Response to Request for Information
Employee Benefits Security Administration
U.S. Department of Labor

Retirement Savings and Climate-Related Financial Risk

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Efforts by the Employee Benefits Security Administration "To Protect the Life Savings and Pensions of U.S. Workers and Families from the Threats of Climate-Related Financial Risk" Under ERISA, FERSA, and Other Laws Would Be Inexorably Politicized, Scientifically Dubious, and Futile; and Would Create New Regulatory and Litigation Risks and Thus Capital Losses for Existing Participants In Retirement Programs Subject to Regulatory Requirements Purportedly Authorized by These Laws.

This comment letter responds to a Request for Information (RFI) from the Employee Benefits Security Administration (EBSA) of the Department of Labor (DoL) soliciting "public input on EBSA's future work relating to retirement savings and climate-related financial risk."[1] The RFI states:

> EBSA's efforts will focus on agency actions that can be taken under the Employee Retirement Income Security Act of 1974 (ERISA), the Federal

[1] See the request for information at https://www.regulations.gov/document/EBSA-2022-0002-0001.

Employees' Retirement System Act of 1986 (FERSA), and any other relevant laws, to protect the life savings and pensions of U.S. workers and families from the threats of climate-related financial risk.

This response to the RFI is organized as follows:

Summary
I. Introduction.
II. Climate Uncertainties and Choices Among Crucial Assumptions.
III. The Evidence on Climate Phenomena and the Effects of Climate Policies in the EPA Climate Model.
IV. Observations on the Concept of "Climate Risk."
V. Conclusions.

Summary

- The managers of no retirement or pension program, nor the officials of few, if any, government agencies — the EBSA in particular — are in a position to evaluate climate phenomena, whether ongoing or prospective, with respect to which the scientific uncertainties are vastly greater than commonly asserted.
- The range of alternative assumptions about central parameters is too great to yield clear implications for the climate "risks" facing specific retirement programs, investment choices, economic sectors, and geographic regions.
- Those central parameters include the choices among climate models, the assumed future increase in atmospheric greenhouse gas (GHG) concentrations through, say, 2100, the assumed sensitivity of the climate system to increases in the atmospheric concentration of GHG, that is, the assumed relative contributions of natural and anthropogenic influences upon climate phenomena. Moreover, there is a large number of variables affecting climate phenomena in both the short and long terms about which our scientific understanding is poor, among them the feedback effects of increasing GHG concentrations on surface evaporation, cloud formation, and precipitation; and little is known *inter alia* about the effects of aerosol emissions on cloud formation. This short list is very far from exhaustive.
- If the managers of retirement and pension programs are driven to use the same (or similar) sets of assumptions about central parameters, a very real danger would arise of more-or-less homogeneous predictions inconsistent with historical, ongoing, and prospective climate phenomena. If they opt to use sets of assumptions that differ in important dimensions, the ensuing predictions about future climate phenomena ("risks") would vary substantially, yielding very large uncertainties in terms of the information made available to participants in retirement and pension programs.
- It is reasonable to hypothesize that the managers of retirement and pension programs forced by regulatory mandates to evaluate climate "risks" will have powerful incentives to undertake climate analysis driven not by the actual evidence and the peer-reviewed literature on climate phenomena. Instead, they will be driven to undertake such analysis, whether in response to regulatory directives or to political pressures, under assumptions and methodologies insulating them from adverse regulatory actions and litigation threats. Such political pressures may be particularly important in the context of

the Federal Employees Retirement System. Such incentives are not consistent with an evaluation of climate "risks" yielding useful information for plan managers and participants.

- It is reasonable to hypothesize also that the aggregate, sectoral, and geographic benefits (that is, positive "risks") of increasing GHG concentrations, as reported by the National Oceanic and Atmospheric Administration and in the peer-reviewed literature, will be excluded from such analytic efforts.
- It is reasonable to hypothesize further that such analyses will exclude the risks of climate policies, prominent among which are the large and adverse implications of artificial increases in energy costs. Such policy risks are likely to be greater when implemented by regulatory agencies insulated from democratic accountability; and it is the existing participants in retirement programs who disproportionately would suffer capital losses attendant upon such public policies.
- Anthropogenic climate change is "real" in that increasing atmospheric concentrations of GHG have yielded effects that are detectable. But they are much smaller than commonly asserted; and there is no evidence in support of the ubiquitous assertions of a climate "crisis," whether ongoing or looming, and no evidence in support of the even more extreme "existential threat" argument. Moreover, the available analysis suggests that the financial risks of anthropogenic climate change in the aggregate are much smaller than many assert.
- Both the central integrated assessment model and the IPCC even in its most alarmist analyses calculate that anthropogenic climate change unmitigated by policy initiatives would reduce global per capita incomes by less than 1.5 percent by the end of this century, at which time the world is certain to be vastly wealthier than now.
- The mainstream climate models have a poor track record in terms of predicting the actual temperature trend of recent decades, having consistently overstated that trend on average by a factor of over two.
- Application of the Environmental Protection Agency climate model suggests strongly that climate policies, whether implemented by the U.S. government alone or as an international cooperative policy, would have temperature effects by 2100 that would be virtually undetectable or very small. Such policies cannot satisfy any plausible benefit/cost test.
- Because the perceived "climate "risks" confronting retirement and pension programs are dependent upon crucial choices among alternative assumptions, the evaluation of such "risks" would be largely arbitrary given that the "correct" assumptions are very far from obvious. A misallocation of capital is a likely result, which means that a requirement, whether formal or informal, that climate "risks" be evaluated would be likely to weaken the actual security — that is, to reduce the market value — of the retirement assets of current and future participants in retirement and pension programs subject to EBSA oversight. When "risk" analysis becomes an arbitrary function of choices among assumptions complex, opaque, and far from obvious, the traditional retirement security objectives of ERISA and FERSA inexorably will be affected adversely, an outcome diametrically at odds with the ostensible objectives of those advocating the evaluation of climate "risks."
- Moreover, the "risks" of anthropogenic climate change are far from the only such mass-geography "risks." A bias toward focusing only on climate "risks" would distort the

allocation of capital.

- For all of these reasons, the rationale asserted by the EBSA for climate risk analysis is deeply problematic, as it shunts aside the massive analytic problems inherent in the analysis of climate "risk." It is perhaps unsurprising that regulators view market incentives as insufficient to engender an efficient outcome in terms of resource allocation, and that a regulatory strengthening of such incentives automatically would yield an allocational improvement. That stance is very far from obviously correct.
- The combination of very great climate uncertainties and litigation and regulatory threats will create a demand from the managers of retirement and pension programs for detailed regulations on how to structure the analysis of climate risks. Because the uncertainties attendant upon the future effects of increasing atmospheric concentrations of GHG are so great, a top-down regulatory approach for the evaluation of any attendant "risks" is itself very risky. A wiser approach would entail allowing market forces — the offerings of employers and the choices of employees — to make such "risk" determinations in a bottom-up fashion, thus avoiding an obvious politicization of the allocation of capital.
- Proposals that the EBSA enforce a mandate that managers of retirement and pension programs evaluate climate "risks" represent a blatant effort to distort the allocation of capital away from economic sectors disfavored by certain political interest groups pursuing ideological agendas. This would represent the return of Operation Choke Point, a past attempt to politicize access to capital, one deeply corrosive of our legal and constitutional institutions.
- Protection of those institutions is consistent only with formal policymaking by the Congress through enactment of legislation, rather than with powerful pressures, whether formal or informal, exerted by regulatory agencies. This institutional protection would preserve the traditional roles of the private sector and of the government, respectively, as part of the larger permanent objectives of maximizing the productivity of resource use under free market competition, and of preserving the political accountability of the policymaking process under the institutions of democratic decisionmaking as constrained by the constitution.

I. Introduction

The RFI presented by the EBSA for climate-related financial risk evaluation by the managers of retirement and pension programs governed by ERISA and FERSA assumes implicitly that the evaluation of such "risks" — that is, a disaggregation of overall climate phenomena affected by increasing atmospheric concentrations of greenhouse gases (GHG) by sector and by geographic region — would be straightforward. Instead, even at the global level, the uncertainties are staggering, in particular for the evaluation of climate phenomena decades or centuries in the future.[2] Disaggregation of such analysis by economic sector and geographic region would be

[2] See, e.g., the greatly simplified disaggregation of various factors asserted in Figure SPM.2 in "The Physical Science Basis" section of the most recent IPCC report, at https://www.ipcc.ch/report/ar6/wg1/downloads/report/IPCC_AR6_WGI_SPM_final.pdf. See McKitrick on the methodological fallacies underlying the purported "attribution" of wealth/climate events to GHG concentrations at https://link.springer.com/article/10.1007/s00382-021-05913-7. See also the various discussions of attribution methodologies at https://judithcurry.com/, in particular https://judithcurry.com/2021/08/18/the-ipccs-attribution-methodology-is-fundamentally-flawed/.

fraught with uncertainties and a requirement for choices among alternative assumptions even more speculative. The managers of retirement and pension programs — as well as officials in all or most government agencies — are in no position to evaluate the enormous complexities of climate science. Even the IPCC has not demonstrated an ability to make such projections that are borne out by the evidence.

The massive uncertainties and analytic difficulties inherent in any such assessments of "risks" created by changing climate phenomena will drive the managers of retirement and pension programs to outsource such risk analysis to outside consultants, the choices among whom will be driven not by any goal of analytic rigor, but instead by a heavy potential for regulatory and litigation penalties. Accordingly, only the most extreme scenarios will be viewed as relevant as a means of minimizing regulatory and litigation risks, a methodology that will distort the allocation of capital, and, perhaps ironically, will have the effect of weakening the financial performance of the retirement and pension investments forced into such analytic biases, and therefore of increasing the financial risks afflicting the participants in the retirement programs.

The combination of very great climate uncertainties and the litigation and regulatory threats will create a demand from the managers of programs governed by ERISA and FERSA requirements for detailed regulations on how to structure the analysis of climate risks. Regulatory agencies are hardly better suited to conduct such analysis in an objective and neutral manner, or of overcoming the massive uncertainties summarized above. Managers of retirement and pension programs, or their consultants, will have powerful incentives to use the Environmental Protection Agency climate model, used by most federal agencies to evaluate climate trends and the effects of climate policies.[3] Precisely because it is the U.S. government model, it would be difficult to attack a program manager for choosing it. For the earlier (2013-2014) suite of IPCC climate models (CMIP-5), the EPA model provided predictions close to the average of those models under a given set of underlying assumptions, equilibrium climate sensitivity in particular. For the new (2021-2022) suite (CMIP-6), the EPA model provides predictions cooler than the average of those models, not because the EPA model now is providing predictions more consistent with the historical evidence, but because the CMIP-6 models have incorporated a range of climate sensitivity assumptions and estimates higher on average than those in the CMIP-5 iteration. That range of climate sensitivity values in CMIP-6 also is wider than that in CMIP-5, meaning that the uncertainty of the climate models is increasing.[4]

In short, the managers of the relevant retirement programs, or their consultants, will be driven to use the EPA climate model despite the reality that it has not demonstrated an ability to predict the past accurately even in terms of global averages. Accordingly, its predictions about the future are unreliable, and *a fortiori* in terms of a "risk" analysis disaggregated by region or economic sector.

Furthermore, large low-probability risks are ubiquitous. Wars, terrorist acts, meteor strikes, mass volcanic eruptions, tsunamis, adverse weather events, and the like are only the beginning of

[3] This is the Model for the Assessment of Greenhouse Gas Induced Climate Change (MAGICC), at www.magic.org. The summary analysis presented below uses version 5.3. Versions 6.0 and 7.0 are available, but generate predictions that are essentially identical, with identical implications for policy analysis.

[4] See https://www.wcrp-climate.org/wgcm-cmip.

a long list that does not require an overactive imagination to construct. For EBSA, a focus only on a small subset of such potential risks is arbitrary: Why some — or, indeed, only one — and not others? For the retirement programs, a focus on that small subset as possibly mandated by regulatory measures would create a likelihood of a substantial misallocation of capital, weaker financial performance, and thus an increase in financial risks for plan participants.

II. Climate Uncertainties and Choices Among Crucial Assumptions

Notwithstanding ubiquitous assertions that climate science is "settled," that a crisis is upon us or looming large, and that government policies must address the "existential threat" posed by anthropogenic climate change, in reality the uncertainties attendant upon the prospective effects of increasing atmospheric concentrations of greenhouse gases (GHG) are very substantial.[5] Moreover, no evidence supports the "crisis" narrative, as discussed below. These realities are illustrated by the ranges of various estimates published by the Intergovernmental Panel on Climate Change (IPCC) in its most recent Assessment Reports, by the wide range of temperature paths projected by the mainstream climate models, and by the scientific literature more generally.[6]

The evaluation of climate "risks" afflicting retirement programs would require choices among the available climate models — as noted above, the "safe" choice for plan managers would be the EPA model — choices among alternative assumptions about the path of future atmospheric concentrations of GHG, choices among assumptions about the effect of increasing GHG concentrations upon the climate system, that is, the "sensitivity" of the climate system and thus the relative importance of natural and anthropogenic influences upon climate phenomena, and deeply problematic assumptions about such feedback effects as cloud formation and precipitation dynamics, which are understood only poorly.[7] That list is very far from exhaustive.

The mainstream climate models have found it very difficult to predict the historical and current climate record even in terms of global averages; as an example, the models have been unable to explain the warming observed from 1910-1945.[8] That period of warming cannot have been the result of increased atmospheric concentrations of GHG, in that such concentrations had

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[5] See, e.g., https://www.nationalaffairs.com/publications/detail/the-case-for-climate-change-realism.

[6] See, e.g., Figure 2.5 in the IPCC Fifth Assessment Report (2013), on alternative paths for future temperature changes, at https://www.ipcc.ch/report/ar5/syr/synthesis-report/. On the wide range of temperature projections yielded by the mainstream climate models, see Figure 2 in the testimony of John R. Christy before the U.S. House Committee on Science, Space, and Technology, March 29, 2017, at https://science.house.gov/imo/media/doc/Christy%20Testimony_1.pdf?1. On the general state of scientific uncertainty in the context of climate phenomena, see e.g., Judith Curry, "Uncertainty About the Climate Uncertainty Monster," *Climate Etc.*, May 19, 2017, at https://judithcurry.com/2017/05/19/uncertainty-about-the-climate-uncertainty-monster/.

[7] See, e.g., Judith Curry, "The Cloud-Climate Conundrum," *Climate Etc.*, June 2, 2016, at https://judithcurry.com/2016/06/02/the-cloud-climate-conundrum/.

[8] See the HadCRUT5 reconstructions of temperature anomalies at https://crudata.uea.ac.uk/cru/data/temperature/. Interestingly enough, the Russian climate models from the Institute for Numerical Mathematics (models INM-CM4 and INM-CM4.8) do the best job of predicting the past and the present. See http://www.glisaclimate.org/node/2220 and https://www.researchgate.net/publication/329748540_Simulation_of_the_modern_climate_using_the_INM-CM48_climate_model.

increased only from about 278 ppm in 1750 to about 300 ppm by 1910, and 310 ppm by 1945.[9] Another example: Every climate model predicts that increasing atmospheric concentrations of GHG should result in an enhanced heating effect in the mid- and upper troposphere over the tropics. The satellite, weather balloon (radiosonde), and reanalysis data for the most part do not show that effect; some analyses find it, but at a level orders of magnitude smaller than predicted by the models.[10] In the latest iteration (CMIP-6) of the suite of climate models, applied in the 6th Assessment Report, the average predicted tropospheric temperature increase for 1979-2019 is 0.40 degrees C per decade. (The CMIP-5 suite of models on average predicted 0.44 degrees C per decade for 1979-2019; accordingly, there has been little improvement in the average performance of the models over the past eight or so years despite substantial expenditures on such research.) The actual record as measured by the satellites: 0.16 degrees C per decade.[11] The climate models on average have overstated the temperature record by a factor of more than two.

Consider only the effect of varying assumptions about the future path of atmospheric GHG concentrations. IPCC in the 5th (2013) Assessment Report used four such alternative paths: Representative Concentrations Pathways 2.6, 4.5, 6, and 8.5.[12] The 6th Assessment Report replaces the RCPs with "Shared Socio-Economic Pathways (SSPs) that for benefit/cost analytic purposes do not differ in any material dimension from the RCPs; instead IPCC claims that the SSPs "look at a far greater range of options/scenarios" with "a greater focus on lower degrees of warming … like 1.5°C and 2°C."[13] The IPCC characterization of warming of 1.5°C and 2°C as "lower" is laughable, in that the satellite temperature record for the middle troposphere for 1979-2021 shows a warming trend of about 0.16°C per decade, or 1.6°C per century.[14] The following table illustrates the range of temperature effects ("anomalies") by 2100 under the four RCPs.

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[9] See the NOAA reconstruction of carbon dioxide emissions and concentrations for 1750-2019 at https://www.climate.gov/sites/default/files/CO2_emissions_vs_concentrations_1751-2019_lrg.gif.

[10] The tropics for the most part are water, and emissions of additional GHG would warm the earth slightly, resulting in an increase in ocean evaporation. In the climate models, as the water vapor rises into the mid troposphere, it condenses, releasing heat. This seems straightforward, but efforts to demonstrate this phenomenon with satellite measurements have proven very difficult. See Ross McKitrick and John R. Christy, "Pervasive Warming Bias in CMIP6 Tropospheric Layers," *Earth and Space Science*, Vol. 7, Issue 9 (September 2020), at https://agupubs.onlinelibrary.wiley.com/doi/10.1029/2020EA001281; and Ross McKitrick, "New Confirmation That Climate Models Overstate Atmospheric Warming," *Climate Etc.*, August 25, 2020, at https://judithcurry.com/2020/08/25/new-confirmation-that-climate-models-overstate-atmospheric-warming/.

[11] See the Coupled Model Intercomparison Project, Phase 6, at https://pcmdi.llnl.gov/CMIP6/. See also, e.g., the recent presentation by Professor John R. Christy at https://www.youtube.com/watch?v=D2Cd4MLUoN0.

[12] The figures (2.6, etc.) are not temperature effects; they are theoretical calculations of "radiative forcings" in watts per square meter. For an introduction, see G.P. Wayne, "The Beginner's Guide to Representative Concentration Pathways," *Skeptical Science*, August 2013, at https://skepticalscience.com/docs/RCP_Guide.pdf.

[13] See https://www.ipcc.ch/site/assets/uploads/2021/06/Fact_sheet_AR6.pdf.

[14] See https://www.drroyspencer.com/latest-global-temperatures/ and the links shown for the respective atmospheric layers. See also CMIP-5 at https://pcmdi.llnl.gov/mips/cmip5/; and CMIP-6 at https://pcmdi.llnl.gov/CMIP6/.

Central Parameters of IPCC AR5 RCP Scenarios

Year 2100	-------Representative Concentration Pathway------ 2.6	4.5	6	8.5
GHG concentration (ppm)	490	650	850	1370
Average increase 2018-2100 (ppm)	1.1	3.0	5.5	11.9
Temperature anomaly 2100 (°C)	1.5	2.4	3.0	4.9

Source: G.P. Wayne, "The Beginner's Guide to Representative Concentration Pathways," *Skeptical Science*, August 2013.
Note: RCP 2.6 (sometimes denoted RCP3PD) predicts radiative forcing of 3 Wm^2 before 2100, declining to 2.6 Wm^2 by 2100. "PD" stands for "peak and decline."

Neither the EBSA nor other government agencies nor the managers of retirement and pension plans are in a position to evaluate the strengths and weaknesses of alternative RCP assumptions, or of the other crucial parameters underlying climate projections in the context of GHG emissions.[15] The IPCC in the 2013 Assessment Report provides a range of estimates for the "likely" equilibrium sensitivity of the climate system of 1.5 degrees to 4.5 degrees, with a mean of 3 degrees.[16] Many of the more extreme or "alarmist" assertions of the effects of anthropogenic climate change assume RCP8.5 and a climate sensitivity of 4.5 degrees (or even higher). The numerous estimates reported in the peer-reviewed literature do not support that assumption, instead supporting an assumption of 2 degrees or even less; the range estimated from the actual data is 1.5 to 2.3 degrees C.[17] IPCC in the AR6 changed the "likely" ECS range to 2.5-4 degrees, with a median of 3.25 degrees, higher than in the AR5, despite the findings in the recent peer-reviewed literature.[18]

Again with respect to the enormous complexities inherent in the analysis of climate phenomena and "risks": Neither the EBSA nor other government agencies nor the managers of

[15] Note that RCP8.5 is a popular assumption among those advocating strong climate policies, but it is a scenario essentially impossible. Under RCP8.5, atmospheric concentrations of GHG rise at almost 12 parts per million (ppm) through 2100 as an annual average; the average for 1985-2019 was about 1.9 ppm, and the single largest increase was about 3 ppm in 2016. See the data reported by NOAA at https://www.esrl.noaa.gov/gmd/ccgg/trends/global.html. See Kevin Murphy, "Reassessing the RCPs," *Climate Etc.*, January 28, 2019, at https://judithcurry.com/2019/01/28/reassessing-the-rcps/; and Judith Curry, "Is RCP8.5 An Impossible Scenario?", *Climate Etc.*, November 24, 2018, at https://judithcurry.com/2018/11/24/is-rcp8-5-an-impossible-scenario/.

[16] The equilibrium sensitivity of the climate system is the temperature increase that would result from a doubling of atmospheric concentrations of GHG, after the climate system were to adjust fully.

[17] See Patrick J. Michaels and Paul C. Knappenberger, *Lukewarming: The New Climate Science That Changes Everything*, Washington D.C.: Cato Institute, 2016; and the recent presentation by Professor John R. Christy at https://www.youtube.com/watch?v=D2Cd4MLUoN0.

[18] See https://judithcurry.com/2021/10/06/ipcc-ar6-breaking-the-hegemony-of-global-climate-models/#:~:text=With%20regards%20to%20equilibrium%20climate,range%20to%202.5%2D4.0%20C..

retirement and pension plans are in a position to evaluate them in ways that would yield useful information for plan participants or regulators. Even government agencies and international bodies wholly dedicated to such analyses find the task daunting, yielding formidable scientific complexities and controversies. Instead, the plan managers will be driven to adopt assumptions — actually, to retain consultants who will do so — minimizing the degree to which their analyses might subject them to political attacks, adverse regulatory actions, and litigation. This is very different from an objective effort to evaluate climate phenomena and to estimate a reasonable range of prospective effects of increasing GHG concentrations, that is, climate "risks."

The combination of very great climate uncertainties and the litigation and regulatory threats will create a demand from the business sector for detailed regulations on how to structure the analysis of climate risks. Regulatory agencies are hardly better suited to conduct such analysis in an objective and neutral manner. Both plan managers and government agencies will have powerful incentives to use the EPA climate model, used by most federal agencies to evaluate the effects of climate policies; precisely because it is the U.S. government model, it would be difficult to attack the managers of retirement programs for choosing it.[19] For the earlier suite of climate models (CMIP-5), the EPA model provided predictions close to the average of those models under a given set of underlying assumptions, equilibrium climate sensitivity in particular. For the new suite (CMIP-6), the EPA model provides predictions cooler than the average of those models, not because the EPA model now is providing predictions more consistent with the historical evidence, but because the CMIP-6 models have incorporated a range of climate sensitivity assumptions and estimates higher on average than those in the CMIP-5 iteration.[20]

Again, plan managers conducting climate "risk" analysis will have powerful incentives to choose among assumptions on future emissions and atmospheric concentrations, climate sensitivity, and other crucial parameters so as to insulate themselves from political attack, adverse regulatory actions, and litigation. They thus will be led toward analytic homogeneity, yielding a very real danger of an artificial "consensus" regardless of the actual evidence, and perhaps largely inconsistent with it. Any such consensus would be an artifact of the political pressures and litigation and regulatory risks to which they would be subjected; it would have nothing to do with "science." Moreover, these perverse incentives imply directly that any rule mandating the disclosure of climate risks to plan participants would provide no actual information improving investment choices.

If, implausibly, those conducting climate "risk" analysis were to opt to use models and/or sets of assumptions that differ in important dimensions, the ensuing predictions about future climate phenomena ("risks") would vary substantially or hugely, yielding very large uncertainties in terms of "risk" implications. What would the EBSA do under that condition, how would the plans respond, and — again — what would such decisions have to do with "science"?

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[19] This is the Model for the Assessment of Greenhouse Gas Induced Climate Change (MAGICC), at www.magic.org. The summary analysis presented below uses version 5.3. Versions 6.0 and 7.0 are available, but generate predictions only on the temperature effects of various GHG concentration scenarios. The differences in temperature predictions are trivial.

[20] Private communication with Professor John R. Christy, March 14, 2021. See also CMIP-5 at https://pcmdi.llnl.gov/mips/cmip5/; and CMIP-6 at https://pcmdi.llnl.gov/CMIP6/.

Those political pressures will lead the retirement and pension plans, and the relevant government agencies, not to consider the benefits of increasing atmospheric concentrations of GHG, as reported by the National Oceanic and Atmospheric Administration (NOAA), and in the peer-reviewed literature. Examples are planetary greening, increased agricultural productivity, increased water use efficiency by plants, and reduced mortality from cold.[21] Nor will such analysis include important dimensions of the adverse impacts of government climate policies, which as a core imperative must have the effect of increasing energy costs artificially, notwithstanding common assertions that alternative energy sources are competitive in terms of costs.[22] In short, government policies that force or induce retirement plans to evaluate the climate "risks" confronting their operations and markets will yield confusion rather than material information. One result of such confusion would be important distortions in capital markets due to a weighting of climate "risks" above those posed by other important phenomena, whether natural or manmade.

III. The Evidence on Climate Phenomena and the Effects of Climate Policies in the EPA Climate Model

The available body of evidence does not support the ubiquitous assertions that a climate "crisis" is upon us or looming large. This means that the asserted climate "risks" threatening the pecuniary interests of participants in retirement and pension systems are far less obvious than often assumed.

That anthropogenic climate change is "real" — that increasing GHG concentrations are having detectable effects — is incontrovertible, but that does not tell us the magnitude of the observable impacts, which must be measured empirically. Temperatures are rising, but as the Little Ice Age ended no later than 1850, it is not easy to separate natural from anthropogenic effects on temperatures and other climate phenomena.[23] The latest research in the peer-reviewed literature suggests that mankind is responsible for about two-tenths of a degree of the approximate temperature increase of 1.1 degrees C since 1880.[24]

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[21] On the carbon dioxide "greening" effect see NOAA at https://www.nasa.gov/feature/goddard/2016/carbon-dioxide-fertilization-greening-earth; and Zaichun Zhu, *et. al.*, "Greening of the Earth and Its Drivers," *Nature Climate Change*, Vol. 6 (2016), pp. 791-795, at https://www.nature.com/articles/nclimate3004. On the agricultural productivity effects, see, e.g., Goudriaan and Unsworth at https://acsess.onlinelibrary.wiley.com/doi/abs/10.2134/asaspecpub53.c8. On water use efficiency by plants, see, e.g., http://www.co2science.org/subject/w/summaries/wateruse.php. On the beneficial impacts of moderate warming on mortality, see https://www.thelancet.com/journals/lancet/article/PIIS0140-6736(14)62114-0/fulltext.

[22] See Benjamin Zycher, *The Green New Deal: Economics and Policy Analytics*, American Enterprise Institute, 2019, at http://www.aei.org/wp-content/uploads/2019/04/RPT-The-Green-New-Deal-5.5x8.5-FINAL.pdf?x91208. See also the Energy Information Administration at https://www.eia.gov/outlooks/aeo/pdf/electricity_generation.pdf, Table 1b (including the costs of backup by gas turbines or battery systems); and the Institute for Energy Research at https://www.instituteforenergyresearch.org/wp-content/uploads/2019/06/IER_LCOE2019Final-.pdf.

[23] On the surface (land/ocean) temperature record, see UK Met Office, Hadley Centre/University of East Anglia Climatic Research Unit, "Tim Osborn: HadCRUT4 Global Temperature Graphs," https://crudata.uea.ac.uk/~timo/diag/tempdiag.htm. On the Little Ice Age, see Michael E. Mann, "Little Ice Age," in *Encyclopedia of Global Environmental Change, Volume 1: The Earth System: Physical and Chemical Dimensions of Global Environmental Change*, ed. Michael C. MacCracken, John S. Perry and Ted Munn (Chichester, England: John Wiley & Sons, 2002), http://www.meteo.psu.edu/holocene/public_html/shared/articles/littleiceage.pdf.

[24] See https://crudata.uea.ac.uk/cru/data/temperature/HadCRUT5.0Analysis_300.png. See also Ross McKitrick and John Christy, "A Test of the Tropical 200- to 300 hPa Warming Rate in Climate Models"; Nicholas Lewis and Judith Curry, "The Impact of Recent Forcing and Ocean Heat Uptake Data on Estimates of Climate Sensitivity,"

The "crisis" assertions are unsupported by the evidence reported in the peer-reviewed, official, or scientific literature. There is little trend in the number of "hot" days for 1895–2017; 11 of the 12 years with the highest number of such days occurred before 1960.[25] NOAA has maintained since 2005 the U.S. Climate Reference Network, comprising 114 meticulously maintained temperature stations spaced more or less uniformly across the lower 48 states, 21 stations in Alaska, and two stations in Hawaii.[26] They are placed to avoid heat island effects and other such distortions as much as possible; the reported data show no trend over the available 2005–20 reporting period.[27] A reconstruction of global temperatures over the past one million years, using data from ice sheet formations, shows that there is nothing unusual about the current warm period.[28]

Global mean sea level has been increasing at about 3.3 mm per year since satellite measurements began in 1992. The tidal-gauge data before then show annual increases of about 1.9 mm per year, but that comparison does not show an acceleration in sea-level rise because the two datasets are not comparable. The tidal gauges do not measure sea levels per se; they measure the difference between sea levels and "fixed" points on land that in reality might not be fixed due to seismic activity, tectonic shifts, land settlement, etc. Accordingly, the data are unclear as to whether there is occurring an acceleration in sea level rise; it is reasonable to hypothesize that there has been such an acceleration simply because temperatures are rising due to both natural and anthropogenic influences, as noted above, and such increases should result in more melting ice and the thermal expansion of water. But because rising temperatures are the result of both natural

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Journal of Climate 31 (August 2018): 6051–71, https://journals.ametsoc.org/doi/pdf/10.1175/JCLI-D-17-0667.1; and John R. Christy and Richard McNider, "Satellite Bulk Tropospheric Temperatures as a Metric for Climate Sensitivity," *Asia-Pacific Journal of Atmospheric Sciences* 53 (2017): 511–18, https://link.springer.com/article/10.1007/s13143-017-0070-z. For a chart summarizing the recent empirical estimates of equilibrium climate sensitivity as reported in the peer-reviewed literature, see Patrick J. Michaels and Paul C. Knappenberger, "The Collection of Evidence for a Low Climate Sensitivity Continues to Grow," Cato Institute, September 25, 2014, https://www.cato.org/blog/collection-evidence-low-climate-sensitivity-continues-grow.

[25] For the reconstruction of the NASA data, see John R. Christy, "Average per Station (1114 USHCN Stations) 1895–2017: Number of Days Daily Maximum Temperature Above 100˚F and 105˚F," drroyspencer.com, http://www.drroyspencer.com/wp-content/uploads/US-extreme-high-temperatures-1895-2017.jpg.

[26] For the Climate Reference Network program description, see National Centers for Environmental Information, "U.S. Climate Reference Network," https://www.ncdc.noaa.gov/crn/.

[27] For a visualization of a prototypical station, see Willis Eschenbach, "NOAA's USCRN Revisited—No Significant Warming in the USA in 12 Years," Watts Up with That?, November 8, 2017, https://wattsupwiththat.com/2017/11/08/the-uscrn-revisited/. For the monthly data and charts reported by the National Oceanic and Atmospheric Administration (NOAA), see National Oceanic and Atmospheric Administration, "National Temperature Index," https://www.ncdc.noaa.gov/temp-and-precip/national-temperature-index/time-series?datasets%5B%5D=uscrn&parameter=anom-tavg&time_scale=p12&begyear=2005&endyear=2020&month=8.

[28] See R. Bintanja and R. S. W. van de Wal, "North American Ice-Sheet Dynamics and the Onset of 100,000-Year Glacial Cycles," *Nature* 454, no. 7206 (August 14, 2008): 869–72, https://www.researchgate.net/publication/23171740_Bintanja_R_van_de_Wal_R_S_W_North_American_ice-sheet_dynamics_and_the_onset_of_100000-year_glacial_cycles_Nature_454_869-872. NOAA published the underlying data at R. Bintanja and R. S. W. van de Wal, "Global 3Ma Temperature, Sea Level, and Ice Volume Reconstructions," National Oceanic and Atmospheric Administration, August 14, 2008, https://www.ncdc.noaa.gov/paleo-search/study/11933. For a chart showing the temperature record over one million years, see Institute for Energy Research, "Temperature Fluctuations over the Past Million Years," https://www.instituteforenergyresearch.org/wp-content/uploads/2020/03/temperature-flucturations.png.

and anthropogenic causes, we do not know the relative contributions of those causes to any such acceleration.[29]

The Northern and Southern Hemisphere sea ice changes tell different stories; the arctic sea ice has been declining, while the Antarctic sea ice has been stable or growing.[30] U.S. tornado activity shows either no trend or a downward trend since 1954.[31] Tropical storms, hurricanes, and accumulated cyclone energy show little trend since satellite measurements began in the early 1970s.[32] The number of U.S. wildfires shows no trend since 1985, and global acreage burned has declined over past decades.[33] The Palmer Drought Severity index shows no trend since 1895.[34] U.S. flooding over the past century is uncorrelated with increasing GHG concentrations.[35] The available data do not support the ubiquitous assertions about the dire impacts of declining pH

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[29] See Frederikse *et. al.* at https://www.nature.com/articles/s41586-020-2591-3. As a crude approximation, the data suggest that about two-thirds of such sea level increases are due to ice melt, and one-third to thermal expansion of water. See Judith Curry, "Sea Level and Climate Change," Climate Forecast Applications Network, November 25, 2018, https://curryja.files.wordpress.com/2018/11/special-report-sea-level-rise3.pdf. Curry cites research from Xianyao Chen and colleagues, the central finding of which is that "global mean sea level rise increased from 2.2 ± 0.3 mm/year in 1993 to 3.3 ± 0.3 mm/year in 2014." See Xianyao Chen et al., "The Increasing Rate of Global Mean Sea-Level Rise During 1993–2014," *Nature Climate Change* 7 (June 26, 2017): 492–95, https://www.nature.com/articles/nclimate3325. Whether the trend from a 21-year period can yield important inferences is a topic not to be addressed here. For a different empirical conclusion from the tidal gauge record, see J. R. Houston and R. G. Green, "Sea-Level Acceleration Based on U.S. Tide Gauges and Extensions of Previous Global-Gauge Analyses," *Journal of Coastal Research* 27, no. 3 (May 2011): 409–17, https://meridian.allenpress.com/jcr/article-abstract/27/3/409/28456/Sea-Level-Acceleration-Based-on-U-S-Tide-Gauges?redirectedFrom=fulltext. For an example of temporary rapid sea-level rise in the 18th century, see W. R. Gehrels et al., "A Preindustrial Sea-Level Rise Hotspot Along the Atlantic Coast of North America," *Geophysical Research Letters* 47 (2020), https://agupubs.onlinelibrary.wiley.com/doi/epdf/10.1029/2019GL085814. For further reported evidence of an acceleration, see Hans-Otto Pörtner et al., *Special Report on the Ocean and Cryosphere in a Changing Climate*, Intergovernmental Panel on Climate Change, 2019, https://www.ipcc.ch/srocc/.

[30] See https://www.thegwpf.org/content/uploads/2021/12/Bates-Sea-Ice-Trends.pdf?mc_cid=dac7df538b&mc_eid=ad653edd6d; and https://www.thegwpf.org/content/uploads/2022/04/Humlum-State-of-Climate-2021-.pdf?mc_cid=dac7df538b&mc_eid=ad653edd6d. See also Patrick J. Michaels, "Spinning Global Sea Ice," Cato Institute, February 12, 2015, https://www.cato.org/blog/spinning-global-sea-ice. It appears to be the case that the Antarctic eastern ice sheet — about two-thirds of the continent — is growing, while the western ice sheet (and the peninsula) may be shrinking. No agreed explanation for this phenomenon is reported in the literature.

[31] For the historical data reported by the NOAA, see National Ocean and Atmospheric Administration, "Historical Records and Trends," https://www.ncdc.noaa.gov/climate-information/extreme-events/us-tornado-climatology/trends.

[32] For data on global tropical cyclone activity, see Ryan N. Maue, "Global Tropical Cyclone Activity, updated March 16, 2021, at http://climatlas.com/tropical/.

[33] For the reported U.S. wildfire data, see National Interagency Fire Center, "Total Wildland Fires and Acres (1926–2019)," https://www.nifc.gov/fireInfo/fireInfo_stats_totalFires.html. On the decline in global area burned over past decades, see Stefan H. Doerr and Cristina Santin, "Global Trends in Wildfire and Its Impacts: Perceptions Versus Realities in a Changing World," *Philosophical Transactions of the Royal Society of London, Series B, Biological Sciences* 371, no. 1696 (2016), https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4874420/pdf/rstb20150345.pdf.

[34] See US Environmental Protection Agency, "Climate Change Indicators: Drought," https://www.epa.gov/climate-indicators/climate-change-indicators-drought; and US Department of Commerce, National Climatic Data Center, "Divisional Data Select," https://www7.ncdc.noaa.gov/CDO/CDODivisionalSelect.jsp.

[35] See R. M. Hirsch and K. R. Ryberg, "Has the Magnitude of Floods Across the USA Changed with Global CO_2 Levels?," *Hydrological Sciences Journal* 57, no. 1 (2012): 1–9, https://www.tandfonline.com/doi/full/10.1080/02626667.2011.621895?scroll=top&needAccess=true&.

levels in the oceans.[36] Global food availability and production have increased more or less monotonically over the past two decades on a per capita basis.[37] The IPCC itself in the *Fifth Assessment Report* was deeply dubious about the various severe effects often asserted to be looming as impacts of anthropogenic warming.[38]

If we apply the Environmental Protection Agency climate model, under the highest IPCC climate sensitivity assumption (4.5 degrees C) reported in the AR5, net-zero U.S. GHG emissions effective immediately would yield a reduction in global temperatures of 0.173 degrees C by 2100. That effect would be barely detectable given the standard deviation (about 0.11 degrees C) of the surface temperature record.[39] The entire Paris agreement: about 0.178 degrees C. Net-zero emissions by the entire Organization for Economic Cooperation and Development: 0.352 degrees C. A 50 percent reduction in Chinese GHG emissions: 0.184 degrees C. A global 75 percent reduction in GHG emissions implemented immediately and maintained strictly would reduce global temperatures in 2100 by 0.540 degrees C.[40] Note that GHG emissions in 2020 fell by about 6.4 percent as a result of the COVID-19 economic downturn.[41] Can anyone believe that even larger GHG reductions — and the attendant economic costs — are plausible politically? Is there a believable benefit/cost model that would justify such policies?

IV. Observations on the Concept of "Climate Risk"

It is clear that those in support of the proposition that the managers of retirement and pension plans subject to ERISA and FERSA requirements evaluate the "risks" of anthropogenic climate change view such analyses as "material" in terms of disclosures to regulators and plan participants. Several problems are attendant upon that premise, in substantial part for the reasons discussed above. Any such projections of climate phenomena and resulting "risks" — far into the future — are very far from trivial methodologically. Which climate model(s) should the retirement plans use? Which assumptions about future emissions, about the sensitivity of the climate system, about policies to be adopted internationally, about the climate effects of those policies, *ad infinitum*, should be incorporated into those models? What confidence should be attached to the predictions made by the models? Are the retirement plans — even very large ones — in a position to do such analysis in a credible fashion? If not, whom should they retain to do that analysis for them, and how should they evaluate the differences among the available alternative providers of such analyses?

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[36] See CO_2 Science, "Ocean Acidification Database," http://www.co2science.org/data/acidification/results.php. See also Alan Longhurst, *Doubt and Certainty in Climate Science*, pp. 214–25, https://curryja.files.wordpress.com/2015/09/longhurst-print.pdf.

[37] See Food and Agriculture Organization of the United Nations, *World Food and Agriculture Statistical Pocketbook 2018*, 2018, Charts 28 and 46, http://www.fao.org/3/CA1796EN/ca1796en.pdf. See also Kevin D. Dayaratna, Ross McKitrick, and Patrick J. Michaels, "Climate Sensitivity, Agricultural Productivity and the Social Cost of Carbon in FUND," *Environmental Economics and Policy Studies* 22 (2020): 433–48.

[38] Julie M. Arblaster et al., "Long-Term Climate Change: Projections, Commitments and Irreversibility—Final Draft Underlying Scientific-Technical Assessment," in *Working Group I Contribution to the IPCC Fifth Assessment Report (AR5), Climate Change 2013: The Physical Science Basis*, September 23–26, 2013, p. 12–78, http://www.climatechange2013.org/images/uploads/WGIAR5_WGI-12Doc2b_FinalDraft_Chapter12.pdf.

[39] See https://agupubs.onlinelibrary.wiley.com/doi/pdf/10.1029/1999JD900835.

[40] Author computations using MAGICC 5.3. The MAGICC model can be found at http://www.magicc.org/.

[41] See https://www.nature.com/articles/d41586-021-00090-3.

Note that the concept of "risk" by its very nature implies a range of possible outcomes delineated by a statistical distribution of likelihoods around some mean and with some standard deviation. "Uncertainty" clearly is a more accurate term than "risk" in this context, in that the mean and/or standard deviation of the relevant statistical distributions are very unlikely to be known. The reality is that a "climate risk" disclosure requirement would be deeply speculative, and the level of detail and the scientific sophistication that would be needed to satisfy such a requirement are staggering. Such "disclosures" and supporting analysis and documentation would take up thousands of pages, with references to thousands more, and the premise that this "disclosure" requirement would facilitate improved decisionmaking by plan administrators, participants, and regulators is difficult to take seriously.

Moreover, the newly emerging "attribution" argument — that statistical analysis can measure the degree to which specific weather events can be "attributed" to increasing atmospheric concentrations of GHG is deeply flawed.[42]

If climate "risks" are deemed important in terms of the plan decisions made by participants, why not others that also are uncertain or speculative? Climate "risks" are hardly the only ones potentially relevant to retirement and pension systems, and all are difficult to evaluate and to incorporate into capital allocation decisions. What about massive volcanic eruptions? Asteroid impacts? Powerful earthquakes? Tsunamis? The potential problem of mass contagion is one with which we are far more familiar now than was the case only somewhat more than a year ago. The use of bioweaponry by terrorists, nuclear war, gamma ray storms, and on and on. Is climate "risk" the most important? If that is the hypothesis, what is the basis for it? Why are those others, and many more, not worthy of incorporation into disclosure requirements for retirement systems? What distortions would result from attention only to climate change and not others?

Because the perceived "climate "risks" confronting retirement plans are dependent upon crucial choices among alternative assumptions, the evaluation of such "risks" would be largely arbitrary given that the "correct" assumptions are very far from obvious. This means that a requirement, whether formal or informal, that climate "risks" be evaluated by the managers of retirement and pension systems would weaken the overall management of risks by those plans. When "risk" analysis becomes an arbitrary function of choices among assumptions complex, opaque, and far from obvious, the traditional protection of the fiduciary interests of plan participants inexorably will be hindered and rendered far less effective in terms of the investment and productivity objectives of the financial markets, an outcome diametrically at odds with the ostensible objectives of those advocating the evaluation of climate "risks."

For these reasons, a requirement that plans governed by ERISA and FERSA evaluatge climate "risks" would be deeply problematic. And such requirement would — necessarily — shunt aside the massive analytic problems inherent in the analysis of climate "risks," instead

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[42] See https://link.springer.com/article/10.1007/s00382-021-05913-7 and https://judithcurry.com/2021/08/18/the-ipccs-attribution-methodology-is-fundamentally-flawed/. In brief: Suppose that the correct statistical model is $Y = XB + Z\Gamma + U = XB\hat{} + Z\Gamma\hat{} + e$. But instead we estimate the model $Y = XB\tilde{} + e\tilde{}$. So the estimated model excludes a vector of relevant variables Γ. The expected value of $B\tilde{}$ (the coefficients estimated with the incorrect model) is $B\hat{} + [X'X]^{-1}X'Z\Gamma\hat{}$. Unless X and Z are uncorrelated, or $\Gamma\hat{}$ is zero (Z is an irrelevant variable), $B\tilde{}$ is biased and inconsistent.

emphasizing a general stance that the plans would fail to protect the fiduciary interests of plan participants in the absence of regulatory mandates. It is perhaps unsurprising that regulators might view the incentives of the managers of retirement and pension plans as insufficient to engender an efficient outcome, and that a regulatory strengthening of such incentives automatically would yield an allocational improvement. That stance is very far from obviously correct.

V. Conclusions

The available analysis suggests that the prospective risks to retirement and pension plans governed by ERISA and FERSA rules attendant upon anthropogenic climate change, at least in the aggregate, are much smaller than many assert. Consider the predictions from the integrated assessment models, the central one of which is the Dynamic Integrated Climate and Economy Model, for which William D. Nordhaus won the Nobel Prize in Economics in 2018.[43] Under DICE, global gross domestic product (GDP) in 2100 varies by about 3 percent across policy scenarios, including no climate policies at all, a figure that is both very small and almost certainly not statistically significant given the vagaries of economic forecasting and the number of years remaining before the end of this century. (I exclude here Nordhaus' "Stern discounting" policy scenario, as it assumes a discount rate effectively equal to zero, a fundamental analytic error.[44]) Per capita consumption varies only by about 1.3 percent across policy scenarios, also a very small number and almost certain not to be statistically significant.

The IPCC — even in its most alarmist analyses — arrives at a conclusion very close to that reported in the DICE analysis. In its 2019report, it finds that the damage from anthropogenic climate change unmitigated by policy initiatives will reduce global GDP by 2.6 percent by 2100.[45] By that year, IPCC projects that individual incomes on average will be at least 400 percent greater than is the case today.[46]

A mandate from the EBSA that retirement and pension plans evaluate climate "risks" is likely to distort the allocation of capital away from economic sectors disfavored by certain political interest groups pursuing ideological agendas. This would represent the return of Operation Choke Point, an attempt to politicize access to credit, one far broader than was applicable only to

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[43] See William Nordhaus and Paul Sztorc, "DICE 2013R: Introduction and User's Manual," Yale University, Department of Economics, October 2013, Figure 4 and Table 1, http://www.econ.yale.edu/~nordhaus/homepage/homepage/documents/DICE_Manual_100413r1.pdf. See also Benjamin Zycher, "The Climate Left Attacks Nobel Laureate Willian D. Nordhaus," monograph, American Enterprise Institute, July 2020, at https://www.aei.org/wp-content/uploads/2020/07/The-Climate-Left-Attacks-Nobel-Laureate-William-D.-Nordhaus.pdf.

[44] See Benjamin Zycher at https://www.regulations.gov/comment/EPA-HQ-OAR-2021-0208-0254; and David Kreutzer, "Discounting Climate Costs," Heritage Foundation, June 16, 2016, at https://www.heritage.org/environment/report/discounting-climate-costs. See Nicholas Stern, *The Economics of Climate Change: The Stern Review* (Cambridge, UK: Cambridge University Press, January 2007), https://www.cambridge.org/us/academic/subjects/earth-and-environmental-science/climatology-and-climate-change/economics-climate-change-stern-review?format=PB.

[45] See Marco Bindi, *et. al.*, "Impacts of 1.5°C of Global Warming on Natural and Human Systems," at https://www.ipcc.ch/site/assets/uploads/sites/2/2019/06/SR15_Chapter3_Low_Res.pdf, Chapter 3 of Valerie Masson-Delmotte, *et. al.*, eds., IPCC Special Report, *Global Warming of 1.5°C*, at https://www.ipcc.ch/site/assets/uploads/sites/2/2019/06/SR15_Full_Report_High_Res.pdf.

[46] This implies average annual growth in per capita GDP of less than 1.5 percent for the rest of this century.

retirement programs, and deeply corrosive of our legal and constitutional institutions. Protection of those institutions is consistent only with formal policymaking by the Congress through enactment of legislation, rather than with pressures exerted by regulatory agencies.