Testimony

The Costs of Climate Change: Risks to the U.S. Economy and the Federal Budget

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Chairman Yarmuth, Ranking Member Womack, and Members of the Committee, thank you for inviting me to participate in today's hearing.

I have asked Ranking Member Womack to introduce into the record a report that I published last year, titled "Overheated: How Flawed Analyses Overestimate the Costs of Climate Change."[1] The report examines in detail the U.S. Government Accountability Office's 2017 report, titled "Climate Change: Information on Potential Economic Effects Could Help Guide Federal Efforts to Reduce Fiscal Exposure"[2]; the synthesis reports relied upon by GAO[3]; and the underlying reports relied upon by those syntheses[4]. This testimony draws on the report's analyses and conclusions.

I hope to convey three important ideas to the committee:

- First, **climate science and climate economics are very different fields**. Climate science makes scientific observations about predictions about physical changes and deserves substantial deference from policymakers. Climate economics does not.

- Second, **the best estimates of climate costs are modest in scale** when placed in proper context. This requires accounting for both future growth and adaptation.

- Third, **none of this means that climate change is not a serious problem or that it does not require a policy response; it is and it does**. In formulating that response, policymakers must recognize that costly efforts to reduce U.S. emissions do not eliminate future costs that are driven by global emissions. They must consider the full range of options—adaptation as well as mitigation, nuclear as well as renewables. In the many cases where adaptation can prove critical, they must ensure that private actors have the right information and incentives to adapt.

I. Climate Science versus Climate Economics

[1] Oren Cass, "Overheated: How Flawed Analyses Overestimate the Costs of Climate Change," Manhattan Institute for Policy Research, March 2018, https://www.manhattan-institute.org/html/overheated-how-flawed-analyses-overestimate-costs-climate-change-10986.html; *see also* Oren Cass, "The Problem with Climate Catastrophizing," *Foreign Affairs*, March 21, 2017, https://www.foreignaffairs.com/articles/2017-03-21/problem-climate-catastrophizing.

[2] U.S. Government Accountability Office, "Climate Change: Information on Potential Economic Effects Could Help Guide Federal Efforts to Reduce Fiscal Exposure," September 2017, https://www.gao.gov/assets/690/687466.pdf.

[3] U.S. Environmental Protection Agency, "Climate Change in the United States: Benefits of Global Action," June 2015, https://www.epa.gov/sites/production/files/2015-06/documents/cirareport.pdf; Robert Kopp et al., "American Climate Prospectus: Economic Risks in the United States," Rhodium Group, October 2014, https://gspp.berkeley.edu/assets/uploads/research/pdf/American_Climate_Prospectus.pdf.

[4] Alan Barreca et al., "Adapting to Climate Change: The Remarkable Decline in the US Temperature-Mortality Relationship over the Twentieth Century," *Journal of Political Economy* 124, no. 1 (February 2016): 105-59; Olivier Deschênes and Michael Greenstone, "Climate Change, Mortality, and Adaptation: Evidence from Annual Fluctuations in Weather in the US," *Applied Economics* 3, no. 4 (October 2011): 152–85; Fernando Garcia-Menendez et al., "U.S. Air Quality and Health Benefits from Avoided Climate Change Under Greenhouse Gas Mitigation," *Environmental Science & Technology* 49 (June 2015): 7580–88; David Mills et al., "Climate Change Impacts on Extreme Temperature Mortality in Select Metropolitan Areas in the United States," *Climatic Change* 131, no. 1 (July 2015): 83–95; Joshua Graff Zivin and Matthew Neidell, "Temperature and the Allocation of Time: Implications for Climate Change," *Journal of Labor Economics* 32, no. 1 (January 2014): 1–26.

Climate scientists have spent decades studying and modeling changes in the Earth's climate and have built substantial consensus around a number of points that are of relevance to policymakers, for instance: that the climate is warming, that human activity is responsible for most of that warming and likely responsible for almost all of it, and that continued emissions will lead to several degrees of warming this century. These points are well-documented in synthesis reports like the United Nations Intergovernmental Panel on Climate Change's Fifth Assessment Report[5] [IPCC] and the U.S. Global Change Research Program's Fourth National Climate Assessment[6] [NCA]. The scientific conclusions in these reports are generally balanced, measured, and carefully substantiated. As with other insights from the scientific world, they should be the starting point for political debates about how to respond, not topics of political debate themselves.

Likewise, these insights provide the starting point for the separate field of climate economics. Unlike climate science, climate economics is not a scientific enterprise, it has not established areas of substantial and long-standing consensus, and it is not owed deference by policymakers and analysts. To the contrary, climate economics requires fundamental and often contested judgments about how the physical changes predicted by climate science will ultimately affect human society via their influence on public health or infrastructure or the economy. It depends upon assumptions about future economic growth and technological progress, the ways in which societies will adapt to changes in the climate, and thus how the physical world's changes will eventually be felt in the future.

Today's hearing, titled "The Costs of Climate Change: Risks to the U.S. Economy and the Federal Budget," invites a discussion about climate economics. What climate change will cost and what risks it will pose to the economy and the budget are questions for policymakers to grapple with, just as they grapple every day with equivalent questions about countless other challenges.

II. Estimates of Climate Costs

[5] IPCC, 2014: *Climate Change 2014: Synthesis Report. Contribution of Working Groups I, II and III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change* [Core Writing Team, R.K. Pachauri and L.A. Meyer (eds.)]. IPCC, Geneva, Switzerland, https://www.ipcc.ch/report/ar5/syr/.

[6] USGCRP, 2017: *Climate Science Special Report: Fourth National Climate Assessment*, Volume I [Wuebbles, D.J., D.W. Fahey, K.A. Hibbard, D.J. Dokken, B.C. Stewart, and T.K. Maycock (eds.)]. U.S. Global Change Research Program, Washington, DC, USA, 470 pp., doi: 10.7930/J0J964J6.

The cost estimates created by climate economics are easily misinterpreted. Take, for instance, the *New York Times* coverage of the NCA's release[7] in November 2018. The online headline read: "U.S. Climate Report Warns of Damaged Environment and Shrinking Economy."[8] That was not correct. While the report describes substantial climate-related costs and the possibility that U.S. Gross Domestic Product will be lower than in a no-climate-change world, nowhere does it suggest that the economy will have ceased to grow and begun to decline because of climate change.

How much does the NCA say climate change will cost? In its print edition, the *Times* gave the story top billing on the front page, with a subhead that warned of a "Reduction of Up to 10 Percent of GDP."[9] That was misleading. The "10 Percent" number came from the report's Figure 29.3, in turn taken from a 2017 article published in *Science*.[10] That figure shows an estimated relationship between climatic warming and damage to the U.S. economy as a percentage of GDP. On the chart's far-right edge, a single datapoint connects warming of 14–15°F (8°C) with projected damage equal to roughly 10% of GDP.

But that level of warming is not contemplated by the NCA. In its "Higher Scenario," the NCA estimates warming by century's end of only 2.4–4.7°C,[11] which would correspond in its damage chart to roughly 1–4% of GDP. This did not stop Senator Ed. Markey (D-MA) from announcing via Twitter that "According to the Trump admin's National Climate Assessment, with no action, *climate change will result in 10% GDP loss* by 2090," and that "A #GreenNewDeal addresses this *climate reality*" (emphasis added).[12]

Accounting for Future Growth

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[7] The NCA was released in two volumes. Volume I, released in 2017 and cited *supra* note 6, focuses on climate science. Volume II, released in 2018, focuses on "Impacts, Risks, and Adaptation." USGCRP, 2018: *Impacts, Risks, and Adaptation in the United States: Fourth National Climate Assessment, Volume II* [Reidmiller, D.R., C.W. Avery, D.R. Easterling, K.E. Kunkel, K.L.M. Lewis, T.K. Maycock, and B.C. Stewart (eds.)]. U.S. Global Change Research Program, Washington, DC, USA, 1515 pp. doi: 10.7930/NCA4.2018.

[8] Coral Davenport and Kendra Pierre-Louis, "U.S. Climate Report Warns of Damaged Environment and Shrinking Economy," *New York Times*, November 23, 2018, accessed June 9, 2019, https://www.nytimes.com/2018/11/23/climate/us-climate-report.html.

[9] "Today's Paper," *New York Times*, November 24, 2018, https://www.nytimes.com/issue/todayspaper/2018/11/24/todays-new-york-times.

[10] Solomon Hsiang et al., "Estimating Economic Damage from Climate Change in the United States," *Science* 356, no. 6345 (June 2017): 1362–69.

[11] *NCA Vol. II*, ch. 2, fig. 2.2.

[12] @SenMarkey (Senator Ed Markey). "Climate change is literally destroying the planet. According to the Trump admin's National Climate Assessment, with no action, climate change will result in 10% GDP loss by 2090. A #GreenNewDeal addresses this climate reality, not right-wing misinformation," *Twitter*, February 28, 2019, 3:37 p.m., https://twitter.com/SenMarkey/status/1101234939058683904.

Correctly understanding that the report estimates damage on the order of 3% of GDP still leaves the question: Is 3% a lot? On one hand, obviously yes. According to the EPA report on which NCA relies for many of its cost estimates, U.S. GDP should grow to roughly $80 trillion by 2100 from roughly $20 trillion today.[13] Three percent of that total would be more than $2 trillion.

On the other hand, $80 trillion is a much larger number, describing an America four times wealthier than the present day. A $2 trillion reduction in that prosperity represents the difference between a future, climate-change-free America that might be 4.0x wealthier than today's and a climate-change-afflicted America that might be 3.9x wealthier. Costly, but hardly catastrophic.

Another way to understand the cost is in temporal terms. Per EPA (and notwithstanding the *New York Times*), the economy will still be growing. Assuming even a modest 1.5% annual growth rate, the damage from climate change represents two years of growth. In other words, a climate-change-afflicted America might not achieve until 2102 the level of economic prosperity that a climate-change-free America might achieve by 2100.

In a 2016 report, the President Barack Obama's Office of Management and Budget studied climate change's impact on the federal budget. The report provided an estimate for "late-century" of $34–112 billion in climate-related costs, which it then calibrated to account for economic growth. Placed in the context of the present-day economy and budget, its estimate was $9–28 billion with a mid-point of $16.3 billion.[14] That, again, is a substantial amount of money. But, again, some perspective is in order. The U.S. Department of the Treasury estimates that the IRS made improper payments worth $18.4 billion through the Earned Income Tax Credit in 2018.[15] The Centers for Medicare & Medicaid Services estimates that Medicare made improper payments worth $31.6 billion.[16] Neither is an "existential threat."

Accounting for Adaptation

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[13] EPA. 2017. Multi-Model Framework for Quantitative Sectoral Impacts Analysis: A Technical Report for the Fourth National Climate Assessment. U.S. Environmental Protection Agency, EPA 430-R-17-001, fig. 1.5, https://cfpub.epa.gov/si/si_public_record_Report.cfm?Lab=OAP&dirEntryId=335095.

[14] "Climate Change: The Fiscal Risks Facing the Federal Government [A Preliminary Assessment]," White House Office of Management and Budget, November 2016, p. 6, https://obamawhitehouse.archives.gov/sites/default/files/omb/reports/omb_climate_change_fiscal_risk_report.pdf.

[15] "Some Refundable Credits Are Still Not Classified and Reported Correctly as a High Risk for Improper Payment by the Internal Revenue Service," Treasury Inspector General for Tax Administration, Office of Audit, May 13, 2019, https://www.treasury.gov/tigta/auditreports/2019reports/201940039_oa_highlights.html.

[16] "Comprehensive Error Rate Testing (CERT)," Centers for Medicare & Medicaid Services, January 14, 2019, https://www.cms.gov/Research-Statistics-Data-and-Systems/Monitoring-Programs/Medicare-FFS-Compliance-Programs/CERT/index.html.

Even in its proper context, the NCA's cost estimates are still implausibly high, because they fail to account for *adaptation*. In other words, the economic models that produce the cost estimates work from an assumption that Americans will make no adjustments in their lives to account for changes in their climate. Bizarre though this may seem, the assumption is well understood and accepted within the world of climate economics. In the fine print beneath the NCA's colorful graphic depicting climate costs, it notes that "results assume limited or no adaptation."[17]

Yet some of the key studies that drive the NCA's cost estimates do provide estimates that account for adaptation, and in doing so illustrate why it must always be considered. For instance, the NCA offers an estimate of $141 billion in annual economic damage from extreme temperature mortality in 2090. But according to the EPA study that the NCA relies on, adaptation could reduce the damage by more than half.[18] NCA offers an estimate of $118 billion for coastal property damage, but EPA says adaptation could reduce the damage by more than three-quarters.[19]

More generally, while extreme temperature mortality—that is, an increase in the number of hot days leading to an increase in death rates—is usually among the largest drivers of cost estimates, recent studies accounting for adaptation find almost *no* effect from climate change[20] or even a reverse effect—that is, a reduction in mortality due to fewer cold days.[21]

Climate change will have real costs. Importantly, adaptation itself comes with costs that must be accounted for. But with adaptation, total costs will be much smaller than the headline-grabbing numbers that climate economists and our government agencies choose to highlight, and with future growth our society will be far better equipped to handle them.

III. Policy Responses

[17] *NCA Vol. II*, fig. 29.2.

[18] *EPA 2017*, tbl. 5.2.

[19] *EPA 2017*, pp. 114–15.

[20] *See, e.g.*, Tamma Carleton et al., "Valuing the Global Mortality Consequences of Climate Change Accounting for Adaptation Costs and Benefits," University of Chicago, Becker Friedman Institute for Economics Working Paper No. 2018-51, August 2018, https://ssrn.com/abstract=3224365; *Barreca 2016*.

[21] *See, e.g.*, Garth Heutel et al., "Adaptation and the Mortality Effects of Temperature Across U.S. Climate Regions," NBER Working Paper No. w23271, March 2017, https://ssrn.com/abstract=2941249.

While warnings of climate catastrophe are not supported by the available evidence, climate change does pose real challenges that will require policy responses. Effective responses will be ones that approach climate change rationally and have the potential to substantially reduce climate-related costs, without using the issue as a pretext for tackling any number of ancillary priorities. In many cases, these policies will emphasize *adaptation* (that is, coping cost-effectively with the climate change that occurs) rather than *mitigation* (that is, trying to prevent climate change from occurring).

Identifying Benefits

Evaluations of climate policy proposals make a common error by measuring the cost to the United States of unmitigated climate change against the cost of eliminating American emissions. Finding the latter cost to be purportedly lower, the analyst declares the action worthwhile. But:

Incurring the cost to eliminate American emissions may not eliminate—or even reduce substantially—the climate-related costs that the United States will incur.

This is because the rate of climate change is driven by *global* emissions, of which the American share is small and declining. The United States could eliminate all of its emissions tomorrow and climate change would proceed more or less apace.

To properly assess the costs and benefits associated with a given climate policy proposal, its proponents need to provide an estimate of the amount by which global emissions will be lower thanks to the policy, the amount by which warming might therefore be lessened, and the amount by which forecasted damage might therefore be reduced. Note that advocates rarely do this. Whether the policy under consideration is a carbon tax or a "Green New Deal," the cost of climate change is asserted and the cost of American action is asserted… nowhere is an actual climate benefit asserted. That's because there is very little.

To meaningfully alter the trajectory of global emissions for the coming century, the developing economies that are building the energy infrastructure that they will operate for decades to come must begin adopt emissions-free technologies. They will do this only if those technologies are cheaper and easier to use than fossil fuels, which today they are not. Building a *marginal unit* of renewable energy may in many cases be economically attractive, but no path yet exists to using intermittent technologies like wind and solar power for providing the dependable baseload that an industrial economy must rely on at all times. That's why coal's share of global power generation remains unchanged from 20 years ago[22] and China is still investing aggressively in coal

[22] Neanda Salvaterra, "Coal Shows Resilience in Global Comeback," *Wall Street Journal*, September 3, 2018, https://www.wsj.com/amp/articles/why-coals-power-persists-1535976000.

power plants.[23] Clean energy investment, by contrast, has been declining since 2015 and is lower in both Asia and Europe than when the Paris Agreement was signed; solar investment in Asia has fallen for seven straight quarters.[24]

Mitigation through Innovation

Any strategy for mitigation must focus obsessively on technological innovation—not the deployment of ever more wind and solar, but the development of new technologies with greater potential. The United States has already been subsidizing wind and solar technologies for decades but, as Bill Gates observed in a recent discussion at Stanford University, they are not going to provide the solution. "The idea that we have the current tools and it's just because these utility people are evil people and if we could just beat on them and put (solar panels) on our rooftop—that is more of a block than climate denial," said Gates. "The 'climate is easy to solve' group is our biggest problem."[25]

Resources should instead be directed toward research and development for new technologies. Subsidies, likewise, should be focused on new technologies trying to make their initial entry into the market. The subsidies should be time-limited, so that developers know they must find a path to economic viability rather than build business models that rely on endless government support. They should also be technology-neutral, so that any new low-emissions technology capable of replacing a high-emissions one is accorded equal treatment.

Nuclear power, in particular, must be given greater attention. Nuclear power may not prove to be a major, enduring component of the world's energy portfolio, but it has the potential. At a minimum, existing nuclear plants should be kept operating where possible and innovation efforts should embrace new approaches to nuclear power as avenues worth exploring. Nothing exposes the unseriousness of a climate agenda faster than a refusal to discuss nuclear or, worse, an insistence that *shutting down* nuclear is somehow "green."

Encouraging Adaptation

Weakness in climate economics is not a reason to abandon efforts at estimating the future costs of climate change. Researchers should continue to study the concrete,

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[23] Matt McGrath, "China coal power building boom sparks climate warning," *BBC*, September 26, 2018, https://www.bbc.com/news/amp/science-environment-45640706.
[24] "Clean Energy Investment Trends, 2018," Blomberg New Energy Finance, January 2019, https://data.bloomberglp.com/professional/sites/24/BNEF-Clean-Energy-Investment-Trends-2018.pdf.

[25] Mark Golden, "Cheap renewables won't stop global warming, says Bill Gates," Stanford University, November 30, 2018, https://energy.stanford.edu/news/cheap-renewables-won-t-stop-global-warming-says-bill-gates.

human effects likely to emerge from changes in the physical climate and the nature of associated adaptation, as these findings help to identify which climate-related threats are the most severe and which adaptations may require changes in public policy. For example, continued research on sea-level changes and their implications for coastal development will be invaluable to responsible public policy in the decades to come. Policymakers should continue to seek out and consider legitimate cost estimates.

Estimating adaptation costs is important too. While failing to account for adaptation in their top-line cost estimates, many economic analyses do consider adaptation pathways and provide estimates of likely cost—for instance, the effects of extreme temperatures on energy consumption if society adapts through greater use of air conditioning.[26] Just because adaptation is desirable and likely to occur does not make it free.

Policymakers should work to ensure that society has the best possible information about likely effects of climate change and the right incentives to take that information into account. Specifically:

- Continue to invest in climate science. If decision-makers from urban planners to farmers to coastal property owners are to make intelligent investments that build resilience and adapt to changes in climate, they will need the best possible forecasts of what those changes are likely to be.

- Focus research directly on adaptation. Rather than accept the convenience of modeling a future without adaptation, emphasize the need for better understanding of adaptation pathways: Where will it occur naturally? Where will it occur but at a cost or only with better policy? In what situations might adaptation be insufficient and what contingency planning is required? Understanding the answers to those questions will highlight the costs that are most concerning and point toward the policy responses that might be most effective. Government agencies should withdraw reports that have failed to account for adaptation and they should require an assumption of adaptation as the default in future cost estimates.

- Ensure that decision-makers have the right incentives to account for climate change and its costs. If government insulates people from the costs of climate change, they will not have sufficient incentive to prepare for the costs or avoid them. Insurance products must accurately reflect risk; the price of water must reflect its supply and demand; urban planners must understand their own cities will be responsible for upgrading infrastructure that they build unwisely.

Conclusion

The failure to consider adaptation has profound consequences for how people conceptualize climate change, leading to what I call *climate catastrophism*. If the entire brunt of a century of climate change were to land on civilization tomorrow—if a

[26] *See, e.g., Deschênes and Greenstone 2011.*

substantial share of agricultural output suddenly vanished, if sea levels were suddenly several feet higher, if regions accustomed to temperate summers suddenly experienced outdoor temperatures to which they were unaccustomed, if hundreds of millions of people were suddenly displaced—the result might well be catastrophic. But if those changes occur gradually (as they are expected to), if they emerge in a world far wealthier and more technologically advanced than today's (as we expect it to be), and if policymakers ensure that people have the information and incentives to plan well (something over which we have control), then climate change will impose real costs but ones that we should have confidence in our ability to manage.

Biography for Oren M. Cass

Oren Cass is a senior fellow at the Manhattan Institute, where his work on strengthening the labor market addresses issues ranging from the social safety net and environmental regulation to trade and immigration to education and organized labor. He also writes extensively on the nature and implications of climate change and on the process of formulating and evaluating public policy. He has written about climate change for publications including the *Wall Street Journal* and *Foreign Affairs*, testified before House and Senate committees, briefed EPA and White House officials, spoken on campuses including MIT and the University of Texas, and appeared on national and international media including NPR and the BBC. An archive of his published work is available at http://www.orencass.com.

In 2011–12, Cass was the domestic policy director for Mitt Romney's presidential campaign, where he shaped campaign policy and communication on issues from health care to energy to trade. Prior to joining the Manhattan Institute, Cass was a management consultant for Bain & Company in the firm's Boston and New Delhi offices, where he advised global companies across a range of industries on implementing growth strategies and performance-improvement programs.

Cass holds a B.A. in political economy from Williams College and a J.D. from Harvard University, where he was an editor and the vice president of volume 125 of the *Harvard Law Review*.