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Why Climate Change Matters for Monetary Policy and Financial Stability

Remarks by

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at

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I want to thank my colleagues at the Federal Reserve Bank of San Francisco, especially Mary Daly, Galina Hale, Òscar Jordà, and Glenn Rudebusch, for organizing this research conference.[1] The presentations today provide important insights into the many important ways climate-related risks may affect our financial system and broader economy.[2]

Similar to many areas around the country, we need not look far from here to see the potentially devastating effects of our changing climate. Less than a hundred miles from here, families have lost their homes and businesses, and entire communities have been devastated by the Kincade fire. Some have described PG&E's bankruptcy as the first climate change bankruptcy.[3] Some insurers have discontinued policies in fire-prone areas, which, in turn, is changing the costs of homeownership and the risk profiles of previously underwritten mortgages.[4] Yet we can also see not far from here the promise of green innovation.[5]

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[1] I am grateful to Brigitte Roth Tran of the Federal Reserve Board for assistance in preparing this text. These remarks represent my own views, which do not necessarily represent those of the Federal Reserve Board or the Federal Open Market Committee.

[2] See Glenn D. Rudebusch (2019), "Climate Change and the Federal Reserve," FRBSF Economic Letter 2019-09 (San Francisco: Federal Reserve Bank of San Francisco, March), https://www.frbsf.org/economic-research/publications/economic-letter/2019/march/climate-change-and-federal-reserve.

[3] For example, see Russell Gold (2019), "PG&E: The First Climate-Change Bankruptcy, Probably Not the Last," *Wall Street Journal*, January 18.

[4] See Michael Finney and Renee Koury (2019), "Thousands of Homeowners in Fire Zones Are Losing Their Insurance,"*ABC7 News*, October 26.

[5] See, for instance, U.S. Energy Information Administration (2019), "Combined Wind and Solar Made Up at Least 20% of Electric Generation in 10 States in 2017," https://www.eia.gov/todayinenergy/detail.php?id=37233; and California Energy Commission (2019), "Energy Research and Development Division," https://www.energy.ca.gov/about/divisions-and-offices/energy-research-and-development-division, and "Highlighting Energy Innovation by the Numbers," http://innovation.energy.ca.gov/SearchHome.aspx?ti=636942212481590669.

The Federal Reserve's Responsibilities

So how does climate change fit into the work of the Federal Reserve? To support a strong economy and a stable financial system, the Federal Reserve needs to analyze and adapt to important changes to the economy and financial system. This is no less true for climate change than it was for globalization or the information technology revolution.

Climate change is projected to increase the frequency and intensity of extreme weather events, raise average temperatures, and cause sea levels to rise. Climate risks are projected to have profound effects on the U.S. economy and financial system.[6] To fulfill our core responsibilities, it will be important for the Federal Reserve to study the implications of climate change for the economy and the financial system and to adapt our work accordingly. Congress has assigned the Federal Reserve specific responsibilities in monetary policy, financial stability, financial regulation and supervision, community and consumer affairs, and payments. Climate risks may touch each of these.

Climate Change and Monetary Policy

Let's start with monetary policy. Increasingly, it will be important for the Federal Reserve to take into account the effects of climate change and associated policies in setting monetary policy to achieve our objectives of maximum employment and price stability. Monetary policy seeks to buffer the economy from unexpected adverse disruptions, or "shocks." It is generally more challenging for monetary policy to insulate the economy from shocks to the supply side of the economy than to the demand side. So it is vital for monetary policymakers to understand the nature of climate disturbances to

[6] See U.S. Global Change Research Program (2018), *Fourth National Climate Assessment: Volume II: Impacts, Risks, and Adaptation in the United States* (Washington: USGCRP), https://nca2018.globalchange.gov.

the economy, as well as their likely persistence and breadth, in order to respond effectively.

For instance, monetary policymakers must accurately assess how disasters such as hurricanes, wildfires, and flooding affect labor markets, household and business spending, output, and prices.[7] In deciding whether to alter monetary policy or, instead, to "look through" such shocks, policymakers need to assess the likely persistence of the effects and how widespread they are. Because there is considerable uncertainty about the persistence, breadth, and magnitude of climate-related shocks to the economy, it could be challenging to assess what adjustments to monetary policy are likely to be most effective at keeping the economy operating at potential with maximum employment and price stability.[8] We need only look back to the oil price shocks of the 1970s and 1980s to see how difficult it was for monetary policymakers to assess accurately the likely persistence of the effects on inflation and output and the appropriate response.

To the extent that climate change and the associated policy responses affect productivity and long-run economic growth, there may be implications for the long-run neutral level of the real interest rate, which is a key consideration in monetary policy. As the frequency of heat waves increases, research indicates there could be important effects

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[7] See Ariel R. Belasen and Solomon W. Polachek (2009), "How Disasters Affect Local Labor Markets: The Effects of Hurricanes in Florida," *Journal of Human Resources*, vol. 44 (Winter), pp. 251–76; and Solomon M. Hsiang and Amir S. Jina (2014), "The Causal Effect of Environmental Catastrophe on Long-Run Economic Growth: Evidence from 6,700 Cyclones," NBER Working Paper Series 20352 (Cambridge, Mass.: National Bureau of Economic Research, July), http://www.nber.org/papers/w20352.

[8] Warwick McKibbin, Adele Morris, Augustus J. Panton, and Peter J. Wilcoxen (2017), "Climate Change and Monetary Policy: Dealing with Disruption," CAMA Working Paper 77/2017 (Canberra, Australia: Crawford School of Public Policy, Australian National University, December), https://cama.crawford.anu.edu.au/sites/default/files/publication/cama_crawford_anu_edu_au/2017-12/77_2017_mckibbin_morris_panton_wilcoxen_0.pdf; Benoît Coeuré (2018), "Monetary Policy and Climate Change," speech delivered at "Scaling up Green Finance: The Role of Central Banks," a conference sponsored by the Network for Greening the Financial System, the Deutsche Bundesbank, and the Council on Economic Policies, Berlin, November 8, https://www.ecb.europa.eu/press/key/date/2018/html/ecb.sp181108.en.html.

on output and labor productivity.[9] A shifting energy landscape, rising insurance premiums, and increasing spending on climate change adaptations—such as air conditioning and elevating homes out of floodplains—will have implications for economic activity and inflation.

As policies are implemented to mitigate climate change, they will affect prices, productivity, employment, and output in ways that could have implications for monetary policy. Just on its own, the large amount of uncertainty regarding climate-related events and policies could hold back investment and economic activity.[10]

Climate Change and Financial Stability

Second, the Federal Reserve will need to assess the financial system for vulnerabilities to important climate risks. The Federal Reserve has important responsibilities for safeguarding the stability of our financial system so that it can continue to meet household and business needs for financial services when hit by negative shocks. Similar to other significant risks, such as cyberattacks, we want our financial system to be resilient to the effects of climate change.[11]

Although there is substantial uncertainty surrounding how or when shifts in asset valuations might occur, we can begin to identify the factors that could propagate losses

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[9] Riccardo Colacito, Bridget Hoffman, and Toan Phan (2018), "Temperature and Growth: A Panel Analysis of the United States." Working Paper 18-09 (Richmond, VA: Federal Reserve Bank of Richmond, March), https://www.richmondfed.org/publications/research/working_papers/2018/wp_18-09.

[10] William Blyth, Richard Bradley, Derek Bunn, Charlie Clarke, Tom Wilson, and Ming Yang (2007), "Investment Risks under Uncertain Climate Change Policy," *Energy Policy*, vol. 35 (November), pp. 5766–73; Mathias S. Kruttli, Brigitte Roth Tran, and Sumudu W. Watugala (2019), "Pricing Poseidon: Extreme Weather Uncertainty and Firm Return Dynamics," Finance and Economics Discussion Series 2019-054 (Washington: Board of Governors of the Federal Reserve System, July), https://doi.org/10.17016/FEDS.2019.054.

[11] Mark Carney (2015), "Breaking the Tragedy of the Horizon—Climate Change and Financial Stability," speech delivered at Lloyd's of London, September 29, https://www.bankofengland.co.uk/speech/2015/breaking-the-tragedy-of-the-horizon-climate-change-and-financial-stability.

from natural disasters, energy disruptions, and sudden shifts in the value of climate-exposed properties. As was the case with mortgages before the financial crisis, correlated risks from these kinds of trends could have an effect that reaches beyond individual banks and borrowers to the broader financial system and economy. As with other financial stability vulnerabilities arising from macroeconomic risks, feedback loops could develop between the effects on the real economy and those on financial markets. For example, if prices of properties do not accurately reflect climate-related risks, a sudden correction could result in losses to financial institutions, which could in turn reduce lending in the economy. The associated declines in wealth could amplify the effects on economic activity, which could have further knock-on effects on financial markets. Beyond these physical risks, policymakers in some jurisdictions are assessing the resilience of the financial system to so-called transition risks: the risks associated with the transition to a policy framework that curtails emissions.

The private sector is focused on climate risks. Private-sector businesses—including insurance companies, ratings agencies, data companies, and actuaries—are actively working to understand climate-related risks and make this information accessible to investors, policymakers, and financial institutions. Although this work is at an early stage, thousands of companies around the world are now reporting climate-related financial exposures to the Carbon Disclosure Project (CDP) under the guidelines of the Financial Stability Board (FSB) Task Force on Climate-Related Financial Disclosures (TCFD).[12] Based on these disclosures, the CDP estimates that the 500 largest companies

[12] Nicolette Bartlett and Tom Coleman (2019), *Major Risk or Rosy Opportunity: Are Companies Ready for Climate Change?* (London: CDP), https://6fefcbb86e61af1b2fc4-c70d8ead6ced550b4d987d7c03fcdd1d.ssl.cf3.rackcdn.com/cms/reports/documents/000/004/588/original/CDP_Climate_Change_report_2019.pdf?1562321876.

by market capitalization are exposed to nearly $1 trillion in risk, half of which is expected to materialize in the next five years. A majority of the reporting companies integrate climate risk into their business strategies and their broader risk-management frameworks.

An essential element of our bank supervision and regulation duties is assessing banks' risk-management systems. We expect banks to have systems in place that appropriately identify, measure, control, and monitor all of their material risks.[13] These risks may include severe weather events that can disrupt standard clearing and settlement activity and increase the demand for cash. Banks also need to manage risks surrounding potential loan losses resulting from business interruptions and bankruptcies associated with natural disasters, including risks associated with loans to properties that are likely to become uninsurable or activities that are highly exposed to climate risks.

Climate Change and Community Reinvestment

The Federal Reserve also has important responsibilities in community reinvestment, which increasingly encompass recovering from and building resilience against natural disasters and severe weather events. Under the Community Reinvestment Act (CRA), banks have an affirmative obligation to meet the needs of their local communities, including low- and moderate-income communities. In recent years, the banking agencies have issued a number of statements to clarify that disaster recovery

[13] Board of Governors of the Federal Reserve System, Division of Banking Supervision and Regulation (1995), "Rating the Adequacy of Risk Management Processes and Internal Controls at State Member Banks and Bank Holding Companies," Supervision and Regulation Letter SR 95-51 (November 14), https://www.federalreserve.gov/boarddocs/srletters/1995/sr9551.htm; Board of Governors, BS&R (2016), "Supervisory Guidance for Assessing Risk Management at Supervised Institutions with Total Consolidated Assets Less than $50 Billion," Supervision and Regulation Letter SR 16-11 (June 8), https://www.federalreserve.gov/supervisionreg/srletters/sr1611.htm; and Board of Governors, BS&R (2017), "Interagency Guidelines Establishing Standards for Safety and Soundness," Compliance Guideline 12 CFR 208 D-1, https://www.federalreserve.gov/supervisionreg/reghcg.htm.

efforts are CRA-eligible activities.[14] Our Community Advisory Council has urged more research on the effect of climate change on low- to moderate-income communities in order to help inform more effective responses.[15] Working with local communities, the Federal Reserve staff have highlighted the ways in which lower-income households and underserved areas tend to be particularly vulnerable to natural disasters.[16] With low levels of liquid savings to meet emergency expenditures, these households tend to be less resilient to the temporary loss of income, property damage, and health outcomes they face from disasters.[17] In our community development work, we seek to encourage lenders and their local communities to rebuild in ways that will increase their resilience to future risks.

Advancing Our Understanding

The staff across the Federal Reserve System are researching a wide range of topics related to climate risks, including how weather and natural disasters affect economic and financial outcomes and the economic implications of climate policies, including for the energy sector.[18] We currently assess the effects of severe weather

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[14] Kevin Dancy (2018), "Weathering the Storm: A Framework for Meeting CRA Obligations," Federal Reserve Bank of Dallas, Community Development Publications (Dallas: FRB Dallas, August), https://www.dallasfed.org/cd/pubs/storm.aspx.

[15] Community Advisory Council and Board of Governors of the Federal Reserve System (2017), Record of Meeting (Washington: Board of Governors, May 26), https://www.federalreserve.gov/aboutthefed/files/cac-20170526.pdf.

[16] Jesse M. Keenan and Elizabeth Mattiuzzi (2019), "Climate Adaptation Investment and the Community Reinvestment Act," Community Development Research Brief 2019-5 (San Francisco: Federal Reserve Bank of San Francisco, June), https://www.frbsf.org/community-development/publications/community-development-research-briefs/2019/june/climate-adaptation-investment-and-the-community-reinvestment-act.

[17] Community Advisory Council and Board of Governors of the Federal Reserve System (2019), Record of Meeting (Washington: Board of Governors, November 1), https://www.federalreserve.gov/aboutthefed/files/cac-20191101.pdf.

[18] See, for example Justin Bloesch and François Gourio (2015), "The Effect of Winter Weather on U.S. Economic Activity," Federal Reserve Bank of Chicago, *Economic Perspectives*, vol. 39 (First Quarter), pp. 1–20, https://www.chicagofed.org/publications/economic-perspectives/2015/1q-bloesch-gourio; Justin Gallagher and Daniel Hartley (2015), "Household Finance after a Natural Disaster: The Case of Hurricane Katrina," Working Paper 14-06R (Cleveland: Federal Reserve Bank of Cleveland, December),

events for all our work—from forecasts for the Federal Open Market Committee to guidance provided to banks in the wake of federal disaster declarations to our efforts to understand the effects on low- to moderate-income communities.[19]

Work to understand the implications of climate-related risks for our economy and financial system is at an early stage. That is why we are particularly eager to learn from the work of our colleagues here and abroad. In that regard, the Commodity Futures Trading Commission's (CFTC) vote to establish the Climate-Related Market Risk Subcommittee is noteworthy, and I look forward to their observations.[20]

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https://www.clevelandfed.org/en/newsroom-and-events/publications/working-papers/2015-working-papers/wp-1406r-household-finance-after-a-natural-disaster.aspx; Daniel J. Wilson (2017), "The Impact of Weather on Local Employment: Using Big Data on Small Places," Working Paper 2016-21 (San Francisco: Federal Reserve Bank of San Francisco, June), https://www.frbsf.org/economic-research/files/wp2016-21.pdf; and Brigitte Roth Tran (2019), "Sellin' in the Rain: Adaptation to Weather and Climate in the Retail Sector," Finance and Economics Discussion Series 2019-067 (Washington: Board of Governors of the Federal Reserve System, September), https://doi.org/10.17016/FEDS.2019.067.

See Stephie Fried, Kevin Novan, and William B. Peterman (2016), "The Distributional Effects of a Carbon Tax on Current and Future Generations," Finance and Economics Discussion Series 2016-038 (Washington: Board of Governors of the Federal Reserve System, April), https://dx.doi.org/10.17016/FEDS.2016.038.

See Joshua A. Blonz (2019), "The Welfare Costs of Misaligned Incentives: Energy Inefficiency and the Principal–Agent Problem," Finance and Economics Discussion Series 2019-071 (Washington: Board of Governors of the Federal Reserve System, September), https://doi.org/10.17016/FEDS.2019.071; and Martin Stuermer and Gregor Schwerhoff (2015), "Non-Renewable Resources, Extraction Technology, and Endogenous Growth," Working Paper 1506 (Dallas: Federal Reserve Bank of Dallas, December), https://www.dallasfed.org/-/media/documents/research/papers/2015/wp1506.pdf.

[19] See Kimberly Bayard, Ryan Decker, and Charles Gilbert (2017), "Natural Disasters and the Measurement of Industrial Production: Hurricane Harvey, a Case Study," FEDS Notes (Washington: Board of Governors of the Federal Reserve System, October 11), https://www.federalreserve.gov/econres/notes/feds-notes/natural-disasters-and-the-measurement-of-industrial-production-hurricane-harvey-a-case-study-20171011.htm; Aditya Aladangady, Shifrah Aron-Dine, Wendy E. Dunn, Laura Feiveson, Paul Lengermann, and Claudia Sahm (2016), "The Effect of Hurricane Matthew on Consumer Spending," FEDS Notes (Washington: Board of Governors of the Federal Reserve System, December 2), https://www.federalreserve.gov/econresdata/notes/feds-notes/2016/effect-of-hurricane-matthew-on-consumer-spending-20161202.html; and Board of Governors of the Federal Reserve System, Division of Banking Supervision and Regulation (2017), "Interagency Supervisory Examiner Guidance for Institutions Affected by a Major Disaster," SR 17-14 (December 15), https://www.federalreserve.gov/supervisionreg/srletters/sr1714.pdf.

[20] U.S. Commodity Futures Trading Commission (2019), "CFTC Commissioner Behnam Announces the Establishment of the Market Risk Advisory Committee's Climate-Related Market Risk Subcommittee and Seeks Nominations for Membership," press release, July 10, https://www.cftc.gov/PressRoom/PressReleases/7963-19.

We also benefit from working with international peers who are taking the lead on understanding the effects of climate-related risks on their financial systems. We are participating in climate-related discussions at the FSB and other standard-setting bodies, and we will continue to support the work of the FSB's TCFD in order to improve standardization of financial disclosures related to climate change. Along with other officials with financial stability responsibilities, I have been following the Bank of England's plans to assess climate risks to the financial system, including through their exploratory stress-test scenario. And we are in discussions about how we might participate in the Central Banks and Supervisors Network for Greening the Financial System in order to learn from our international colleagues' approaches to measuring and managing climate risks in the financial system.

We also have a lot to learn from the broader research community about the economic and financial effects of climate change. As we have seen today, researchers are making progress on addressing questions regarding how climate change relates to labor markets, trade policy, and monetary policy. By participating more actively in climate-related research and practice, the Federal Reserve can be more effective in supporting a strong economy and a stable financial system.