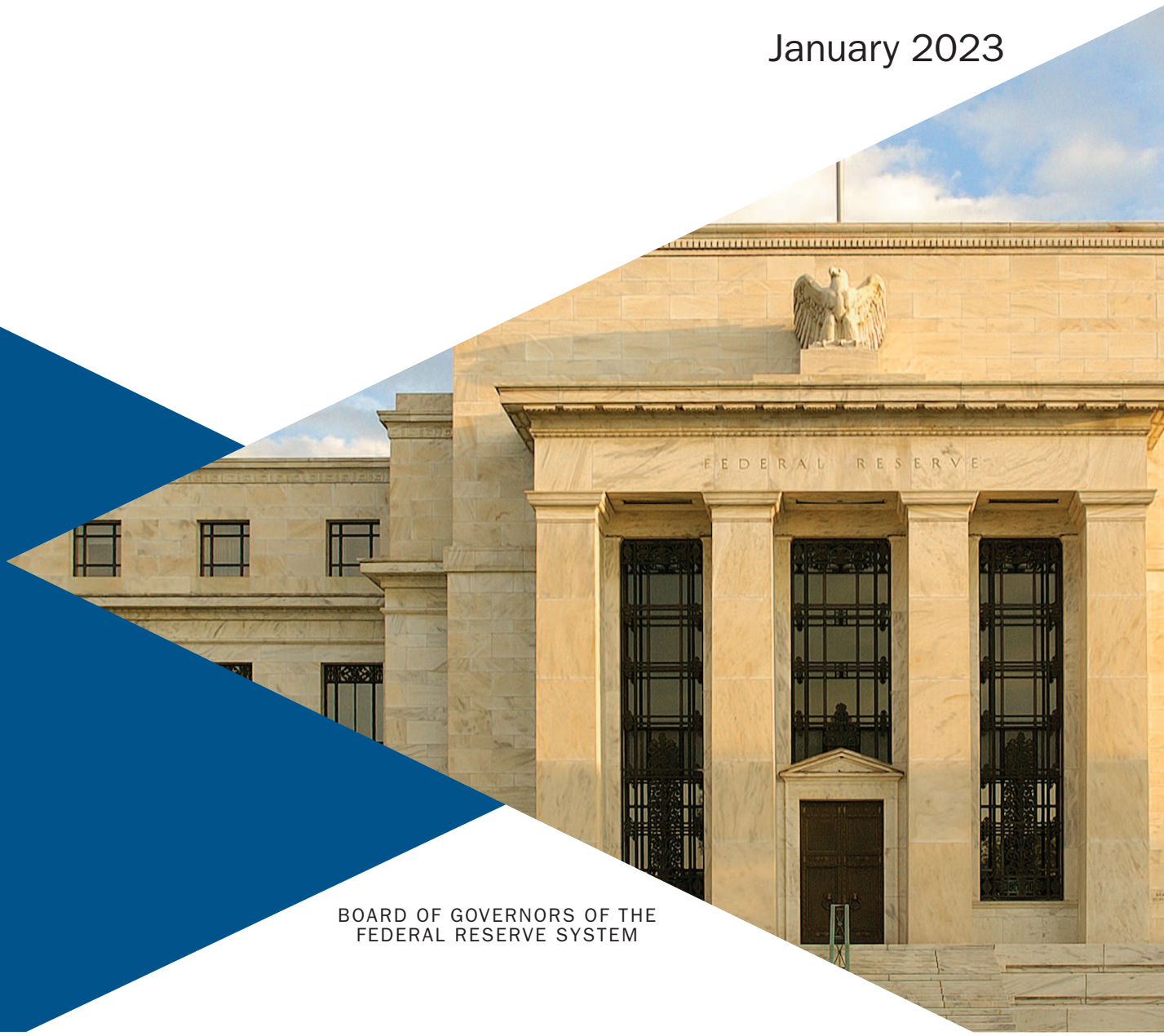
Pilot Climate Scenario Analysis Exercise

Participant Instructions

January 2023



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Preface

The Federal Reserve Board (Board) promotes a safe, sound, and efficient banking system that supports the U.S. economy through its supervision and regulation of banking organizations.

As part of its supervision efforts, the Board is conducting a pilot climate scenario analysis (CSA) exercise. This exercise has two primary objectives:

- learn about large banking organizations' climate risk-management practices and challenges; and
- enhance the ability of both large banking organizations and supervisors to identify, measure, monitor, and manage climate-related financial risks.

Climate scenario analysis—in which the resilience of financial institutions is reviewed under different climate scenarios—is an emerging risk-management and supervisory tool used to evaluate climate-related financial risks. By considering a range of possible future climate pathways and associated economic and financial developments, scenario analysis can help large banking organizations and supervisors understand climate-related financial risks.

These climate scenarios are neither forecasts nor policy prescriptions and do not necessarily represent the most likely future outcomes or a comprehensive set of possible outcomes. Rather, they represent a range of plausible future outcomes that can help build understanding of how certain climate-related financial risks could manifest for large banking organizations and how these risks may differ from the past.

The Board views climate scenario analyses as distinct and separate from regulatory stress tests. The Board's stress tests are designed to assess whether large banking organizations have enough capital to continue lending to households and businesses during a severe recession. The pilot CSA exercise, on the other hand, is exploratory in nature and does not have consequences for bank capital or supervisory implications.

See https://www.federalreserve.gov/publications/climate-scenario-analysis-exercise-instructions.htm for materials related to this exercise.

Abbreviations

BCBS	Basel Committee on Banking Supervision
BHC	Bank holding company
CRE	Commercial real estate
CSA	Climate scenario analysis
EAD	Exposure at default
EJ/year	Exajoules per year
FOIA	Freedom of Information Act
FSOC	Financial Stability Oversight Council
GDP	Gross domestic product
GHG	Greenhouse gas
IAM	Integrated assessment model
IIASA	International Institute for Applied Systems Analysis
IPCC	Intergovernmental Panel on Climate Change
LGD	Loss given default
MnToe	Million tons equivalent
NCA4	Fourth National Climate Assessment
NGFS	Network of Central Banks and Supervisors for Greening the Financial System
PD	Probability of default
RCP	Representative Concentration Pathway
RRG	Internal risk rating grade
SSP	Shared Socioeconomic Pathway
t/CO_2-e	Tons of CO_2-equivalent
USD	United States dollar
USGCRP	United States Global Change Research Program

Executive Summary

The Board is conducting a pilot CSA exercise to learn about large banking organizations' climate risk-management practices and challenges and to enhance the ability of both large banking organizations and supervisors to identify, measure, monitor, and manage climate-related financial risks.

To accomplish these objectives, the Board designed the pilot CSA exercise to gather qualitative and quantitative information about the climate risk-management practices of large banking organizations. Over the course of the exercise, the Board will engage with participants to understand their approaches and challenges with respect to the financial risks of climate change. Information collected and discussed with participants will include detailed documentation of governance and risk-management practices, measurement methodologies, data challenges and limitations, estimates of the potential impact on specific portfolios, and lessons learned from this exercise that could inform any future CSA exercises.

The pilot CSA exercise comprises two separate and independent modules: a physical risk module and a transition risk module. Physical risks represent the harm to people and property that may result from climate-related events, while transition risks represent stresses that may result from the transition to a lower carbon economy. Both can manifest as traditional prudential risks for large banking organizations.

For both the physical and transition risk modules, the Board will describe forward-looking scenarios to participating large banking organizations, including core climate, economic, and financial variables, where appropriate. In selecting scenarios for this exercise, the Board leveraged existing work conducted by the Intergovernmental Panel on Climate Change (IPCC) and the Network of Central Banks and Supervisors for Greening the Financial System (NGFS). The climate scenarios used in the CSA exercise are neither forecasts nor policy prescriptions. They do not necessarily represent the most likely future outcomes or a comprehensive set of possible outcomes. Rather, the pilot CSA exercise includes a range of plausible future outcomes that can help build understanding of how certain climate-related financial risks could manifest for large banking organizations and how these risks may differ from the past.

Participants will estimate the effect of these scenarios on a relevant subset of their loan portfolios over a future time horizon. For each loan, participants will calculate and report to the Board credit risk parameters, such as probability of default (PD), internal risk rating grade (RRG), and loss given default (LGD), as appropriate. Participants will respond to qualitative questions describing their governance, risk-management practices, measurement methodologies, results for specific portfo-

lios, and lessons learned. Focusing on changes to risk metrics like PD, RRG, and LGD, rather than on estimates of losses, will provide information about how the relative riskiness of exposures within participants' credit portfolios may evolve over time in response to different climate scenarios. Loss estimates would involve additional assumptions around the evolution of participants' balance sheets and business models and would be incomplete given the partial nature of the exercise, which focuses on specific regions and certain portfolios for six participants.

Six U.S. bank holding companies (BHCs) will participate in this pilot exercise: Bank of America Corporation; Citigroup Inc.; The Goldman Sachs Group, Inc.; JPMorgan Chase & Co.; Morgan Stanley; and Wells Fargo & Company. These six banking organizations will submit completed data templates, supporting documentation, and responses to qualitative questions to the Federal Reserve Board by July 31, 2023.

The Board anticipates publishing insights gained from this pilot exercise around the end of 2023. The Board expects to disclose aggregated information about how large banking organizations are incorporating climate-related financial risks into their existing risk-management frameworks. Consistent with the objectives and design of the pilot exercise, the Board does not plan to disclose quantitative estimates of potential losses resulting from the scenarios included in the pilot exercise. No firm-specific information will be released.

This pilot CSA exercise will support the Board's responsibilities to ensure that supervised institutions are appropriately managing all material risks, including financial risks related to climate change.

Overview of the Exercise

Climate Change and Large Banking Organizations

Climate change poses significant challenges for the global economy and financial system, with implications for the structure of the economy, the safety and soundness of financial institutions, and the stability of the financial sector more broadly.

Large banking organizations and the broader financial system are exposed to climate change through macroeconomic and microeconomic transmission channels associated with physical and transition risk drivers. Physical risks refer to the harm to people and property arising from acute, climate-related disaster events, such as hurricanes, wildfires, floods, heatwaves, and droughts as well as longer-term chronic phenomena, such as higher average temperatures, changes in precipitation patterns, sea-level rise, and ocean acidification. Transition risks refer to stresses to certain institutions, sectors, or regions arising from the shifts in policy, consumer and business sentiment, or technologies associated with the changes that would be part of a transition to a lower carbon economy.[1]

Figure 1 describes the transmission channels through which climate-related risk drivers could impact large banking organizations. Physical and transition risk drivers associated with climate change may affect households, communities, businesses, and governments through damages to property, shifts in business activity, or changes in the values of assets and liabilities.[2] These effects could manifest as traditional prudential risks to large banking organizations, including credit, market, operational, and liquidity risk. For example, an increase in the frequency of severe weather events could increase the credit risk of affected real estate portfolios. Similarly, a change in the industrial organization of the U.S. economy could alter the profitability of borrowers across a large banking organization's loan portfolio or lead to the repricing of financial assets.

Large banking organizations are increasingly focused on climate-related financial risks and are incorporating these risks into their risk-management frameworks. Conceptual and practical challenges, however, make it difficult to understand fully how climate-related financial risks may impact the financial condition of large banking organizations. Challenges include the forward-looking

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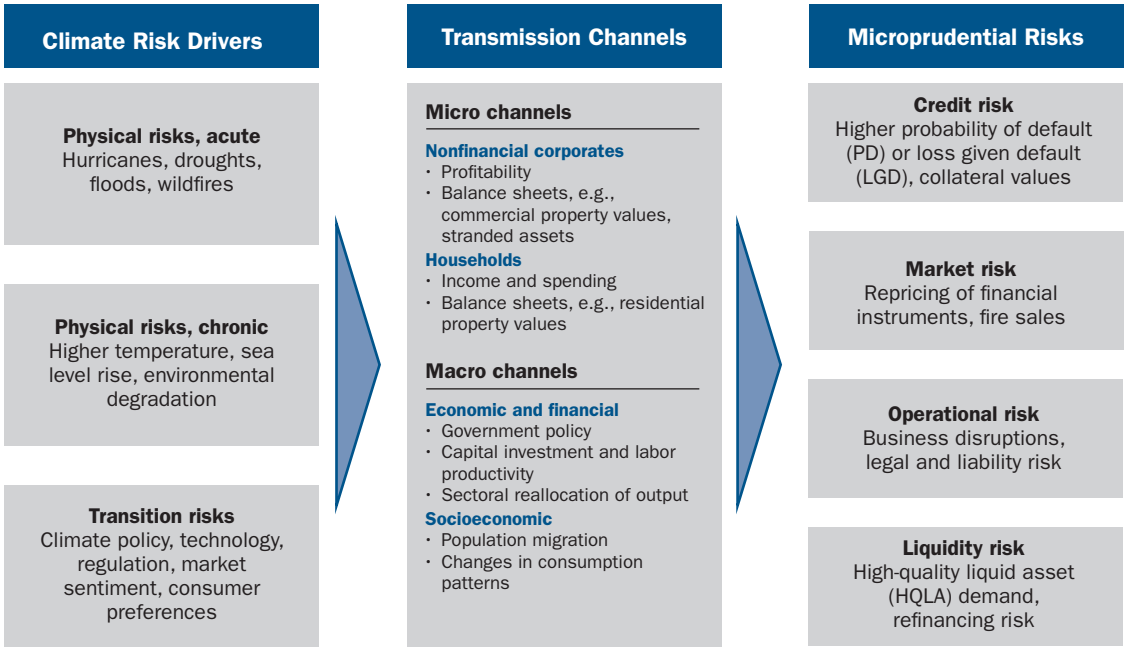
[1] Financial Stability Oversight Council, *Report on Climate-Related Financial Risk* (Washington: FSOC, 2021), https://home.treasury.gov/system/files/261/FSOC-Climate-Report.pdf.

[2] FSOC, *Report on Climate-Related Financial Risk*. See also Bank for International Settlements, Basel Committee on Banking Supervision, *Climate-Related Risk Drivers and Their Transmission Channels* (Basel: BIS, April 2021), https://www.bis.org/bcbs/publ/d517.pdf and *Climate-Related Financial Risks—Measurement Methodologies* (Basel: BIS, April 2021), https://www.bis.org/bcbs/publ/d518.pdf.

Figure 1. Climate risk drivers manifest as prudential risks

Climate risk drivers could bring about microprudential risks to supervised financial institutions. These risks may manifest through a variety of transmission channels.



Note: Examples are indicative and not exhaustive.

nature of climate risks and the lack of relevant historical data; complex feedback effects that are difficult to model; and uncertain links between climate change and economic and financial outcomes. There are also practical issues associated with the granularity of data needed to evaluate the vulnerabilities of a particular counterparty, sector, geography, or asset class; heterogeneity across both large banking organizations and borrowers; and the need to develop new models to measure risks at potentially longer time horizons than usual. These issues challenge existing risk-management and supervisory approaches and result in a high degree of uncertainty around the potential implications of climate risk drivers for large banking organizations. The pilot CSA exercise will provide insight into how participants are approaching and addressing these conceptual and practical challenges.

Exercise Design

The Board has designed the pilot CSA exercise to learn about large banking organizations' climate risk-management practices and to enhance the ability of large banking organizations and supervisors to identify, measure, monitor, and manage these risks. This approach will support the Board's responsibilities to ensure that supervised institutions are appropriately managing all material risks.

To achieve these objectives, the pilot CSA exercise considers several scenarios for climate risk drivers and asks participants to estimate the effect of those climate risk drivers on select portfolios. These climate scenarios are neither forecasts nor policy prescriptions and do not necessarily represent the most likely future outcomes or a comprehensive set of possible outcomes. Rather, they represent a range of plausible future outcomes that can help build understanding of how certain climate-related financial risks could manifest for large banking organizations and how these risks may differ from the past.

The pilot CSA exercise comprises two separate and independent modules: a physical risk module and a transition risk module. By separating these two types of climate-related financial risks, large banking organizations and supervisors will be able to better identify critical data, modeling, and risk-management components for each type of risk, although this approach does not capture potential interactions between physical and transition risks.

For each module, the Board will describe forward-looking physical or transition risk scenarios, including core climate, economic, and financial variables, where appropriate. Each participant will estimate the effect of these scenarios on a relevant subset of credit exposures. The physical risk module will focus on estimating the effect of specific scenarios on residential real estate and commercial real estate (CRE) loan portfolios over a one-year horizon in 2023. The transition risk module will focus on estimating the effect of specific scenarios on corporate loan and CRE loan portfolios over a 10-year horizon from 2023–32. The pilot CSA exercise will not include a review of the trading book.

For each loan, participants will calculate and report to the Board traditional credit risk parameters, such as PD, RRG, and LGD, under a range of scenarios. The pilot CSA exercise requires estimates of the same risk parameters under different scenarios and assumptions to better understand large banking organizations' risk-management approaches and the sensitivity of results to a range of potential outcomes.

For purposes of this pilot exercise, participants will assume that balance sheets remain static over the relevant projection horizon. This approach allows participants to focus on risk measurement, rather than on forecasting how business strategies and balance sheets could evolve over time.

Participants will submit to the Board supporting documentation and responses to qualitative questions describing their governance, risk-management practices, measurement methodologies, results, and lessons learned from this pilot exercise. Participants will also submit their climate-adjusted credit risk parameters for specific portfolios using standardized data templates. The Board will review qualitative and quantitative submissions and hold meetings with participants to

gain additional insight into large banking organizations' approaches and the challenges they face in evaluating climate-related financial risks.

Physical Risk Module

Physical risks refer to the harm to people and property arising from acute, climate-related disaster events, such as hurricanes, wildfires, floods, heatwaves, and droughts, and chronic shifts in climate, including higher average temperatures, changes in precipitation patterns, sea level rise, and ocean acidification.[3] The pace and severity of climate change is driven primarily by the world's cumulative greenhouse gas (GHG) emissions.[4]

As described in figure 1, physical risks can drive traditional prudential risks for large banking organizations. For example, an increase in the frequency or severity of extreme weather events could increase borrowers' financial stress and reduce their ability to repay or service debt. Similarly, an increase in the frequency or severity of extreme weather events could reduce a banking organization's ability to fully recover the value of a loan in the event of default.[5]

The Board's pilot CSA exercise leverages the IPCC's illustrative GHG concentration trajectories to better understand the resilience of participants' real estate credit portfolios to a range of physical risk events of varying severity. These GHG concentration trajectories represent a widely referenced set of projections about possible governmental policies and socioeconomic trends developed with input from domestic and international climate experts. These trajectories are considered plausible and illustrative scenarios, and they do not have probabilities attached to them. Using a common set of assumptions allows participants to focus on evaluating risks, rather than developing the trajectories themselves.

The pilot exercise specifies GHG concentration pathways as presented by the IPCC and brings forward potential future climate-related events from 2050 when the effects of physical risk drivers are likely to be more severe. This approach is designed to test the resilience of participants' current balance sheets to a range of potential future climate outcomes. The pilot exercise includes a common physical risk shock with varying levels of severity that applies to all participants and an idiosyncratic physical risk shock that each participant specifies based on the most material risks to its real estate portfolios. Finally, the pilot exercise considers the effect of insurance as a mitigant to potential losses. This approach captures some of the uncertainty in projecting climate-related outcomes.

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[3] FSOC, *Report on Climate-Related Financial Risk*.

[4] Intergovernmental Panel on Climate Change, *Climate Change 2021: The Physical Science Basis*, Contribution of Working Group I to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change, Summary for Policymakers (Cambridge: IPCC, August 2021), https://www.ipcc.ch/report/sixth-assessment-report-working-group-i/.

[5] BCBS, *Climate-Related Risk Drivers and Their Transmission Channels*.

Transition Risk Module

Transition risks refer to stresses to certain institutions or sectors arising from the shifts in policy, consumer and business sentiment, or technologies associated with the changes that would be part of a transition to a lower carbon economy.

As described in figure 1, these changes can lead to traditional prudential risks for large banking organizations. For example, changes in consumer sentiment or policy could impact a corporate borrower's production, sales, and profitability as demand shifts or costs change. Similarly, technological innovation could have heterogeneous impacts across sectors and borrowers that reflect, in part, a borrower's ability to adapt to new opportunities and challenges during an economic transition. Both types of changes could impact a corporate borrower's creditworthiness from a large banking organization's perspective.[6]

The Board's pilot CSA exercise leverages scenarios provided by the NGFS to consider potential climate-related outcomes. Using an existing and widely used set of scenarios allows participants to focus on evaluating the implications of the scenarios for their portfolios, rather than on developing the scenarios themselves. Use of existing scenarios, however, reduces the ability of large banking organizations and supervisors to tailor the scenarios to focus on risks that are most relevant to any given large banking organization.

The NGFS scenarios reflect different combinations of economic, technological, and policy assumptions that generate projections for economic and financial variables like GDP growth and carbon prices, but they do not represent forecasts or policy recommendations. Instead, these scenarios serve as useful reference points to consider how economic and financial variables might evolve under different sets of plausible conditions. By considering large banking organizations' performance across a consistent set of scenarios and a range of potential outcomes, supervisors and large banking organizations can gain insight into the resilience of large banking organizations to transition risks and the effectiveness of their risk-management practices.

[6] BCBS, *Climate-Related Risk Drivers and Their Transmission Channels*.

Summary of Design Elements

Tables 1 and 2 summarize key design elements of the physical risk and transition risk modules.

Table 1. General design elements of the pilot climate scenario analysis exercise

Element	Description
Risk drivers	Physical risks and transition risks modeled independently in separate modules
Estimation	Participants estimate loan-level results for select credit portfolios
Balance sheet assumption	Static
Key risk parameters	Probability of default (PD) and loss given default (LGD)
Bank submissions	Data templates, supporting documentation, and responses to qualitative questions
As-of date	December 31, 2022

Table 2. Module-specific elements of the pilot climate scenario analysis exercise

Element	Physical risk module	Transition risk module
Scenarios	Range of severity of shocks	NGFS: Current Policies and Net Zero 2050
Type of shock	Common hazard specified by the Federal Reserve Idiosyncratic hazard chosen by each participant	
Projection horizon	1 year: 2023	10 years: 2023–32
Loan portfolios	Residential real estate Commercial real estate	Corporate Commercial real estate
Potential mitigants	Insurance	Obligor transition capacity

General Instructions

Exercise Participants

Six U.S. BHCs will participate in this pilot exercise: Bank of America Corporation; Citigroup Inc.; The Goldman Sachs Group, Inc.; JPMorgan Chase & Co.; Morgan Stanley; and Wells Fargo & Company.

These large banking organizations have material corporate and real estate portfolios and have made significant investments in their climate-related, risk-management capacity.

For purposes of this document, these BHCs will be referred to as “large banking organizations” or “participants.”

Exercise Timeline

Participants should submit completed data templates, supporting documentation, and responses to qualitative questions to the Federal Reserve Board by Monday, July 31, 2023. The Board will review these submissions and hold individual supervisory meetings with participants.

The pilot exercise is expected to conclude around the end of 2023. The Board anticipates publishing at the conclusion of the exercise insights gained at an aggregate level, reflecting what has been learned about climate risk-management practices and how insights from scenario analysis will help identify potential risks and promote effective risk-management practices. The Board does not plan to disclose quantitative estimates of potential losses resulting from the scenarios. No firm-specific information will be released.

Model Risk Management

In general, large banking organizations should apply sound model risk-management principles to models that inform business decisions or otherwise could affect financial or operational conditions. The Federal Reserve Board's "Guidance on Model Risk Management" (SR letter 11-7) provides guidance on such principles.

Many large banking organizations are in the early stages of model development for their climate-related financial risk models. Moreover, forward-looking models such as those used for climate modeling can pose specific challenges from a model risk-management perspective, including for model validation. In such cases, large banking organizations may need to modify their model risk-management practices, may not be able to conduct certain activities, and/or may have to apply compensating controls.

In addition, this CSA exercise is a pilot exercise designed to build capacity. Unless participants also rely on a model used in this exercise for business-as-usual decisionmaking, or to assess risks on a regular basis, participants may use models that have not been fully integrated into their model risk-management framework, including those that have not yet been subject to comprehensive model validation. Examples of constraints include limited data or challenges in confirming model performance via outcomes analysis. The Board recognizes and accepts that these limitations may inhibit the application of certain principles for sound model risk management to models used in this pilot exercise.

Data Quality

Information submitted to the Board as part of this pilot CSA exercise must be prepared in good faith using reasonable efforts of the participant to conform with the instructions issued by the Board.

While the loan population and reporting instructions for this exercise in many instances mirror those of the FR Y-14 collection, the Board does not require that a participant's chief financial officer or equivalent senior officer sign a written attestation.

Rules of Consolidation

In general, refer to the FR Y-14 and FR Y-9C General Instructions for a discussion of the rules of consolidation.

Submissions

The Board will provide participants specific instructions on how to submit completed data templates, supporting documentation, and responses to qualitative questions.

Frequently Asked Questions (FAQs)

The Board will provide participants an email address through which they may submit questions. Over the course of the pilot exercise, the Board will make anonymized questions and generalized responses available to all participants. To promote transparency, the Board will also make FAQs available on its public website.

In general, participants should first refer to the FR Y-14Q and FR Y-14M instructions for questions about the data templates that are not addressed by this document.

Confidentiality

In general, information submitted to the Board as part of this exercise will be protected from disclosure pursuant to exemption 8 of the Freedom of Information Act (FOIA), 5 U.S.C. § 552(b)(8), which protects confidential supervisory information collected as part of the Board's supervisory process. Information submitted may also be protected by exemption 4 of the FOIA, 5 U.S.C. § 552(b)(4), which protects confidential commercial or financial information. This set of items includes, but is not limited to, completed data templates, supporting documentation, responses to qualitative questions, and other information participants may provide to the Board as part of this exercise. The Board may publish aggregated results from the exercise; firm-specific information will not be made public.

Physical Risk Module

The objective of the physical risk module is to build understanding of large banking organizations' climate risk-management practices and to enhance the ability of large banking organizations and supervisors to identify, measure, and manage the impact of acute physical risks. Estimates across multiple scenarios will show the sensitivity of results to risk drivers and assumptions.

Physical Risk Scenarios

IPCC's *Sixth Assessment Report* states that many changes in the climate system—including, but not limited to, increases in the frequency and intensity of hot extremes, marine heatwaves, heavy precipitation, cyclones, and droughts—become larger in direct relation to global warming caused by concentrations of GHGs in the atmosphere. As global warming increases, chronic changes in climate may also amplify the impact of extreme events. For example, continued sea level rise may increase the typical levels of storm surge associated with a hurricane of a given intensity. In addition, compound extreme events (separate extreme events affecting one location repeatedly or multiple locations simultaneously) that currently occur rarely may become more frequent, and there will be a higher likelihood that events with increased intensities, durations, frequencies, and/or spatial extents unprecedented in the observational record will occur.[7]

These types of changes in the climate could give rise to increased physical risks for large banking organizations. As described earlier and shown in figure 1 of "Overview of the Exercise," these physical risk drivers can increase traditional prudential risks for large banking organizations. For example, an increase in the frequency or severity of extreme weather events could contribute to borrowers' financial stress and reduce their ability to repay or service debt. Similarly, an increase in the frequency or severity of extreme weather events could reduce a large banking organization's ability to recover fully the value of a loan in the event of default.

Understanding the potential impact of physical risks on large banking organizations requires an assessment of the severity and pace of these physical changes. The IPCC reports that the magnitude of climate change in the next few decades, and the resultant physical impact, will depend primarily on the amount of GHGs emitted globally.[8] To gauge potential future climate conditions, the IPCC generates illustrative GHG concentration trajectories to characterize how the climate may

[7] IPCC, *Climate Change 2021: The Physical Science Basis*.
[8] IPCC, *Climate Change 2021: The Physical Science Basis*.

evolve under different mitigation and adaptation strategies.[9] These trajectories, or pathways, are considered plausible and illustrative scenarios, and do not have probabilities attached to them. The pilot CSA exercise leverages the IPCC's illustrative GHG concentration trajectories to consider the resilience of large banking organizations' real estate credit portfolios to a range of physical events of varying severity.

A fundamental challenge with understanding the impact of physical risks on large banking organizations is the uncertainty around the future frequency and severity of particular physical hazards.[10] For example, the severity of shocks will depend on the overall GHG emissions pathway, on the timing of the shock as climate change conditions worsen over time, and the characteristics of the particular event that is modeled.

To partially reflect this uncertainty, the pilot CSA exercise incorporates a range of potential physical risk shocks and mitigation assumptions, rather than focusing on a single shock. By specifying potential emission pathways and a future date for an extreme event, the pilot exercise brings forward potential future climate risks from 2050 when the effects of physical risk drivers are likely to become more severe.

Scenario Narratives

For the physical risk module, the pilot CSA exercise will focus on how acute physical risk drivers impact large banking organizations' real estate portfolios. The physical risk scenarios consider physical impacts based on a distribution of potential future physical shocks of different levels of severity for both a common and an idiosyncratic hazard. The scenarios also consider different degrees of risk mitigation related to insurance coverage.

The Federal Reserve will set the broad parameters around the severity of physical hazards by selecting a future point in time on specific Representative Concentration Pathways (RCP) or Shared Socioeconomic Pathways (SSP) presented by the IPCC and a specific return period loss. For example, a 100-year return period loss is a loss that has a 1 percent chance (1 in 100 years) of being equaled or exceeded in a given year.

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[9] In the most recent *Sixth Assessment Report*, IPCC uses five illustrative scenarios referred to as SSPx-y, where "SSPx" refers to the Shared Socio-economic Pathway or "SSP" describing the socioeconomic trends underlying the scenario, and "y" refers to the approximate level of radiative forcing resulting from the scenario in the year 2100. In earlier versions, IPCC used Representative Concentration Pathways or "RCPs" selected to have different targets in terms of radiative forcing at 2100. *See* IPCC, *Climate Change 2013: The Physical Science Basis*, contribution of Working Group I to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change (Cambridge: IPCC, September 2013), https://www.ipcc.ch/report/ar5/wg1/. See also IPCC, *Climate Change 2021: The Physical Science Basis* for details.

[10] Examples of physical hazards could include, but are not limited to, coastal flooding, drought, hurricane, wildfire, and heat wave.

Projecting hazards across multiple RCP/SSP pathways, return periods, and mitigation assumptions illustrates some of the uncertainty in climate projections and explores the sensitivity of results by providing a range of possible outcomes for each hazard.

The IPCC's *Sixth Assessment Report* concludes that global surface temperature will continue to increase until at least mid-century under all emissions scenarios considered and physical risk drivers are likely to become more severe. The physical risk module pulls forward potential future climate conditions along specific RCP/SSP pathways from 2050 to the present and considers the effects of those shocks on participants' current balance sheets.

Common Shock

The common shock component of the physical risk module considers participants' vulnerability to a severe hurricane (or a series of hurricanes) resulting in both storm surge and precipitation-induced flooding in the Northeast region of the United States, as defined by the Fourth National Climate Assessment (NCA4).[11] See table 3. The Northeast region was selected for the pilot CSA exercise because it is a region in which all participants have material commercial and residential real estate exposures as well as a region that could see an increase in the severity of shocks.[12]

Table 3. Composition of National Climate Assessment regions in NCA4

Region	Composition
Northeast	Connecticut, Delaware, Maine, Maryland, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, Vermont, West Virginia, District of Columbia
Southeast	Alabama, Arkansas, Florida, Georgia, Kentucky, Louisiana, Mississippi, North Carolina, South Carolina, Tennessee, Virginia
Caribbean	Puerto Rico, U.S. Virgin Islands
Midwest	Illinois, Indiana, Iowa, Michigan, Minnesota, Missouri, Ohio, Wisconsin
Northern Great Plains	Montana, Nebraska, North Dakota, South Dakota, Wyoming
Southern Great Plains	Kansas, Oklahoma, Texas
Northwest	Idaho, Oregon, Washington
Southwest	Arizona, California, Colorado, Nevada, New Mexico, Utah
Alaska	Alaska
Hawai'i and U.S. Pacific Islands	Hawai'i, Commonwealth of the Northern Mariana Islands, Federated States of Micronesia, Republic of the Marshall Islands, Republic of Palau, Territory of American Samoa, Territory of Guam

Source: Adapted from the United States Global Change Research Program (USGCRP).

Participants should estimate the impact of the common hazard for their residential and CRE exposures within the Northeast region across two different degrees of physical risk severity and with

[11] See USGCRP, *Climate Science Special Report: Fourth National Climate Assessment, Volume 1* (Washington: USGCRP, 2017), https://science2017.globalchange.gov/.

[12] See "Chapter 18: Northeast" of the NCA4, at USGCRP, *Impacts, Risks, and Adaptation in the United States: Fourth National Climate Assessment, Volume II* (Washington: USGCRP, 2018), https://nca2018.globalchange.gov/.

different insurance assumptions. Participants should document their assumptions about how the particular event impacts different areas within the Northeast region.

For each of the iterations, participants should consider climate conditions broadly consistent with possible future climate conditions in 2050 as characterized by a specified pathway. Participants may leverage either RCPs or newer SSPs.

Participants should select a severe hurricane event (or a series of events) in the Northeast region with the specified return period loss from these future climate conditions in year 2050, for example, a 100-year return period loss consistent with future climate conditions along an SSP or RCP path in year 2050. Participants should assume either existing insurance coverage or no insurance coverage as specified in the particular iteration.

Specifically, for the iterations of the common shock component, participants should estimate the impact of a hurricane event(s) within the Northeast region with the following characteristics:

1. Climate conditions broadly consistent with possible future climate conditions in 2050 as characterized by the **SSP2-4.5 (or RCP 4.5) pathways** with a **100-year return period loss**. Impact should be estimated **assuming insurance coverage** as of December 31, 2022, if any.
2. Climate conditions broadly consistent with possible future climate conditions in 2050 as characterized by the **SSP5-8.5 (or RCP 8.5) pathways** with a **200-year return period loss**. Impact should be estimated **assuming insurance coverage** as of December 31, 2022, if any.
3. Climate conditions broadly consistent with possible future climate conditions in 2050 as characterized by the **SSP5-8.5 (or RCP 8.5) pathways** with a **200-year return period loss**. Impact should be estimated **assuming no insurance coverage**.

To estimate the impact of the hurricane event(s) in 2050 across the three iterations above, participants may need to make additional assumptions around the state of climate and the related chronic physical features in 2050, including, but not limited to, an increase in surface temperatures, sea level rise, and precipitation levels.

Idiosyncratic Shock

For the idiosyncratic shock component, participants should select a hazard event (or a series of events) and one of the 10 geographic regions (table 3) included in the NCA4 based on materiality to their business models and exposures.

Participants should select a geographic region other than the Northeast region, which is used in the common shock component. Participants should provide a qualitative description and rationale

supporting the selection of the particular hazard and geographic region based on materiality for their real estate portfolios.

Participants should estimate the impact of the selected hazard for their residential real estate and CRE exposures within the selected geographic region across two different degrees of physical risk severity and with different insurance assumptions. Participants should document their assumptions about how the particular event impacts different areas within the selected region.

For each of the iterations, participants should consider climate conditions broadly consistent with possible future climate conditions in 2050 as characterized by a specified pathway. Participants may leverage either RCPs or newer SSPs.

Participants should select a hazard event (or series of events) with the specified return period loss from these future climate conditions in year 2050, for example, a 100-year return period loss consistent with future climate conditions along an SSP or RCP path in year 2050. Participants should assume either existing insurance coverage or no insurance coverage as specified in the particular iteration.

Specifically, for the three iterations of the idiosyncratic shock component, participants should select a hazard event (or series of events) with the following characteristics within a selected NCA region:

1. Climate conditions broadly consistent with possible future climate conditions in 2050 as characterized by the **SSP2-4.5 (or RCP 4.5) pathways** with a **100-year return period loss**. Impact should be estimated **assuming insurance coverage** as of December 31, 2022, if any.
2. Climate conditions broadly consistent with possible future climate conditions in 2050 as characterized by the **SSP5-8.5 (or RCP 8.5) pathways** with a **200-year return period loss**. Impact should be estimated **assuming insurance coverage** as of December 31, 2022, if any.
3. Climate conditions broadly consistent with possible future climate conditions in 2050 as characterized by the **SSP5-8.5 (or RCP 8.5) pathways** with a **200-year return period loss**. Impact should be estimated **assuming no insurance coverage**.

Similar to the common shock, participants should document all material assumptions they make around the design of the idiosyncratic hazards across all scenarios and assumptions around the state of climate and the related chronic physical features in 2050.

Summary of Physical Risk Shocks

Table 4 gives a summary of the six iterations of physical risk shocks considered in the pilot CSA exercise.

Table 4. Summary of physical risk shocks

Iteration	Severity			Impact		Mitigant
	Climate pathway	Return period loss	Year of shock	Hazard	Geography	Property insurance
Common shock						
1	SSP2-4.5/RCP 4.5	100-year	2050	Severe hurricane(s)	Northeast NCA region	Existing coverage
2	SSP5-8.5/RCP 8.5	200-year	2050	Severe hurricane(s)	Northeast NCA region	Existing coverage
3	SSP5-8.5/RCP 8.5	200-year	2050	Severe hurricane(s)	Northeast NCA region	No coverage
Idiosyncratic shock						
4	SSP2-4.5/RCP 4.5	100-year	2050	Participant chosen	Participant chosen NCA Region	Existing coverage
5	SSP5-8.5/RCP 8.5	200-year	2050	Participant chosen	Participant chosen NCA Region	Existing coverage
6	SSP5-8.5/RCP 8.5	200-year	2050	Participant chosen	Participant chosen NCA Region	No coverage

Credit Estimation Methodology

The evaluation of physical risk for the pilot CSA exercise will focus on physical hazards occurring in the United States in 2023: (1) a common hazard prescribed by the Federal Reserve, and (2) an idiosyncratic hazard that is selected by each participant.

Projection Horizon

The common and idiosyncratic shocks should be applied on January 1, 2023, to the relevant asset positions held by the participants on December 31, 2022. The analysis of physical risk will focus on a one-year projection horizon for risk parameters after the shock is realized. While climate hazards can occur any time throughout a year, this exercise assumes that each hazard occurs at the start of the year as a simplification and to allow for comparable estimates of a one-year impact.

Portfolios In-Scope

For the pilot CSA exercise, participants should estimate the impact of the common and idiosyncratic hazards on their directly held residential and CRE credit exposures, comprising in-scope lending exposures as reported in the FR Y-14M, Schedules A.1 (Domestic First Lien Closed-end 1-4 Family Residential Loans) and B.1 (Domestic Home Equity Loans and Home Equity Lines) and the FR Y-14Q, Schedule H.2 (CRE Loans) as of December 31, 2022. The physical risk module explores how these portfolios are impacted by physical risks through, for example, impacts to their collateral values. For the specific requirements defining the loan population for estimation and reporting, including any relevant exclusion criteria, see appendix C, "Data Templates."

Projection Granularity

Participants will provide loan- or facility-level projections for select risk parameters, as applicable. For portfolios in scope, participants should include projections for all loans or facilities collateralized by at least one property located in the relevant NCA region for the common and idiosyncratic hazards.

Descriptive detail for each loan and/or credit facility is currently collected in the relevant FR Y-14M and FR Y-14Q schedules. This includes, for example, geolocational information of residential property collateral, such as the property street address. The Federal Reserve will leverage the descriptive detail reported in these schedules as of December 31, 2022, to dimension the composition of participants' exposures and projections. For CRE facilities where this information is not currently collected, the Federal Reserve will supplement the existing FR Y-14Q CRE data by collecting additional data fields on facility collateral. These additional data fields should be viewed as a one-time data request and not an amendment to the regulatory reports. See appendix C, "Data Templates," for additional detail.

Direct and Indirect Impacts

Given the exploratory nature of this pilot exercise, the review will primarily focus on the direct impact of physical risks on credit risk. In addition to direct impacts, participants are encouraged, but not required, to incorporate indirect effects of the event where possible. Examples of indirect impacts could include, but are not limited to, impacts on the local economy, infrastructure, municipal debt, and supply chains. These effects, if any, should be documented and described qualitatively.

Mitigants

Financial safeguards such as effectively functioning insurance markets currently limit the credit risk large banking organizations face from climate-related physical risks in their real estate lending portfolios. To evaluate the sensitivity of the physical risk impact to insurance assumptions, the pilot CSA exercise considers two iterations of physical risk shock—one for the common and one for the idiosyncratic hazard—in which the credit impact of physical hazards is estimated assuming no public or private insurance coverage, including no coverage from the National Flood Insurance Program. If data gaps exist with respect to existing insurance coverage at the loan or facility level, participants should document any assumptions made.

For purposes of this pilot exercise, participants should assume no Disaster Declarations provided for in the Robert T. Stafford Disaster Relief and Emergency Assistance Act (as amended) are activated and no other additional government aid is provided for either the common or idiosyncratic

hazards.[13] This will provide insights into how participants measure the direct impact in a way that is independent of support assumptions.

Participants should not assume any changes in climate adaptation relative to current levels when assessing the impact of risk drivers from 2050 on current exposures.

Balance Sheet Approach

The physical risk module assumes an immediate physical shock to the December 31, 2022, balance sheet. Participants will report the impact on relevant credit metrics for each loan or facility on the balance sheet assuming the shock is realized on January 1, 2023.

Projected Risk Parameters

Participants should report best estimates of scenario-adjusted PD and LGD as of January 1, 2023, across the six scenario iterations for each loan or facility in the portfolios in scope. In addition, participants should report best estimates of the scenario-adjusted RRG for CRE exposures across both hazards and scenarios.

- **Probability of default.** The participant's best estimate of the long-run average one-year default rate for an exposure within a segment after adjusting for the realization of a hazard. PD projections should be consistent with the definition of the related PD estimate reported on the FR Y-14M, Schedule A.1, Field 125 for domestic first lien closed-end 1–4 family residential loans; the FR Y-14M, Schedule B.1, Field 103 for domestic home equity loans and lines; or the FR Y-14Q, Schedule H.2, Field 16 for CRE loans as of December 31, 2022.
- **Internal risk rating grade (CRE only).** The participant's single rating grade that reflects the exposure's PD projection for the same period. RRG projections should be consistent with the RRG used in estimating the PD reported on the FR Y-14Q, Schedule H.2, Field 16 for CRE loans as of December 31, 2022.
- **Loss given default.** The participant's best estimate of the economic loss it would expect to incur if the exposure within a segment were to default within a one-year horizon after adjusting for the realization of a hazard. LGD projections should be consistent with the definition of the related LGD estimate reported on the FR Y-14M, Schedule A.1, Field 126 for domestic first lien closed-end 1–4 family residential loans; the FR Y-14M, Schedule B.1, Field 104 for domestic home equity loans and lines; or the FR Y-14Q, Schedule H.2, Field 17 for CRE loans as of December 31, 2022.

The PD and LGD for both residential and CRE portfolios and RRG projections for CRE should be based on the ex-post realization of each of the hazards, rather than on the ex-ante probability of

[13] See, for example, Federal Emergency Management Agency, *Disaster Information* (Washington: FEMA, September 2021), https://www.fema.gov/disaster.

these hazards occurring. In other words, the initial PD, LGD, and RRG should be adjusted for the impact of the hazard.

If participants are considering indirect impacts of both or either of the hazards, these should be included in the best estimates of the scenario-adjusted PD, LGD, and RRG for each iteration and described qualitatively.

For segmenting residential real estate exposures, participants should continue to group exposures according to those segments identified as having homogeneous risk characteristics as reported on the FR Y-14M schedules as of December 31, 2022.

Participants are not required to estimate facilities' exposure at default (EAD) parameter. As such, projected PD and LGD parameters should correspond to participants' estimate of expected credit losses as a percentage of EAD for a given exposure (generally, the product of PD and LGD for non-defaulted obligors or segments of non-defaulted retail exposures), rather than the monetary value of expected credit losses for a given exposure (generally, the product of PD, LGD, and EAD for non-defaulted obligors or segments of non-defaulted retail exposures). Any qualitative adjustments or judgmental overlays to modeled estimates should be applied at the risk parameter level, and the impact of such adjustments should be quantified and documented.

Participants should report six sets of estimates for each credit risk parameter: three iterations for the common shock and three iterations for the idiosyncratic shock.

Transition Risk Module

The objective of the transition risk module is to build understanding of large banking organizations' current climate risk-management practices and to enhance the ability of large banking organizations and supervisors to identify, measure, and manage the impact of transition risks. Estimates across scenarios will also show the sensitivity of results to risk drivers and assumptions.

Transition Risk Scenarios

Transition risk drivers such as climate policies, technology development, and changing consumer and investor sentiment can impact large banking organizations' financial risks via microeconomic and macroeconomic transmission channels, as described in figure 1 of "Overview of the Exercise." Transition risk drivers can impact a large banking organization's credit risk through its obligors, notably households, corporates, and governments. Transition risk drivers can also impact a large banking organization's market risk through the value of its financial assets or of the underlying loan collateral. Through forward-looking approaches, scenario analysis helps large banking organizations and supervisors understand the range of path-dependent economic effects on obligors from transition risk drivers.[14]

The Federal Reserve leverages scenario narratives from the NGFS for the transition risk module of the pilot CSA exercise. The NGFS scenario narratives posit different economic outcomes that help illustrate how transition risks may evolve and their potential implications for financial institutions. The NGFS developed its climate scenarios to provide central banks and supervisors with a common starting point for analyzing climate risks under different future pathways. A number of financial authorities have used or adapted the NGFS scenarios for their climate scenario analysis exercises.[15]

The Federal Reserve's use of the NGFS scenarios aligns with the key objectives of the pilot exercise. Using an existing and widely used set of scenarios allows participants to focus on evaluating the implications of the scenarios for their portfolios, rather than on developing the scenarios themselves. Use of existing scenarios, however, reduces the ability of large banking organizations and supervisors to tailor the scenarios to risks that are most relevant to any individual large banking organization.

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[14] BCBS, *Climate-Related Risk Drivers and Their Transmission Channels*.

[15] Financial Stability Board, *Climate Scenario Analysis by Jurisdictions: Initial Findings and Lessons* (Basel: FSB, November 2022), https://www.fsb.org/wp-content/uploads/P151122.pdf.

These scenarios are neither forecasts nor policy prescriptions and do not necessarily represent the most likely future outcomes or a comprehensive set of possible outcomes. Rather, they represent a range of plausible future outcomes that can help build understanding of how certain climate-related financial risks could manifest for large banking organizations and how these risks may differ from the past.

The pilot CSA exercise leverages the most recent vintage of climate scenarios released by the NGFS in October 2022. Variable pathways from the NiGEM model begin in 2022. As a result, recent macroeconomic and financial conditions are not reflected in the transition risk scenarios used in the pilot exercise.

Scenario Narratives

For the transition risk module, the Federal Reserve has selected two scenarios from the Phase III vintage of climate scenarios from NGFS: Current Policies and Net Zero 2050.[16] The scenarios posit different policy designs, ambition levels, and patterns of technological change. The NGFS produces macroeconomic, financial, and transition variables consistent with each scenario narrative. These variables are available in the NGFS Scenarios Database hosted by the International Institute for Applied Systems Analysis (IIASA).[17]

The NGFS scenarios represent different levels of physical and transition risk. For this module of the pilot exercise, participants should use NGFS variable paths that only capture transition risks. Participants should consider physical risks separately in the physical risk module of the exercise.

For more information on the narratives and scenario variables, refer to the NGFS scenario overview and technical documentation.[18]

Current Policies

The NGFS Current Policies scenario assumes that all countries or regional groups preserve currently implemented policies and adopt no new policies, including those already announced, to abate emissions.[19] This scenario reports increases in GHG emissions until 2080 and an overall warming of 3°C by 2100.[20] Transition risks in the Current Policies scenario are minimal. For the

[16] See https://www.ngfs.net/en/communique-de-presse/ngfs-publishes-third-vintage-climate-scenarios-forward-looking-climate-risks-assessment.

[17] See https://data.ene.iiasa.ac.at/ngfs/.

[18] See https://www.ngfs.net/sites/default/files/medias/documents/ngfs_climate_scenarios_for_central_banks_and_supervisors_.pdf.pdf and https://www.ngfs.net/sites/default/files/media/2022/11/21/technical_documentation_ngfs_scenarios_phase_3.pdf.

[19] The NGFS Current Policies Scenario does not capture the provisions of the Inflation Reduction Act.

[20] Temperature increases are relative to pre-industrial observations, approximated by the period 1850–1900 (IPCC, 2021).

pilot CSA exercise, participants should use the Current Policies scenario as the applicable baseline scenario.[21]

Net Zero 2050

The NGFS Net Zero 2050 scenario limits global warming to around 1.5°C through stringent climate policies and innovation, reaching net zero CO_2 emissions around 2050. The scenario assumes that stringent climate policies are introduced immediately, and carbon prices increase over the time horizon of the exercise. The scenario involves some regional variation in policy stringency, but carbon prices are consistent across sectors within countries. The scenario involves a relatively rapid change in the technological landscape, including medium to high use of carbon dioxide removal technologies. In this scenario, the United States reaches net zero GHG emissions by around 2050. Transition risks are moderate in this scenario.

NGFS Scenario Variables

Scenario Variables

The NGFS developed its scenarios using three integrated assessment models (IAMs)[22]—GCAM, MESSAGEix-GLOBIOM, and REMIND-MAgPIE—and a macroeconomic model, NiGEM. The Federal Reserve has provided a subset of NGFS scenario variable projections from the REMIND-MAgPIE (REMIND) and NiGEM models for use by participants in estimating the impact of transition risks on select portfolios.[23]

The REMIND model is a general equilibrium model solved with an intertemporal optimization algorithm. The model produces endogenous projections for variables such as consumption, GDP, and demand for energy, allowing simulations of economic outcomes with and without transition policies.[24] The NiGEM model is an econometric model with key behavioral equations econometrically estimated using historical data. Variables from REMIND are in five-year time steps for the years 2020, 2025, 2030, and 2035. The NGFS reports variables from NiGEM at an annual frequency for years starting 2022. The Federal Reserve is providing NiGEM data through 2032. The Federal Reserve has provided this subset of NGFS variables in an Excel workbook named "Transition Risk—Scenario Data."

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[21] See appendix A, "NGFS Scenarios," for technical information on how to combine the baseline scenario with the other selected NGFS scenario.

[22] IAMs combine macroeconomic, agriculture and land-use, energy, water, and climate systems into a common numerical framework that enables the analysis of the complex and non-linear dynamics in and between these components. The models provide cost-effective transition pathways that aim to minimize energy- and land-use system costs subject to a range of scenario-varying constraints, such as temperature warming limits and techno-economic and policy assumptions.

[23] Specifically, REMIND-MAgPIE 3.0-4.4 and NiGEM NGFS v1.22 [REMIND-MAgPIE 3.0-4.4] vintages from the NGFS Phase III data release.

[24] MAgPIE is a partial equilibrium model of the agricultural sector, coupled to REMIND.

For more information on the modeling results available through the NGFS portal, see the NGFS technical documentation.[25] Participants may refer to the variable tables in appendix A, "NGFS Scenarios," for more detail on variable names. Section 3.4.2 in the NGFS technical documentation describes variable naming conventions. For further detail on naming conventions in the REMIND and NiGEM models, and on the methodology to convert variables from relative to absolute levels, refer to appendix A, "NGFS Scenarios."

Data Sources

The full suite of NGFS scenario variables is available in the NGFS Scenarios Database hosted by IIASA.[26] Participants should use variable paths from the NGFS Phase III data release for the appropriate scenario and version, such as the "Transition" version of the Net Zero 2050 scenario. Of the three IAM models presented, participants should use variables produced by NiGEM NGFS v1.22 [REMIND-MAgPIE 3.0-4.4] or the REMIND-MAgPIE 3.0-4.4 model. For further detail on NGFS scenario selection, refer to appendix A, "NGFS Scenarios."

The Federal Reserve understands that participants may not use all the variables provided in the scenario by the NGFS. Participants may transform the provided variables, or may expand to include additional variables, as appropriate. Participants should ensure that the paths of such additional or transformed variables are consistent with the respective scenario narratives and variables. For example, participants may downscale aggregate macroeconomic variables to the sector or industry level. Participants that perform scenario expansion should strive for internal consistency between downscaled variables and their aggregate, macroeconomic counterparts. Assumptions and methodologies used in transforming or expanding the scenario variables should be clearly documented.

NGFS Scenarios for the United States

This section describes select variables for the U.S. provided in the NGFS scenarios. As indicated earlier, these scenarios are neither forecasts nor policy prescriptions. Rather, they are hypothetical scenarios that are useful to gauge the potential impact of transition risk drivers on large banking organizations.

In the economic models leveraged by the NGFS, carbon prices are used as a proxy to represent the level of effort in mitigation policies; for example, the carbon price may refer to the rate of a carbon tax or the price of emissions permits.[27] REMIND estimates future carbon prices under different scenario specifications, with higher mitigation ambition translating to higher projected emissions prices (figure 2).

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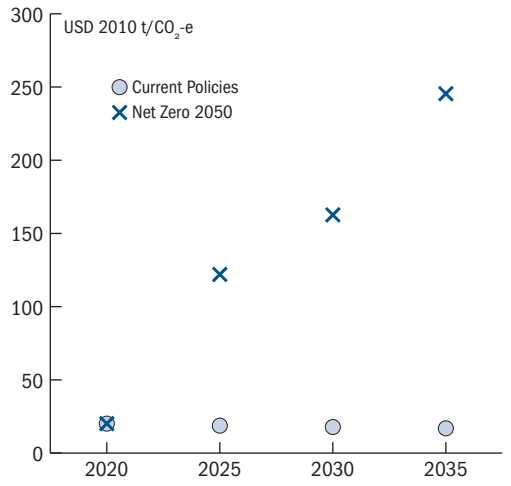
[25] See https://www.ngfs.net/sites/default/files/media/2022/11/21/technical_documentation_ngfs_scenarios_phase_3.pdf.

[26] See https://data.ene.iiasa.ac.at/ngfs/.

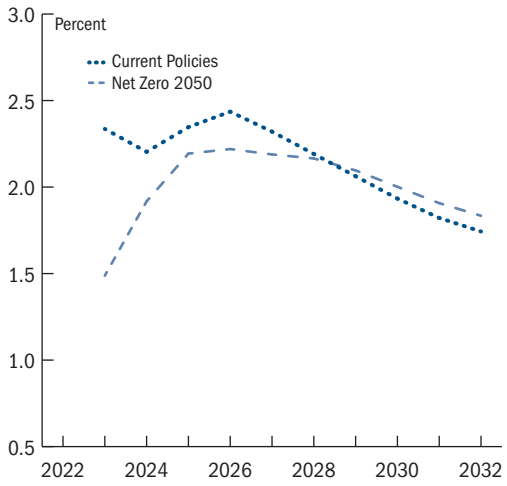
[27] The term "carbon prices" is used as a shorthand for pricing across all GHG emissions, measured in CO_2-equivalents.

Figure 2. NGFS projected U.S. carbon price, 2020–35



Source: NGFS (REMIND-MAgPIE).

Figure 3. NGFS projected U.S. GDP annual growth rate, 2023–32



Source: NGFS (NiGEM).

- In the Current Policies scenario, the U.S. carbon price remains at a constant value around $20 U.S. (2010) t/$CO_2$-e throughout the simulation.
- In the Net Zero 2050 scenario, the model projects a carbon price path for the U.S. that starts around $120 U.S. (2010) t/$CO_2$-e in 2025.

NGFS scenarios differ in the paths of their macroeconomic indicators, such as GDP, inflation, unemployment, and price indices. For example, as shown in figure 3, the U.S. GDP growth rate is lower in the Net Zero 2050 scenario than in the Current Policies scenario until 2029.

Credit Estimation Methodology

Using the NGFS scenarios, participants should estimate the effects of transition risk drivers on select credit portfolios. Specific instructions related to estimation methodologies are provided below.

Projection Horizon

Participants should estimate relevant risk parameters over a 10-year projection horizon on an annual basis. Transition risks are anticipated to manifest over a longer time horizon than is typically considered for large banking organizations' risk management and strategic planning,

although risks could manifest sooner than anticipated.[28] Projections over longer time horizons are inherently more uncertain, as they require assumptions about the behavior of economic agents, the pace of technological advancement, and policy developments. The 10-year projection horizon is intended to balance the likely longer-term nature of these risks, projection uncertainty, and capacity building in decision-useful, risk-management and measurement practices.

Participants should estimate projections using their positions as of December 31, 2022. As the Phase III NGFS macroeconomic variables from the NiGEM model begin in 2022, participants should view the year 2022 within the NGFS scenarios as projection "Year 1" for purposes of the pilot exercise, and participants should project the impact of the scenarios on select credit portfolios over the 10-year projection horizon.

Portfolios In-Scope

For the pilot exercise, participants should estimate the impacts of the scenarios on their wholesale credit exposures within the banking book, comprising the corporate and CRE lending exposures as reported in the FR Y-14Q, Schedules H.1 (Corporate Loan Data Schedule) and H.2 (CRE Schedule) as of December 31, 2022. Other exposures, such as retail credit, trading positions, or counterparty credit, are not in-scope. While these other exposures may face transition risks, wholesale credit exposures are anticipated to be most directly impacted by transition risks through impacts to obligor financial performance and collateral values, and efforts to develop measurement estimation methodologies have been focused on these exposures.[29] For the specific requirements defining the exposure population for estimation and reporting, including any relevant exclusion criteria, see appendix C, "Data Templates."

Projection Granularity

Participants should provide loan- or facility-level projections for select obligor- or facility-specific risk parameters, as appropriate. The Federal Reserve recognizes that industry measurement practices for transition risks continue to evolve and that large banking organizations are in various stages of developing their own credit estimation methodologies. The Federal Reserve anticipates that measurement approaches across segments of the exposure population may differ, and that participants may apply simplifying techniques to estimate risk parameter projections for certain segments. Participants applying these simplifying techniques should document a clear rationale for tiering the measurement approaches by segment, including (but not limited to) materiality of transition risk to these exposures.

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[28] For example, the FSOC has suggested that if these shifts were to occur "in a disorderly way owing to substantial delays in action or abrupt changes in policy, their impact on firms, market participants, individuals, and communities is likely to be more sudden and disruptive." See FSOC, *Report on Climate-Related Financial Risk*.

[29] See, for example, BCBS, *Climate-Related Risk Drivers and Their Transmission Channels* and BCBS, *Climate-Related Financial Risks—Measurement Methodologies*.

Descriptive detail for each loan and/or credit facility is currently collected in the relevant FR Y-14Q schedules. This includes, for example, industry code classification schemes for obligors. The Federal Reserve will leverage the descriptive detail reported in these schedules as of December 31, 2022, to dimension the composition of participants' exposures and projections. In certain limited cases where relevant descriptive information is not currently collected, the Federal Reserve will collect additional data fields to those included on the existing FR Y-14Q data. These additional data fields should be viewed as a one-time data request and not an amendment to the regulatory reports. See appendix C, "Data Templates," for additional detail.

Treatment of Obligor Transition Capacity

In projecting the impact of scenarios on obligor- or facility-specific risk parameters, participants may incorporate information about an obligor's forward-looking transition capacity within their estimation approaches. An obligor's capacity to adapt or respond to potential climate-related transitions of the economy may help mitigate the impact of transition risks on its financial performance or business model. Information regarding an obligor's transition capacity may be sourced from, for example, publicly available information, such as an obligor's transition strategy (conventionally known as a "transition plan") or other obligor-specific disclosures, or from internal risk-management processes, such as due diligence performed by credit officers. Participants that elect to incorporate obligors' transition capacity into their measurement approaches should document the source and assumptions related to an obligor's transition capacity, demonstrate a robust process to review and evaluate the credibility of those assumptions, and identify and quantify the effect of those assumptions.

Balance Sheet Approach

A key assumption in long, forward-looking scenario analyses pertains to the evolution of a large banking organization's balance sheet across the projection horizon. Static balance sheet assumptions hold the size and risk characteristics of the balance sheet constant over the projection horizon. This approach can build capacity around the measurement of potential risks by isolating the scenario impacts on measurements of PD and LGD for current exposures, but it does not take into account management actions that could help to mitigate the impact of transition risks. Dynamic balance sheet assumptions, by contrast, allow the balance sheet to evolve over the projection horizon in response to the normal maturing of a balance sheet and management actions anticipated in response to the evolution of the economy and the potential risks the large banking organization may face. A dynamic balance sheet approach could produce a more realistic estimate of losses that large banking organizations may face under various scenarios, but it could also obscure how risks could evolve for a given portfolio of exposures or business model.

For purposes of this pilot CSA exercise, participants should employ a static balance sheet approach. To isolate the impact to select obligor- or facility-specific risk parameters, participants

should hold constant the loan and/or facility characteristics of each exposure as of December 31, 2022. The Federal Reserve expects participants to hold constant the residual maturity of each exposure that is in effect at the as-of date across the projection horizon. In particular, exposures should not mature or amortize across the projection horizon, nor should callable features be exercised. Where time-to-maturity is deemed a relevant driver in the estimation of an exposure's risk parameter(s), participants should hold constant the loan payment schedule in effect as of December 31, 2022, and assume the time-to-maturity of the fixed schedule remains constant throughout the projection horizon.[30]

Individual exposures within the exposure population at the start of the exercise should remain within the reported exposure population throughout the duration of the exercise. If a participant estimates that an exposure's RRG transitions to the terminal rating grade associated with defaulted obligors (i.e., a PD of 100 percent), banks should continue to report the exposure within the loan population and fix future RRG (PD) projections at the terminal rating grade (100 percent) for the remainder of the exercise. That is, "defaulted" exposures should not be effectively written off and removed from the exposure universe.[31] Participants are not permitted to estimate transitions or cures out of default for the RRG or the PD parameters. However, participants may estimate recoveries within the LGD projections, if relevant.

Projected Risk Parameters

Participants will estimate the impact of the scenarios on select obligor- or facility-specific risk parameters for each year in the projection horizon. Specifically, participants should estimate the following risk parameters:

- **Probability of default.** For each projection year, the participant's best estimate of the long-run average one-year default rate for the rating grade estimated for the obligor for that year. PD projections should be consistent with the definition of the related PD estimate reported on the FR Y-14Q, Schedule H.1, Field 88 for corporate loans or on the FR Y-14Q, Schedule H.2, Field 16 for CRE loans as of December 31, 2022.[32]
- **Internal risk rating grade.** For each projection year, the participant's single rating grade that reflects the exposure's PD projection for the same period. RRG projections should be consistent with the RRG used in estimating the PD reported on the FR Y-14Q, Schedule H.1, Field 88 for

[30] While the maturity profile of a loan facility is an important risk-management tool, holding constant the residual maturity over the projection horizon will serve to isolate the transition risk of an obligor for a given maturity profile across the projection horizon.

[31] This importantly differs from the Credit Supply Maintenance approach described in the Board's Stress Testing Policy Statement (12 C.F.R. § 252, appendix B, 2.7), which assumes loans that mature or default are removed from the loan pool and replaced by loans that reflect the loan composition of the exercise at the as-of date.

[32] For corporate loans, participants may estimate the PD over the projection horizon using an alternative RRG associated with the primary repayment entity, such as for the guarantor, for an exposure, provided the participant had applied this entity's rating grade in the estimation of the exposure's PD as reported on the FR Y-14Q, Schedule H.1 as of December 31, 2022. The use of an RRG other than that of the obligor is typically associated with the PD substitution approach.

corporate loans or on the FR Y-14Q, Schedule H.2, Field 16 for CRE loans as of December 31, 2022. Participants should identify to which entity the RRG (and PD) estimate pertains, for example obligor, guarantor, or entity that is the primary source of repayment.[33]

- **Loss given default.** For each projection year, the participant's best estimate of the long-run default-weighted average economic loss it would expect to incur if the obligor were to default within a one-year horizon. LGD projections should be consistent with the definition of the related LGD estimate reported on the FR Y-14Q, Schedule H.1, Field 89 for corporate loans or on the FR Y-14Q, Schedule H.2, Field 17 for CRE loans as of December 31, 2022.

Participants are not required to estimate facilities' EAD parameter. As such, projected PD and LGD parameters should correspond to participants' estimate of expected credit losses as a percentage of EAD for a given exposure (generally, the product of PD and LGD for non-defaulted obligors), rather than the monetary value of expected credit losses for a given exposure (generally, the product of PD, LGD, and EAD for non-defaulted obligors). Any qualitative adjustments or judgmental overlays to modeled estimations should be applied at the risk parameter level, and the impact of such adjustments should be quantified and documented.

[33] For corporate loans, the reporting entity should also identify which RRG reported on the FR Y-14Q, Schedule H.1, as of December 31, 2022, corresponds to the PD estimate reported in Field 88. See appendix C, "Data Templates," for more details.

Appendix A: NGFS Scenarios

Baseline Naming Conventions and Conversion Methodology

The Federal Reserve has provided data from NGFS model simulations that assume no new GHG policies and no climatic disruption. Such variables derived from the NiGEM model are labeled as "Baseline" in the pilot CSA exercise. Variables from the REMIND-MAgPIE model are labeled as "Current Policies." Participants should treat these variables together as the base case against which to compare the transition effects reflected in the Net Zero 2050 scenario. For simplicity, the Federal Reserve may occasionally refer to this suite of variables as "Current Policies," recognizing that the relevant variables from NiGEM are known as "Baseline."

All scenario variables from REMIND are provided in levels, not as deviations from a base case. NiGEM provides its Baseline values in levels, but other variable values are expressed as deviations from Baseline values. For example, Baseline GDP is expressed in United States dollars (USD), and inflation and unemployment rates are in percentages. In other scenarios, some deviations from Baseline are in percentage differences, and some are in absolute differences. For example, in Net Zero 2050, the GDP variable is the deviation in percentage terms from Baseline GDP levels, and the inflation variable is the absolute deviation in percentage points from Baseline.

For more consistency across variables, the Federal Reserve has converted all the provided NiGEM scenario variables to levels.[34]

NiGEM Variables

All variables in table A.1 are from the NiGEM NGFS v1.22 [REMIND-MAgPIE 3.0-4.4] model.

All variables listed in the following table are provided for the following scenarios:

1. Baseline (NiGEM)
2. Net Zero 2050

[34] Computing levels for a given NiGEM variable and scenario, depending on the units of the Baseline variable, requires either multiplying the Baseline level with the pertinent percentage change relative to the Baseline plus one or adding the absolute change to the baseline level. For example, the GDP level in 2030 for the Net Zero 2050 scenario equals the GDP level in 2030 from the Baseline scenario times one plus the percentage change in GDP in 2030 from the Net Zero 2050 scenario, while the inflation rate in 2030 for the Net Zero 2050 scenario equals the inflation rate in 2030 from the Baseline scenario plus the absolute change in the inflation rate in 2030 from the Net Zero 2050 scenario.

In the data, variables for Net Zero 2050 scenario are appended with "Transition."[35] For example, in the baseline scenario the GDP is labeled as "NiGEM|Gross Domestic Product (GDP)"; its counterpart in the Net Zero 2050 scenario is labeled "NiGEM|Gross Domestic Product (GDP)|Transition." Further, the variables produced by the NiGEM NGFS v1.22 [REMIND-MAgPIE 3.0-4.4] model are prepended by "NiGEM" to specify that these variables are according to the NiGEM model definition.

Furthermore, in the data, each region is prepended by "NiGEM NGFS v1.22" which specifies that this region definition is also specific to the modeling framework.

Table A.1. NiGEM variables for Baseline and Net Zero 2050 by region

Variable	Unit
United States	
GDP	2012 prices; local currency (US$ Bn)
Real personal disposable income	2012 prices; local currency (US$ Bn)
Unemployment rate	%
Inflation rate	%
Central bank intervention rate (policy interest rate)	%
Long-term interest rate	%
Equity prices	index; 2017=100
House prices (residential)	index; 2012=100
Coal price	US$ per barrel (equiv)
Gas price	US$ per barrel (equiv)
Oil price	US$ per barrel
Quarterly consumption of coal	MnToe
Quarterly consumption of gas	MnToe
Quarterly consumption of oil	MnToe
Europe	
GDP	2015 prices; local currency (Euro Bn)
Inflation rate	%
Effective exchange rate	index; 2017=100
United Kingdom	
GDP	2019 prices; local currency (GBP Mn)
Inflation rate	%
Effective exchange rate	index; 2017=100
Japan	
GDP	2015 prices; local currency (Yen Bn)
Inflation rate	%
Effective exchange rate	index; 2017=100

[35] For each variable path provided from the NiGEM model, there are multiple variable options labeled "transition," "chronic physical," and "combined." This part of the exercise leverages the "transition" variables, which simulate the impact of transition risks only, thus excluding chronic physical and business confidence impacts.

REMIND Variables

All variables in table A.2 are from the REMIND-MAgPIE 3.0-4.4 model. Further, all variables are specific to the region "REMIND-MAgPIE 3.0-4.4|United States of America."

For more details (on variable names, units, etc.), refer to NGFS technical documentation and the IIASA scenarios portal.[36]

Table A.2. REMIND variables for Current Policies and Net Zero 2050 in the United States

Scenario	Variable	Unit
Current Policies	Price|Carbon	USD 2010 t/CO_2-e
Net Zero 2050	Price|Carbon	USD 2010 t/CO_2-e
Current Policies	Final Energy	EJ/yr
Net Zero 2050	Final Energy	EJ/yr

[36] See https://www.ngfs.net/sites/default/files/media/2022/11/21/technical_documentation_ngfs_scenarios_phase_3.pdf and https://data.ene.iiasa.ac.at/ngfs/.

Appendix B: Submission and Documentation Requirements

As part of the pilot CSA exercise, participants will submit completed data templates, supporting documentation, and responses to qualitative questions oriented around four primary areas: (1) governance and risk management, (2) measurement methodologies, (3) results, and (4) lessons learned and future plans.

Indicative qualitative questions for each of the four areas are provided below. More detailed questions and information related to submission materials and supporting documentation will be provided to participants through normal supervisory channels.

The Board will review participants' submissions, supporting documents, and responses and will also engage with participants to gain additional insight into participants' approaches and the challenges they face in evaluating climate-related financial risks. Further, the Board may request additional information, including responses to additional questions, at various points throughout the exercise.

1. **Governance and Risk Management.** This section will cover the participant's current governance and risk-management practices with respect to managing climate-related financial risks.
    - What governance practices were applied specifically for this exercise for the scenario analyses performed within the physical and transition risk modules?
    - What governance practices, if any, are in place more broadly to oversee the banking organization's management of climate-related financial risks?
    - What additional approaches or tools, if any, beyond scenario analysis does the banking organization use in business-as-usual risk management to measure and monitor climate-related financial risks?
    - How, if at all, does the banking organization identify and evaluate climate-related financial risks within its business-as-usual risk identification process?
    - How, if at all, does the banking organization currently use climate scenario analysis to inform business decisions?
2. **Measurement Methodologies.** This section will cover the approaches used in estimating results for each scenario within the physical and transition risk modules.
    - What quantitative and qualitative estimation methodologies were used to estimate the impacts of the physical and transition risk scenarios on the portfolios in scope?

- What key assumptions were used in deriving estimates and projections under each scenario?
- Were any management overlays or adjustments made to the estimates and projections under any of the scenarios and why?
- How were scenario variables transformed or interpolated for the transition risk module, if at all?
- How were the physical hazard and NCA region selected for the idiosyncratic physical risk scenario module?
- What challenges did the banking organization face in deriving estimates and projections for this exercise or completing the required data templates?

3. **Results.** This section will cover the exercise results from both the physical and transition risk modules.
   - Provide a narrative description of the results under each scenario.
4. **Lessons Learned and Future Plans.** This section will cover lessons learned from the pilot CSA exercise and the participant's forward-looking plans or strategies to manage and oversee climate-related financial risks.
   - What lessons were learned from this pilot CSA exercise?
   - What changes, if any, are planned to enhance the banking organization's ability to identify, measure, monitor, and manage potential climate-related financial risks?
   - How, if at all, does the banking organization expect to use climate scenario analysis to inform business decisions in the future?
   - What other approaches or considerations would the banking organization employ in any future climate scenario analysis exercises?

Appendix C: Data Templates

Physical Risk Module

General Instructions

The physical risk module consists of two data templates:

1. Physical Risk—Results Schedule, and
2. Physical Risk—Supplemental CRE Schedule.

The Physical Risk—Results Schedule collects projected loan-level risk parameters on residential real estate loans (first lien and home equity loan/line), and CRE credit facilities (table C.1). Each participant should report six versions of this schedule for each portfolio—one version for each iteration of the physical risk shock (three iterations for the common and three iterations for the idiosyncratic shock).

The Physical Risk—Supplemental CRE Schedule collects the physical street addresses of CRE properties that serve as collateral for CRE loans and other supplemental fields.

Loan Population

The loan population includes all loans and/or credit facilities reportable in the FR Y-14M, Schedule A.1—Domestic First Lien Closed-end 1–4 Family Residential Loan Schedule and Schedule B.1—Domestic Home Equity Loan and Home Equity Line Schedule that are directly held on the participant's portfolio as defined by the FR Y-14M Instructions, and in the FR Y-14Q, Schedule H.2—Commercial Real Estate Loan Schedule. For each of the six iterations of the physical risk shock, participants should report all loans or facilities in this loan population that are located within the relevant NCA region considered for each hazard.

Projections

The Physical Risk—Results Schedule collects data for a one-year projection horizon. Participants should only report one risk parameter estimate for each loan for each version.

Table C.1. Physical Risk—results schedule

Item	Field name	Description	Allowed values
1	Loan number	Report an identifier for a loan or credit facility that will be the same from month to month. A reference number may be used in lieu of actual loan or facility numbers as long as it meets these criteria. This identifier must uniquely identify any loan or facility in the file, as appropriate. It must identify the loan or facility for its entire life and must be unique (piggy-backs should be separated). Each unique internal identifier must correspond to a unique internal identifier on either the FR Y-14M, Schedule A.1, Field 1 for Domestic First Lien Closed-end 1-4 Family Residential Loans, the FR Y-14M, Schedule B.1, Field 1 for Home Equity Loans and Home Equity Lines, or the FR Y-14Q, Schedule H.2, Field 1 for CRE facilities. See FR Y-14 instructions for more details.	A contributor-defined alphanumeric value up to 50 characters. Must be unique within a submission and over time. That is, the same submission file must not have two loans or facilities with the same loan or facility identifier. May not contain a carriage return, line feed, comma, or any unprintable character.
2	Internal risk rating projection	For CRE loans (reportable on FR Y-14Q, Schedule H.2) only, report the estimated internal risk rating grade that corresponds to the credit facility's probability of default projection for the same period. For non-CRE loans, leave this field blank.	Free text indicating the internal risk rating grade projection. Internal risk rating must be consistent with FR Y-14Q, Schedule H.4 (Internal Risk Rating Schedule), Field 1.
3	Probability of default (PD) projection	Report the PD projection for the loan or credit facility. For Domestic First Lien Closed-end 1–4 Family Residential Loans, Domestic Home Equity Loans, and Home Equity Lines, report the PD projections associated with the account's corresponding segment. For CRE facilities, report the PD projections for the credit facility.	Express as a decimal to four decimal places, e.g., 0.05 percent is 0.0005; 100 percent is 1. Use decimal format; do not use scientific notation.
4	Loss given default (LGD) projection	Report the LGD projection for the loan or credit facility. For Domestic First Lien Closed-end 1-4 Family Residential Loans, Domestic Home Equity Loans, and Home Equity Lines, report the LGD projections associated with the account's corresponding segment. For CRE facilities, if the credit facility includes multiple loans with different LGD projections, report a weighted average LGD that approximates the overall LGD on the committed balance of the credit facility using the dollar weights in effect on the as-of date, consistent with weighting requirement for FR Y-14Q, Schedule H.2, Field 17.	Express as a decimal to four decimal places, e.g., 0.05 percent is 0.0005; 100 percent is 1. Use decimal format; do not use scientific notation.

Supplemental CRE Schedule

The Physical Risk—Supplemental CRE Schedule collects the physical street address, city, state, and zip code of CRE properties that serve as collateral for CRE facilities (table C.2). Participants should report this information for all CRE properties that serve as collateral for any CRE facility having at least one property within the NCA region considered for each hazard. Where a CRE facility is collateralized by a single property, report the information for that property. Where a CRE facility is collateralized by more than one property, report property-level addresses for all properties in the facility, including those properties located outside the relevant NCA region. This schedule also collects property type and property current value for CRE facilities collateralized by more than one property.

Table C.2. Physical Risk—supplemental CRE schedule

Item	Field name	Description	Allowed values
1	Loan number	Report an internal identifier for this credit facility record as of the most recent filing date. It must identify the credit facility for its entire life and must be unique. Each unique internal identifier must correspond to a unique internal identifier on the Physical Risk—Results Schedule.	A contributor-defined alphanumeric value up to 50 characters. Must be unique within a submission and over time. That is, the same submission file must not have two facilities with the same credit facility identifier. May not contain a carriage return, line feed, comma, or any unprintable character.
2	Property number	Where a CRE facility is secured by a single property, report 1. Where a CRE facility is secured by more than one property, report a unique ordinal number for the property corresponding to each set of address fields. The largest property number for a facility should be equal to the total number of properties securing the facility. For example, if a CRE facility is secured by three properties with different physical addresses, then a participant should report three observations with the same loan number. Each observation will have a different property number (1, 2, or 3) and will specify a different physical address for the corresponding property.	Integer
3	Property street address	Report the street address associated with the property. Must include street direction prefixes and direction suffixes.	Text (100)
4	Property city	Report the city in which the property is located (not the mailing city of the borrower).	Text (50)
5	Property state	Report the state in which the property is located (not the mailing state of the borrower).	Character (2)
6	Property zip code	Report the nine-digit ZIP code of the property or five-digit ZIP code if nine-digit is not available (not the mailing ZIP code of the borrower). Note: Provide the zip code as nine digits when available.	Character (9) Five-digit or nine-digit number. Include leading zeroes with no dashes (e.g., 00901, 101015271).

(continued)

Table C.2—*continued*

Item	Field name	Description	Allowed values
7	Property type	For individual loan facilities secured by multiple properties (having a property number greater than 1 in field 2), report the property type for the property associated in the property street address field (field 3). For individual loan facilities secured by a single property (having a property number of 1 in field 2), leave this field blank. The value for this field will be derived from the FR Y-14Q, Schedule H.2, Field 9.	1. Retail 2. Industrial 3. Hotel/hospitality/gaming (including resorts) 4. Multifamily for rent (including low income housing) 5. Homebuilders except condo 6. Condo/co-op 7. Office (including medical office) 8. Mixed 9. Land and lot development 10. Other 11. Healthcare (including hospitals, assisted living, memory care, and skilled nursing) 12. Warehouse/distribution
8	Current value	For individual loan facilities secured by multiple properties (having a property number greater than 1 in field 2), report the most recent value of the property associated in the property street address field (field 3), which may be either from an appraisal or an independent evaluation depending on legal (12 C.F.R. § 34) and bank policy requirements. In cases of cross-collateralization, provide the property value as adjusted for prorated participations. The sum of all property current value fields for individual properties securing a loan or credit facility should equal the value on the FR Y-14Q, Schedule H.2, Field 42 for the loan or credit facility. For individual loan facilities secured by a single property (having a property number of 1 in field 2), leave this field blank. The value for this field will be derived from the FR Y-14Q, Schedule H.2, Field 42.	Rounded whole dollar amount with no cents, e.g., 20000000 Supply numeric values without any non-numeric formatting, such as dollar signs, commas, or decimals.

Transition Risk Module

General Instructions

The transition risk module consists of two data templates:

1. Transition Risk—Results Schedule, and
2. Transition Risk—Supplemental Industry Code Schedule.

The Transition Risk—Results Schedule collects loan level results on corporate and CRE loans and leases (table C.3). The participant should submit one version of the Transition Risk—Results Schedule for each scenario and each portfolio (corporate and CRE).

The Transition Risk—Supplemental Industry Code Schedule collects the industry code of credit facility guarantors.

Loan Population

The loan population includes all loans reportable in the FR Y-14Q, Schedule H.1—Corporate Loan Data Schedule, and the FR Y-14Q, Schedule H.2—Commercial Real Estate Schedule, excluding any credit facility reported as disposed at the as-of date. Excluded facilities correspond to Disposition Flag options 1 through 7 on FR Y-14Q, Schedule H.1, Field 98, or FR Y-14Q, Schedule H.2, Field 61.

Projections for the population of loans should be reported at the credit facility level, consistent with the FR Y-14Q Instructions. See FR Y-14Q Instructions for reporting requirements.

Projections

The Transition Risk—Results Schedule collects data on a "projection horizon." The projection horizon refers to the 10 annual projection periods starting with the first year following the as-of date.

Table C.3. Transition Risk—results schedule

Item	Field name	Description	Allowed values
1	Internal credit facility ID/loan number	Report the reporting entity's unique internal identifier for the credit facility record. It must identify the credit facility for its entire life and must be unique. Each unique internal identifier must correspond to a unique internal identifier on the FR Y-14Q, Schedule H.1, item 15 (Internal Credit Facility ID), or FR Y-14Q, Schedule H.2, item 1 (Loan Number). See FR Y-14Q instructions for more details.	A contributor-defined, alphanumeric value up to 32 characters. Must be unique within a submission and over time. That is, the same submission file must not have two facilities with the same credit facility ID. May not contain a carriage return, line feed, comma, or any unprintable character.
2	Internal risk rating type	For corporate loans only, report the entity type for the internal risk rating grade reported in item 3. Option 1 (Obligor): the obligor risk rating (FR Y-14Q, Schedule H.1, Field 10) Option 2 (Guarantor): the guarantor internal risk rating (FR Y-14Q, Schedule H.1, Field 48) Option 3 (Entity): the entity that is the primary source of repayment for the facility (FR Y-14Q, Schedule H.1, Field 51)	1. Obligor 2. Guarantor 3. Entity
3	Internal risk rating projection	Report the estimated internal risk rating grade that corresponds to the credit facility's probability of default projection for the same period. For corporate loans, the rating grade should correspond to the entity whose PD is projected for the credit facility (obligor, guarantor, or entity that is the primary source of repayment).	Free text indicating the internal risk rating grade projection. Internal Rating must be consistent with FR Y-14Q, Schedule H.4 (Internal Risk Rating Schedule), Field 1.
4	Probability of default (PD) projection	Report the PD projection for the credit facility.	Express as a decimal to four decimal places, e.g., 0.05 percent is 0.0005; 100 percent is 1. Use decimal format; do not use scientific notation.
5	Loss given default (LGD) projection	Report the LGD projection for the credit facility. If the credit facility includes multiple loans with different LGD projections, report a weighted average LGD that approximates the overall LGD on the committed balance of the credit facility using the dollar weights in effect on the as of date, consistent with weighting requirement for FR Y-14Q, Schedule H.1, Field 89, or FR Y-14Q, Schedule H.2, Field 17.	Express as a decimal to four decimal places, e.g., 0.05 percent is 0.0005; 100 percent is 1. Use decimal format; do not use scientific notation.

Supplemental Industry Code Schedule

The Transition Risk—Supplemental Industry Code Schedule should be submitted for all corporate or CRE loans reportable on the Transition Risk—Results Schedule that report option 2 (Guarantor) in Schedule C.3, Item 2 (Internal Risk Rating Type). See table C.4.

Table C.4. Transition Risk—supplemental industry code schedule

Item	Field name	Description	Allowed values
1	Internal credit facility ID/loan number	Report an internal identifier for the credit facility record. It must identify the credit facility for its entire life and must be unique. Each unique internal identifier must correspond to a unique internal identifier on the Transition Risk—Results Schedule.	A contributor-defined alphanumeric value up to 50 characters. Must be unique within a submission and over time. That is, the same submission file must not have two facilities with the same credit facility identifier. May not contain a carriage return, line feed, comma, or any unprintable character.
2	Guarantor industry code	Report the numeric code that describes the primary business activity of the entity identified in FR Y-14Q, Schedule H.1, Field 45 according to the North American Industry Classification System (NAICS). If the NAICS code is not available, provide either the Standard Industrial Classification (SIC), or Global Industry Classification Standard (GICS). If the entity identified in Field 45 is an individual, the industry code should be consistent with the industry in which the commercial purpose of the loan operates. If the business or individual operates in multiple industries, the BHC should report the industry that best represents the commercial risk of the loan (i.e., the predominant industry).	Report four-to-six digit number. If this code is not available, then provide a SIC or GICS industry code.
3	Industry code type	Select the type of industry code identification scheme used in field 2.	1. NAICS 2. SIC 3. GICS

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