

**ADDRESSING CLIMATE AS A  
SYSTEMIC RISK: THE NEED TO  
BUILD RESILIENCE WITHIN OUR  
BANKING AND FINANCIAL SYSTEM**

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**HYBRID HEARING**  
BEFORE THE  
SUBCOMMITTEE ON CONSUMER PROTECTION  
AND FINANCIAL INSTITUTIONS  
OF THE  
COMMITTEE ON FINANCIAL SERVICES  
U.S. HOUSE OF REPRESENTATIVES  
ONE HUNDRED SEVENTEENTH CONGRESS  
FIRST SESSION

\_\_\_\_\_  
JUNE 30, 2021  
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Printed for the use of the Committee on Financial Services

**Serial No. 117-36**



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U.S. GOVERNMENT PUBLISHING OFFICE

45-383 PDF

WASHINGTON : 2021

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**ADDRESSING CLIMATE AS A  
SYSTEMIC RISK: THE NEED TO  
BUILD RESILIENCE WITHIN OUR  
BANKING AND FINANCIAL SYSTEM**

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**Wednesday, June 30, 2021**

U.S. HOUSE OF REPRESENTATIVES,  
SUBCOMMITTEE ON CONSUMER PROTECTION  
AND FINANCIAL INSTITUTIONS,  
COMMITTEE ON FINANCIAL SERVICES,  
*Washington, D.C.*

The subcommittee met, pursuant to notice, at 2:01 p.m., in room 2128, Rayburn House Office Building, Hon. Ed Perlmutter [chairman of the subcommittee] presiding.

Members present: Representatives Perlmutter, Foster, Vargas, Lawson, Casten; Luetkemeyer, Lucas, Posey, Barr, Loudermilk, Kustoff, and Timmons.

Ex officio present: Representatives Waters and McHenry.

Chairman PERLMUTTER. The Subcommittee on Consumer Protection and Financial Institutions will come to order.

Without objection, the Chair is authorized to declare a recess of the subcommittee at any time. Also, without objection, members of the full Financial Services Committee who are not members of this subcommittee are authorized to participate in today's hearing.

With the hybrid format of this hearing, we have some Members and witnesses participating in person, and others on the Webex platform.

I would like to remind all Members participating remotely to keep themselves muted when they are not being recognized by the Chair. The staff has been instructed not to mute Members except when a Member is not being recognized by the Chair, and there is inadvertent background noise.

Members are also reminded that they may only participate in one remote proceeding at a time. If you are participating remotely today, please keep your camera on, and if you choose to attend a different remote proceeding, please turn your camera off.

Today's hearing is entitled, "Addressing Climate as a Systemic Risk: The Need to Build Resilience Within Our Banking and Financial System."

I now recognize myself for 4 minutes to give an opening statement.

In 2008, the housing bubble collapse and financial crisis caught many experts, investors, and policymakers off guard, and the re-

sulting Great Recession devastated communities across the country.

When threats to financial stability are not properly valued and mitigated, the consequences can be severe and longstanding: 2020 tied 2016 as the hottest year on record, and the 7 hottest years recorded have all occurred since 2014. In 2020 alone, more than 58,000 wildfires burned 10.1 million acres and caused \$20 billion in damages.

In my home State of Colorado, in addition to more severe and frequent wildfires, we are seeing less annual snowpack, more water scarcity and droughts, and more heat waves. These changes pose long-term risks for Colorado's agriculture, tourism, and housing industries.

Whether it is rising sea levels threatening coastal communities, more severe hurricanes on the East and Gulf Coasts, wildfires in the West, or regional climate changes affecting crop yields on the plains, climate change is affecting every State and community in our nation.

These risks are intertwined with the financial system. Insurers can expect more claims related to extreme weather events, lenders will see more risks in underwriting carbon-dependent industries, and economic changes will affect asset values across many sectors. Climate change is creating significant and complex risks in our financial system that we cannot ignore.

Last month, President Biden signed an Executive Order directing the National Economic Council, the Treasury Department, and the Office of Management and Budget to develop a government-wide strategy for evaluating and addressing climate-related financial risk and assessing the necessary financing to achieve net-zero emissions by 2050.

Several of the financial regulators have already begun work to understand climate risk. We can either work together in Congress and across the government to coordinate sensible policies to evaluate and mitigate financial risk related to climate, and help our economy transition to a carbon-neutral future, or we can wait until the market and the consequences of climate change dictate such actions for us.

Last week, I reintroduced the Green Neighborhoods Act, a bill aimed at making the housing sector more energy-efficient, and ensuring that workers can get trained for green jobs. This is one example of how Congress can help facilitate an orderly transition of our economy and make the housing sector greener.

The canary in the coal mine has stopped singing. We must act now to ensure our financial system is resilient in the face of climate change and the economic transition.

Today's hearing will examine physical and transition risks posed by climate change and how financial regulators can work to evaluate and mitigate these risks. I look forward to our discussion today, so we can ensure that our financial system is ready for what is coming.

With that, I now recognize the ranking member of the subcommittee, Mr. Luetkemeyer from Missouri, for 4 minutes for an opening statement.

Mr. LUETKEMEYER. Thank you, Mr. Chairman.

Climate risk has certainly been a buzzword, both within the banking industry and within the Biden Administration. The Administration has issued multiple Executive Orders focused on climate risk, specifically an Executive Order titled, “Climate-Related Financial Risk,” which requires the Financial Stability Oversight Council (FSOC) to assess climate-related financial risk to the stability of the Federal Government and the stability of the financial system.

Within the Administration, the Federal Reserve has been the most active regulator in this space. In May, they announced the establishment of the Financial Stability Climate Committee to identify, assess, and address climate-related risk. Furthermore, the Federal Reserve has requested information from lenders on how they handle climate risk at their institutions.

Let me be clear: Federal regulators should understand how financial institutions are handling risk mitigation in their lending portfolio. This includes numerous types of risk, including credit risk, concentration risk, and default risk.

However, the inclusion of climate-related financial risk must be better understood by both regulators and financial institutions before any framework around this risk can be initiated.

It is clear that certain financial institutions, particularly the largest U.S. firms, are including climate risk in their risk-assessment processes. The U.S. global systemically important banks (G-SIBs) have all limited their approach to carbon financing in one way or another. Some have pledged to provide investments in sustainable businesses and technologies, and others have pledged to reach net-zero greenhouse gas emissions in their financial activities by a certain year.

As the economy and consumer demands change, it is appropriate for financial institutions to change as well. Ensuring your lending and investment portfolio is diversified and risk-averse is a core tenet of risk management.

However, as financial institutions move in the direction of sustainable investment, it is appropriate to determine if the U.S. economy, in particular the energy industry, is ready to move away from fossil fuels and carbon-intensive energy.

Will the energy sector be choked off from financial services that they need to exist? What are the costs of the transition risks to the U.S. economy?

These are questions that must be seriously considered and understood before an industry-wide stance is taken regarding investments in carbon-intensive industries.

While Federal regulators should understand these risks, I must associate myself with the comments of Federal Reserve Vice Chairman of Supervision Randal Quarles, who said, “Broad climate policy is the role of Congress and other Federal agencies, not the Federal Reserve.”

Congress should not deputize the financial services industry to be the climate police, greenlighting sustainable projects and shutting down legally-operating businesses that are carbon-intensive, especially when they have no understanding of how climate risks will impact the economy and do not have sufficient data and modeling to determine these impacts.

The Comprehensive Capital Analysis and Review (CCAR) stress testing amongst financial institutions looks 9 quarters into the future. Most climate change models look about 30 to 100 years into the future. If we go down the path of forcing institutions to speculate on future risk, and tying their capital requirements to this risk before we have an appropriate understanding of the economic impacts and the effect on access to credit and the ability of the energy sector to pivot to new technologies, we could do irreparable harm to our economy.

And yet, that is exactly what my colleagues on the other side of the aisle are proposing. They have noticed legislation in this hearing that would directly tie climate-related risks to bank capital by increasing the risk weighting of assets financing greenhouse gas (GHG) emissions.

This is an extremely irresponsible proposal. Again, we have no understanding of how this would impact the economy, no real data on how this would impact the world's climate, no clear information on how we can accurately predict climate-related financial risk, and no clear understanding of how transition risks could impact the safety and soundness of financial institutions and the U.S. economy at large.

I look forward to bringing up these concerns with the panelists today.

And with that, Mr. Chairman, I yield back.

Chairman PERLMUTTER. The gentleman yields back.

The Chair of the full Financial Services Committee, the gentlewoman from California, Chairwoman Waters, is now recognized for 1 minute.

Chairwoman WATERS. Thank you, Chairman Perlmutter.

Over the past year, we have witnessed examples of how climate change can disrupt our financial system. The financial toll, including insurance losses from the most devastating wildfire seasons on record, grew so sharply that our Governor in California had to issue a moratorium to prevent insurers from denying insurance coverage to homeowners.

Meanwhile, the hundreds of bankruptcies in the oil and gas sector as a result of the economic fallout from COVID-19 have provided a preview of the type of pain our economy will likely face as climate change becomes worse.

I am pleased that President Biden, Treasury Secretary Yellen, and policymakers at the Fed and elsewhere have listened to those of us who have raised concerns about the urgent financial stability risk of climate change and that they are beginning to take action.

So, I am looking forward to the hearing today. And I assure you, Chairman Perlmutter, that we are going to be hearing from Seattle and Portland. Portland was 116 degrees as of yesterday, and Seattle was 104 as of Sunday. And I don't know what financial disruption this is going to cause, but climate change is real.

I yield back the balance of my time.

Chairman PERLMUTTER. The gentlelady yields back.

The ranking member of the Full Committee, the gentleman from North Carolina, Ranking Member McHenry, is recognized for 1 minute.

Mr. MCHENRY. Thank you, Chairman Perlmutter.

You have heard me say this before, and I have said it repeatedly: Climate change is real. But instead of taking the time to get this legislation right, my Democrat colleagues are once again rushing to legislate to appease the progressive left.

Usurious policies will have far-reaching and unintended harmful consequences. Just as with the so-called Climate Crisis Financial Stability Act, without doing any work, without listening to any experts, without any data, the Democrats want to take the step of determining risks for financial institutions and punishing certain institutions with a capital surcharge.

Now, not only is this unrealistic, I think it is a dangerous step. We need to make sure that any next step strengthens the resiliency of the system and seriously addresses climate risk, not appeases some progressive stakeholder group.

I yield back.

Chairman PERLMUTTER. The gentleman yields back.

And I would just like to alert the Members and the panelists that we are expecting votes probably around 3:00, and what I would like to do is get through the statements of all of the witnesses as much as we can before we have to take a break for those votes. And if we can get some questioning in before the votes are called, we will do that. Otherwise, we will recess until we finish the votes on the Floor, and then we will reconvene once the votes are finished.

With that, we will turn to our witnesses.

Professor Hilary Allen is an associate professor of law at American University. Professor Allen's research is focused on domestic and international financial stability regulation, and she teaches classes in banking law, securities regulation, financial regulation, and other topics.

Dr. Rachel Cleetus is a policy director with the Union of Concerned Scientists. Dr. Cleetus is an economist with 20 years of experience working on climate and clean energy policies and is an expert on the United Nations Framework Convention on Climate Change process.

Ms. Mayra Rodriguez Valladares is the managing principal with MRV Associates. Ms. Rodriguez Valladares is an independent consultant who has advised central banks, insurers, regulators, and financial services firms on risk and compliance issues.

Mr. Steven Rothstein is the managing director of Ceres Accelerator for Sustainable Capital Markets. Mr. Rothstein's work at Ceres Accelerator is focused on transforming practices governing capital markets to reduce the financial impacts of the climate crisis.

And Dr. Clifford Rossi is the executive-in-residence and professor of the practice at the Robert H. Smith School of Business, University of Maryland. Dr. Rossi has almost 25 years of experience in government and financial services and has held senior roles in risk management at several of the largest financial services companies.

Our witnesses are reminded that their oral testimony will be limited to 5 minutes. You should be able to see a timer on your screen or on your desk in front of you that will indicate how much time you have left. When you have 1 minute remaining, a yellow light will appear. I would ask that you be mindful of the timer, and when the light appears, wrap up your testimony so that we can be

respectful of both the other witnesses' and the subcommittee members' time.

And without objection, your written statements will be made a part of the record.

Professor Allen, you are now recognized for 5 minutes to give an oral presentation of your testimony.

**STATEMENT OF HILARY J. ALLEN, ASSOCIATE PROFESSOR OF LAW, AMERICAN UNIVERSITY WASHINGTON COLLEGE OF LAW**

Ms. ALLEN. Thank you, Chairman Perlmutter. Thank you, also, Chairwoman Waters, Ranking Member McHenry, and Ranking Member Luetkemeyer. And thank you, members of the subcommittee.

I very much appreciate the opportunity to testify at today's hearing. As Chairman Perlmutter already mentioned, my name is Hilary Allen, and I am an associate professor at the American University Washington College of Law. I teach classes in corporate law and financial regulation, and my research focuses on financial stability regulation.

Prior to entering academia, I spent 7 years working in the financial services groups of prominent law firms in London, Sydney, and New York, and in 2010, I worked with the Financial Crisis Inquiry Commission, which was appointed by Congress to study the causes of the financial crisis of 2008.

The views I am expressing today are entirely my own. They do not represent American University or any other institution.

In my testimony today, I would like to highlight three points for the committee.

First, I will underline the stakes involved in preparing the financial system for the physical and transitional risks associated with climate change. The impacts of a financial crisis can be irreversible and catastrophic, particularly for the most vulnerable members of society, so financial regulators should take steps to make the financial system more robust to the climate-related uncertainty that we face.

Second, I would like to advocate for increased focus on the potential systemic effects of operational problems arising from extreme weather events and other environmental changes, because financial stability regulation often neglects these operational risks.

Finally, I will speak about reforming the Office of Financial Research, known as the OFR.

All of the Federal financial regulatory agencies need to be involved in making this financial system more robust to climate-related threats, but the OFR can play a unique and crucial part in that effort if it is rebuilt as an interdisciplinary hub of the different kinds of expertise needed to assess and respond to these threats.

It has never been good policy to just let financial crises happen and then clean up afterwards. Even with the Herculean and imaginative crisis response efforts that we saw from the Federal Reserve and other governmental bodies in the wake of the financial crisis of 2008, the economic fallout of that crisis could not be fully contained. Many of the most vulnerable members of our society still have not recovered from it.



I therefore urge the committee to take a precautionary approach to financial stability regulation in general and, in particular, towards climate-related risks.

A precautionary approach requires us to be creative in our thinking about risks to financial stability and favors bold, simple responses where possible.

I have outlined a number of responses in my written statement that are designed to help manage the uncertainty about the precise physical and transitional risks we face, including regulatory capital requirements that require banks to fund themselves with more common equity to act as a buffer against uncertainty and help prevent financial institution failures and asset fire sales.

One reform that I want to stress for the committee today is the need for what I call macro-operational regulation, which takes seriously the possible systemic consequences of the steps taken by individual financial institutions to manage their own operational risks.

For example, a financial institution that finds part of its physical infrastructure damaged could shift its operations to alternative infrastructure. That would be a rational step by the institution, designed to enable it to keep providing financial services. But if that alternative infrastructure is overloaded as a result, that may create problems for other financial institutions that also rely on the alternative infrastructure.

Different kinds of experts are needed to help think creatively about the types of threats that climate change poses for the financial system. In the case of the operational risk spillovers that I just mentioned, complex science expertise would be very helpful.

Climate scientists and environmental economists will obviously be crucial to the effort. Data scientists and software engineers would also make important contributions.

The Office of Financial Research should be the new home for these types of interdisciplinary personnel, because consolidating interdisciplinary expertise in one agency can create virtuous cycles that make hiring easier and promote collaboration and consistency in responding to new threats.

In my written testimony, I set out proposals for rebuilding the OFR as an interdisciplinary expertise hub. Many of these proposals relate to staffing and to the OFR's relationship with other financial regulatory bodies, particularly the Financial Stability Oversight Council (FSOC).

I urge the committee to pursue these proposals as a matter of urgency in order to ensure that our financial regulatory architecture is equipped to deal with the challenges of climate change.

Thank you.

[The prepared statement of Professor Allen can be found on page 32 of the appendix.]

Chairman PERLMUTTER. Thank you for your testimony.

Now, I would like to recognize Dr. Rachel Cleetus for 5 minutes for her testimony.

#### **STATEMENT OF RACHEL CLEETUS, POLICY DIRECTOR, UNION OF CONCERNED SCIENTISTS**

Ms. CLEETUS. Thank you very much, Chairman Perlmutter, Ranking Member Luetkemeyer, and members of the subcommittee,

for providing me the opportunity to testify remotely here today on the systemic risks of climate change. My name is Rachel Cleetus, and I am the policy director for the climate and energy program at the Union of Concerned Scientists.

Summer has barely begun and we are already in the midst of a stunning drought in much of the Western United States. Record-setting heatwaves are underway, including an unprecedented one in the Pacific Northwest. The Midwest has been hit by heavy rain and flash flooding. The wildfire season is underway, another intense one. We are projected to have an above-normal hurricane season.

Meanwhile, the COVID-19 pandemic and the economic crisis continue to be a threat.

What we are experiencing this summer is part of a very sobering trend. In addition to steadily rising temperatures, climate change is also driving accelerating sea level rise and ocean acidification. Many sectors of the economy are at risk.

Our infrastructure, agriculture, fisheries, insurance, real estate, tourism, and the impact on the health and safety of people, including outdoor workers, is very significant, too.

Our nation experienced \$22 billion-plus extreme weather and climate-related disasters last year. Climate-related infrastructure disruptions are increasing. Our roads, bridges, rail lines, and air travel are all at risk.

The electricity system which underpins our daily lives has repeatedly failed. Heat waves put enormous pressure on the power grid right at a time when we need power for cooling. We get power outages, as we are seeing in the Northwest right now, which can trigger cascading effects, including business interruptions and loss of critical services that depend on electricity.

Meanwhile, heat-trapping emissions that fuel climate change are still rising. The science is clear: We need to cut emissions by half in 2030 and get to net zero no later than 2050.

And yet, today our economic and financial systems are not accounting for these risks, nor are they helping drive a rapid shift to a net-zero economy.

A combination of shortsightedness, inadequate policies, the outsized power of fossil fuel companies, and business-as-usual inertia is getting in the way.

And if we fail to take action now, the potential for severe shocks to our financial system will grow. And as with previous crises, the impacts will be especially harsh for those who can least afford it—low-income households, communities of color.

Instead, we have an opportunity now to ensure that our economy and financial system are put on a path to be fairer, more climate-resilient, and compatible with a low-carbon future.

We need a coordinated, comprehensive approach from the national to the international, the local level, with Congress, financial regulators, and the Federal Government all playing their part.

We need mandatory risk disclosure in the marketplace to help correct market failures. Fossil fuel companies and their investors who bear an outsized responsibility for climate change must face market pressures to change their business model and lending prac-

tices. We need transparent, uniform disclosure of market risks from climate change based on the best available science.

Congress must pass legislation to set up an advisory committee on climate risk in the FSOC, require climate risk disclosure in the marketplace, and take steps to prioritize the well-being of marginalized communities.

Much more is at stake than the fiscal well-being of U.S. businesses. The public relies on these companies to grow and manage our savings, investments, pension funds, and energy choices. Our market rules and financial safeguards must help develop the outcomes we need to protect our health, welfare, and prosperity, not simply the profits for the powerful and elite few.

We need a transformative climate strategy that addresses underlying systemic challenges, like structural racism and social-economic inequities. We have urgent choices before us.

But because it is our actions that are the source of heat-trapping emissions, here in one of the most powerful economies in the world, we can also help set the rules of the market. We cannot have a healthy economy if the planet is on fire and vast areas are under water.

Thank you for this opportunity to testify today, and for your efforts to protect our financial system from climate risk and to ensure that it helps contribute to the climate solutions we so urgently need.

[The prepared statement of Dr. Cleetus can be found on page 52 of the appendix.]

Chairman PERLMUTTER. Thank you, Dr. Cleetus, for your testimony.

Ms. Rodriguez Valladares, you are now recognized for 5 minutes to give an oral presentation of your testimony.

#### **STATEMENT OF MAYRA RODRIGUEZ VALLADARES, MANAGING PRINCIPAL, MRV ASSOCIATES**

Ms. RODRIGUEZ VALLADARES. Chairman Perlmutter, Ranking Member Luetkemeyer, and distinguished members of the subcommittee, thank you for the opportunity to appear before you.

I am Mayra Rodriguez Valladares, managing partner of MRV Associates. For over 3 decades, I have worked with bankers and financial regulators in over 30 countries on a wide range of risks that can threaten financial institutions' safety and soundness.

Unlike the global financial crisis, scientists have been warning us for decades about the danger of climate change. Through the numerous financial crises I have endured, I have learned that when someone tells me this time it is going to be different, it is a warning signal that urgent action is critical now to avoid another painful crisis.

U.S. global systemically important banks are very exposed to climate risks. Not only do they provide financial services in States vulnerable to intensifying climate events, they have operations in foreign countries such as the UK, Japan, Canada, and Mexico, which are exposed to physical and transition risks.

Regional, community, and agricultural banks are also exposed to climate change. In 2019, severe flooding in the Midwest brought

loan defaults and payment challenges to their highest levels in 20 years.

Banks in areas that serve people of color are also vulnerable to climate change since many of them are also in areas with a myriad of environmental, infrastructure, and housing challenges.

I must note that the very significant rise in corporate leverage in the United States in the last 2 decades means that those companies are the most likely to default in the event that they are affected by climate change.

Market investors have not priced in climate change risks because financial institutions and corporations are not required to identify, measure, control, and monitor their climate-related risks and to disclose them to the public.

Opacity in the financial system is dangerous to investors and ordinary Americans.

Given its membership of leading international standard-setting bodies, such as the Financial Stability Board and the Basel Committee on Banking Supervision, U.S. regulators already work on climate change risk frameworks.

In the U.S., the Financial Stability Oversight Council and its Office of Financial Research should be given the necessary human, data, and technological resources so they can analyze how climate change is impacting the entire financial system and to detect sources of systemic risk.

Inaction is costly.

FSOC and OFR should focus on non-banks that are exposed to climate-related risks. They are interconnected to banks, do not have strong management requirements, and are very opaque.

Under Basel III, Pillar 1, bank regulators can require banks to model operational risk, which includes natural disasters that can hurt a bank's assets, both in the banking and trading portfolios.

Under Pillar 2, banks can incorporate different risks, including climate change-induced defaults or market volatility, into their Internal Capital Adequacy Assessment Processes to determine economic capital levels to sustain unexpected losses.

I respectfully recommend that financial regulators, especially the Federal Reserve, the OCC, and the FDIC, recommend to them that they should: one, create climate change stress tests or add climate change scenarios to existing supervisory exercises, such as the Comprehensive Capital Analysis Review and Dodd-Frank Stress Test; two, design specific climate change supervisory guidance for banks; three, update supervisory bank examination manuals to include how climate change impacts banks; four, conduct a review of the human resources to determine if they have enough professionals with knowledge about climate science, risk data aggregation, and modeling; five, review if they have robust technological systems to analyze climate change data and its impact on banks' risks; and six, address their climate change data gaps.

I also recommend that bank regulators require banks to: one, conduct a gap analysis to determine what resources they need to improve risk data aggregation, climate change risk modeling, and technology; two, incorporate physical and transition risks into their enterprise-wide risk management frameworks and long-term financial plans to measure their climate risk exposures; three, include

in their bank recovery and resolution plans and their comprehensive liquidity assessment reviews how physical and transition risks impact banks' funding, cost of borrowing, liquidity, and risk mitigation ability; and, lastly, disclose to the public climate change model results, including tail risks, via Basel III's Pillar 3 disclosures.

I look forward to your questions, and I would be pleased to serve as a resource to you in the future as you continue to explore how to reduce the adverse impact of climate change on the safety and soundness of the American financial system.

Thank you.

[The prepared statement of Ms. Rodriguez Valladares can be found on page 66 of the appendix.]

Chairman PERLMUTTER. Thank you very much for your testimony.

I now recognize Mr. Rothstein for 5 minutes for his oral testimony.

**STATEMENT OF STEVEN ROTHSTEIN, MANAGING DIRECTOR,  
CERES ACCELERATOR FOR SUSTAINABLE CAPITAL MARKETS**

Mr. ROTHSTEIN. Thank you, Chairman Perlmutter, and distinguished Members of Congress. Thank you for the invitation to be here.

My name is Steven Rothstein, and I am the managing director of the Ceres Accelerator for Sustainable Capital Markets. Ceres is a nonprofit organization working with investors and companies to build sustainable leadership within our firms and drive policy solutions throughout our economy. Our membership represents Fortune 500 companies and investors with over \$30 trillion of assets under management.

Our testimony draws from Ceres reports that we have also submitted into the record, Mr. Chairman. I am not here to talk about the systemic risk our climate has to our planet and our people, although it is paramount to the lives of our children and grandchildren.

I am here to highlight the underrecognized risk to the safety and soundness of our financial institutions due to climate risk and the risks of the business-as-usual approach that some of the financial institutions pose on a livable, climate-safe world.

If a banker or a bank regulator suggested that they don't need to plan for another pandemic or cyber attack, there would be a chorus of opinions saying they are not meeting their fiduciary responsibility.

Potential exposure to climate risk is bigger and more systemic. Yet, there are leaders today in banking, insurance, and among financial regulators that do not fully account for financial risk.

Even as we are working to overcome the unprecedented pandemic and the pain and loss that it brought, we have simultaneously had record-breaking fires, hurricanes, and unparalleled climate-related risks. As our Secretary of State said recently, we are running out of records to break.

In short, we know more about the climate risk, as the chairman said in his introductory remarks, than we knew about the mortgage finance risk in 2008. But, surprisingly, we are not acting with the urgency required.

There are dozens of strong international examples from financial regulators around the world, and we appreciate the initial steps from the Department of the Treasury, the Federal Reserve, and the SEC. But that is all they are, initial steps. So, we recommend that regulators take five immediate steps.

One, immediately affirm the systemic nature of climate risk and its impacts on the financial market. The affirmation can take the form of a statement of an agency Chair or a report from the agency.

Two, activate action on prudential supervision, as some of my colleagues have said. U.S. regulators have an explicit responsibility to supervise the risks that financial institutions take on. Consistent with that mandate, financial regulators should integrate climate change into the prudential supervision of banks, insurance companies, and other regulated financial institutions.

The Federal Reserve, in particular, should take immediate steps to assess the climate risk to financial markets and mandate scenario analysis by the banks and the other financial institutions it supervises.

They should also outline plans for conducting pilot climate stress tests of its supervised institutions to measure the impact of climate-related shocks and consider enhancing capital and liquidity requirements.

In addition, we recommend that the Federal Reserve, the FDIC, the OCC, and the National Credit Union Administration expand their examiner training programs and manuals to ensure that staff fully understand climate risks faced by the financial institutions they monitor.

Three, support the SEC's work on mandatory climate disclosure. We congratulate the SEC for their initial steps and hope they will be issuing bold rules later this year.

Four, address how climate risks further exacerbate systemic racism, particularly as reflected in financial institutions. Financial regulators should develop strategies to address systemic climate risks and structural racism in an integrated way. The Community Reinvestment Act is a ripe opportunity to do this.

Five, build capacity for smart decision-making on climate change by coordinating action with other U.S. and global regulators and by hiring and training additional staff.

Coordinated action by U.S. regulators at the global, Federal, and State levels is essential to accelerating this. The FSOC generally, and the Biden Executive Order that has been referred to, are critical steps. We appreciate the recent actions of U.S. financial regulators to coordinate with global peers as a start.

To conclude, U.S. financial regulators have a critical role to play in ensuring the resilience of our economy, weakened by the global pandemic and systemic racism, and threatened by future climate shocks. The fundamental safety and soundness of our financial institutions is relying on them and on each of you.

Thank you again for this opportunity.

[The prepared statement of Mr. Rothstein can be found on page 104 of the appendix.]

Chairman PERLMUTTER. Thank you for your testimony. You hit that right on 5 minutes, so I appreciate that.

Dr. Rossi, you are now recognized for 5 minutes.

**STATEMENT OF CLIFFORD V. ROSSI, EXECUTIVE-IN-RESIDENCE AND PROFESSOR-OF-THE-PRACTICE, ROBERT H. SMITH SCHOOL OF BUSINESS, UNIVERSITY OF MARYLAND**

Mr. ROSSI. Thank you, Chairman Perlmutter, Ranking Member Luetkemeyer, and members of the subcommittee. I am Dr. Clifford Rossi, professor of the practice and executive-in-residence at the Robert H. Smith School of Business at the University of Maryland.

The views that I am expressing today are solely my own and do not represent those of the University of Maryland.

I am here today to inform the subcommittee that imposing climate risk mandates on regulated depository institutions at this time would be detrimental to consumers, to the financial services sector, and to the economy at large.

Let me be clear: Climate change is a real risk that requires a firm understanding of the current limitations of climate models, underlying data, how those data do and do not integrate with standard financial and risk models, and numerous other components in order to craft effective solutions to the underlying risk.

I offer a unique perspective on this issue, having worked for about 23, 25 years, depending on sort of how you calculate those things, in the financial services industry, first as a regulator during the S&L crisis, and then at both Fannie Mae and Freddie Mac—pre-conservatorship—as well as at one of the largest commercial banks, the largest savings and loan, and the largest non-bank mortgage company during my tenure as a C-level risk executive, and now as a finance and risk professor working on climate risk issues and banking.

Models in use today for climate scenario analysis are designed to represent the physics of a complex Earth system well into the future, and their output is limited for near-term use by financial institutions.

As I have outlined in my written testimony, the models upon which urgent demands for a public policy response are based are subject to significant model risk. Model risk can be defined as the risk associated with errors in data, methods, or assumptions used to generate output from analytical models used for decision-making.

Forcing financial institutions and their regulators toward expansive climate risk regulation based on effects that are not well-understood presents more risk to the financial system than a staged and methodical approach.

Now, I applaud the intent of the Biden Administration, through their Executive Order, to assess climate-related financial risks and data. However, I would caution policymakers and regulators from imposing measures on regulated depositories based on the state of current climate analytics for the following reasons.

First, the output from climate and associated integrated assessment models, or IAMs, are not close to being ready for use in bank financial and risk analytics such as bank stress test modeling, and suffer from the supposed, “square peg in the round hole” syndrome.

The empirical linkages between long-term climate effects and short- to intermediate-term financial and risk factors are not suffi-

ciently established currently to properly assess physical or transition risk impacts to the banking system from climate change.

Second, both the climate and integrated assessment models upon which scenarios such as those proposed by the Network for Greening the Financial System (NGFS) are based are subject to considerable empirical error due to the underlying complexity of these models on interactions that are not fully understood in the scientific and financial research communities.

Now, why is this important? Requiring banks to make hard money strategic decisions on lending, capital allocation, pricing, and other activities that have long-term consequences for consumers, the financial system, and economic growth based on models with a high degree of uncertainty is not at all consistent with prudent model risk management practices.

Third, it is well-established in the psychology and economics literature that decision-making is affected by a number of cognitive biases. One of these is what I refer to as model or shiny object bias.

Model bias occurs when decision-makers embrace the results from highly-sophisticated quantitative models based on perceptions that the apparent analytical rigor in those models necessarily translates into accurate and reliable outputs.

There is widespread shiny object bias in the use of climate and integrated assessment models today among policymakers worldwide. This poses serious concerns regarding the use of these models for anything other than research applications at this time, as described earlier. Placing bets on financial markets on such models invites a host of long-term unintended consequences on the financial system.

Climate change is a real risk that banks and other financial institutions should actively incorporate in with their existing risk management processes. However, such firms must take measured steps to understand these risks and not be forced into conducting analyses for which the models and outputs are not well-understood as they relate to financial services.

Banks should instead focus attention on bolstering their risk awareness to climate change, starting with enhancing their risk governance process and controls, data, and analytics.

Quantifying with a reasonable degree of confidence the impacts of physical and transition risk from climate change will require significant effort, time, and a true interdisciplinary approach between climate scientists and the very people who are actually running financial and risk management at these organizations and gathering additional data and modifying existing models.

This work should commence, and only when the results have been deemed to conform to regulatory model risk standards should consideration of the disclosure and use in financial decision-making be permitted.

Thank you for your time, and the invitation to testify on this important matter, and I look forward to answering your questions.

[The prepared statement of Dr. Rossi can be found on page 95 of the appendix.]

Chairman PERLMUTTER. Thank you, Dr. Rossi.

And thank you to all of the panelists. You were all right on time or a little early. So, I appreciate that.



I will now recognize myself for 5 minutes for questions. And we will get through as many of the Members as we can before we have to break for votes. We might be lucky and get through all of us. We will see.

Dr. Rossi, I want to just start with where you have left off. And I think we would agree. A number of us on this committee are also on the Science Committee, and yesterday we had a hearing on the science of wildfires or wildfire predictions, mitigation, and a whole variety of things. And I don't think we would disagree with you that we don't have all of the science we would like to predict wildfires.

In Colorado, we had our worst wildfire season ever last year, and most of the Northwest is frying right now. But, in my opinion, that is not a reason to not begin to put precautions in place.

So, Dr. Cleetus, Colorado, as I just said, had its worst wildfire season on record. The three largest wildfires in our State's history occurred in 2020, torching over 540,000 acres.

Climate change is now forcing Colorado and many other States to prepare for larger and more destructive wildfire seasons. In fact, the director of the Colorado Division of Fire Prevention and Control just remarked, "We are having fire years, not fire seasons anymore."

In the West, we have wildfires. The Gulf has hurricanes. There is increased flooding in the South and the Midwest. And these changes are having a significant impact. The smoke that comes into the Denver area from the wildfires either in Colorado or the West is affecting our tourist industry and our housing industry.

As the severity and frequency of extreme weather events continues to rise, how will the housing market react? And what does it mean for homeowners in climate-sensitive areas?

Ms. CLEETUS. Yes, as you are pointing out, the reality is that this is not some distant future. These climate impacts are here and now. And it is very clear from the science that hotter, dryer conditions in the West are contributing to these longer, more intense fire seasons. It is undeniable. And, unfortunately, the uncertainty, to the extent it exists, seems to be breaking in the wrong direction.

This is why the precautionary principle that the other panelists highlighted is so important. We are talking about managing risks; we cannot avoid them completely.

And what we are starting to see is the insurance market reflecting this risk with wildfires, where we have seen insurers drop policyholders, or try to raise rates. State regulators have had to step in with stop-gap measures. We have thousands of homes at risk right now in the West, millions, actually, if you look across all of the States in the American West. And this risk is growing, both because of climate change and also our development patterns and how we manage our forests.

So, we have to act on all fronts to make sure that we contain this risk. Otherwise, both the economic consequences, as well as the public health and human toll, will rise every year, unfortunately.

Chairman PERLMUTTER. Thank you for your answer.

Several of us on this committee—I was a bankruptcy lawyer representing financial institutions for many years, and we have individuals who were bankers or bank regulators on this committee.

And the failure of Pacific Gas and Electric, the failure of many oil and gas companies and their bankruptcies, make me concerned about the impact on the financial industry.

So, Ms. Rodriguez Valladares, 2 years ago this subcommittee held a hearing about how leveraged lending may pose a threat to financial stability. As you know, leveraged loans are characterized as corporate debt extended to highly-indebted non-financial businesses.

How does leveraged lending interact with climate risk? And what types of institutions are particularly exposed?

Ms. RODRIGUEZ VALLADARES. This is really a very good point that you make. I have published 40-some-odd articles about leveraged lending and collateralized loan obligations, and we should definitely be very concerned, because American companies are more leveraged than they ever have been historically, either in aggregate amounts or when you see it as an equivalent percent of gross domestic product (GDP).

And there are incredible interconnections because a lot of these companies, especially in the energy sector, which presently is exhibiting a very, very high default probability, are incredibly vulnerable to extreme climate events.

And there is a lot of opacity in leveraged lending and collateralized loan obligations, and there are a lot of interconnections between the non-banks such as hedge funds and private equity, home offices, and other types of financial institutions of that nature. They are very interconnected to banks. They hold a lot of these leveraged loans and a lot of these securitizations.

We definitely need to be very, very mindful about their probability of default, and especially those companies that are imminently affected either by the physical or the transition risks.

Chairman PERLMUTTER. Thank you very much for your response.

My time has expired. I now recognize the ranking member of the subcommittee, the gentleman from Missouri, Mr. Luetkemeyer, for 5 minutes.

Mr. LUETKEMEYER. Thank you, Mr. Chairman.

Mr. Rossi, in your testimony you have a graph in there, "Long-Term Changes in the Earth System." And the first graph talks about land surface temperatures, and it starts out at 1850.

And it is interesting, because that seems to be where most people who want to talk about climate change want to start, is 1850. It is interesting, because that is actually the trough of the cold trend that started at that point—or ended at that point. If you actually take the chart and you go back 1,000 or 2,000 years, you see this wave effect.

And so what I am saying is, if you take that chart and go in the other direction, which is what we are trying to talk about today, actually within the next probably 25 to 50 years, you are going to see the wave start going in the other direction.

And we are talking here today about modeling. If you are in the banking business and you are trying to model what your risks are with regard to climate change, if you go back 5 years or 50 years, it is one thing, and if you look forward 5 years or 50 years based on what you saw in the past, that is really—you need a crystal ball to look at all of the things that have happened in our economy and

the world in the last 5 years or 50 years. And then try and project that to the next 5 years or 50 years and look at—and you throw in there the technology and things like that.

How do you, Dr. Rossi, analyze this when you look at the fact that this wave could actually go in the other direction? And we are looking at trying to model this so we actually get an assessment of true risk. How can you do that? You just got done talking about how you didn't think that could actually work. Could you elaborate on that a little bit? Am I wrong in my assessments here?

Mr. ROSSI. No. And as someone who actually either developed or oversaw the development of such models in the past, either loan loss reserving models or stress test models, I can tell you for sure that this is probably one of the most difficult, if not the most difficult exercise that banks will face in estimating or assessing risk in their portfolios.

As for all the reasons that you just described, in the case of credit risk or market liquidity or these other risks that are out there, we can get our arms around that pretty readily because we have that data, we have that historical time series, that is, to be able to kind of ingest that into our financial and risk models and project out how much capital we will have.

When we are talking about taking physical outputs, such as how many gigatons of greenhouse gases are spewed out, and trying to translate that into macroeconomic factors that then translate in turn to how much risk is on our lending or investment portfolios, that is what we are talking about as being extraordinarily difficult to do.

And keep in mind that when we do that, we are today really only going out, as was said earlier, 9 quarters forward on our stress test, so trying to go out 5 years or even 10 years, or more than that creates an enormous amount of uncertainty, such that if we are trying to estimate the tail of the distribution, as other witnesses have talked about, the tail of that distribution is so noisy, it would be very, very difficult to quantify that with any degree of reliability.

And personally, as someone, as a former CRO, signing a sub-attestation, I would not today, given where the state of climate models are today, sign any sub-attestations related to climate risk.

Mr. LUETKEMEYER. If you take that one step further then, the concern that we need to be thinking about here is if you destroy the fossil fuels industry based on this graph showing continued warming, and all of a sudden in a few years it turns the other way, we have destroyed an industry that we definitely need and are going to need in the long term for many different reasons.

It would seem to me that we need to be very careful how we go into this modeling situation. Would you agree with that?

Mr. ROSSI. I would agree with that. And I want to be clear here. I am not saying not to do anything—I am not saying that. I am saying that we need to start in a very methodical fashion. There are things that we can do today that aren't going—leapfrogging to, let's adopt what is in these IAMs and climate models today and just start to implement stress tests and—

Mr. LUETKEMEYER. Mr. Rossi, let me quickly interject here.

You talked about some things we could do. Would you identify things that financial institutions or regulators, what significant data things they can put together today to actually make it work?

Mr. ROSSI. Yes, absolutely. First and foremost—and I am a simple-minded guy when it comes to these things—is to do what you understand right now.

What banks can understand right now are the positions on their portfolios that are exposed to different climate events. They can actually engage with vendors that are out there that can supply this information that can help them assess what their exposure is to wildfire risk or drought or flooding, and they can size that up in terms of the probability of those outcomes, as well as the impact or the severity of those outcomes. They can do that today.

The other thing that they can do is to start to do what I have done in an academic research paper that will be published later this year, to actually try to tie, to determine these empirical linkages between physical outputs, let's just say hurricane impacts, severity and frequency of hurricanes, to, let's say, mortgage default. Trying to establish those empirical linkages will be extraordinarily important to actually getting a better handle on estimating what this climate risk looks like on these bank portfolios.

Mr. LUETKEMEYER. Thank you for your response. I am out of time. Thank you, Dr. Rossi.

Chairman PERLMUTTER. Thank you, Dr. Rossi, and Mr. Luetkemeyer.

The Chair will now recognize Mr. Foster, who is the only physicist in Congress. But apparently, he is going to yield to Mr. Casten, an engineer.

Mr. FOSTER. Thank you. And I yield to Mr. Casten.

Mr. CASTEN. Thank you, Mr. Physicist.

I truly hope we are not still arguing about whether climate change is real. My goodness, the science is so settled. We know the last time CO<sub>2</sub> was this high. Sea levels were 50 feet higher. Let's move on.

If you don't believe the scientists, listen to Fed Governor Lael Brainard, who said in January that the science is settled but the impact on our financial sector is highly uncertain, that we should be concerned about the impact of rapid repricing events. I am partially misquoting that.

We had Jamie Dimon in a couple of weeks ago, and he said that JPMorgan is not reducing their fossil fuel exposure. And I said, "Okay, have you changed your senior debt, sub debt equity level?" He said, "No, not yet." And I said, "Can I assume that you will once you see things coming?" And he said, "Oh, absolutely."

So my first question for you, Mr. Rothstein, is, we know once these changes come, the sophisticated players will see it coming first and we will have capital movement in the system.

Can you explain to us the difference between stress testing the banks and scenario modeling the system, and how you think we should be balancing those two to make sure that our system is robust and continues to be robust?

Mr. ROTHSTEIN. Thank you, Congressman. And thanks for all of your leadership on this issue.

We have a very diverse system with thousands of banks, and while the biggest banks, obviously, are responsible for the loans, most people operate with small banks. They have to operate in a very concentrated area. They are more at risk for physical risk because they tend to loan within a 5- to 10-mile area.

We did an analysis of the largest 20 banks and looked at their syndicated loan portfolio, just to use the same methodology that the European Central Bank did, and for that we identified over half-a-trillion dollars of exposure.

What we need to do is use every tool. Climate change is an all-of-government initiative, it is an all-of-society initiative. We have to do stress tests on individual bank portfolios and then we have to look at scenario analysis for the whole system, both small and large.

Mr. CASTEN. I want to follow up, because your point about small banks intrigues me, because there is the physical risk that at least we think we understand—there are lots of ripple effects—but then there is the transitional risk that shifting wealth from energy producers to energy consumers is good for Americans, but it creates our political tension. And I find myself thinking, is the First Bank of Frankfort, Kentucky, going to be okay?

Does this feel more like the S&L crisis than the 2008 crisis to you, as we think about how diverse the exposure is going to be in the system?

Mr. ROTHSTEIN. I believe, Congressman, that the exposure is even broader and more systemic than either of those.

For a small bank, they could be affected on physical risk if they are in an area with fires, floods, or tornadoes. But they also could be if they are in an area that is an energy-producing community and the jobs decline in that sense.

Last year, the oil companies wrote off \$145 billion of assets in the first 3 quarters. That is banks, insurance companies, and investors that are somehow dealing with that, so this is a deeper and wider potential area of exposure than any of those.

Mr. CASTEN. As I pointed out recently, ExxonMobil didn't write off all of that money because they were woke.

I want to shift, if I could, with the little time I have left, to Ms. Rodriguez Valladares.

I really appreciated your comments. I was in the energy industry for 20 years before I got here, and we used to joke that you could always tell that there was a downturn coming in the energy sector because the big banks started creating special purpose energy opportunities funds for—that was the thing they were doing to move assets into non-Dodd-Frank-compliant vehicles.

Assuming that we pass this legislation, including my bills that are noticed in this markup, and the Biden White House moves, we are probably 2 years away, realistically, from getting all of these changes implemented.

I don't know what you think of my own metric, but are there metrics you think we should be watching in the financial system that will be a sign that the sophisticated players are starting to off-load risk onto other players?

What are the red lights you are watching that you think we should be paying attention to in these next few years?

Ms. RODRIGUEZ VALLADARES. One thing, of course, is to watch whether banks are increasingly selling their loans that are exposed to climate change. Are they selling their commercial real estate loans, ag loans, energy loans to special purpose vehicles? Then that tells you that they are trying to get rid of that risk because it weighs on their capital and their leverage requirements.

I think also watching the number of loans that they underwrite to these sectors that are so sensitive to climate change is also another important signal.

But it is not just about banks' exposure to these kinds of companies from the lending side. Let's not forget that banks also are in financial derivatives and repos with these different kinds of companies, to also see whether that is lessening. That is another signal that they feel that this is of concern.

I am a little concerned about some of the comments that I am hearing that we have no data to be measuring climate change risk and how it can affect default probabilities or how it can affect market volatility, because if there is one thing Americans are known for, it is for data.

Chairman PERLMUTTER. I am going to interrupt you, and somebody else will let you finish your answer to that question. But thank you very much for your testimony.

And I thank the gentleman for his time.

I now recognize the gentleman from Oklahoma, who is also the ranking member on the House Science Committee, Mr. Lucas.

Mr. LUCAS. Thank you, Mr. Chairman.

Today's hearing is an opportunity to have a constructive dialogue on the issue of climate risk in the financial system.

We know that the climate is changing and that global industrial activity has played a role in this. Further, I believe my friends on the other side of the aisle would agree that Congress and the regulators still have much to learn about the implications of climate change in the financial system. However, the argument that we are in a race against a ticking climate Doomsday Clock is counter-productive to achieving real progress on this issue.

The United States has already made progress in the science and innovation needed for cleaner energy production. Weaponizing the financial regulators to drive capital away from fossil fuels, still the most reliable and essential form of energy in the United States, would have dire consequences for the economy and U.S. competitiveness abroad.

Instead, we need a more thoughtful approach based on the current state of climate risk assessment tools.

Dr. Rossi, the electric power grid is absolutely essential to the U.S. economy, generating the energy needed for businesses and families across the country. In 2020, fossil fuels were the largest source of U.S. electricity generation, at about 60 percent. Nuclear energy was the source of roughly 20 percent.

So, Dr. Rossi, could you speak to the potential consequences to the U.S. economy if we see a rapid government-driven disinvestment away from fossil fuels and nuclear energy?

Mr. ROSSI. Yes. In the near-term, we could see several things.

First of all, let me give you some perspective. These are numbers—I have been looking at Citigroup recently, and a little while

ago, they released their climate financial disclosure for this year, and it was very interesting. One of the things that they flagged was their oil and gas exposure of something in the order of 50-plus billion dollars or so, pretty sizeable, but only about 6 or 7 percent of their overall exposure.

Why that is important is because imagine now if you have multiple banks, just like what happened during the liquidity coverage ratio implementation several years back when banks were looking at trying to measure how much liquidity they had on their balance sheet from a regulatory requirement standpoint and found that they were—some of the largest banks were certainly not in compliance.

And what would they do? They would have to then rotate out of some of their lesser high-quality assets into higher-quality assets. They would have to sell mortgage-backed securities in order to try and comply by buying U.S. Treasuries.

In this case, divesting from oil and gas investments would actually have a further amplifying effect, downward movement effect, that is, for some time period, which would actually cause the prices of oil and gas to go down, those securities, and in addition would—temporarily anyway—impose some harm to the balance sheets of these banks.

Now, I am not saying it is crushing by any sense. They are well-capitalized. So, that is not going to be an issue.

But from a knock-on effect standpoint, we are talking about impacts associated with lack of investment if banks aren't lending again to oil and gas companies, their inability to do the kind of exploration that is needed to continue to provide us with the supply necessary to have heating and having to fuel our cars, and that sort of thing.

So, it would have adjacent effects on increasing prices to consumers for things like utility bills, prices at the gas pump, et cetera, and so certainly would have adverse consequences in the near-term for that.

Mr. LUCAS. Continuing with you, Dr. Rossi, you explained in your written testimony how climate credit default swaps could be utilized as a risk-mitigation tool for climate-related events. Could you discuss further how this financial tool could be used?

Mr. ROSSI. Sure. The idea here is simply—and I think one of the other witnesses mentioned the use of financial derivatives by financial institutions. And during the financial crisis, I think Warren Buffet famously said something to the effect of, these were weapons of financial mass destruction.

Actually, derivatives are an important risk-mitigation tool that are used extensively in the industry for things like transferring credit risk to private investors, such as what is going on with the Government-Sponsored Enterprises (GSEs), Fannie Mae and Freddie Mac, in transferring credit risk off their balance sheets and onto other private investors.

In the case we are talking about here, we have had for many years weather derivatives, rainfall derivatives, and we have had temperature derivatives that have not really kind of taken off much in the industry.

But as climate change accelerates and continues to evolve, we need to think about developing credit- or climate-related derivative tools that could remove that risk off of these balance sheets.

You could imagine that both Fannie and Freddie, for example, that are engaged heavily in credit risk transfer of their securities to—or of their mortgage losses, that is—are exposed increasingly, potentially, to more hurricanes and flooding events if and when that occurs from climate change.

Being able to transfer that off directly by way of what is called a climate derivative instrument, just like a credit default swap (CDS), where there is a buyer and a seller in that market for that, a bank or a GSE could, for that matter, buy protection from a seller on the other side, and that is how that climate derivative could actually function.

Chairman PERLMUTTER. Thank you, Dr. Rossi.

Mr. LUCAS. Thank you, Mr. Chairman.

Chairman PERLMUTTER. The gentleman's time has expired.

Mr. Vargas, the gentleman from California, is now recognized for 5 minutes.

Mr. VARGAS. Mr. Chairman, thank you very much for holding this hearing.

I want to thank all of the witnesses for being here today. I found this very informative.

Dr. Rossi, have you ever seen hearings like this before with Congress, when you have witnesses testifying?

Mr. ROSSI. I have actually testified twice before, yes.

Mr. VARGAS. The way I think it usually works is this way. You have one side, it doesn't matter, but one side will say something, and then, if they are in the Majority, they will have two or three witnesses, and then the last witness will say just the opposite.

It is sort of analogous to the issue: Do cigarettes cause cancer? Yes, they do, and they destroy your lungs. And the next one: Oh, yes, they cause cancer, yes, they do. And then the last guy always says: No, they are healthy. They keep you thin and fit.

But in this case, I think that almost everyone agrees that climate change is real.

Now, I have been arguing this point for decades, and I have had a hard time with some of my colleagues on the other side accepting it. And I think you said it until I heard you say, from some of the examples given by my friends on the other side, well, this kind of happens in history, you kind of go one way and then the other way.

Do you think that climate change today, a large part of that is because of human actions and what we do?

Mr. ROSSI. I do. And that is based on the fact that I work on a fairly regular basis with climate scientists now at the University of Maryland and I have seen the data. I am not a climate naysayer. And I don't know that folks on the other side, of your side, are either.

I think what we are trying to figure out, though, is how best to move the ball along in a way that doesn't destroy the economy in the short term, while making sure that we have what we need to protect everybody from climate change.

Mr. VARGAS. I have to tell you, I think that is a big step forward, honestly. I think that is a big step forward, just saying that the



science is settled. Because, again, I hear some of my friends on the other side say, well, wait a minute, but it does this all the time, and we can't really do much about it, it will destroy our economy, it will destroy our world if we try to do anything about our actions.

You don't agree with that?

Mr. ROSSI. I would say that there are long-term climatological effects that have occurred throughout thousands of years, and that there is no dispute. I also don't think that there is any dispute that there are human-based changes that have occurred over the last 150 or so years based on the data that I have seen.

At the same time, we do need to take care about how we move forward, because the models underlying that have significant issues. I don't think we are debating the climate change; we are debating how we can best implement them into financial models.

Mr. VARGAS. I think I understood your testimony well, and you said you have the shiny models and you chase the shiny thing. You find out the shiny thing is going to hurt you because it is not modeling it right, and you can do real damage to the economy and these large companies and other companies. I think I understood that.

And I appreciate your testimony, I really do. I think it is a huge step forward.

Dr. Cleetus, you said that back in 2020, the nation experienced nearly 59,000 wildfires, which burned approximately 10 million acres. About 40 percent of that was in California, and CAL FIRE now says that 3 million homes are at risk in California, so much that, in fact, we have to do something.

What can we do? I have a bill that passed out of here with others about at least disclosures, at least disclosing this information. Don't you think that is a good idea, at least doing that?

Ms. CLEETUS. I think this is the main problem here. We have a real information asymmetry going on in the financial sector.

Believe me, there are sophisticated actors in the financial sector who have proprietary data sets. They are moving their assets around. It is the ordinary public that is being left exposed, the taxpayer that is being left exposed.

We have done some research just using publicly-available data from NOAA, tide gauge data, looking at sea level rise and the risk to coastal property.

What we found was that over 300,000 homes and commercial properties with a collective market value of \$136 billion today are at risk just by 2045. That is within the lifetime of a mortgage issued today. There is someone who is going to be left holding the bag when those houses start to flood.

Mr. VARGAS. I want to interrupt you just for a second to give Ms. Mayra Rodriguez Valladares an opportunity to tell us about that data you were talking about.

I have 23 seconds. Go ahead.

Ms. RODRIGUEZ VALLADARES. We have a lot of data in the United States, both from scientists, so we have just hundreds of years of scientific data that can be used, and we also have a lot of different kinds of probability of default data. We have incredible professionals in quantitative fields both in and outside of financial institutions.

There is a lot there that we can be doing to model climate change risks. And models are dynamic. We should be working on that already, and not wait until it is too late.

Mr. VARGAS. Thank you. My time has expired.

Thank you very much, Mr. Chairman.

Chairman PERLMUTTER. Thank you, Mr. Vargas.

Votes have been called, but I think we can get through the questions of Mr. Posey, Mr. Lawson, Mr. Barr, and Mr. Kustoff. So, those of you who aren't going to be asking questions can go vote, if you choose.

I would now like to recognize the gentleman from Florida, Mr. Posey, for 5 minutes of questioning.

Mr. POSEY. Thank you very much, Mr. Chairman.

Dr. Rossi, we are here today to explore an expansive role of the government in our economy to reduce systemic financial risk. History suggests that government has repeatedly missed the mark on ensuring such financial stability.

What assurances do we have that government can and will do better than the private sector and individuals in assessing and responding to potential financial risks posed by climate change?

Mr. ROSSI. If what you are asking is about whether or not we can regulate climate change by way of financial institutions, I think that is a tricky problem to address, because on the one hand, as we were talking about earlier, forcing divestment, for example, or some variation of that from financial institutions out of oil and gas would very much have a negative impact.

And so, from a safety and soundness standpoint, when we think about what the role of those safety and soundness regulators are, they are there to ensure that the long-term viability of those financial institutions is, in fact, intact.

Forcing them to implement some sort of changes in the way in which they are balance-sheeting certain asset types is certainly not consistent with the way in which our economy or our financial system has gone in the past.

That is an issue that I see associated with that.

Mr. POSEY. Thank you.

To follow up on that, Dr. Rossi, we have in recent history faced some pretty large shocks. I recall the large oil price shocks from OPEC that plagued us for years before we attained our recent energy independence.

Looking over our shoulder literally right now at COVID-19, should we really start selecting out the risks of the day, like climate change, and build an entire new regulatory apparatus around them?

Mr. ROSSI. Here's the thing. Climate risk, depending on whom you talk to, is a fairly long-tailed risk. It is not one you could say, okay, today we had 115-degree temperatures in Portland and Seattle. There is a difference between weather and climate. So, those things might, in fact, turn out to be predictive of longer-term climatological changes.

But what I will say from a risk-management standpoint is, from a banking perspective, there are risks that we—financial risks, market, credit, liquidity risks that we need to be managing, and banks do manage those very effectively today, credit risk. And then

the nonfinancial risk, in which I would include operational risk, those actually are things that also have to be addressed.

Mr. POSEY. People like to talk about risk, and there is a reference to the risk that government climate regulations might pose in the Chair's memo for this hearing.

I recall that Milton Friedman said, "The Great Depression, like most other periods of severe unemployment, was produced by government mismanagement rather than by any inherent instability of the private economy."

Isn't there a rather large risk about regulators who get it wrong on climate risks like they did in mismanaging the money supply in the Great Depression? And should we—

Mr. ROSSI. Well—

Mr. POSEY. Go ahead.

Mr. ROSSI. I'm sorry. Absolutely. I do think that there is exactly that type of risk until we are armed with the information that would give us the degree of reliability that we have those risks understood.

And all of the risks that I just mentioned earlier, the financial risk, the nonfinancial risk that banks are on point to manage today in their day-to-day operations, there is a wealth of historical information from which they can draw upon to be able to make those assessments.

I will say that the one that they have the most difficulty with is the risk associated with operational risk, because we just don't have that type of data there.

And if we don't have the right type of data there, and we have been dealing with operational risks for many, many years, imagine the issues that we have associated with trying to get our arms around and quantify climate risk impacts from a physical and transition risk standpoint.

That is extraordinarily difficult. And anybody who will tell you that the data exists for banks to be able to make very precise estimates and make hard money decisions on that, I am just not a buyer on that.

Mr. POSEY. Okay. Thank you very much, Dr. Rossi.

I see my time is about to expire. And so, Mr. Chairman, I yield back.

Chairman PERLMUTTER. Thank you, Mr. Posey.

I now recognize another gentleman from Florida, Mr. Lawson, for 5 minutes.

Mr. LAWSON. I would just like to say to my colleague, Mr. Posey, that we worked so hard, because of natural disasters in Florida, on citizens establishing a government-run insurance program to make insurance available.

And this is to everyone. The effects of climate change, as seen year after year, are strong, and more frequently, natural disasters are destroying homes and businesses at record-breaking rates.

In 2018, Hurricane Michael hit the Florida Panhandle where I am, causing approximately \$25 billion in damage and devastating our local community. Only a few months after Michael hit, we saw property insurance rates increase, leaving some Florida homeowners unable to find affordable policies.

What steps should Congress ensure be taken to address these issues, because they come every time? And we were devastated in Florida after Andrew, and even Michael, and it is just never going to stop. But we have to do something here in Congress to make things happen.

This question is posed to everyone: What do you think we should be doing in Congress?

Ms. CLEETUS. If I could jump in, I think that there are two really important things going on here. One is that we are seeing in a systemic way these risks rising over time, as you pointed out. And the other is that we have many, many people, low-income folks, fixed-income folks, who are being really harshly punished by the financial consequences of these disasters.

In terms of insurance, we need to make sure that more people are carrying insurance in the first place. It needs to be more widely available, and more affordable. But at the same time, we need to recognize that some of these risks over time are going to become inherently uninsurable in some of the highest-risk places.

So, we have to create other pathways out of risk for people. There are so many, many people on the front lines of this risk. In the State of Florida, for example, we have to create pathways out of risk, because right now it is not just having financial consequences, but taking a real toll on people's lives and their well-being.

Mr. LAWSON. I have a little bit of a follow-up. Many residents quickly found out, as you stated earlier, that their policy didn't cover the damage caused by rising waters. Climate risk is not adequately priced in the housing market. [Inaudible] Found that current home prices, mortgage interest rates, and guaranteed fees in the secondary mortgage market did not make much sense either.

There are a lot of concerns about rising water playing a role in property values. What should Congress, the GSEs, and the housing agencies be doing to address this concern?

Ms. CLEETUS. I think in the first place, it is really important to evaluate the risk fairly and communicate that risk to the public. We need better flood risk maps that actually communicate this information to the public so that they can make informed decisions about what is likely to be their single biggest asset.

Right now, we have large swaths of the public who are largely unaware of how serious these risks are and how quickly they are coming.

The other piece of this is really building in an equity and justice component into our climate resilience policies, because we are seeing communities of color get gentrified out of their communities, and we are seeing resilience investments that benefit an elite few and not the broader public. And that needs to change as we go forward, because these risks are now affecting way too many parts of our country.

Mr. LAWSON. Dr. Cleetus, you also testified that we can fix the climate crisis. [Inaudible] Which I am not sure, if we don't build justice and equity into our solutions from the onset.

Will you please elaborate a little bit more on that, and how can the whole-of-government approach be undertaken by Treasury Secretary Yellen and the National Economic Council (NEC) and others

through the recent climate financial Executive Order to inform our approach here?

Ms. CLEETUS. I think we ought to start with the fact that our current market outcomes inherently have baked into them years of structural racism and social-economic inequities. We have had communities that haven't been able to build generational wealth because of the legacy of mortgage redlining and the lack of access to credit, as just one example.

And that means, when you have climate risk coming on, they are coming on as a layer of additional risk over these longstanding problems. As we create solutions, let's not have Band-Aids on top of the current system. Let's actually be thinking about a more fair and equitable system that keeps people safe, for everybody, not just for a few.

Mr. LAWSON. With that, Mr. Chairman, I yield back.

Chairman PERLMUTTER. Thank you, Mr. Lawson.

We will get through Mr. Barr's questioning, and then I think we can adjourn this panel.

I would now recognize the gentleman from Kentucky, Mr. Barr.

Mr. BARR. I thank my friend, the chairman of the subcommittee, and I appreciate the testimony of the witnesses.

I know that fighting climate change is in vogue and everyone wants in on the action. But count me as someone who is a skeptic that increasing bank capital requirements or punishing lenders for not redlining energy companies is the way to go about it.

My colleagues and also some folks in the Administration clearly want to weaponize the blunt instrument of bank capital requirements to force a precipitous and unrealistic and, I would argue, uneconomic transition away from fossil energy.

The problem is, this will do nothing to change demand. People will still need to drive cars, turn on their lights, and heat their homes. And the Biden Administration's own data shows that fossil energy will still make up more than 70 percent of consumption in 2050.

These efforts will just disrupt the supply side by shifting financing for those industries to less-regulated non-bank lenders, drive up the cost of capital, and raise prices for consumers.

Now, I know some of the witnesses want our regulators to go beyond just banks and go into non-bank financing as well. But combine all of this with data aggregated by the Bank for International Settlements which shows that increases in capital requirements lead directly to reductions in lending and it becomes clear that this effort is not about managing financial stress, but it is really about causing financial stress, specifically to those companies and industries that are politically unpopular.

Dr. Rossi, what impact would the assessment of capital surcharges, like those detailed in the draft Climate Crisis Financial Stability Act, have on lending to fossil energy firms?

Mr. ROSSI. You have hit on many of the points that I would make. I think the first one that I would mention is that raising capital, first of all, will squeeze out lending in other segments, particularly in that segment.

If you are talking about, as I have seen, 150-percent risk rate associated with oil and gas investments as one of those proposed bills

has in it, I would be concerned, first of all, as to where does that 150-percent risk rate actually come from? What is the empirical basis for that?

Because if you can imagine what that means, we are talking about significant amounts of capital being dedicated to investments in oil and gas which have knock-on effects, as I mentioned earlier, in terms of lack of ability through lack of lending to be able to go out and do the kind of oil and gas exploration that is needed to keep us protected against having to go elsewhere abroad for our fuel needs.

Mr. BARR. I do think there is a risk here that by choking off financing to some of these energy companies that are really at the forefront of innovation in carbon capture and other technologies, that this could actually be very counterproductive.

And it does look like an effort to exploit climate as an excuse to justify a move towards government central planning as opposed to an effort to help deploy capital to innovative companies that actually might ameliorate emissions and decrease emissions.

Let's talk about systemic risk for a second. There is an important distinction between systemic risk and business risk. Systemic risk has a very specific definition: A certain activity or entity has the potential to actually bring down the entire financial system without enhanced supervision. But business risks are the countless risks firms manage every day, that if not mitigated properly, may have an impact on their bottom line.

No one is denying the risk of changing weather patterns, and, in fact, banks, insurers, and other financial firms are already managing them as traditional business risk.

It is hyperbolic to suggest, as some of my colleagues and vocal advocates have, that climate change, a phenomenon that occurs over literally decades, can somehow suddenly and precipitously overwhelm the banking system, the insurance sector, and the reinsurance sector, especially when you consider that a lot of the stress testing happens only over 9 quarters.

So, Dr. Rossi, how are banks currently managing climate risk, and are they capable of effectively managing it without prudential supervision?

Mr. ROSSI. I am going to take you back, Congressman, to the earlier comment that I made about this with regard to Citigroup's climate disclosure.

Now, again, I don't work at Citigroup any longer, but having looked at that just objectively, I would say that is a really good first step in the process.

They have gone through and they have identified where their climate risk exposures are, and they have identified the governance and the processes and controls that are necessary to manage climate risk. And they are doing it fairly comprehensively. Again, you are talking about a far-flung portfolio reaching out to many, many countries in terms of their investments.

I think they are on the right track, and I am sure all of the other big banks are on a similar path to do that.

Mr. BARR. My time has expired. If I could just—if the chairman would just indulge one final comment.

We talk about transition risk. A lot of these bills that are being proposed by this hearing, I think create the transition risk.

Chairman PERLMUTTER. The gentleman's time has expired.

Mr. BARR. I yield back.

Chairman PERLMUTTER. I thank him for that one additional comment.

I would like to thank the witnesses.

I think there is agreement here that there is some real risk in the financial system. And I think the question is, how long of a horizon can we really analyze and determine?

But there is no question that there is risk here. I think all the panelists would agree.

And I just appreciate the testimony. I am sorry that it has been kind of a rushed afternoon. I want to thank you all for your testimony and for devoting the time and resources to share your expertise with this subcommittee. Your testimony today will help advance the work of our subcommittee and of the House.

The Chair notes that some Members may have additional questions for these witnesses, which they may wish to submit in writing. Without objection, the hearing record will remain open for 5 legislative days for Members to submit written questions to these witnesses and to place their responses in the record. Also, without objection, Members will have 5 legislative days to submit extraneous materials to the Chair for inclusion in the record.

This hearing is now adjourned, and I thank the witnesses. I am going to come down and thank you personally.

And to those of you on the screen, thank you very much. Your testimony was really appreciated.

And, again, we are in the middle of a very busy afternoon, so we really appreciate you being here. Thank you.

[Whereupon, at 3:28 p.m., the hearing was adjourned.]





# **A P P E N D I X**

June 30, 2021

**Hearing on  
“Addressing Climate as a Systemic Risk:  
The Need to Build Resilience within Our Banking and Financial System”  
Before the U.S. House of Representatives Committee on Financial Services  
Subcommittee on Consumer Protection and Financial Institutions**

**Wednesday, June 30, 2021**

**Prepared Statement**

**Hilary J. Allen  
Associate Professor  
American University Washington College of Law**

Chairman Perlmutter, Ranking Member Luetkemeyer, and Members of the Committee:

Thank you for inviting me to testify at today’s hearing. My name is Hilary Allen, and I am an Associate Professor at the American University Washington College of Law. I teach courses in corporate law and financial regulation, and my research focuses on financial stability regulation. I have authored numerous law review articles and a book about financial stability, which have (among other things) defined the concept, explored its precautionary and interdisciplinary nature, and considered the financial regulatory architecture needed to promote financial stability.

Prior to entering academia, I spent seven years working in the financial services groups of prominent law firms in London, Sydney and New York. In 2010, I worked with the Financial Crisis Inquiry Commission, which was appointed by Congress to study the causes of the financial crisis of 2007-2008.

I am not testifying on behalf of the Washington College of Law or any other institution; the views expressed here are entirely my own.

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## 1. Executive Summary

Tackling climate-related threats to financial stability will require a coordinated and interdisciplinary approach from our financial regulatory agencies. In this statement, I propose a number of reforms to this end (these reforms are summarized on pages 18-20), but before diving into their technical details, it's important to recognize the stakes of the problem at hand. The economic and social impacts of financial crises can be irreversible and catastrophic, particularly for the most vulnerable members of society (who are also more likely to be suffering from the more direct environmental consequences of climate change). Because emergency measures taken once a financial crisis comes to a head will struggle to fully contain that crisis, financial regulators should take steps *in advance* to make the financial system more robust to the climate-related uncertainty that we face.

In this statement, I stress the importance of a precautionary approach to climate as a systemic risk. Policymakers and regulators following a precautionary approach should be creative in their thinking about threats to financial stability, and favor bold, simple responses that err on the side of preventing the irreversible and catastrophic harms I just mentioned. While uncertainty remains about many of the precise threats that climate change will generate for the financial system, we are already aware of broad contours of these threats. Physical and transition risks can create market, credit, liquidity, and operational risks for financial institutions, and these can interact to create systemic risks that threaten the stability of the entire financial system.

I will draw particular attention to the operational risks posed by extreme weather events and other environmental changes, as the potential systemic interactions of operational risks have not received the attention they deserve. I propose a new form of “macro-operational regulation” that can respond to the systemic dimensions of operational risks. I also consider risk-based capital requirements, and how to use them appropriately given the uncertainty surrounding climate-related threats to financial stability. For some acute transition risks, heightened risk-weightings are already appropriate, but simpler buffers of equity funding are a better response to the general uncertainty surrounding climate-related threats to financial stability. In terms of supervision more generally, I argue for a robust precautionary principles-based approach to supervising financial institutions, which will require banking regulators to repudiate recent efforts to hamstring their own supervisory discretion.

This statement also stresses that a robust financial regulatory architecture is needed to support these reforms. It focuses on the Financial Stability Oversight Council (the “FSOC”) and the Office of Financial Research (the “OFR”), highlighting that both of these regulatory bodies need more staffing and would benefit from greater independence. I single out the OFR as a regulatory body that could serve as a hub for the interdisciplinary expertise needed to confront climate as a systemic risk (particularly climate science, environmental economics, data science, computer science, and complexity science). With this interdisciplinary expertise, the OFR could develop new technologically-informed approaches to data collection and analysis, improving our understanding of building physical and transitional risks. The OFR could also innovate new regulatory approaches, like a real-time reporting system for operational outages, and consistent physical identifiers for financial assets and collateral.

## 2. Financial stability as a regulatory goal

Today's hearing is about climate-related systemic risks that could impact the stability of our financial system. I want to start this statement by elaborating on what "financial stability" means, so that our end goal is clear. We can't say that our financial system is stable just because we're not currently experiencing a financial crisis; our financial system is only stable if it is robust to future shocks. Of course, that does not mean that all risks should be eliminated from the financial system. The focus of financial stability regulation should be on systemic risks that could compromise the ability of financial institutions and markets to perform the risk management, capital intermediation and payments processing functions necessary for broader economic growth. Financial stability regulation should not lose sight of the fact that the endgame is sustainable economic growth – protecting the financial institutions and markets that make up that system is a means to that end.<sup>1</sup>

Promoting financial stability should be a mandated goal for all financial regulatory agencies. A financial stability goal is already implicit in the mandates for many financial regulatory agencies – for example, the Federal Reserve takes the view that its "financial stability mandate is seen in the penumbra of the Federal Reserve Act, and that is legally sufficient"<sup>2</sup> – but most agencies lack an explicit statutory direction to promote financial stability (the exceptions that do have clear statutory mandates focusing on systemic risks and financial stability are the Financial Stability Oversight Council, the Office of Financial Research, and the Federal Insurance Office which I will discuss shortly). Legislating financial stability mandates for each of the federal financial regulatory agencies would make it abundantly clear that they are authorized to take the precautionary steps needed to protect financial stability generally, and more specifically, to address climate as a systemic risk. While my testimony today is focused on systemic risk and financial stability, climate change will also impact other financial regulatory mandates relating to market efficiency, investor protection, consumer protection, and competition.<sup>3</sup>

## 3. A precautionary approach to financial stability regulation

The financial system is only one part of the broader, highly-interconnected, adaptive and complex system that is our economy. That system has social, ecological and technological components, and the financial system cannot be completely insulated from the other components

<sup>1</sup> For further discussion of financial stability as a regulatory goal, see Hilary J. Allen, *Putting the "Financial Stability" In Financial Stability Oversight Council*, 76 OHIO ST. L. J. 1087, 1098 *et seq.* (2015).

<sup>2</sup> Thomas C. Baxter, Jr., Exec. Vice President & Gen. Counsel, Fed. Reserve Bank of N.Y., Remarks at the Future of Banking Regulation and Supervision in the EU Conference, Financial Stability: The Role of the Federal Reserve System (Nov. 15, 2013) (transcript available at <http://www.newyorkfed.org/newsevents/speeches/2013/bax131120.html>). For a discussion of the SEC's implicit financial stability mandate, see Hilary J. Allen, *The SEC as Financial Stability Regulator*, 43 J. CORP. L. 715, 728-9 (2018).

<sup>3</sup> For an overview of the different goals of financial regulation, see JOHN ARMOUR ET AL., *PRINCIPLES OF FINANCIAL REGULATION*, 62-68 (1<sup>st</sup> ed. 2016). For a discussion of how the SEC's climate-related reforms can serve other regulatory goals of protecting investors, promoting competition and facilitating capital formation (which relates to the market efficiency goal), see Comment letter from Jill E. Fisch et al. responding to the SEC's request for public input on climate disclosure (Jun. 11, 2021), <https://www.sec.gov/comments/climate-disclosure/cli12-8911728-244385.pdf>.

– including ecological disruptions from climate change.<sup>4</sup> The interactions of components within complex adaptive systems are very difficult to predict,<sup>5</sup> and so many of the threats that the financial system faces from climate change are not, strictly speaking, risks (risks occur with a known probability and therefore lend themselves well to measurement). Instead, the major concern is *uncertainty* about how changes in our climate, and a transition to a carbon-neutral economy, will impact the financial system.<sup>6</sup> When faced with uncertainty, one possible response is to wait and see what will happen. However, when uncertain outcomes are potentially irreversible and catastrophic, “wait and see” is not good policy. In the face of these kinds of irreversible and catastrophic outcomes, government should err on the side of preventing them. This is known as the “precautionary principle”.<sup>7</sup>

Financial crises are both irreversible and catastrophic. The consequences of the 2008 financial crisis demonstrate that even once the financial system starts to recover from a financial crisis, economic recovery is often elusive for many members of society – and many of the crisis’ social harms can never be undone. A decade after the 2008 crisis, measures of broader economic growth like GDP remained persistently lower than their pre-crisis trend suggested they should be, with one study estimating the impact of the crisis as a “lifetime present-value income loss of about \$70,000 for every American”.<sup>8</sup> The GAO has estimated the total cost of the crisis to the American people as \$13 trillion.<sup>9</sup> This cost was not evenly distributed, though: while almost everyone’s net worth decreased as a result of the crisis, those with investments in the stock market saw them rebound relatively quickly with the S&P 500 returning to its pre-crisis high by March of 2013. However, only about 50% of American families own any stocks.<sup>10</sup> For most middle class families, their net worth in 2017 remained lower than it had been in 2007.<sup>11</sup> These disparities were even more pronounced for middle class African American and Hispanic families.<sup>12</sup> The brunt of the irreversible economic damage caused by the 2008 crisis was therefore borne by more vulnerable members of society, and there’s no reason to believe that things will be any different with future crises.

All of this economic damage was incurred despite herculean and imaginative crisis response efforts from the Federal Reserve and other governmental bodies: emergency responses

<sup>4</sup> For a discussion of SETS, see J.B. Ruhl, *Governing Cascade Failures in Complex Social-Ecological-Technological Systems: Framing Context, Strategies and Challenges*, 22 VAND. J. ENT. & TECH. L. 407 (2020).

<sup>5</sup> CHARLES PERROW, *NORMAL ACCIDENTS: LIVING WITH HIGH-RISK TECHNOLOGIES*, 5 (1999).

<sup>6</sup> “There is a fundamental distinction between the reward for taking a known risk and that for assuming a risk whose value itself is not known”; “true uncertainty [is].... “not susceptible to measurement.” FRANK H. KNIGHT, *RISK, UNCERTAINTY AND PROFIT* 21 (1921).

<sup>7</sup> For a discussion of different formulations of the precautionary principle, see Hilary J. Allen, *A New Philosophy for Financial Stability Regulation*, 45 LOY. U. CHI. L.J. 173, 195 *et seq.* (2013).

<sup>8</sup> Regis Barnichon et al., *The Financial Crisis at 10: Will We Ever Recover?*, (Fed. Res. Bank S.F. Econ. Letters Working Paper, 2018), <https://www.frbsf.org/economic-research/publications/economic-letter/2018/august/financial-crisis-at-10-years-will-we-ever-recover/>.

<sup>9</sup> U.S. GOV’T ACCOUNTABILITY OFF., GAO-13-180, *FINANCIAL CRISIS LOSSES AND POTENTIAL IMPACTS OF THE DODD-FRANK ACT* (2013).

<sup>10</sup> Lowell Ricketts, *When the Stock Market Rises, Who Benefits?*, FED. RES. BANK ST LOUIS ON THE ECON. BLOG (Feb. 27, 2018), <https://www.stlouisfed.org/on-the-economy/2018/february/when-stock-market-rises-who-benefits>.

<sup>11</sup> Nelson D. Schwartz, *The Recovery Threw the Middle Class Dream Under a Benz*, N.Y. TIMES, Sept. 12, 2018, <https://www.nytimes.com/2018/09/12/business/middle-class-financial-crisis.html>.

<sup>12</sup> *Id.*

can't always contain the economic impact of financial crises once they occur. And it's also important to note that this is not a purely economic issue. Referring to the heightened unemployment rates following the 2008 crisis, Janet Yellen observed that "[t]hese are not just statistics. . . . The toll is simply terrible on the mental and physical health of workers, on their marriages, on their children."<sup>13</sup> Growing unemployment can also result in increases in crime and substance abuse.<sup>14</sup> The stress associated with the experience of financial crises can also impact the health of those impacted economically – medical studies conducted following the 2008 financial crisis demonstrated increased rates in heart attacks and suicides, and people were less likely to seek preventative medical care in general because of concerns associated with the costs.<sup>15</sup> Even among people who were able to keep their jobs and some sense of financial security during the recession that followed the 2008 crisis, many experienced a pervading sense of uncertainty and precariousness that may have caused delays in life events like marriage, home purchases and retirement.

We shouldn't assume that the 2008 crisis was a "once-in-a-generation" event. Many people believe that we narrowly missed another financial crisis in March/April 2020,<sup>16</sup> and unless action is taken, financial crises may become much more frequent events as technology allows for more and quicker transactions,<sup>17</sup> and as climate-related events supply more shocks to the financial system. The most vulnerable members of society are most likely to bear the brunt of the economic fallout from financial crises, and with more frequent crises, they will have less time to recover from them. At the same time, the most vulnerable members of society are also likely to be suffering most from the more direct environmental consequences of climate change.<sup>18</sup>

Given the stakes involved, the avoidance (or at least mitigation) of financial crises is a matter of paramount social concern. Regulatory intervention would be justified even if there were only small chance of climate-related issues causing catastrophic financial crises, but as I will discuss shortly, we can already anticipate some very significant problems that climate-related

<sup>13</sup> Janet L. Yellen, Vice Chairwoman, Board Governors of the Fed. Res. Sys., Remarks at "A Trans-Atlantic Agenda for Shared Prosperity": A Conference Sponsored by the AFL-CIO, Friedrich Ebert Stiftung, and the IMK Macroeconomic Policy Institute, A Painfully Slow Recovery for America's Workers: Causes, Implications, and the Federal Reserve's Response 10 (Feb. 11, 2013).

<sup>14</sup> Ronald A. Wilson, *The View from South Tucson: How the Economic Crisis Affects Defendants in My Courtroom*, 48 JUDGES' J. 14 (2009).

<sup>15</sup> Mona Fiuzat et al., *United States stock market performance and acute myocardial infarction rates in 2008–2009 (from the Duke Databank for Cardiovascular Disease)*, 106 AM. J. CARDIOLOGY 1545 (2010); Aaron Reeves et al., *Increase in state suicide rates in the USA during economic recession*, 380 LANCET 1813 (2012); Annamaria Lusardi et al., *The Economic Crisis and Medical Care Use: Comparative Evidence from Five High-Income Countries*, 96 SOC. SCI. Q. 202 (2015).

<sup>16</sup> For discussion of the near miss at the start of the Covid-19 pandemic, see Paul Tucker, *Time to look again at the financial system's dangerous faultlines*, FIN. TIMES (Jan. 20, 2021), <https://www.ft.com/content/0d848d03-7d66-4a76-a4f2-8f09980747fa>.

<sup>17</sup> "Faster trades means more trading". Saule T. Omarova, *Technology v Technocracy: Fintech as a Regulatory Challenge*, 6 J. FIN. REG. 75, 89 (2020).

<sup>18</sup> "Communities of color and low-income or low-wealth, indigenous, rural, and rustbelt communities are more likely to be impacted by floods, storms, drought, food and water insecurity, increased diseases, faltering infrastructure, increased violence, and most other climate harms. These same communities often have the fewest economic resources with which to respond". PUBLIC CITIZEN & AMERICANS FOR FINANCIAL REFORM, CLIMATE ROADMAP FOR U.S. FINANCIAL REGULATION, iv (2021), <https://www.citizen.org/wp-content/uploads/Climate-Financial-Reg-Report.pdf>.

issues are likely to cause for the financial system.<sup>19</sup> A precautionary approach counsels us not to wait until we understand the precise risks involved before taking action – by then, it might be too late to do anything about them.

While policy in the United States is very precautionary in some areas (for example, counter-terrorism policy), the United States' approach to financial regulation has not typically been precautionary.<sup>20</sup> Instead, the preference has often been to wait for a crisis to develop and then provide emergency support and legislate a response after the fact. As I have just explored, that is not a responsible or sustainable approach when it comes to financial stability in general, and climate-related financial stability issues in particular.

#### 4. Climate-related threats to financial stability

Although we do not yet have a precise understanding of many of the climate-related risks that financial stability faces, we already know a lot about the general types of threats that could disrupt the financial system. These threats have generally been divided into “physical risks” and “transition risks” (although many of them are not really risks in the strictest sense, because we don't know their probability of occurring). When one or more of these threats become reality, then they can generate market, credit, liquidity, and operational risks for financial institutions and other participants in the financial markets. The interactions of these risks could potentially create problems for the stability of the entire financial system.

The Financial Stability Board, an influential international body that monitors threats to financial stability, has defined physical risk as “the possibility that the economic costs and financial losses from the increasing severity and frequency of extreme climate-change related weather events might erode the value of financial assets, and/or increase liabilities.”<sup>21</sup> Physical risks are most obviously of concern to the insurance industry, but they could also affect property that serves as collateral for loans, if such property is threatened by rising seas, fires, hurricanes, or any other manner of extreme weather or lasting environmental change.<sup>22</sup> If collateral proves to be vulnerable, the financial institutions that extended the secured loans could find themselves exposed to significant losses in the event of borrower default – and borrower default could also be made more likely by climate-related uncertainties (including an inability to renew insurance policies on the collateral property as insurers exit challenging insurance markets).<sup>23</sup>

The Financial Stability Board characterizes transition risks as those relating “to the process of adjustment towards a low-carbon economy, including shifts in policies designed to mitigate and

<sup>19</sup> “[I]t is worth considering that the probability of financial risks from climate change materializing is high, if not a certainty. Graham S. Steele, *Confronting the 'Climate Lehman Moment': The Case for Macroprudential Climate Regulation*, 30 CORNELL J. L. & PUB. POL'Y 109, 120 (2020).

<sup>20</sup> For a discussion of variations in US precautionary attitudes, see Jonathan B. Wiener, *Whose Precaution After All? A Comment on the Comparison and Evolution of Risk Regulatory Systems*, 13 DUKE J. COMP & INT'L L. 207, 210 (2003).

<sup>21</sup> FIN. STAB. BD., STOCKTAKE OF FINANCIAL AUTHORITIES' EXPERIENCE IN INCLUDING PHYSICAL AND TRANSITION CLIMATE RISKS AS PART OF THEIR FINANCIAL STABILITY MONITORING, 2 (2020).

<sup>22</sup> *Id.* at 7.

<sup>23</sup> Steele, *supra* Note 19, at 119.

adapt to climate change, which would affect the value of financial assets and liabilities.”<sup>24</sup> Investments in and loans to fossil fuel-related businesses are obvious candidates for assets that would be vulnerable to policy shifts regarding carbon-producing activities, as are commodity swaps.<sup>25</sup> However, we may ultimately be surprised by seemingly unrelated assets suffering from transition risks – the spillover effects of a global phenomenon like climate change response are likely to produce unexpected correlations amongst asset classes. Transition risks could arise from domestic policy shifts with regard to certain kinds of assets, or policy changes made abroad, and these changes will not necessarily be gradual: swift political action could come hard on the heels of the occurrence of a major natural disaster. Assets could also be compromised following the invention of a new and superior green technology that quickly renders existing industries obsolete, or by retail investors’ increasing focus on environmental issues and rejection of carbon-intensive industries.<sup>26</sup> To be clear, these transition risks are not a reason to avoid adjustments towards a low-carbon economy – these kinds of adjustments will be necessary to avoid what are likely to be much larger economic dislocations from physical risks, and so it is the job of financial stability regulation to try to mitigate the impact of these adjustments on our financial system.

If a large bank were exposed to enough market risk (in other words, if its investments were to lose enough value) because of a physical or transition risk, it could fail and then its contractual counterparties would be exposed to credit risks as it defaulted. If those credit risks were big enough, some of the bank’s contractual counterparties could fail themselves, potentially dragging down some of *their* counterparties, like dominos.<sup>27</sup> Because contractual relationships between financial institutions can serve as transmission belts that spread problems throughout the financial system, financial stability regulation typically focuses on the largest financial institutions with more relationships that are likely to generate more credit risk for the system overall if they fail.<sup>28</sup> However, the simultaneous failure of many smaller financial institutions could also create systemic risk.<sup>29</sup>

Financial institutions (large and small) are unlikely to simply accept the inevitability of failure, though. In an attempt to save themselves, financial institutions that had invested in assets suffering from a physical or transitional risk would seek to sell them off *en masse*, which would put further downward pressure on the price of such assets (creating more market risk), potentially

<sup>24</sup> FIN. STAB. BD., *supra* Note 21 at 2. “Carbon emissions have to decline by 45% from 2010 levels over the next decade in order to reach net zero by 2050. This requires a massive reallocation of capital. If some companies and industries fail to adjust to this new world, they will fail to exist.” Bank of England, *Open Letter on Climate-Related Financial Risks* (Apr. 17, 2019) (available at <https://www.bankofengland.co.uk/news/2019/april/open-letter-on-climate-related-financial-risks>).

<sup>25</sup> Steele, *supra* Note 19, at 126.

<sup>26</sup> On the subject of changing investor preferences, see Michal Barzuza et al., *Shareholder Value(s): Index Fund ESG Activism and the New Millennial Corporate Governance*, 93 S. CAL. L. REV. 1243 (2020).

<sup>27</sup> Regarding the transmission of risks by institutions, see Steven L. Schwarcz, *Systemic Risk*, GEO. L. J. 193, 201 (2008).

<sup>28</sup> Regulatory capital requirements, for example, are higher for the largest banks because of the heightened risk they pose to financial stability. See Financial Stability Board, *2020 List of Global Systemically Important Banks (G-SIBs)* (Nov. 11, 2020), <https://www.fsb.org/wp-content/uploads/P111120.pdf>.

<sup>29</sup> “[T]he weakest link in the financial stability chain might be *small*, rather than large, financial intermediaries.” Eric S. Rosengren, President & CEO of the Federal Reserve Bank of Boston, *Defining Financial Stability, and Some Policy Implications of Applying the Definition*, Keynote Remarks at the Stanford Finance Forum, Graduate School of Business, Stanford University, 9 (Jun. 3, 2011).



requiring still more institutions to divest their holdings in a vicious cycle sometimes referred to as a “fire sale externality.”<sup>30</sup> If assets compromised by physical or transition risks were to become difficult to sell because of uncertainty about their value, holders of those assets would also experience liquidity risk, and they could then be forced to sell off other types of assets at a discount in order to satisfy their obligations when they come due, potentially jeopardizing their own solvency and transmitting the panic to other asset markets, instigating more fire sales.

Liquidity pressures could also arise because of reputational concerns, and then transform into solvency pressures. For example, if a government were to adopt a policy that penalizes the fossil fuel industry, the customers of a bank that is perceived as being close to the fossil fuel industry might assume that the bank is in trouble, even if the bank’s portfolio is well-diversified. If the bank’s customers rush *en masse* to withdraw their deposits on the basis of that mistaken assumption, then the bank will be forced to start liquidating its assets in order to meet those withdrawal requests, and if the time pressures involved mean that the bank has to sell those assets at a discount, then it may very well become insolvent. Of course, there could also be liquidity issues if the bank does indeed have significant exposures to fossil fuel related assets. For example, if a bank has made many long-term loans to the oil and gas industry and funded those loans by rolling over short-term funding (like overnight sale and repurchase agreements), that funding could easily dry up as result of concerns about the bank’s exposure to the fossil fuel industry. This would force the bank to sell these or other assets at a discount in order to raise the cash necessary to satisfy its obligations when they come due: once again, we’re faced with the prospect of bank insolvencies and fire sales (particularly if many banks have exposure to the same kinds of fossil fuel related assets, and are selling at the same time).

These dynamics of domino institutional failures and fire sales dragging down markets are systemic risks that can compromise the entire financial system. As financial institutions and markets become compromised in these ways, their ability to provide the capital intermediation services on which the broader economy depends – most notably, the provision of credit – is also compromised.<sup>31</sup> The financial system also provides important “plumbing” services, such as the processing of payments, that are essential to economic growth. The physical infrastructure involved in providing these types of services is vulnerable to physical risks,<sup>32</sup> and this is another potential (but often overlooked) source of systemic risk. Operational problems are usually considered to be idiosyncratic problems for the institution experiencing them, with few spillover effects. However, failure of one kind of financial infrastructure may sometimes result in its users migrating to an alternative infrastructure, which could buckle under the increased load, forcing more users to overload any remaining alternatives in yet another vicious cycle.<sup>33</sup> There are a variety of stress tests and other approaches that could be pursued to get a sense of when and how

<sup>30</sup> For a discussion of fire sale dynamics, see Anil K. Kashyap et al., *The Macroprudential Toolkit*, 59 IMF ECON. REV. 145 (2011).

<sup>31</sup> Ben Bernanke, *The Real Effects of Disrupted Credit: Evidence from the Global Financial Crisis*, BROOKINGS PAPERS ON ECONOMIC ACTIVITY, 3 (Sept. 13, 2018).

<sup>32</sup> Christina Parajon Skinner, *Central Banks and Climate Change*, 75 VAND. L. REV. (forthcoming), [https://papers.ssrn.com/sol3/papers.cfm?abstract\\_id=3703142](https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3703142).

<sup>33</sup> For a discussion of cascading operational failures in the payments system, see Hilary J. Allen, *Payments Failure*, 62 B.C. L. REV. 453, 469 et seq. (2021).

usage might shift to alternative infrastructure following the manifestation of a physical risk;<sup>34</sup> examining the business continuity plans of financial institutions involved in payments processing and other “plumbing” functions would be a critically important part of any such exercise.

## 5. Regulatory responses

### Disclosure

I want to start my discussion of possible regulatory responses to these threats by making it clear that climate-related systemic risks are not something that the markets can be expected to manage on their own. First, financial stability is a classic “public good”, in the sense that everyone benefits from it, but the public can’t be forced to pay for it.<sup>35</sup> Therefore, in the absence of regulation, market participants have limited incentives to promote the stability of the financial system – even if those market participants knew enough about the risks at hand to quantify and price them (which they often do not), they would not automatically be “priced in” to assets. Second, financial crises are a systemic problem, and avoiding them typically requires coordinated action by many market participants. Market participants couldn’t compel other market participants to coordinate their actions for the greater good, even if they wanted to. Because market participants can’t manage systemic risks on their own, regulations mandating climate-related disclosures to those market participants are necessary, but not a complete solution to climate-related systemic risks.<sup>36</sup>

### Regulatory Capital Requirements

Regulatory capital requirements should also be part of the response to these systemic risks. Regulatory capital requirements are complicated, but their main goal is to create a cushion of funding that allows banks to better absorb losses on their investments.<sup>37</sup> If the cushion is too small and the bank experiences losses on its investments, there is a greater chance that the bank’s repayment obligations will end up exceeding the value of its investments. If the losses are big enough and the cushion small enough, the bank may even become insolvent. Because banks have strong incentives (particularly under the tax code) to fund their investments with more borrowed money, minimum regulatory capital requirements have been implemented to protect bank solvency

<sup>34</sup> “Netflix uses something called “chaos monkey” to shut down parts of its system randomly in order to learn more about the connections therein, as well as the ability of those connections to transmit cascade failures. Although the consequences of payments failure are much greater than an unavailable movie, some variation on this theme—perhaps a simulation of shutting down parts of the system—could assist in understanding the pathways through a constantly evolving ecosystem. Breakthroughs are also being made in the field of novelty detection, where artificial intelligence is being utilized to “find unexpected outcomes in a system.” Recently, this type of technology has been used to detect changes in retail payments flows that could serve as early warning signals of credit-related problems with payments providers. Presumably, it also could be used to identify unusual payments flows that signal operational problems.” *Id.* at 506-7.

<sup>35</sup> For an introduction to the concept of public goods, and regulation as a response to the public goods problem, see Matthew D. Adler, *Regulatory Theory* in Dennis Patterson (ed.), *A COMPANION TO PHILOSOPHY OF LAW AND LEGAL THEORY* 598-9 (2d ed. 2010).

<sup>36</sup> For further elaboration on this point, see Madison Condon, *Market Myopia’s Climate Bubble*, UTAH L. REV. (forthcoming), [https://papers.ssrn.com/sol3/papers.cfm?abstract\\_id=3782675](https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3782675).

<sup>37</sup> For further explanation of regulatory capital requirements, see Hilary J. Allen, *Cocos Can Drive Markets Cuckoo*, 16 Lewis & Clark L. Rev. 125, 129 *et seq.* (2012).

by requiring banks to fund their investments with a cushion of funding that doesn't need to be repaid to anyone. These minimum regulatory capital requirements (i.e. the size of the required cushion) are typically expressed as percentages, and the percentages required are reasonably consistent throughout the world because they are based on international standards promulgated by the Basel Committee on Banking Supervision.

The numerator of any percentage calculation is the cushion of funding – the “capital” itself. Capital can take many forms, ranging from the simplest and most loss-absorbent “Common Equity Tier 1” (which includes common equity and retained earnings) to more complicated debt-equity hybrid forms of funding. The denominator of the percentage calculation will depend on whether you're calculating a risk-based capital ratio (in which case, a complex process of risk-weighting is applied to the bank's assets to come up with the denominator) or a leverage ratio (the denominator here is simpler – it is the total assets of the bank). When designing capital requirements, regulators can therefore choose between more simple and more complicated approaches.

The risk-weighting approach is more complicated, but it can be useful for making banks more robust to quantifiable risks; risk-weightings can also be used to discourage banks from making certain types of investments that are considered risky. This approach could be used to address known transition risks, such as those affecting investments in fossil fuel-related businesses.<sup>38</sup> When dealing with most climate-related threats, though, regulators should backstop any complicated approach to risk-weighting with simpler approaches that are more robust to uncertain events.<sup>39</sup> We can think of these backstops as making the financial system more robust to climate-related threats generally, rather than trying to anticipate a particular type of shock to the system. A buffer of extra equity computed as part of a leverage ratio would be one way to respond to that uncertainty (this is not contemplated in Basel Committee's existing capital regime, and this kind of change would benefit from international agreement). At the very least, adding a buffer of extra equity to the risk-based capital requirements would provide a cushion to absorb miscalculations of risk-weightings.<sup>40</sup> This latter approach could be started immediately, relying on the Basel Committee's existing capital regime. Regulators already have the authority to implement a countercyclical buffer that requires banks to fund up to an additional 2.5% of their risk-weighted assets with Common Equity Tier 1 capital. As an alternative or a supplement to the countercyclical buffer, regulators already have the authority to require the largest banks to fund their investments with higher percentages of Common Equity Tier 1 capital – the current percentages could be increased to provide more cushion to absorb climate-related uncertainties.

### Stress Tests

When we have a good understanding of particular physical and transition risks, that understanding can inform the development of hypothetical climate scenarios that can be used to

<sup>38</sup> For detailed proposals in this vein, see Gregg Gelzinis, *Addressing Climate-Related Financial Risk Through Bank Capital Requirement*, CENTER FOR AMERICAN PROGRESS (May 11, 2021).

<sup>39</sup> For further discussion the benefits of simpler approaches to capital regulation, see Andrew G. Haldane & Vasilios Madouros, Speech at the Federal Reserve Bank of Kansas City's 366th economic policy symposium, “The changing policy landscape” titled *The Dog and the Frisbee* (Aug. 31, 2012).

<sup>40</sup> For further discussion of the benefits of increased equity funding for banks, see Anat Admati et al., *Healthy Banking System Is the Goal, Not Profitable Banks*, FIN. TIMES, Nov. 9, 2010, <https://www.ft.com/content/63fa6b9c-cb8c-11df-bbb5-00144feab49a>.

stress test whether a financial institution has sufficient capital to withstand that kind of shock to the system.<sup>41</sup> Right now, these types of stress tests would be best suited to assessing known transition risks, such as those affecting investments in fossil fuel-related businesses (as discussed in the context of risk-weightings above). Stress tests can also be used to help better understand how resilient financial institutions are likely to be in the face of climate change more generally. Instead of being engineered to test for a particular outcome, these kind of stress tests would be designed simply to find out “what would happen if . . .”, and are particularly well-suited to uncertain environments.<sup>42</sup> Regulators should therefore consider running hypothetical scenarios of possible physical risks, transition risk, and combinations of the two, to get a sense of what the outcomes for individual financial institutions, and the financial system as a whole, are likely to be in the long-term. These kinds of stress tests can start immediately, and regulators can learn from their output. While it will sometimes be appropriate to adjust regulation in light of this output, given the uncertainty involved in addressing climate as a systemic risk, financial regulators need to be somewhat humble about the predictive value of these kinds of open-ended stress tests.

### Supervision

Regulators will also need to be nimble. Because of the evolving nature of climate-related threats, the hard work of making the financial system more robust will often need to be done through tweaks made as part of the ongoing supervision of financial institutions (for example, limitations may need to be placed on financial institutions’ portfolios of carbon-related assets, or divestiture orders may become appropriate).<sup>43</sup> In the face of this evolving and uncertain situation, a use of principles-based regulation may be necessary. In a principles-based regulatory regime, high level objectives are adopted through formal rule-making procedures, and then informal guidance supplies much of the detail on how to satisfy these objectives – in a fluid situation, this affords greater flexibility to both the regulators and the regulated entities in determining how to comply with the high-level objectives.<sup>44</sup> To be clear, regulators should not adopt the light-touch principles-based regulation we have sometimes seen in the past, which can devolve into too much deference to the financial industry and therefore work as a type of deregulation.<sup>45</sup> In particular, regulators should not be too deferential to banks’ hedging strategies and internal risk models, because those strategies and risk models will not be able to respond to true uncertainty and may very well leave banks’ vulnerable to unanticipated threats. Instead, we need precautionary principles-based regulation that is committed to the high-level objective of protecting financial

<sup>41</sup> Gregg Gelzinis & Graham Steele, *Climate Change Threatens the Stability of the Financial System* (Nov. 21, 2019) (available at [https://cdn.americanprogress.org/content/uploads/2019/11/20072438/Climate-Change-Financial-Stability-brief.pdf?\\_ga=2.190241067.187054642.1601052962-604474383.1601052962](https://cdn.americanprogress.org/content/uploads/2019/11/20072438/Climate-Change-Financial-Stability-brief.pdf?_ga=2.190241067.187054642.1601052962-604474383.1601052962)); Bank of England, *The 2021 Biennial Exploratory Scenario on the Financial Risks from Climate Change* (Dec. 18, 2019) (available at <https://www.bankofengland.co.uk/-/media/boe/files/paper/2019/the-2021-biennial-exploratory-scenario-on-the-financial-risks-from-climate-change.pdf?la=en&hash=73D06B913C73472D0DF21F18DB71C2F454148C80>).

<sup>42</sup> For further discussion of the benefits of open-ended stress tests, see Robert F. Weber, *A Theory for Deliberation-Oriented Stress Testing Regulation*, 98 MINN. L. REV. 2236 (2014).

<sup>43</sup> Steele, *supra* Note 19, at 150.

<sup>44</sup> For a discussion of a principles-based approaches to financial regulation, see Julia Black et al., *Making a Success of Principles-Based Regulation*, 1 L. & FIN. MKT. REV. 191 (2007).

<sup>45</sup> As an example, see the critique of the UK FSA’s principles-based approach as being somewhat light-touch and deregulatory in FINANCIAL SERVICES AUTHORITY, *THE TURNER REVIEW: A REGULATORY RESPONSE TO THE GLOBAL BANKING CRISIS*, 86 *et seq.* (Mar. 2009), [http://www.actuaries.org/CTTEES\\_TFRISKCRISIS/Documents/turner\\_review.pdf](http://www.actuaries.org/CTTEES_TFRISKCRISIS/Documents/turner_review.pdf).

stability from climate-related risks, but flexible in its application. The Interagency Statement Clarifying the Role of Supervisory Guidance adopted by banking regulatory agencies in 2018 will complicate flexible approaches to regulation, though.<sup>46</sup> This Interagency Statement (often referred to as the “guidance on guidance”) made clear the agencies’ position that they would no longer enforce their informal guidance against regulated banks.<sup>47</sup> The Federal Reserve adopted a rule in March of 2021 that effectively codified this guidance on guidance, but it and the other financial regulatory agencies should move in the other direction and disaffirm this approach. Climate-related supervision requires the flexibility that can come from informal guidance.

Climate-related supervision can also be improved if bank regulators start requiring banks to disclose any known climate-related exposures in the call reports they submit to regulators. This practice should begin immediately, and would benefit from input from the experience of banking agencies around the world that have already integrated climate-related threats into their supervisory process. An international network of central banks and financial regulators known as the Network for Greening the Financial System (“NGFS”) is focused on “integrat[ing] the monitoring of climate-related financial risks into day-to-day supervisory work, financial stability monitoring and board risk management”.<sup>48</sup> banking regulatory agencies should join the NGFS immediately to enable them to take advantage of its collective expertise in this area (the Federal Reserve has already joined the NGFS).<sup>49</sup>

#### Operational Risk Regulation

Finally, the threats posed by climate change require us to revise our current approach to regulating operational risk. The Basel Committee had developed Principles for the Sound Management of Operational Risk that require banks to monitor, identify and mitigate operational risks, but these Principles mostly treat operational risk as something that a bank should manage on its own, as a matter of internal governance and risk management. Principle 4, for example, provides that “[t]he board of directors should approve and periodically review a risk appetite and tolerance statement for operational risk that articulates the nature, types, and levels of operational risk *that the bank is willing to assume*” [emphasis added].<sup>50</sup> But what about the risks that a financial institution might create for others? If the costs of operational failure fall on others, institutions may be encouraged to underinvest in the robustness of their own infrastructure.

Even if a bank were willing to invest heavily to limit the consequences of any operational problems, that bank might not have the capacity to assess and address the systemic consequences

<sup>46</sup> Available at <https://www.fdic.gov/news/press-releases/2018/pr18059a.pdf>.

<sup>47</sup> For further background on the “guidance on guidance”, see Sidley, *Federal Reserve Finalizes Rule on Role of Supervisory Guidance and Issues Consolidated Regulatory FAQs*, SIDLEY (Apr. 2, 2021) <https://www.sidley.com/en/insights/newsupdates/2021/04/federal-reserve-finalizes-rule-on-role-of-supervisory-guidance-and-issues-consolidated-reg-faqs>.

<sup>48</sup> Bank of England, *Open Letter on Climate-Related Financial Risks* (Apr. 17, 2019), <https://www.bankofengland.co.uk/news/2019/april/open-letter-on-climate-related-financial-risks>.

<sup>49</sup> Bd. Gov. Fed. Res. Sys., *Federal Reserve Board announces it has formally joined the Network of Central Banks and Supervisors for Greening the Financial System, or NGFS, as a member* (Dec. 15, 2020), <https://www.federalreserve.gov/newsevents/pressreleases/bcreg20201215a.htm>.

<sup>50</sup> BASEL COMMITTEE ON BANKING SUPERVISION, PRINCIPLES FOR THE SOUND MANAGEMENT OF OPERATIONAL RISK, 5 (Jun. 2011), <https://www.bis.org/publ/bcbs195.pdf>.

of the operational risks it is taking. It probably wouldn't know how its competitors would be affected by its operations, and even if it did, no bank can compel its competitors to resolve collective problems. Financial regulators, on the other hand, have broader oversight and access to confidential information (particularly business continuity plans) through their supervisory functions. These regulators should take a more systemic approach to the management of operational risks – I have described this approach as “macro-operational regulation” (reflecting its parallels with macroprudential regulation, which seeks to avoid the systemic consequences of actions taken by individual institutions to address their own credit and liquidity risks).<sup>51</sup>

We already have some regulatory tools that could be considered macro-operational. For example, financial infrastructure can be designated as a “systemically important financial market utility” by the Financial Stability Oversight Council,<sup>52</sup> and then it will need to comply with the Federal Reserve’s Regulation HH (which includes some relatively prescriptive requirements relating to the management of operational risks).<sup>53</sup> More macro-operational regulation is needed, though. As physical threats to financial institutions’ operating systems become more pressing, a real-time reporting system for operational issues will become crucial. Regulators should also consider developing types of circuit breakers that can be deployed when operational issues occur, preventing the execution of any business continuity plan that could overload shared financial infrastructure. These regulatory measures should be backed by a whole-of-government approach to improving the critical infrastructure (particularly telecommunications infrastructure) on which the financial industry relies to provide its services – a lot can be learned from cyberpreparedness exercises, for example. Finally, because none of these strategies are foolproof, it would be wise to adopt policies that prevent a transition to a completely cashless society (for example, the definition of “legal tender” could be amended to *require* businesses to accept cash as payment for goods and services).<sup>54</sup> The Federal Reserve has responded to past natural disasters by distributing physical cash to affected communities;<sup>55</sup> if we transition to a cashless society, that will no longer be an option, raising the stakes of operational problems.

## 6. FSOC coordination

These are just some of the kinds of financial stability regulations that could make our financial system more robust to climate-related threats. However, financial stability regulation is often very challenging to implement in the United States. We have a very fragmented financial

<sup>51</sup> Allen, *supra* Note 33, at 456.

<sup>52</sup> This designation power is found in Dodd-Frank Section 804.

<sup>53</sup> Regulation HH requires a “designated financial market utility” to enact “a robust operational risk-management framework” that, relevantly, “[h]as systems that have adequate, scalable capacity to handle increasing stress volumes and achieve the designated financial market utility’s service-level objectives” and “[h]as comprehensive physical, information, and cyber security policies, procedures, and controls that address potential and evolving vulnerabilities and threats.” It also sets out parameters for business continuity planning in the event of an operational failure, establishing the goal of same-day resumption of settlement services even in a worst-case scenario. Section 234.4(b) of Regulation HH also expressly authorizes emergency changes to be made to a FMU’s rules, procedures, and operations if its ability to provide services in a safe and sound manner is compromised. See Allen, *supra* Note 33, at 483.

<sup>54</sup> This definition is found in 31 USC § 5103.

<sup>55</sup> Federal Reserve Bank of San Francisco, *Emergency Funds: Why Americans Choose Cash for Disaster Preparation*, SF FED BLOG (Mar. 31, 2017), <https://www.frbsf.org/our-district/about/sf-fed-blog/emergency-funds-why-americans-choose-cash-for-disaster-preparation/>.

regulatory architecture with many different regulatory agencies, and the communication problems and regulatory gaps that arise from this fragmentation pose challenges for all financial stability regulation – not just regulation responding to climate as a systemic risk.<sup>56</sup> This fragmentation may be part of the reason why the United States has fallen behind the United Kingdom and the European Union in developing regulatory approaches that respond to climate-related threats: to regain this ground and confront the realities of climate change, all of the federal financial regulatory agencies will need to coordinate on developing precautionary responses to climate threats.

The most readily available solution to these coordination problems is to involve the FSOC, which was created in 2010 “to respond to emerging threats to the stability of the United States financial system.”<sup>57</sup> This FSOC is a council of the officials who lead the federal financial regulatory agencies. Each of the Chairman of the Federal Reserve, the Comptroller of the Currency, the Chairperson of the FDIC, the Director of the CFPB, the Chairman of the SEC, the Chairman of the CFTC, the Director of the FHFA and the Chairman of the NCUA is a voting member of the FSOC, as is “an independent member appointed by the President, by and with the advice and consent of the Senate, having insurance expertise.” The FSOC also has five non-voting members: the Director of the Office of Financial Research, the Director of the Federal Insurance Office, and representative state banking, insurance and securities commissioners. Finally, the Treasury Secretary is a voting member, and also acts as the Chair of the FSOC.<sup>58</sup> The FSOC should start responding to climate as a systemic risk by coordinating a road map of all the climate-related regulatory approaches that are being pursued by each of these agencies, together with a timing and implementation plan for each approach.

Since the FSOC was created, many reform proposals have sought to make increased use of the FSOC (including the Addressing Climate Financial Risk Act of 2021, which proposes to create a Climate Risk Advisory Committee within the FSOC). However, the FSOC has limited legislative authority, and was set up with very limited resources (the FSOC was designed to leverage the resources of the agencies headed by its members).<sup>59</sup> The FSOC needs to be strengthened before it can really be effective in responding to climate-related threats to financial stability. Because of the Treasury Secretary’s agenda-setting position as chair of the FSOC, the efficacy of the FSOC is dependent on how committed the Treasury Secretary is.<sup>60</sup> Ideally, the legislation that created the FSOC would be amended to give the FSOC a politically independent chair, but if that kind of legislative reform is not possible, the FSOC should at least have a more substantial staff. No legislative change would be needed before hiring more personnel for the FSOC, and these resources are needed to support any Climate Risk Advisory Committee formed within the FSOC.

The FSOC is also critical to extending financial stability regulation beyond banks to other important financial institutions and markets.<sup>61</sup> Dodd-Frank responded to the systemic risks posed

<sup>56</sup> For a discussion of the coordination challenges resulting from this fragmented regulatory structure, see Allen, *supra* Note 1, at 1128 *et seq.*

<sup>57</sup> Dodd-Frank Section 112.

<sup>58</sup> Dodd-Frank Section 111.

<sup>59</sup> Allen, *supra* Note 1, at 1120.

<sup>60</sup> *Id.* at 1126-7.

<sup>61</sup> “The complexity of modern finance means that regulators must address not only lending, but also capital-markets financing mechanisms, many of which are currently outside any meaningful regulatory oversight. In securities,

by non-bank financial institutions by giving the FSOC power to designate those institutions as systemically important and subject them to heightened regulation by the Federal Reserve.<sup>62</sup> In 2019, however, the FSOC adopted guidance that largely neutered its own designation power<sup>63</sup> – that guidance should be replaced and the designation power revived. The FSOC should also consider whether additional financial market utilities need to be designated as systemically important pursuant to Section 804 of Dodd-Frank. In addition, legislative amendments should be made to Section 120 of Dodd-Frank, to authorize the FSOC to promulgate regulations that govern systemically risky activities, not just make recommendations (this and other reforms were included in the Systemic Risk Mitigation Act proposed in 2020).<sup>64</sup>

A “whole system” approach to climate change and systemic risk would also be boosted by implementing my recommendation to give all of the FSOC’s member agencies financial stability mandates – a climate committee on the FSOC would then be able to leverage the work of individual agencies in order to promote stability. In the absence of this kind of mandate, some member agencies may simply not consider climate-related systemic risks to be part of their job description. The Addressing Climate Financial Risk Act of 2021 proposes that “Each member agency should develop and make available a strategy to identify and mitigate climate financial risks *within the jurisdiction of the member agency*.” (emphasis added), but if an agency does not consider financial stability issues to be “within their jurisdiction”, then there will be gaps in the regulation of climate-related systemic risks. To further encourage member agencies to diligently monitor and respond to these risks, the signed statement and testimony requirements in Sections 112(b) and 112(a)(2)(N) of Dodd-Frank could be revised to require each member agency to certify and testify that their individual agency is taking steps to promote financial stability by identifying and responding to emerging climate-related threats.

It would also help to legislate a precautionary definition of “financial stability”, so that the scope of the financial stability mandate is delineated (for the FSOC itself, as well as the individual agencies). Right now, there is no definition of “financial stability” in Dodd-Frank. Something like the following would be helpful:

The term “financial stability” shall mean a state of affairs wherein (i) financial institutions and markets are able to facilitate capital intermediation, risk management, and payments in a way that enables sustainable and inclusive economic growth; and (ii) financial institutions and markets are able to withstand economic and other shocks so that there will be no significant disruption to the performance of the functions set forth in (i).

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capital has flowed away from SEC registered offerings to exempt offerings and from public markets to private ones. Private equity, hedge funds and other private funds have enjoyed meteoric growth. At the same time, the shadow banking system—a constellation of less regulated capital markets, products, and intermediaries ranging from asset-backed securities to repo to money market mutual funds—has come to dwarf the traditional depository banking system. For climate financial regulation to be effective, policymakers must extend rules to private offerings of securities while simultaneously reversing decades of capital migration to less regulated, darker corners of the financial universe.” PUBLIC CITIZEN & AMERICANS FOR FINANCIAL REFORM, *supra* Note 18, at iv.

<sup>62</sup> This designation power is found in Section 113 of Dodd-Frank.

<sup>63</sup> <https://home.treasury.gov/system/files/261/Authority-to-Require-Supervision-and-Regulation-of-Certain-Nonbank-Financial-Companies.pdf>

<sup>64</sup> Systemic Risk Mitigation Act of 2020, H.R. 6501, 116th Cong. § 5 (2020).



The final challenge that needs to be addressed with regard to the FSOC relates to insurance. Even if all of the other federal financial regulatory agencies have a mandate to coordinate on financial stability issues, insurance will continue to pose a problem because it is primarily regulated at the state level. Financial stability mandates aren't a very good fit for state-level regulators (because financial stability is a borderless public good that will accrue largely to persons residing outside of their state),<sup>65</sup> but leaving insurance out of the discussion about climate as a systemic risk is foolhardy. The Federal Insurance Office ("FIO") should therefore be made a voting member of FSOC, and given more authority "to shape insurance regulation when it has credibly determined that doing so is necessary to help monitor, manage, or prevent systemic risk in insurance."<sup>66</sup>

## 7. Interdisciplinary expertise and the Office of Financial Research

The types of precautionary regulation that I have called for in this statement ask a lot of regulators. Regulatory agencies will need to be nimble, humble about what they don't know, understand environmental as well as financial issues, and staunchly promote the public interest in the face of financial industry pressure. None of this will be possible without the necessary expertise. In addition to the economic, legal, and financial expertise that is already well represented in financial regulatory agencies, there will be an increasing need for climate scientists, environmental economists, data scientists, computer scientists, and complexity scientists.

The benefits of these types of new expertise will be maximized if the expertise is concentrated in a hub, rather than scattered through the different regulatory agencies. Establishing a hub will serve a coordinating function for climate-risk policy, preventing fractured policy from emerging from the different regulatory agencies. A hub will also respond to anticipated hiring difficulties in several ways (with new types of climate-based regulations coming into play, banks and other financial institutions will also be seeking to hire personnel with climate-related expertise, offering salaries that make it harder for the government to attract these personnel). First, consolidating interdisciplinary personnel in a hub prevents agencies from poaching from one another those experts who *are* willing to work for the government. Second, the prospect of working with like-minded experts (rather than being one of a few at an agency where their expertise isn't understood or seen as core to the agency's mission) would be attractive to prospective hires. The synergies that could emerge from having a large innovative and interdisciplinary workforce considering creative responses to climate-related systemic risks (and other emerging systemic risks, like those arising from fintech) would be of benefit to everyone.

The obvious location for this interdisciplinary expertise hub is the OFR.<sup>67</sup> The OFR was created by Dodd-Frank to address the gaps in data availability and analysis that hampered governmental authorities in their response to the events of 2008.<sup>68</sup> It is already authorized to engage in "performing applied research and essential long-term research" by Section 153(a)(3) of Dodd-Frank, and the OFR's Research and Analysis Center is already authorized by Section

<sup>65</sup> Daniel Schwarcz & Steven L. Schwarcz, *Regulating Systemic Risk in Insurance*, 81 U. CHI. L. REV. 1569, 1628 (2014).

<sup>66</sup> *Id.* at 1635.

<sup>67</sup> For a fulsome discussion of my proposals to reform the OFR, see Hilary J. Allen, *Resurrecting the OFR*, J. CORP. L. (forthcoming), [https://papers.ssrn.com/sol3/papers.cfm?abstract\\_id=3727585](https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3727585).

<sup>68</sup> Senator Jack Reed, Floor Statement on the National Institute of Finance Act (Feb. 4, 2010).

154(c)(1)(C) of Dodd-Frank to “maintain expertise in such areas as may be necessary to support specific requests for advice and assistance from financial regulators.” The OFR’s staffing and other resources were cut substantially during the Trump Administration,<sup>69</sup> but that offers an opportunity to rebuild the OFR in a new, interdisciplinary way. Because personnel is policy, the next director of the OFR should be committed to using innovative interdisciplinary approaches to address emerging financial stability challenges like climate change.

With this interdisciplinary expertise, the OFR could lead the way in developing climate-related stress test scenarios, as well as new capital risk-weightings that reflect acute climate-related risks.<sup>70</sup> There is also a lack of readily available data about the physical location of assets, and this data is necessary for assessing physical risks;<sup>71</sup> the OFR previously took a leading role in developing standardized legal entity identifiers (known as LEIs), and it could draw on that experience to spearhead a project to standardize reporting of asset locations around the world. The OFR could also work on new types of technology-informed regulatory strategies (often referred to as “suptech”), including a real-time reporting system for operational outages.

In addition to these types of activities, a rebuilt, interdisciplinary OFR could also provide direct assistance to other financial regulatory agencies. While OFR employees would not have primary responsibility for supervising any financial institutions, they could accompany the primary regulators during some examinations, as well as help review call reports and other relevant disclosures made to regulators. Interagency collaboration could also take the form of task forces or joint research projects, where employees of other financial regulatory agencies raise the research questions, and then partner with the technical experts employed by the OFR to develop and interrogate solutions. These kinds of interagency collaboration can be established through Memoranda of Understanding. If the financial regulatory agencies fail to instigate these ventures themselves, then the FSOC’s Deputies Committee can play a coordinating role. The possibility of secondments from other agencies to the OFR should also be explored, with the dual aim of bringing different kinds of regulatory experience (including regulatory problems to be solved) to the OFR, and training secondees on financial stability issues and new interdisciplinary approaches to them in a way that they can take back to their home agency.

These are new proposals for an expanded OFR role; the OFR’s core function of data collection and analysis will also be vital to monitoring climate-related systemic risks. President Biden’s Executive Order on Climate-Related Financial Risk called for “the sharing of climate-related financial risk data and information among FSOC member agencies and other executive departments and agencies (agencies) as appropriate”, and the OFR is the natural candidate to collect and analyze that data. Unfortunately, this is easier said than done – there are currently a lot of roadblocks to data sharing. As former OFR economist Greg Feldberg puts it “[l]egacy data-collection technologies, old-school thinking, and bureaucratic turf fights continue to hinder the authorities’ ability to monitor systemic risks.”<sup>72</sup> Standardization of data reporting formats across

<sup>69</sup> “A round of layoffs was conducted in August of 2018, and many more personnel were encouraged to leave. As a result, the agency shrank from over 200 staff in 2016, to 96 as reported in the OFR’s 2019 Annual Report.” Allen, *supra* Note 67, at 11-12.

<sup>70</sup> Gelzinis & Steele, *supra* Note 41.

<sup>71</sup> FIN. STAB. BD., *supra* Note 21 at 13.

<sup>72</sup> Greg Feldberg, *Fixing Financial Data to Assess Systemic Risk*, BROOKINGS 5 (Dec. 2020),

different regulatory agencies as well as across different industries in the private sector will be needed to monitor climate-related threats, as will innovation in new data collection and analysis technologies.<sup>73</sup> Even with these changes, turf wars may remain an issue – the OFR has had difficulties in obtaining data from other regulatory agencies in the past,<sup>74</sup> and that may continue. It would therefore be helpful for any reform legislation adopted to include a clear statutory direction to other financial regulators that they must share data with the OFR.<sup>75</sup> Even in the absence of such a legislative amendment, though, Dodd-Frank already provides indirect authorization for the OFR to collect data from other agencies: Section 153(a)(1) directs the OFR to collect data on behalf of the FSOC, and Section 112(a)(1)(A) directs the FSOC to collect data from other agencies. The FSOC and the OFR working together could therefore compel the production of data from regulatory agencies (the OFR already has the power under Section 153(f) of Dodd-Frank to subpoena data from private sector firms).

As currently structured, the OFR is very dependent on a supportive FSOC and Treasury Secretary. More independence for the OFR is desirable, however: “[i]dentifying financial stability risks and data gaps means saying things that are unpopular. That mission requires more independence, not less.”<sup>76</sup> A number of steps could be taken to give the OFR more independence, including removing the OFR from the Treasury Department (which would include transferring authority for determining the OFR’s funding from the Treasury Department to the OFR itself), and making the Director of the OFR a voting member of the FSOC (they are currently a non-voting member). These steps would require legislative changes; if those are not feasible, it is crucial that the Treasury Secretary and the FSOC support the OFR in its efforts to address climate as a systemic risk.

## 8. Summary of action plan

This statement has covered a wide range of proposals designed to make the financial system more robust to physical and transition risks. Some of these proposals are specific responses to those physical and transition risks, others are intended to improve our financial regulatory architecture in general so that it is better equipped to execute financial stability regulation. These proposals can also be divided into “things that can be done right now”, and longer-term goals. For ease of reference, I will use these categories to summarize this statement’s proposals here.

### Things that can be done right now (without legislative changes)

- Banking regulators

<sup>73</sup> *Id.* at 10.

<sup>74</sup> Ryan Tracy, *Washington’s \$500 Million Financial-Storm Forecaster is Foundering*, WALL ST. JOURNAL (Feb. 19, 2018).

<sup>75</sup> For more on this kind of reform proposal, see Gregg Gelzinis, *Strengthening the Regulation and Oversight of Shadow Banks* (Jul. 18, 2019), <https://www.americanprogress.org/issues/economy/reports/2019/07/18/471564/strengthening-regulation-oversight-shadow-banks/>. A provision to this effect was included in Section 5 of the proposed Systemic Risk Mitigation Act, which proposes to amend Section 153(b) of Dodd-Frank to “require any member agency to produce such data and other information as the Director may determine necessary to carry out the duties of the Office.” Systemic Risk Mitigation Act of 2020, H.R. 6501, 116th Cong. § 5 (2020).

<sup>76</sup> Greg Feldberg, *Don’t Dismantle the Post-Crisis Early Warning System*, BROOKINGS (Nov. 21, 2018), <https://www.brookings.edu/research/dont-dismantle-the-post-crisis-early-warning-system/>.

- Deploy the countercyclical capital buffer to provide a capital cushion for climate-related threats
- Disaffirm the “guidance on guidance”
- Require climate-related risk disclosures in the call reports they receive from regulated banks
- Join the Network for Greening the Financial System
- The FSOC
  - Hire more staff
  - Apply the FSOC designation power to any non-bank financial institutions that are systemically important and significantly threatened by physical and transition risks
  - Apply the FSOC designation power for financial market utilities to designate any providers of critical infrastructure to the financial industry that have not yet been designated
  - Coordinate a road map of all the climate-related regulatory approaches that are being (and should be) pursued by each FSOC member agency, together with a timing and implementation plan for each approach.
- The OFR
  - Hire more staff, particularly climate scientists, environmental economists, data scientists, computer scientists, and complexity scientists (offering competitive salaries where possible)
  - Projects should include developing a real-time reporting system for operational outages; developing consistent physical identifiers for financial assets and collateral; working on climate scenarios for stress tests and climate-related risk-weightings for capital requirements
- Investments in infrastructure critical to the provision of financial services (particularly telecommunications infrastructure)

#### Longer-term goals

- The next person hired as director of the OFR should be committed to using innovative interdisciplinary approaches to emerging financial stability challenges like climate change
- Pass an omnibus financial reform bill that includes the following:
  - A definition of “financial stability”
  - Financial stability mandates for each FSOC member agency
  - The appointment of an independent chair for the FSOC
  - Amendments to Sections 112(b) and 112(a)(2)(N) of Dodd-Frank requiring each FSOC member agency to certify and testify that their individual agency is taking steps to promote financial stability by identifying and responding to emerging climate-related threats
  - Amendments to Section 120 of Dodd-Frank allowing the FSOC to make rules, not just recommendations, regarding systemically risky activities
  - Directors of the Office of Financial Research and Federal Insurance Office become voting members of FSOC
  - The OFR becomes an independent agency with authority to establish its own funding rule

- A clear statutory direction to other financial regulators requiring them to share data with the OFR
- Pass legislation requiring businesses to accept cash payments
- Coordinate with other members of the Basel Committee on Banking Supervision on:
  - Adding an equity buffer to the leverage ratio to provide a cushion against climate-related uncertainty
  - Adopting a more “macro” approach to the supervision of operational risks

Testimony of Dr. Rachel Cleetus,  
Policy Director, Climate and Energy Program, Union of Concerned Scientists

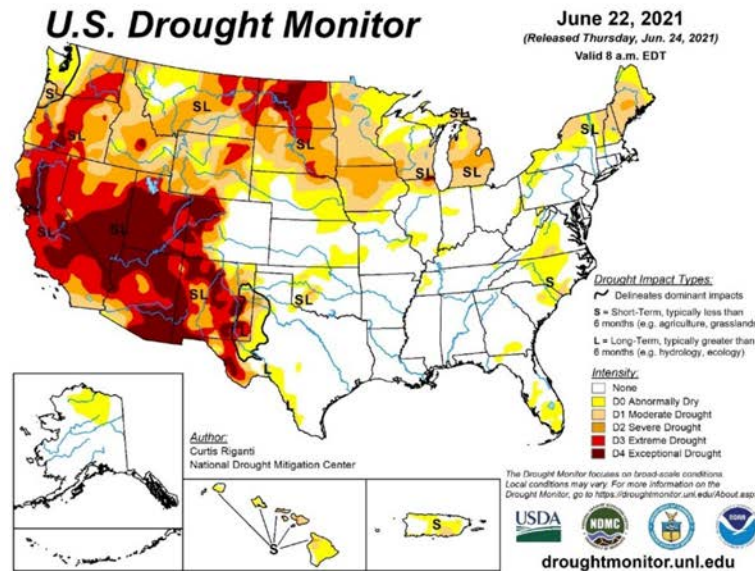
*“Addressing Climate as a Systemic Risk: The Need to Build Resilience within Our Banking and Financial System”*

**House Financial Services Subcommittee on Consumer Protection and Financial Institutions hearing  
June 30, 2021**

Hello and thank you, Chairman Perlmutter, Ranking Member Luetkemeyer, and Members of the Subcommittee, for providing me the opportunity to testify remotely today. My name is Rachel Cleetus, and I am the policy director and lead economist for the climate and energy program at the Union of Concerned Scientists. I am here today to share my perspectives on the threat climate change poses to our economy, our financial system, and our well-being, including disproportionate harms to low-income communities and communities of color. I also want to highlight some vital, urgent steps Congress and the federal government must take to limit these harms, including passage of the *Addressing Climate Financial Risk Act of 2021* and the *Climate Change Financial Risk Act of 2021*.

The impacts of climate change are already manifesting around us. Summer has barely begun this year, and we are already in the midst of a stunning drought in much of the western US (see figure 1) and have already seen record-setting heatwaves, including the blisteringly intense heat wave that hit the Pacific Northwest just this past weekend. Simultaneously, heavy rain and flash flooding are hitting the Midwest. The wildfire season is also underway and is unfortunately setting up to be yet another intense one. And this year’s hurricane season is also forecast to be an above-normal one, following on last year’s very active season. Meanwhile, the COVID-19 pandemic and the economic crisis it unleashed are far from over. All of this means that many communities and businesses around the country are being forced to cope with a complex set of compounding risks.

Figure 1: Map of drought conditions in the U.S. as of June 22, 2021



Meanwhile, the heat-trapping emissions that are fueling climate change continue to rise—with just a brief dip due to the COVID-19 pandemic. The science is clear: to help limit some of the worst impacts of climate change, here in the U.S. and around the world, global carbon emissions must be cut approximately in half by 2030 and to net zero emissions by mid-century. The U.S. has a responsibility to reduce its emissions at least 50-52 percent below 2005 levels by 2030 and to net zero no later than 2050.

Today, our economic and financial systems are not yet sufficiently accounting for the grave risks posed by climate change, nor are they doing enough to help drive the rapid shift to a net zero economy we need. Major fossil fuel companies, enabled by investment banks and the lack of a strong federal climate policy framework, continue to double down on fossil fuel investments despite claiming to acknowledge the reality of climate change and touting their commitment to achieving the goals of the Paris climate agreement. These failures are putting more assets, more investments, more retirement and savings portfolios—and more people—in harm's way and locking in long-lived high-carbon infrastructure. If we fail to take action, the potential for severe shocks to our financial system will grow—and, as with previous crises, the impacts will be especially severe for those who can least afford it, low-middle and fixed-income households.

Instead, we have an opportunity now to ensure that our economy and our financial system are more climate-resilient and that the choices we make today help put us on a path to a more equitable, secure and prosperous future. Congress must pass legislation to set up an Advisory Committee on Climate Risk on the Financial Stability Oversight Council (FSOC), require climate risk disclosure in the marketplace, and

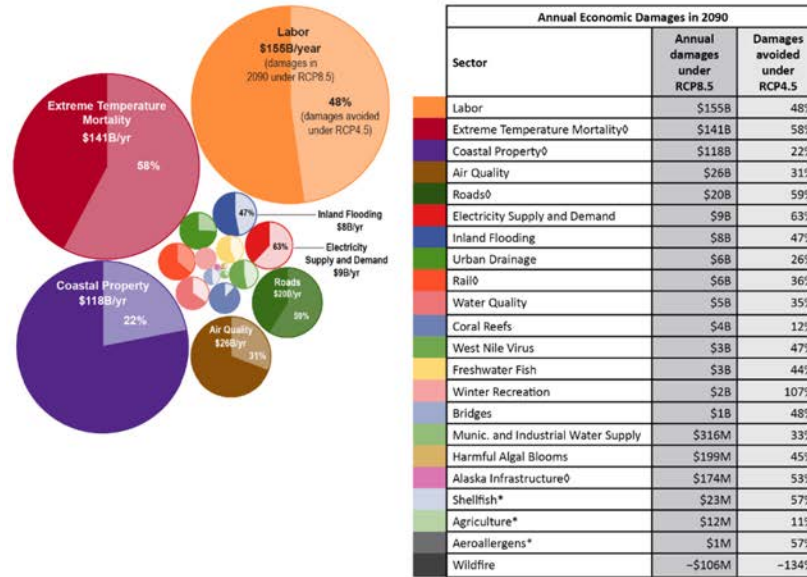


take steps to prioritize the well-being of households and communities that bear disproportionate harms from climate change and the transition away from fossil fuels.

### 1. What we know from the latest science

The 2018 National Climate Assessment, an authoritative report from the federal government, clearly underscores that the impacts of climate change are already here—and will get significantly worse if we fail to sharply curtail global warming emissions.<sup>1</sup> Under high emissions scenarios with little or no adaptation, the report found that annual losses in some sectors are projected to exceed \$100 billion by the end of the century and surpass the gross domestic product of many states (see Figure 2). Another recent study estimated that national damages for the contiguous U.S. from nine sectors range from \$600 million annually per degree of national warming for winter recreation to \$8 billion annually per degree of national warming for labor impacts.<sup>2</sup>

**Figure 2: Projected damages and potential for risk reduction by sector**



Source: Fourth National Climate Assessment,<sup>3</sup> adapted from EPA 2017<sup>4</sup>

<sup>1</sup> <https://nca2018.globalchange.gov/>

<sup>2</sup> <https://link.springer.com/article/10.1007/s10584-021-03048>

<sup>3</sup> Fourth National Climate Assessment, Chapter 29: Reducing risks through emissions mitigation.

<https://nca2018.globalchange.gov/chapter/29/>

<sup>4</sup> EPA. 2017. Multi-Model Framework for Quantitative Sectoral Impacts Analysis: A Technical Report for the Fourth National Climate Assessment. U.S. Environmental Protection Agency, Washington, D.C.

[https://cfpub.epa.gov/si/si\\_public\\_record\\_Report.cfm?Lab=OAP&dirEntryId=335095](https://cfpub.epa.gov/si/si_public_record_Report.cfm?Lab=OAP&dirEntryId=335095)



The total area of each circle represents the projected annual economic damages (in 2015 dollars) under a higher scenario of climate change (RCP8.5) in 2090 relative to a no-change scenario. The decrease in damages under a lower scenario (RCP4.5) compared to RCP8.5 is shown in the lighter-shaded area of each circle. Adaptation was shown to reduce overall damages in sectors marked by the diamond symbol. Asterisks denote sectors with annual damages that may not be visible at the given scale.

Data from NOAA and NASA show that we are continuing to see a relentless rising trend in global average temperatures, with 2020 ranking as the warmest or second warmest year on record (tied with 2016 or just behind it).<sup>5</sup> The summer of 2020 was the warmest on record for the Northern Hemisphere.<sup>6</sup> The seven warmest years in the 1880–2020 record have all occurred since 2014. The 10 warmest years have occurred since 2005. 2020 is the 44th consecutive year (since 1977) above the 20th century average, meaning that no one under the age of 44 has ever experienced a cooler-than-average year. The global average temperature has risen over 2 degrees Fahrenheit (1.2C) since the Industrial Revolution began in the late 1800s. Along with rising temperatures, we are also seeing an increase in frequency or severity of heat waves, flooding, hurricanes, droughts, wildfires and extreme precipitation in the US and around the world. Human-caused climate change is the dominant driver of these changes.

Growing scientific evidence shows a trend of hurricanes intensifying faster, and becoming wetter, slower and more destructive—which is linked to climate change.<sup>7,8,9,10</sup> In the early 1980s, hurricanes had a roughly 1-in-100 chance of undergoing rapid intensification. Those odds increased to 1-in-20 by 2005.<sup>11</sup> In 2020, there were a record-breaking 30 tropical storms in the Atlantic, of which 12 made landfall in and seven were billion dollar plus disasters.<sup>12</sup> The 2020 hurricane season saw 10 storms that intensified rapidly, a trend that scientists link to climate change.<sup>13</sup>

Hotter, drier conditions in the western US are driving longer and more intense wildfire seasons.<sup>14,15</sup> Recent studies have attributed over half of the observed trends in the dryness of wildfire fuels and forest fire areas directly to climate factors.<sup>16</sup> A history of mismanagement of forests and wildfires, along with growing development in wildfire prone areas, is also raising risks to people, property and ecosystems.

<sup>5</sup> 2020 is tied with 2016 as the warmest year, according to NASA:

<https://www.giss.nasa.gov/research/news/20210114/>, and is the second warmest, behind 2016 by a slight margin, according to NOAA: <https://www.ncdc.noaa.gov/sotc/global/202013>

<sup>6</sup> <https://www.noaa.gov/news/northern-hemisphere-just-had-its-hottest-summer-on-record>

<sup>7</sup> Holland, G., Bruyère, C.L. Recent intense hurricane response to global climate change. *Clim Dyn* **42**, 617–627 (2014). <https://doi.org/10.1007/s00382-013-1713-0>

<sup>8</sup> Patricola, C.M., Wehner, M.F. Anthropogenic influences on major tropical cyclone events. *Nature* **563**, 339–346 (2018). <https://doi.org/10.1038/s41586-018-0673-2>

<sup>9</sup> Hall, T.M., Kossin, J.P. Hurricane stalling along the North American coast and implications for rainfall. *npj Clim Atmos Sci* **2**, 17 (2019). <https://doi.org/10.1038/s41612-019-0074-8>

<sup>10</sup> Aslak Grinsted, Peter Ditlevsen, Jens Hesselbjerg Christensen. Normalized US hurricane damage estimates using area of total destruction, 1900–2018. *Proceedings of the National Academy of Sciences* Nov 2019, 116 (48) 23942–23946; DOI: 10.1073/pnas.1912277116.

<sup>11</sup> <https://journals.ametsoc.org/jcli/article/31/20/8281/92614/Projected-Response-of-Tropical-Cyclone-Intensity>

<sup>12</sup> <https://www.climate.gov/news-features/blogs/beyond-data/2020-us-billion-dollar-weather-and-climate-disasters-historical>

<sup>13</sup> <https://blog.ucsusa.org/astrid-caldas/rapid-intensification-unprecedented-number-of-storms-make-2020-a-record-hurricane-season/>

<sup>14</sup> <https://www.ucsusa.org/resources/climate-change-and-wildfires>

<sup>15</sup> UCS Infographic: Wildfires and Climate Change. <https://www.ucsusa.org/resources/infographic-wildfires-and-climate-change>

<sup>16</sup> <http://www.pnas.org/content/113/42/11770.short>

In 2020, the nation experienced nearly 59,000 wildfires which burned approximately 10.12 million acres, the second highest total area affected in single year, just behind 2015.<sup>17</sup> About 40 percent of the burned area was in California alone.<sup>18</sup> Five of California's six largest fires on record occurred in 2020.<sup>19</sup> Engulfing approximately 1 million acres, the 2020 August Complex fire became California's largest ever wildfire, doubling the previous record. In Alaska, where temperatures are increasing twice as fast as the rest of the country, wildfires have been increasing in frequency and size.<sup>20</sup> While Alaska's boreal forests evolved with fire, current fire regimes surpass those of the previous 3,000 years.<sup>21</sup> Four of the 10 largest fire years on record have occurred in the past 15 years, with each burning over 2 million acres. Fire patterns and behavior are also changing in the southeastern United States, where drought, pathogens, and insect infestations are changing ecosystems and raising fire risks.<sup>22</sup>

Communities are experiencing compound risks from the overlap of the COVID-19 pandemic, the economic crisis it triggered, and ongoing climate and extreme-weather related disasters.<sup>23,24</sup> Unfortunately, the future is likely to bring more of these types of situations. The current crises also are laying bare all the fundamental inequities in our society, including racism, the wealth and income gap, unaffordable healthcare, and economic disparities faced by rural communities. Recent studies and CDC data show that COVID-19 is inflicting a disproportionately deadly toll on African Americans, Latinos and Indigenous communities, for example.<sup>25,26</sup> We also know that climate change and the economic crisis are exacerbating these inequities.<sup>27,28</sup>

## 2. Physical risks to the US economy and financial sector

It is undeniable that climate change is already imposing significant costs to the economy, and to people. In 2020, the nation experienced a record-breaking 22 extreme weather and climate related disasters that each cost at least one billion dollars (see Figure 3).<sup>29</sup> This was the sixth year in a row where 10 or more billion dollar-plus extreme events occurred. These disasters are not just costly in economic terms, they take a profound toll on people, including causing death, injury and other lasting harms. Just last year, Hurricane Laura caused at least 42 deaths and the western wildfires resulted in at least 46 deaths.<sup>30</sup>

<sup>17</sup> Data from the NIFC: <https://www.nifc.gov/fire-information/statistics/wildfires>. NIFC data show that 2020 had the second highest annual total of area burned. <https://fas.org/sgp/crs/misc/IF10244.pdf>

<sup>18</sup> <https://fas.org/sgp/crs/misc/IF10244.pdf>

<sup>19</sup> [https://www.fire.ca.gov/media/4jandlh/top20\\_acres.pdf](https://www.fire.ca.gov/media/4jandlh/top20_acres.pdf)

<sup>20</sup> <https://science2017.globalchange.gov/chapter/11/>

<sup>21</sup> <https://www.pnas.org/content/110/32/13055>

<sup>22</sup> <https://www.ucsusa.org/resources/climate-change-and-wildfires>

<sup>23</sup> Phillips, C.A., Caldas, A., Cleet, R. et al. Compound climate risks in the COVID-19 pandemic. *Nat. Clim. Chang.* 10, 586–588 (2020). <https://doi.org/10.1038/s41558-020-0804-2>

<sup>24</sup> Sen Pei, Kristina A. Dahl, Teresa K. Yamana, Rachel Licker, Jeffrey Shaman. Compound risks of hurricane evacuation amid the COVID-19 pandemic in the United States. *medRxiv* 2020.08.07.20170555; doi: <https://doi.org/10.1101/2020.08.07.20170555>

<sup>25</sup> Yancy CW. COVID-19 and African Americans. *JAMA.* 2020;323(19):1891–1892. doi:10.1001/jama.2020.6548. <https://jamanetwork.com/journals/jama/fullarticle/2764789>

<sup>26</sup> <https://www.cdc.gov/coronavirus/2019-ncov/covid-data/investigations-discovery/hospitalization-death-by-race-ethnicity.html>

<sup>27</sup> <https://blog.ucsusa.org/adrienne-hollis/african-americans-are-disproportionately-exposed-to-extreme-heat>

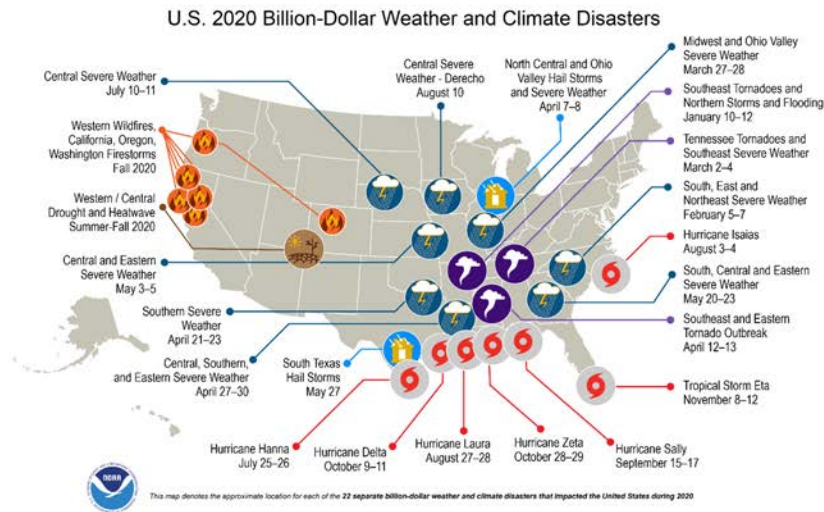
<sup>28</sup> <https://blog.ucsusa.org/rachel-cleetus/economic-recovery-depends-on-controlling-the-covid-19>

<sup>29</sup> NOAA National Centers for Environmental Information (NCEI) U.S. Billion-Dollar Weather and Climate Disasters (2021). <https://www.ncei.noaa.gov/billions/>, DOI: 10.25921/stkw-7w73

<sup>30</sup> <https://www.climate.gov/news-features/blogs/beyond-data/2020-us-billion-dollar-weather-and-climate-disasters-historical>

Firefighters and other first responders and hard-hit communities are face a steep mental toll from repeated and extended disasters. It's no longer tenable to assume that current and future climate conditions will resemble the recent past: all economic sectors and communities must be better prepared for a climate-altered future, and policymakers have a vital role in making that a reality.

**Figure 3: U.S. 2020 Billion-dollar Weather and Climate Disasters**



In addition to extreme events, slower moving disasters like sea level rise and ocean acidification are also big threats. These types of physical risks of climate change pose challenges for many facets and sectors of the economy, including infrastructure, agriculture, fisheries, insurance, real estate and tourism. The impact on the health, safety and productivity of workers, especially those who work outdoors, is also significant.

Take the risks to the coastal real estate market posed by accelerating sea level rise, for example. Recent research from the Union of Concerned Scientists shows that more 300,000 coastal homes and commercial properties with a collective market value of about \$136 billion today, are at risk of chronic inundation by 2045.<sup>31</sup> By the end of the century, that number jumps to more than \$1 trillion. Every coastal state faces this risk to some extent, with Florida, New Jersey, New York, California, Louisiana and South Carolina among the most exposed.<sup>32</sup> Louisiana, North Carolina, New Jersey, and Maryland also have significant numbers of highly exposed communities with above-average rates of poverty, creating hotspots of heightened risk. Many experts in risk assessment, credit rating, real estate markets, insurance markets, affordable housing and flood policy recognize that the risk of sea level rise to coastal real estate is

<sup>31</sup> <https://www.ucsusa.org/resources/underwater>

<sup>32</sup> For information by congressional district, please see this online searchable map: <https://ucsusa.maps.arcgis.com/apps/MapJournal/index.html?appid=b53e9dd7a85a44488466e1a38de87601>



significant and growing— and yet, for the most part, financial markets do not currently account for these risks.

Real estate in the western U.S. is also increasingly at risk from longer, more intense wildfire seasons. Research from CoreLogic has found that nearly 2 million homes in the United States—worth nearly \$640 billion in total—have an elevated risk of wildfire damage.<sup>33</sup>

The potential loss in value of homes that may be exposed to these kinds of risks is firstly of great harm and consequence to homeowners, especially low- and fixed-income homeowners for whom this is likely to be their single biggest asset. It is also a risk for the local property tax base. It's a risk for anyone with a retirement portfolio that includes real estate. It's a risk to the federal government if federally backed mortgages or federally backed flood insurance is implicated. And thus it is a risk to the taxpayer at large.

Extreme heat is one of the most harmful and deadly hazards we face. A 2019 analysis from UCS provides a detailed view of how extreme heat events caused by dangerous combinations of temperature and humidity are likely to become more frequent and widespread in the United States over this century as a result of climate change (see Table 1 and figure 4). Without global action to reduce heat-trapping emissions, the number of days per year when the heat index—or “feels like” temperature—exceeds 100 degrees Fahrenheit would more than double from historical levels to an average of 36 across the country by midcentury and increase four-fold to an average of 54 by late century. The number of days per year when the heat index exceeds 105 degrees Fahrenheit would quadruple from historical levels (1970-2000) such that more than 150 of our larger cities across the country (cities with a population greater than 50,000) would experience an average of 30 or more days per year with a heat index above 105. That is compared to 3 such cities today.

By the end of the century, with no action to reduce global emissions, about 120 million people across the US—more than one-third of today's population—would experience the equivalent of a week or more of conditions so hot they exceed the upper limit of the National Weather Service's current heat index scale and a heat index would be incalculable. Such “off-the-charts” conditions could pose unprecedented health risks. Among those most vulnerable to the impacts of extreme heat include the elderly, the very young, outdoor workers, those with pre-existing health conditions, low or fixed-income households that may not have access to air conditioning or may not be able to afford paying higher electric bills to run it, people living in urban areas where the heat island effect can exacerbate extreme heat, the homeless, and incarcerated people.

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<sup>33</sup> <https://www.corelogic.com/press-releases/insights/wildfires-threaten-the-west-nearly-2-million-homes-at-elevated-risk-of-wildfire-damage-according-to-corelogic/>

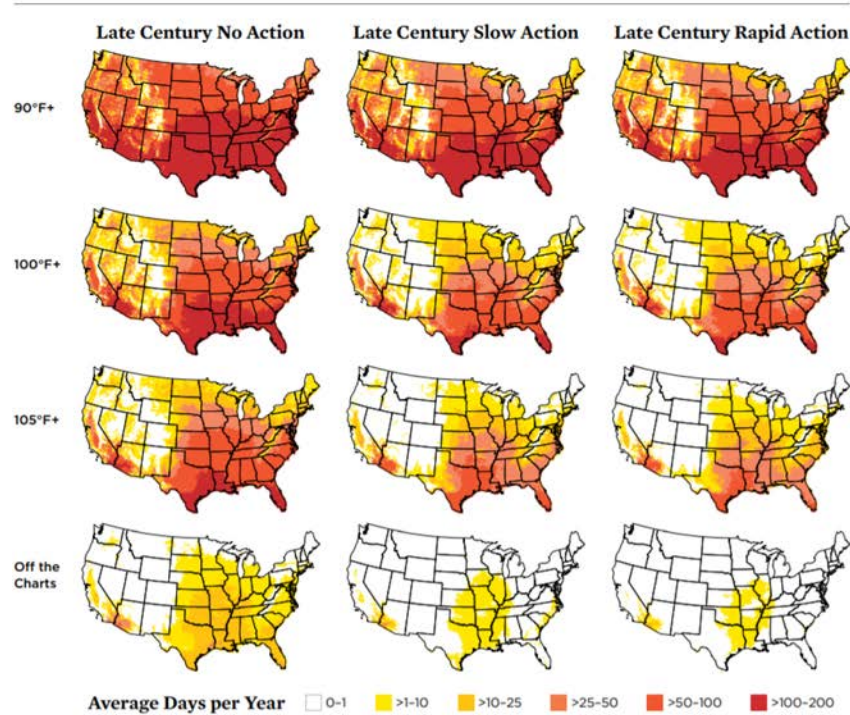
**Table 1: Extreme heat will become more severe and frequent in every region of the country**

Time Period	Scenario	Heat Index Threshold	Mid-west	North-east	N. Plains	North-west	South-east	S. Plains	South-west	US
Historical	-	90°F	25	13	13	6	69	71	37	41
Midcentury	No Action	90°F	62	40	36	20	113	109	60	69
Midcentury	Slow Action	90°F	54	32	31	16	105	102	54	63
Late Century	No Action	90°F	90	70	57	37	140	134	84	93
Late Century	Slow Action	90°F	63	39	37	21	113	109	60	70
-*	Rapid Action	90°F	56	34	32	17	107	104	56	65
Historical	-	100°F	6	3	3	1	15	21	23	14
Midcentury	No Action	100°F	30	14	12	4	65	61	24	36
Midcentury	Slow Action	100°F	22	10	8	3	51	51	22	30
Late Century	No Action	100°F	53	32	24	11	96	88	35	54
Late Century	Slow Action	100°F	27	12	10	4	60	57	24	34
-	Rapid Action	100°F	22	10	8	3	52	52	22	31
Historical	-	105°F	3	2	2	0	4	7	13	5
Midcentury	No Action	105°F	17	8	6	2	40	39	17	24
Midcentury	Slow Action	105°F	12	5	4	1	27	30	17	18
Late Century	No Action	105°F	38	20	14	5	73	66	22	40
Late Century	Slow Action	105°F	15	7	5	2	34	35	17	22
-	Rapid Action	105°F	12	5	4	1	27	30	18	19
Historical	-	Off the Charts	0	0	0	0	0	0	2	0
Midcentury	No Action	Off the Charts	2	1	1	1	3	3	8	3
Midcentury	Slow Action	Off the Charts	2	1	1	0	2	2	6	2
Late Century	No Action	Off the Charts	7	3	3	2	12	12	10	9
Late Century	Slow Action	Off the Charts	2	1	1	1	2	3	7	3
-	Rapid Action	Off the Charts	2	1	1	0	2	2	7	2

*As heat-trapping emissions rise, each region of the country is projected to experience an increase in the average number of days per year with heat above the thresholds analyzed in this study.*

The report also shows how actions taken, or not taken, within the next few years to reduce global emissions will help determine how hot and humid our future becomes. If the goal of the Paris Agreement is met and future global average warming is limited to 2 degrees Celsius, by late century the United States would see half the number of days per year, on average, with a heat index above 105 degrees Fahrenheit, and almost 115 million fewer people would experience the equivalent of a week or more of “off-the-charts” heat days. The longer the U.S. and other countries wait to drastically reduce emissions, the less feasible it will be to realize the “rapid action scenario” analyzed.

Figure 4: Frequency of extreme heat depends on the choices we make



The emissions choices we make in the coming decades will profoundly shape the frequency and severity of extreme heat later this century. With no action to reduce global emissions, the contiguous United States would face an average of twice as many days with a heat index above 105°F in late century as it would with rapid action.

Infrastructure disruptions due to climate impacts—such as roads, bridges, rail lines, air travel and power infrastructure disrupted or damaged by extreme heat, floods, storms and wildfires, or barge traffic on major waterways affected by drought—are also very costly, and these costs are mounting.<sup>34</sup> The electricity system, for example, underpins multiple critical services as well as basic fundamentals of daily living, and has repeatedly faltered and failed in the face of worsening climate impacts. Such impacts include heatwaves, which put enormous pressure on the power grid, decreasing the efficiency and availability of some electricity resources at the same time as demand for cooling increases electricity use;

<sup>34</sup> <https://www.mckinsey.com/business-functions/sustainability/our-insights/climate-risk-and-response-physical-hazards-and-socioeconomic-impacts>; <https://www.mckinsey.com/business-functions/sustainability/our-insights/will-infrastructure-bend-or-break-under-climate-stress>; <https://www.sciencedirect.com/science/article/pii/S0020768316300634>

drought, which threatens hydropower supplies as well thermogenerators that rely on water for cooling;<sup>35</sup> wildfires, which can be both sparked by and cause the destruction of electricity infrastructure; and worsening floods and severe storms, which expose critical grid infrastructure to inundation.<sup>36</sup> Resulting power outages can trigger cascading effects, such as business interruptions, loss of critical services like healthcare, and shutdown of other infrastructure that depends on electricity such as water treatment systems and gas pumps. During power outages, major oil refineries, petrochemical plants and other industrial facilities have also released enormous amounts of toxic pollution, with disproportionate impacts on Black and Latino communities.<sup>37</sup> A recent study showed that the incidence of major grid failures is on the rise and could pose serious health risks if they occur during heatwaves.<sup>38</sup> If power losses occur during heatwaves (as has happened during the summer wildfire season and summer hurricane season) or during extreme cold snaps (as the one that hit Texas earlier this year), they can be extremely costly and life-threatening.<sup>39</sup> The Government Accountability Office (GAO) has released recent reports citing the need for more investments in grid resilience, including more assertive actions from DOE and FERC.<sup>40</sup>

The impact on the insurance market is serving as an early warning sign of the systemic and growing risks of climate change. The federally backed National Flood Insurance Program (NFIP), vital to millions of homeowners, is struggling with growing debt triggered by extreme flooding disasters and has been repeatedly cited by the Government Accountability Office (GAO) as a growing source of risk to the federal government.<sup>41,42</sup> The federal crop insurance program, also affected by floods and droughts, has been similarly cited by the GAO. Worsening wildfire seasons in the western U.S. are causing private insurance companies to raise insurance rates and/or drop policyholders, in some cases triggering temporary stop-gap actions by state regulators to help protect consumers. Major reinsurers like Munich Re, Swiss Re and Zurich Re, have repeatedly highlighted the growing risks of climate change globally—with the U.S. ranking high in terms of the dollar value of losses.

Unfortunately, instead of taking into account the latest scientific projections and incorporating the risks into market decisions in a proactive way, the financial system is still largely operating in a reactive, one-off way when disasters strike. A combination of short-sightedness, maladaptive policies and business-as-usual inertia is getting in the way of the transformative resilience we need to build.

### 3. Transition risks to the economy and financial system

The financial sector, and individual companies, also face risks because the current fossil fuel-dominated economy is simply incompatible with our climate goals. We must cut carbon emissions swiftly and deeply—and that means fossil fuel companies and their investors will have to change their business model or risk major losses. Delaying this inevitable transition will only increase the exposure of these

<sup>35</sup> <https://www.eenews.net/energywire/2021/06/28/stories/1063735943>

<sup>36</sup> <https://blog.ucsusa.org/jamesine-rogers-gibson/as-the-san-joaquin-valley-grows-hotter-questions-arise-about-future-power-grid-reliability/>; <https://www.ucsusa.org/resources/lights-out/>; <https://blog.ucsusa.org/julie-mcnamara/california-wildfires-power-outages-and-climate-ambition/>; <https://blog.ucsusa.org/julie-mcnamara/hurricane-irma-power-outage/>

<sup>37</sup> <https://www.edf.org/media/millions-pounds-air-pollution-released-because-grid-failure-freeze-texas>

<sup>38</sup> According to the study, “Major electrical grid failure or “blackout” events in the United States, those with a duration of at least 1 h and impacting 50,000 or more utility customers, increased by more than 60% over the most recent 5 year reporting period.” <https://pubmed.ncbi.nlm.nih.gov/33930272/>

<sup>39</sup> <https://blog.ucsusa.org/astrid-caldas/the-polar-vortex-has-killed-24-in-texas-so-far-whos-to-blame/>; <https://blog.ucsusa.org/julie-mcnamara/texas-power-outages-wake-up-call/>

<sup>40</sup> <https://www.gao.gov/assets/gao-21-346.pdf>; <https://www.gao.gov/assets/gao-21-274.pdf>

<sup>41</sup> <https://www.gao.gov/highrisk/limiting-federal-governments-fiscal-exposure-better-managing-climate-change-risks>

<sup>42</sup> <https://www.gao.gov/highrisk/national-flood-insurance-program>



companies. Transitioning away from fossil fuels quickly will require proactive policies and investments, including investments in ensuring that workers and communities who depend on fossil fuels are not left behind.<sup>43</sup>

#### 4. Addressing climate risks to the financial sector

##### *A coordinated and comprehensive approach is required*

Addressing the risks of climate changes will take a robust and coordinated approach from the national to the international level, and from the national to the local level. In terms of the financial sector, Congress, financial regulators and the federal government will each need to play their part. UCS strongly supports mandatory disclosure rules for climate risk to avoid untenable growth of climate and ESG risk within our markets that harms investors, spurs the improper allocation of capital, and may increase the cost of capital for U.S. companies. Mandatory disclosures should address companies' stewardship of a just and equitable transition to a low-carbon economy; human capital management; impacts on and strategies related to racial, economic, environmental, and climate justice; accounting of country-by-country tax payments; and disclosure of political activity including direct and indirect spending on elections and lobbying.

We are encouraged to see growing support from several quarters for taking steps to evaluate climate risks and create a framework for risk disclosure.

- The Commodity Futures Trading Commission (CFTC) issued a first-ever report last year, *Managing Climate Risk in the U.S. Financial System*, and in March this year established an interdivisional Climate Risk Unit (CRU) to assess the risks to US financial stability posed by climate change.<sup>44</sup>
- The Federal Housing Finance Agency (FHFA) recently held a public listening session and issued a Request for Information on current and future climate and natural disaster risk to the housing finance system and to the regulated entities: Fannie Mae and Freddie Mac and the Federal Home Loan Banks.<sup>45</sup>
- The Securities and Exchange Commission recently requested public input on climate change risk disclosure.<sup>46</sup>
- The U.S. Department of the Treasury recently announced a Coordinated Climate Policy Strategy with a New Treasury Climate Hub and a Climate Counselor.
- The Federal Reserve recently issued a note outlining an approach to evaluating the financial risks of climate change and potential avenues to include it in the Federal Reserve's financial stability monitoring framework.<sup>47</sup>
- President Biden recently issued an Executive Order on Climate-Related Financial Risks and calling for a report outlining a comprehensive whole-of-government Climate-Related Financial Risk Strategy.<sup>48</sup>

<sup>43</sup> <https://www.ucusa.org/resources/support-coal-workers>

<sup>44</sup> <https://www.cftc.gov/PressRoom/PressReleases/8234-20>  
<https://www.cftc.gov/PressRoom/PressReleases/8368-21>

<sup>45</sup> <https://www.fhfa.gov/Media/PublicAffairs/Documents/Climate-and-Natural-Disaster-RFI.pdf>

<sup>46</sup> <https://www.sec.gov/news/public-statement/lee-climate-change-disclosures>

<sup>47</sup> <https://www.federalreserve.gov/econres/notes/feds-notes/climate-change-and-financial-stability-20210319.htm>

<sup>48</sup> <https://www.whitehouse.gov/briefing-room/presidential-actions/2021/05/20/executive-order-on-climate-related-financial-risk/>



- Legislation has been put forward in Congress to help advance climate risk disclosure, including the *Climate Risk Disclosure Act of 2021* and the *Climate Change Financial Risk Act of 2021*. At the international level, important initiatives are underway, including through The Taskforce on Climate-Related Financial Disclosures and The Network for Greening the Financial System. The U.S. Federal Reserve is a member of the latter and Treasury Secretary Janey Yellen has indicated an interest in also having the U.S. Treasury participate.

UCS has submitted comments to the Securities and Exchange Commission, the Commodity Futures Trading Commission<sup>49</sup> and the Federal Housing Finance Agency<sup>50</sup> to highlight each body's role in ensuring these outcomes. We have also endorsed Congressional action, including organizing a letter of support for the Climate Risk Disclosure Act of 2021 (introduced by Rep. Sean Casten, D-IL) signed by 82 environmental and social justice groups, faith-based and public interest organizations and socially responsible investors.<sup>51</sup> Given the existential threat posed by climate change, concurrent and complementary administrative, regulatory, and legislative actions to strengthen disclosures are urgently needed.

#### ***Mandatory Risk Disclosure Will Help Correct Market Failures***

Climate change is a systemic and growing risk to our economy, yet is not priced into most market decisions today because of multiple market failures including a lack of information and a mismatch in time horizons for assessing risks considered material. This has the potential to increasingly creating an unstable financial system with broader implications for the economy and the public. The financial system requires transparent, uniform disclosure of climate risks, based on the best available science, to evaluate which companies are best prepared to weather the physical and transition risks of climate change. Yet many companies don't mention—or even downplay—the effects of climate change in their publicly available information, misleading investors into overconfidence about long-term returns, and propping up the oil and gas industries, which operate as though the status quo is sustainable when they are fully aware they should be moving toward a clean-energy business model. The lack of standardization of data for climate risk disclosure creates additional hurdles, even for companies that are seeking to be more transparent about climate risks but may find that regulators or investors may not be able to easily understand or compare such data within or across industries.

Despite efforts by some lawmakers, the White House, and domestic financial bodies, US public companies—particularly those in the fossil fuel industry—currently lack sufficient incentives to disclose accurate, standardized, and comparable metrics regarding their climate risks. The statement “what is measured is managed” applies here, as the lack of consistent, accurate, and comparable measurement of climate-related financial metrics suggests a lack of management of climate-related financial risks.

Furthermore, accurate disclosure of climate risks is also important to create a fuller accounting of the benefits of low and zero-carbon sources of energy relative to the costs of fossil fuels, helping to accelerate their deployment to meet global goals of achieving net zero emissions by 2050.

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<sup>49</sup> Pinko, N., R. Cleetus, and K. Mulvey. 2020. Union of Concerned Scientists Submission to the Climate-Related Market Risk Subcommittee Under the Market Risk Advisory Committee of the CFTC. Online at <https://comments.cftc.gov/PublicComments/ViewComment.aspx?id=62482&SearchText=>.

<sup>50</sup> Cleetus, R. and S. Udvardy. 2021. Union of Concerned Scientists Response to the FHFA RFI on Climate Risk. Online at <https://www.fhfa.gov/AboutUs/Contact/Pages/input-submission-detail.aspx?RFID=1426>.

<sup>51</sup> Letter in support of the Climate Risk Disclosure Act. 2021. Online at <https://casten.house.gov/sites/casten.house.gov/files/Climate%20Risk%20Disclosure%20Act%20Support%20051121.pdf>.

### **Lack of Disclosure Disproportionately Harms Working People and Communities of Color**

Climate change is not just an environmental crisis, but one of social justice, wealth distribution, equity and human rights. Climate change is already imposing a harsh toll on these communities and our current disaster aid policies exacerbate these problems.<sup>52-53</sup> Much more is at stake than simply the fiscal well-being of US businesses. The public relies on these companies to grow and manage our savings, investments, pension funds, future energy choices, and other long-term portfolios. Currently, some large companies and investors are able to use proprietary datasets to help reduce their exposure to climate risks but the lack of widely available, standardized, comparable data means that the broader public is largely unaware and unprepared for the financial consequences of these risks. As we saw during the economic crisis generated by COVID-19, economic insecurity has a disproportionate, much harsher impact on low-income communities and communities of color.<sup>54</sup> Many of these communities have also been excluded from building generational wealth due to racist policies like mortgage redlining and lack of access to credit. Alongside climate risk disclosure, we must also invest in a comprehensive suite of policies to avoid harms like climate gentrification that reinforce existing disparities.

Realigning market incentives to reflect the latest science is necessary but not sufficient; we also need a transformative climate resilience strategy that addresses underlying systemic challenges like structural racism and socioeconomic inequities so as to better protect all communities as we grapple with the near and long-term threats of climate change.

### **Standardized Requirements Are Necessary for Climate Accountability**

Burning fossil fuels for electricity, heat, and transportation is the largest source of global warming emissions. Scientists can now quantify the global warming emissions, global average temperature increase, sea level rise, and ocean acidification attributable to the product-related emissions of particular fossil fuel companies.<sup>55</sup> Due to the impact of burning its oil, gas, and coal products—and also to its past and ongoing campaigns to deceive the public and policymakers about climate science and solutions<sup>56</sup>—the fossil fuel industry bears an outsize responsibility for climate change.<sup>57</sup>

The fossil fuel industry faces a unique mix of climate-related financial risks, such as potential regulations to reduce emissions, market competition from renewable energy technologies, climate damages lawsuits,

<sup>52</sup> A recent investigative report from NPR using Federal Emergency Management Agency data shows that with more funding going to richer communities than poorer ones <https://www.npr.org/2019/03/05/688786177/how-federal-disaster-money-favors-the-rich>

<sup>53</sup> <https://journals.sagepub.com/doi/full/10.1177/2378023118816795>

<sup>54</sup> <https://www.lancetcountdownus.org/2020-lancet-countdown-u-s-brief/>

<sup>55</sup> Licker, R., B. Ekwurzel, S. C. Doney, S. R. Cooley, I. D. Lima, R. Heede, and P. C. Frumhoff. 2019. Attributing ocean acidification to major carbon producers. *Environmental Research Letters* 14 124060.

<https://iopscience.iop.org/article/10.1088/1748-9326/ab5abc>. Ekwurzel, B., J. Boneham, M. W. Dalton, R. Heede, R. J. Mera, M. R. Allen, and P. C. Frumhoff. 2017. The rise in global atmospheric CO<sub>2</sub>, surface temperature, and sea level from emissions traced to major carbon producers. *Climatic Change* 144(4): 579–590. <https://doi.org/10.1007/s10584-017-1978-0>.

<sup>56</sup> Mulvey, K., and S. Shulman. 2015. The climate deception dossiers: Internal fossil fuel industry memos reveal decades of corporate misinformation. Cambridge, MA: Union of Concerned Scientists. Online at <http://www.ucsusa.org/global-warming/fight-misinformation/climate-deception-dossiers-fossil-fuel-industry-memos>.

<sup>57</sup> Shue, H. 2017. Responsible for what? Carbon producer CO<sub>2</sub> contributions and the energy transition. *Climatic Change* 144(4): 591–596. <https://link.springer.com/article/10.1007/s10584-017-2042-9>. Frumhoff, P., R. Heede, and N. Oreskes. 2015. The climate responsibilities of industrial carbon producers. *Climatic Change* 132:157. <https://link.springer.com/article/10.1007/s10584-015-1472-5>.

and reputational damage for knowingly deceiving<sup>58</sup> the public and shareholders<sup>59</sup> about the climate risks of its products.<sup>60</sup> The industry is also particularly vulnerable to physical damages to infrastructure and disruption of operations due to acute climate impacts.<sup>61</sup>

In recent years, several shareholder proposals calling for publicly listed oil and gas companies to disclose how they are managing the risks and opportunities of climate change and the energy transition have won majority support. In response to investor pressure, companies such as ExxonMobil and Chevron now publish annual climate risk reports. But the woeful inadequacy of these voluntary (and unaudited) climate risk disclosures has contributed to shareholder rebellions by asset owners and managers dissatisfied with how both companies are aligning their business models and policy advocacy with the goals of the Paris Agreement. If climate risk reporting is to have any value to investors, it must be connected to companies' financial reports and subject to an auditor's review. In addition, it is vital that banks that are funding fossil fuel investments also be required to be more transparent about their lending policies and practices for fossil fuel clients, including client banks with significant oil and gas exposures.<sup>62</sup>

In closing, thank you for this opportunity to testify today and for your efforts to help ensure our economy and financial systems are better protected from climate risks and better able to help contribute to the climate solutions we so urgently need. Our future economic prosperity and the well-being of communities around the nation depends on these kinds of vital efforts.

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<sup>58</sup> Brief of Amici Curiae Robert Brulle, Center for Climate Integrity, Justin Farrell, Benjamin Franta, Stephan Lewandowsky, Naomi Oreskes, Geoffrey Supran, and the Union of Concerned Scientists in Support of Plaintiff-Appellee and Affirmance, *State of Rhode Island v. Shell Oil, LLC*, Case No. 19-1818. 2020. Online at [http://climatecasechart.com/climate-change-litigation/wp-content/uploads/sites/16/case-documents/2020/20200102\\_docket-19-1818\\_amicus-brief-3.pdf](http://climatecasechart.com/climate-change-litigation/wp-content/uploads/sites/16/case-documents/2020/20200102_docket-19-1818_amicus-brief-3.pdf).

<sup>59</sup> *Commonwealth of Massachusetts v. ExxonMobil Corporation*, No. 19-3333, Mass Super. Ct. Online at <https://www.mass.gov/doc/october-24-2019-massachusetts-complaint-exxon/download>.

<sup>60</sup> Pinko, N., K. Mulvey, B. Ekwurzel, and P. Frumhoff. 2018. *The 2018 Climate Accountability Scorecard: Insufficient Progress from Major Fossil Fuel Companies*. Cambridge, MA: Union of Concerned Scientists. Online at <https://www.ucsusa.org/resources/climate-accountability-scorecard-0#ucs-report-downloads>.

<sup>61</sup> Carlson, C., G. Goldman, and K. Dahl. 2015. *Stormy Seas, Rising Risks: What Investors Should Know About Climate Change Impacts at Oil Refineries*. Cambridge, MA: Union of Concerned Scientists. Online at <https://www.ucsusa.org/resources/stormy-seas-rising-risks#ucs-report-downloads>.

<sup>62</sup> See letter to JP Morgan to request information from JPMorgan Chase & Co. (JPMC) regarding its lending policies for oil and gas clients, including client banks with significant oil and gas exposures.

<https://oversight.house.gov/sites/democrats.oversight.house.gov/files/2021-06-21.Khanna%20KP%20to%20Dimon-JPMC%20re%20Oil%20and%20Gas%20Lending.pdf>

MRV ASSOCIATES



**Testimony Before the U.S. House Committee on Financial Services’  
Subcommittee on Consumer Protection and Financial Institutions**

**“Addressing Climate as a Systemic Risk: The Need to Build Resilience within  
Our Banking and Financial System”**

Mayra Rodríguez Valladares  
Managing Principal, MRV Associates  
June 30, 2021

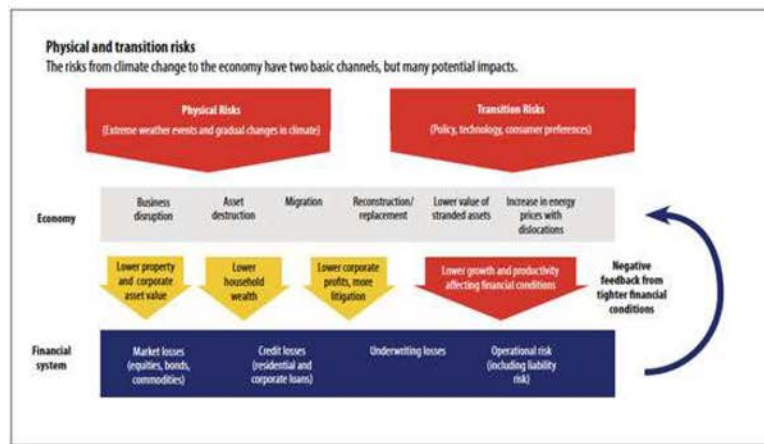
[www.MRVAssociates.com](http://www.MRVAssociates.com)

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Chairman Perlmutter, Ranking Member Luetkemeyer, and distinguished members of the subcommittee, thank you very much for convening this very important hearing. I am Mayra Rodriguez Valladares, Managing Principal of MRV Associates. For three decades I have worked with bankers and financial regulators in over 30 countries on a wide range of country, macroeconomic, financial, and operational risks that can threaten the safety and soundness of financial institutions. Financial stability is critical to American competitiveness,<sup>1</sup> that is, how the standard of living of Americans can be raised for all.

Unlike the Global Financial Crisis or the COVID-19 economic and public health crisis, where we did not get as much warning that a crisis was coming, scientists and other experts have been warning us for decades about the dangers of climate change. During my career, I have lived through numerous events that have hurt the financial industry, and worst yet, millions who do not work at financial institutions: the European currency crises of the early 1990s, the Asian and Russian financial crises of the late 90s, the tech meltdown in 2000, the tragedy of September 11, 2001, the Global Financial Crisis of 2007-2009, and most recently, the economic and market volatility due to COVID-19. I have learned many lessons from all these crises; mainly, that when someone tells me 'this time it will be different,' or 'such an event has never happened before,' it means that urgent action is critical now to avoid another painful crisis.



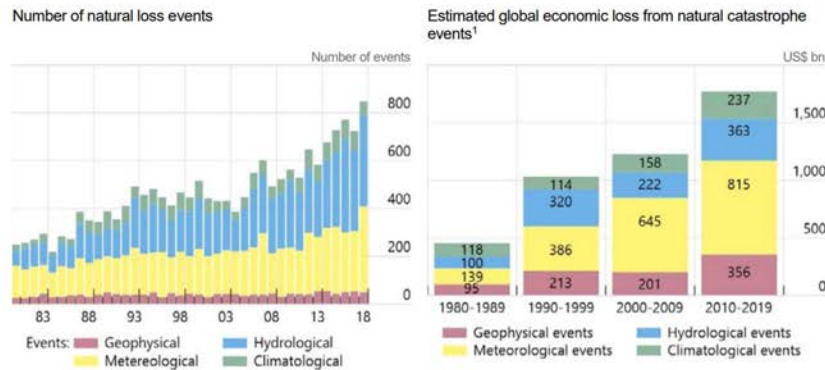
Source: IMF, December 2019.

<sup>1</sup> [The Global Competitiveness Report](#), World Economic Forum.

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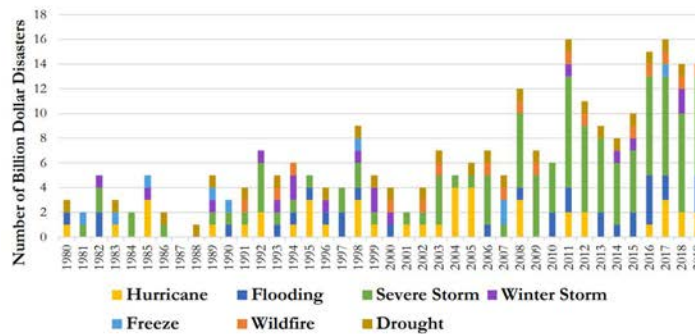
The economic and financial impact of climate-related physical risks on the global economy has increased significantly in recent decades.<sup>2</sup>



<sup>1</sup> Not all natural catastrophes enumerated in the chart result from climate change.  
Sources: Bank for International Settlements, Banque de France and MunichRe.

Closer to home, natural disasters in practically every U.S. state are increasing as climate-change risks intensify. Costs are borne by businesses, financial institutions, farmers, individuals who lose their jobs, homeowners, taxpayers, and national, state, and local governments. (Appendix II)

## Number of U.S. Billion-Dollar Disasters in the U.S. by Disaster Category, 1980-2019<sup>3</sup>



<sup>2</sup> [“The Implications of Climate Change on Financial Stability,”](#) The Financial Stability Board, November 23, 2021.

<sup>3</sup> [“Climate Change Fueled Weather Disasters,”](#) Environmental Defense Fund, Summer 2020.



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Climate change events are significant drivers of rising credit, market, operational and liquidity risks in banks and what are referred to as shadow banking, non-banks, or Other Financial Institutions (OFIs): insurance companies, pension funds, asset managers, broker dealers, securities firms, hedge funds, home offices, and private equity firms. These financial risks are very interconnected, and all too often are positively correlated; this means that precisely when borrowers who are hurt by climate change default on their loans, this leads to market volatility because stock and bond prices decrease precipitously. Hence, banks' and OFIs' asset quality can suffer from both credit and market risks simultaneously. Because banks and insurance companies have significant asset and liability mismatches due to their role as financial intermediaries, any climate change stress can quickly hurt their earnings and even their liquidity. The interconnections between banks, insurance companies, and OFIs means that even if climate change were to hurt only one type of financial institution, there is a very high risk of contagion throughout the entire financial system and the economy of Main Street.

Risk	Potential effects of climate risk drivers (physical and transition risks)
Credit risk	Credit risk increases if climate risk drivers reduce borrowers' ability to repay and service debt (income effect) or banks' ability to fully recover the value of a loan in the event of default (wealth effect).
Market risk	Reduction in financial asset values, including the potential to trigger large, sudden and negative price adjustments where climate risk is not yet incorporated into prices. Climate risk could also lead to a breakdown in correlations between assets or a change in market liquidity for particular assets, undermining risk management assumptions.
Liquidity risk	Banks' access to stable sources of funding could be reduced as market conditions change. Climate risk drivers may cause banks' counterparties to draw down deposits and credit lines.
Operational risk	Increasing legal and regulatory compliance risk associated with climate-sensitive investments and businesses.
Reputational risk	Increasing reputational risk to banks based on changing market or consumer sentiment.

Source: BCBS, April 2021.

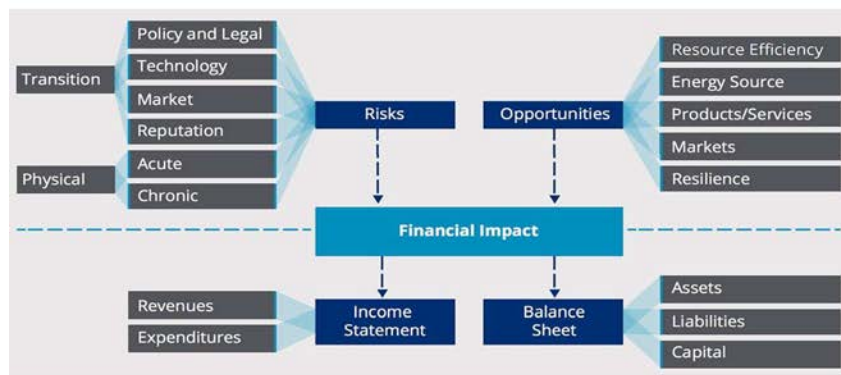
Financial institutions' assets in the form of mortgages, personal loans, and commercial credit products, as well as bond, stock, and derivatives trading portfolios, are exposed to climate-related risks. They are exposed both to physical risks<sup>4</sup> such as damage to property and infrastructure, as well as to transition risks such as changes in policies, consumer and market sentiment, regulations and technology as a result of companies, governments, municipalities and financial institutions transitioning to a lower-carbon economy globally. Under no circumstances should we assume that market investors have priced in these risks, especially since financial

<sup>4</sup> "Climate Change and Financial Risk," International Monetary Fund, December 2019.

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institutions and corporations are not yet required to identify, measure, control and monitor their climate-related risks and to disclose these risks to the public. Opacity in the financial system, especially related to climate risk, is dangerous to institutional and retail investors and to any of us who have a pension or a retirement plan.



Source: Financial Stability Board.

Our globally systemically important banks<sup>5</sup> (G-SIBs), especially Citibank, JPMorgan, Goldman Sachs, Morgan Stanley, Bank of America and Wells Fargo are very exposed to the risks of climate change. Not only do these banks provide financial services in U.S. states, which are vulnerable to intensifying fires, droughts, and floods that impact their borrowers and their derivatives and repurchase agreement counterparties, they have legal entities in foreign geographic areas such as the United Kingdom,<sup>6</sup> Japan,<sup>7</sup> Canada,<sup>8</sup> and Mexico,<sup>9</sup> which are exposed to the physical and transition risks of climate change.

<sup>5</sup> [2020 List of Globally Systemically Important Banks \(G-SIBs\)](#), Financial Stability Board.

<sup>6</sup> ["What is Climate Change?"](#) Met Office, United Kingdom.

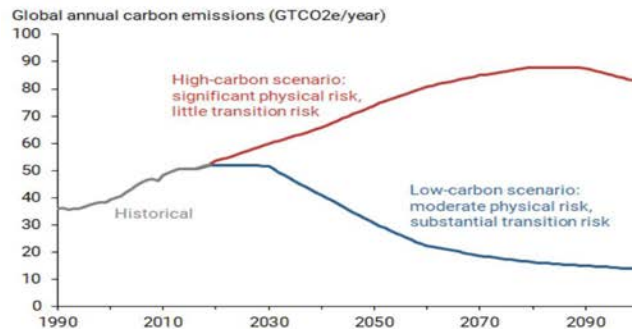
<sup>7</sup> [Japan, Climate Action Tracker](#), 2020.

<sup>8</sup> ["Climate Change"](#) Government of Canada.

<sup>9</sup> ["Mexico, Climate Change Adaptation"](#), UNDP.



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Source: Federal Reserve Bank of San Francisco, 2021.<sup>10</sup>

Importantly, all U.S. internationally active banks and other financial institutions have to comply with existing and future climate change capital rules, stress tests and risk disclosures in other countries. The United Kingdom, where U.S. banks have their largest foreign operations, has already been using its stress testing framework<sup>11</sup> to assess climate-related risks at banks operating in the UK.<sup>12</sup> In continental Europe, the European Central Bank first assessed banks' climate-related disclosures<sup>13</sup> in 2019, and last year, it set supervisory expectations for banks' climate-related risk management and disclosures.<sup>14</sup> Additionally, the European Union is already implementing the Sustainable Finance Disclosure Regulation,<sup>15</sup> that requires a wide range of financial institutions with activities in the EU such as asset managers, pension funds, venture capital firms and other investors, to disclose new information about the sustainability of their investments. This month, the Bank of Japan<sup>16</sup> announced that it would introduce a lending facility to help banks finance projects connected to climate change; such a facility will encourage banks in Japan, including American ones, to expand to climate friendly projects.

Specifically, GSIBs are exposed not only to mortgage and consumer loan borrowers in climate change sensitive geographies, they are also exposed to companies in sectors of the economy such

<sup>10</sup> "FRBSF Newsletter," February 8, 2021.

<sup>11</sup> "Key Elements of the 2021 Biennial Exploratory Scenario: Financial Risks From Climate Change," Bank of England.

<sup>12</sup> "Climate Change" Bank of England.

<sup>13</sup> "ECB Report on Institutions' Climate-related and Environmental Risk Disclosures," November 2020.

<sup>14</sup> "Guide on Climate-related and Environmental Risks," European Central Bank, November 2020.

<sup>15</sup> "What is the Impact of the EU's Sustainable Finance Disclosure Regulation?" S&P Global, April 1, 2021.

<sup>16</sup> "Bank of Japan to Launch Climate Lending Facility," Green Central Banking, June 21, 2021.

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as commercial real estate<sup>17</sup>, agriculture<sup>18</sup>, and energy<sup>19</sup> that are very vulnerable to climate-related physical and transition risks. In addition to credit risk exposure via loans, GSIBs are very significant investors in syndicated loans,<sup>20</sup> commercial paper, bonds, securitizations such as Collateralized Loan Obligations (CLOs)<sup>21</sup>, and stocks of those companies; hence, banks are exposed not only to the probability of default and loss severity of these instruments, but also to market risk exposure. Market risk, the change in interest rate, foreign exchange, equity, and commodity prices, and the volatility thereof, can cause significant financial losses at financial institutions.

Additionally, GSIBs, along with individual investors and other financial institutions, are significant holders of municipal debt; they can suffer financial losses when those municipalities in climate change sensitive areas have fiscal stresses brought about by extreme weather events. Unfortunately, municipalities often do not have long-term financial plans that show rating agencies or investors what their revenues and expenses might be even five years from now, especially under adverse climate scenarios. Climate change events can have a very negative effect not only on the municipalities prone to droughts or flooding, but also often can impact the whole state's economy. For example, states that are the most dependent on coastal economic activity include Hawaii (Aa1 negative), Delaware (Aaa stable), Rhode Island (Aa2 stable), Massachusetts (Aa1 stable), New York (Aa1 negative), Florida (Aaa stable), New Jersey (A3 negative), California (Aa2 stable) and Washington (Aaa stable). Each of these states depends on coastal counties for 70% or more of their gross domestic product (GDP). Florida is particularly vulnerable because 24% of its GDP is within the 100-year flood zone while other states in the aforementioned list generate from 3% to 9% of their GDP in the 100-year flood zone. Areas in the 100-year flood zone have a 26% chance of flooding over the next 30 years, meaning a high probability of a flood impacting economic activity in flood prone areas.

Financial pressure on states due to climate change has led a number of states<sup>22</sup> to bring legal action against energy companies arguing that they knew that their exploration, production, and refining, as well as use of energy products, caused sea level rise and stronger hurricanes and willfully misled the public about those and other dangers related to global warming. Connecticut and Delaware have also joined Massachusetts, Minnesota and Rhode Island in filing legal suits.

According to Moody's Investor Services' analysis, over the next several decades, states and municipalities will need "increased investment in adaptation and coordinated government

<sup>17</sup> [Preparing for Climate Change: Commercial Real Estate's Next Great Challenge](#), CBRE.

<sup>18</sup> [Agriculture and Climate](#), United States Environmental Protection Agency.

<sup>19</sup> [U.S. Energy Sector Vulnerabilities to Climate Change and Extreme Weather](#), July 13, 2013.

<sup>20</sup> [Financing a Net-Zero Economy: Measuring and Addressing Climate Risks for Banks](#), Ceres, October 19, 2020.

<sup>21</sup> Gerding, Erik. "Testimony on 'Emerging Threats to Stability: Considering the Systemic Risk of Leveraged Lending' Before the U.S. House of Representatives Committee on Financial Services, Subcommittee on Consumer Protection and Financial Institutions," June 4, 2021.

<sup>22</sup> Hasemyer, David. [Five States Have Filed Climate Change Lawsuits, Seeking Damages From Big Oil and Gas](#), Inside Climate News.

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responses will become essential for federal, state and local governments to more effectively respond to sea level rise.”<sup>23</sup>

Coastal county economic activity is critical to coastal states' economic health  
Percent of state GDP from its coastal counties

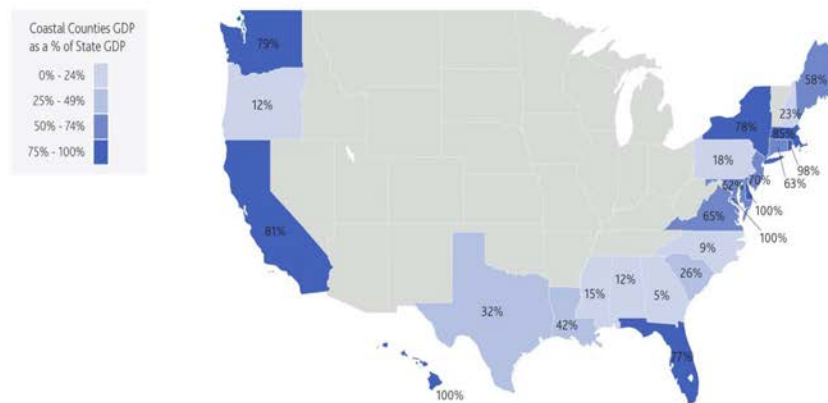


Exhibit based on 2014 data.  
Sources: Moody's Investors Service, National Oceanic and Atmospheric Administration and US Bureau of Economic Analysis

Large internationally active U.S. banks, as well as regional ones, are significant lenders<sup>24</sup> to fossil fuel companies. They also invest in energy companies' bonds, stocks, securitizations, and syndicated loans and are derivatives counterparties to these companies. As these energy companies have to meet changing environmental and climate-change standards and risk disclosures, banks are exposed to those companies' transition risks. (Appendix III)

<sup>23</sup> “[Rising Sea Levels Signals Need for US State and Local Governments to Address Growing Climate Risks.](#)” Moody's Investor Services, September 17, 2020.

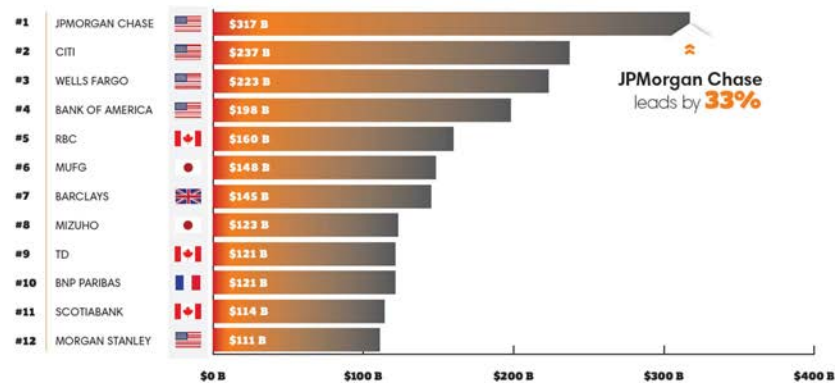
<sup>24</sup> “[Banking on Climate Chaos.](#)” Fossil Fuel Finance Report 2021.



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## FOSSIL FUEL FINANCING 2016-2020 (BILLIONS \$USD)



U.S. G-SIBs and regional banks are not the only banks exposed to climate change risks. In 2019, severe flooding in the Midwest brought loan defaults and repayment challenges to its highest level in twenty years.<sup>25</sup> This brought significant stress to agriculture and community banks exposed not only to the agriculture sector in those states, but to consumer loans affected by the floods and the troubled agriculture sector. Climate change will continue to increase water stress in agricultural areas.<sup>26</sup> Half of U.S. agricultural loans come from lenders with portfolios of at least 25% debt-to-farm operations,<sup>27</sup> which means they have a significant concentration to severe climate events. The National Oceanic and Atmospheric Administration expects flooding in the U.S. to rise significantly<sup>28</sup> in the decades to come, which will stress financial institutions in those areas. Moreover, intensifying heatwaves<sup>29</sup>, like we are seeing in the western U.S. are also hurting the agricultural sector, our infrastructure, and other sectors of the economy. (See Appendix IV) Banks in areas that serve Native Americans<sup>30</sup> should also be very mindful of the effects of climate change. Alaska and southwest states have already experienced the adverse effects of flooding and droughts.

<sup>25</sup> "AgLetter," Federal Reserve Bank of Chicago, August 2019.

<sup>26</sup> "Measuring What Matters: A New Approach to Assessing Sovereign Climate Risk," Four Twenty Seven, 2020.

<sup>27</sup> "Slowing Agricultural Markets Highlight the Importance of Sound Risk Management Principles," Federal Reserve Bank of Kansas City, 2019.

<sup>28</sup> [The National Oceanic and Atmospheric Administration](#).

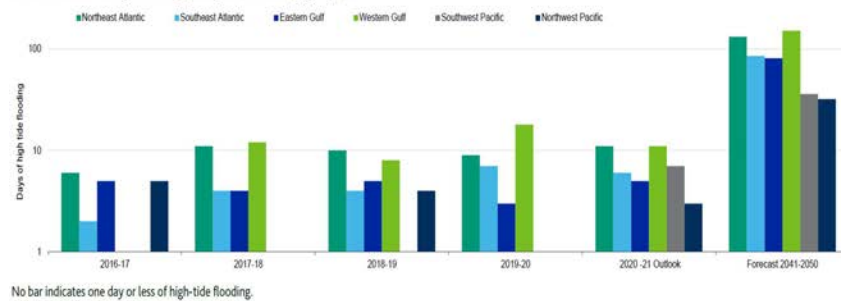
<sup>29</sup> [Climate Change Indicators: Heat Waves](#), U.S. Environmental Protection Agency.

<sup>30</sup> Flavelle, Christopher and Goodluck, Kalen. "Dispossessed, Again: Climate change Hits Native Americans Especially Hard," The New York Times, June 27, 2021.

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Median number of days annually of high-tide flooding by region



Source: Moody's Investor Services and National Oceanic and Atmospheric Administration (NOAA) Technical Reports 2016-2020, State of U.S. High Tide Flooding.

I must note that the very significant rise in corporate leverage in the U.S. in the last two decades also means that those companies are the most likely to default or suffer repayment challenges in the event that they are affected by climate change. Leverage means that their debt levels are five times or higher than their Earnings Before Interest, Tax, and Depreciation (EBITDA). EBITDA is a measure that is very subjective and the assumptions that go into its calculation can often be too rosy.<sup>31</sup> This understates' companies' true earnings. Financial institutions such as, but not limited to, banks, insurance companies, pension funds, and asset managers are exposed to heavily leveraged zombie companies, because they hold their loans, invest in their bonds or stocks. Also, they are often in financial derivatives with these leveraged counterparties. (See Appendix V)

In particular, the energy sector is very leveraged and vulnerable to climate-change transition risk. In 2020, stresses in the energy sector were the highest since 2009.<sup>32</sup> More than 100 oil and gas companies filed for bankruptcy in 2020<sup>33</sup> and energy companies constituted 25% of all corporate defaults last year.<sup>34</sup> Presently, the probability of default rate of energy companies with leveraged

<sup>31</sup> Rodríguez Valladares, Mayra "Leveraged Loan Borrowers Are Requesting Covenant Relief at an Extraordinary Pace," Forbes July 21, 2021.

<sup>32</sup> Rodríguez Valladares, Mayra. "U.S. Corporate Default Volume, Especially in the Energy Sector is Worse than in 2009," Forbes.

<sup>33</sup> Takahashi, Paul. *Houston Chronicle*, January 21, 2021.

<sup>34</sup> Rodríguez Valladares, Mayra. "Energy Companies Comprise Over 25% of Total U.S. Corporate Defaults," Forbes, July 22, 2020.



loans stands at 20%.<sup>35</sup> Scholars<sup>36</sup> and energy experts have been researching the impact of climate change on energy companies for over a decade; they are very sensitive to transition risks.

U.S. Institutional Leveraged Loan Default Rate Breakdown

(%)	Amount Outstanding (\$ Bil.)	2018	2019	2020	5/21TTM	2021F	2022F
Total Index	1,502.5	1.8	1.8	4.5	2.4	1.5	2.5-3.5
Broadcasting and Media	64.2	14.7	3.5	1.6	0.8	2.0	NA
Energy	42.3	11.2	5.5	19.6	14.5	5.0	NA
Healthcare and Pharmaceutical	174.3	0.6	1.2	2.8	2.0	1.0	NA
Leisure and Entertainment	45.9	—	1.9	9.9	7.4	14.0	NA
Retail	41.4	4.7	7.0	16.7	10.5	7.0	NA
Technology	232.5	0.0	0.4	1.3	0.9	1.0	NA
Telecommunications	68.8	—	4.0	7.5	0.7	3.0	NA

F - Forecast, NA - Not Applicable.  
Source: Fitch U.S. Leveraged Loan Default Index.

Source: U.S. Leveraged Loan Default Insight, Fitch Ratings, June 2021.

### Financial Regulators

Financial regulators, especially bank and insurance regulators, have a critical role to play in protecting Americans from the financial systemic crisis that could arise from intensifying climate change events. Importantly, President Joseph Biden's Executive Order on Climate-related Financial Risks<sup>37</sup> calls for a government wide strategy by November 2021.

### The U.S. and International Standard Setters

It is important to remember that the United States is a key member of multiple important international standard settings bodies, which are already working on climate change risk identification, measurement, and disclosure frameworks and guidance. Currently, the U.S. is not

<sup>35</sup> [U.S. Leveraged Loan Default Insight](#), Fitch Ratings, June 2021

<sup>36</sup> Schaeffer, Roberto, Alexandre Salem Szklo, André Frossard, Pereira de Lucena, Bruno Soares Moreira, Cesar Borba, Larissa Pinheiro Pupo Nogueira, Fernanda Pereira Fleming, Alberto Troccoli, Mike Harrison, Mohammed Sadeck Boulahya, "Energy sector vulnerability to climate change: A review," [Volume 38, Issue 1](#), February 2012, Pages 1-12.

<sup>37</sup> "Executive Order on Climate-Related Financial Risk," The White House, May 20, 2021.

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only a member, but also is the current leader<sup>38</sup> of the Financial Stability Board (FSB), a global systemic regulator; the FSB and its Task Force on Climate-related Financial Disclosures<sup>39</sup> have published recommendations on, and research about, climate change and its risks to the financial system globally.

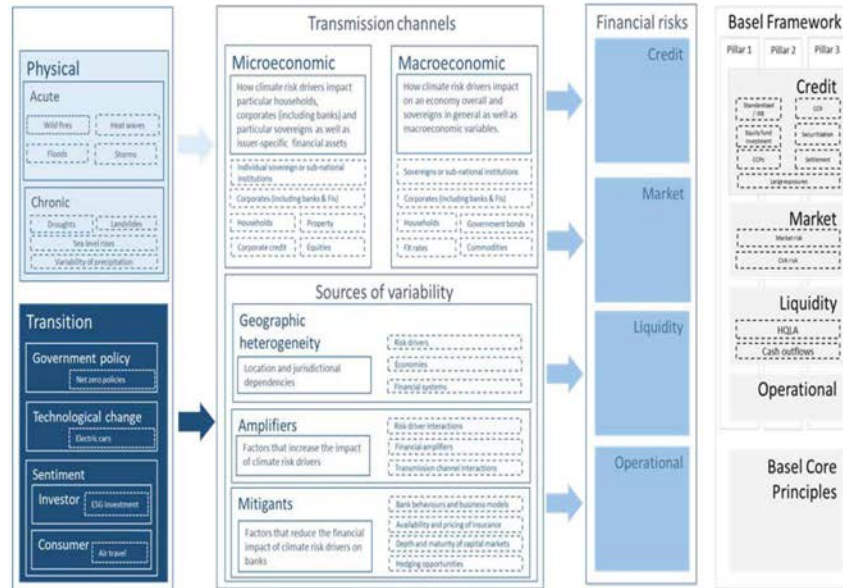
The U.S. is one of the founding members of the Basel Committee on Banking Supervision (BCBS); hence it has been instrumental in creating the international bank capital and risk management framework, The Basel Accord, now known as Basel III. The U.S. also participates in the creation of every consultative document, quantitative impact studies, and all guidance produced by the BCBS. In April 2021, the BCBS published a report<sup>40</sup> about how climate change can impact banks and the banking system globally.

<sup>38</sup> [Chair of the FSB](#) is Governor and Vice Chairman of the Federal Reserve Randal Quarles.

<sup>39</sup> [Task Force on Climate-related Financial Disclosures](#), FSB.

<sup>40</sup> [Climate-related Risk Drivers and their Transmission Channels](#), Basel Committee on Banking Supervision, April 2021.





Source: The Basel Committee on Banking Supervision, April 2021.

The Commodities Futures Trading Commission (CFTC) and the Securities and Exchange Commission (SEC) are the United States' representatives at the International Organization of Securities Commissions (IOSCO).<sup>41</sup> IOSCO develops, implements and promotes adherence to internationally recognized standards for securities and derivatives regulation. It also works intensively with the Group of 20 (G20) and the Financial Stability Board (FSB) on the global regulatory reform agenda and to address emerging financial vulnerabilities that could impact financial stability globally. In July, IOSCO<sup>42</sup> intends to publish its first regulatory guidance for

<sup>41</sup> [Fact Sheet](#), IOSCO.

<sup>42</sup> ["IOSCO Chair Outlines the Future of Climate Risk Regulation,"](#) Mayer Brown, February 23, 2021.



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companies that rate corporate environmental, social and governance (ESG) performance. It is doing so “to stem growing concern among asset managers about overstated green credentials.”<sup>43</sup> According to IOSCO Ashley Alder, IOSCO is “now working on ways to ensure better transparency and clearer definitions. Our work is likely to involve guidance to service providers and ratings agencies, together with recommendations for regulators on how to deal with potential conflicts of interest.”

The United States is also a member of the International Association of Insurance Supervisors (IAIS). The IAIS recently finalized “The Application Paper on the Supervision of Climate-related risks in the Insurance Sector.”<sup>44</sup> IAIS recommends that “supervisors should identify, monitor, and assess the impact of climate change risk on the insurance sector, as well contribute to the mitigation of this risk, with the ultimate objective of protecting policyholders and contributing to financial stability.” IAIS also recommends insurance supervisors that they establish clear two-way communication between the supervisor and the supervised entities. “Such communication also helps to better understand the challenges faced by insurers and find adequate long-term solutions to overcome them.” The Application Paper highlights the United States National Association of Insurance Commissioners and its work on climate change. (See Appendix V)

### Recommendations

In the United States, the Financial Stability Oversight Council (FSOC), the financial systemic regulator under Dodd-Frank’s Title I, and its Office of Financial Research (OFR) should be given the necessary human, data,<sup>45</sup> and technological resources so that they can analyze how climate change is impacting the entire U.S. financial system and where there could be sources of systemic risk.

It is especially important that FSOC and OFR focus on those non-banks<sup>46</sup>, that unlike banks, do not have strong regulatory capital, liquidity, and leverage risk requirements, and are for more, opaque than banks and insurance companies.<sup>47</sup> Non-banks are exposed to climate risk change in that they invest in a wide range of sectors sensitive to physical and transition climate related-risks. Without regulating non-banks, risks simply transfer from banks and insurance companies to non-banks; risks do not disappear from the financial system. Moreover, many non-banks are

<sup>43</sup> “Global Watchdog to Target ‘Greenwashing’ in First Guidance for ESG Raters,” BusinessDay, June 23, 2021.

<sup>44</sup> “The Application Paper on the Supervision of Climate-related risks in the Insurance Sector,” May 2021.

<sup>45</sup> Rodriguez Valladares, Mayra. “The Data is Mightier than the Sword, Mr. President,” The Hill, August 15, 2018.

<sup>46</sup> “Climate Roadmap for Financial Regulation,” Public Citizen and Americans for Financial Reform, April 2021.

<sup>47</sup> Rodriguez Valladares, Mayra “Market Participants and Regulators Should Be More Vigilant on Non-Banks,” Forbes, February 4, 2019.

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incredibly interconnected to banks<sup>48</sup> and to leveraged corporations<sup>49</sup>; consequently, their financial health is critical to the safety and soundness of our economy.

FSOC is also in a good position to request that rating agencies<sup>50</sup> include climate change risks in their ratings of companies and financial institutions. FSOC should also request that rating agencies disclose their methodologies to rate companies' and institutions' Environmental Social and Governance (ESG) adherence at a granular level. Numerous banks, insurance companies, and asset managers rely on ratings for their portfolio asset locations. FSOC and the Securities and Exchange Commission (SEC) can request more oversight of rating agencies and more transparency about how they rate companies and financial institutions sensitive to climate-change risks.

Our national bank regulators: the Federal Reserve Bank, the Office of the Comptroller of the Currency, and the Federal Deposit Insurance Corporation are aware of the adverse consequences that climate change can have on banks under their mandate and on the availability of banking services to Americans at those banks. The Federal Reserve, as the regulator for bank holding companies and as a member of the Financial Stability Oversight Council, has a key role to play in climate-risk identification, measurement, and monitoring in the financial system.<sup>51</sup> Last year, the Federal Reserve Board mentioned climate change for the first time in its annual Financial Stability Report. Importantly, it stated "climate change adds a layer of economic uncertainty and risk that we have only begun to incorporate into our analysis of financial stability. Different sectors of the economy and geographic regions face different risks that will diverge from historical patterns."<sup>52</sup> The Federal Reserve Banks of New York<sup>53</sup> and San Francisco have been contributing climate-change research that is important for regulators and banks.

<sup>48</sup> Rodríguez Valladares, Mayra. "[Non-banks are the Largest Holders of Collateralized Loan Obligations](#)," Forbes, June 11, 2019.

<sup>49</sup> Rodríguez Valladares, Mayra. "[Non-banks Need to Be More Transparent About Their Leveraged Loans](#)," Forbes, February 4, 2019.

<sup>50</sup> Harrington, Bill. "[Public Input Welcomed in Climate Change Disclosures](#)," Letter to the Securities and Exchange Commission, June 14, 2021.

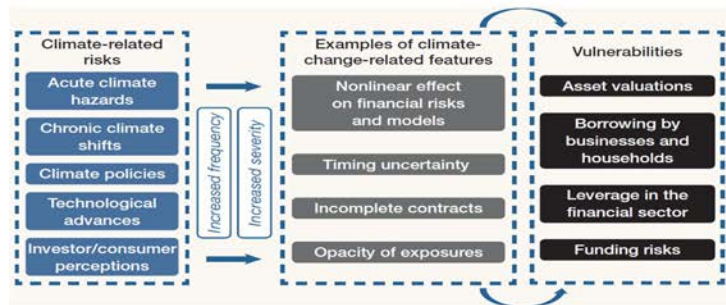
<sup>51</sup> "[Climate Change and Financial Stability](#)," FEDS Notes, March 19, 2021.

<sup>52</sup> [November 2020 Financial Stability Report](#), Federal Reserve, November 2020. p. 58

<sup>53</sup> "[Community Development: Climate](#)," Federal Reserve Bank of New York.



#### Possible Transmission from Climate-related risks to Financial System Vulnerabilities<sup>54</sup>



Recent<sup>55</sup> and current<sup>56</sup> Acting Comptrollers of the Office of the Comptroller of the Currency have stated that the OCC's "role is to ensure that those financial institutions understand the risks they face and have robust risk management to control and monitor the risks and their impacts. Those risks can arise in many ways including contexts that relate to climate change, either because of physical conditions or climate-related transitions in business and other environments." For decades, the OCC has witnessed how Americans are hurt by natural disasters. Consequently, it advises<sup>57</sup> banks in its jurisdictions to waive fees or reassess any penalties on borrowers who have trouble paying loans due to physical property damage.

The New York State Department of Financial Services, under the admirable leadership of Superintendent Linda A. Lacewell, has been a leader in the area of climate change, not only by being the first American regulator to join the Network, but also by providing climate change guidance to insurance companies<sup>58</sup> and to banks<sup>59</sup> in my state. National bank regulators, as well as state financial regulators can benefit from NYDFS' leadership in the area of climate change.

National bank regulators already have laws that permit them to ask banks to disclose drivers of credit, market, operational, and liquidity risks. National bank regulators, for example, already have the power to do sampling. That is, they can request banks to show them loan portfolios of borrowers in climate change sensitive areas so that supervisors can see how those loans have

<sup>54</sup> Federal Reserve Staff.

<sup>55</sup> [Acting Comptroller of the Currency Statement Regarding Climate Risk at the Financial Stability Oversight Council](#), March 31, 2021.

<sup>56</sup> [Michael J. Hsu Statement to Agency Employees on Becoming Acting Comptroller of the Currency](#), May 10, 2021.

<sup>57</sup> ["Responding to a Declaration of a Legal Holiday or a Natural Disaster: Supervisory Guidance on Natural Disasters and Other Emergency Conditions,"](#) OCC, September 21, 2012.

<sup>58</sup> [Superintendent Lacewell Announces Proposed DFS Guidance to New York Insurers on Managing the Financial Risks from Climate Change](#), March 25, 2021.

<sup>59</sup> [October 29, 2020 – Climate Change and Financial Risks](#), New York Department of Financial Services.



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performed during fires, droughts, and flooding. National bank regulators can and should request more data about banks' loan and trading portfolios and can already enforce existing capital, stress testing, and risk disclosure rules. For example,

- Under Basel III, Pillar I, banks are required to collect data on operational risk, defined as the threat to earnings and liquidity due to problems with people, processes, technology and external events. External events include any natural disasters that can hurt a bank's asset quality in both the banking and trading portfolios.
- Under Basel III's Pillar II, banks can incorporate any risks, including climate change, into their Internal Capital Adequacy Assessment Process (ICAAP) to determine their economic capital to help them sustain unexpected losses. This means that banks can already include how floods, fires, heatwaves, and droughts could impact the probability of default of their borrowers and counterparties, as well as how climate change can impact market price volatility in their trading portfolios.

I respectfully recommend that national bank regulators

- create climate change stress tests, or at the very least, add climate change scenarios to existing supervisory exercises such as the Comprehensive Capital Analysis Review (CCAR), which quantitative component is the Dodd-Frank Stress Test (DFAST); presently DFAST has macroeconomic, credit, and market scenarios but not climate change ones;
  - The Network for Greening the Financial System, which counts the NY Department of Financial Services and the Federal Reserve as members, has created useful climate change scenarios<sup>60</sup> for financial regulators and financial institutions.
  - In 2017, the Financial Stability Board's Task Force on Climate-Related Financial Disclosures published important recommendations<sup>61</sup> about data and scenario analysis that are useful to all financial institutions, but especially to banks and insurance companies.
- design specific climate change supervisory guidance as regulators explore how to write concrete rules for climate change scenario analysis and or stress tests;
- request banks to include in their bank recovery and resolution plans (living wills) and their Comprehensive Liquidity Assessment Reviews (CLAR) how climate change-related physical and transition risks could impact banks' funding, cost of borrowing, liquidity, and risk mitigation ability;

<sup>60</sup> "[The Future is Uncertain](#)," Network for Greening the Financial System.

<sup>61</sup> "[Recommendations of the Task Force on Climate-Related Financial Disclosures](#)," TFCFD, June 2017.

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- update regulatory compliance and examination manuals to include the term climate change and how it can impact banks;
- conducts a review of their human resources to see if they have enough professionals with knowledge about climate science and also those with expertise in risk data aggregation and modeling;
- review if they have robust technological systems to analyze climate change data and its impact on banks' credit, market, operational, and liquidity risk exposures; and
- address their climate change data gaps, as well, as that of banks.

Additionally, I also recommend that bank regulators require banks to:

- conduct a gap analysis to determine what resources they need to improve risk data aggregation, climate change risk modeling, human resources and technology;
  - Bank regulators should request that banks create long-term financial plans that incorporate how physical and transition risks could impact their asset quality, capital, and liquidity for the next 3-5 years at least.
- incorporate physical and transition risks into their enterprise-wide risk management frameworks;
  - This includes identifying and measuring their exposures to climate risks in their lending, underwriting, trading, and derivatives trading decisions.
- disclose to the public how climate change physical and transition risks are drivers for credit, market, operational, and liquidity risks via Basel III's Pillar III Risk Disclosures;
  - Since Basel II in the mid-2000s, these important risk disclosures already enable market participants to discipline banks if they are very concerned about banks' risks; they can do so by selling banks' bonds and stocks or transacting credit derivatives or options referencing those banks' issuances. Investors in bank stocks and bonds are critical in signaling to others about potential problems at banks; they can only signal well if they have high quality and comprehensive financial and risk disclosures from banks.

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Risk	Areas where further analysis would be valuable
Credit risk	Whilst existing research is weighted towards credit risk, it is largely focused on aggregate and country-level data. Further research and more granular data would usefully assess the impact of transmission channels on corporates, households and sovereigns for specific types of products.
Market risk	Research suggests that climate risk drivers have impacted the value of certain types of financial assets. Additional research could usefully explore how climate risk drivers undermine or challenge banks' assumptions on market liquidity and price correlations when managing market risk, as well as investigating how climate change impacts a broader set of assets in banks' trading portfolios.
Liquidity risk	Limited research on banks' liquidity risk has been undertaken, with existing research weighted towards wider liquidity impacts of physical risk drivers on the economy. Further research on the impact of physical and transition risk drivers on banks' liquidity would be valuable.
Operational risk	Existing studies suggest the potential for material operational climate losses on banks is small. However, this is based on modelling of idiosyncratic events and limited public information. In addition, liability and/or compliance risks related to climate changes may be significant and are yet to be studied in detail. Further research on bank-relevant operational risks would therefore be valuable.

Source: Basel Committee on Banking Supervision, April 2021.

I thank you for the opportunity to appear before you. I look forward to your questions now, and I would be pleased to serve as a resource to you in the future as you continue to explore how to reduce the adverse impact of climate change on the safety and soundness of the financial system.

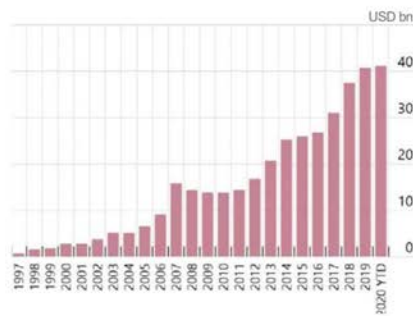
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## Appendix I

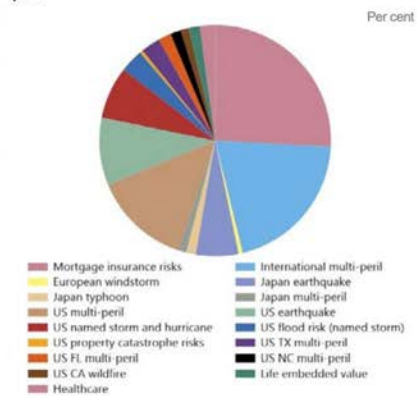
### The Global Market for Catastrophe Bonds<sup>62</sup>

Catastrophe bond & ILS risk capital outstanding



Source: ECB.

Catastrophe bonds & ILS risk capital outstanding by risk or peril



<sup>62</sup> [“The Implications of Climate Change on Financial Stability,”](#) The Financial Stability Board, November 23, 2020

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## Appendix II

### Selected US Billion-Dollar Disasters, Their Total Direct Costs, and Affected States<sup>63</sup>

Year	Disaster	States Severely Affected	Total Direct Costs*	State Featured in This Report
2017	Hurricane Harvey	TX, LA, MS, AL, NC	<b>\$130B</b>	Texas
2017	Hurricane Irma	FL, GA, PR	<b>\$52B</b>	Florida
2018	Severe Weather and Tornadoes	IA, CT, MA, NY, PA, NJ, MD, WV, VA, OH, IN, IL, MO, KS, OK, TX, CO	<b>\$1.6B</b>	Iowa
2016	Inland Flooding Matthew**	NC, FL, SC, GA, VA	<b>\$5B to 10B</b>	North Carolina
2018	Inland Flooding Florence**	NC, SC	<b>\$20 to 50B</b>	North Carolina
2018	Northeast Winter Storm	NY, CT, MD, VA, PA, NJ	<b>\$2.3B</b>	New York
2017	Southeast Freeze	GA, SC, NC, FL, AL, MS, TN, KY, VA	<b>\$1.1B</b>	Georgia
2017	Northern Plains Drought	ND, SD, MT	<b>\$2.6B</b>	North Dakota
2017	Western Wildfires	CA, MT, WA, OR	<b>\$18.7B</b>	California

Source: NOAA 2020. \*CPI-adjusted to 2019 dollars. \*\*States affected and total direct costs are for Hurricane Matthew and Hurricane Florence, respectively; total direct costs are the NOAA-estimated range for NC only.

<sup>63</sup> [“Climate Change Fueled Weather Disasters,”](#) Environmental Defense Fund, Summer 2020.



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## Appendix III

## Banking on Fossil Fuels

Bank financing for 2,300 companies active across the fossil fuel life cycle

B = BILLIONS M = MILLIONS

RANK	BANK	2014	2017	2018	2019	2020	TOTAL 2014-2020	TREND
1	JPMORGAN CHASE	\$63,729 B	\$70,271 B	\$67,296 B	\$68,009 B	\$51,300 B	\$316,735 B	
2	CIBC	\$42,437 B	\$47,702 B	\$46,963 B	\$52,496 B	\$48,389 B	\$231,477 B	
3	WELLS FARGO	\$34,031 B	\$34,812 B	\$61,827 B	\$45,084 B	\$26,400 B	\$233,345 B	
4	BANK OF AMERICA	\$27,670 B	\$36,764 B	\$33,808 B	\$45,091 B	\$42,149 B	\$198,452 B	
5	BNC	\$29,322 B	\$38,440 B	\$27,658 B	\$35,717 B	\$16,994 B	\$168,129 B	
6	BMO	\$20,304 B	\$20,777 B	\$35,454 B	\$31,783 B	\$20,070 B	\$147,737 B	
7	BARCLAYS	\$20,202 B	\$20,700 B	\$25,911 B	\$30,393 B	\$27,700 B	\$144,897 B	
8	INDIAN	\$21,248 B	\$19,200 B	\$25,799 B	\$30,484 B	\$22,267 B	\$122,472 B	
9	ID	\$20,705 B	\$29,405 B	\$25,941 B	\$27,044 B	\$16,868 B	\$121,062 B	
10	BNP PARIBAS	\$14,892 B	\$17,716 B	\$16,567 B	\$28,900 B	\$40,751 B	\$120,825 B	
11	SCOTIABANK	\$18,745 B	\$24,509 B	\$28,033 B	\$26,087 B	\$16,452 B	\$113,846 B	
12	MORGAN STANLEY	\$24,141 B	\$24,517 B	\$19,484 B	\$22,072 B	\$20,605 B	\$110,778 B	
13	HSBC	\$17,914 B	\$22,172 B	\$20,499 B	\$26,407 B	\$23,542 B	\$110,746 B	
14	BANK OF CHINA	\$25,944 B	\$13,832 B	\$22,202 B	\$25,208 B	\$18,850 B	\$101,194 B	
15	GOLDMAN SACHS	\$22,894 B	\$19,904 B	\$17,187 B	\$21,080 B	\$16,941 B	\$100,506 B	
16	BANK OF MONTREAL	\$17,348 B	\$21,218 B	\$21,539 B	\$21,869 B	\$15,154 B	\$97,307 B	
17	ICBC	\$18,788 B	\$12,285 B	\$14,794 B	\$19,017 B	\$29,621 B	\$96,405 B	
18	HSBC GROUP	\$26,545 B	\$12,117 B	\$15,445 B	\$19,095 B	\$29,199 B	\$94,391 B	
19	CREDIT SUISSE	\$19,292 B	\$21,022 B	\$17,709 B	\$14,184 B	\$9,484 B	\$82,201 B	
20	DEUTSCHE BANK	\$19,457 B	\$16,424 B	\$15,257 B	\$11,190 B	\$9,126 B	\$74,424 B	
21	SOCIÉTÉ GÉNÉRALE	\$13,671 B	\$10,192 B	\$15,453 B	\$14,674 B	\$10,034 B	\$72,024 B	
22	CIBC	\$12,272 B	\$14,048 B	\$13,610 B	\$19,068 B	\$9,742 B	\$66,739 B	
23	CREDIT AGRICOLE	\$8,886 B	\$11,220 B	\$13,089 B	\$11,819 B	\$10,094 B	\$64,087 B	
24	CHINA CONSTRUCTION BANK	\$16,828 B	\$9,926 B	\$9,013 B	\$12,727 B	\$13,043 B	\$64,534 B	
25	INDUSTRIAL BANK	\$9,210 B	\$9,806 B	\$12,329 B	\$11,467 B	\$14,043 B	\$56,861 B	
26	AGRICULTURAL BANK OF CHINA	\$11,830 B	\$5,478 B	\$7,460 B	\$11,021 B	\$13,709 B	\$49,702 B	
27	CHINA CITIC BANK	\$9,090 B	\$6,043 B	\$9,262 B	\$10,731 B	\$10,390 B	\$46,464 B	
28	BOJ	\$9,266 B	\$8,774 B	\$11,338 B	\$8,941 B	\$6,493 B	\$44,309 B	
29	SHANGHAI PUJONG DEVELOPMENT BANK	\$6,007 B	\$4,093 B	\$6,999 B	\$7,759 B	\$12,160 B	\$37,075 B	
30	SPENABANK	\$9,130 B	\$5,780 B	\$19,028 B	\$7,708 B	\$6,360 B	\$34,496 B	

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## Appendix IV

**Credit Risk in Agriculture Lending Resources**

- Federal Reserve Bank of Chicago — [AgLetter](#)

This quarterly publication summarizes survey data for agricultural land values and credit conditions in the Seventh District.

- Federal Reserve Bank of Dallas — [Agricultural Survey](#)

This survey reports on agricultural credit conditions and farmland values in the Eleventh District.

- Federal Reserve Bank of Kansas City — [Survey of Tenth District Agricultural Credit Conditions](#)

This survey reports on agricultural credit conditions and farmland values in the Tenth District.

- Federal Reserve Bank of Minneapolis — [Agricultural Credit Conditions Survey](#)

This survey reports on agricultural credit conditions and farmland values in the Ninth District.

- Federal Reserve Bank of St. Louis — [Agricultural Finance Monitor](#)

This quarterly survey reports on agricultural credit conditions in the Eighth District.

- Federal Reserve Board's Commercial Bank Examination Manual, Section 2140, "[Agricultural Loans](#)"

- FedLinks: "[Risk Management Supervisory Expectations for Agricultural Credit Risk](#)," November 2012

- Supervision and Regulation Letter 11-14 "[Supervisory Expectations for Risk Management of Agricultural Credit Risk](#)"

- [United States Department of Agriculture](#) (USDA)

The USDA provides a wide range of reports and data on market conditions.

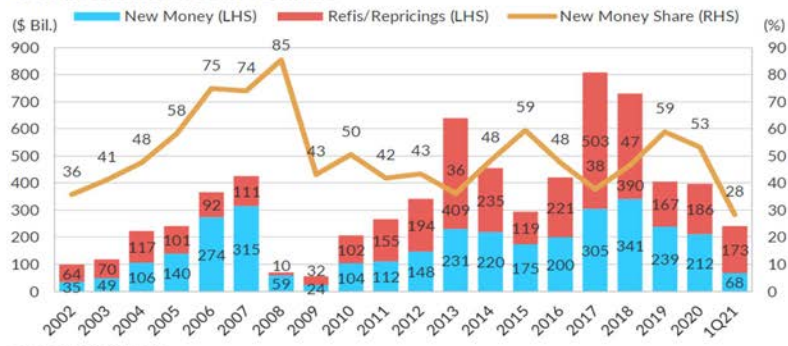
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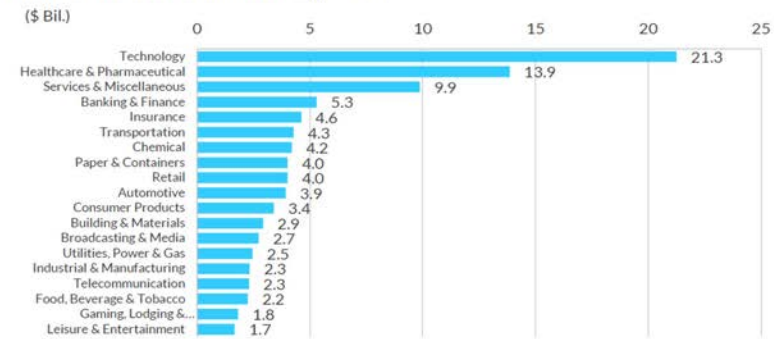
## Appendix V

Leveraged Loans in the U.S.<sup>64</sup>

## U.S. Institutional Loan Issuance



## Institutional Loan Issuance by Sector



<sup>64</sup> "U.S. Leveraged Loan Chart Book: First-Quarter 2021," Fitch Ratings, May 6, 2021.

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US leveraged loan returns, by sector			
	December	2020	Weight
Aerospace & Defense	1.47%	1.79%	1.49%
Air Transport	2.73%	-11.62%	1.46%
All Telecom	1.47%	5.39%	4.09%
Automotive	1.57%	5.46%	2.99%
Building & Development	1.18%	3.79%	3.04%
Business Equipment & Services	1.61%	4.41%	9.45%
Cable & Satellite Television	1.14%	3.32%	3.75%
Chemicals & Plastics	1.16%	4.81%	4.15%
Clothing/Textiles	2.16%	1.35%	0.55%
Containers & Glass Products	1.19%	3.37%	2.36%
Cosmetics/Toiletries	5.50%	-11.96%	0.38%
Drugs	0.98%	6.86%	2.44%
Ecological Services & Equipment	0.88%	5.12%	0.69%
Electronics/Electrical	1.14%	4.94%	15.79%
Equipment Leasing	1.57%	2.38%	0.61%
Financial Intermediaries	1.18%	3.51%	1.83%
Food Products	1.02%	7.31%	1.90%
Food Service	1.52%	2.65%	2.66%
Health Care	1.28%	5.22%	9.71%
Home Furnishings	1.74%	-5.67%	0.50%
Industrial Equipment	1.41%	4.00%	3.65%
Insurance	0.87%	3.83%	3.89%
Leisure Goods/Activities/Movies	0.50%	-5.33%	3.86%
Lodging & Casinos	1.60%	2.43%	3.62%
Nonferrous Metals/Minerals	4.68%	-0.05%	0.37%
Oil & Gas	3.11%	-6.01%	2.49%
Publishing	1.18%	6.07%	1.44%
Radio & Television	2.16%	2.54%	2.18%
Retailers (except food & drug)	1.07%	-0.42%	2.85%
Steel	1.10%	5.38%	0.39%
Surface Transport	1.43%	2.79%	0.91%
Utilities	0.54%	2.34%	2.79%
<b>Total LLI return</b>	<b>1.35%</b>	<b>3.12%</b>	

Data through Dec. 31, 2020.

Sources: LCD, an offering of S&amp;P Global Market Intelligence; S&amp;P/LSTA Leveraged Loan Index.



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### Appendix VI

#### Questions Supervisors Should Ask Insurers<sup>65</sup>

Examples of relevant indicators and sources of information that supervisors may consider asking insurers, inter alia based on guidance published by the SIF and United States National Association of Insurance Commissioners (US NAIC),<sup>10</sup> include:

##### Qualitative questions:

##### General

- What are the environmental, economic, social, political, technological, or reputational risks and opportunities related to climate change that are relevant for your business?
- Has your organisation implemented or planned any substantive changes to its business model, strategy and/or risk appetite in response to current and potential future climate-related risks?
- Does your organisation have a strategy to address climate change?
- Are there governance structures in place in your organisation through which Board Members may have oversight over climate-related risks? Is there a specific Board Member identified to deal with these risks?

##### Physical risk

- Does your organisation expect that physical risks will materially affect business performance, in terms of market demand, claims experience, or other factors?
- Does your organisation expect that physical risks will materially affect the valuation of financial assets in your investment portfolio, and how do you expect these risks to materialise over the short, medium, and long-term?
- Does your organisation directly or indirectly incorporate climate-related factors into the pricing and underwriting of insurance products?

<sup>65</sup> SIF (2020), [Question Bank on Climate Change Risks to the Insurance Sector](#); NAIC (2013), Financial Condition Examiners Handbook (which was updated to reflect climate specific aspects, including templates to be used as a starting point when interviewing an insurer).

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### Transition risk

- Does your organisation expect that transition risks will materially affect underwriting business performance, in terms of market demand, claims burden, or other factors?
- To what extent does the investment strategy include climate-related considerations, and does the insurer comply with its stated strategy?

### Liability risk

- Has there been a legal judgement awarded in your jurisdiction relating to liability for climate change damages?
- Does your organisation consider that it may be directly or indirectly exposed to liability risks stemming from climate change, either now or into the future?

### Quantitative information:

#### General

- Carbon-intensity of sectors for both asset and liability exposures; or
- ESG/climate scoring, if available (internally developed or from third parties).

#### Physical risk

- The vulnerability to climate change by jurisdiction, for instance according to the Notre Dame Global Adaptation Initiative ([ND-GAIN](#)) Index or Standard & Poor's methodology;
- Percentage of power plant locations that are exposed to various levels of water stress, flood, and wildfire risks (eg from Paris Agreement Capital Transition Assessment ([PACTA](#)) model);
- Exposure to flood risk, or exposure of real estate investments to perils;
- Agricultural insurance with exposure to drought, variations in weather patterns and other climate change impacts; and
- Outputs from catastrophe models.

### Transition risk

- Distribution of energy performance labels in insurers' commercial real estate and/or residential real estate portfolios;
- Carbon intensity ratings of various assets and proportion of assets that are exposed to carbon intensive industries; and
- Implied warming of the portfolio such as through the PACTA model.

### Liability risk

- General insurance for coal, oil and gas energy operations with exposure to climate litigation;
- Portfolio of relevant insurance liability covers such as for Directors and Officers; and
- Professional liability insurance with exposure to climate litigation, such as architects' professional liability risks for a new commercial development that did not anticipate the increased risk of flooding.

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## Appendix VII

### Author's Select Articles About Climate Change, Energy Companies, Financial Stability, Leverage, and Operational Risk

[All U.S. Bank Regulators Should Require Banks To Incorporate Climate Change Risks into Their Risk Management Frameworks and Disclosures](#)

[Bank Operational Risk Ignored More than a Bridesmaid](#)

[Banks are the Largest Holders of Leveraged Loans and Collateralized Loan Obligations](#)

[Banks Can Suffer Financial Losses From Physical And Transition Climate Change Risk Drivers](#)

[Banks Should Implement Principles For Operational Resilience](#)

[Big Banks Are Very Exposed to Leveraged Lending and CLO Markets](#)

[The Data is Mightier than the Sword, Mr. President](#)

[Climate Change Is A Key Priority To The G20 And Financial Stability Board](#)

[Climate Change Risks Should Be A Priority For U.S. Bank Supervisors](#)

[Energy Companies Comprise Over 25% of Total U.S. Corporate Defaults](#)

[Highly Leveraged Companies Threatened the Global Company](#)

[Ignoring Climate Related Physical and Transition Risks Imperil Global Financial Stability](#)

[Legislators And Regulators Should Ask These Questions About Leveraged Loans and CLOs](#)

[Leveraged Loan Borrowers Are Requesting Covenant Relief At An Extraordinary Pace](#)

[Market Participants and Regulators Should Be More Vigilant Of Non-Banks](#)

[Mnuchin Should Require More Transparency about Leveraged Lending and CLO Markets](#)

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[Non-Banks Are The Largest Holders Of Collateralized Loan Obligations](#)

[Non-Banks Need To Be More Transparent About Their Leveraged Loans and Other High Yield Exposures](#)

[Rising Sea Levels Pose Increasing Credit Risks for Many U.S. Coastal States and Investors in their Bonds](#)

[Risk Data Aggregation: Why Regulators and Banks are Finally Paying Attention](#)

[Syndicated Leveraged Loan Covenant Quality is at Record Weakness](#)

[U.S. Corporate Debt Continues to Rise as do Problem Leveraged Loans](#)

[U.S. Corporate Default Volute Especially in the Energy Sector is Worse than in 2009](#)



TESTIMONY of Dr. Clifford V. Rossi<sup>1</sup>

## Addressing Climate as a Systemic Risk: The Need to Build Resilience within Our Banking and Financial System

June 30, 2021

Chair Perlmutter, Ranking Member Luetkemeyer and Members of the Subcommittee, I am Dr. Clifford Rossi, Professor-of-the-Practice and Executive-in-Residence at the Robert H. Smith School of Business at the University of Maryland.

I am here today to inform the Subcommittee that imposing climate risk mandates on regulated banking institutions at this time would be detrimental to consumers, the financial services sector, and economy at-large. Let me be clear, climate change is a real risk that requires a firm understanding of the current limitations of climate models, underlying data, how those data do and do not integrate with standard financial and risk models, and numerous other components—in order to craft effective solutions to the underlying risk.

I offer a unique perspective on this issue having worked for 23 years in the financial services industry, first as a regulator during the S&L Crisis and then at both Fannie Mae and Freddie Mac—pre-conservatorship, as well as at one of the largest commercial banks, the then largest savings and loan and the largest nonbank mortgage company during my tenure as a C-level risk management executive, and now as a finance professor working on climate risk issues and banking.

I am not here to dismiss the reality of climate change and its potential risks, but rather to shed light on the state of climate risk assessment in banking and its implications for banking policy and regulation. While I am not a climate scientist, the preponderance of research suggests that long-term changes to Earth systems is evident as shown in Figure 1.<sup>2</sup> Across a range of key attributes such as land and sea surface temperatures, sea levels and arctic sea ice, the trends since the late 19<sup>th</sup> century to the present day indicate that the climate is indeed changing.

Models in use today for climate scenario analysis are designed to represent the physics of a complex Earth system well into the future and their output is of limited near-term use by financial institutions. It is essential that a better understanding of the limitations of these models and scenarios be gained to guide a pragmatic approach to climate risk policy for regulated depository institutions. A key question for policy makers is what actions can be taken to mitigate this trend that will not impose severe unintended consequences on markets, consumers, and the economy. Policy makers should abide by the adage in medicine, “first do no harm.”

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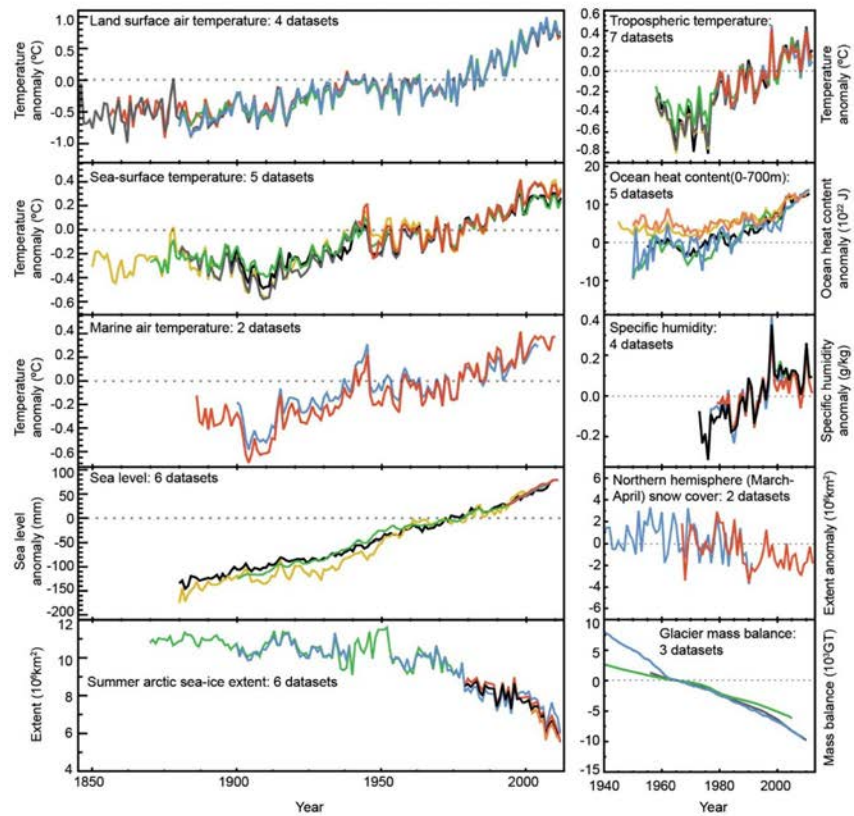
<sup>1</sup> The views and opinions expressed in this testimony do not reflect those of the Robert H. Smith School of Business or the University of Maryland.

<sup>2</sup> Intergovernmental Panel on Climate Change, Climate Change 2013, The Physical Science Basis, 2013.

### Climate-Related Financial Risk

A pivotal study released by the United Nations' Intergovernmental Panel on Climate Change (IPCC) in 2018 noted that CO<sub>2</sub> emissions would need to fall nearly 50% by the year 2030 in

**Figure 1: Long-term Changes in the Earth System**



order to prevent global temperatures from rising more than 1.5 degrees Celsius; a goal of the Paris climate agreement.<sup>3</sup> This study and the Paris climate agreement have spurred calls of urgency among climate risk advocates and others. As I will outline in more detail, the models upon which such urgent demands for public policy response are based are subject to significant model risk. Model risk can be defined as the risk associated with errors in data, methods or assumptions used to generate output from analytical models used for decision-making. Effective public policy must be based on a sound understanding of the state of climate change risk assessment. Forcing financial institutions and their regulators toward expansive climate risk regulation based on effects that are not well understood presents more risk to the financial system than a staged and methodical approach. I applaud the intent of the Biden Administration in its Executive Order on Climate-related Financial Risk to assess climate-related financial risks and data, however, I would caution policy makers and regulators from imposing measures on regulated depositories based on current climate analytics.<sup>4</sup> The output from climate and associated integrated assessment models is not close to being ready for use in bank financial and risk analytics and suffers from the “square peg in the round hole” syndrome.

#### **Square Peg and Round Hole Problem of Climate and Financial Risk Models**

Banks, particularly the largest and most complex institutions engage in a variety of risk analyses leveraging large databases and complex models for underwriting, loan loss reserving and loss forecasting, capital allocation, and asset and liability management and pricing, among other key banking activities. I have either developed such models or overseen the development and use of those models in my industry experience. In the years following the Global Financial Crisis, these large institutions were subject to annual regulatory stress tests designed to assess these companies’ ability to withstand a variety of adverse economic events.<sup>5</sup> Stress tests rely on a set of macroeconomic forecasts provided by regulators that are used as inputs into financial and risk models of banks. These projections are relatively short-term in nature, going out only nine quarters. There is a reason for such a short planning horizon; longer financial forecasts are much less accurate, and the composition of bank balance sheets change over a longer horizon. In their 2020 TCFD climate change disclosure, Citigroup acknowledged these issues in the following statement describing their experience in conducting transition risk analysis: *“The long-term nature of these scenarios was also not well aligned with the time horizon of our lending portfolio.”*<sup>6</sup> Moreover, significant inconsistencies and data integrity issues exist between climate model output and financial and risk models. For these reasons and others, conducting stress

<sup>3</sup> IPCC, 2018: Summary for Policymakers. In: *Global Warming of 1.5°C. An IPCC Special Report on the impacts of global warming of 1.5°C above pre-industrial levels and related global greenhouse gas emission pathways, in the context of strengthening the global response to the threat of climate change, sustainable development, and efforts to eradicate poverty* [Masson-Delmotte, V., P. Zhai, H.-O. Pörtner, D. Roberts, J. Skea, P.R. Shukla, A. Pirani, W. Moufouma-Okia, C. Péan, R. Pidcock, S. Connors, J.B.R. Matthews, Y. Chen, X. Zhou, M.I. Gomis, E. Lonnoy, T. Maycock, M. Tignor, and T. Waterfield (eds.)]. *World Meteorological Organization, Geneva, Switzerland, 32 pp.*

<sup>4</sup> The White House, Executive Order on Climate-Related Financial Risk, May 20, 2021.

<sup>5</sup> The Comprehensive Capital Analysis and Review (CCAR) stress tests conducted by large bank holding companies and the Dodd-Frank Act Stress Tests (DFAST) for large commercial banks.

<sup>6</sup> Citigroup, Finance for a Climate-Resilient Future II, Citi’s 2020TCFD Report, p. 21.

and/or scenario analysis over a longer period is simply not reliable in understanding and managing a bank's risk profile today.

In contrast with what is done today in regulatory stress testing, climate scenarios today are drawn up by entities such as the Network of Central Banks and Supervisors for Greening the Financial System (NGFS) and rely on projections extending decades into the future. The NGFS' 6 climate scenarios characterizing the effects of transition and physical risks to the financial system from changes in public policy, temperature and emissions extend out to the year 2100.<sup>7</sup> These climate and socio-economic models operate on a global scale and with a level of complexity and long-term horizon that is incompatible with the level of granularity required and relatively shorter-term focus of bank stress tests to reliably assess risk in bank portfolios. The linkages between long-term climate effects and short- to intermediate-term financial and risk factors are not sufficiently reliable, at present, to properly assess physical or transition risk impacts to the banking system from climate change.

### Climate and Socio-economic Model Limitations

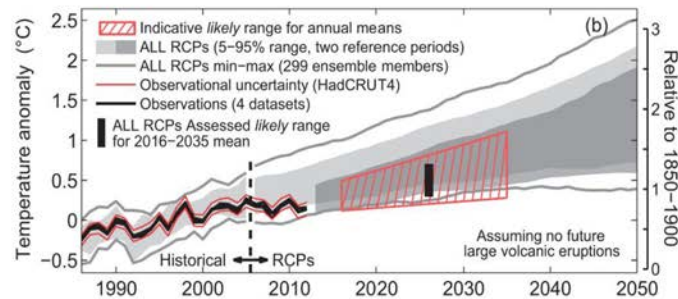
Climate scenarios such as those proposed by the NGFS are dependent on output from global climate models and large-scale Integrated Assessment Models (IAMs) that incorporate scientific and socio-economic relationships. Both model types pose significant uncertainty in their results. This is acknowledged by those organizations developing and/or leveraging these models. For instance, the NGFS revealed in their discussion of climate scenario development that "*Modelling the GDP impacts from transition risk and physical risk is subject to significant uncertainty.*"<sup>8</sup>

To gain a sense of the issues associated with the climate models consider Figure 2, which is from the IPCC's 2013 report on climate change.<sup>9</sup> The graph depicts a range of actual and projected estimates of global temperature anomaly over time. These estimates are drawn from 299 climate model simulations. The first takeaway is that there is a significant amount of uncertainty in the combined model results and that uncertainty increases over time (widening of the area between the gray lines over time). The second takeaway is that the IPCC acknowledges that the model projections tend to overpredict the temperature anomaly. This is seen by the heavy black line tilted toward the bottom gray line indicating the lower end of the models' predictions. What this means is that climate scientists developing the models acknowledge that there is potentially great error in their estimates. Why is this important? Requiring banks to make hard-money strategic decisions on lending, capital allocation, pricing and other activities that have long-term consequences for consumers, the financial system and economic growth based on models with a high degree of uncertainty is not at all consistent with prudent model risk management practices.

<sup>7</sup> Network for Greening the Financial System, NGFS Climate Scenarios for central banks and supervisors, June 2021.

<sup>8</sup> Network for Greening the Financial System, NGFS Climate Scenarios for central banks and supervisors, June 2020, p. 26.

<sup>9</sup> IPCC, 2013.

**Figure 2: Climate Model Temperature Anomaly Projections**

Climate model projections such as those provided by the IPCC in the Fifth Assessment Report (AR5) are represented by an average of results from multiple climate models.<sup>11</sup> Modeling at a global scale requires the use of multiple models taking into account a multitude of earth system dynamics and accordingly supercomputing power to generate model outputs on such a scale. However, the old adage—all models are wrong, but some are useful—applies in the world of climate modeling. Some climate models perform better than others in certain geographical areas but the approach to generating climate results has tended to average good and bad models together, which can generate misleading results.<sup>12</sup> This reminds me of the old modeling joke that if you put your head in the oven and your arms in the refrigerator then on average you feel fine.

While the climate models have come a long way over the last decade, they are still subject to uncertainties related to the proper quantification of feedback mechanisms, which remains one of the biggest unknowns in climate modeling. One of these feedback mechanisms is the ice-albedo effect: albedo refers to the reflectivity properties of materials. Ice is highly reflective of incoming solar energy. If climate models project more greenhouse gases and thus higher temperatures, ice will melt leading to a darker surface. Darker surfaces (low albedo) absorb more solar energy resulting in a further increase in temperature, more ice melt, more absorption, even warmer temperatures and so on and so on. Climate scientists acknowledge that quantitative assessment of this effect is inadequate.<sup>13</sup> This is just one example of the complex issues

<sup>11</sup> IPCC, AR5 Synthesis Report: Climate Change 2014, 2014.

<sup>12</sup> Eyring, V., Cox, P.M., Flato, G.M., et al., Taking Climate Model Evaluation to the Next Level, *Nature Clim. Change*, 9, 102-110, 2019.

<sup>13</sup> Kashiwase, H., Ohshima, K., Nihashi, S., and Eiken, H., Evidence for Ice-Ocean Albedo Feedback in the Arctic Ocean Shifting to a Seasonal Ice Zone, *Sci. Rep.*, 7, 8170, 2017.

associated with climate models and should engender a healthy dose of skepticism before accepting the results of any model: climate, socio-economic or financial for that matter.

The IAM models used in developing climate scenarios are likewise fraught with error. These models attempt to integrate scientific and socio-economic analysis to produce a variety of projections such as economic growth, population shifts, carbon and energy prices, and sectoral changes in key industries such as energy and agricultural, among others. While carbon prices are key inputs to climate scenarios, significant variability exists in estimating these prices. In a study using a well-known IAM for their analysis, Moore and Diaz estimated that the social cost of carbon was \$220 per ton not \$37 per ton as estimated in a study by the federal government.<sup>14</sup> This has enormous implications for financial institutions and their customers. In their 2020 TCFD climate change disclosure report, Citigroup conducted carbon price sensitivity analysis on their oil and gas company portfolio using a range of prices from \$50-\$100 per ton. While this might be a useful analysis in theory, there is considerable uncertainty in applying such an analysis; ultimately rendering it of limited value for financial and risk decision-making.

In his seminal article, the Use and Misuse of Models for Climate Policy, Pindyk levies a damning indictment of IAMs including the arbitrary parameterization and assignment of model input functional forms, difficulty in understanding climate sensitivity impacts to the models, a paucity of data relating to damage functions and poor characterization of tail risk associated with climate outcomes.<sup>15</sup> He goes further and makes the following statement; *“In fact, I would argue that the problem goes beyond their ‘crucial flaws’: IAM-based analyses of climate policy create a perception of knowledge and precision that is illusory and can fool policymakers into thinking that the forecasts the models generate have some kind of scientific legitimacy.”*<sup>16</sup> If models developed in my organization as a former risk executive in the financial services industry had such claims leveled against them, it would be difficult to support using them in the business.

My points here are not meant to disparage the enormous effort by teams of scientists, economists and others to understand the effects of climate change; this is critical work that must be done. However, there are far too many issues associated with the reliability of the climate and IAM model outcomes to use in making financial and risk decisions today.

### Model Bias and Its Effect on Decisions

It is well-established in the psychology and economics literature that decision-making is affected by a number of cognitive biases. One of these is what I refer to as model, or shiny object bias; something that Pindyk implies in his assessment of IAMs. Model bias occurs when decisionmakers embrace the results from highly sophisticated quantitative models based on perceptions that the apparent analytical rigor in those models necessarily translates into accurate

<sup>14</sup> Diaz, D and Moore, F., Quantifying the Economic Risks of Climate Change, Nature Clim. Change, 7, 774-782, 2017.

<sup>15</sup> Pindyk, R.S., The Use and Misuse of Models for Climate Policy, Review of Environmental Economics and Policy, 11, 1, Winter 2017, 100-114

<sup>16</sup> Pindyk, 2017.

and reliable outputs. An example of this was the wide use of a method (Gaussian copula methodology) by traders in pricing mortgage-based credit default swaps (CDS) during the years leading up to the Great Financial Crisis. The underlying mathematics of the copula method used to value CDS is quite complicated and is dependent on the nature of correlations in underlying assets. The method took off among trading departments and helped fuel an explosion in trading of CDS during that period. The problem was that this very elegant and, on its face, mathematically rigorous model, was seriously flawed by underlying assumptions made with regard to asset correlations. The model's Achilles Heel was an assumption that correlations did not change. Unfortunately, they did change and in a way that led the copula model to vastly underestimate risk, thus resulting in a crash in CDS values. Traders and other key decisionmakers who became enamored with the technical elegance of the Gaussian copula were drawn in by shiny object bias; that the mathematical rigor associated with the model boosts the confidence of nontechnical decisionmakers to use such models in financial decision-making.

There is already a widespread shiny object bias in the use of climate and IAM models today among policymakers worldwide. This poses serious concerns regarding the use of these models for anything other than research applications at this time as described earlier. Placing bets in financial markets on such models invites a host of long-term unintended consequences on the financial system.

#### **A Path Forward in Assessing Climate Financial Risk**

Having laid out the issues on the state of climate and IAM models and their lack of direct integrability with financial and risk analytics, I have several recommendations for how banks should proceed to understand their resiliency to climate change:

##### **Recommendation 1: Risk Identification & Governance**

Prudent risk management practices start and end with effective governance and controls. Climate risk should be integrated into bank risk taxonomies and assessed in terms of other top risks of these firms such as credit, market, operational and strategic. Climate risk must also be incorporated into board and executive risk and business committee discussions with dedicated resources having subject matter expertise in climate risk assessment.

##### **Recommendation 2: Risk Measurement**

Banks should undertake an assessment of current exposures to physical risk from climate change in their portfolios and facilities and do so on a periodic basis as needed. This could entail understanding where loan and investment portfolios are exposed to certain climate events and estimating the likelihood of such events and loss potential to the firm. Banks should also embark on a process to develop empirical linkages between climate events and key financial and nonfinancial risks. An example of such analysis is described in my forthcoming article in the

Journal of Risk Management in Financial Institutions on estimating the impact of hurricane frequency and intensity on mortgage default.<sup>17</sup> The data and analytical linkages between climate risk and financial and nonfinancial risks are not well understood, thus making this a priority. As these analytics are being developed, firms should develop risk metrics and targets based on available information and risk assessments even if these are qualitatively oriented. Regulators should focus their attention on understanding the limitations of climate and IAM models, data and associated outputs and facilitate the development of data and analysis that could one day be used by banks to manage climate risk more effectively. Now is not the time to impose mandates for scenario or stress testing analysis or other restrictions on bank activities based on climate and IAM models that would not meet regulatory standards for model validation required by banks.

#### Recommendation 3: Risk Mitigation

While many financial instruments exist in the market to absorb natural disaster risk such as reinsurance and catastrophe risk bond structures, further work should be done to build out alternative ways for portfolio holders of risk to transfer such exposures off their balance sheet efficiently. An example of such a structure I have developed is a climate credit default swap (CCDS) that could be used to mitigate credit-related losses across multiple asset classes. To illustrate how this could work, imagine a regional bank with significant exposure to hurricane risk along Florida's Gold Coast. Knowing that the spring NOAA hurricane forecast calls for a well above average number of hurricanes rated 3-5 on the Saffir-Simpson Wind Scale, the bank enters into a CCDS to protect against defaults that occur up to 12 months after the formal designation by FEMA of a disaster. Other structures such as residual climate tranches of Fannie Mae and Freddie Mac credit risk transfer (CRT) securities could also be developed to address credit risk exposure from an increase in climate-related events.

#### Recommendation 4: Risk Disclosure

Today, financial institutions such as publicly traded banks disclose a significant amount of information with regard to key risks, their approach to risk management and governance in their financial statements. Climate risk should be incorporated as another important risk into bank financial disclosures along with credit, market and liquidity risk, for example. Recommendations made by the Task Force on Climate-Related Financial Disclosures (TCFD) regarding climate risk disclosures would be useful in guiding institutions in how they could integrate this in with their existing risk disclosure process. Banks should not, however, be required to report climate-based physical or transition risks given the range of uncertainty of such analyses and data. At this time, if I were a Chief Risk Officer at a bank, I would have

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<sup>17</sup> Rossi, C., Assessing the Impact of Hurricane Frequency and Intensity on Mortgage Delinquency, forthcoming Journal of Risk Management in Financial Institutions, 2021.



difficulty signing any attestations or sub attestations associated with these aspects of climate risk for financial disclosures.

### **Summary**

Climate change is a real risk that banks and other financial institutions should actively incorporate in with their existing risk management processes. However, such firms must take measured steps to understand these risks and not be forced into conducting analyses for which the models and outputs are not well understood as they relate to financial services. Banks should instead focus attention on bolstering their risk awareness to climate change starting with enhancing their risk governance, process and controls, data and analytics. Quantifying with a reasonable degree of confidence the impacts of physical and transition risk from climate change will require significant efforts and time and a true interdisciplinary approach between climate scientists and financial institutions in gathering additional data and modifying existing models. This work should commence and only when the results have been deemed to conform to regulatory model risk standards should consideration of their disclosure and use in financial decision-making be permitted.

Prudent risk management depends on identifying inherent risks, gathering appropriate data and developing analytics to accurately measure risks and taking actions based on the results of well-tested analytics to mitigate and control risks. Requiring banks to implement and disclose the results from climate scenario analysis based on models that represent the state-of-the-art but have significant underlying deficiencies has great potential to destabilize markets, harm consumers and lead to unintended economic and financial turbulence.



**Oral Testimony of Steven Rothstein**  
**Managing Director, Ceres Accelerator for Sustainable Capital Markets**

Prepared for the U.S. House of Representatives, Committee on Financial Services,  
 Subcommittee on Consumer Protection and Financial Institutions

Hearing: [Addressing Climate as a Systemic Risk:](#)  
[The Need to Build Resilience within Our Banking and Financial System](#)

Wednesday, June 30, 2021 2:00 pm

Thank you for the opportunity to appear before you today. My name is Steven Rothstein. I am the Managing Director of the Ceres Accelerator for Sustainable Capital Markets. Ceres is a non-profit organization working with investors and companies to build sustainability leadership within their firms and to drive policy solutions throughout the economy. I represent our membership networks of Fortune 500 companies and 200 investors with over \$30 trillion of assets under management.

My testimony today also draws from Ceres reports that include detailed recommendations. We have also submitted these into the record.

I am not here only to talk about the direct systemic risk climate has on our planet or people, although that is paramount to the lives of our children and grandchildren.

I am here to highlight both the under-recognized risk to the safety and soundness of our financial institutions due to climate change and the risks the business-as-usual approach of some financial institutions pose to a livable, climate-safe world.

If a banker or a bank regulator suggested they did not need to plan for another pandemic or cyber attack, there would be a chorus of opinions saying that they were not meeting their fiduciary responsibility. Potential exposure to climate risk is bigger and more systemic, yet there are leaders in banking, insurance and even financial regulators that do not fully account for climate risk.

Even as we are working to overcome the unprecedented pandemic, and the pain and loss it brought, we simultaneously had record-breaking fires, hurricanes and unparalleled climate-related transition risks.

We are, as the Secretary of State said, running out of records to break.

In short, we know more about the climate risks than we knew about the mortgage finance risks facing our financial system in 2008. But, surprisingly, we are not acting with the urgency required.

There are dozens of strong international examples from financial regulators we can learn from. We appreciate that the Treasury Department, the Federal Reserve, the SEC and some others have taken initial actions but we need to move faster.

We recommend regulators take five essential steps:

**1. Immediately affirm the systemic nature of the climate crisis and its impacts on financial market stability.**

This affirmation should take the form of a statement from the agency chair or an agency-issued report to underscore the risks posed by climate change to financial markets.

**2. Activate action on prudential supervision.**

U.S. regulators have explicit responsibilities to supervise the risks that financial institutions take on. Consistent with this mandate, financial regulators should integrate climate change into their prudential supervision of banks, insurance companies and other regulated financial institutions.

**The Federal Reserve**, in particular, should take immediate steps to assess the climate risk to financial markets and mandate scenario analyses by the banks and other financial institutions it supervises. The Fed should also outline plans for conducting pilot climate stress tests on its supervised institutions to measure the impact of climate-related shocks, and consider enhancing capital and liquidity requirements to integrate climate risk.

In addition, we recommend the Federal Reserve, the FDIC, the Office of the Comptroller of the Currency and the National Credit Union Administration expand their examiner training programs and manuals to ensure staff fully understand the climate risk faced by the financial institutions they monitor.

**3. Support the Securities and Exchange Commission's work on mandatory climate disclosure.**

We congratulate the SEC for seeking comments and for hopefully issuing bold rules later this year mandating corporate climate disclosure.

**4. Address how climate risks further exacerbate systemic racism, particularly reflected in financial institutions.**

Financial regulators should develop strategies to address systemic climate risks and structural racism in an integrated way. The Community Reinvestment Act (CRA) offers ripe opportunities to enhance economic and climate resilience for low-income and vulnerable communities.

**5. Build capacity for smart decision-making on climate change by coordinating action with other U.S. and global financial regulators and by hiring and training additional staff.**

Coordinated action by U.S. financial regulators at the global, federal and state levels is essential to accelerating efforts to address climate risk. The Financial Stability Oversight Council (FSOC) generally and the Executive Order on Climate-Related Financial Risk plays a critical coordination role.

We appreciate the recent actions of U.S. financial regulators to coordinate with global peers to build on their learnings and experiences to date.

To conclude, U.S. financial regulators have a critical role to play in ensuring the resilience of our economy, weakened from a global pandemic, systemic racism, and threatened by future climate shocks. The safety and soundness of our financial institutions are relying on them and all of you to act.

Thank you.



**Background Materials for Oral Testimony of Steven Rothstein  
Managing Director, Ceres Accelerator for Sustainable Capital Markets**

Prepared for the U.S. House of Representatives, Committee on Financial Services,  
Subcommittee on Consumer Protection and Financial Institutions

Hearing: [Addressing Climate as a Systemic Risk:  
The Need to Build Resilience within Our Banking and Financial System](#)

Wednesday, June 30, 2021 2:00 pm

**Ceres Reports**

- April 2021 Ceres report presenting progress by U.S. financial regulators on addressing climate as a systemic risk to the financial system: "[Turning Up the Heat: The need for urgent action by U.S. financial regulators in addressing climate risk](#)"
- February 2021 Ceres analysis on [Financing a Net-Zero Economy](#): The role of Time Horizons and Relationship Banking
- October 2020 Ceres report on the risks the largest banks across the country are taking with their current syndicated loan portfolios: "[Financing a Net-Zero Economy: Measuring and Addressing Climate Risk for Banks](#)"
- June 2020 Ceres report outlining how and why U.S. financial regulators need to recognize and act on climate change as a systemic risk: "[Addressing climate as a systemic risk: A call to action for US financial regulators](#)"
- October 2020 Ceres report [Automaker Roadmap for Climate Scenario Analysis](#) outlines how auto companies can use climate scenario analysis to assess climate change-related risks and opportunities in line with the latest science from the IPCC 1.5°C report
- August 2019 Ceres report [Climate Strategy Assessments for the U.S. Electric Power Industry: 2019 Update](#) provides a framework developed by M.J. Bradley & Associates (MJB&A) that provides specific guidance for assessing climate change-related risks and opportunities for companies in the U.S. electric power industry
- March 2017 Ceres report [A Framework For 2 Degrees Scenario Analysis: A Guide For Oil And Gas Companies and Investors for Navigating the Energy Transition](#). This paper proposes the basis for 2 degrees scenario analysis for oil and gas companies, examples of best practices to date, the basics for meaningful climate disclosures, and key questions investors ask when engaging with companies on these analyses
- See Appendix B for highlights of key recommendations from Ceres reports relevant to the hearing.



#### Past Ceres Testimony

- [Written testimony](#) of Veena Ramani, Senior Program Director, Capital Market Systems, Ceres. Prepared for the U.S. House of Representatives, Committee on Financial Services, Subcommittee on Investor Protection, Entrepreneurship and Capital Markets. Hearing: **"Climate Change and Social Responsibility: Helping corporate boards and investors make decisions for a sustainable world"** (February 25, 2pm)
- [Written testimony](#) of Mindy S. Lubber, Chief Executive Officer and President, Ceres. Prepared for the U.S. House of Representatives, Committee on Financial Services, Subcommittee on Investor Protection, Entrepreneurship and Capital Markets. **"Building a Sustainable and Competitive Economy: An Examination of Proposals to Improve Environmental, Social and Governance Disclosures"** (July 10, 2019)

#### Recent Regulatory Filings

- Ceres [comments](#) in response to the Securities and Exchange Commission's RFI on Climate Disclosure
- Sign-on [statement](#) (over \$2.7 trillion in AUM) to the SEC asking for mandatory climate disclosure
- May 2021 Ceres [submission](#) to the National Association of Insurance Commissioners (NAIC)
- April 2021 Ceres [comment letter](#) in response to the Federal Housing Finance Agency (FHFA) RFI
- February 2021 Ceres comment letter in response to the Federal Reserve's Advanced notice for proposed rulemaking for public comment regarding the modernization of CRA
- January 2021 Ceres [comment letter](#) to the Municipal Securities Rulemaking Board's (MSRB) RFI on strategic goals and priorities

#### Other

- [Letters to Federal Reserve Chairman Jerome Powell and other leaders of key financial regulatory agencies](#) coordinated by the Ceres Accelerator from a broad-based, bipartisan collection of investors, businesses, former regulators, politicians, and nonprofit leaders. (See stories in the [New York Times](#), [Forbes](#), [Financial Times](#), and [Washington Examiner](#)).
- Forbes piece by Mindy Lubber, President & CEO of Ceres: [The Time for Mandatory Climate Disclosure is Now](#)
- Commodity Futures Trading Commission (CFTC) report: ["Managing Climate Risk in the U.S. Financial System"](#), that issued dire warnings about the impact of climate change on financial markets, as the costs of extreme weather events continue to spread through the insurance industry, mortgage markets, the banking sector, and pension funds and other institutional investors. See also our column in [Barron's](#), as well as press coverage thus far in the [New York Times](#), [Reuters](#), and [Pensions and Investments](#).

## Appendix A

### SCORECARD for Initial Steps on Climate Change Action

This table identifies only the foundational steps that federal financial regulators should put in place to activate climate change across their mandate  
 Affirmed climate change as systemic risk  
 Public research on climate change  
 Senior staff focused on climate change



<b>Federal Reserve System</b>		
Chair remarks, Financial Stability Report	Conferences and events	Climate Supervision Committee
<b>Federal Deposit Insurance Commission</b>		
Board member remarks		
<b>Office of the Comptroller of the Currency</b>		
<b>National Credit Union Administration</b>		
<b>Securities and Exchange Commission</b>		
Acting Chair statement on climate disclosure, Acting Chair call for public comments		Senior Policy Advisor for Climate and ESG and other staff
<b>Commodity Futures Trading Commission</b>		
Acting Chair remarks	Climate-Related Market Risk Subcommittee report	Climate Risk Unit
<b>Public Company Accounting Oversight Board</b>		
<b>Municipal Securities Rulemaking Board</b>		
<b>Federal Housing Finance Agency</b>		
Remarks by Director	Economics of Climate Change Summit; RFI, summit and research by GSEs	Hired economist and recruiting two climate staff
<b>Financial Stability Oversight Council</b>		
Treasury Secretary remarks on climate change	Commitment to establish a climate "hub"	Senior staff
<b>ACTION</b>	<b>SOME ACTION</b>	<b>NO NOTABLE ACTION</b>

Information as of March 30, 2021  
 For the latest version of this scorecard, visit our website:  
[ceres.org/runninguptheheat](https://ceres.org/runninguptheheat)





## EXECUTIVE SUMMARY

In June 2020, Ceres released [Addressing Climate as a Systemic Risk: A Call to Action for U.S. Financial Regulators](#). It laid out how climate change threatens the stability of financial markets and the overall economy, and how and why U.S. financial regulators must address this systemic risk as part of their existing responsibilities.

Much has changed since the report's release 10 months ago.

We have seen early progress from financial regulators to acknowledge the systemic financial risks of climate change. Of particular note, in November 2020 the Federal Reserve [identified climate as a near-term "financial stability risk."](#) The U.S. Commodity Futures Trading Commission (CFTC) climate risk subcommittee [issued a comprehensive report](#) with an unequivocal warning: "Climate change poses a major risk to the stability of the U.S. financial system and its ability to sustain the US economy." Regulators are starting to indicate their intention to integrate climate change into their mandate and are starting to build up their own internal capacity.

Despite these advances, most U.S. federal and state financial regulators have yet to act on the climate crisis and lag far behind their global counterparts and what the science demands.



THE CERES ACCELERATOR FOR  
SUSTAINABLE CAPITAL MARKETS

### SCORECARD for Initial Steps on Climate Change Action

This table identifies only the foundational steps that federal financial regulators should put in place to activate climate change across their mandate.

Affirmed climate change as systemic risk	Public research on climate change	Senior staff focused on climate change
<b>Federal Reserve System</b>		
Chair remarks, Financial Stability Report	Conferences and events	Climate Supervision Committee
<b>Federal Deposit Insurance Commission</b>		
Board member remarks		
<b>Office of the Comptroller of the Currency</b>		
<b>National Credit Union Administration</b>		
<b>Securities and Exchange Commission</b>		
Acting Chair statement on climate disclosure; Acting Chair call for public comments		Senior Policy Advisor for Climate and ESG and other staff
<b>Commodity Futures Trading Commission</b>		
Acting Chair remarks	Climate-Related Market Risk Subcommittee report	Climate Risk Unit
<b>Public Company Accounting Oversight Board</b>		
<b>Municipal Securities Rulemaking Board</b>		
<b>Federal Housing Finance Agency</b>		
Remarks by Director	Economics of Climate Change Summit; RPI, summit and research by GSEs	Hired economist and recruiting two climate staff
<b>Financial Stability Oversight Council</b>		
Treasury Secretary remarks on climate change	Commitment to establish a climate "hub"	Senior staff

ACTION SOME ACTION NO NOTABLE ACTION

Information as of March 30, 2021  
For the latest version of this scorecard, visit our website  
Click on hyperlinked text in boxes for further information

**This lack of urgency is playing out in the face of mounting climate risks and a changing investment landscape**



The past year was also marked by a national reckoning on systemic racism and its [longstanding linkages to the American economy](#). Astonishing [wealth gaps](#), [damages from climate disasters](#) and broader [social and economic inequities](#) were laid bare. Financial regulators can no longer afford to look at systemic racism, climate change or the pandemic in isolation. Each feeds into the other, with significant populations, especially communities of color, [bearing the most severe burdens](#).

**The coming months are a unique opportunity for U.S. financial regulators to leapfrog into global leadership on the climate crisis. With [an engaged president](#) and senior administration officials, financial regulators can help catalyze a low-carbon transition that will bolster the country's competitiveness while driving a more equitable economy. With the clock ticking on the climate crisis, quick and decisive action is crucial.**

This report lays out the steps that U.S. financial regulators should take now to address climate change consistent with their mandates. Among our recommendations:

**I. Immediately affirm the systemic nature of the climate crisis** and impacts on financial market stability

This affirmation should be in the form of a statement from the agency chair or an agency issued report. It should underscore the risks posed by climate change to financial markets writ large and should outline specific action steps.

Such statements are particularly important given the complex nature of climate risks and continuing ambiguities about the extent to which the issue falls under specific agency mandates. Arguments that climate change is a special interest environmental issue and that climate solutions should be handled only through legislation are no longer valid.

Some state and federal financial regulators have already acknowledged the systemic nature of climate risks, including the [Federal Reserve](#), the [CFTC](#) and the [New York State Department of Financial Services](#). Many [global regulators](#), especially in Europe, have also taken this first step.

**II. Activate action on climate-related measures**, including prudential supervision, investor protections and enhanced climate disclosure mandates

**PRUDENTIAL SUPERVISION**

Many U.S. regulators have explicit responsibilities to supervise the risks that financial institutions and the financial sector take on. Consistent with this mandate, financial regulators should be integrating climate change into their prudential supervision of banks, insurance companies and other regulated institutions.

The **Federal Reserve**, in particular, should take immediate steps to assess the overall health of financial markets from climate risks and should mandate climate scenario analyses by banks and other financial institutions. The Fed should also outline plans for conducting climate stress tests, which measure how climate-related shocks, whether from a sudden drop in economic growth or the decline of a specific industry, would affect individual institutions and the broader financial system. Many [other central banks globally](#) are already taking such steps.

Stronger leadership is needed from other federal and state regulators as well. The Federal Reserve should coordinate with other banking regulators to develop guidance on how financial institutions should integrate climate change into their risk management, internal controls, business strategies, governance and disclosures. State insurance and bank regulators should also require banks and insurers to address climate risks. The New York Department of Financial Services [issued proposed guidance](#) on climate change to the banks and insurance companies it supervises.



### INVESTOR PROTECTIONS

Reinstating and reinforcing mechanisms that help investors manage climate risks should be a high priority for financial regulators.

The **Securities and Exchange Commission** (SEC) and **Department of Labor** (DOL) play especially important roles in influencing how investors can consider climate change in decision-making. Many SEC- and DOL-governed rules that investors have long relied on were stripped away in 2020 under the Trump administration.

The SEC and DOL should move immediately to amend or eliminate Trump era rules, including SEC Rule 14a-8 that increases [share ownership requirements for filing shareholder proxy proposals](#) and DOL Rule 1210-AB95, [which limits how fund managers can consider climate and ESG](#) (environmental, social and governance) factors when making decisions on 401-Ks and other retirements plans governed under the ERISA law. The DOL has recently announced that [it will not enforce Rule 1210-AB95](#).

### MANDATE CLIMATE CHANGE DISCLOSURE

While current voluntary climate disclosure practices have been important steps, they are [not producing](#) the standardized, reliable and actionable data that investors and other market players need to assess risks and make informed decisions. The SEC should build on its initial steps and issue rules mandating climate change disclosure, building on reporting frameworks developed by the Task Force on Climate-related Financial Disclosures (TCFD).

Other federal financial regulators should coordinate with the SEC and identify opportunities to get additional climate disclosures from industries that they supervise.

Some U.S. regulators are already moving in this direction. In February 2021, the SEC's Acting Chair Allison Herren Lee [directed SEC staff](#) to enhance their focus on climate-related disclosures. In March, she called for [public comments](#) to inform the SEC's thinking on climate change disclosure rules.

**III. Pursue holistic approaches**, including considering climate impacts in addressing the pandemic and addressing systemic racism and the climate crisis as interrelated stability risks

Financial regulators, especially the Fed, should more proactively link pandemic recovery efforts to climate mitigation and resiliency. Among the options the Fed should consider include withholding financial support for assets with significant climate risk exposure, attaching climate conditions to loans made to carbon intensive industries and including climate factors in qualitative easing.

Financial regulators should also develop strategies to address systemic risks of climate change and structural racism in an integrated way. The Community Reinvestment Act (CRA) especially offers ripe opportunities to enhance financial access and economic and climate resilience for low-income and vulnerable communities. Ceres submitted [specific recommendations](#) in this regard as part of the Fed's recent public comment process for modernizing CRA regulations.

**IV. Build capacity for smart decision-making on climate change** by coordinating action with other U.S. financial regulators, global peers and other external stakeholders and by hiring and training staff

Coordinated action by U.S. financial regulators at the federal and state levels and with global financial regulators is essential to accelerating climate mitigation efforts and low-carbon capital flows. The Financial Stability Oversight Council (FSOC), which plays a critical coordination role among federal financial regulators, should immediately declare that climate change threatens financial stability and start engaging with members to develop coordinated responses, including on prudential oversight and climate disclosure.

The FSOC could also charter a “climate committee” comprised of relevant member regulators to drive climate action across the regulatory ecosystem. Related to this, Treasury Secretary Janet Yellen [recently pledged to develop a Treasury “Hub”](#) that would examine financial system risks from climate change. This hub could also coordinate with the FSOC and Office of Financial Research on needed research on climate-related impacts on market stability.

Financial regulators should also find opportunities to coordinate with global peers to build on their learnings and experiences to date and to develop a shared global playbook for action. For example, by [recently joining](#) the global Network for Greening the Financial System, the Fed is well positioned to coordinate with other global central banks on issues such as climate stress testing scenarios.

Finally, regulators should hire staff with expertise with climate change, and educate and train existing staff on how climate change fits into their roles. Regulators could also consult with external advisory groups, including advocacy groups, scientists, academics, industry groups and others, in pursuing an informed approach to climate change regulation.

**Our full list of recommendations is available on pages 17-37.**

## CONCLUSION

U.S. financial regulators have a critical role to play in bolstering our economy, weakened from a global pandemic and threatened by future climate shocks. Financial regulators in countries around the globe have shown leadership in this work. Rather than standing back, U.S. regulators should seize the vast opportunity of a sweeping economic transformation that can stabilize our climate while reducing long-standing social and economic inequalities.



9 | Turning Up The Heat

[ceres.org/turf/here](https://www.ceres.org/turf/here)

6/29/2021

Financing a Net-Zero Economy: The Role of Time Horizons and Relationship Banking | Ceres



## Financing a Net-Zero Economy: The Role of Time Horizons and Relationship Banking

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February 23, 2021 | Blair Bateson and Dan Saccardi | Banking and Finance

*Technical Analysis by CLIMAFIN consultants Stefano Battiston, Antoine Mandel and Irene Monasterolo*

Banks' exposure to climate risk is much broader than they are disclosing—and than is commonly understood by regulators and investors. In an October report, *Financing a Net-Zero Economy: Measuring and Addressing Climate Risk for Banks*, Ceres found that more than half of bank lending is potentially exposed to climate risks due to the failure of many bank clients to plan for the transition to a net-zero economy.<sup>[1]</sup> A worst case scenario could result in hundreds of billions of dollars in losses for U.S. banks and potentially trigger a new financial crisis.

In assessing climate risks, many banks reason that transition risk may be less of a threat because most of their loans are short term, and they can simply decide not to renew the loans that might face increased risk due to climate change. New analysis from Ceres finds that that reasoning is flawed, and that banks must look beyond the individual loan to the long-term and multi-faceted relationship with the client. When that lens is applied, the need for banks to address climate risk in their portfolios becomes much more urgent.

The urgency comes from the fact that, due to the complexity of these long-term client relationships, it might take a decade to implement a proactive engagement strategy that puts clients on the path to decarbonization. Right now, most banks aren't even thinking about time horizons longer than five years. The solution is for banks to do three things:

1. Think longer term by adopting 10-year time horizons for risk management
2. Plan longer term by creating 10-year financing plans for each sector
3. Act longer term by engaging clients starting now and incorporating phases of evaluation, collaboration and execution over the next 10 years.

Those solutions are supported by quantitative analysis from our partners at CLIMAFIN and Ceres' in-depth interviews with industry experts and investors on the topic of relationship banking. The long-term focus is needed because banks can't quickly move away from long-term client relationships, which are built on a valuable combination of customer loyalty and the mutual sharing of information, without significant costs. And for decarbonization to happen within banks' portfolios, as one former banker said, "it has to be a profit center rather than a cost center for the bank."

By examining the unique aspects of relationship banking, we outline recommendations below for how banks can think, plan and act in ways that will minimize the risk of climate change for themselves, their clients and society.

### Part 1: The Value of Relationship Banking to Banks

If all loans and other banking services were independent of each other, banks could theoretically move quickly to react to escalating climate risks within a five-year planning window.

However, even casual observers can see that interdependencies exist. Just like most consumers establish a relationship with their bank that starts by opening a checking account but then grows to include savings and loans, banks' commercial customers rely on them for many related products and services.

We've found through multiple interviews that banks work to move clients up a "food chain" of financial services. Typically, this means offering clients favorable terms on lower-margin products like revolving credit facilities to try to secure more profitable services (typically investment banking- and advisory-related).<sup>[2][3]</sup> Losing out on a loan doesn't just forgo the revenue from that loan, it also jeopardizes these other lucrative opportunities. As one former bank executive put it, "banks will typically fight over opportunities to participate in revolving credit facilities because that's seen as an entrée into conversations about other, more profitable services."

<https://www.ceres.org/news-center/blog/financing-net-zero-economy-role-time-horizons-and-relationship-banking>

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banking can help banks maintain profitability despite competitive pressure.<sup>11</sup> Research shows that it increases in more competitive lending markets, like the US.<sup>12</sup>

Given these dynamics, it doesn't make sense to assess the risk of individual corporate loans in isolation. That would misleadingly suggest that since loans only last 25 months on average, it's possible for a bank to just walk away when that time is up.<sup>13</sup> In reality, since client relationships typically generate revenue from many products and services over decades, a different unit of analysis and a longer time horizon for risk management and strategic planning are required.

**Recommendation: When evaluating climate risk, the unit of analysis banks should use is the client relationship, including all the revenue derived from that relationship over time.**

**Recommendation: To effectively assess the financial impact of climate change on client relationships, banks should extend their planning and risk management time horizons to include a 10-year view.**

This longer term view is uncommon in the U.S., where the regulatory framework is built around time horizons of nine and 20 quarters. Confidential Ceres research from 2019 shows that only one of nine banks studied is looking at a risk management time horizon longer than five years. Two others are looking longer term with respect to climate risk, but not for more conventional risks like credit risk or market risk.

## Part 2: Relationship Banking and Climate Policy Relevant Sectors

If they do have to confront a disorderly carbon transition, banks that have deep relationships with high-carbon firms will face a difficult trade-off.<sup>14</sup> They will either have to refinance customers whose credit quality has suddenly deteriorated or stop lending to them. In the first case, they might avoid losses in the short term but end up increasing their long-term transition risk. Alternatively, banks could abruptly terminate lending relationships with certain borrowers (i.e., by declining to roll over credit facilities). This would destroy value on two levels. First, for some banks, it would lead to a substantial loss of customers and drop in market share. As one former JPMorgan banker put it, "It would be very damaging to the relationship with a client if a bank said it wouldn't roll over a revolver, particularly if other banks continued to extend credit." Such abrupt action would destroy the informational value of the lending relationship.

The way to avoid this value destruction—and mitigate the worst impacts of climate change—is for banks to help clients gradually and strategically reduce their risk through transition plans aligned with the objectives of the Paris Agreement. This means that banks and their clients need to set net-zero targets that aim to decarbonize most sectors by 2040, and the whole economy by 2050.

Banks can help clients make the business case for change (and reduce their own risk) by adjusting the pricing of products and services to match the level of climate risk their clients face. Banks can also help clients by providing transition finance—many firms' decarbonization plans will require significant injections of capital.

While target setting, pricing adjustments and transition finance are approaches that can help clients in all sectors lower their climate risk, other engagement considerations (material issues, due diligence procedures, data availability, level of sophistication, technology pathways) might vary depending on the sector.

As a result, banks need to prioritize certain sectors, at least in the near term. While the most important criteria that banks should use to decide which sectors to prioritize are their level of financial exposure to a given sector and the level of climate risk that sector faces, the extent of relationship banking in a sector is also important.

In sectors with high levels of relationship banking, there is additional value at risk beyond what's on the balance sheet. It may take longer to move away from certain clients in these sectors if engagement isn't successful. Conversely, high levels of relationship banking in a sector may allow engagement to move faster and have a higher chance of success, not only because a bank might have more leverage in these situations but also because of pre-existing trust and connectivity.

**Recommendation: Banks should adjust their sectoral engagement strategies based on the level of relationship banking in each sector. Sectors with many valuable relationships should be prioritized, engagement should move faster and more time should be allocated for these relationships to potentially unwind or be restructured.**

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lenders may be indicative of a high level of relationship banking.

To analyze the interplay between climate risk and relationship banking, Figure 1 maps economic sectors (using CLIMAFIN's CPRS classification system) along these two dimensions.<sup>[10]</sup>

This indicates that relationship banking is more prevalent in the most climate-relevant sectors, especially electricity, oil and transportation. Substantial bank resources should be directed toward client engagement in these sectors as soon as possible. It is also apparent that the average maturity of loans in the coal sector is lower than for other fossil fuels. This gap has emerged recently, and hints at an increase in the perceived riskiness of coal and the associated decline of banking relationships in many cases.

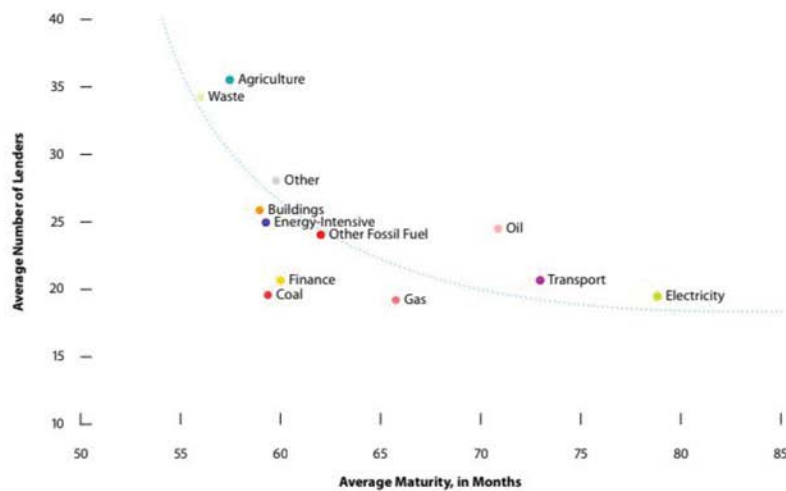


Figure 1: Average # of lenders and average maturity of syndicated loans in climate relevant sectors and other sectors ("Other")

Figure 1 is based on the Refinitiv DealScan® dataset focused on syndicated loans. These loans have a longer maturity than the average commercial and industrial loans, 60 months compared to 25 months.<sup>[9]</sup> Our inferences about relationship banking in climate-relevant sectors would ideally rely on internal bank data, but we have no reason to expect that would change them significantly; if anything, the nature of syndicated loans (i.e., involving many banks) could mean that the extent of relationship lending is underestimated.

### Part 3: The Need for a 10-Year Plan to Mitigate Risks and Capitalize on Opportunities

Banks have built their reputations on "keeping clients happy...and ensuring they are well positioned." This is why it has been easier for banks to capture opportunities associated with climate change, such as sustainable finance, than it has been to mitigate climate risk, which inevitably involves having to decline certain transactions.

Yet, while relationship banking can add risk, it paradoxically provides an opportunity to develop a positive approach to climate risk mitigation that banks can sell to their clients. Typically, environmental financing restrictions apply to individual transactions (for example, "we won't lend you money to



around them. "The next step is to have a much more in-depth client experience," said Savage.

We see the client engagement process moving through the following stages:

#### Short term: Evaluation

1. Banks work to understand their exposure to climate-relevant sectors, the level of risk in each sector and the relationship dynamics at play
2. Banks define long-term climate ambitions consistent with the latest science and set 2030 targets specific enough to build a financing plan around
3. Banks develop 10-year Paris-aligned financing plans for each sector

#### Medium term: Collaboration

1. Banks implement the Ceres Accelerator's recommendations on transition risk
2. Sectors are prioritized based on exposure, risk and relationships
3. Banks' 10-year plans are presented to clients
4. Banks develop firm-level risk assessment tools like climate-conscious earnings models or internal carbon prices to identify the firms at greatest risk and the lowest-cost ways for those clients to transition
5. Banks ask clients to set targets and adjust pricing and provide related expertise to incentivize such action

#### Long term: Execution

1. Client decarbonization plans are in place and capital needs are understood
2. Banks focus on deploying transition capital effectively to capture key opportunities
3. Clients and banks that acted early will begin to reap the rewards
4. Banks will shift their capital further toward proactive firms and away from those firms where engagement has not been successful
5. Pricing will fully reflect climate risks and opportunities

Losing clients will be a concern as banks move through these phases. If banks move too fast, there could be a short-term cost as affected clients look elsewhere for financing. This could be counterproductive, especially if those clients move to less regulated parts of the financial system where they won't face climate-related scrutiny. This is another reason why banks need to allow a longer lead time for execution, and why the largest U.S. banks need to begin now.

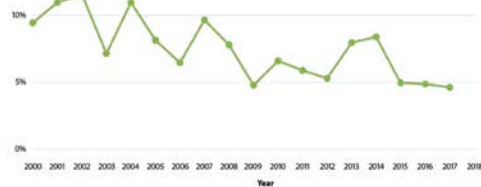
The progression through these stages will vary by sector and firm. Banks are already in the execution phase in the most exposed sectors, such as coal. In other key sectors, such as oil, gas and electricity, banks are quickly moving into the collaboration phase as their risk becomes increasingly clear. The remaining climate-relevant sectors are in the evaluation phase, as banks grapple with the risk these sectors could present and the technological paths their transitions could take.

Getting all clients on the path to success means that banks will have to be well into the execution phase by the end of the decade. It will take time to exit relationships that don't fit with a bank's climate strategy. More specifically, our research shows that, given the share of banks' portfolios in the fossil fuel and electricity sectors and the average rate of change of overall portfolio composition, it could take several years for most banks to make important structural changes to this part of their lending portfolio.

Figure 2 shows that, for most U.S. banks, the sectoral composition of their loan portfolios evolve slowly, with a yearly rate of change between 5 and 10%, despite market shocks such as the 2007-2008 financial crisis. This rate has been decreasing progressively over the past 20 years.

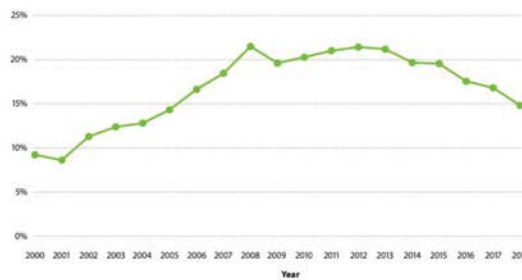
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**Figure 2: Average Yearly Change in the Sectoral Composition of the Loan Portfolio of Major U.S. Banks (Top 12 Banks Measured by Total Loan Value).**

Figure 3 shows the evolution of the exposure that banks face to the most climate-relevant sectors. CLIMAFIN research finds that while close to two-thirds of bank lending is climate-relevant, a smaller proportion (about 15%) is in "core" sectors related to fossil fuels and electricity. These "core" sectors, shown in the graph, have the highest levels of relationship banking and, in many assessments, they also face the most climate risk.<sup>[10] [15]</sup>



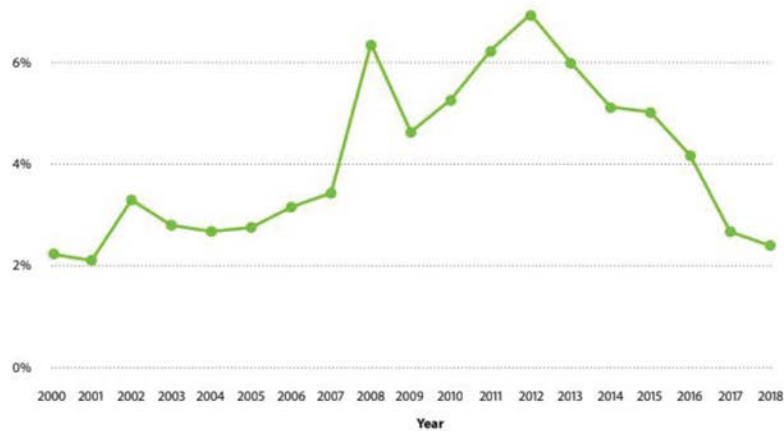
**Figure 3: Percentage of U.S. banks' syndicated loans in fossil-fuel and utility sectors. (Top 12 Banks Measured by Total Loan Value)**

Comparing the two charts at a high level, we see that the share of banks' portfolios in the fossil fuel and electricity sectors is substantially larger than the average rate of change of overall portfolio composition. This means decisions about the success or failure of client engagement in these sectors will have to be made in the next few years, to allow sufficient time for the relationships to be unwound or restructured, if necessary.

The coal industry (see Figure 4) provides a useful illustration of what happens when a climate-relevant sector comes under gradually increasing but ultimately severe economic pressure. The fall in loan value of about 70% from the peak reflects both transition (as companies move away from coal and their loans are reallocated to a different subsector) and disengagement (as coal companies that did not transition are deemed a poor investment).

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**Figure 4: Percentage of banks' syndicated lending in the coal sector over time.**

In transition scenarios where a sudden crisis is avoided, other fossil fuel sectors might follow a similar pattern. The fall in coal lending, spread over a decade, represents a reasonable upper bound for the possible speed of transition and should inform the development of banks' 10-year plans. A rapid exit from any of these sectors is unlikely, as one former banker noted: "There will be tremendous pressure not to fire profitable clients...the fear of not being top of the league table is the cultural driver." A more feasible transition will take time and should start as early as possible. "They will need to make the case clear to the client with a lot of runway to get them to change," said the same former banker. Working backward from 2030 means that much of the decision-making within banks will have to be done in the next three to five years. This adds to the urgency created by the possibility of a near-term systemic shock and should prompt banks to take immediate action.

**Recommendation: Banks should immediately prioritize client engagement in climate-relevant sectors, with the aim of determining, before 2025, the ability and willingness of clients in the riskiest sectors to implement robust transition plans.**

Some banks are already acting. JPMorgan Chase recently established a Center for Carbon Transition that is focused on client engagement.<sup>[6]</sup> Other banks must devote even greater resources to this challenge to address the risk to capital markets and society more broadly. Banks that are proactive will have major upside over the next few years, with winners and losers being determined quickly. As one former Goldman Sachs banker told us: "Fossil fuel valuations have collapsed already...the [leading] banks see what's going on...they are not looking back, they're looking forward".

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Article published in: *Financing a Net-Zero Economy: The Role of Time Horizons and Relationship Banking* | *Journal of Applied Corporate Finance*, Volume 33, Number 4, Summer 2021. The article discusses the role of relationship banking in financing a net-zero economy, particularly for companies operating in high-carbon industries. *Business Strategy and the Environment*, 27(8), 1131-1144.



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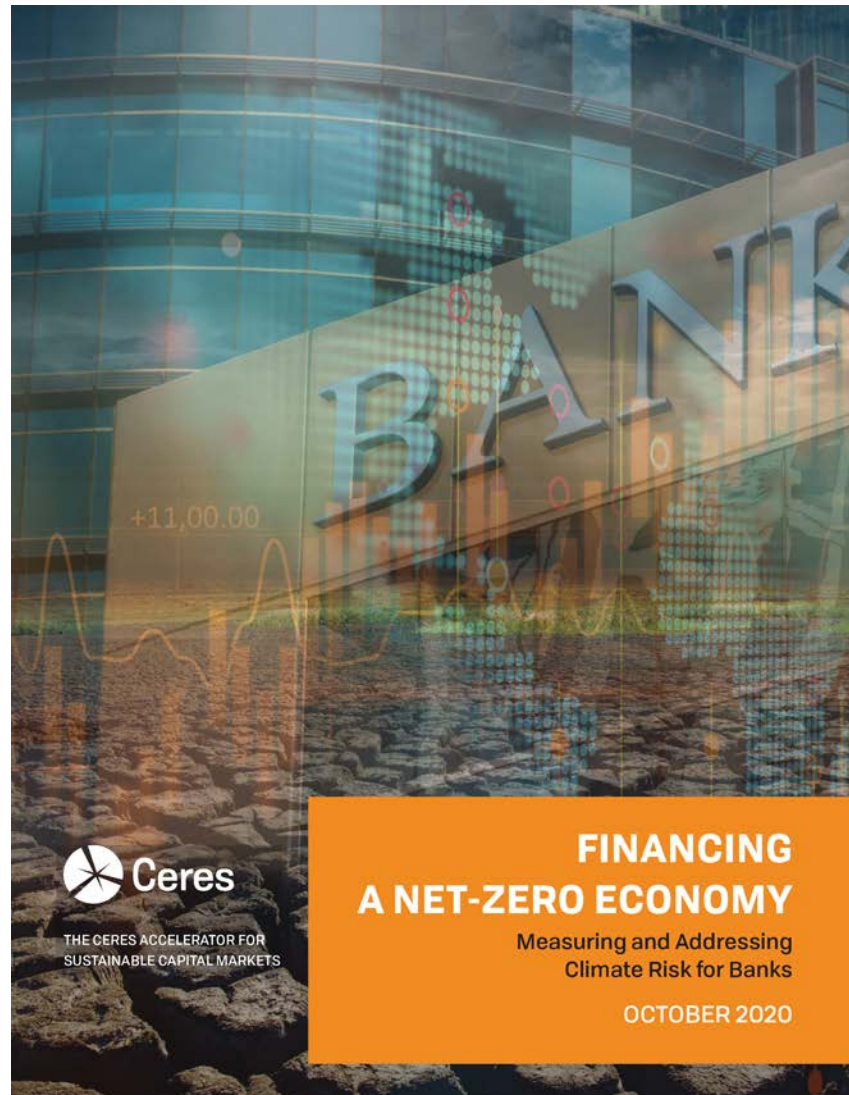
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As the lynchpin of the global economy, banks have an essential role to play in minimizing the worst impacts of climate change. How banks respond to the climate risk that they individually and collectively face depends heavily on how they measure and analyze their exposure to it.

The climate risk banks face stems from the failure of their clients to adequately prepare for a lower-carbon future. This risk has the potential to significantly damage financial institutions and the broader economy—and impede society’s ability to tackle climate change at the speed and scale required to avoid its worst impacts. This is doubly true because the understanding of tail risks—risks once thought too extreme to consider—has dramatically changed, first with the 2008 financial crisis and now with the COVID-19 pandemic.

Many banks have begun to act. Some lending policies are being adjusted for risky fossil fuel companies. Some banks have called on policymakers to address systemic climate risk. Global players including Barclays,<sup>[1]</sup> [JPMorgan Chase](#)<sup>[2]</sup> and [Morgan Stanley](#)<sup>[3]</sup> have even made climate commitments that cover their financing activities.

But for most banks, the current view of climate risk is incomplete—it focuses narrowly on fossil fuel sectors or broadly on the need for policy action. It is what lies in the middle—the massive amount of financing banks provide to sectors, including agriculture, manufacturing, construction and transportation, that rely heavily on oil, gas and coal—that could threaten climate and financial stability if unaddressed.

This report investigates the syndicated loan portfolios of the largest U.S. banks and their exposure to climate transition risk, which arises from the policy, regulatory, consumer preference and reputational impacts of the transition to a lower-carbon economy. It complements other leading-edge approaches and highlights the imperative for banks to use their proprietary data to fully test its findings.





**Key Finding #1**

**Over half the syndicated lending of major U.S. banks is exposed to climate transition risk** because many bank clients in a wide range of sectors have inadequately prepared for emissions reductions in line with the Paris Climate Agreement.

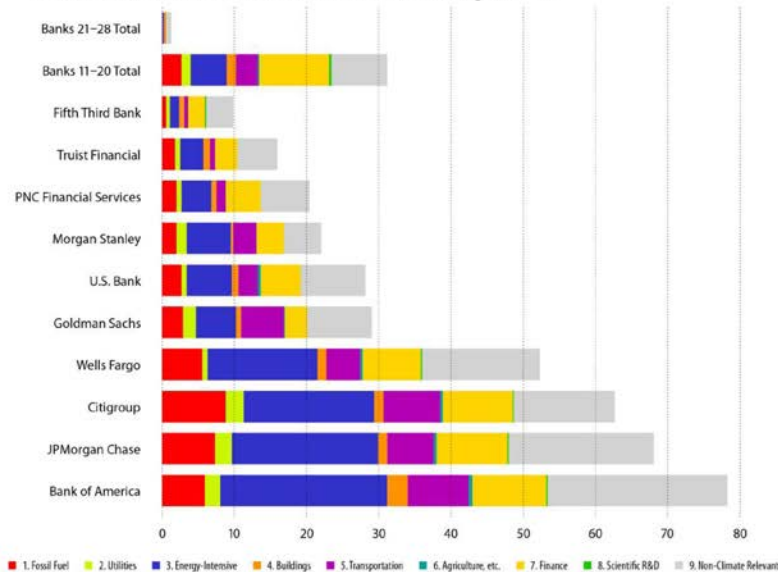


Figure 1: Climate-relevant sectors in U.S. syndicated loan portfolios (\$ billions).

Given this potential exposure, every bank should assess its resilience against disorderly climate transition scenarios (brought on, for instance, by a sudden shift in investor and public sentiment around climate risks following a policy change). The limited publicly available data show that in a worst-case scenario, banks could sustain heavy losses on their syndicated loan book and, by extension, other areas of their business, as the market shares and profitability of unprepared clients decline.

**Key Finding #2**

**Banks may face substantial losses from direct exposure** in the months following a major sentiment shift.

- The “Core-Impact” view of banks’ exposure to the fossil fuel and electricity sectors produces modest loss estimates—up to 3% for the syndicated loan portfolio of an average bank.
- But the “Wide-Impact” view, which accounts for all non-financial, climate-relevant sectors (including energy-intensive manufacturing, buildings, transportation and agriculture) produces much higher average loss estimates—up to 18% on these loans.



## FINANCING A NET-ZERO ECONOMY: MEASURING AND ADDRESSING CLIMATE RISK FOR BANKS

- The six largest banks in the U.S. all face above-average risk in the wide-impact results.

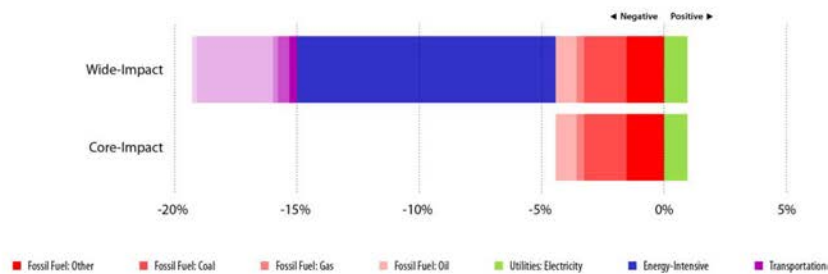


Figure 2: Percentage losses on the syndicated loan portfolios of major U.S. banks (by sector) in the months following a shock.

These losses reflect a worst-case scenario, but only for a portion of each bank's business and a single type of risk. Banks face other risks, including from physical risk (extreme weather, fires, droughts or sea level rise). They also face potential legal liability and risks from other elements of their business lines. Together, these could combine to ratchet up total exposure even more. Just as critical but perhaps less obvious is that banks also face indirect transition risk from interbank lending and other exposures within the financial system itself. This key driver of the 2008 financial crisis has not been factored into publicly disclosed climate risk analysis to date.

### Key Finding #3

Banks' level of leverage and connectivity within the financial system could lead to substantial **incremental climate risk**.

- The extent to which banks finance each other leads to **indirect transition risk** from exposure to other firms' own direct risk.
- Additionally, banks could face **balance-sheet contagion (or "fire sales,")** where assets are rapidly devalued and banks are forced to sell them to stay in compliance with regulatory capital requirements.

These results are not the final word. **Individual banks have the power to substantially change this narrative and differentiate themselves from peers.** Methodologies for stress testing and scenario analysis are robust enough to be widely used and provide a starting point for the urgent work of conducting more granular risk assessment at the client level. By improving client selection and engagement, banks will not just lower their risk and create new upside, they will help propel the transition to a zero-carbon economy. That will, in turn, minimize risks to financial stability and the entire banking sector and help catalyze more momentum to curb the most severe impacts of climate change by meeting the objectives of the Paris Agreement.

**Further dialogue and analysis around these complex issues is required, which is why Ceres views this report as the next step in a deeper collaboration with the sector on how to act on the report's recommendations, which fall into three broad categories:**

➔ **Assess and Disclose Risk (Recommendations 1-5)**

Most firms in climate-relevant sectors today are exposed to climate risk, but there are a growing number that would greatly benefit from a low-carbon transition scenario. Quantifying the upside (and downside) at both the firm and portfolio levels will improve banks' client selection and identify a larger number of investable opportunities that could offset potential losses.

➔ **Improve Tools and Methods (Recommendations 6-9)**

Existing analysis can be strengthened by developing science-based, transparent valuation approaches that can be used to meaningfully engage clients on their own climate strategies. Key improvements needed as part of this include:

- Requiring that clients provide more data in key climate-related areas, such as energy technology and emissions profiles
- Aggregating those data using methods such as carbon accounting
- Further developing risk management techniques, including stress testing and scenario analysis
- Building climate risk into day-to-day decision-making tools, such as client earnings models

➔ **Act to Mitigate Climate Risk and Ultimate Impact (Recommendations 10-13)**

Good analysis allows banks to decarbonize their portfolios through **client engagement**, which is critical for achieving real economy emissions reductions. Engagement only reduces risk if it leads to target setting and emissions reductions by clients, so banks need accountability mechanisms to ensure this occurs.

That is why Ceres is calling on every bank to set a **Paris-aligned emissions target** before the next major UN climate conference in November 2021. This should include detailed interim targets and specific timelines for sectoral portfolios to reach net-zero emissions—some sectors as soon as 2030, others by 2040 or 2050.

This will ensure that client engagement is focused on results and also serve as an external signal about the bank's own risk. Banks that set such targets will send an unambiguous message that they are serious about reducing their own climate risk and about building a just and sustainable global economy.

### Ceres' Recommendations for Banks

1. While this report focuses on transition risk, banks should assess all elements of climate risk and opportunity that may affect their business (including transition risk, physical risk and litigation risk), and disclose an overall assessment to investors and other external stakeholders.
2. Banks should assess their entire balance sheet to identify which assets may be exposed to climate transition risk (including indirect risk from elsewhere in the financial system).
3. Banks should disclose a portfolio risk assessment that identifies the sectors that the bank considers to be climate relevant and the percentage of assets in these sectors that the bank considers to be at risk.
4. Risk assessment should include stress testing based on both backward-looking data (such as past emissions) and forward-looking data (such as planned expenditures). The findings of these analyses should be disclosed at a high level.
5. U.S. banks should align their policy positions and lobbying with the regulatory recommendations outlined in Ceres' June 2020 report **Addressing Climate as a Systemic Risk**.
6. Banks should use, improve and develop internal valuation tools that translate climate-relevant information into securities prices, earnings forecasts and value-at-risk estimates.
7. Banks should seek industry agreement to use their market power and relationship leverage to incentivize clients to voluntarily disclose additional forward- and backward-looking climate data.
8. Banks should internally prioritize and reward their employees for integrating climate considerations into day-to-day decision-making.
9. Banks should recognize the risk mitigation potential of constructing a more fundamentally sound, equitable and sustainable economic system.
10. Banks should publicly state that they will use engagement and leverage to accelerate client transition plans and wind down relationships that do not include such plans.
11. Banks should communicate to employees and investors any risk-mitigation value they ascribe to their sustainable finance programs.
12. Banks should set and disclose financing portfolio targets that are aligned with the goals of the Paris Climate Agreement and should include detailed interim targets and specific timelines for sectoral portfolios to reach net-zero emissions—some sectors as soon as 2030, others by 2040 or 2050.
13. Banks should publicly commit to and begin work on the 12 recommendations above within the next year.





## EXECUTIVE SUMMARY

**Systemic risks** have the potential to destabilize capital markets and lead to serious negative consequences for financial institutions and the broader economy. Under this definition, climate change, like the current COVID-19 crisis, is indisputably a systemic risk. Its wide-ranging physical impacts, combined with expected transitions to a net-zero carbon economy and other socio-economic ripples, are likely to manifest in both cumulative and unexpected ways and present clear systemic risks to U.S. financial markets -- and the broader economy. Left unmanaged, these risks could have significant, disruptive consequences on asset valuations, global financial markets and global economic stability.

This Ceres report, "Addressing Climate as a Systemic Risk: A call to action for U.S. financial regulators," outlines how and why U.S. financial regulators, who are responsible for protecting the stability and competitiveness of the U.S. economy, need to recognize and act on climate change as a systemic risk. It provides more than 50 recommendations for key financial regulators to adopt, including the Federal Reserve Bank (the Fed), the Office of the Comptroller of the Currency (OCC), the Federal Deposit Insurance Corporation (FDIC), the Securities and Exchange Commission (SEC), the Commodity Futures Trading Commission (CFTC), state and federal insurance regulators, the Federal Housing Finance Agency (FHFA), and the Financial Stability Oversight Council (FSOC).

Given the ongoing response to the COVID-19 pandemic, the role of financial regulators is more prominent than ever. While financial regulators are taking critical actions to support the U.S. economy in response to this immediate crisis, it is imperative that their efforts do not inadvertently worsen the impacts of climate change.

"The evidence on climate risk is compelling investors to reassess core assumptions about modern finance. Research from a wide range of organizations -- including the U.N.'s Intergovernmental Panel on Climate Change, the BlackRock Investment Institute, and many others, including new studies from McKinsey on the socioeconomic implications of physical climate risk -- is deepening our understanding of how climate risk will impact both our physical world and the global system that finances economic growth."

"These questions are driving a profound reassessment of risk and asset values. And because capital markets pull future risk forward, we will see changes in capital allocation more quickly than we see changes to the climate itself. In the near future -- and sooner than most anticipate -- there will be a significant reallocation of capital."

**Larry Fink**

**Chairman and CEO, BlackRock**

"A fundamental reshaping of finance,"

Fink's 2020 CEO Letter to BlackRock portfolio companies



## ADDRESSING CLIMATE AS A SYSTEMIC RISK

### Frequent extreme weather events are leading to mounting economic losses.

Physical risks from [rising global temperatures](#) – up 1.8° F since the mid-20th century – are the most immediate threat to the U.S. economy. Catastrophic flooding, droughts, [wildfires and storms are becoming more frequent and extreme](#) and have caused billions of dollars in financial losses. As global greenhouse gas (GHG) emissions and temperatures continue to rise, deeper economic losses are projected for the years ahead.

The [Fourth National Climate Assessment \(Vol.II\)](#), based on the work of thousands of researchers, suggests that unmitigated climate change could reduce the U.S. economy by as much as 10% annually by 2100. In a [2019 CDP survey](#), 215 of the world's largest listed companies reported nearly \$1 trillion at risk from climate impacts, much of it in the next five years. A [London School of Economics](#) study projects that, unless it is addressed, climate change could reduce the value of global financial assets by as much as \$24 trillion – resulting in permanent damage that would far eclipse the scale of the 2007-2009 financial crisis.

### Social and environmental factors are exacerbating the economic impacts.

Unmitigated climate change and extreme weather events will have significant health impacts, including respiratory issues, the spread of diseases and premature deaths. Climate change and extreme weather events will also create major [productivity losses](#), particularly in industries that require workers to be outside. Migration forced by [climate change has already displaced an average of 26.4 million people per year](#) globally between 2008 and 2015. By 2050, [climate change will force 50 to 700 million people to emigrate](#). Finally, the rapid loss of forests and other ecosystems is starting to impact ecosystem-dependent industries such as agriculture, tourism, drinking water and pharmaceuticals.

### Climate impacts are already manifesting in the largest state economies.

In just the last few years, [California has experienced record-breaking wildfires](#), in both number and size, that have taken hundreds of lives, bankrupted the state's largest utility, left millions regularly without power and brought home insurability into question. Florida is facing rapidly rising sea levels and now-routine flooding that are eroding coastal property values and wiping out freshwater supplies. [Texas experienced two devastating once-in-a-thousand-years flood events between 2016 and 2019](#), each caused by torrential rains of 40 inches or more.

### An unplanned transition to a low-or-zero-carbon economy could cripple key industries.

Changes in government policies, consumer sentiment, liability risks and technological innovation could cause significant losses for high-carbon industry sectors, and those that rely on them. Given the large size of these industries, these cumulative losses could send broad, intersecting and amplifying financial ripples on major financial institutions holding related assets.

Economists and financial leaders say the scale of the [losses from climate change could eclipse the subprime mortgage securities meltdown](#) that triggered bank failures and, ultimately, a deep global recession a dozen years ago. "Even if only a fraction of the [climate] science is right, this is a much more structural, long-term crisis [than the 2007-2009 recession]," said BlackRock CEO Larry Fink in 2020.

Despite these risks, national and global efforts to mitigate climate change's impacts could create enormous clean energy investment opportunities that would translate into economic growth and job creation. Research suggests that transitioning to a low-carbon [sustainable economy could deliver direct economic gains of \\$26 trillion](#) through 2030, compared to business as usual.



**Insurance companies and banks are on the frontlines of risk.**

The insurance sector is particularly vulnerable to the physical impacts of climate change, and has already faced growing losses; insurers' investments are also at risk. Banks and financial institutions that have lent to and invested in risky, carbon-intensive sectors have the potential to have their investments become "stranded" in the face of the transition to a low-or-zero-carbon future.

**The cumulative and unpredictable nature of climate impacts poses a risk to financial market stability.**

While any of the impacts outlined above are significant, their cumulative, correlated and nonlinear nature poses the real risk to financial market stability. To put it simply, the whole is not only greater than the sum of its parts – it magnifies them, as well. If climate change affects markets suddenly and unexpectedly, it could burst a "carbon bubble," which could pose grave dangers to financial markets and the real economy, already weakened from the ongoing coronavirus pandemic.

At the same time, the response to the pandemic has also underscored the power financial regulators have to buttress markets in the face of a disruptive risk. With that power, regulators also have the responsibility to assess market vulnerability to such risks, and take action to make the economy resilient to such shocks. As stewards of the largest economy in the world, U.S. financial regulators, including the Federal Reserve, the SEC and others, have critical roles to play. They can send the appropriate market signals about the risks posed by climate change to the U.S. and global economy, and take the necessary steps to recalibrate our financial system.

**ACTIONS NEEDED**

This report outlines why and how key U.S. financial regulators can and should take action to protect the financial system and economy from potentially devastating climate-related shocks. Financial regulators have a mandate to maintain financial market stability, foster capital growth and competitiveness, protect consumers and investors and ensure market efficiency and integrity. Climate risk is relevant to each of these considerations.

This report focuses on the roles of those financial regulators that Ceres believes are particularly important to jumpstart the necessary action on climate risk now. However, we also believe that all regulators – financial and otherwise – have important roles to play in addressing the climate risk. "Addressing Climate as a Systemic Risk" makes a series of recommendations that build on the existing mandates of the relevant regulatory agencies. We also identify similar actions being taken by global regulators that could serve as important models for U.S. agencies to consider.

**Our key recommendations:**

The **Federal Reserve System**, including the **Federal Reserve Bank**, should:

- Acknowledge that climate change poses risks to financial market stability and immediately begin assessing their impacts. This includes building awareness of regional climate vulnerabilities, and conducting the needed research.
- Integrate climate change into their prudential supervision and regulation of systemically important financial institutions to ensure they adequately address climate change as a part of their risk management and are well prepared for transition risks. One clear opportunity is to require financial institutions to conduct climate stress tests. Another opportunity is to work with the SEC and other agencies to require banks to assess and disclose climate risks, including carbon emissions from their lending and investment activities. Finally, the Fed should coordinate with its global counterparts to define activities that are likely to exacerbate climate risks.
- Explore how climate risks can be addressed through monetary policy to keep the economy resilient in the face of disruptive risks. This policy assessment should include considering the climate impacts of injecting more liquidity into the economy, and integrating climate risk into collateral frameworks and economic outlook assessments.
- Explore the integration of climate risk into the community reinvestment process to bolster the resilience of low-income communities to climate change.
- Join efforts, such as the [Network for the Greening the Financial System](#), and to allow for globally coordinated efforts on climate risks.

*“When you put all these pieces together, it becomes pretty clear: climate change is an economic issue we can’t afford to ignore.*

*This isn’t just a concern for the Twelfth District. Or even the United States. Countries around the world are dealing with the economic impacts of climate change. And conferences like this are essential to understanding the challenges that lie ahead – for all of us.*

*Ultimately, this is our job. The San Francisco Fed is a public service organization. We’re responsible for the people and the communities we serve. So, we have to get out in front of this issue and do what we do best.*

*Convene the best people and ideas. Study data and conduct research.*

*Talk to the communities we serve – and really listen when they tell us what they need.”*

**Mary Daly**

**President and CEO, Federal Reserve Bank of San Francisco**

*“Why climate change matters to us,” November 2019*

The **Office of the Comptroller of the Currency** and the **Federal Deposit Insurance Corporation** should:

- Coordinate with each other and all banking regulators to ensure that climate change is integrated into the financial supervision process. This integration could include jointly issuing a bulletin highlighting the wide ranging ways that climate risks could impact financial performance and outlining principles to help financial institutions prudently manage them.
- (OCC) update the Comptroller’s Handbook to issue enhanced guidance on climate risk to examiners, to be used in supervision of financial institutions. They should also integrate climate-risk supervision into the examiner education process.
- (FDIC) closely monitor the impacts of climate risk on bank lending and investments activities and explore how to integrate climate risk into the risk-based premium system for the Deposit Insurance Fund.

**The Securities and Exchange Commission should:**

- Analyze climate risk impacts on the securities markets and on the SEC mandate, and consider establishing a cross-divisional taskforce to allow for coordinated responses.
- Make clear that consideration of material environmental, social and governance (ESG) risk factors, such as climate change, is consistent with investor fiduciary duty.
- Issue rules mandating corporate climate risk disclosure, building on the framework established by the Financial Stability Board's Task Force on Climate-related Financial Disclosures (TCFD). In the short term, the SEC should enforce the existing regulations and interpretive guidance on climate risk.
- Direct the Public Company Accounting Oversight Board (PCAOB), overseen by the SEC, to assess whether firm audits adequately detect climate risks, and issue guidance to help auditors better understand how climate risk affects audits and accounting. The PCAOB should also assess existing standards to identify when amendments and updates may be needed, and issue such amendments.
- Encourage the Financial Accounting Standards Board to drive consistency in the way that climate risk is disclosed in financial statements.
- Issue guidance encouraging credit raters to provide more disclosure on how climate risk factors are factored in ratings decisions. They could also examine the extent to which climate risk is considered by credit raters, and summarize findings in annual examination reports.

**The Commodity Futures Trading Commission should:**

- Upon receiving the Climate-Related Market Risk Subcommittee's report, engage other financial regulators on climate change.
- Use the report's recommendations to enhance oversight of climate risk in the commodities and derivatives market.

*"We purport to modernize, without mentioning what may be the single most momentous risk to face markets since the financial crisis. Where we should be showing leadership, we are conspicuously silent. In so doing, we risk falling behind international efforts and putting U.S. companies at a competitive disadvantage globally."*

**State and federal insurance regulators should:**

- Acknowledge the material risks climate change poses to the insurance sector and pledge coordinated action to address them.
- Assess the adequacy of current insurer actions for addressing climate risks.
- Join the Sustainable Insurance Forum.
- Require insurance companies to conduct climate risk stress tests and scenario analyses to evaluate potential financial exposure to climate change risks.
- Require insurers to integrate climate change into their Enterprise Risk Management (ERM) and Own Risk and Solvency Assessments (ORSA) processes.
- (State regulators) require insurance companies to assess and manage their climate risk exposure through their investments, and examine how climate trends affect company holdings and long-term solvency.
- (State regulators) encourage insurers to develop products for the new technologies, practices and business models that will emerge in response to climate risk that are responsive to both risks and opportunities.
- (State regulators) mandate insurer climate risk disclosure using the TCFD recommendations.
- Assess the sector's vulnerabilities to climate change, and report findings to the Financial Stability Oversight Council.

**Allison Herren Lee**  
**Commissioner, Securities and**  
**Exchange Commission**  
*"Modernizing" Regulation S-K:*  
*"Ignoring the elephant in the room,"*  
 January 2020

## ADDRESSING CLIMATE AS A SYSTEMIC RISK

ceres.org/accelerator

The **Federal Housing Finance Authority**, responsible for government-sponsored mortgage giants Freddie Mae and Fannie Mae, should:

- Acknowledge the impacts of climate risk on the housing market.
- Conduct research to examine the impacts of climate risk on the mortgage holdings of Government-Sponsored Enterprises, particularly Fannie Mae and Freddie Mac.
- Launch a formal effort to develop strategies to address climate risk, being particularly aware of the impacts on vulnerable communities disproportionately threatened by climate change.

The **Financial Stability Oversight Council**, whose mandate is to identify risks to financial stability, should:

- Identify climate risk as a vulnerability and make recommendations on regulations that relevant agencies could adopt.
- Coordinate regulatory actions on climate change and the integration of efforts by all financial regulators addressing climate risk to allow for overall financial stability.

*"In the crowded regulatory and supervisory space, there is limited scope for focusing attention on new issues but climate risks need immediate action in order to limit or reverse the impact of some of the negative trends under way. It is incumbent on supervisors to put in place the necessary measures for insurers to address any significant risks that could adversely affect policyholders and financial stability. In previous financial crises, events once deemed implausible have materialized. Climate change poses the same threat."*

**Bank of International Settlements**  
"Turning up the heat: Climate risk assessments in the insurance sector," 2019



## CONCLUSION

Ceres knows that climate change is the biggest sustainability issue of our time, affecting everything from our financial markets, to our political security to our very existence on earth. For over three decades, Ceres has worked with companies, investors and policy makers to drive the consideration of climate change as a financial risk, and foster the uptake of climate solutions. We also believe that legislative action on climate change – such as a carbon price – is necessary to move the U.S. economy towards a competitive and prosperous net-zero carbon future.

But while policymakers at the federal, state and global levels need to take the lead in tackling the climate crisis, U.S. financial regulators themselves have critical roles to play in keeping a now-weakened economy resilient in the face of ongoing and future climate shocks. Rather than standing back, they should seize the opportunity in this moment of potential economic transformation to join global peers and develop a playbook for climate action. With global emissions and average temperatures still rising, watching and waiting are no longer responsible options, and will in fact guarantee the worst. And, unlike in the possible resolution to the COVID-19 pandemic, there will never be vaccines developed to protect against climate risk. But the good news is: we already have all the tools and knowledge in the financial markets to take sound preventative action.

Climate change presents risks to both the future and today -- unless regulators act boldly, now.





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June 21, 2021

Rep. Maxine Waters  
Chair, Committee on Financial Services  
2129 Rayburn House Office Building  
Washington, DC 20515

Rep. Patrick McHenry  
Ranking Member  
2129 Rayburn House Office Building  
Washington, DC 20515

Chair Waters and Ranking Member McHenry,

Thank you for scheduling an upcoming hearing to address the risk that climate change poses to our nation's housing and financial systems. On behalf of CoreLogic, please accept this statement for the record, outlining our data and analytical capabilities that can further inform your views on risks and how to quantify them.

As the committee understands, the U.S. housing supply is exposed to many natural hazards. CoreLogic is able to quantify this exposure into a composite risk score for seven individual hazards (earthquake, wildfire, inland flood, severe convective storm, winter storm, hurricane/tropical storm coastal surge, hurricane/tropical storm wind) for approximately 169 million residential structures across the U.S. We then use this value to rank all structures with a 1-100 score, where higher scores equate to higher risk. Having an accurate assessment of all risks is necessary to identify individual homes, neighborhoods, and entire regions that will require targeted investments in resiliency measures over the coming years. (For more, see Parts II & III of the attached CoreLogic 2020 Climate Change Catastrophe Report.)

Identifying and quantifying physical risks that impact our nation's housing supply is central to understanding how resiliency investments can be made. Since these risks evolve over time, a frequently-updated composite risk score can be used by all participants in the housing finance ecosystem to: track risks in portfolios on a year-over-year basis, identify changing concentration risks (including counterparty risks), and project into the future the likely changes in identified risks or even the mix of risks. This provides full transparency for all market participants (even consumers) and ensures accurate information can be reported to regulators via supervisory exams or otherwise, allowing investors to make secure financial decisions that take into account a variety of important risk factors. Such information can also be included in loan-level data which accompanies pools of securitized mortgages bought by investors and reported in Home Mortgage Disclosure Act data.

We hope this letter and attached report can serve as a resource to the committee as it continues to evaluate the options and tools available to improve our understanding and quantification of risks posed by increasing frequency and severity of natural hazard events on our economy. We are happy to meet with the Committee to discuss how we're solving for the science, data and analytics gaps which will make risk disclosures and assessments possible.

Sincerely,

A handwritten signature in black ink, appearing to read "Stuart Pratt".

Stuart Pratt  
Global Head, Public Policy and Industry Relations  
CoreLogic



**2020**

# Climate Change Catastrophe Report

## AUTHORS

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17-CTR-012-00



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# Introduction

2020, without a doubt, was a year of record-breaking and unexpected catastrophic events. In addition to reeling from the health and economic shock of a global pandemic, the U.S. was hit with one natural disaster after the next, marking the sixth straight year with more than 10 weather and climate events surpassing \$1 billion in economic losses<sup>1</sup>. Our front-line workers, critical infrastructure and first responders were put to the test by hurricanes, flooding, tornadoes and wildfires as the world was simultaneously urged to stay home and prevent the spread of the coronavirus.

What does 2020 look like when we put it all together?



<https://www.noaa.gov/news/ue-hit-by-16-billion-dollar-disasters-year-so-far>

# PART I

## What Happened in 2020?

JAN

### NATURAL HAZARDS

In January, we began the year with a dramatic set of over 80 tornadoes and severe storms that damaged many states in the Southeast. This was paired with storms and severe flooding in northern states such as Michigan, Wisconsin and New York.

### HOUSING

Despite the natural hazards, the housing market started the year on a solid footing with home prices steadily increasing at about 4% and 30+ days delinquent loan share at 3.5%, reaching the lowest rate since data recording started in 1999.

### ECONOMIC

The economy was also performing solidly, with a record 112 consecutive months of nonfarm payroll employment growth. Nevertheless, news of the novel coronavirus spreading across Asia led to concerns, and the World Health Organization (WHO) declared a global health emergency.

FEB

### NATURAL HAZARDS

Severe weather continued in February with the South, East and Northeast doing hit hardest. There were over 20 tornadoes across central Mississippi and Tennessee and hundreds of high-wind damage reports across the East Coast. North Carolina, South Carolina and Florida were hit with the costliest damages from this series of severe storms.

### HOUSING

The housing market continued to hum along nicely with home sales and mortgage applications outperforming last year's levels and continually declining mortgage rates providing an incentive for home purchases and refinances. Home price growth started picking up the pace again to over 4% after a lull in 2019 when home price growth remained below 4%.

## JANUARY

Natural Hazards

80+ tornadoes

Housing

4% home price increase

Economic

112 months of growth

## FEBRUARY

Natural Hazards

20 tornadoes

Housing

Below 4% home price growth

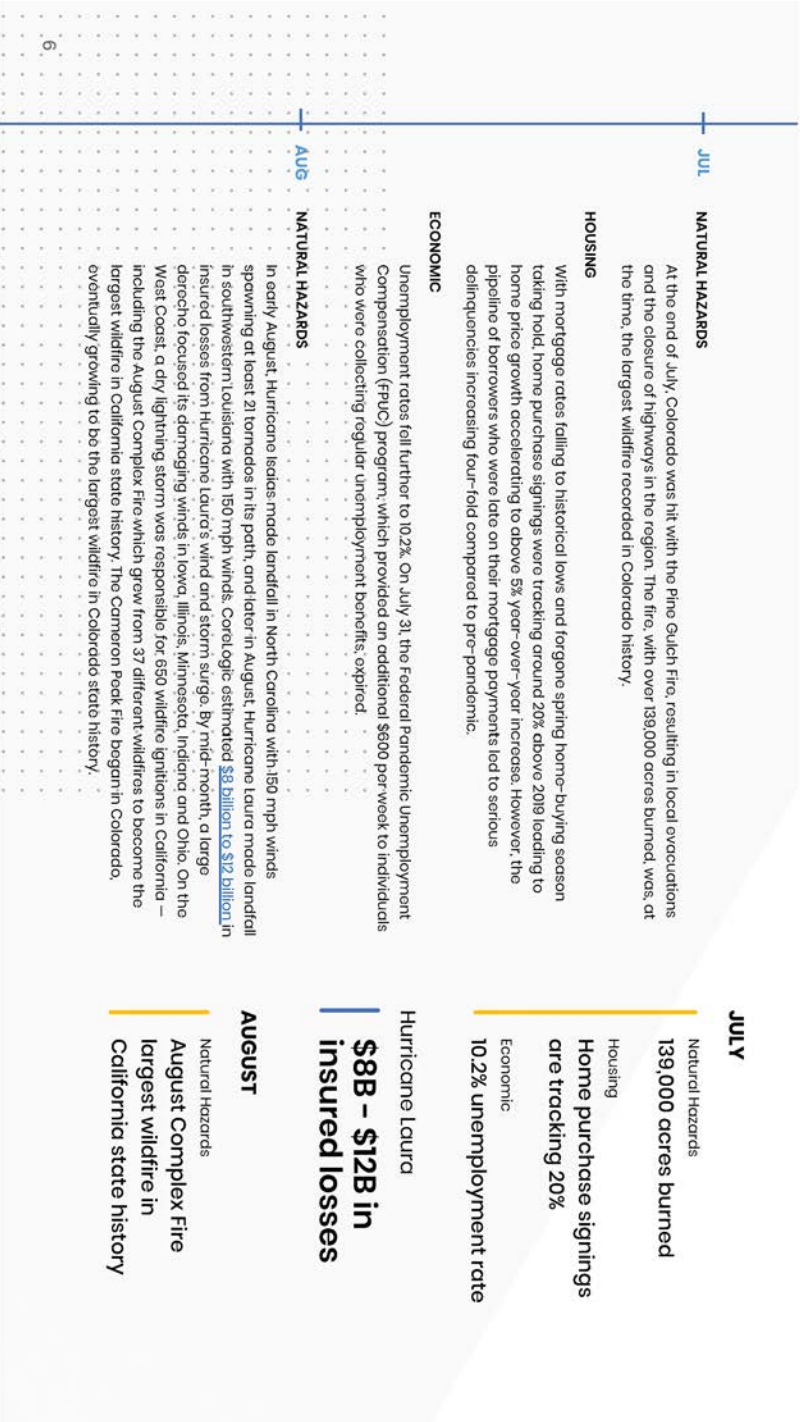


<div>APR</div> <div>NATURAL HAZARDS</div> <div>In April, tornadoes, high winds and hail were rampant. North Central and Ohio Valley states were hit with numerous hailstorms and over 20 tornadoes. Later in the month, there was an outbreak of over 140 tornadoes from Texas to Maryland. Corlogic estimates indicate that over <a href="#">40,000 structures were affected</a> with a reconstruction cost of over \$5 billion. High winds, hail and tornadoes also caused significant damage in Oklahoma and Louisiana.</div> <div>HOUSING</div> <div>With stay-at-home orders taking place across many states, housing market activity slowed to a crawl and the signing of home purchase contracts fell by over 50% compared to 2019. Early mortgage defaults (those 30 days past due) doubled from 1.9% in March to 4.2% in April – the largest one-month jump in the history of the series. At the same time, federal and state financial institution regulators urged mortgage servicers to work with consumers affected by COVID-19. Under the CARES Act, borrowers with a federally backed mortgage loan experiencing a financial hardship due to the COVID-19 pandemic were able to request forbearance from their mortgage servicer; servicers were required to provide a CARES Act forbearance for up to 180 days with another 180 days extension.</div> <div>ECONOMIC</div> <div>Total nonfarm payroll employment fell by 20.5 million in April, and the unemployment rate jumped to 14.7 percent. This was the largest one-month decline in employment and the highest monthly unemployment rate in the history of the series (seasonally adjusted data are available back to 1948).</div> <div>MAY</div> <div>NATURAL HAZARDS</div> <div>May continued to bring high winds, thunderstorms, tornadoes and hail to Central, Eastern and Southern states. Earlier in the month, high winds and hail damage caused significant damage across southern Missouri and Tennessee. Then, thunderstorms, high winds, hail and tornadoes caused significant damage in Texas, Illinois and North Carolina. This was followed by dramatic hailstorms in south Texas, where golf ball-sized hail caused damage to many homes and businesses. Hail damage was concentrated in north San Antonio. Flooding persisted and spread across the Mississippi basin.</div>	<div>APRIL</div> <div>Natural Hazards</div> <div>Over \$5b in reconstruction cost from tornadoes</div> <div>Housing</div> <div>4.2% early mortgage defaults</div> <div>Economic</div> <div>14.7% unemployment rate</div> <div>Unemployment rates</div> <div>Largest one-month decline and highest monthly unemployment rate in the history</div> <div>MAY</div> <div>Natural Hazards</div> <div>High winds, thunderstorms, tornadoes and hail</div>
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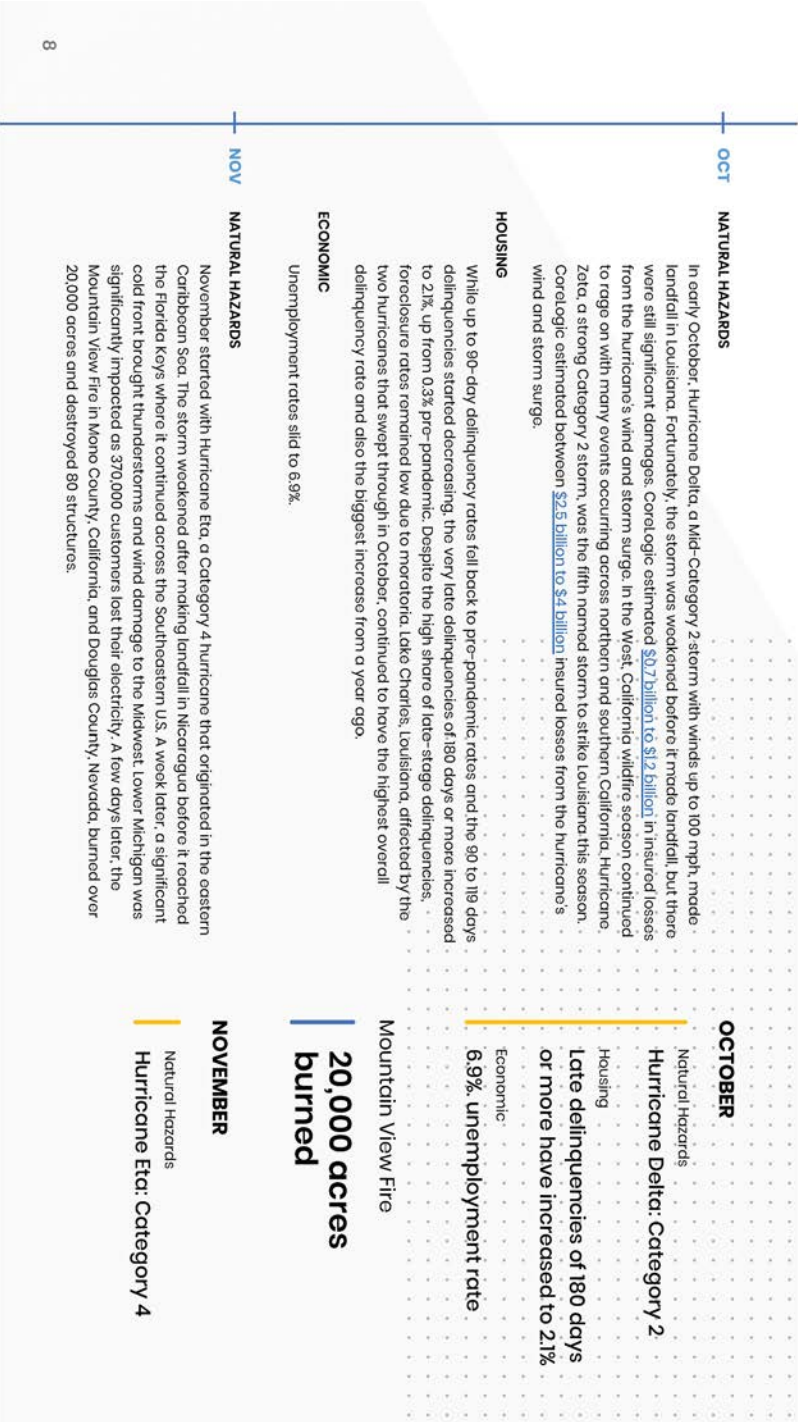












DEC	
<b>HOUSING</b>	
Despite the usual seasonal slowdown, the housing market continued to outperform 2019's levels, resulting in the total 2020 home sales exceeding 2019 levels. Mortgage interest rates continued to reach historic lows, prompting many buyers to enter the market. Home price growth accelerated to 8.2% in November – marking the largest annual appreciation since March 2014.	
<b>ECONOMIC</b>	
While unemployment rates continued to decline to 6.7% in November, hiring showed signs of slowing, and new unemployment claims picked up again. Hiring in the service sector slowed and continued to suffer from pandemic impacts. A decline in labor force participation was the primary driver behind falling unemployment rate.	
<b>NATURAL HAZARDS</b>	
Wildfire season continued into December with four wildfires starting across Southern California. The two largest were the Bond Fire in Orange County that burned over 6,800 acres and the Creek Fire in San Diego that burned over 4,200 acres. The Northeast was also hit with Winter Storm Gail with gusts up to 63 mph and over a foot of snow in much of the region.	
<b>HOUSING</b>	
Housing market indicators ended the year on a high note with home sales and home prices well above expectations. The loan performance data report also suggested the share of serious delinquencies began declining from August's peak.	
<b>ECONOMIC</b>	
Unemployment rates remained unchanged in December as total nonfarm unemployment declined by 140,000, reflecting the increase in COVID-19 cases and significant job losses in leisure and hospitality from efforts made to contain the pandemic. The U.S. ended the year with nearly 350,000 deaths and about 20 million total cases of COVID-19 infections.	
<b>HOUSING</b>	<b>8.2% home price growth</b>
<b>ECONOMIC</b>	<b>6.7% unemployment rate</b>
<b>DECEMBER</b>	
<b>Natural Hazards</b>	
<b>4 major wildfires</b>	
<b>Housing</b>	
<b>Delinquencies at a decline</b>	
<b>Economic</b>	
<b>Nonfarm unemployment declined by 140,000</b>	
<b>COVID-19</b>	
<b>350,000 deaths and about 20 million cases</b>	



# PART II

## Quantifying Multi-Peril Property Risk in the U.S.

### U.S. HOUSING: MOST PROPERTIES HAVE SOME RISK

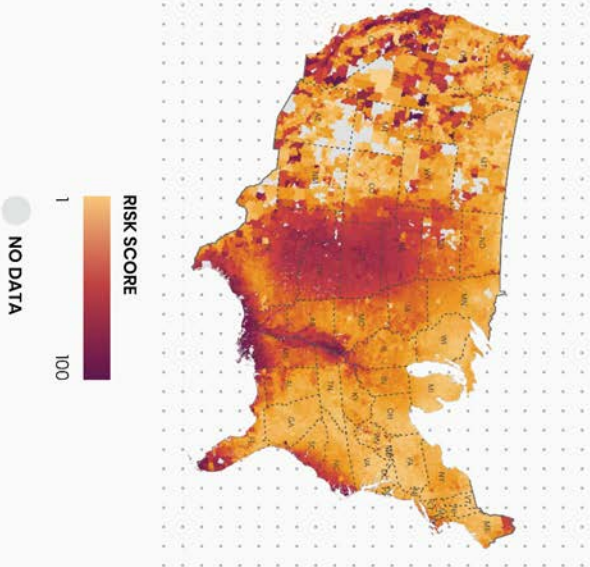
The U.S. is exposed to many natural hazards: Hurricanes bring devastating winds, storm surge and inland flooding to coastal locations. Severe convective storms bring damaging tornadoes, hailstorms and derechos to a great portion of the country. Earthquakes, wildfires and seasonal flooding combine to produce risks that persist throughout the U.S. Properties also have varying degrees of non-weather risk, from appliance flooding and house fires to crime-related loss, depending on location of the property.

Utilizing risk modeling, CoreLogic combined the severity and frequency of damage into a composite risk score. The composite risk score represents the sum of the average Annual Loss (AAL) for seven individual hazards (earthquake, wildfire, inland flood, severe convective storm, winter storm, hurricane/tropical storm coastal surge, hurricane/tropical storm wind) for approximately 105 million residential structures across the U.S. The value of this composite AAL, relative to the calculated

Reconstruction Cost Value (RCV), is used to rank all structures with a 1-100 score, where the higher scores equates to higher risk.

These values can be used in insurance markets, the housing finance ecosystem (primary and secondary), investors in credit risk transfers and asset-backed securities, financial services prudential regulators for supervisory stress testing and oversight, as well as by publicly traded companies, preparing materiality disclosures in SEC filings when it's necessary to understand the relative risk for any structure across the U.S.

These composite scores can be mapped in a composite risk map to identify the areas with the highest risk homes. Figure 1 illustrates that the highest risk homes are in California (dominated by earthquake and wildfire), Texas, Oklahoma, Kansas, Nebraska (dominated by tornado/hail), along the Mississippi River (dominated by river flooding and earthquake risk) and large Gulf and Atlantic coastal stretches (dominated by hurricane winds and storm surge/riverine flooding).



# PART III

## New Technology Introduces New Insurance and Financial Services Market Solutions

Insurance, the housing finance ecosystem, investors in credit risk transfers and asset-backed securities, financial services prudential regulators, and financial services are facing an increasingly volatile catastrophe risk environment. This is shrinking profit margins and prompting deep losses where intense, large-spread catastrophes like wildfire, hurricanes and unemployment concentrate in certain areas. Improved data and geographic accuracy have enabled the development of better information of the risk of damage to a single location. The computational power brought from cloud-computing has enabled probabilistic risk models that help us anticipate the severity of a potential disaster. Weather monitoring technology has evolved to rapidly to deliver an accurate understanding to insurers and lenders of what happened after an event. All of these elements are supporting us on the path toward rapid recovery post-incident and more resilient homes, businesses and communities.

### INSURANCE

Disaster resilience is the ability of individuals, communities and states to adapt to and recover from hazards, shocks or stresses without compromising long-term prospects. Strengthening new homes is important and has played a large role in the reduction of losses from fires and natural disasters. While strengthening buildings is one part of resilience, another part is our ability to recover in a cost-effective manner. The best way to recover cost-effectively and fast is to better predict what damages might occur should the worst happen. Catastrophe modeling and property risk analysis are paramount to accurately predicting the damages that could occur down to a parcel level. Insurers can model large-scale financial needs using aggregate risk scores, or composite scores, for a certain portfolio or area to understand their AAL.

With access to catastrophe modeling and property data, insurance businesses have an important opportunity to change the way they protect homeownership and property, offering new insurance options and transformational experiences that better suit today's reality of risk and policyholder expectations.



Parametric Insurance

New weather verification technology has created the opportunity to introduce new types of insurance, specifically parametric insurance. The National Association of Insurance Commissioners (NAIC) defines **parametric insurance** as:

*a type of insurance contract that insures a policyholder against the occurrence of a specific event by paying a set amount based on the magnitude of the event, as opposed to the magnitude of the losses in a traditional indemnity policy.<sup>2</sup>*

Real-time risk assessment is helping with the development of new financial offerings – such as parametric insurance as an alternative to indemnity insurance. CoreLogic's weather verification technology for hail has reduced the uncertainty in the size of hail stones affecting a location, enabling the efficient transfer of risk without requiring the time and cost of traditional indemnity claims adjustment. This technology is now used to support insurance written in the U.S.

While not likely to replace indemnity insurance, parametric insurance brings the potential to broaden insurance coverage in the U.S. and improve a homeowner's ability to recover from the effects of natural catastrophes through quicker claims processing and faster payouts.

Private Flood Insurance

For most homes in the U.S., rising waters from floods represents the greatest damage potential. For the last 50 years, the foundation of the residential flood insurance market in the U.S. has been the U.S. Federal Emergency Management Agency (FEMA) National Flood Insurance Program (NFIP). While the NFIP is expected to remain a foundation of the residential flood insurance market, recent legislation has enabled some private insurance to satisfy the mandatory insurance purchase provisions imposed upon mortgage lenders, adding more diversity to the insurance offerings to consumers. Additionally, improved catastrophe risk modeling and property risk characteristic data availability have enabled the development of flood risk pricing for homes outside of the designated Special Flood Hazard Areas (SFHAs). Historical experience shows many homes outside of the SFHA are at risk of flooding but are not required to purchase insurance.

The availability of models to price the risk of this previously neglected market niche is producing new opportunities to provide value and security to homeowners and improve community resilience to the effects of flooding. Globally, flooding is anticipated to affect twice as many people by 2030 – further exacerbating the strain on federal programs and highlighting the fact that now is the time to ramp up efforts to protect this underserved market.

Flood and Wildfire Reinsurance

Natural catastrophes by their nature impose sudden and severe financial burdens on the homes and businesses in the affected region. For the large-scale perils of hurricanes and earthquakes, reinsurance markets have provided the reservoirs of rebuilding and reconstruction capital to insurers and commercial enterprises. This has proven to be an efficient means to support communities.

The NFIP has purchased private reinsurance (leveraging the Insurance-Linked Securities, or ILS, market) on its insured flood exposure for three years in a row, and experience has demonstrated that the latest version of analytical flood risk modeling can be used to support and grow a wholesale flood insurance risk market.

In California, two sequential years of wildfire U.S. issuances based on computer-risk modeling have begun the same acceptability process. The importance of these initiatives is elevated in the face of climate change – a changing climate negates the value of experience rating and highlights the need for reliable computer risk modeling that can account for changed environmental conditions.

<sup>2</sup>[https://content.naic.org/cipr\\_topics/topic\\_parametric\\_disaster\\_j\\_memo03a.htm](https://content.naic.org/cipr_topics/topic_parametric_disaster_j_memo03a.htm)

## MORTGAGE AND FINANCIAL SERVICES

Natural hazards affect all areas of the housing economy and property ecosystem. When disaster strikes, homes and businesses can be damaged or destroyed, leaving a trail of devastation in its wake. This results in a drop in vacancy rates, an increase in delinquencies, a local economic recovery and increased demand for resources – all during a recovery period involving aid and reconstruction of at least several months.

The increased severity and frequency of natural hazards underscores the importance of scientifically-based catastrophe modeling to protect homeownership and brace the economy for disasters. This modeling can estimate the impact of natural disasters with greater certainty to better address risk mitigation. By leveraging this technology, mortgage lenders and financial services alike can accelerate local economic recovery and protect homeowners once a natural hazard hits

### *Portfolio Risk Management*

A natural hazard can not only devastate a community but also increase its mortgage delinquency rate to historic levels and put strain on the local economy. By determining the probability of homes that are in various stages of delinquency, default or at risk for missing payments, lenders can minimize portfolio risk. This, combined with actionable property and natural hazard exposure insights, can help pinpoint portfolio risks at both the macro and micro levels.

### *Comprehensive Mortgage Relief*

With the post-disaster timeline comes the need to rebuild. As each individual is different, so too is each individual's unique financial needs. As an economic burden is placed on both individuals and communities, revisiting the payment structure or modifying loans after a disaster can help homeowners recover more quickly.

**The increased severity and frequency of natural hazards leads to the importance of scientifically-based catastrophe modeling to protect homeownership and brace the economy for disasters.**



# Conclusion

2020 has been quite a year. The nation has seen record-breaking wildfires, hurricanes, floods and tornadoes, prompting governments, insurers and property owners to think of new ways to mitigate risk and make our neighborhoods more resilient.

As the world continues to adapt to a global pandemic and ever-changing climate, being equipped with the latest catastrophe modeling tools can help us make sense of the disasters that damage our communities. By understanding the risk these events pose to property, we can better plan for a catastrophic tomorrow and build a resilient future.



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