CENTER FOR ENVIRONMENTAL ACCOUNTABILITY

COMMENTS OF THE
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Comments on Technical Documentation for the
Framework for Evaluating Damages and Impacts (FrEDI).

Notice of Document Availability
and Request for Comments.
Docket No. EPA–HQ–OAR–2023–0614
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I. Introduction

This letter serves as a comment on the Environmental Protection Agency ("EPA")'s "Technical Documentation for the Framework for Evaluating Damages and Impacts (FrEDI)." 89 Fed. Reg. 13717 (Feb. 23, 2024). EPA explains that "[t]he main objective of the framework, implemented through the associated FrEDI R package, is to provide projections of annual physical and economic impacts of climate change in the U.S. through the 21st century under any custom temperature scenario, for a broad range of economically important impact category sectors (e.g., impacts across human health, infrastructure, labor, electricity, agriculture, and ecosystems and recreation)." EPA, 430-R-24-001, *Draft Technical Documentation for the Framework for Evaluating Damages and Impacts (FrEDI)* 1 (Feb. 2024) ("FrEDI Draft Technical Documentation"), https://perma.cc/93L5-NWMA.

We write to explain that FrEDI's projections are fatally flawed because they systematically overestimate damage in two ways.

First, and most importantly, all but one of the studies FrEDI relies on project damages using the RCP8.5. RCP8.5 is an emissions pathway generated to inform the Intergovernmental Panel on Climate Change ("IPCC") in 2005 and was intended to show the impact of very high emissions consistent with a fivefold increase in the use of coal and effectively no policies to limit greenhouse gas emissions. This reference scenario was always exceedingly unlikely and is now only of use as a counterfactual. FrEDI's reliance on this outdated and extreme scenario results in much larger damages at lower temperatures and introduces a significant bias in its results, predicting elevated damages even when there is virtually no increase in the underlying projections.

Second, many of the damage projections in FrEDI effectively exclude the possibility of adaptation to the effects of rising atmospheric greenhouse gas concentrations, adaptations which in many cases could reduce projected damages with minimal expense. It beggars belief to suggest that communities across the United States will do *nothing* to modify their infrastructure to protect themselves from, for example, increased inland flooding. But this is what EPA assumes.

This comment explains how an adaptation-free RCP8.5 trajectory is wholly unrealistic, and how its lingering presence in the scientific literature, EPA's social cost of carbon, and FrEDI is a black mark on scientific integrity. The attached expert report of Prof. Roger Pielke details how these assumptions infect nearly every part of FrEDI's damage projections, how this causes FrEDI to systematically overproject damage, and why this means FrEDI cannot be used to usefully project temperature related mortality, air quality, flooding, or anything else.

This comment further explains why the framework if adopted would violate the Information Quality Act and EPA's Scientific Integrity Policy. These flaws would fatally undermine any future action that relies on FrEDI. Finally, the comment explains that giving official government endorsement to these wildly inaccurate projections of damages misleads the public and propagates the misinformation that the Biden Administration purports to hate.

Climate science and climate policy are difficult and complex, but at their root, they both depend on the credibility of scientific and governmental authority. As proposed, FrEDI undermines that credibility. EPA should not adopt or use FrEDI in any fashion without first correcting the fundamental errors in its methodology.

II. RCP8.5 is Unsuitable for Use in FrEDI.

As detailed in Prof. Pielke's attached expert report, all of the studies in FrEDI incorporate an emissions scenario called RCP 8.5 or its equivalent into their damage calculations. Pielke Rep. ¶ 10. Though it is often labeled the "business-as-usual scenario," RCP8.5 is now widely regarded by the climate science community as implausibly extreme. Malte Meinshausen, et al., *A Perspective on the Next Generation of Earth System Model Scenarios: Towards Representative Emission Pathways (REPs)*, Geoscientific Model Development (preprint) (Sep. 6, 2023), https://doi.org/10.5194/gmd-2023-176. While the latest projections of the International Energy Agency expect a median warming of around 2.4°C by 2100, RCP8.5 projects a temperature rise of around 5°C. Int'l Energy Agency, *World Energy Outlook 2023*, at 22 (2023), https://perma.cc/8S7J-8R88; Zeke Hausfather & Glen P. Peters, Comment, *Emissions—The "Business As Usual" Story Is Misleading*, 577 Nature 618, 618 (2020), https://doi.org/10.1038/d41586-020-00177-3; Zeke Hausfather, *Explainer: The High-Emissions 'RCP8.5' Global Warming Scenario*, CarbonBrief (Aug. 21, 2019), https://perma.cc/9LD9-EGDU.

Despite this, RCP8.5 is now firmly lodged in the scientific literature as the expected trajectory of radiative forcing. Thousands of scientific papers refer to RCP8.5 as the "business-as-usual" scenario. *See* Google Scholar Search, https://scholar.google.com/scholar?hl=en&as_sdt=0%2C6&q=rcp8.5+%22business+as+usual%22&btnG= (searching "rcp8.5 'business as usual'").[1] Among these are many of the studies on which EPA's FrEDI relies.

[1] Admittedly, some of these papers are critiquing the use of the term "business-as-usual" to describe RCP8.5, but many if not most take the scenario at face value.

A. The origins of RCP8.5 as the "business-as-usual" scenario.

Accurate emissions scenarios are fundamental for reliable climate damage projections because they serve as the primary driver in complex climate models. Climate models incorporate atmospheric physics, biogeochemical cycles, and feedbacks to simulate how future greenhouse gas concentrations will translate into global and regional changes in temperature, precipitation patterns, and extreme weather events. Essentially, emissions scenarios provide the input signal that determines the magnitude and character of the climate response we project.

Scientists create emissions scenarios by first defining socioeconomic assumptions about factors like economic and population growth, energy use, land-use changes, and pollution levels. These assumptions about future human behavior on a global scale are then fed into integrated assessment models which produce different possible pathways for future emissions. The resulting emissions scenarios include time-resolved predictions of carbon dioxide, methane, and nitrous oxide emissions over the coming decades. These scenarios are fed into more complex climate models, which are themselves used to calculate radiative forcing (a measure of atmospheric energy imbalance), which in turn feeds climate models that project future climate conditions like global temperature or sea-level rise.

Early climate research relied on scenarios that were highly idealized and focused on exploring what would happen if, for example, carbon dioxide concentrations doubled from their preindustrial levels or increased at a steady rate of 1 percent per year. When it was formed in 1988, the IPCC introduced several more sophisticated scenarios intended both to predict the current trajectory and to try to understand how changes in emissions patterns could result in alternate futures. The 1990 IPCC report created four scenarios to model "four hypothetical future patterns of greenhouse gas emissions and their effect on the atmosphere." IPCC, *Policymaker Summary of Working Group III (Formulation of Response Strategies* 121 (1990), https://perma.cc/XE7U-DXNF. Climate policies could then be evaluated based on the benefits that might come from changing emissions patterns to conform with one of the reduced scenarios, or the consequences associated with sticking with the baseline.

The first scenario of these four scenarios was called the "business as usual," scenario, and was meant to capture what the future would look like in the absence of unforeseen events or changes to emission rates either through a shift in energy sources, a reduction in energy use, or changes in population trajectories. That scenario projected that cumulative greenhouse gas emissions would result in an atmospheric concentration in the year 2100 of more than 1,200 parts per million of carbon dioxide equivalent, a consequent radiative forcing of 10 watts per square meter, and a

global temperature rise of between 2.9 and 6.2 degrees Celsius above preindustrial values. *Id.* at 121–123 (*see* Figure 3). The second scenario assumed that various energy efficiency measures and emissions controls would be adopted globally, and that the share of the world's primary energy provided by natural gas would increase and the share of coal would decrease. *Id.* "Under this scenario, the cumulative effect of such measures is a CO_2 equivalent doubling around 2060" as opposed to 2025 in the business-as-usual scenario. The remaining two scenarios were intended to reflect futures where emission reduction efforts in addition to those in the second scenario were taken. These efforts included: "utilization of renewable energy sources, strengthening of the Montreal Protocol, and adoption of agricultural policies to reduce emissions from livestock systems, rice paddies, and fertilizers." *Id.* at 121.

The IPCC has since updated its scenarios several times. In 2005, the IPCC was beginning to produce a new generation of emissions scenarios but was worried that an extended development would delay the advance of climate modeling research. As a stopgap, the IPCC selected a set of four radiative forcing pathways to the year 2100 to be used immediately by researchers while scenario developers worked in parallel to develop socioeconomically plausible emissions scenarios to match. These pathways, called Representative Concentration Pathways, or RCPs, were drawn from the hundreds of existing emissions scenarios to represent a low, medium, high, and very high radiative forcing pathways. These scenarios were called RCP2.6, RCP4.5, RCP6.0, and RCP8.5, respectively, indicating the radiative forcing expected by 2100 (e.g., RCP8.5 assumed a pathway that reached a radiative forcing of 8.5 watts per square meter in 2100).

These scenarios were not intended—like IPCC's 1990 scenarios—to be *predictions* of different policy pathways. Indeed, in 2008 the IPCC stressed that "[i]t is an open research question as to how wide a range of socioeconomic conditions could be consistent with a given [RCP] pathway of forcing, including its ultimate level, its pathway over time, and its spatial pattern." IPCC, *IPCC Expert Meeting Report: Towards New Scenarios for Analysis of Emissions, Climate Change, Impacts, and Response Strategies*, at ix, 43 (Sept. 2007), https://perma.cc/NKC2-GULA. The IPCC warned researchers and policymakers against reading too much into the different scenarios: "The differences between the RCPs can therefore not directly be interpreted as a result of climate policy or particular socioeconomic developments." RCP Database (version 2.0, 2009), https://perma.cc/UJR3-MTYT.

But somewhere along the way some wires got crossed. When the RCP scenarios were published, the IPCC labeled RCP8.5 as the "business-as-usual" scenario, seemingly inadvertently branding that scenario as the baseline against which all future policy intervention would be set. This labeling was quickly set upon by climate activists, like Tom Steyer, who had been looking for ways to

"make climate change feel real and immediate." Burt Helm, *Climate Change's Bottom Line*, N.Y. Times (Jan. 31, 2015), https://tinyurl.com/4ehefamv. Steyer, joined by Michael Bloomberg and Hank Paulson, eventually funded a project which would result in the 2014 report, *Risky Business: The Economic Risks of Climate Change in the United States.* Risky Bus. Project (2014), https://perma.cc/KDN4-BNSD. That report focused on characterizing RCP8.5 not as one of several possible radiative forcing scenarios, but instead "as the pathway closest to a future without concerted action to reduce future warming." Roger Pielke Jr., *Climate Cooking*, The Honest Broker (Apr. 13, 2024), https://perma.cc/D3BA-E4PS.

The Risky Business Project spawned a host of papers that uncritically adopted this assumption. One 2016 paper, published in *Science*, compared the social and economic impacts from the "business as usual (RCP 8.5)" and "stringent emissions mitigation (RCP 2.6)." Tamma A. Carleton & Solomon M. Hsiang, *Social and Economic Impacts of Climate*, 353 Sci., no. 6304, Sept. 9, 2016, https://www.science.org/doi/10.1126/science.aad9837. Another used the same assumptions to project a 10 percent loss in U.S. GDP "under business-as-usual emissions (Representative Concentration Pathway 8.5)." Solomon Hsiang et al., *Estimating Economic Damage from Climate Change in the United States*, 356 Sci., no. 6345, at 1362 (June 2017), https://www.science.org/doi/10.1126/science.aal4369 (*see* Figure 5A). Both papers have been cited over 1,000 times and the 10 percent GDP loss projection was featured prominently in the Fourth National Climate Assessment and became a favorite headline of media outlets. *See* Amir Jina, *Will Global Warming Shrink U.S. GDP 10%? It's Complicated Says the Person Who Made the Estimate*, Forbes (Dec. 5, 2018), https://tinyurl.com/3625yjrf.

B. RCP8.5 is an incredibly implausible future.

Whatever its likelihood when it was first published, RCP8.5 has become increasingly implausible with every passing year. Hausfather & Peters, *supra*, at 619. EPA itself has recognized this repeatedly, though that hasn't stopped RCP8.5 from continuing to run the show in zombie form, as explained in more detail below.

This is wrong. There is strong evidence that both near-term and long-term greenhouse gas emissions are already well below those needed to create emissions scenarios associated with RCP8.5. There are several factors that have combined to achieve this.

First, as Zeke Hausfather and Glen Peters explained, the "[e]mission pathways to get to RCP8.5 generally require an unprecedented fivefold increase in coal use by the end of the century, an amount larger than some estimates of recoverable coal reserves." Hausfather & Peters, *supra*, at 619. But at this point this is unlikely to occur. "It is thought that global coal use peaked in 2013,

and although increases are still possible, many energy forecasts expect it to flatline over the next few decades." *Id.* With coal-derived energy gradually being replaced with natural gas or other low carbon sources, emissions per unit of energy will tend to decline, and absent a proportional rise in energy use, total emissions will fall.

Second, the high emissions scenarios associated with RCP8.5 also generally rely on a continued growth in global population, which would raise total emissions even if emissions per capita declined. But this isn't likely to happen either. There were 129 million births globally in 2021. GBD 2021 Fertility and Forecasting Collaborators, *Global Fertility in 204 Countries and Territories, 1950–2021, with Forecasts to 2100*, Lancet (Mar. 20, 2024), https://doi.org/10.1016/S0140-6736(24)00550-6. This is an increase from around 93 million in 1950, but a decline from the peak of 142 million in 2016. *Id.* Overall, fertility has declined steadily at a global level and across almost all countries and territories since 1950 and is likely to continue to do so until 2100, from a global total fertility rate of more than 4.8 births per woman in 1950 to approximately 2.2 in 2021. *Id* (*see* Figure 1). For nearly all countries sustained low fertility will produce a contracting population before the end of the 21st century. *Id.* With a declining population—particularly in wealthier countries which are responsible for higher per capita greenhouse gas emissions—emissions will also tend to decline.

These and other factors have led EPA to acknowledge that RCP8.5 is not a plausible emissions pathway. When it began to update its Social Cost of Greenhouse Gases methodology in 2022, EPA noted the weakness of models that depended on RCP8.5, and excised it from its own emissions projections, "based on a review of available sources of long-run projections for socioeconomic variables and GHG emissions necessary for damage calculations." EPA, *External Review Draft of Report on the Social Cost of Greenhouse Gases: Estimates Incorporating Recent Scientific Advances* 19 (Sept. 2022), https://perma.cc/QB6W-LBH7. Instead, EPA decided to use "the socioeconomic and emissions projections recently developed under the Resources for the Future Social Cost of Carbon Initiative." *Id.*

As shown in Figure 1 below, the Resources for the Future emissions projections that EPA used (the black line) are far, far less than those of RCP8.5, most closely approximated by the orange line, representing the somewhat different SSP5-8.5. That emissions scenario is so unlike all other projections of emissions that EPA felt the need to explain that SSP5-8.5 is the "only SSP-RCP pairing with CO_2 emissions projections outside the 1st to 99th percentile range of RFF-SPs." *Id.* at 24. In other words, RCP8.5 is the only scenario ever discussed in the Social Cost of Greenhouse Gases modeling that EPA considers to be essentially impossible.

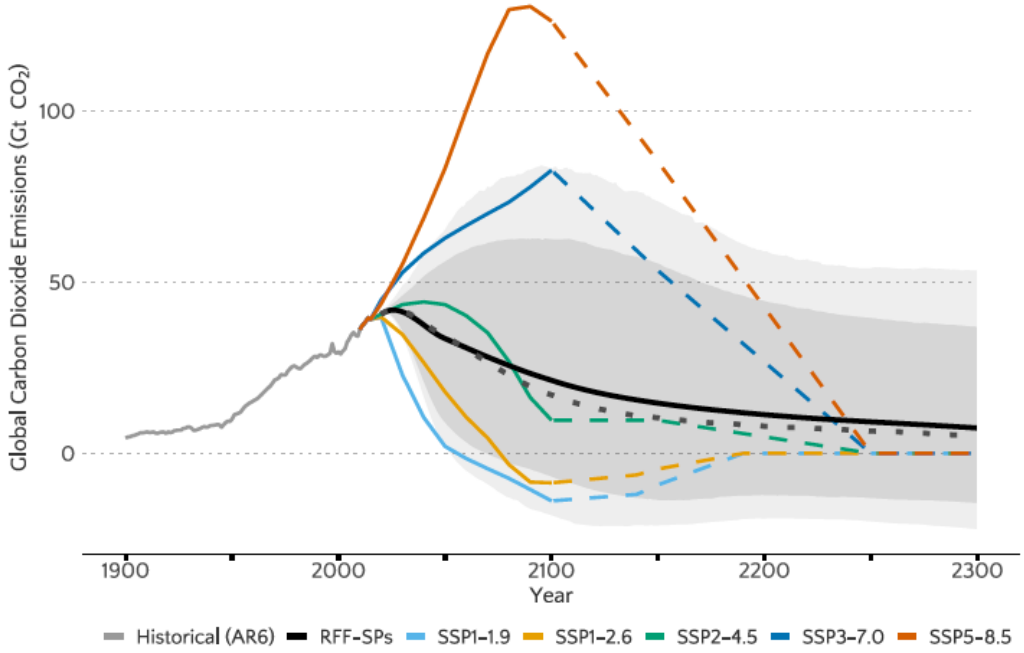

Figure 1: Net Annual Global Emissions of Carbon Dioxide (CO_2) under RFF-SPs and SSPs, 1900-2300. *Id.* at 25 (Figure 2.1.3).

C. The use of RCP8.5 in EPA's modelling undermines the damage predictions of FrEDI.

The draft framework purports to be capable of providing "projections of annual physical and economic impacts of climate change in the U.S. through the 21st century under any custom temperature scenario." FrEDI Draft Technical Documentation, *supra*, at 1. In other words, FrEDI provides damage as a function of temperature, and its users are free to supply their own temperature as a function of time. To estimate these damages, FrEDI uses "pre-processing," where damages are individually related to increasing temperatures via the development a mathematical function—typically a simple linear regression of damages on changes in temperature—across the 25 different "impact categories," most of which were the subject of an individual study under the EPA CIRA project. Pielke Rep.¶¶ 9–13.

But each of these impact functions uses RCP8.5 (or even more extreme scenarios) to project damages for temperature rises of 5°C or higher values above a 2010 baseline. *Id.* at ¶ 10, 19. Due to the nature of nonlinear impact at extreme temperatures, the more extreme the values that are included in creating a damage function, the higher the damage function will be at all temperatures. *Id.* at ¶ 30, 32, 48, 49. Thus, the use of the extreme RCP8.5 scenario results in much larger damages at lower temperatures than would result if extreme scenarios were not included, simply due to the linear fitting used to create the impact function. *Id.*

For example, projections of temperature related mortality—which appears to make up about 75 percent of the total damage, *see* FrEDI Draft Technical Documentation, *supra*, at 46 (Figure 5)—rely on the same Hsiang et al. study mentioned above that projected a 10 percent GDP reduction based solely on RCP8.5. *Id.* at 8–9 (Table 1). Virtually all of the damages associated with mortality in that study are dependent upon RCP8.5. Pielke Rep.¶ 43–45. At lower temperatures, up to around 3°C, there is virtually no correlation between temperature and mortality. *Id.*

This is unsurprising, as the broader scientific literature suggests that there is small but noticeable mortality decrease at low temperatures, due to a reduction in cold-related deaths. *See, e.g.*, Jangho Lee & Andrew E. Dessler, *Future Temperature-Related Deaths in the US: The Impact of Climate Change, Demographics, and Adaptation*, 7 GeoHealth art. no. e2023GH000799 (2023).. A 2015 meta-study found that 17 times more deaths are attributable to low temperatures than to high. *See* Antonio Gasparini et al., *Mortality Risk Attributable to High and Low Ambient Temperature: A Multicountry Observational Study*, 386 Lancet 369, Table 2 (2015), https://doi.org/10.1016/S0140-6736(14)62114-0 (showing a attributable mortality of 7.29 percent for cold and 0.42 percent for heat). Similarly, a 2021 study found that, while heat-related deaths have increased somewhat over the last two decades, they were more than offset by reductions in cold-related deaths, with the net effect that climate-related mortality has decreased by about 166,000 deaths per year. Qi Zhao et al., *Global, Regional, and National Burden of Mortality Associated with Non-optimal Ambient Temperatures from 2000 to 2019: A Three-stage Modelling Study*, 5 Lancet Planetary Health E415 (2021) https://doi.org/10.1016/S2542-5196(21)00081-4 (finding "global excess death ratio changed by −0.51 percentage points for cold temperatures and increased by 0.21 percentage points for hot temperatures, resulting in a net decline of −0.30 percentage points" with global excess deaths of approximately 5.5 million).

Similarly, FrEDI's assessment of air quality—which makes up about 7 percent of the total damage, *see* FrEDI Draft Technical Documentation, *supra*, at 46 (Figure 5)—relies on a study that uses only RCP8.5 to generate temperature changes across two climate models and four time steps. FrEDI then uses a linear regression to fit impact functions from 0°C mean warming up to 7°C mean warming. Pielke Rep.¶ 46. But when a linear regression is performed with warming levels above 4.5°C (only possible with RCP8.5) excluded, any significant relationship between mean warming and air-quality deaths disappear. *Id.* at ¶ 48–49. In other words, the use of RCP8.5 in the original study creates extreme values that, when fitted with a linear trend, results in increasing losses from 0°C to 4.5°C despite no evidence of these losses in the underlying data.

Prof. Pielke's declaration goes to highlight how similar results occur for the wind damage module, the sea level rise module, and could be expected from almost every other module within the

draft framework. Correcting the erroneous use of RCP8.5 in just those modules would likely reduce the damage projections of FrEDI by a factor of 10.

D. FrEDI's accuracy is further undermined by the assumption of no or limited adaptation.

Humanity has an impressive track record of reducing vulnerability to extreme weather. There has been an over 90 percent decline in annual global deaths from extreme weather over the last century even while the world population has more than tripled. Hannah Ritchie & Pablo Rosado, *Natural Disasters*, Our World in Data (rev. Jan. 2024), https://perma.cc/W9CH-QRWU. One recent study documented a "a clear decreasing trend in both human and economic vulnerability, with global average mortality and economic loss rates that have dropped by 6.5 and nearly 5 times." Giuseppe Formetta & Luc Feyen, *Empirical Evidence of Declining Global Vulnerability to Climate-related Hazards*, 57 Glob. Env't Change, art. 101920, at *1 (2019), https://doi.org/10.1016/j.gloenvcha.2019.05.004.

This is because wealthier societies with abundant access to energy and technology are far better at adapting to extreme weather than our predecessors. When hot weather threatens heat stroke, we install air conditioners. When areas become prone to flooding, we build on higher ground. Indeed, the World Health Organization has explained in its own *Quantitative Risk Assessment of the Effects of Climate Change*, that "the attributable mortality is zero when 100% adaptation is assumed." WHO, at 23 (2014), https://tinyurl.com/24wc8ddv.

But FrEDI largely ignores this reality. Instead, the framework only considers adaptation in a few select sectors and even there does so incompletely. Eleven sectors—including the temperature-related mortality sector, which dominates damages—assume *no additional adaptation*. Most of the others assume only a limited form of adaptation. The only unqualified use of adaptation occurs in the "winter recreation" sector, where adaptation is expected to mitigate revenue lost from suppliers of alpine, cross-country skiing, and snowmobiling.

This effect is exacerbated by a restrictive definition of adaptation that has been broadly adopted by the climate impacts literature. *See* Patrick Brown, *The IPCC Report on the Impacts of Climate Change is Depressing*, Breakthrough Inst. (Mar. 30, 2023), https://perma.cc/NKF4-WC9H. In this literature, adaptation is often narrowly defined as only those actions explicitly taken to reduce the impact of climate change. Thus, if some technological or socioeconomic trend would have occurred in the absence of climate change, then it cannot be counted as adaptation. "For example, the adoption of tractors instead of manual labor can cause a large increase in [crop]

yields, but this would not be an explicit adaptation to climate change, and thus it would typically not be considered in a projection of future [crop] yields that 'accounts for adaptation.'" *Id.*

As Brown explains

> Herein lies the obscurantism. Although most readers will understand the word "decrease" to mean a *decrease relative to today*, the IPCC uses the word to mean a decrease *relative to a hypothetical world without climate change*. So crop yields can be projected to continue to increase overall, but still be said to decrease compared to a hypothetical world with no climate change but in which everything else is the same.

Id. While it is appropriate for damages framework is right to use the right reference, this highlights another important point. Money spent to avoid climate change could also potentially be used to "adapt" (using the limited definition adopted above) or advance other sectors. Thus, even if FrEDI was accurately capturing the damages from future climate change, it cannot capture the damages from investing the money spent to reduce climate change instead of in more useful quarters.

While precise quantification of future reduced vulnerability is difficult, there is no doubt that at least some adaptation will occur. Even with no technological changes—a highly improbable future—there are already meaningful ways that populations can reduce their exposure to the most damaging aspects of climate change. Consequently, an accurate projection of the future impacts and damages of climate change must include some discounting of damages as a result of cost-effective adaptation. Failure to consider this important aspect of the problem further undermines the validity of FrEDI's damage projections, and the reliability of the model.

III. FrEDI Violates the Information Quality Act.

The Information Quality Act ("IQA") places strict requirements on federal agencies to ensure the accuracy of information they disseminate to the public. Pub. L. No. 106-554, app. C, § 515, 114 Stat. 2763A-153 (2000) (H.R. 5658). To that end, the IQA mandates that agencies implement measures to guarantee the quality, objectivity, utility, and integrity of released information. Both the Office of Management and Budget ("OMB") and individual agencies have developed guidelines to uphold these standards.

EPA's own IQA guidance explains that "[w]hen evaluating environmental problems or establishing standards," EPA must use "a 'weight-of-evidence' approach that considers all relevant information and its quality." EPA, 260R-02-008, *Guidelines for Ensuring and Maximizing the Qual-*

ity, Objectivity, Utility and Integrity of Information Disseminated by the Environmental Protection Agency § 6.4 (Oct. 2002) ("EPA IQA Guidance"), https://perma.cc/8QV4-K9BH. EPA explains that doing this requires ensuring two related things about the information it uses:

> (A) The substance of the information is accurate, reliable and unbiased. This involves the use of:
>
> > (i) the best available science and supporting studies conducted in accordance with sound and objective scientific practices, including, when available, peer reviewed science and supporting studies; and
> >
> > (ii) data collected by accepted methods or best available methods (if the reliability of the method and the nature of the decision justifies the use of the data).
>
> (B) The presentation of information on human health, safety, or environmental risks, consistent with the purpose of the information, is comprehensive, informative, and understandable. In a document made available to the public, EPA specifies:
>
> > (i) each population addressed by any estimate of applicable human health risk or each risk assessment endpoint, including populations if applicable, addressed by any estimate of applicable ecological risk;
> >
> > (ii) the expected risk or central estimate of human health risk for the specific populations affected or the ecological assessment endpoints, including populations if applicable;
> >
> > (iii) each appropriate upper-bound or lower-bound estimate of risk;
> >
> > (iv) each significant uncertainty identified in the process of the assessment of risk and studies that would assist in resolving the uncertainty; and
> >
> > (v) peer-reviewed studies known to the Administrator that support, are directly relevant to, or fail to support any estimate of risk and the methodology used to reconcile inconsistencies in the scientific data.

Id. FrEDI fails both tests.

First, the "substance of the information" presented in FrEDI is not "accurate, reliable[, or] unbiased." A predictive model that produces inflated damage estimates through the use of the flawed RCP8.5 scenario is not using the "best available" data, as it is widely recognized as out-of-date

and as having been empirically falsified. Sound scientific practice requires collecting data on future damage projections from studies that consider reasonably likely future outcomes and not results tainted by a scenario that EPA itself has conceded is incredibly improbable. FrEDI's systematic reliance on RCP8.5 indicates a failure by EPA to consider all relevant factors or reflects an inaccurate understanding of the causal relationships within the system being modeled. The biased data implies the model was built on information that is deliberately unrepresentative, leading to deliberately unreliable and misleading predictions.

Further, FrEDI's use of a linear fit on non-linear data violates the requirement for the "science and supporting studies [to be] conducted in accordance with sound and objective scientific practices." Linear models assume a constant rate of change, and are unsuitable for complex systems like climate change where relationships are rarely so simple. Here, the mismatch between model and reality undermines accuracy. As demonstrated in the attached expert report of Roger Pielke, the reliance on linear fits to non-linear data leads to consistent overprediction and introduces an inherent bias into the output.

Second, the information is not presented in a way that either "expected risk" or the "significant uncertaint[ies]" in FrEDI are "comprehensive, informative, and understandable." The draft framework, by consistently overestimating damages, paints an inaccurate and misleading picture of true "human health, safety, or environmental risks." This undermines the IQA's requirement to present information in a way that is "comprehensive, informative, and understandable." Systematically inflating risk makes it impossible for the public to gain a true understanding of potential impacts, rendering the FrEDI misleading rather than informative. Additionally, neglecting to provide even the option for alternative calculations using less extreme scenarios directly violates (B)(iii), which mandates presentation of "appropriate upper-bound or lower-bound estimate[s] of risk."

Further, FrEDI's exclusive reliance on studies anchored in RCP8.5 casts doubt on the objectivity of the results. The EPA's IQA guidance demands that EPA specify studies that "support, are directly relevant to, or fail to support any estimate of risk." Including only biased sources gives the illusion of scientific rigor while actively undermining the objectivity and comprehensiveness the legal standard is designed to ensure. This casts doubt on the draft framework's ability to provide the unbiased, scientifically sound risk assessment that the IQA expects. Indeed, the only thing certain about the FrEDI model is that it will mislead and confuse.

IV. FrEDI Violates EPA's Scientific Integrity Policy.

EPA's Scientific Integrity Policy explains that "[s]cience is the backbone of the EPA's decision-making" and that the agency's mission "depends upon the integrity of the science on which it relies." EPA, *Scientific Integrity Policy* 2 (2012), https://perma.cc/36T6-248U. To that end, the policy requires that every scientist adheres to "information quality" and "quality assurance" policies and to "act honestly and refrain from all of scientific misconduct." *Id.* at 6. As particularly relevant here, this includes the requirement that "when communicating scientific findings, Agency employees include a clear explication of underlying assumptions, accurate contextualization of uncertainties, and a description of the probabilities associated with both optimistic and pessimistic projections." *Id.* at 7.

The draft framework directly violates the Scientific Integrity Policy's core principles of "information quality" and "quality assurance." First, the model's systematic overestimation of risk by cherry-picking studies based on the now-highly-improbable RCP8.5 scenario demonstrates a complete disregard for data accuracy and completeness. Additionally, by using a linear fit on non-linear data to project damages even when underlying studies do not support it fundamentally undermines the quality of the projections presented. As demonstrated above, FrEDI's use of linear fitting overstates projected damages at low temperatures by at least an order of magnitude. This is not honest.

Furthermore, framing the model as scenario neutral and claiming that FrEDI can provide "projections of annual physical and economic impacts of climate change in the U.S. through the 21st century under *any custom temperature scenario*," FrEDI Draft Technical Documentation, *supra*, at 1 (emphasis added), while simultaneously relying solely on an outdated and unrealistic scenario associated with extreme increases in temperature is demonstrably misleading. True scenario neutrality would necessitate incorporating a range of possibilities, including damage function fit to less severe scenarios. Omitting this possibility creates an incomplete and biased picture, hindering a comprehensive understanding of potential risks. The Scientific Integrity Policy explicitly requires a "clear explication of underlying assumptions" and an "accurate contextualization of uncertainties." But the draft framework fails to meet these standards.

Finally, the draft framework completely neglects to describe the "probabilities associated with both optimistic and pessimistic projections." This omission directly contradicts the Scientific Integrity Policy's guidelines for communicating scientific findings. By failing to provide a balanced perspective on potential outcomes, the model prioritizes worst-case scenarios without ac-

knowledging their likelihood (or lack thereof). This approach undermines transparency and prevents informed decision-making. As the policy explains, EPA's mission "depends upon the integrity of the science on which it relies." The current draft fails that mission.

The Scientific Integrity Policy is not an aspirational statement. The public relies on EPA to candidly present accurate information with all of the necessary caveats and explanations. As a result, violations of the Scientific Integrity Policy can result in formal disciplinary action against EPA employees, including reprimands, suspensions, or even termination of employment. Serious misconduct—like deliberately misrepresenting the "probabilities associated with both optimistic and pessimistic projections"—can trigger investigation by the EPA's Office of Inspector General or other oversight bodies.

V. Using FrEDI in Other Contexts Would Undermine Those Actions.

EPA's draft framework does not exist in a vacuum. As the agency explained, FrEDI was developed as a tool "to provide projections of annual physical and economic impacts of climate change in the U.S. through the 21st century … for a broad range of economically important impact category sectors (e.g., impacts across human health, infrastructure, labor, electricity, agriculture, and ecosystems and recreation)." 89 Fed. Reg. at 13717.

Previous versions of FreDI have been used in a variety of contexts and could be used in others in the future. *FrEDI Publications and Applications*, EPA (updated Feb. 22, 2024), https://perma.cc/DSC3-ZYZ3. These include:

- In the regulatory impact analysis for major rules. *See, e.g.*, EPA, EPA-452/R-23-013, *Regulatory Impact Analysis of the Standards of Performance for New, Reconstructed, and Modified Sources and Emissions Guidelines for Existing Sources: Oil and Natural Gas Sector Climate Review* (Dec. 2023), https://perma.cc/CL6B-GBL8; EPA, Doc. ID No. EPA-HQ-OAR-2021-0317-1549, *Supplementary Material for the RIA for the Supplemental Proposed Rulemaking, NSPS and EG for Existing Sources: Oil and Natural Gas Sector Climate Review – EPA External Review Draft of Report on the Social Cost of Greenhouse Gases: Estimates Incorporating Recent Scientific Advances* (Sept. 2022), https://tinyurl.com/ypdeby7c.

- In the environmental reviews conducted to satisfy the requirements of the National Environmental Policy Act ("NEPA"). *See* 42 U.S.C. § 7609 ("The Administrator shall review and comment in writing on the environmental impact of any matter … in any (1) legislation proposed by any Federal department or agency, (2) newly authorized Federal projects for construction and any major Federal agency action …, and (3) proposed regulations published by any department or agency of the Federal Government.").

- In determining the allocation of grant funding. *See, e.g.*, Pub. L. No. 117-169, § 60103, 136 Stat. 1818, 2065 (2022) (establishing the "Greenhouse Gas Reduction Fund"); *id.* § 60114, 136 Stat. at 2076 (establishing the "Climate Pollution Reduction Grants"); *id.* § 60201, 136 Stat. at 2078 (establishing "Environmental and Climate Justice Block Grants").

- In projecting exposure to costs and lost revenue by the White House or other federal agencies. *See* OMB, White Paper, *Budget Exposure to Increased Costs and Lost Revenue Due to Climate Change: A Preliminary Assessment and Proposed Framework for Future Assessments* (Mar. 2023), https://perma.cc/5U9K-AW57.

In essence, a flawed framework acts like a faulty map. It leads to a distorted view of the true risks, hindering effective decision-making and leading the federal government down dead-end roads, delaying effective climate action while wasting trillions. Given the methodological flaws identified in EPA's Framework, any use in these or other contexts would create legal vulnerabilities for any agency actions that might rely upon FrEDI as part of the justification for the agency action.

For regulatory impact analyses, analysis based on FrEDI could make the rule arbitrary and capricious. "The APA's arbitrary-and-capricious standard requires that agency action be reasonable and reasonably explained." *FCC v. Prometheus Radio Project*, 592 U.S. 414, 423 (2021). Agencies "must … articulate a satisfactory explanation for [their] action including a 'rational connection between the facts found and the choice made.'" *Motor Vehicle Mfrs. Ass'n of the U.S., Inc. v. State Farm Mut. Auto. Ins. Co.*, 463 U.S. 29, 43 (1983). Because FrEDI does not represent a "reasonable" accounting of damages, costs calculated with FrEDI cannot provide a "satisfactory explanation" for agency action.

For example, in EPA's recently finalized *Standards of Performance for New, Reconstructed, and Modified Sources and Emissions Guidelines for Existing Sources: Oil and Natural Gas Sector Climate Review*, EPA uses FrEDI as an alternative domestic justification for the benefits of its rule. EPA, *supra*, at 3-24. The rule primarily relies on EPA's recent update of the Social Cost of Greenhouse gas emissions, by which EPA purports to realize billions of dollars in benefits to offset the costs of the rule.[2] *Id.* But in response to "commenters who suggest that the EPA can or

[2] EPA's Social Cost of Greenhouse gases estimates are also gross overstatements of damage because RCP8.5 is used in the damage functions of those calculations. EPA maintains RCP8.5 in each of the three damage functions in that model: the Data-driven Spatial Climate Impact Model developed by the Climate Impact Lab; the Greenhouse Gas Impact Value Estimator model developed under Resources for the Future's Social Cost of Carbon Initiative; and the

should use a metric focused on benefits resulting solely from changes in climate impacts occurring within U.S. borders" EPA also ran an alternative analysis using FrEDI to show that the rule would still be justified because impacts within the contiguous United States "are estimated to be $27 billion." *Id.* at 3-25. As explained in detail above, this estimate of benefits fails because FrEDI systematically overstates damages.

FrEDI would similarly undermine a NEPA environmental impact analysis or environmental assessment. Such analyses require the agency to make quantitative assessments of the impacts of a project. When faced with uncertainty as to impacts, NEPA regulations require that "[t]he agency's evaluation of such impacts [be] based upon theoretical approaches or research methods generally accepted in the scientific community." 40 C.F.R. § 1502.21(c)(4). But RCP8.5, and thus the damages assessed by the draft Framework, are not "generally accepted in the scientific community." Instead, they have been widely rebuffed, including by EPA.

Nor can FrEDI be used to effectively allocate grant funds. Many grants, including EPA's Greenhouse Gas Reduction Fund, are to be distributed on a "competitive basis." 42 U.S.C. § 7434(a). *Cf. Competitive*, Britannica Dictionary, https://tinyurl.com/yzzbke5h (last accessed Apr. 24, 2024) ("a situation in which people or groups are trying to win a contest or be more successful than others"). It is impossible to determine what projects would be more successful if the projections of their benefits are based on a flawed accounting of climate damage.

FrEDI is also unsuitable for performing budget risk exposure analysis or other economic policy projections. Budgets are based on priorities and risks. If the true costs of climate change are overstated, federal resources might be directed away from more pressing issues. Even within the climate context, inaccurate representations of damages direct critical investments away from the most effective forms of climate adaptation and mitigation.

The likelihood that EPA—or other actors within the executive branch—will encourage agencies across the federal government to use FrEDI in their own policymaking processes magnifies the possibility that the methodological flaws in FrEDI will undermine the integrity of future federal policymaking. This makes it all the more urgent for EPA to withdraw FrEDI until these systematic methodological issues are addressed.

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global damage function estimation based on Howard and Sterner. Approximately 50 percent of EPA's damages are based on projected temperature changes of between 3–8°C by 2300. *See* Roger Pielke Jr., *Secret Sauce*, The Honest Broker (Dec. 4, 2023), https://perma.cc/RCK2-MCNR.

VI. FrEDI Propagates Misinformation.

The Biden Administration has consistently expressed its desire to combat "misinformation" across a variety of spheres, even going so far as to establish Disinformation Governance Board in April 2022 before rapidly "pausing" the board less than a month later after predictable constitutional issues were raised. *See* Benjamin Hart, *Poorly Conceived Biden Disinformation Board Put on Pause*, N.Y. Mag. (May 18, 2022), https://tinyurl.com/4rmd3xah. The "misinformation" at issues spans a wide range of topics, but the most frequently recurring are election misinformation, health misinformation, and climate misinformation.

In June 2022, at an Axios event entitled "A Conversation on Battling Misinformation," White House National Climate Advisor Gina McCarthy took aim at "climate misinformation" saying: "We have to get together; we have to get better at communicating, and frankly, the tech companies have to stop allowing specific individuals over and over to spread disinformation." *Missouri v. Biden*, 680 F. Supp. 3d 630, 722 (W.D. La. 2023). McCarthy explained that climate "misinformation" went beyond just "denying the problem," and extended to anything that mislead its readers "about the costs associated with" climate change, green technologies, and the effectiveness of government policies. Editorial, *Climate Change Censorship: Phase Two*, Wall St. J. (June 13, 2022), https://tinyurl.com/53w55eba. As an example of this new "disinformation," McCarthy cited the response to the week-long power outage in Texas in February 2021 following Winter Storm Uri. "'The first thing we read in the paper was' that the black-outs occurred 'because of those wind turbines,' she said. 'That became the mantra.'" *Id.*

McCarthy was wrong about the specifics—wind turbines failing *was* a but-for cause of the black-outs, *see* Michael Buschbacher & Taylor Myers, *FERC Gaslights America*, Am. Conservative (Sept. 6, 2022), https://perma.cc/BUZ6-8VEM—but her point is valid, nonetheless. Accurate information about the trajectory of global temperatures, damage from current and future weather events, and the effectiveness of various technologies *is* critical to policymaking in highly complex and technical fields like environmental and energy law. The special deference often given to the federal government when it speaks only heightens the importance of making sure that speech is accurate.

FrEDI is not accurate. As detailed above and in the attached expert report of Roger Pielke, EPA's Framework makes several errors which cause it to systematically overstate the damage that can be expected from climate change. Because these overstatements are made by government tool intended to be used across a variety of contexts, this misinformation can be expected to

spread, and metastasize, negatively shaping policy and public opinion in ways that could be incredibly damaging.

VII. Conclusion

FrEDI is methodologically flawed and politically inflected. Its finalization would violate the Information Quality Act, would violate EPA's own scientific integrity policy, and would infect every action that subsequently relied on it. For these reasons, the Center for Environmental Accountability urges the EPA to withdraw the draft.

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