

STATEMENT OF
DR. ROGER PIELKE JR.
to the COMMITTEE ON the BUDGET
of the UNITED STATES SENATE

HEARING on
Dollars and Degrees:
Investigating Fossil Fuel Dark Money's Systemic Threats to Climate and the Federal Budget
Dirksen Senate Office Building 608
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Effective decision making requires accurate information. High standards of scientific integrity in scientific research and assessment provide the most reliable path to generating accurate information in support of decision making. Congress has an essential role to play in supporting research and overseeing mechanisms of scientific advice to bring the results of research into the policy process. Congress should (a) support scientific assessment, both via funding and oversight, (b) respect the independence and legitimacy of such assessments, even when individual members may disagree with them, and crucially, (c) refrain from acting in ways that compromise scientific integrity.

Four 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. The best and likely, the only, antidote to misinformation is accurate information. Successfully producing, communicating, legitimizing, and trusting accurate information to inform policy requires upholding standards of scientific integrity.
3. Unfortunately, in important areas of climate science such standards have not been upheld and the self-correcting function of science has short-circuited. In my testimony, I illustrate examples of shortfalls, with a focus on the persistent misuse of outdated and implausible scenarios.
4. Concerns expressed about misinformation are sometimes weaponized by politicians, journalists, and experts, ironically and pathologically, to spread misinformation and to undermine accurate information.

The remainder of my written testimony elaborates on these four take-home points.

Elaboration of the Four 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 (IPCC) has for more than 35 years through its Working Group 1 provided routine assessments of the physical science aspects of climate change.¹ The IPCC recently completed its 6th assessment cycle. These assessments have documented consistently that changes in climate have been detected and attributed to human causes, notably the emission of carbon dioxide and other greenhouse gases, and that these changes pose risks to society and the environment.

My views on the importance of climate policy have been similarly consistent for almost three decades. For instance, in 2006 I testified before the House of Representatives on the significance of the then-current IPCC assessment:

“ . . . 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

Making sense of such complexities is one reason why the provision of expert advice to Congress, the administration, and the federal agencies is so important.

For a deeper elaboration of 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 nothing less than the absolute highest standards of scientific integrity in research and the information being provided to policymakers.

2. *The best and likely the only³ antidote to misinformation is accurate information. Successfully producing, communicating, legitimizing, and trusting accurate information to inform policy requires upholding standards of scientific integrity.*

The notion of “misinformation” lacks a common definition in the academic literature.⁴ The idea is generally interpreted to mean information that is false or misleading. Whether misinformation has become more pervasive or not, or is meaningful in policy adoption, there is general agreement that our current media environment and political discourse are rife with misinformation. In my areas of expertise, this is certainly the case.

“Scientific integrity,” as I use the phrase here, has been usefully defined as consisting “of proper reasoning processes and handling of evidence essential to doing science” and “a respect for the

¹ <https://www.ipcc.ch/>

² <https://www.govinfo.gov/content/pkg/CHRG-109hhrg29932/html/CHRG-109hhrg29932.htm>

³ Debunking or fact correcting does not seem to work, see, Chan, Mp.S., Albarracín, D. A meta-analysis of correction effects in science-relevant misinformation. *Nat Hum Behav* (2023). <https://doi.org/10.1038/s41562-023-01623-8>

⁴ Nguyen, H., Ogbadu-Oladapo, L., Ali, I., Chen, H., & Chen, J. (2023). Fighting Misinformation: Where Are We and Where to Go?. In *International Conference on Information* (pp. 371-394). Springer, Cham.

underlying empirical basis of science.”⁵ It is uncontroversial that we want science conducted with integrity to inform policy debates and decisions.

The U.S. Congress has long recognized the importance of scientific integrity in science advice and the research that informs that advice. 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.⁶

On climate, in 1990, the U.S. Congress established an advisory mechanism for climate science in the form of a national climate assessment.⁷ 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, 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.”⁸

Congress thus has an important role to play in supporting scientific integrity, and a role that is just as important – not acting in ways that compromise scientific integrity.⁹

3. *Unfortunately, in important areas of climate science such standards have not been upheld and the self-correcting function of science has short-circuited. In my testimony, I illustrate examples of shortfalls, with a focus on the persistent misuse of outdated and implausible scenarios.*

The persistent misuse of climate scenarios is perhaps the most pervasive and consequential example of climate misinformation today.¹⁰ Scenarios are important tools, which is why a large proportion of research on climate science, impacts, and economics depends upon scenarios of the

⁵ 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).

⁶ <https://www.facadatabase.gov/FACA/FACAPublicPage>

⁷ <https://www.govinfo.gov/content/pkg/STATUTE-104/pdf/STATUTE-104-Pg3096.pdf>

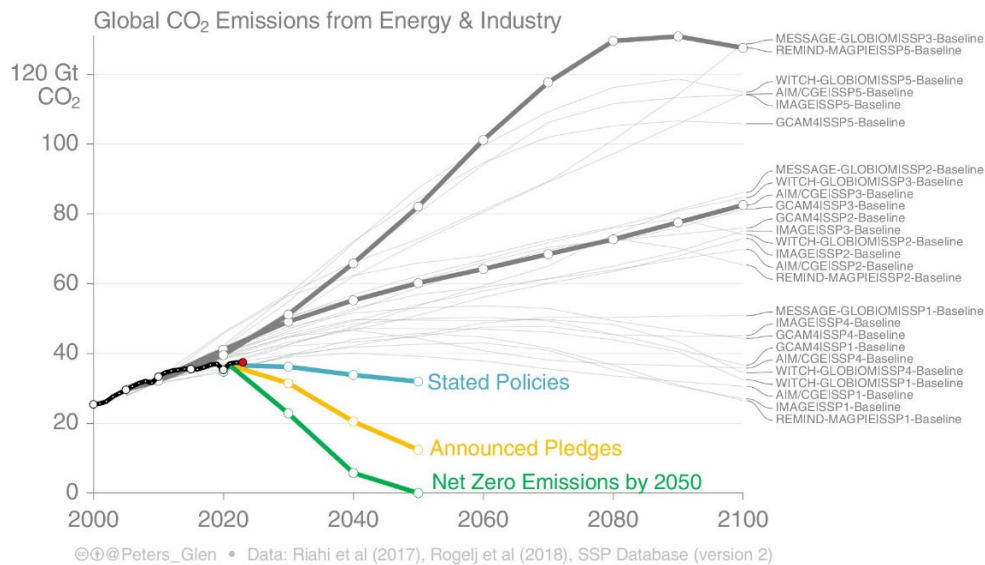
⁸ Pielke, R. A. (1995). Usable information for policy: an appraisal of the US Global Change Research Program. *Policy Sciences*, 28(1), 39-77.

⁹ For a discussion of legislation that might reinforce and protect scientific integrity, see my testimony before the House Science Committee in 2019: <https://docs.house.gov/meetings/SY/SY15/20190717/109800/HHRG-116-SY15-Wstate-PielkeR-20190717.pdf>

¹⁰ Much attention has been devoted to concerns about “climate skepticism,” however opinion polls over decades by Gallup in the U.S. routinely indicate that large majorities of Americans in 2023 are concerned about climate change (61%-39%) and that global warming is the result of pollution (62%-36%). On the latter, Democrats generally hold views that are more consistent with the conclusions of the IPCC, than do Republicans. The most notable feature of U.S. opinion on climate change is not skepticism but the yawning partisan divide. See: <https://news.gallup.com/poll/474542/steady-six-say-global-warming-effects-begun.aspx> Of note, across the partisan divide, one recent poll indicates that Republicans generally hold views on trends in extreme weather that are more consistent with the IPCC than do Democrats. See: <https://www.ipsos.com/en-us/many-americans-believe-climate-change-mostly-caused-human-activity-few-report-making-changes-help> In both cases – one where Republicans appear to be more misinformed and the other where Democrats appear more misinformed – the situation is not the result of skepticism or denial, but partisanship and identity. Gallup concludes, “Public concern and certainty about global warming was generally less pronounced at the start of this century, from 2001 to 2015, than it is today.”

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.¹¹ 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.¹²

Carbon dioxide emissions in the real world are already – *today* -- at a level far less than those projected in the most commonly-used climate scenarios found in research and assessment. This can be clearly seen in the figure below which shows baseline scenarios of the IPCC for carbon dioxide emissions (from energy and industry) to 2100.¹³ The overwhelmingly most-used scenario in climate research and cited in the assessments of the IPCC is the highest curve on the graph (called SSP5-Baseline, or SSP5-RCP8.5). Under current policies, the real world is currently following a trajectory consistent with the blue curve titled “Stated Policies.”¹⁴ The difference between the two is wide and getting wider. Every day that we continue to prioritize the most extreme scenario in research and policy is a day that we mislead ourselves.



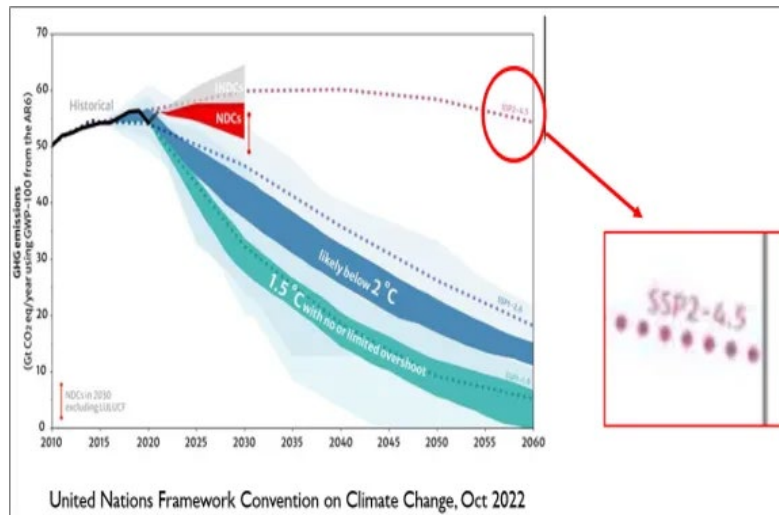
¹¹ Brian C. O’Neill, Timothy R. Carter, Kristie Ebi, Paula A. Harrison, Eric Kemp-Benedict, Kasper Kok, Elmar Kriegler, Benjamin L. Preston, Keywan Riahi, Jana Sillmann, Bas J. van Ruijven, Detlef van Vuuren, David Carlisle, Celia Conde, Jan Fuglestedt, Carole Green, Tomoko Hasegawa, Julia Leininger, Seth Monteith, and Ramon Pichs-Madruga, “Achievements and needs for the climate change scenario framework,” *Nature Climate Change* 10 (2020): 1074–1084.

¹² 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.

¹³ Source: Glen Peters CICERO: https://twitter.com/Peters_Glen/status/1666543071826178052/photo/1 These are the baseline scenarios of the Shared Socioeconomic Pathways or SSPs.

¹⁴ For a technical analysis of baseline scenarios used in climate research see: Burgess, M. G., Ritchie, J., Shapland, J., & Pielke, R. (2020). IPCC baseline scenarios have over-projected CO2 emissions and economic growth. *Environmental Research Letters*, 16(1), 014016.

The U.N. Framework Convention on Climate Change (UNFCCC), under which the Paris Agreement was developed, has acknowledged that the real world is currently tracking a trajectory that is consistent with a much less extreme scenario.¹⁵ You can see this in the UNFCCC graph below, produced in late 2022 (with the annotation zooming in added by me). The graph shows the range of projected global greenhouse gas emissions (including carbon dioxide) to 2030 as the red wedge. The graph shows that the entire red wedge falls below a scenario called SSP2-RCP4.5.



The most used climate scenario in research and assessment is the RCP8.5 scenario (meaning 8.5 watts per meter²) which represents a global temperature increase of 4.8°C above 1850-1900, according to the IPCC.¹⁶ The real world is actually tracking below a RCP4.5 scenario (meaning 4.5 watts per meter²) which represents a global temperature increase of 2.9°C above 1850-1900.¹⁷

Here is why this matters: Much if not most policy guidance relies on the outdated RCP8.5 scenario as our current trajectory and a RCP4.5 scenario as indicating policy success. For example, the 2022 White House White Paper titled, “Climate Risk Exposure: An Assessment of the Federal Government’s Financial Risks to Climate Change” used the RCP8.5 scenario to represent where we are heading, the RCP4.5 scenario to represent successful climate policy, and the difference between the two to represent the benefits of mitigation.^{18,19}

¹⁵ <https://unfccc.int/news/climate-plans-remain-insufficient-more-ambitious-action-needed-now>

¹⁶ https://www.ipcc.ch/report/ar6/wg1/downloads/report/IPCC_AR6_WGI_Chapter04.pdf

¹⁷ The are both central estimates of the IPCC and include both land and oceans.

¹⁸ The White House justifies its use of scenarios in this way based on the same usage found in the 4th U.S. Climate Assessment: “this paper attempts to follow the framing of the NCA by using data and modelling references from RCP4.5 and RCP8.5...”. https://www.whitehouse.gov/wp-content/uploads/2022/04/OMB_Climate_Risk_Exposure_2022.pdf This offers a clear example how outdated research moves from science-to-assessment-to-policy.

¹⁹ For a discussion of the challenges to scientific integrity created by locating the U.S. National Climate Assessment (NCA) in the White House, see my 2021 testimony to the U.S. Senate Committee on Banking, Housing and Urban Affairs. Such challenges are present under both Democratic and Republican administrations:

Partisans might argue over whether or not the misuse of scenarios is misinformation, but all should be able to agree that characterizing an RCP8.5 scenario as our current trajectory and a RCP4.5 scenario to represent policy success are both misleading, false or just out-of-date. This is not a unique example – the misuse of extreme, implausible and outdated climate scenarios is pervasive in climate science, assessment and policy.²⁰ It is a massive problem.

The pervasive misuse of climate scenarios is not a unique failure of scientific integrity in climate science. Here are several other important examples, documented in detail at the links provided:

- Misrepresentation of NOAA’s “billion-dollar disasters” as an indicator of climate change;²¹
- Misuse of scenarios in the production of “social cost of carbon” estimates;²²
- Promotional claims of disaster “event attribution” at odds with the IPCC;²³
- Clear errors on tropical cyclone intensity in the IPCC AR6 report;²⁴ Confirmed by an IPCC insider;²⁵
- Misrepresentations of agricultural science by IPCC AR6;²⁶
- Inaccurate IPCC AR6 challenges to the quality of NOAA’s hurricane “best track” data;²⁷
- Conflicting claims between IPCC AR6 Working Groups 1 and 2;²⁸
- IPCC AR6 claims in many places that the RCP8.5 is “business as usual”;²⁹
- Misuse of extreme scenarios by the Network for Greening the Financial System;³⁰
- False claims by the United Nations of increasing disasters;³¹

Most of these examples are clear and unambiguous cases of information that are wrong or misleading (as opposed to legitimate differences of judgment). There are enough examples of failures of scientific integrity that the climate science community and those who oversee and fund its research should take steps to ensure that quality is upheld.

<https://www.banking.senate.gov/imo/media/doc/Pielke%20Testimony%207-20-21.pdf> Congress could fix this by removing the NCA from close political oversight in the Executive Office of the President.

²⁰ For examples, 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.

²¹ <https://rogerpielkejr.substack.com/p/billion-dollar-disasters-are-a-national>

²² <https://rogerpielkejr.substack.com/p/the-biden-administration-just-failed>

²³ <https://rogerpielkejr.substack.com/p/how-to-be-a-smart-consumer-of-climate>

²⁴ <https://rogerpielkejr.substack.com/p/misinformation-in-the-ipcc>

²⁵ <https://rogerpielkejr.substack.com/p/a-tip-from-an-ipcc-insider>

²⁶ <https://thebreakthrough.org/issues/food-agriculture-environment/the-ipcc-report-on-the-impacts-of-climate-change-is-depressing>

²⁷ <https://rogerpielkejr.substack.com/p/misinformation-in-the-ipcc>

²⁸ <https://thebreakthrough.org/issues/food-agriculture-environment/the-ipcc-report-on-the-impacts-of-climate-change-is-depressing>

²⁹ <https://twitter.com/RogerPielkeJr/status/1499805074863771648?s=20>

³⁰ <https://rogerpielkejr.substack.com/p/questionable-climate-scenarios-for>

³¹ <https://rogerpielkejr.substack.com/p/dont-believe-the-hype>

4. *Concerns expressed about misinformation are sometimes weaponized by politicians, journalists, and experts, ironically and pathologically, to spread misinformation and to undermine accurate information.*

In 2015, following testimony I delivered before both the House and the Senate summarizing consensus conclusions of the IPCC, a member of Congress suggested that I may have been the recipient of undisclosed funding from fossil fuel companies. He demanded that I be investigated by my university. My university complied. I was investigated and the results were of course not surprising to me – I was not the recipient of any funding from fossil fuel interests – openly or hidden – and never had been. However, the very public accusation was enough to derail my work and upset my career in ways that continue today.³²

This is a good example of the creation of misinformation in the insinuation that I was receiving payments from fossil fuel companies in exchange for expressing the results of peer-reviewed science in my area of expertise. In this way, the substance of my research and testimony on climate (and specifically on extreme weather and climate change) could easily be discounted as misinformation paid for under-the-table by fossil fuel companies. Because my testimony was based on the IPCC assessments, the creation of misinformation about me was used to turn robust science and assessment into perceived misinformation, without confronting the IPCC assessment itself.

My experiences are far too common. For instance, in *Financial Times* last week Oxford professor Ben Caldecott, director of the Oxford Sustainable Finance Group, wrote of challenges to academic freedom related to ESG research.³³ Specifically, he wrote,

... of instances where financial institutions and ESG data providers have sought to undermine academic freedom. They have done this by trying to change the results of research before publication, or have attempted to prevent it from being published at all, to protect their products and services.

Harassment and intimidation, including threats of legal action and of funding being withdrawn, have been used to bully universities and individual researchers. The organisers of academic conferences have also been pressured to remove peer-reviewed papers from schedules.

To cite another example, in 2020 several scholars published a paper in PNAS defending the use of the most extreme RCP8.5 climate scenario as the most appropriate climate scenario to inform policy.³⁴ It is of course common for researchers to disagree with each other's work in the literature, so a defense of RCP8.5 is neither unexpected nor inappropriate.

However, what was inappropriate was the authors' failure to disclose an actual or perceived financial conflict of interest. They were funded by McKinsey & Co., a consultancy that relies

³² For details: <https://rogerpielkejr.substack.com/p/the-hounding-of-roger-pielke-jr>

³³ <https://www.ft.com/content/eee948a1-c70a-44f5-96f7-482ae13d5db0>

³⁴ Schwalm, C. R., Glendon, S., & Duffy, P. B. (2020). RCP8. 5 tracks cumulative CO2 emissions. *Proceedings of the National Academy of Sciences*, 117(33), 19656-19657.

heavily on RCP8.5 in its business promotion and services.³⁵ In their funding disclosure accompanying paper the authors declared “no competing interests.” This was false.

That PNAS study has been cited in other studies more than 500 times since it was published – a rate of every other day – typically as justification for the continued use of the outdated and implausible RCP8.5 scenario in research. Meantime, so far in 2023, about a dozen studies have been published every day using the outdated RCP8.5 scenario, according to Google Scholar.

The mere fact that research is commissioned or funded by an interested party of course does not mean that the research is improper or flawed, much less that it is misinformation. However, it is standard practice in science to acknowledge funding and actual or perceived conflicts of interest, as a basis for adding context to interpreting published research.

Climate research does not play by the same rules as, for instance, the medical sciences, in disclosing or managing financial conflicts of interest. This is problematic in the context of many billions of dollars devoted to climate advocacy and incentives found in philanthropy, business, and government.³⁶ Climate change is big business. Maintaining standards of scientific integrity means that it is essential that everyone follow well-established standards of scientific integrity – and this includes those funded by fossil fuel interests, renewable energy interests, and, in fact, all interests.

Partisans may argue that the rules apply only to their opponents, and not their allies. They may argue over which “side” is worse. Such behaviors are pathological – the simple fact is that principles of scientific integrity apply to everyone.³⁷ Anything less is a recipe for systemic failures of scientific integrity and misinformation. Congress has an important role to play in helping to ensure that standards of scientific integrity apply to everyone across the board.

³⁵ See, e.g., <https://www.mckinsey.com/capabilities/sustainability/our-insights/climate-risk-and-response-physical-hazards-and-socioeconomic-impacts>

³⁶ See, e.g., Nisbet, M. C. (2019). Climate Philanthropy and the Four Billion (Dollars, That Is). *Issues in Science and Technology*, 35(2), 34-36. <https://issues.org/sciences-publics-politics-climate-philanthropy-and-the-four-billion-dollars-that-is/> and <https://robertbryce.substack.com/p/the-anti-industry-industry>

³⁷ <https://www.science.org/content/article/targeted-crusading-congressman-scientist-speaks-out-conflicts-climate-and-controversy>

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, environment, energy, climate, innovation and sports. At Colorado, Roger is a professor in the College of Arts and Sciences. Most recently Roger was on sabbatical at the University of Oslo where he worked to help the university start up a pandemic research center. Roger is also an Honorary Professor at University College London, awarded in 2022.

Roger also oversees a popular Substack —The Honest Broker — where he is experimenting with a new approach to research, writing and public engagement. Roger is frequently called upon by governments businesses, universities, sport governance organizations and others around the world as a speaker and policy advisor. His research is widely cited in multiple fields, and is one of a small group of researchers whose work has been cited by all three IPCC Working Groups. Roger's most recent NSF grant focused on science advice in the pandemic across the world.

Roger holds degrees in mathematics, public policy and political science, all from the University of Colorado Boulder. 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 in 2006 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 Boulder, Roger founded and directed the Center for Science and Technology Policy Research and the Sports Governance Center, both of which are no longer active. He also created and led the university's Graduate Certificate Program in Science and Technology Policy, which has seen 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, full text free as PDF), **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).