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**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”**

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June 30, 2021

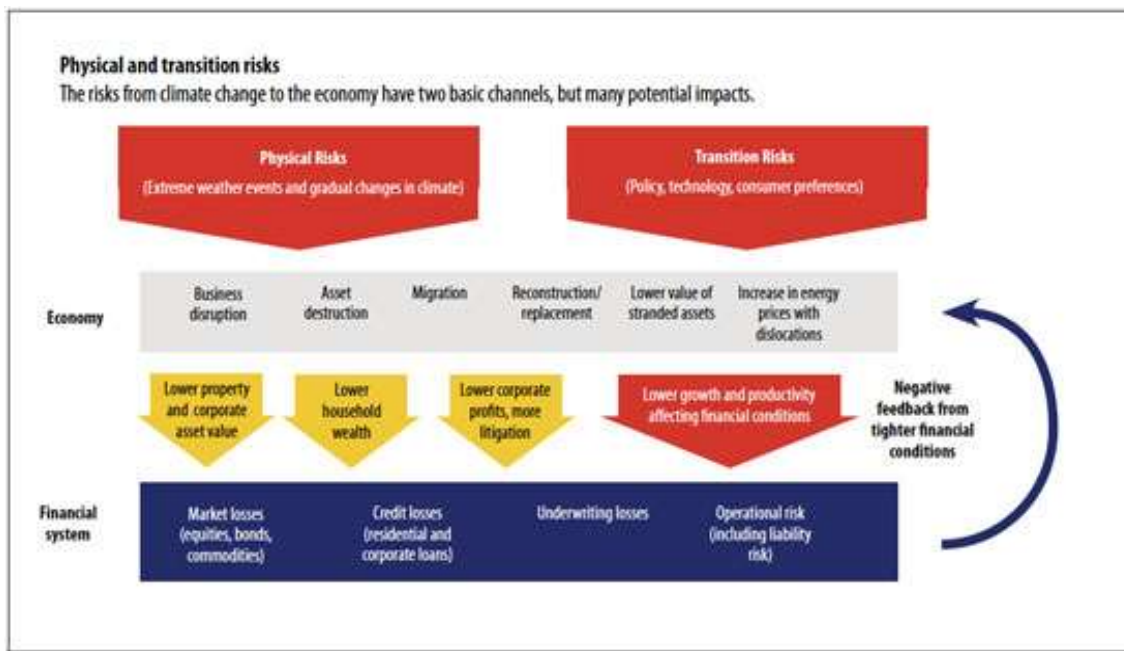
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Chairman Perlmutter, Ranking Member Luetkemeyer, and distinguished members of the subcommittee, thank you very much for convening this very important hearing. I am Mayra Rodríguez Valladares, Managing Principal of MRV Associates. For three decades 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,¹ 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.



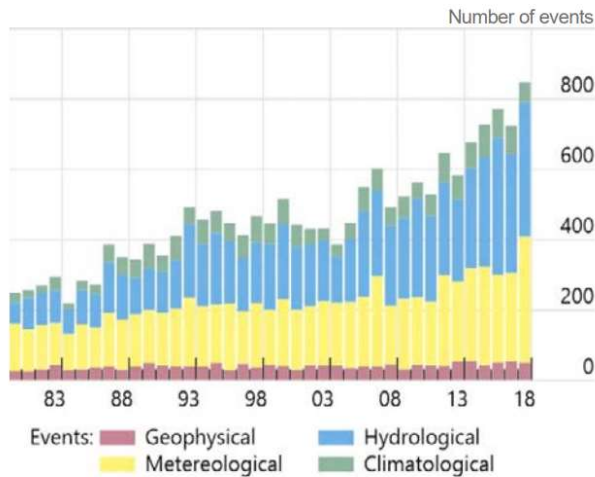
Source: IMF, December 2019.

¹ [The Global Competitiveness Report](#), World Economic Forum.

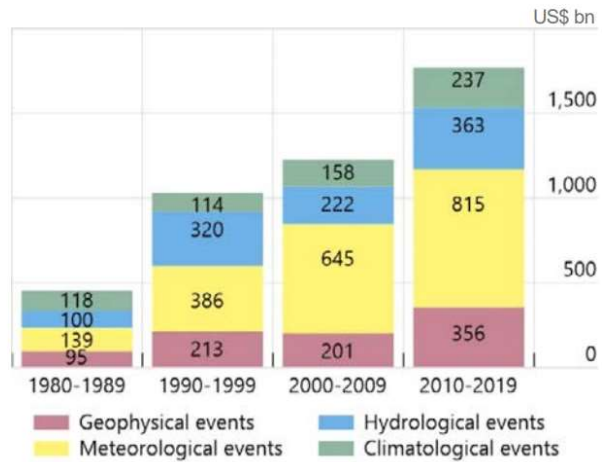


The economic and financial impact of climate-related physical risks on the global economy has increased significantly in recent decades.²

Number of natural loss events



Estimated global economic loss from natural catastrophe events¹

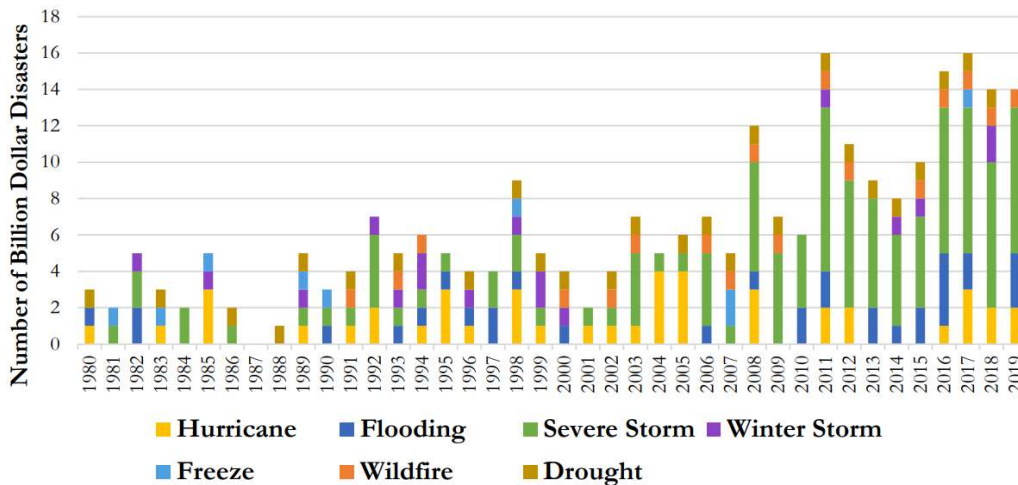


¹ Not all natural catastrophes enumerated in the chart result from climate change.

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, 1980-2019³



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

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



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.

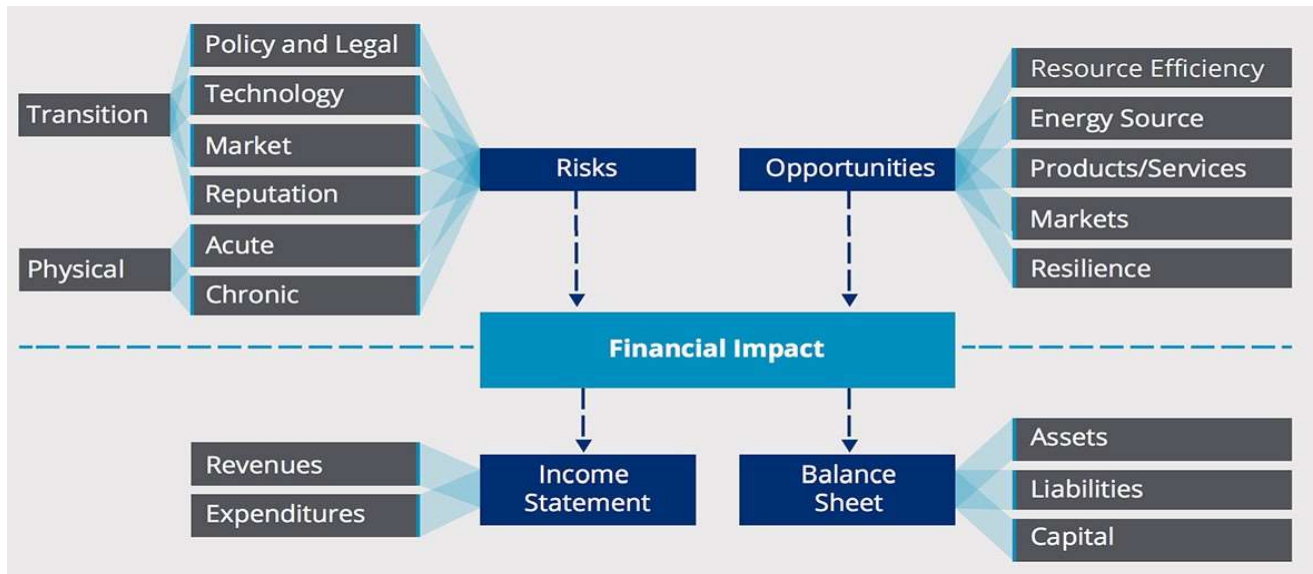
Financial institutions’ assets in the form of mortgages, personal loans, and commercial credit products, as well as bond, stock, and derivatives trading portfolios, are exposed to climate-related risks. They are exposed both to physical risks⁴ such as damage to property and infrastructure, as well as 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

⁴ [“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 banks⁵ (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,⁶ Japan,⁷ Canada,⁸ and Mexico,⁹ which are exposed to the physical and transition risks of climate change.

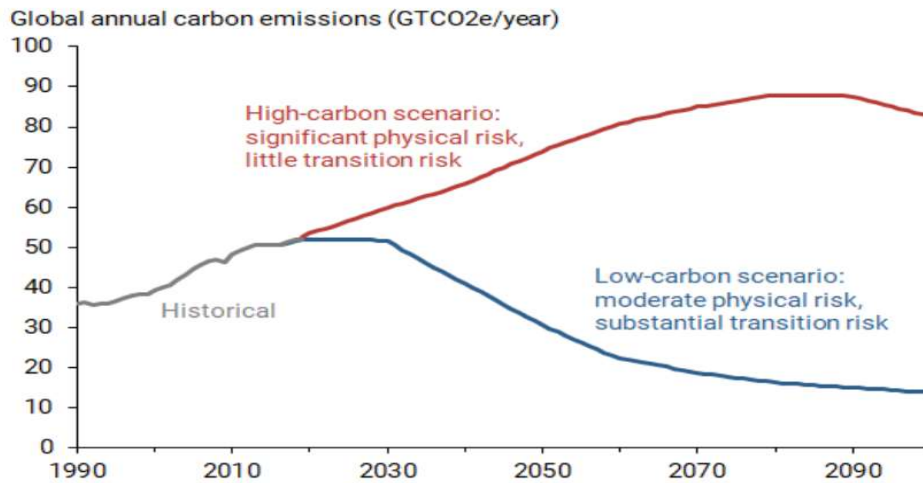
⁵ [2020 List of Globally Systemically Important Banks \(G-SIBs\)](#), Financial Stability Board.

⁶ [“What is Climate Change?”](#) Met Office, United Kingdom.

⁷ [Japan, Climate Action Tracker](#), 2020.

⁸ [“Climate Change”](#) Government of Canada.

⁹ [“Mexico, Climate Change Adaptation,”](#) UNDP.



Source: Federal Reserve Bank of San Francisco, 2021.¹⁰

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 framework¹¹ to assess climate-related risks at banks operating in the UK.¹² In continental Europe, the European Central Bank first assessed banks' climate-related disclosures¹³ in 2019, and last year, it set supervisory expectations for banks' climate-related risk management and disclosures.¹⁴ Additionally, the European Union is already implementing the Sustainable Finance Disclosure Regulation,¹⁵ 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 Japan¹⁶ 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

¹⁰ "[FRBSF Newsletter](#)," February 8, 2021.

¹¹ "[Key Elements of the 2021 Biennial Exploratory Scenario: Financial Risks From Climate Change](#)," Bank of England.

¹² "[Climate Change](#)" Bank of England.

¹³ "[ECB Report on Institutions' Climate-related and Environmental Risk Disclosures](#)," November 2020.

¹⁴ "[Guide on Climate-related and Environmental Risks](#)," European Central Bank, November 2020.

¹⁵ "[What is the Impact of the EU's Sustainable Finance Disclosure Regulation?](#)" S&P Global, April 1, 2021.

¹⁶ "[Bank of Japan to Launch Climate Lending Facility](#)," Green Central Banking, June 21, 2021.



as commercial real estate¹⁷, agriculture¹⁸, and energy¹⁹ 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,²⁰ commercial paper, bonds, securitizations such as Collateralized Loan Obligations (CLOs)²¹, 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 there of, 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 states²² 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

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

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

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

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

²¹ 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.

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



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

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

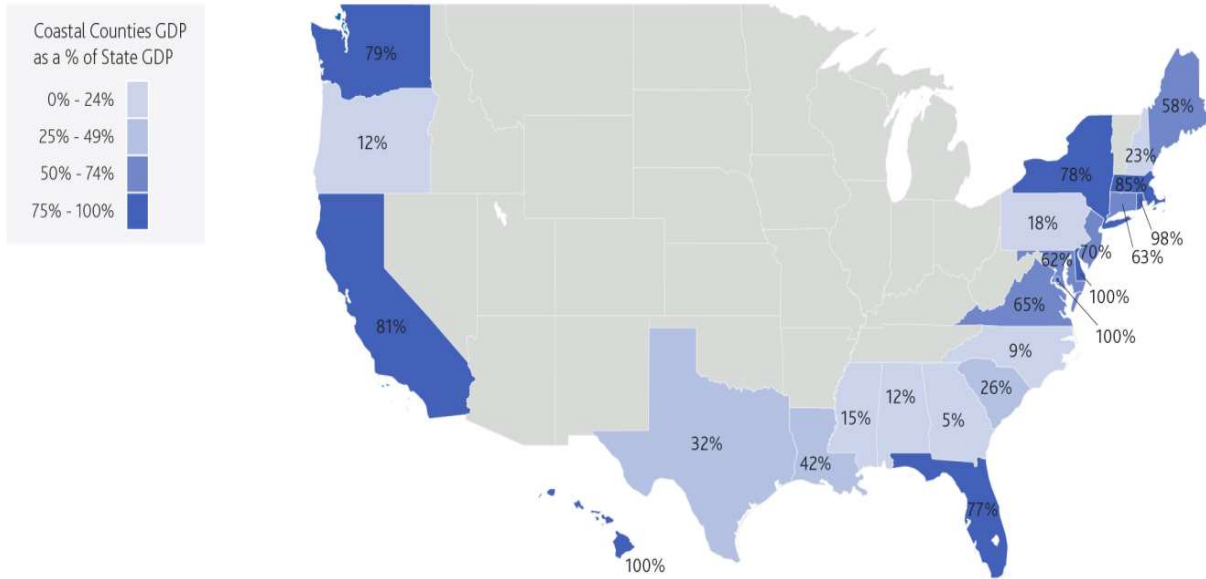


Exhibit based on 2014 data.
 Sources: Moody's Investors Service, National Oceanic and Atmospheric Administration and US Bureau of Economic Analysis

Large internationally active U.S. banks, as well as regional ones, are significant lenders²⁴ 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)

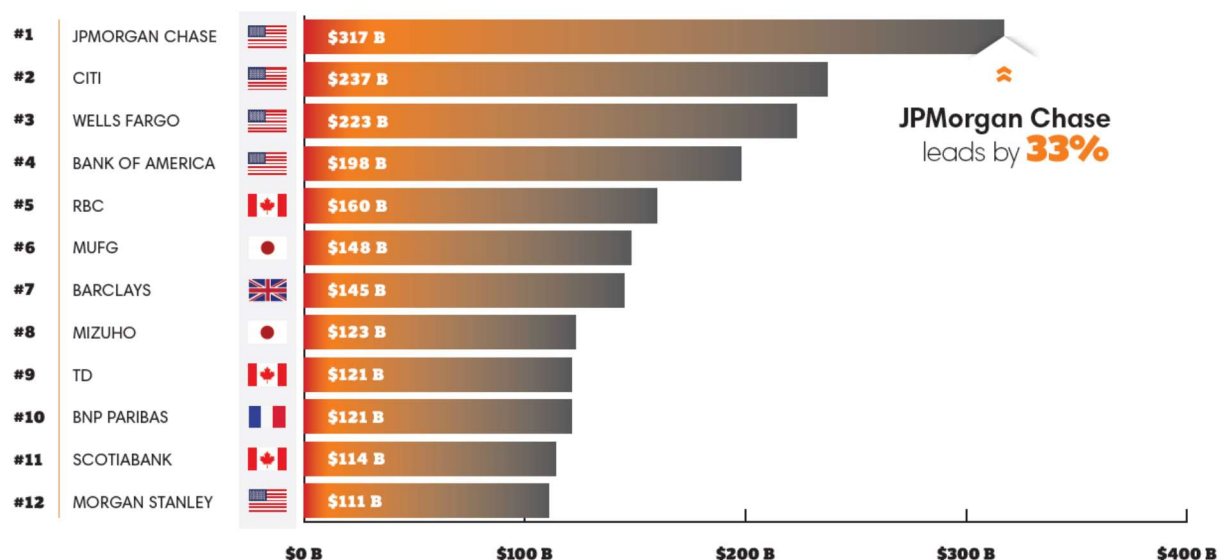
²³ [“Rising Sea Levels Signals Need for US State and Local Governments to Address Growing Climate Risks,”](#) Moody’s Investor Services, September 17, 2020.

²⁴ [“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.²⁵ 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.²⁶ Half of U.S. agricultural loans come from lenders with portfolios of at least 25% debt-to-farm operations,²⁷ 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 significantly²⁸ in the decades to come, which will stress financial institutions in those areas. Moreover, intensifying heatwaves²⁹, 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 Americans³⁰ 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.

²⁵ [‘AgLetter,’](#) Federal Reserve Bank of Chicago, August 2019.

²⁶ [“Measuring What Matters: A New Approach to Assessing Sovereign Climate Risk,”](#) Four Twenty Seven, 2020.

²⁷ [“Slowing Agricultural Markets Highlight the Importance of Sound Risk Management Principles,”](#) Federal Reserve Bank of Kansas City, 2019.

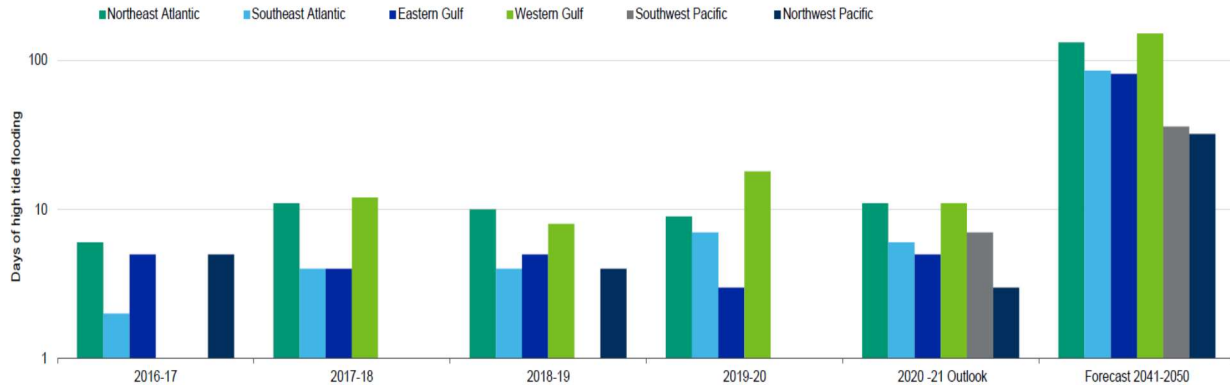
²⁸ [The National Oceanic and Atmospheric Administration.](#)

²⁹ [Climate Change Indicators: Heat Waves.](#) U.S. Environmental Protection Agency.

³⁰ Flavelle, Christopher and Goodluck, Kalen. [“Dispossessed, Again: Climate change Hits Native Americans Especially Hard,”](#) The New York Times, June 27, 2021.



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



No bar indicates one day or less of high-tide flooding.

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.³¹ 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 2009.³² More than 100 oil and gas companies filed for bankruptcy in 2020³³ and energy companies constituted 25% of all corporate defaults last year.³⁴ Presently, the probability of default rate of energy companies with leveraged

³¹ Rodríguez Valladares, Mayra “[Leveraged Loan Borrowers Are Requesting Covenant Relief at an Extraordinary Pace](#),” Forbes July 21, 2021.

³² Rodríguez Valladares, Mayra. “[U.S. Corporate Default Volume, Especially in the Energy Sector is Worse than in 2009](#),” Forbes.

³³ Takahashi, Paul. [Houston Chronicle](#), January 21, 2021.

³⁴ Rodríguez Valladares, Mayra. “[Energy Companies Comprise Over 25% of Total U.S. Corporate Defaults](#),” Forbes, July 22, 2020.



loans stands at 20%.³⁵ Scholars³⁶ 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 | 5/21 TTM | 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 Risks³⁷ 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

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

³⁶ 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.

³⁷ “[Executive Order on Climate-Related Financial Risk](#),” The White House, May 20, 2021.

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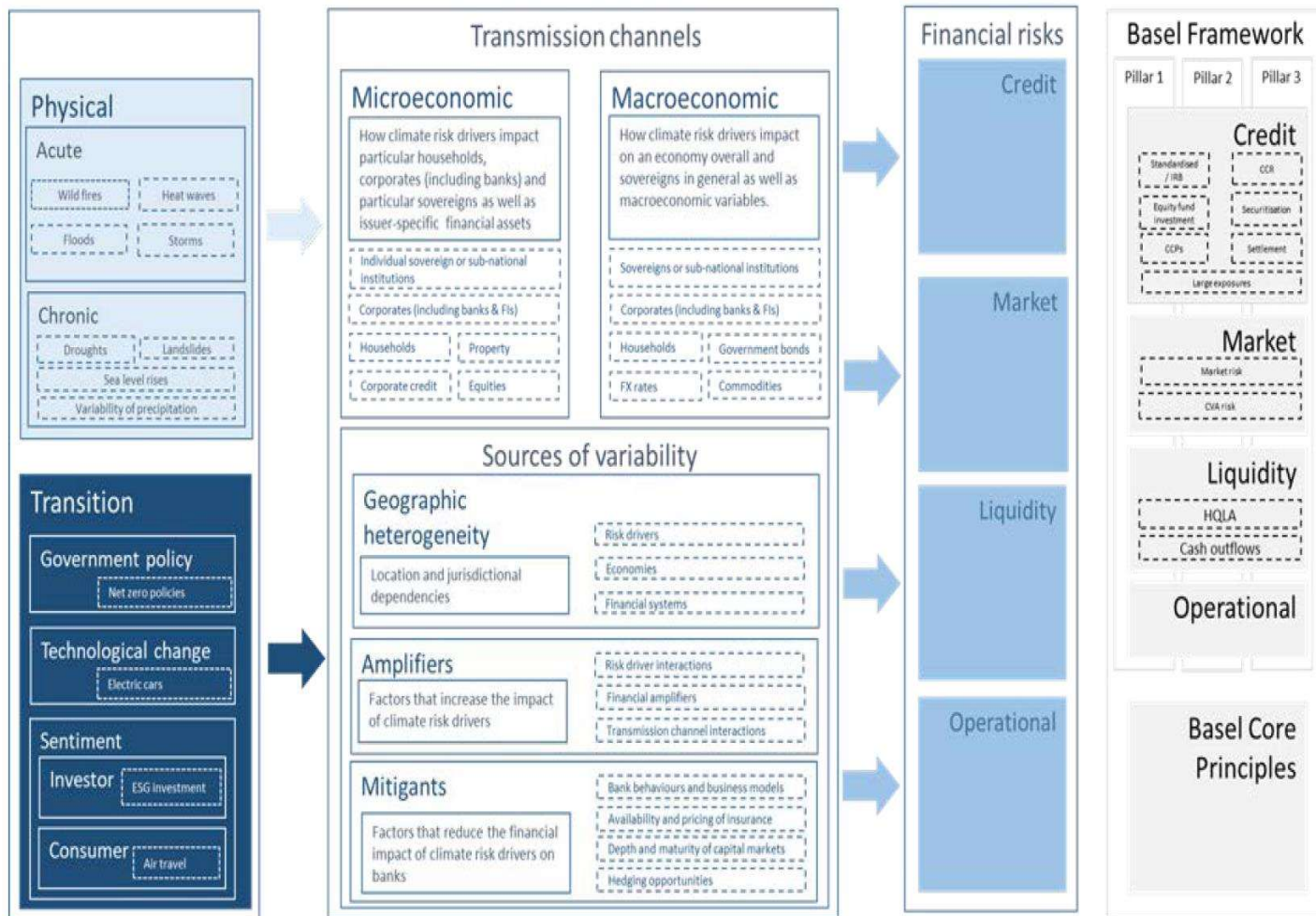
only a member, but also is the current leader³⁸ of the Financial Stability Board (FSB), a global systemic regulator; the FSB and its Task Force on Climate-related Financial Disclosures³⁹ have published recommendations on, and research about, climate change and its risks to the financial system globally.

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 report⁴⁰ about how climate change can impact banks and the banking system globally.

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

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

⁴⁰ [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).⁴¹ 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, IOSCO⁴² intends to publish its first regulatory guidance for

⁴¹ [Fact Sheet](#), IOSCO.

⁴² “[IOSCO Chair Outlines the Future of Climate Risk Regulation](#),” Mayer Brown, February 23, 2021.



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.”⁴³ 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.”⁴⁴ 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,⁴⁵ 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-banks⁴⁶, that unlike banks, do not have strong regulatory capital, liquidity, and leverage risk requirements, and are for more, opaque than banks and insurance companies.⁴⁷ 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

⁴³ “[Global Watchdog to Target “Greenwashing” in First Guidance for ESG Raters,](#)” BusinessDay, June 23, 2021.

⁴⁴ “[The Application Paper on the Supervision of Climate-related risks in the Insurance Sector,](#)” May 2021.

⁴⁵ Rodríguez Valladares, Mayra. “[The Data is Mightier than the Sword, Mr. President,](#)” The Hill, August 15, 2018.

⁴⁶ “[Climate Roadmap for Financial Regulation,](#)” Public Citizen and Americans for Financial Reform, April 2021.

⁴⁷ Rodríguez Valladares, Mayra “[Market Participants and Regulators Should Be More Vigilant on Non-Banks,](#)” Forbes, February 4, 2019.

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incredibly interconnected to banks⁴⁸ and to leveraged corporations⁴⁹; 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 agencies⁵⁰ 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.⁵¹ 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.”⁵² The Federal Reserve Banks of New York⁵³ and San Francisco have been contributing climate-change research that is important for regulators and banks.

⁴⁸ Rodríguez Valladares, Mayra. “[Non-banks are the Largest Holders of Collateralized Loan Obligations](#),” Forbes, June 11, 2019.

⁴⁹ Rodríguez Valladares, Mayra. “[Non-banks Need to Be More Transparent About Their Leveraged Loans](#),” Forbes, February 4, 2019.

⁵⁰ Harrington, Bill. “[Public Input Welcomed in Climate Change Disclosures](#),” Letter to the Securities and Exchange Commission, June 14, 2021.

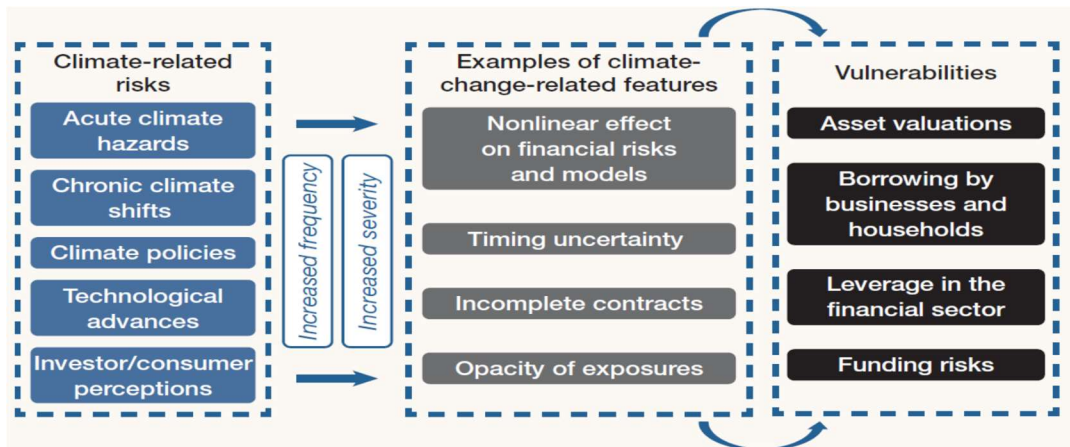
⁵¹ “[Climate Change and Financial Stability](#),” FEDS Notes, March 19, 2021.

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

⁵³ “[Community Development: Climate](#),” Federal Reserve Bank of New York.



Possible Transmission from Climate-related risks to Financial System Vulnerabilities⁵⁴



Recent⁵⁵ and current⁵⁶ 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 advises⁵⁷ 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 companies⁵⁸ and to banks⁵⁹ 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

⁵⁴ Federal Reserve Staff.

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

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

⁵⁷ [“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.

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

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



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 scenarios⁶⁰ for financial regulators and financial institutions.
 - In 2017, the Financial Stability Board's Task Force on Climate-Related Financial Disclosures published important recommendations⁶¹ 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;

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

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



- 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.



| 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.

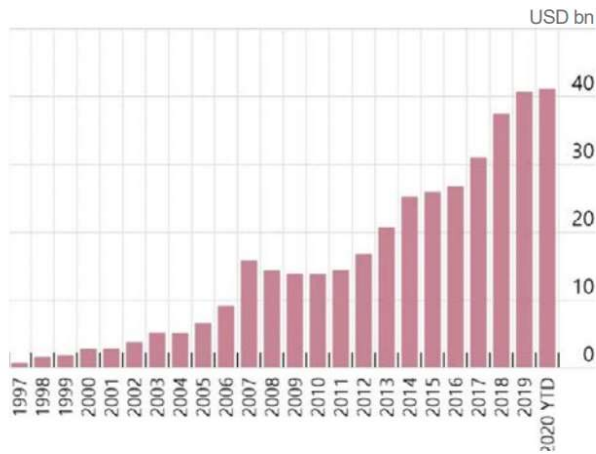
I thank you for the opportunity to appear before you. I look forward to your questions now, and I would be pleased to serve as a resource to you in the future as you continue to explore how to reduce the adverse impact of climate change on the safety and soundness of the financial system.



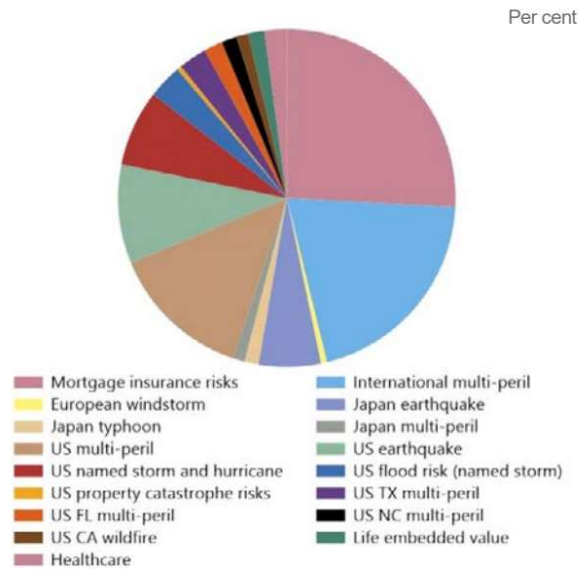
Appendix I

The Global Market for Catastrophe Bonds⁶²

Catastrophe bond & ILS risk capital outstanding



Catastrophe bonds & ILS risk capital outstanding by risk or peril



Source: ECB.

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



Appendix II

Selected US Billion-Dollar Disasters, Their Total Direct Costs, and Affected States⁶³

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

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



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 | 2016 | 2017 | 2018 | 2019 | 2020 | TOTAL 2016-2020 | TREND |
|------|----------------------------------|------------|------------|------------|------------|------------|-----------------|-------|
| 1 | JPMORGAN CHASE | \$63.729 B | \$70.271 B | \$67.396 B | \$64.039 B | \$51.300 B | \$316.735 B | |
| 2 | CITI | \$42.637 B | \$47.102 B | \$46.853 B | \$52.496 B | \$48.389 B | \$237.477 B | |
| 3 | WELLS FARGO | \$34.631 B | \$54.812 B | \$61.821 B | \$45.684 B | \$26.400 B | \$223.349 B | |
| 4 | BANK OF AMERICA | \$37.670 B | \$36.744 B | \$33.808 B | \$48.081 B | \$42.149 B | \$198.452 B | |
| 5 | RBC | \$29.322 B | \$38.440 B | \$37.656 B | \$35.717 B | \$18.994 B | \$160.129 B | |
| 6 | MUFG | \$25.304 B | \$26.177 B | \$35.404 B | \$31.782 B | \$29.070 B | \$147.737 B | |
| 7 | BARCLAYS | \$30.202 B | \$30.730 B | \$25.911 B | \$30.353 B | \$27.702 B | \$144.897 B | |
| 8 | MIZUHO | \$21.268 B | \$19.200 B | \$28.730 B | \$31.484 B | \$22.791 B | \$123.472 B | |
| 9 | TD | \$20.705 B | \$29.605 B | \$25.941 B | \$27.944 B | \$16.868 B | \$121.063 B | |
| 10 | BNP PARIBAS | \$16.892 B | \$17.716 B | \$16.567 B | \$28.900 B | \$40.751 B | \$120.825 B | |
| 11 | SCOTIABANK | \$18.765 B | \$24.509 B | \$28.033 B | \$26.087 B | \$16.452 B | \$113.846 B | |
| 12 | MORGAN STANLEY | \$24.141 B | \$24.617 B | \$19.484 B | \$22.072 B | \$20.465 B | \$110.778 B | |
| 13 | HSBC | \$17.914 B | \$22.172 B | \$20.489 B | \$26.627 B | \$23.542 B | \$110.745 B | |
| 14 | BANK OF CHINA | \$25.944 B | \$13.832 B | \$22.302 B | \$20.268 B | \$18.850 B | \$101.195 B | |
| 15 | GOLDMAN SACHS | \$22.894 B | \$19.924 B | \$17.167 B | \$21.580 B | \$18.941 B | \$100.506 B | |
| 16 | BANK OF MONTREAL | \$17.369 B | \$21.216 B | \$21.559 B | \$21.869 B | \$15.194 B | \$97.207 B | |
| 17 | ICBC | \$18.788 B | \$13.285 B | \$14.794 B | \$19.617 B | \$29.521 B | \$96.005 B | |
| 18 | SMBG GROUP | \$10.505 B | \$12.117 B | \$15.845 B | \$19.595 B | \$28.199 B | \$86.261 B | |
| 19 | CREDIT SUISSE | \$19.293 B | \$21.932 B | \$17.108 B | \$14.384 B | \$9.484 B | \$82.201 B | |
| 20 | DEUTSCHE BANK | \$19.637 B | \$19.424 B | \$15.257 B | \$11.180 B | \$9.126 B | \$74.624 B | |
| 21 | SOCIÉTÉ GÉNÉRALE | \$13.671 B | \$10.193 B | \$15.453 B | \$14.674 B | \$19.034 B | \$73.026 B | |
| 22 | CIBC | \$12.272 B | \$14.048 B | \$11.610 B | \$19.068 B | \$9.742 B | \$66.739 B | |
| 23 | CRÉDIT AGRICOLE | \$8.886 B | \$11.220 B | \$13.069 B | \$11.819 B | \$19.594 B | \$64.587 B | |
| 24 | CHINA CONSTRUCTION BANK | \$15.828 B | \$9.925 B | \$9.013 B | \$13.727 B | \$12.043 B | \$60.536 B | |
| 25 | INDUSTRIAL BANK | \$8.216 B | \$8.806 B | \$12.529 B | \$11.467 B | \$14.043 B | \$55.061 B | |
| 26 | AGRICULTURAL BANK OF CHINA | \$11.839 B | \$5.678 B | \$7.445 B | \$11.021 B | \$13.769 B | \$49.752 B | |
| 27 | CHINA CITIC BANK | \$8.050 B | \$6.043 B | \$9.262 B | \$10.731 B | \$10.398 B | \$44.484 B | |
| 28 | ING | \$9.266 B | \$8.276 B | \$11.338 B | \$8.841 B | \$6.488 B | \$44.209 B | |
| 29 | SHANGHAI PUDONG DEVELOPMENT BANK | \$6.007 B | \$4.955 B | \$6.980 B | \$7.759 B | \$12.165 B | \$37.875 B | |
| 30 | BPCE/NATIXIS | \$5.130 B | \$5.730 B | \$12.028 B | \$7.739 B | \$6.350 B | \$36.978 B | |



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)

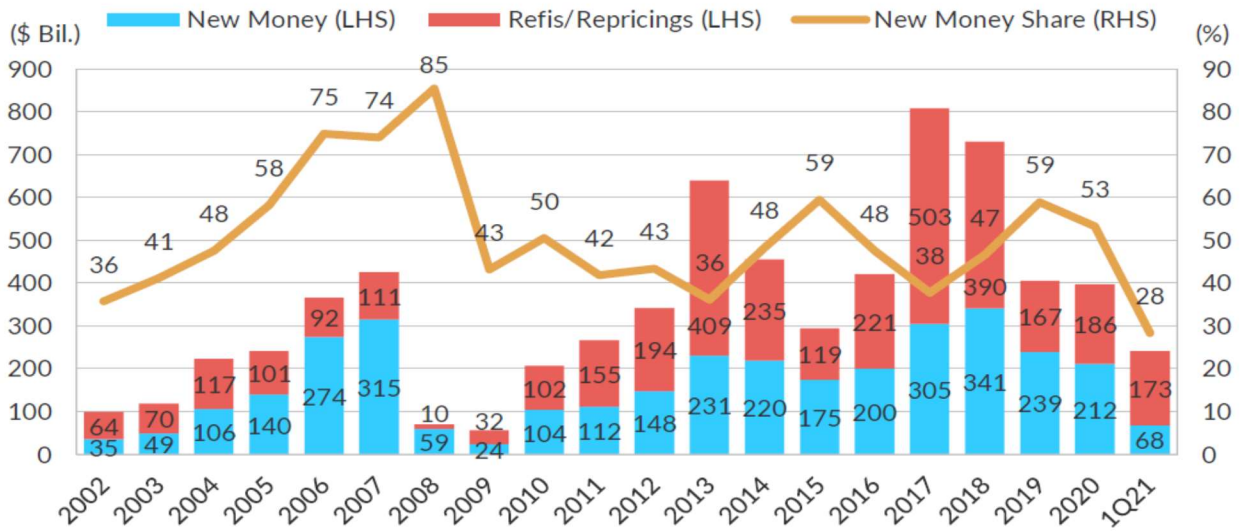
The USDA provides a wide range of reports and data on market conditions.



Appendix V

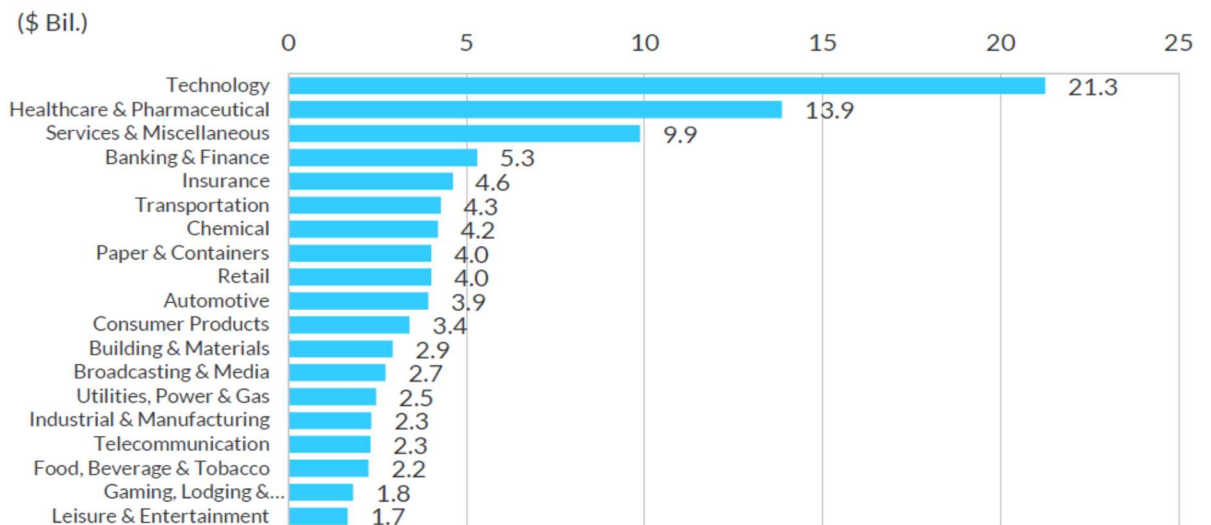
Leveraged Loans in the U.S.⁶⁴

U.S. Institutional Loan Issuance



Source: Refinitiv LPC.

Institutional Loan Issuance by Sector



Source: Source: Fitch Ratings, LevFin Insights, Refinitiv LPC, Bloomberg.

⁶⁴ “U.S. Leveraged Loan Chart Book: First-Quarter 2021,” Fitch Ratings, May 6, 2021.

MRV ASSOCIATES



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% |
| Total LLI return | 1.35% | 3.12% | |

Data through Dec. 31, 2020.

Sources: LCD, an offering of S&P Global Market Intelligence; S&P/LSTA Leveraged Loan Index



Appendix VI

Questions Supervisors Should Ask Insurers⁶⁵

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),¹⁰ 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?

⁶⁵ 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).



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.



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](#)



[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](#)