STATEMENT OF
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to the COMMITTEE ON BANKING, HOUSING, AND URBAN AFFAIRS
of the UNITED STATES SENATE

HEARING on
21st Century Communities: Climate Change, Resilience, and Reinsurance
Dirksen Senate Office Building 538
20 July 2021

My testimony focuses on the importance of securing robust scientific advice on climate change. Unfortunately, key scientific guidance on climate that informs policy– including central bank stress testing and U.S. government estimates of the social cost of carbon – has departed from basic standards of scientific integrity. A main reason for this departure is that climate science has increasingly been enlisted in support of policy advocacy rather than to inform policy debates and decisions. My biography is included at the end of this statement. My testimony today represents my individual views not those of any organization.

Five Take-Home Points

1. At the outset, I emphasize explicitly and unequivocally that human-caused climate change is real, that it poses significant risks to society and the environment, and that various policy responses in the form of mitigation and adaptation are necessary and make good sense.
2. However, the reality and importance of climate change does not provide a rationale or excuse for the evasion or avoidance of meeting basic standards of research integrity in the provision of scientific advice to policy makers.
3. Currently, policy makers are being badly misled in a number of crucial areas related to climate science, impacts and economics. Specifically:
    - The climate scenarios that underlie much of climate research are badly outdated and no longer offer insight to plausible futures;
    - Economic losses associated with extreme events are routinely attributed to changes in climate, while changes in society and its exposure and vulnerability – which also influence future risks -- are largely ignored;
    - Trends in the incidence of extreme weather events in the United States and around the world are far more nuanced than discussions found in the media and in politics.
4. Shortfalls in robust science advice on climate are more than just an academic issue – they also show up in important policy contexts, such as:
    - Proposals for "climate stress testing" in the global and national financial systems;
    - The estimated "social cost of carbon" of the Biden, Trump and Obama administrations;
    - Proposed Congressional legislation to address financial system risks related to climate change.
5. Climate change is too important to allow shortfalls of scientific integrity in science advice to persist. Congress should enhance its oversight of the U.S. Global Change Research Program and its National Climate Assessment to ensure that the scientific advice that it receives is up-to-date and accurate.

The remainder of my written testimony elaborates and substantiates these five take-home points.

Elaboration of the Five Take-Home Points

1. *At the outset, I emphasize explicitly and unequivocally that human-caused climate change is real, that it poses significant risks to society and the environment, and that various policy responses in the form of mitigation and adaptation are necessary and make good sense.*

The Intergovernmental Panel on Climate Change has for more than 30 years through its Working Group 1 provided routine assessments of the physical science aspects of climate change.[1] The IPCC WG1 is scheduled to release its 6th assessment report on 9 August 2021. These assessments have documented changes in climate that have been detected and attributed to human causes, notably the emission of carbon dioxide and other greenhouse gases.

My views on the importance of climate policy have been consistent for almost three decades. For instance, in 2006 I testified before the House of Representatives on the conclusions of the IPCC: "on this basis alone I am personally convinced that it makes sense to take action to limit greenhouse gas emissions. Of course, the answer to what action is not at all straightforward. It involves questions of on what time scales, at what cost, with what consequences, with what foregone opportunities, and what mix of adaptation and mitigation."[2] Such complexities are why the provision of expert advice to Congress and the federal agencies is so important.

For more insight on my views on the science and policy of climate, please see my book **The Climate Fix** (2010). Nothing in the testimony that follows should be interpreted as downplaying the importance of climate change or policy responses to it. In fact, the issue is so crucial that we should expect the absolute highest standards of scientific integrity in the information being provided to policy makers.

2. *However, the reality and importance of climate change does not provide a rationale or excuse for the evasion or avoidance of meeting basic standards of research integrity in the provision of scientific advice to policy makers.*

"Scientific integrity," as I use the phrase here, is defined by several leading scholars to consist "of proper reasoning processes and handling of evidence essential to doing science" and "a respect for the underlying empirical basis of science."[3] It is uncontroversial that we want good science to inform policy.

The U.S. Congress has established countless mechanisms for the provision of science advice to government across many areas of policy making – such as in the more than 1,000 FACA (Federal Advisory Committee Act) committees that provide guidance on topics as varied as vaccine approval and the regulation of pollutants.[4]

[1] https://www.ipcc.ch/
[2] https://www.govinfo.gov/content/pkg/CHRG-109hhrg29932/html/CHRG-109hhrg29932.htm
[3] Douglas, H. E., & Bour, E. (2014). Scientific integrity in a politicized world. In *Logic, Methodology, and Philosophy of Science: Proceedings of the Fourteenth International Congress* (pp. 253-268).
[4] https://www.facadatabase.gov/FACA/FACAPublicPage

In 1990, the U.S. Congress established an advisory mechanism for climate science in the form of a national climate assessment.[5] That legislation required the national climate assessment to be produced every four years by the interagency U.S. Global Change Research Program and, among other tasks, is to document "the effects of global change on the natural environment, agriculture, energy production and use, land and water resources, transportation, human health and welfare, human social systems, and biological diversity" in order to provide "usable information on which to base policy decisions relating to global change."[6]

In practice, however, the U.S. National Climate Assessment (NCA) has been politicized in varying degrees by both Democratic and Republic administrations. It has been used less as a mechanism of science advice to Congress and the President (as mandated in law) but as a tool for promoting the climate policy agenda of the administration. This continues today. The main reason for the politicization of the NCA is that it is housed in the Executive Office of the President (under the Office of Science and Technology Policy) and is ultimately led by political appointees – which is not an ideal structure for effective science advice.[7]

Thus, due to the politicization of the NCA, the ability of the U.S. government's primary science advisory body on climate to ensure scientific integrity, and to correct course when things get off track, is limited. I say more on how to address these shortfalls under #5 below.

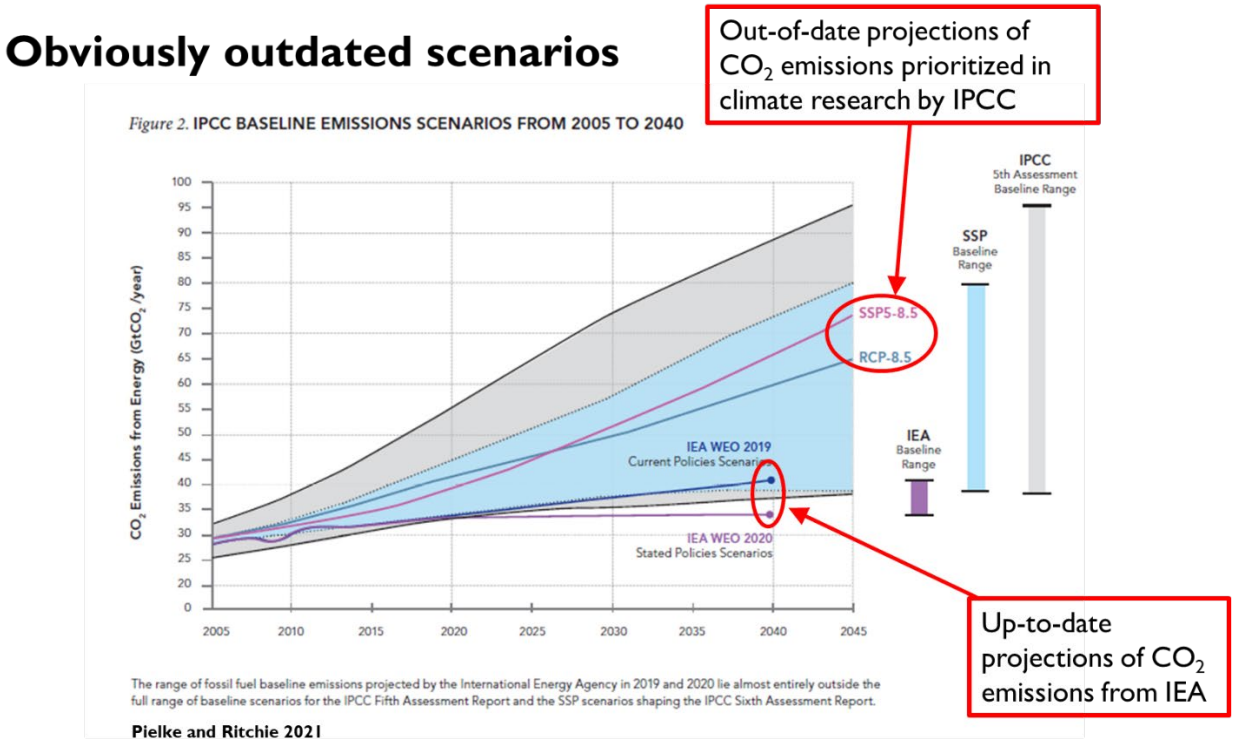
3. *Currently, policy makers are being badly misled in a number of crucial areas related to climate science, impacts and economics. For instance:*

    - *The climate scenarios that underlie much of climate research are badly outdated and no longer offer insight to plausible futures;*

A large proportion of research on climate science, impacts and economics depends upon scenarios of the long-term future to produce projections of future changes in climate, their impacts on society and the environment and the consequences of alternative possible policy actions.[8] However, the scenarios that are currently prioritized in climate research and in policy analyses are badly outdated, and for a range of reasons have not been updated.[9]

[5] https://www.govinfo.gov/content/pkg/STATUTE-104/pdf/STATUTE-104-Pg3096.pdf
[6] Pielke, R. A. (1995). Usable information for policy: an appraisal of the US Global Change Research Program. *Policy Sciences*, *28*(1), 39-77.
[7] For more details see: https://rogerpielkejr.substack.com/p/fixing-the-us-national-climate-assessment
[8] Brian C. O'Neill, Timothy R. Carter, Kristie Ebi, Paula A. Harrison, Eric Kemp-Benedict, Kasper Kok, Elmar Kriegler, Benjamin L. Preston, Keywan Riahi, Jana Sillmann, Bas J. van Ruijven, Detlef van Vuuren, David Carlisle, Celia Conde, Jan Fuglestvedt, Carole Green, Tomoko Hasegawa, Julia Leininger, Seth Monteith, and Ramon Pichs-Madruga, "Achievements and needs for the climate change scenario framework," *Nature Climate Change* 10 (2020): 1074–1084.
[9] R. Pielke Jr. and J. Ritchie, 2021. How Climate Scenarios Lost Touch With Reality, *Issues in Science and Technology*, Summer. And for a deeper, more technical analysis see: Pielke Jr, R., & Ritchie, J. (2021). Distorting the view of our climate future: The misuse and abuse of climate pathways and scenarios. *Energy Research & Social Science*, *72*, 101890.

The figure below shows clearly that carbon dioxide emissions in the real world are already at a level far less that those projected in the highest priority climate scenarios (which are typically used to represent a "business as usual" or reference case projection of the future).



- *Economic losses associated with extreme events are routinely attributed to changes in climate, while changes in society and its exposure and vulnerability – which also influence future risks -- are largely ignored;*

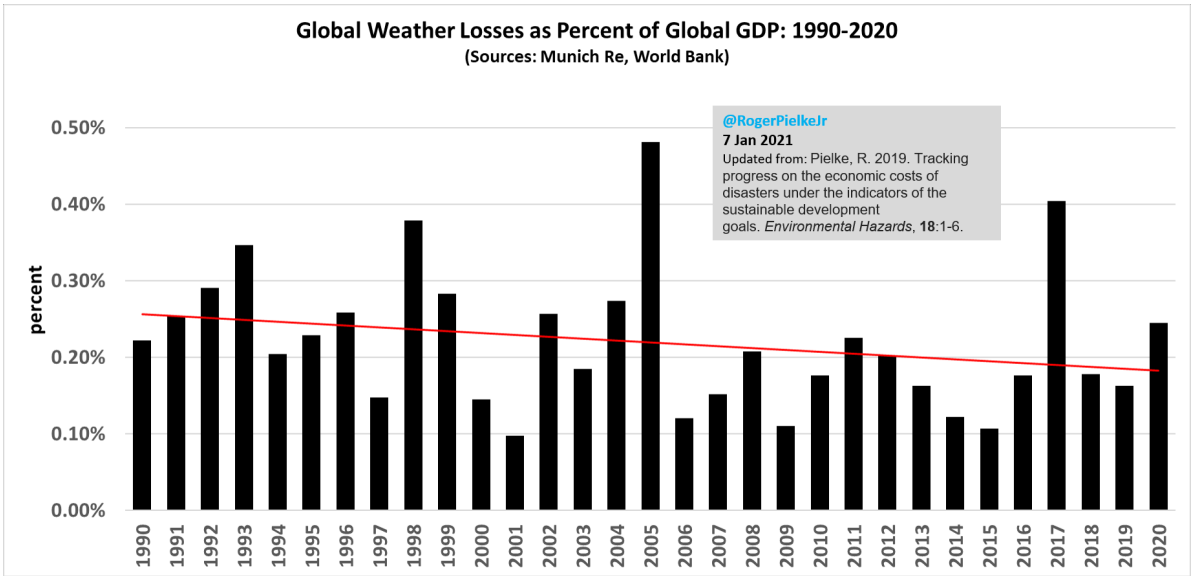
Every day, somewhere on planet earth extreme weather events are happening. With 21st century communication technology and platforms we are all able to witness disasters in ways that in earlier times just wasn't possible. But the visceral appreciation of extremes and their impacts is no substitute for data and evidence.

Data and evidence indicate that since at least 1990 (about when global data on disaster losses is judged to become reliable) the economic damages associated with extreme weather have in fact *decreased* when measured in the context of global GDP. This is shown clearly in the graph on the next page, based on data from the global reinsurance company Munich Re and global GDP from the World Bank.[10] The trend of decreasing impacts of weather as a proportion of GDP holds for countries at all income levels.[11] This data should not be confused with data on the frequency or

[10] Pielke, R. (2019). Tracking progress on the economic costs of disasters under the indicators of the sustainable development goals. *Environmental Hazards*, *18*(1), 1-6.
[11] https://www.thelancet.com/journals/lancet/article/PIIS0140-6736(19)32596-6/fulltext

intensity of weather events – weather and climate data will always better serve for that purpose.

What the evidence shows is that the world has become *less vulnerable* to the direct economic impacts of weather and climate extremes as the global economy has grown.[12] This is in fact very good news, but there is no guarantee that it will continue, unless we pay greater attention in policy making to societal exposures and vulnerabilities to climate variability and change.



Regrettably, one of the U.S. governments most important science agencies has for years been contributing to the spread of misinformation on the economic costs of disasters. The National Oceanic and Atmospheric Administration (NOAA)[13] maintains a dataset of "billion dollar disasters" since 1980 that provides simple count of the number of disasters each year that exceed $1 billion in losses.[14] The U.S. government uses this simple metric as an indicator of climate change.[15]

What the dataset actually shows is a combination of poor methodology and the consequences of a growing society, with more people and property in locations exposed to loss from extreme weather. It is not an indicator of climate change. Climate data, not economic data, should be used for that purpose.

Consider just one example that illustrates the flawed methodology: Hurricane Kate made landfall near Mexico Beach, Florida, in 1985 and caused about $600 million in damages in current

[12] Formetta, G., & Feyen, L. (2019). Empirical evidence of declining global vulnerability to climate-related hazards. *Global Environmental Change*, *57*, 101920.
[13] I worked for 16 years in a NOAA cooperative institute and have great respect for its scientists. NOAA's longstanding promotion of the "billion dollar disaster" tabulation is in my view an aberration from what is typically one of the nation's most rigorous science agencies.
[14] https://www.ncdc.noaa.gov/billions/
[15] https://www.globalchange.gov/browse/indicators/billion-dollar-disasters

dollars—not enough to make NOAA's list for that year. But estimates that I developed with colleagues, published in the journal *Nature Sustainability* in 2018,[16] show that if we take into account the 50% increase in the region's population over almost four decades, and the parallel rise in the value of homes, their contents and other built infrastructure, that exact same storm today would cause damages amounting to some $2 billion. Yet, Hurricane Kate doesn't appear in the NOAA tabulation.

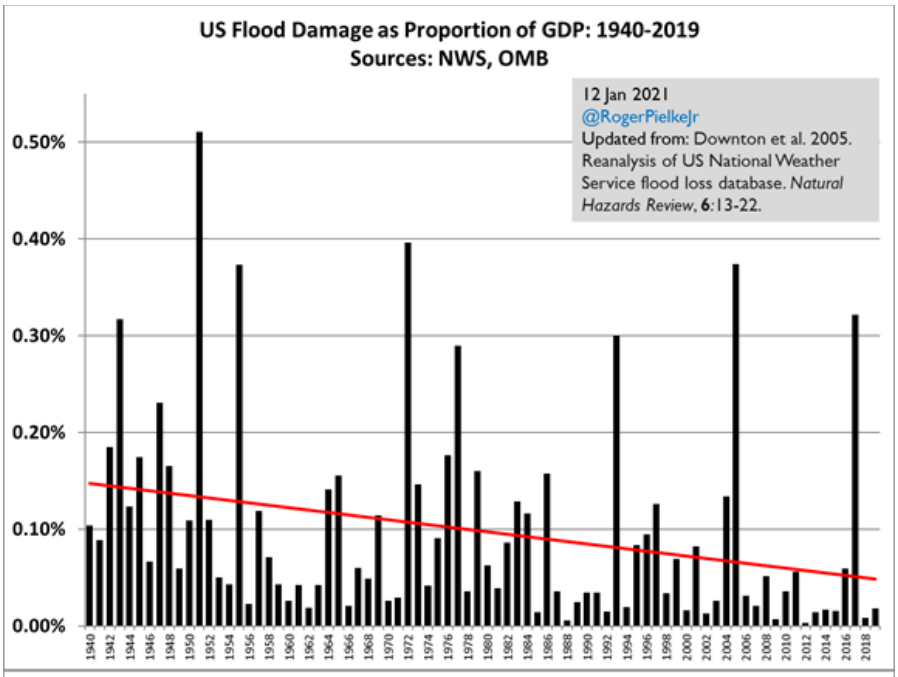
The "billion dollar disaster" list is routinely used in policy settings to suggest that disasters costs are increasing dramatically due to climate change, but what the dataset really indicates is growing wealth in locations exposed to loss. Every time you see this dataset invoked as evidence of human-caused climate change you should think instead about the state of scientific integrity in U.S. federal science agencies.

A more accurate and scientifically robust picture of the economic losses associated with extreme weather in the United States is available. For instance, based on work I've conducted with a number of colleagues, the three panels on the following page show the economic impacts of floods, hurricanes and tornadoes, considering growth in wealth and exposure. The picture that emerges is very different than that conveyed by the misleading NOAA dataset.

The three-panels show:

> **Top**: U.S. flood damage as a proportion of U.S. GDP from 1940 to 2019 (updated from Downton et al. 2005). The data show a sharp decline in the toll of flood damage as a proportion of the U.S. economy. This trend can be attributed to a combination of factors, including policy, development and climate.
>
> **Middle**: U.S. hurricane damage normalized to 2020 values, based on population, wealth and inflation (updated from Weinkle et al. 2018). The data show no trend and are consistent with trends in landfalling hurricanes.
>
> **Bottom**: U.S. tornado damage normalized to 2017 values, based on population, building stock and wealth, and inflation (updated from Simmons et al. 2012). The data show a downward trend which can be attributed to a number of factors, including a decrease in the incidence of strong tornadoes.

[16] Weinkle, J., Landsea, C., Collins, D., Musulin, R., Crompton, R. P., Klotzbach, P. J., & Pielke, R. (2018). Normalized hurricane damage in the continental United States 1900–2017. *Nature Sustainability*, *1*(12), 808-813.


US Flood Damage as Proportion of GDP: 1940-2019
Sources: NWS, OMB
12 Jan 2021
@RogerPielkeJr
Updated from: Downton et al. 2005. Reanalysis of US National Weather Service flood loss database. Natural Hazards Review, 6:13-22.
0.50%
0.40%
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0.20%
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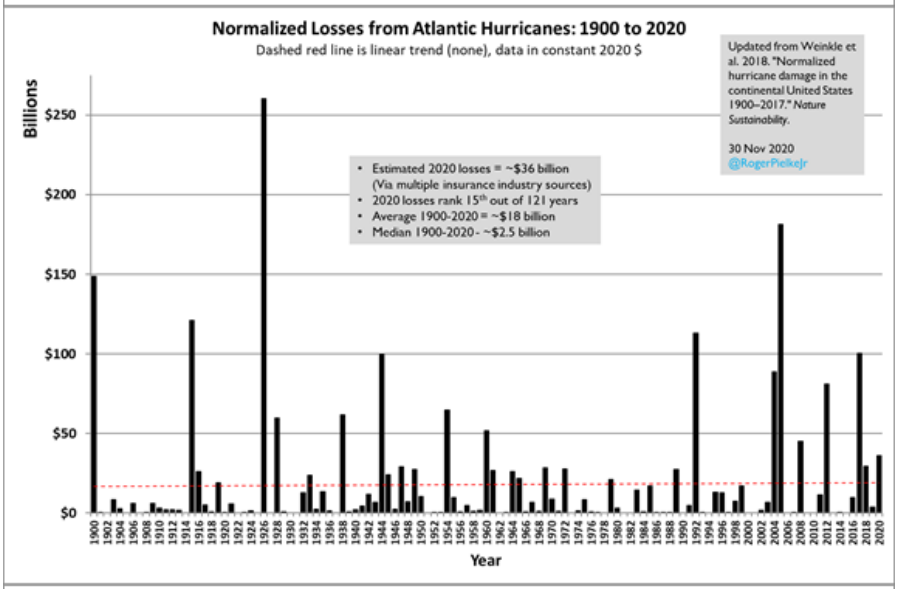
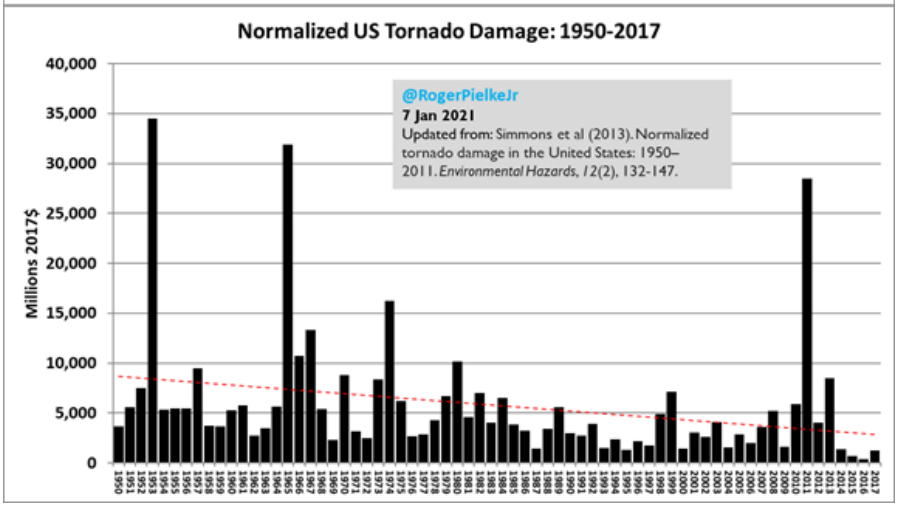

Normalized Losses from Atlantic Hurricanes: 1900 to 2020
Dashed red line is linear trend (none), data in constant 2020 $
Updated from Weinkle et al. 2018. "Normalized hurricane damage in the continental United States 1900–2017." Nature Sustainability.
30 Nov 2020
@RogerPielkeJr
• Estimated 2020 losses = ~$36 billion (Via multiple insurance industry sources)
• 2020 losses rank 15th out of 121 years
• Average 1900-2020 = ~$18 billion
• Median 1900-2020 - ~$2.5 billion
Billions
$250
$200
$150
$100
$50
$0
Year


Normalized US Tornado Damage: 1950-2017
@RogerPielkeJr
7 Jan 2021
Updated from: Simmons et al (2013). Normalized tornado damage in the United States: 1950–2011. Environmental Hazards, 12(2), 132-147.
Millions 2017$
40,000
35,000
30,000
25,000
20,000
15,000
10,000
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- *Trends in the incidence of extreme weather events in the United States and around the world are far more nuanced than discussions found in the media and in politics.*

Detecting changes in the frequency, intensity and other dimensions of extreme events beyond observed natural variability on climate time scales (that is, according to the IPCC, of >30 to 50 years) is scientifically challenging. Evidence for detection of change is often subject to competing expert perspectives on data, methods and conclusions as in many cases the signals of change are small in the context of observed variability. Detection and attribution of trends is also difficult because extreme events – by definition – are rare.

Such competing views are normal and indicate healthy scientific activity in the context of a complex field. Leading assessments accurately reflect the complexities and nuance associated with identifying changes in the behavior of extreme events. However, virtually all of this nuance is lost in public and policy debate, as extreme events have become enlisted as symbols in the public debate over climate change and are used to represent the need for changes in energy policy. In addition to oversimplifying the science on extremes, the loss of nuance also has the unfortunate consequence of pushing aside the reality that the most effective policy responses to extreme events in the context of climate variability and change will be adaptive and highly local in order to reduce societal exposure and vulnerabilities.

As just one example of important nuance that is overlooked -- the most recent U.S. National Climate Assessment did not show trend data on the incidence of landfalling hurricanes in the United States. Landfalling hurricanes cause considerable damage and are always at the center of discussion of climate change. Thus, the failure to show trends in hurricane incidence is a major oversight for a U.S.-focused climate science assessment.

That data is shown on the following page. Neither hurricane nor major hurricane landfalls have increased in the United States over the past century – contrary to much conventional wisdom represented in the media and in political debates. Nor have tropical cyclone landfalls of hurricane-strength increased globally since at least 1970.[17] The case for action on energy policy is strong with or without evidence of more hurricanes hitting the US (or around the world), and policy makers should know these trends. It is remarkable that they were not included in the US NCA.

The role of climate change in observed and projected hurricane behavior is the subject of ongoing research and according to recent assessments of the World Meteorological Organization there is not presently a scientific consensus that a signal of climate change has been detected or attributed to human causes in observed activity with high levels of certainty.[18] As two NOAA scientists

[17] Weinkle, J., et al. (2012). Historical global tropical cyclone landfalls. *Journal of Climate*, *25*(13), 4729-4735.

[18] The four recent WMO assessments are:

Knutson, T., Camargo, S. J., Chan, J. C., Emanuel, K., Ho, C. H., Kossin, J., Mohapatra, M., Satoh, M., Sugi, M., Walsh, K., & Wu, L. (2019). Tropical cyclones and climate change Assessment: Part I: Detection and attribution. Bulletin of the American Meteorological Society, 100(10), 1987–2007.

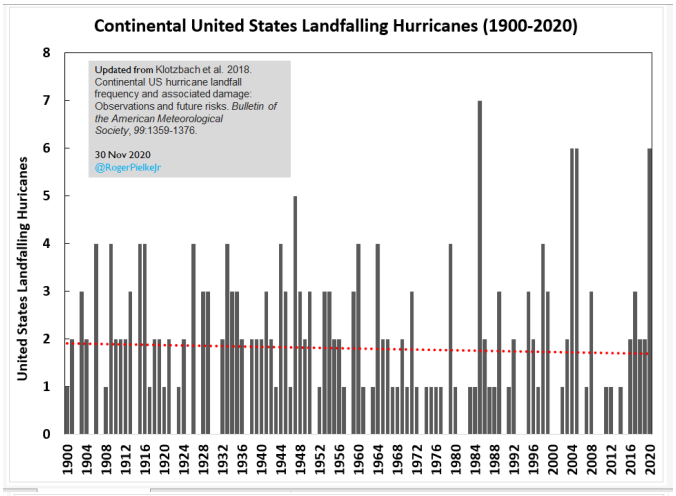
Knutson, T., Camargo, S. J., Chan, J. C., Emanuel, K., Ho, C. H., Kossin, J., Mohapatra, M. & Wu, L. (2020). Tropical cyclones and climate change assessment: Part II: Projected response to anthropogenic warming. *Bulletin of the American Meteorological Society*, *101*(3), E303-E322.

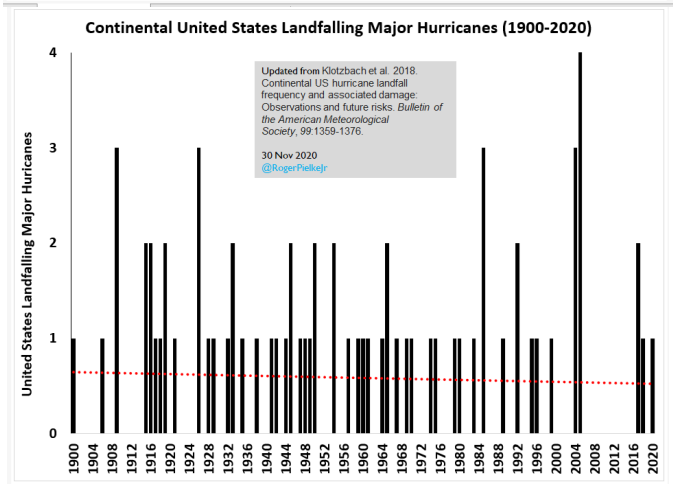
Lee, T. C., Knutson, T. R., Nakaegawa, T., Ying, M., & Cha, E. J. (2020). Third assessment on impacts of climate change on tropical cyclones in the Typhoon Committee region – part I: Observed changes,

observed last week: "Various scientists within NOAA have differing opinions about global warming's impact on hurricanes and there is no official NOAA policy on the topic. Varying ideas on an issue often mean that it is a science in progress with no definitive answers."[19]

The IPCC and the World Meteorological Organization have each produced recent assessments of the state of scientific understandings of hurricanes (tropical cyclones) and together do an admirable job overall in identifying what is known, what is not yet known and areas of uncertainty and fundamental ignorance.

If you happen to among those who believe incorrectly that U.S. hurricanes or major hurricanes have increased since 1900 (when data is reliable) or global tropical cyclone landfalls (since 1970 when data is reliable), you should think about the integrity of science advice being provided to policy makers on climate.





detection and attribution. Tropical Cyclone Research and Review, 9(1), 1–22.
Cha, E. J., Knutson, T. R., Lee, T. C., Ying, M., & Nakaegawa, T. (2020). Third assessment on impacts of climate change on tropical cyclones in the Typhoon Committee Region–Part II: Future projections. *Tropical Cyclone Research and Review*, *9*(2), 75-86.

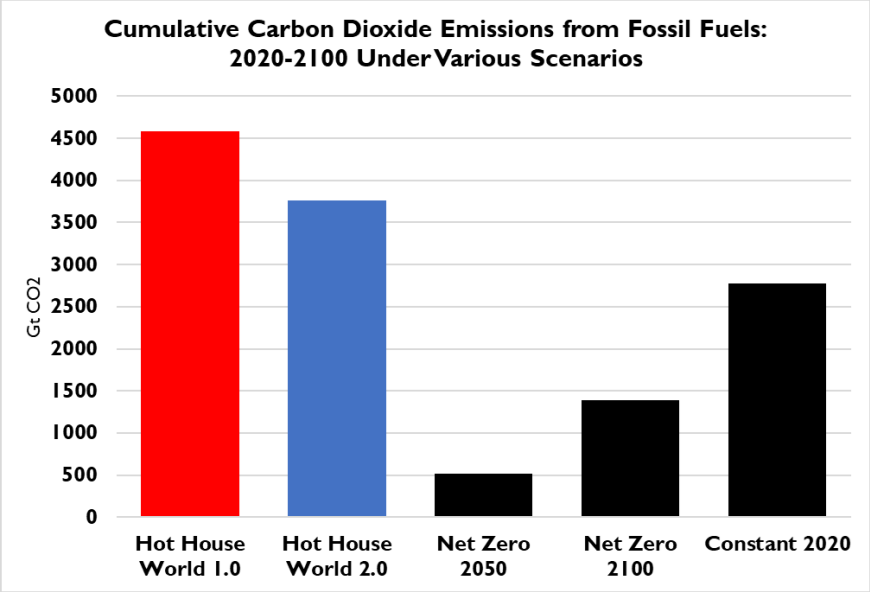
[19] https://noaanhc.wordpress.com/2021/06/30/was-2020-a-record-breaking-hurricane-season-yes-but/

4. *Shortfalls in robust science advice on climate are more than just an academic issue – they also show up in important policy contexts, such as:*

    - *Proposals for "climate stress testing" in the global and national financial systems;*

The Network for Greening the Financial System (NGFS) is voluntary consortium comprised of more than 60 central banks representing almost 50% of the global economy.[20] The NGFS provides climate scenarios for use by governments and businesses to "stress test" their activities in the context of projected climate change and proposed climate policies. To their credit the NGFS is one of the few institutions that that has recognized that the most commonly used climate scenarios (of the IPCC) "were designed about 10 years ago and do not match well with recent emissions trends."[21] The NGFS has thus taken it upon itself to create new scenarios for climate stress testing.

However, despite the recognition that the IPCC scenarios are outdated, the reference scenario created by the NGFS (called "Hot House World") – both its first iteration and then an update released last month[22] -- are also well out of date when compared to recent emissions trends and projections. This can easily be seen in the graph below which compares cumulative carbon dioxide emissions 2020 to 2100 for the two NGFS "Hot House World" scenarios (red and blue) with those that assume constant 2020 emissions to 2100, and then two that assume the world moves toward net-zero carbon dioxide in 2050 and 2100 (in black).



The scenarios underlying climate stress testing assume continued growth in emissions to at least 2090, to a level about ~50% greater than those of today. Whether or not such an assumption is plausible has not been explored, but if such aggressive growth in emissions is implausible (and our

[20] https://www.ngfs.net/sites/default/files/medias/documents/synthese_ngfs-2019_-_17042019_0.pdf
[21] https://www.ngfs.net/sites/default/files/ngfs_climate_scenario_technical_documentation_final.pdf
[22] https://www.ngfs.net/en/communique-de-presse/ngfs-publishes-second-vintage-climate-scenarios-forward-looking-climate-risks-assessment

work suggests that it is implausible), then the "stress tests" conducted under the scenario will have no real-world meaning and instead will just be academic exercises.

- *The estimated "social cost of carbon" of the Biden, Trump and Obama administrations;*

In 2008, a federal court ruled that the U.S. Department of Transportation was in error in conducting a benefit-cost analysis when it assigned a value of zero to the economic consequences of carbon dioxide emissions, concluding, "while the record shows that there is a range of values, the value of carbon emissions reduction is certainly not zero."[23] This judgment meant that the government would need to develop a defensible estimate of economic consequences of carbon dioxide emissions.[24] Subsequently, in 2009 the Obama administration established an "interagency working group" (IWG) to develop estimates of the "social cost of carbon" (SCC), "to ensure that agencies were using the best available science and to promote consistency in the values used across agencies."[25]

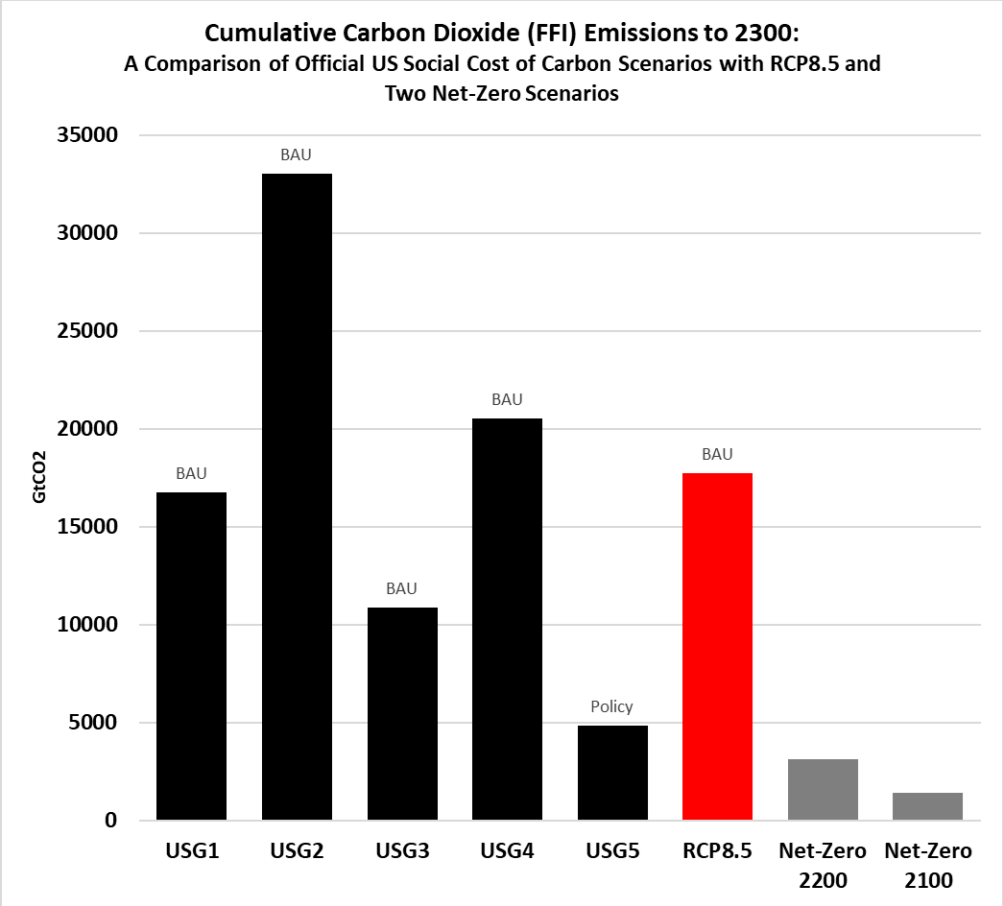
Soon after, in 2010 the IWG estimated the SCC at $26 (in 2007$ for 2020) per ton of carbon dioxide, and following several updates, in 2016 set the value at $42 (in 2007$ for 2020) per ton in 2016.[26] In March, 2017, the Trump administration disbanded the IWG and issued a new and much lower estimate for the SCC of $7 per ton (in 2018$ for 2020).[27] Recently, the Biden administration restored the final estimate of the Obama administration (now $51 per ton in inflation-adjusted 2020$ for 2020), as an "interim step" to issuing updated estimates sometime in the next year.[28]

In order to estimate future damages resulting from the emissions of carbon dioxide into the atmosphere, plausible estimates of how that future might unfold are necessary. The IWG based its original 2010 SCC on eight different scenarios of the climate future, developed decades ago.[29] Four of the scenarios were to represent different visions of how the future might unfold in the absence of climate policies (called "business as usual") and four others were combined into a single scenario to reflect a future with climate policy. These five scenarios looked out to 2100, so the IWG extended them to 2300 using a range of assumptions. Each of the five scenarios is weighted equally in estimating the SCC.

These scenarios are all badly outdated and have never been updated in the IWG methodology.[30] All of them, including the policy scenario, envisage enormous emissions of carbon dioxide from the burning of fossil fuels to 2300. None of these futures are remotely plausible. This can be seen in the figure below, which shows the scenarios of the IWG (in black) compared to the implausible

[23] https://bit.ly/3wHyKK2
[24] https://www.whitehouse.gov/sites/whitehouse.gov/files/omb/circulars/A4/a-4.pdf
[25] https://www.whitehouse.gov/wp-content/uploads/2021/02/TechnicalSupportDocument_SocialCostofCarbonMethaneNitrousOxide.pdf
[26] https://www.nap.edu/catalog/24651/valuing-climate-damages-updating-estimation-of-the-social-cost-of
[27] https://www.federalregister.gov/documents/2017/03/31/2017-06576/promoting-energy-independence-and-economic-growth and https://www.gao.gov/assets/710/707776.pdf
[28] https://www.whitehouse.gov/briefing-room/blog/2021/02/26/a-return-to-science-evidence-based-estimates-of-the-benefits-of-reducing-climate-pollution/
[29] https://doi.org/10.1016/j.eneco.2009.10.013
[30] https://www.nap.edu/catalog/24651/valuing-climate-damages-updating-estimation-of-the-social-cost-of

"business as usual" scenario of the IPCC Representative Concentration Pathways (in red), as well as two much more plausible scenarios that assume the world achieves net-zero carbon dioxide in 2100 and in 2200 (in grey).



One does not have to be a climate expert to observe that the scenarios underlying the "social cost of carbon" estimates of the Obama, Trump and (to date) Biden administration are far out of touch with any plausible projection of future emissions. There are many technical and political debates about the "social cost of carbon" – but none of these debates mean much so long as the entire effort is built upon a foundation of implausibility.

- *Proposed Congressional legislation to address financial system risks related to climate change*.

Recently introduced legislation risks exacerbating the issues of scientific integrity related to climate science discussed in this testimony. Two examples follow:

- H.R. 1549 introduced in early 2021 would create a new scientific advisory body called the "Climate Risk Advisory Committee" to advise the Financial Stability Oversight Council.[31] The proposed legislation establishes no connection of new advisory committee with

[31] https://financialservices.house.gov/uploadedfiles/bills-117pih-addressingclimatefinancialr.pdf

existing climate advisory bodies of the U.S. government, notably the U.S. Global Change Research Program and its National Climate Assessment. This new advisory body would set the stage for disparate, conflicting or unclear guidance being provided to policy makers across uncoordinated advisory mechanisms.

- H.R. 3571, also introduced in early 2021, would create yet another expert advisory body, the "Climate Risk Scenario Technical Development Group" under the Board of Governors of the Federal Reserve.[32] The proposed legislation exempts the advisory group from the Federal Advisory Committee Act and requires that it develop one business-as-usual scenario and two policy scenarios and update them every three years. Not only would this add further complexity and possible dissonance in expert advice to policy makers, but it also risks codifying in law the establishment of flawed scenarios (imagine if new scenarios were produced in December, 2019, on the eve of the pandemic – these would have been immediately out-of-date). Congress should not mandate the substance of scenarios or how often they shall be updated.

Policy making will be improved with mechanisms for the provision of expert advice on climate, including that related to financial risks. However, attention should first be paid to addressing documented shortfalls in advisory systems before proliferating new advisory committees.

5. *Climate change is too important to allow shortfalls of scientific integrity in science advice to persist. Congress should enhance its oversight of the U.S. Global Change Research Program and its National Climate Assessment to ensure that the scientific advice that it receives is up-to-date and accurate.*

In 1990, Congress established in legislation (P.L. 101-606) the U.S. Global Change Research Program to provide "usable information on which to base policy decisions relating to global change."[33] In the legislation Congress also mandated that the USGCRP produce a "national climate assessment" (NCA) not less frequently than every four years, to provide guidance to Congress and the president on

(1) integrates, evaluates, and interprets the findings of the Program and discusses the scientific uncertainties associated with such findings;
(2) analyzes the effects of global change on the natural environment, agriculture, energy production and use, land and water resources, transportation, human health and welfare, human social systems, and biological diversity; and
(3) analyzes current trends in global change, both human-inducted and natural, and projects major trends for the subsequent 25 to 100 years.[34]

Crucially, the NCA does not exist to promote or to sell the policy agenda of the current administration — regardless of the merits of a particular administration's policy proposals. The NCA exists to produce a "scientific assessment" which can certainly including evaluation of policy

[32] https://financialservices.house.gov/uploadedfiles/bills-1173571ihccfra.pdf
[33] Pielke, R. A. (1995). Usable information for policy: an appraisal of the US Global Change Research Program. *Policy Sciences*, *28*(1), 39-77.
[34] https://www.govinfo.gov/content/pkg/STATUTE-104/pdf/STATUTE-104-Pg3096.pdf

alternatives, but as a mechanism of expert advice, it does not exist to advance the political goals of the White House.

However, in every administration since the first NCA was produced under President Bill Clinton, the NCA has been overseen by the White House and, ultimately, political appointees. This has created what is apparently an irresistible temptation to manage the NCA in such a way as to promote the current administration's policy agenda. This dynamic of influencing the substance of the NCA for apparent political gain is predictably bipartisan. Ultimately, the politicization of the NCA means that neither Congress nor the president are receiving the quality of scientific advice on climate of the sort envisioned by Congress when it established the USGCRP in 1990.

To fix the NCA would not be difficult. Three actions are needed.

First, the assessment should be housed within and implemented entirely from a federal agency within the scope of the USGCRP. There should be no oversight or control exerted from the White House or its OSTP. It should be treated like other high-profile scientific advisory mechanisms that must operate in the context of highly politicized issues. We have good experience with meeting this challenge and, generally, with providing robust expert advice on contested subjects such as vaccine approval and pollution regulation.

Second, the report should be led and written by experts chosen by an empaneling team. This team should be selected by a bipartisan group, as is typically done for reports on highly politicized issues. For instance, the majority and minority members of the House Science Committee could each select (say) 3 members of this empaneling committee, with two co-chairs. The empaneling committee would then identify and justify its recommended selection of experts to lead the production of the report.

Third, before the writing starts, the assessment team should formally query decision makers — federal, state, local, in business and civil society — to identify what information they perceive to be most useful to their decisions related to climate mitigation and adaptation. Such information would also be useful to the Congress in its oversight of the USGCRP to help ensure that research priorities line up with the needs of decision makers.[35]

These three steps would ensure that there is no perception of White House influence on the report, that it is authored by experts assembled in a bipartisan manner and that the topics that the report focuses on have direct relevance to decision makers. The NCA is far too important to be politicized because politicization can compromise scientific integrity.

Mechanisms already exist for the Congress and federal agencies within the executive branch to receive higher quality expert advice on climate, including climate-related financial risks. However, for that potential to be realized requires that the Congress improve its oversight of the USGCRP and the NCA and establish the expectation that the requirements of P.L. 101-606 will be fulfilled. At present there are troubling signs that Congress and the federal agencies are not receiving the high-quality advice necessary to inform decision making on this important subject.

[35] Sarewitz, D., & Pielke Jr, R. A. (2007). The neglected heart of science policy: reconciling supply of and demand for science. *environmental science & policy*, *10*(1), 5-16.

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Biography of Roger Pielke Jr.

Roger Pielke, Jr. has been on the faculty of the University of Colorado Boulder since 2001, where he teaches and writes on a diverse range of policy and governance issues related to science, technology, innovation and sports. Roger is a professor in the Environmental Studies Program. Roger is currently leading the EScAPE project (Evaluation of Science Advice in a Pandemic Emergency) a 16-country evaluation of science advice in the COVID-19 pandemic, sponsored by the U.S. National Science Foundation.

Roger holds degrees in mathematics, public policy and political science, all from the University of Colorado. In 2012 Roger was awarded an honorary doctorate from Linköping University in Sweden and was also awarded the Public Service Award of the Geological Society of America. In 2006, Roger received the Eduard Brückner Prize in Munich, Germany for outstanding achievement in interdisciplinary climate research.

Roger has been a Distinguished Fellow of the Institute of Energy Economics, Japan since 2016. From 2019 he has served as a science and economics adviser to Environmental Progress. Roger was a Fellow of the Cooperative Institute for Research in Environmental Sciences from 2001 to 2016. He served as a Senior Fellow of The Breakthrough Institute from 2008 to 2018. In 2007 Roger served as a James Martin Fellow at Oxford University's Said Business School. Before joining the faculty of the University of Colorado, from 1993 to 2001 Roger was a Scientist at the National Center for Atmospheric Research.

At the University of Colorado, Roger founded and directed both the Center for Science and Technology Policy Research and the Sports Governance Center. He also created and led the university's Graduate Certificate Program in Science and Technology Policy, which saw its graduates move on to faculty positions, Congressional staff, presidential political appointees and in positions in business and civil society.

His books include **Hurricanes: Their Nature and Impacts on Society** (with R. Pielke Sr., 1997, John Wiley), **Prediction: Science, Decision Making and the Future of Nature** (with D. Sarewitz and R. Byerly, 2001, Island Press), **The Honest Broker: Making Sense of Science in Policy and Politics** published by Cambridge University Press (2007), **The Climate Fix: What Scientists and Politicians Won't Tell you About Global Warming** (2010, Basic Books). **Presidential Science Advisors: Reflections on Science, Policy and Politics** (with R. Klein, 2011, Springer), and **The Edge: The War Against Cheating and Corruption in the Cutthroat World of Elite Sports** (Roaring Forties Press, 2016). His most recent book is **The Rightful Place of Science: Disasters and Climate Change** (2nd edition, 2018, Consortium for Science, Policy & Outcomes).