March 4, 2016).

[39] For example, a press release from NASA titled: “NASA, NOAA Analyses Reveal *Record-Shattering* Global Warm Temperatures in 2015” (emphasis added). David Kreutzer, “Why Calling 2015 the Warmest Year on Record Is Problematic,” *The Daily Signal*, January 22, 2016, <http://dailysignal.com/2016/01/22/why-calling-2015-the-warmest-year-on-record-is-problematic/>.

[40] *Environment 360*, “Forum: Is Extreme Weather Linked to Global Warming?” Yale University, June 2, 2011, http://e360.yale.edu/feature/forum_is_extreme_weather_linked_to_global_warming/2411/ (accessed March 4, 2016).

[41] Intergovernmental Panel on Climate Change, “Managing the Risks of Extreme Events and Disasters to Advance Climate Change Adaption,” United Nations, p. 124, http://www.ipcc-wg2.gov/SREX/images/uploads/SREX-All_FINAL.pdf (accessed March 4, 2016).

[42] Judith Curry, “Extreme Testimony,” *Climate Etc.*, March 8, 2011, <http://judithcurry.com/2011/03/08/extreme-testimony/> (accessed March 4, 2016).

[43] D. L. Hartmann et al., “Observations: Atmosphere and Surface,” in *Climate Change 2013: The Physical Science Basis. Contribution of Working Group I to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change*, p. 216, http://www.climatechange2013.org/images/report/WG1AR5_Chapter02_FINAL.pdf (accessed March 4, 2016).

[44] *Ibid.*, p. 214.

[45] *Ibid.*, p. 216.

[46] *Ibid.*, pp. 214–215.

[47] After accounting for the apparent increase in tornado counts due to improved identifying technology. National Oceanic and Atmospheric Administration, “Historical Records and Trends,” U.S. Department of Commerce, <http://www.ncdc.noaa.gov/climate-information/extreme-events/us-tornado-climatology/trends> (accessed March 7, 2016).

[48] The Cryosphere Today, “Global Sea-Ice Area, 1979-Present,” University of Illinois Urbana–Champaign, <http://arctic.atmos.uiuc.edu/cryosphere/IMAGES/global.daily.ice.area.withtrend.jpg> (accessed February 3, 2016).

[49] Paul Homewood, “Glacial Advance During the Little Ice Age,” Not a Lot of People Know That, January 25, 2015, <https://notalotofpeopleknowthat.wordpress.com/2015/01/25/glacial-advance-during-the-little-ice-age/> (accessed March 7, 2016), and M. A. Kominz, “Sea Level Variations Over Geologic Time,” *Encyclopedia of Ocean Sciences*, 2001, http://curry.eas.gatech.edu/Courses/5225/ency/Chapter10/Ency_Oceans/Sea_Level_Variations.pdf (accessed April 15, 2016).

[50] For instance, see Jonathan Fairman, Udaysankar Nair, Sundar Christopher, and Thomas Molg, “Land Use Change Impacts on Regional Climate Over Kilimanjaro,” *Journal of Geophysical Research*, Vol. 116, No. D3 (February 16, 2011), <http://onlinelibrary.wiley.com/doi/10.1029/2010JD014712/abstract;jsessionid=A01537EBB6360F23B4DFBA6553BA0CD5.f01t04> (accessed March 1, 2016).

[51] NOAA PMEL Carbon

Program, <http://www.pmel.noaa.gov/co2/story/What+is+Ocean+Acidification%3F> (accessed March 14, 2016).

[52] Craig Idso, “Ocean Acidification (The Phenomenon)—Summary,” *CO2 Science*, <http://www.co2science.org/subject/o/summaries/acidificationphenom.php> (accessed February 3, 2016).

[53] Ibid.

[54] Ibid.

[55] Kevin D. Dayaratna, Nicolas D. Loris, and David W. Kreutzer, “Consequences of Paris Protocol: Devastating Economic Costs, Essentially Zero Environmental Benefits,” Heritage Foundation *Backgrounder* No. 3080, April 13, 2016, <http://www.heritage.org/research/reports/2016/04/consequences-of-paris-protocol-devastating-economic-costs-essentially-zero-environmental-benefits>.

[56] Gina McCarthy, “The Promise of the Clean Power Plan: A Conversation with Gina McCarthy, Administrator, U.S. Environmental Protection Agency,” remarks at Resources for the Future Policy Leadership Forum, Washington, DC, August 11, 2015, https://www.youtube.com/watch?v=B_krtNhukdY (accessed March 8, 2016).

[57] Patrick Michaels and Paul Knappenberger, “*Current Wisdom: We Calculate, You Decide: A Handy-Dandy Carbon Tax Temperature-Savings Calculator*,” *Cato at Liberty*, June 23, 2013, <http://www.cato.org/blog/current-wisdom-we-calculate-you-decide-handy-dandy-carbon-tax-temperature-savings-calculator> (accessed March 8, 2016).

[58] Ibid.

[59] James Hansen, former head of NASA’s Goddard Institute for Space Studies said of the Clean Power Plan: “The actions are practically worthless. They do nothing to attack the fundamental problem.” Tony Dokoupil, “Obama’s Climate Policy Is ‘Practically Worthless,’ Says Expert,” *MSNBC*, August 4, 2015, <http://www.msnbc.com/msnbc/obamas-climate-policy-practically-worthless-says-expert> (accessed March 8, 2016).

[60] Gina McCarthy, “Examining EPA’s Regulatory Overreach,” testimony before the Committee on Science, Space, and Technology, U.S. House of Representatives, July 9, 2015, starting at 19:00 minute mark, <http://www.epw.senate.gov/public/index.cfm/hearings?ID=8655EDD9-03AC-BB36-CAB8-7913EC6C2B94> (accessed March 8, 2016).

[61] Nicolas Loris, “John Kerry’s Surprising Comments on International Regulations and Climate Change,” *The Daily Signal*, December 11, 2015, <http://dailysignal.com/2015/12/11/john-kerrys-surprising-comments-on-international-regulations-and-climate-change/>.

[62] For another example, see analysis of the EPA’s Utility MACT rule: Anne E. Smith, “The American Energy Initiative—A Focus on What EPA’s Utility MACT Rule Will Cost U.S. Consumers,” testimony before the Subcommittee on Energy and Power, Committee on Energy and Commerce, U.S. House of Representatives, February 8, 2012, p. 16, <http://www.nera.com/publications/archive/2012/nera-testimony-on-the-american-energy-initiative--a-focus-on-w.html> (accessed March 8, 2016).

[63] Anne Smith, “EPA’s Final Clean Power Plan Rulve,” testimony before the Committee on Science, Space, and Technology, U.S. House of Representatives, November 18, 2015, p. 22, <http://docs.house.gov/meetings/SY/SY00/20151118/104182/HHRG-114-SY00-Wstate-SmithA-20151118.pdf> (accessed March 8, 2016).

[64] Institute for Energy Research, “Five Charts That Blow Apart EPA’s Asthma Claims,” July 22, 2015, <http://instituteforenergyresearch.org/analysis/five-charts-that-blow-apart-epas-asthma-claims/> (accessed March 1, 2016).

[65] R. S. Pindyck, “Climate Change Policy: What Do the Models Tell Us?” *Journal of Economic Literature*, September 2013, pp. 860–872.

[66] Gerard H. Roe and Marcia B. Baker, “Why Is Climate Sensitivity So Unpredictable?” *Science*, Vol. 318, No. 5850 (October 26, 2007), pp. 629–632 (accessed March 8, 2016). See also Patrick J. Michaels, “An Analysis of the Obama Administration’s Social Cost of Carbon,” testimony before the Committee on Natural Resources, U.S. House of Representatives, July 22, 2015, <http://www.cato.org/publications/testimony/analysis-obama-administrations-social-cost-carbon> (accessed March 8, 2016).

[67] Nicholas Lewis, “An Objective Bayesian Improved Approach for Applying Optimal Fingerprint Techniques to Estimate Climate Sensitivity,” *Journal of Climate*, Vol. 26, No. 19 (October 2013), pp. 7414–7429 (accessed March 8, 2016); Alexander Otto et al., “Energy Budget Constraints on Climate Response,” *Nature Geoscience*, Vol. 6, No. 6 (June 2013), pp. 415–416 (accessed March 8, 2016); and Magne Aldrin et al., “Bayesian Estimation of Climate Sensitivity Based on a Simple Climate Model Fitted to Observations of Hemispheric Temperatures and Global Ocean Heat Content,” *Environmetrics*, Vol. 23, No. 3 (May 2012), pp. 253–271 (accessed March 8, 2016).

[68] Kevin D. Dayaratna and David W. Kreutzer, “Unfounded FUND: Yet Another EPA Model Not Ready for the Big Game,” Heritage Foundation *Backgrounder* No. 2897, <http://www.heritage.org/research/reports/2014/04/unfounded-fund-yet-another-epa-model-not-ready-for-the-big-game>. See also Kevin D. Dayaratna and David W. Kreutzer, “Loaded DICE: An EPA Model Not Ready for the Big Game,” Heritage Foundation *Backgrounder* No. 2860, November 21, 2013, <http://www.heritage.org/research/reports/2013/11/loaded-dice-an-epa-model-not-ready-for-the-big-game>.

[69] News release, “New Report: \$12.1 Trillion Must be Invested in New Renewable Power Generation over Next 25 Years to Limit Climate Change,” Ceres, January 29, 2016, <http://www.ceres.org/press/press-releases/report-on-12.1-trillion-investment-in-renewable-power-needed-to-limit-climate-change> (accessed March 8, 2016).

[70] Nicolas D. Loris, “No More Energy Subsidies: Prevent the New, Repeal the Old,” Heritage Foundation *Backgrounder* No. 2587, July 26, 2011, <http://www.heritage.org/research/reports/2011/07/no-more-energy-subsidies-prevent-the-new-repeal-the-old>.

[71] Nuclear Energy Institute, “Land Requirements for Carbon-Free Technologies,” June 2015, http://www.nei.org/CorporateSite/media/filefolder/Policy/Papers/Land_Use_Carbon_Free_Technologies.pdf?ext=.pdf (accessed April 13, 2016).

[72] Ibid.

[73] Vishwa Mohan, “India Invokes ‘Right to Grow’ to Tell Rich Nations of Its Stand on Future Climate Change Negotiations,” *The Times of India*, June 17, 2014, <http://timesofindia.indiatimes.com/home/environment/global-warming/India-invokes-right-to-grow-to-tell-rich-nations-of-its-stand-on-future-climate-change-negotiations/articleshow/36724848.cms> (accessed March 8, 2016).

[74] The World Bank, GDP Per Capital (Current US\$) Data Series, 2014, <http://data.worldbank.org/indicator/NY.GDP.PCAP.CD>(accessed March 8, 2016).

Authors



David Kreutzer

Former Senior Research Fellow, Labor Markets and Trade



[Nicolas Loris](#)

Deputy Director, Thomas A. Roe Institute



[Katie Tubb](#)

Senior Policy Analyst



[Kevin Dayaratna](#)

Senior Statistician and Research Programmer