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“Examining the Macroeconomic Impacts of a Changing Climate”

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Rayburn Office Building, Room 2139

Chair Cleaver, Ranking Member Stivers, and Members of the Committee,

Thank you for the opportunity to appear before the Committee today to testify on the macroeconomic impacts of a changing climate and the role of climate-related financial reporting. My name is Alicia Seiger and I am the Managing Director of the Sustainable Finance Initiative at Stanford University’s Precourt Institute for Energy. I also manage the Steyer-Taylor Center for Energy Policy and Finance, a joint initiative of the Stanford Graduate School of Business and Law School, and I teach courses on climate finance and climate mitigation at Stanford Law school.

The macroeconomic impacts of a changing climate are extensive and well documented. Given the areas of expertise among my fellow witnesses, my testimony focuses on how climate change is unique among other structural economic drivers and the role of climate-related financial reporting. My three main points can be summarized as follows: 1) climate change merits special consideration; 2) climate risks can be measured and analyzed but reporting is

only as useful as the quality of the data on which it is sourced; and 3) climate-related financial reporting can form the basis for good policy and market stability.

The stated purpose of this hearing is to examine the “macroeconomic” impacts of climate change. Because the proposed bill refers to both the Fed and the SEC, I also include discussion of private risk (i.e. the micro) and weave the roles of the Fed and the SEC throughout.

### **The Fed and The SEC – Systemic and Private Risks**

The Fed’s purview is to ensure economic growth and price stability and maximize employment. The SEC is primarily concerned with the efficiency and credibility of investment markets, the stock market in particular. The following simplified and fact-based scenario in Florida illustrates the relationship between climate change and the responsibilities of the SEC and the Fed.

Rising sea-level, sunny-day flooding and storm surges impact property values in Miami. As the amount of property damage increases, insurance companies raise premiums and eventually exit the market entirely. Without access to insurance and with frequent damage from storms and flooding, people are less likely to choose to purchase real estate in Miami. The SEC is responsible for protecting investors from the private risk of financial losses by, say, requiring issuers of securities whose value is tied to Miami real estate to properly disclose the economic impact of these physical impacts.

A July 2019 report from the Union of Concerned Scientists predicted that Florida is likely to see temperatures over 100 degrees for four months every year by mid-century.<sup>1</sup> Well before mid-century, prolonged extreme heat is likely to deter the elderly from retiring to the state. With no state income tax, the Florida economy is supported by retirees and a growing housing market.<sup>2</sup> A reduction in the flow of retirees and the lack of availability of home insurance in the country's fourth largest economy poses systemic risk to the state and the U.S. mortgage market. The Fed, presumably, does not want that set of circumstances to come as a surprise.

### **Climate-related impacts are unique among other structural changes**

The Fed considers many macroeconomic trends affecting the economy and financial system. Climate change however, has four distinctive characteristics that merit special consideration and management.<sup>3</sup>

- 1. Climate change is not an environmental issue, it's an everything issue.** Climate change affects all agents in the economy, across all sectors and geographies.
- 2. Climate change is foreseeable.** Climate science models offer businesses, investors and policy-makers a high degree of certainty that physical and transition risks will materialize in the future.
- 3. Climate change cannot be reversed.** According to scientists, climate change will have irreversible consequences for our planet.

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<sup>1</sup> <https://www.ucsusa.org/press/2019/southeast-region-areas-endure-about-four-months-year-when-feels-temperature-exceeds-105>

<sup>2</sup> <https://www.forbes.com/sites/adammillsap/2018/06/06/floridas-population-is-booming-but-should-we-worry-about-income-growth/#67351f56134d>

<sup>3</sup> [https://www.banque-france.fr/sites/default/files/media/2019/08/19/ngfs-report-technical-supplement\\_final\\_v2.pdf](https://www.banque-france.fr/sites/default/files/media/2019/08/19/ngfs-report-technical-supplement_final_v2.pdf)

- 4. Climate is a long-term condition that depends on near-term actions.** Enough global warming is already “baked into the system” to cause significant disruption and impacts to financial assets regardless of the speed and scale of a transition. However, the ultimate magnitude of future impacts and future costs will be determined by actions taken today.<sup>4</sup>

To delay action is itself a decision to enter unprepared into a more volatile economy and increase the likelihood of more abrupt and disorienting market corrections.

To better understand the macroeconomic impacts of a changing climate, it is useful to consider the drivers of risk. There are two primary drivers – physical risk and transition risk.

### **Physical and Transition Risks**

Physical risks stem from chronic and acute changes in weather patterns including storms and floods, droughts, sea-level rise, wildfires, and extreme heat. Physical impacts disrupt supply chains and consumption patterns, threaten real assets (including property and agriculture), and disturb the health and movement of people.

Physical risks can add-up to significant financial losses. In the case of insured losses, insurance and reinsurance firms are impacted by higher claims. If losses are uninsured, the burden

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<sup>4</sup> According to a Harvard meta-analysis, a one-decade delay in addressing climate change would lead to about a 40% increase in the net present value cost of addressing climate change. <https://voxeu.org/article/cost-delaying-action-stem-climate-change-meta-analysis>

ultimately falls on the US taxpayer. Uninsured losses also create uncertainty in federal budgets in the form of large and unexpected disaster relief. Physical risks also threaten asset values and increase credit risk for banks and investors. The frequency and intensity of losses from extreme weather is rising exponentially. Consider this, in the 35-year period prior to 1990, the average number of billion-dollar weather related disasters globally was 5 per year. In 2017, there were 16 separate billion-dollar disaster events in the U.S. alone.<sup>5</sup>

Transition risks rise from a suite of factors as economies and enterprises transition from low to high resilience and from high to low-carbon intensity. Price dislocations can result from misjudging the pace and scale of technology innovation and failing to prepare for abrupt shifts in policy and consumer behavior. Investments in long-lived emissions-intensive assets face the risk of becoming so-called “stranded assets,” retired before the end of their productive lifespan, thereby imposing financial losses. While emphasis has been placed on risks to firms involved in the production and distribution of fossil fuels, transition risk will impact asset values across utilities, heavy industry, petrochemicals, cement, transportation (including aviation and shipping), real estate and agriculture.

The degree to which an economy is impacted by transition risk can depend on where it sits on the spectrum of globalization. Highly globalized economies have less control over the impact of transition risks. For example, the stability of the German automotive sector is highly subject to

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<sup>5</sup> <https://www.climate.gov/news-features/blogs/beyond-data/2017-us-billion-dollar-weather-and-climate-disasters-historic-year>

electric vehicle (EV) policy in the European Union and China. And U.S. investors are subject to policy and technology transitions in countries where their investments are deployed or operate.

Companies and investors also face liability risk as the possibility of claims for damages increase and climate-related losses increase. The increasing sophistication of attribution science (i.e. the likelihood that a particular extreme weather event was caused by climate change) will serve to increase the threat of legal liability.<sup>6</sup>

### **The value of reporting and disclosure**

The value of climate risk reporting is two-fold. First, investors benefit from robust and comparable data when trying to determine how climate risks and opportunities impact companies and projects. And second, businesses and workers often find that climate-related risk reporting catalyzes ingenuity, improves strategic thinking, and increases competitiveness. In sum, you manage what you measure and if you manage it, you can improve performance.

In recognition of the role disclosure can play in preventing financial instability, and following his seminal “Tragedy of the Horizon” speech at Lloyd’s of London in September 2015<sup>7</sup>, Governor of the Bank of England and G20 Financial Stability Board (FSB) Chair Mark Carney established the Task Force on Climate-related Financial Disclosures (TCFD). The final TCFD recommendations,

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<sup>6</sup> <https://www.scientificamerican.com/article/scientists-can-now-blame-individual-natural-disasters-on-climate-change/>

<sup>7</sup> <https://www.bankofengland.co.uk/speech/2015/breaking-the-tragedy-of-the-horizon-climate-change-and-financial-stability>

issued in 2017, provided a framework for companies to develop more effective climate-related financial disclosures and marked a positive step toward ensuring greater stability of the global financial system.

Investors have repeatedly validated and echoed the intention of the TCFD. In June 2019, 477 investors with \$34 trillion (USD) in assets urged world leaders to step up ambition on climate change. The statement had an emphasis on improving corporate climate risk disclosure in financial filings, including asking governments to improve climate-related financial reporting and commit to implementing the TCFD recommendations.<sup>8</sup>

Companies have also benefited from following the TCFD reporting framework and employing voluntary disclosure reporting such as those provided by the Sustainable Accounting Standards Board (SASB) and CDP (formerly the Carbon Disclosure Project.) Based on analysis of corporate disclosures from 215 of the world's 500 biggest companies, CDP found that these firms faced roughly \$1 trillion in costs related to climate change unless they took proactive steps to prepare.<sup>9</sup> According to research from Ceres, a sustainability non-profit on whose Board of Directors I serve, companies that disclose climate-related financial risks in annual financial filings are nearly twice as likely to have time-bound commitments to reduce GHG emissions than companies that do not.<sup>10</sup>

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<sup>8</sup> <https://theinvestoragenda.org/wp-content/uploads/2019/07/190704-GISGCC-correction-3.pdf>

<sup>9</sup> <https://www.cdp.net/en/research/global-reports/global-climate-change-report-2018>

<sup>10</sup> <https://www.ceres.org/resources/roadmap-for-sustainability>

In June 2019, the FSB published a TCFD status report that found while disclosure has increased since 2016, it is still insufficient for investors given the lack of specificity and standardization of data. The report also found that mainstreaming climate-related issues requires the involvement of multiple functions within a firm.<sup>11</sup> This is also true for governments - mitigating and managing the impacts of climate change is an all-agencies on deck exercise. As the head of the International Monetary Fund Christine Lagarde put it, “any institution has to actually have climate change risk at the core of their understanding of their mission.”<sup>12</sup>

### **Limits of current risk assessment models**

While reporting is valuable, the value of reports depends entirely on the quality of the underlying models, assumptions and data sources. Physical risk is relatively straightforward to analyze because of the robust volume of observations from climate science models. Today, leading companies and investors are using granular models and machine learning techniques to assess physical risk to assets and operations.

Transition risk is more difficult to analyze because assessment models have fewer observations and less certainty than physical risk models. The Network for Greening the Financial System (NGFS) is a group of thirty-six Central Banks and Supervisors, collectively representing five continents and half of global GHG emissions, who voluntarily share experiences and best practices in pursuit of climate risk management. In July 2019, the NGFS published a technical

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<sup>11</sup> <https://www.fsb.org/2019/06/tcfd-report-finds-encouraging-progress-on-climate-related-financial-disclosure-but-also-need-for-further-progress-to-consider-financial-risks/>

<sup>12</sup> <https://www.nytimes.com/2019/09/04/business/climate-change-ecb-lagarde.html>

supplement report entitled “Macroeconomic and financial stability: Implications of climate change.” The report identifies limitations of current risk assessment models and charts a course to fill analytical gaps. The report concludes:

Financial stability assessment using modeling approaches necessitates more bottom-up quantitative estimates of risk for individual issuers and borrowers which is currently lacking. There is also a need to better understand how physical and transition risks are interrelated, and the potential for climate-related feedback loops between the economy and financial system.<sup>13</sup>

The recent bankruptcy of my utility, Pacific Gas & Electric, exemplified the lack of prevalence and sophistication with regard to climate-risk modeling, and the relationship between private and systemic risk from climate change. PG&E outperformed its peers on Environment, Social and Governance (ESG) metrics. But ESG ratings do not adequately account for the risk of increased heat and drought, liability risk, shifting land-use patterns, and safety lapses. Passive index investors had no warning, and even few active investors tracked the foreseeable consequences of California’s devastating wildfires on the utility’s share price. In the end, PG&E’s bankruptcy not only caused billions in losses for shareholders, but also losses to insurers, customers, creditors and taxpayers.<sup>14</sup> The path forward for California’s utility, insurance, and housing policies remain unclear.

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<sup>13</sup> [https://www.banque-france.fr/sites/default/files/media/2019/08/19/ngfs-report-technical-supplement\\_final\\_v2.pdf](https://www.banque-france.fr/sites/default/files/media/2019/08/19/ngfs-report-technical-supplement_final_v2.pdf)

<sup>14</sup> <https://www.forbes.com/sites/chunkamui/2019/01/24/pge-is-just-the-first-of-many-climate-change-bankruptcies/#553624887e5f>

Without mandates and standards, that status quo leaves investors to grapple with limited and largely unhelpful information. The current practice of confounding ESG and climate risk and the lack of enforcement of the SEC’s current guidance regarding climate change disclosure<sup>15</sup> has pushed the development of next generation Integrated Assessment Models (IAMs) to pioneering entrepreneurs and a small group of NGOs. IAMs are models that combine a climate science module describing how emissions derived from an economic activity impact temperature and an economic module describing how economic outcomes driven by rising temperatures and shifts in technology, policy and consumer behavior. Universities are playing a role in developing next generation IAMs too, including the Stanford Sustainable Finance Initiative. But most of this work is being done either for foreign governments or for niche applications. Mandated reporting requirements will improve and standardize risk models and better protect financial stability and economic growth.

### **An investor perspective – New York State Common Retirement Fund**

The year I spent as an advisor to New York State Comptroller Thomas DiNapoli in his capacity as the sole fiduciary of the \$210 billion New York State Common Retirement Fund (NYCRF) illustrated the challenges investors confront in the face of limited climate-related financial information.

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<sup>15</sup><https://www.ceres.org/sites/default/files/Fact%20Sheets%20or%20misc%20files/Ceres%20Investor%20Letter%20SEC%20Concept%20Release%207-20-16.pdf>

Our Decarbonization Advisory Panel’s recommendations<sup>16</sup> were well received and within two months, the Comptroller and his staff issued a Climate Action Plan<sup>17</sup> that largely embodied the thrust of our panel’s recommendations. But my work with NYCRF made clear the limitations of current climate-related risk disclosure (e.g. voluntary, limited, and incomparable) and the need for more robust, consistent, comparable and granular climate-risk reporting and analysis by companies, asset managers and consultants.

NYCRF is a leader among its peers with regard to climate change. Its investment staff have worked with third-party experts to conduct climate risk analyses at the portfolio and asset level and design new low-emission investment products. And yet, despite NYCRF’S willingness to pursue our panel’s recommendations, its proactive posture on investing in climate solutions and engaging companies on climate, and its efforts to practice best-in-class climate-related research and product development, NYCRF remains highly exposed to climate risk.

Like most large pensions, to limit costs, NYCRF is heavily invested in passive index funds. In other words, they own the market, along with any mispriced risk or systemic failure. In the absence of high-quality climate-related financial disclosures, NYCRF is a passive taker on a bet wagered with insufficient information. Not only does this bet increase the risk of financial loss for New York state employee pensioners, but it poses a systemic risk in that a majority of state

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<sup>16</sup> [https://law.stanford.edu/wp-content/uploads/2019/05/newer.PDF-NYCRF\\_DAP\\_FinalReport\\_Full.pdf.pdf](https://law.stanford.edu/wp-content/uploads/2019/05/newer.PDF-NYCRF_DAP_FinalReport_Full.pdf.pdf)

<sup>17</sup> <https://osc.state.ny.us/pension/climate-action-plan-2019.pdf>

pensions also rely heavily on passively managed index funds. A shock to the public markets from an abrupt or disorderly transition will smash nest eggs across the country.

### **A sovereign perspective – the case of South Africa**

As the hearing memo and my fellow witnesses have articulated, lots of information exists about the impacts of physical risk on the U.S. economy. What has been less well covered is the impact of transition risk, and the combination of the two. A global example that may be of interest to this committee is a recent report that analyzed the impacts of the low-carbon transition on the South African economy by the data analytics firm Climate Policy Initiative (CPI).

South Africa generates significant revenue from exporting coal (\$4.2 billion in 2017) and more than 100,000 people are employed in the extraction, development and export of this natural resource. In early 2018, Cape Town, the country's second largest city with a population of 4 million, came within days of running out of water. The country faces competing pressures of the physical impacts of climate change and the threat of reduction in demand for coal. Patrick Dlamini, Chief Executive Officer and Managing Director, Development Bank of Southern Africa responded to the CPI analysis this way:

“One of the most striking findings from this report is that South Africa faces “transition risk” approaching R1.8 trillion (\$125 billion) in present value terms if the world achieves a path consistent with the Paris targets. With much of this risk apparently due to fall on the public balance sheet, such transition risk could strain the public finances [and]

jeopardize the sovereign credit rating... It would be irresponsible of us not to investigate these risks more thoroughly.”<sup>18</sup>

Several major economic sectors in the U.S. will be affected by the low-carbon transition including the oil and gas, petrochemicals, automotive and agriculture industries. Not enough research has been done to calculate the impacts to companies, workers and the overall economy.

### **The road ahead**

On Sunday June 22, 1969, a spark from a passing train flared into the Cuyahoga river igniting industrial debris floating on the surface of the water. It wasn't the first time the Cuyahoga river caught fire, nor was it the most destructive. But it occurred at a time of increased consciousness about protecting natural resources, and a month later a photo of the fire appeared in Time magazine, igniting national outrage.<sup>19</sup> Then Cleveland Mayor Carl Stokes became deeply committed to greater federal involvement in pollution control. Stokes' advocacy played a part in the passage of the 1972 Clean Water Act, signed by a Republican President.

Sadly, climate is harder than water. For most of the thirty-plus years since climate science was firmly established, carbon pollution couldn't be seen. Nothing was on fire. There was no “Baby

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<sup>18</sup> <https://climatepolicyinitiative.org/wp-content/uploads/2019/03/CPI-EF-Understanding-the-impact-of-a-low-carbon-transition-on-South-Africa-2019.pdf>

<sup>19</sup> The 1969 Time Magazine photo was actually from a previous and more devastating Cuyahoga River fire in November 1952.

Jessica” moment for television news crews to focus national attention. In recent years, that has changed. Today, we are seeing the impacts of carbon pollution in the form of devastating storms and wildfires, increased heat and drought, and shifting human migration. Had Congress and the rest of the world tackled climate change thirty years ago, we might not be discussing it in this committee. Instead, the world has emitted as much atmospheric carbon in the last thirty-years as in the previous two centuries of industrialization. As a result, climate change has progressed to the point where it is increasingly necessary to protect investors and financial stability from climate impacts.

Reporting on the economic costs of climate is one way for the Fed and the SEC to better prepare the national government, businesses, workers and investors for a changing climate. In order for those reports to be useful, they must be built upon data gleaned from mandated financial disclosures that benefit from standardization and best-in-class integrated assessment models. And thoughtful attention should be paid between what is disclosed and what the agencies will do with the information.

For example, the Fed could develop a set of key risk indicators (KRIs) to monitor potential risks and use climate reports to inform those KRIs. According to the NGFS, KRIs should include, “insured and non-insured losses due to catastrophe events, residential loans in areas exposed to frequent natural disasters, financial indicators such as equity prices and profitability of

companies in ‘non-green’ sectors, credit exposure to sectors with high GHG intensity and the global carbon price.”<sup>20</sup>

Armed with reports and KRIs, the Fed can choose among a portfolio of actions. One possibility is to simply measure and report risk. Other possibilities the Fed might consider include: requiring stress testing for financial system exposure to climate risk, introducing standards for how much money banks are permitted to have in certain types of investments, or extending preferable borrowing rates for firms that maintain certain “climate resilient” portfolio standards. The Fed will ultimately need to evaluate the levers it feels are appropriate pull as an independent institution.

Appropriate SEC action appears more straightforward – mandating climate-related financial disclosure.

## **Conclusion**

Mandatory reporting on the economic costs of climate is both possible and beneficial. And regardless, the U.S. legislature must pass comprehensive, science-based climate policy or the Fed and the SEC will not be able to manage what they have measured, no matter how much data is at their fingertips.

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<sup>20</sup> [https://www.banque-france.fr/sites/default/files/media/2019/08/19/ngfs-report-technical-supplement\\_final\\_v2.pdf](https://www.banque-france.fr/sites/default/files/media/2019/08/19/ngfs-report-technical-supplement_final_v2.pdf)