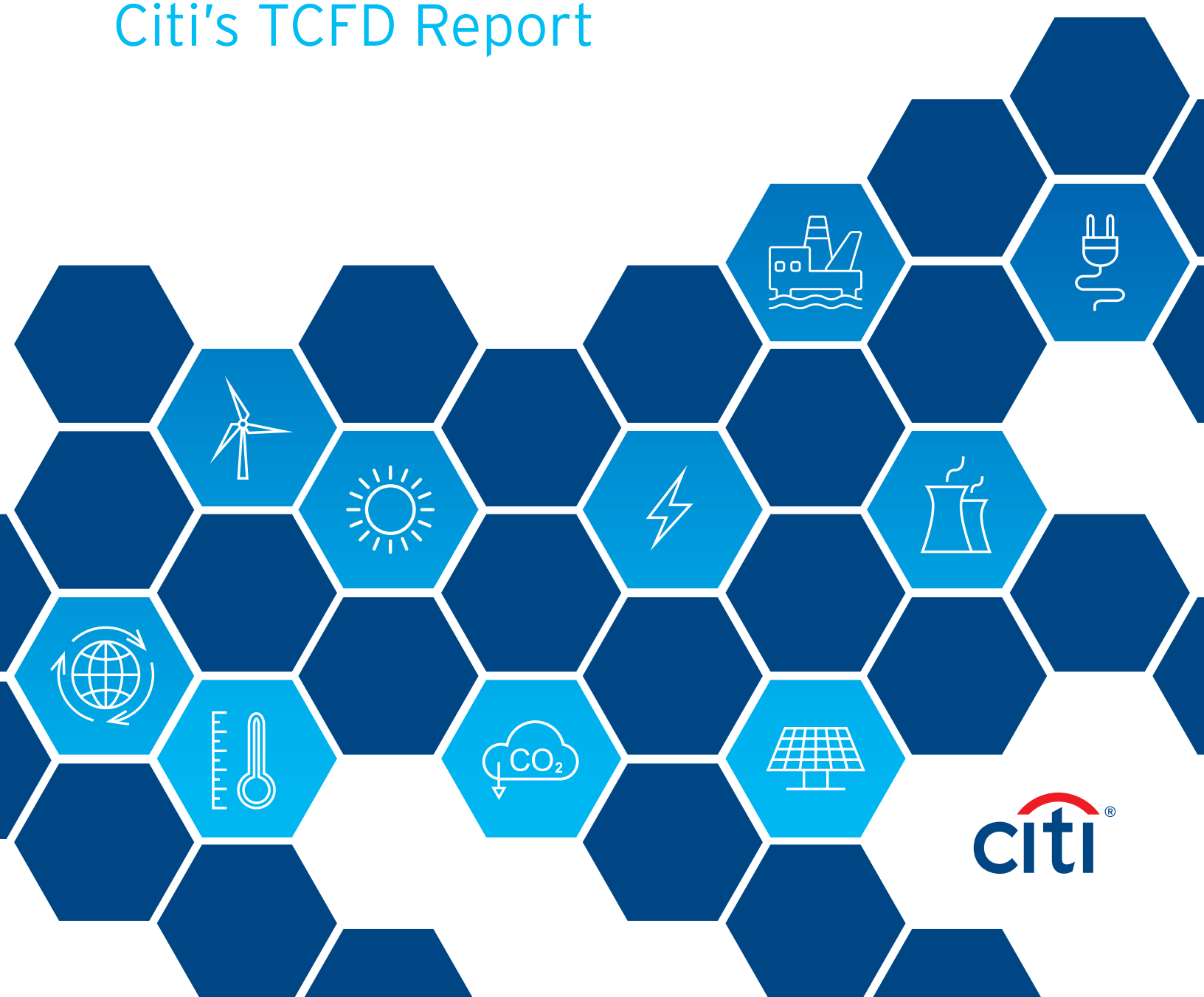
Finance for a Climate-Resilient Future

Citi's TCFD Report



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About This Report

This report presents information on Citi's business and operational climate performance and efforts towards implementing the Task Force on Climate-related Financial Disclosures (TCFD) recommendations, including the climate scenario analyses that Citi undertook as part of the UN Environment Finance Initiative (UNEP FI) Banking Sector Pilot Project alongside 15 other financial institutions.

This report is just the beginning of our journey to incorporate climate scenario analysis into our overall strategy and reporting. Climate scenario analysis is a new area for many companies, including Citi, and we expect the methodology and tools to conduct climate scenario analysis to evolve and improve over time. This report represents an important first step upon which we will build to deepen our understanding of climate risks and opportunities.

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SECTION 1:

Introduction

Climate change is one of the most critical issues facing society today. As detailed in the latest Intergovernmental Panel on Climate Change (IPCC) Special Report, *Global Warming of 1.5°C*, climate change is already affecting many industries and regions globally, and the related impacts are only expected to increase.

Sustainability — including efforts to address climate risks — is a factor in how we do business to support growth and enable progress. Combating climate change is one of the main themes of our five-year **Sustainable Progress Strategy** that sets out business drivers for sustainability. Under Citi's Sustainable Progress Strategy, our sustainability activities are organized under three primary pillars, each of which relates directly to our efforts on climate change:

- Environmental Finance
- Environmental and Social Risk Management
- Operations and Supply Chain

Our work across these pillars is interrelated, and we look for innovations and best practices that can drive cross-functional progress.

Stakeholder engagement and reporting have long been central to our sustainability efforts, and we will continue to emphasize transparency and open engagement with clients, investors, suppliers, employees and stakeholders as the foundation of our sustainability strategy, including as that strategy relates to climate change.

Citi's participation in the United Nation Environment Finance Initiative (UNEP FI) pilot, and this resulting report, are an important part of our efforts to enhance transparency and engagement with investors as we evaluate different approaches to climate risk assessment and the sensitivity of our lending portfolios to potential climate risks. While the efforts described in this report represent only an initial sensitivity analysis — which was useful as much for the gaps it identified as for the resulting outputs — we have prepared this report as a part of Citi's commitment to ongoing transparency in the evaluation of sustainability issues, including climate risks and opportunities.

Citi's Support of the Paris Agreement

In 2007, the IPCC, a scientific and intergovernmental body established by the United Nations and tasked with providing an objective, scientific view of climate change, concluded that the impacts of climate change could be catastrophic if the world's average temperature continues to rise as projected. In December 2015, 195 countries, including the U.S., entered into the Paris Agreement, a global agreement to reduce emissions that have an impact on the climate. The countries agreed, among other things, that the increase in global temperature this century should be kept below 2°C above pre-industrial levels and to pursue efforts to limit the temperature increase to 1.5°C.

Citi has been outspoken in our support of the Paris Agreement. In May 2017, Citi CEO Michael Corbat, along with his counterparts in 30 other large companies, signed an **open letter** to the U.S. President that laid out the business case for the Paris Agreement. Even

though the U.S. announced it would be withdrawing from the Paris Agreement, we signed the "We Are Still In" declaration and continue to voice our support for the global agreement due to the unique and widespread risks that climate change presents to society and to the global economy. We believe that U.S. participation in the Paris Agreement would strengthen American competitiveness in global markets, create jobs and support investments and new market development by setting clear, long-term goals.

Citi remains fully committed to contributing to climate change solutions and global collaboration, and the Paris Agreement will remain a guiding framework for Citi's public and private sector activities around the world. We recognize that adhering to the Paris Agreement's goal of limiting global temperature increase may lead to more stringent policies and may affect certain sectors of the economy disproportionately. At the same time, this transition from the status quo to a low-carbon economy will create profitable business opportunities for many organizations, including for banks like Citi. For example, environmental non-governmental organization Ceres expects that the transition to a low carbon economy "will generate tens of trillions of dollars of clean energy investment opportunities over the decades to come." Citi plans to be an active participant in this transition. In 2015, we announced our $100 Billion Environmental Finance Goal to finance and facilitate $100 billion in investments toward environmental and climate change solutions including clean energy, infrastructure and technology.

Task Force on Climate-related Financial Disclosures

In December 2015, the G20's Financial Stability Board (FSB) appointed the Task Force on Climate-related Financial Disclosures (TCFD) to recommend a reporting framework for use by companies to provide investors and other stakeholders with information relevant to evaluating climate-related risks and opportunities. The FSB's purpose in creating the TCFD was to generate greater understanding among stakeholders in the financial sector regarding the potential effects of climate change on global economic systems through enhanced disclosures. In developing its recommendations, the TCFD solicited and received input from various stakeholders, including financial institutions. Citi was one of many stakeholders that engaged with the TCFD during its public consultation process.

In June 2017, the TCFD presented its **final recommendations** for voluntary climate-related financial disclosures. The recommendations included industry-specific guidance for the financial services industry as well as for other sectors. The goals of these recommendations are to provide disclosures that are consistent, comparable, reliable, clear and efficient, and that provide useful information to lenders, insurers, investors and regulators to support good decision-making. Citi CEO Michael Corbat, along with over 100 other company heads, signed a **statement of support** for the recommendations.

The TCFD recommendations separate climate risks and opportunities into two general categories — transition and physical — and recommend that companies undertake climate scenario analysis, as described in more detail within this report, to better understand and account for potential risks and opportunities under each category. The TCFD defines transition risks and opportunities as those risks and opportunities that relate to technological innovations, policy changes, carbon pricing, and other factors in the transition to a low-carbon future. Under the TCFD framework, physical risk analysis is intended to address the direct impacts of climate change, which include acute extreme weather events or chronic changes to climate that could affect companies' businesses. TCFD's discussion of physical opportunities includes the ability to provide a variety of services, including financing and resilience planning, to mitigate exposure to physical climate risks.

The TCFD recommends that companies consider addressing four core categories of climate disclosure:

Governance
The organization's governance around climate-related risks and opportunities

Strategy
The actual and potential impacts of climate-related risks and opportunities on the organization's business, strategy and financial planning

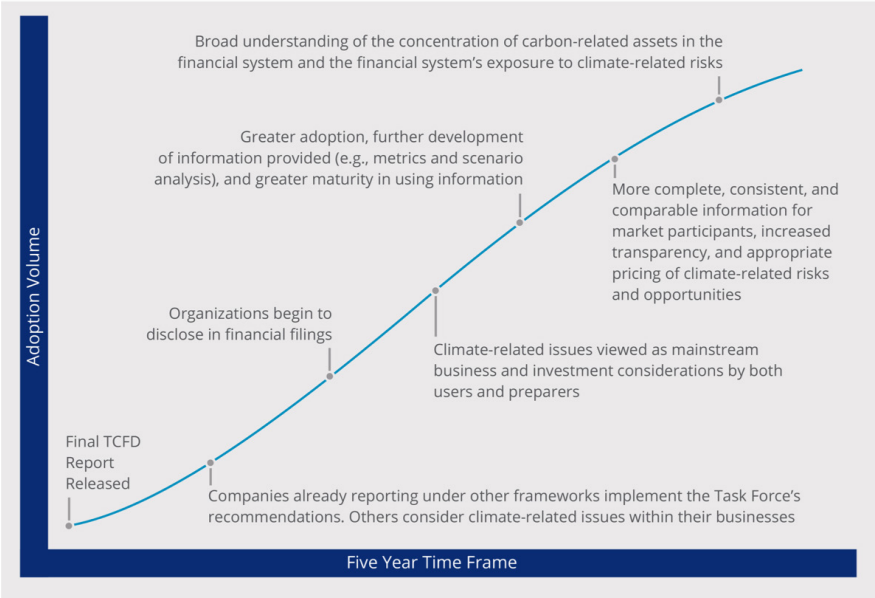
Risk Management
The processes used by the organization to identify, assess and manage climate-related risks

Metric and Targets
The metrics and targets used to assess and manage relevant climate-related risks and opportunities

Source: TCFD

As shown in the graphic to the right, the TCFD does not expect companies to fully implement its recommendations immediately. Instead, it expects that companies will evolve in their understanding of potential climate risks and opportunities over time and that climate disclosures will correspondingly adapt over time.

The TCFD's Suggested Implementation Path



Source: TCFD

UNITED NATIONS ENVIRONMENT FINANCE INITIATIVE BANKING SECTOR PILOT PROJECT

Following the publication of the TCFD recommendations, 16 leading global and regional financial institutions – including Citi – announced that they would work together with the United Nations Environment Finance Initiative (UNEP FI) on a pilot project to implement the TCFD recommendations "to develop scenarios, models and metrics to enable scenario-based, forward-looking assessment and disclosure of climate-related risks and opportunities." This collaborative project has enabled participating financial institutions to work toward TCFD-aligned climate-related disclosures in a credible and timely manner.

Consistent with the TCFD recommendations, the UNEP FI pilot project focused its efforts on the two main categories of climate-related risks and opportunities: transition and physical. The pilot considered the transition risks associated with the transition to a low-carbon economy, brought about by changes in policies (through the use of carbon pricing) and changes in technologies that reduce greenhouse gas emissions or may impact the demand for products that produce greenhouse gases. The pilot considered the physical risks companies face due to physical changes in the climate from incremental (chronic) climate change, such as increased numbers of hot days and changes in precipitation, and extreme weather (acute) events, which are expected to increase in frequency and severity.

In assessing potential transition risks and opportunities, the participants in the UNEP FI pilot engaged Oliver Wyman, a global management consultancy with deep financial services and risk management expertise, to help develop a methodology and tool to perform climate scenario analysis. Oliver Wyman collaborated with two leading research institutions with climate modeling expertise – the Potsdam Institute for Climate Impact Research (PIK) and the International Institute for Applied Systems Analysis (IIASA) – to obtain climate scenario data from the integrated assessment models that those experts have developed. Climate scenarios considered in relation to transition risks were 1.5°C and 2°C scenarios (scenarios that are aligned with the ambitions of the Paris Agreement and where transition risks were expected to be prevalent) relative to a business-as-usual scenario of 4°C. The participants in the UNEP FI pilot published their work on developing a methodology to assess and disclose potential transition risks and opportunities in a report, **Extending Our Horizons**, in April 2018.

UNEP FI released a second report, **Navigating a New Climate**, which focuses on physical climate risk, in July 2018. Developed in consultation with Acclimatise, a U.K. based advisory and analytics company that specializes in climate change adaptation and risk management, the physical risk methodology considers the physical impacts from incremental (chronic) climate change and extreme (acute) weather and climate events and how they may affect key credit risk metrics. Because physical climate risks increase as global temperatures rise, the scenarios used to analyze potential physical risks were a 2°C scenario and a business-as-usual scenario of 4°C.

In assessing both categories of climate-related risks and opportunities, the UNEP FI pilot relied on the climate models as well as extensive input from financial institutions on how to integrate the models' outputs into their internal risk analysis. The pilot uncovered important insights into different possible climate warming pathways and their implications for financial institutions and their borrowers. We shared the findings and insights from our pilot climate scenario analyses for transition risks and physical risks in Section 2 of this report. Through our participation in the pilot, we have gained valuable experience in the process underlying climate scenario analysis and ideas for how this analysis can be improved in the future, as described in Section 4 of this report.

SECTION 2:

Climate Scenario Analyses

Scenario analysis is a way to test the potential business impacts of future events that include assumptions regarding policies, technologies, demand and various other macroeconomic factors.

Scenario analysis is not a prediction of future events. In the context of climate change, many scenario analyses explore possible futures that could keep global temperatures below 2°C above pre-industrial levels this century. Considering a variety of scenarios, including different 2°C scenarios as well as those in which the 2°C goal is not realized, allows companies to better assess and plan for the full range of potential risks and opportunities associated with climate change.

Climate scenarios, such as those used in studies conducted by the IPCC and in other climate impact studies, are often based on integrated models that take into account energy and land-use systems and socio-demographic and economic projections. Because these models were built for macroeconomic and policy assessments, they are limited in their ability to predict potential financial impacts on individual companies or industries. As such, all companies undertaking scenario analysis face challenges in determining how to synthesize the global-scale outputs of these models into information that can be used to test their sensitivity to climate risks and the potential financial impacts on their business.

The UNEP FI pilot is aimed at bridging the gap between the macro outputs of the existing climate models and their potential effects on individual companies and industries. In doing so, the pilot considers the transition risks and physical risks of climate change, and how those risks could impact certain aspects of banks' business under three global warming scenarios: 1.5°C and 2°C scenarios relative to a business-as-usual 4°C scenario for transition risks, and 2°C and 4°C scenarios for physical risks.

Citi has been piloting different types of climate risk analyses even before the TCFD published its final recommendations. In 2016, we collaborated with the Natural Capital Finance Alliance and the UNEP FI to pilot test a **drought stress-testing tool** to better understand the resilience of several lending portfolios to drought scenarios in the U.S. and Mexico. We found that our portfolios were resilient to drought in the U.S., with limited impacts on clients' credit quality. Drought may have larger impacts on clients in water-dependent sectors in Mexico but due to the relative strength of the borrowers in our portfolios, this would not lead to major impacts on clients' probability of default. More importantly, we learned how to set up our systems to undertake such climate-related stress tests.

We followed this up with a stranded assets analysis to calculate the likelihood that upstream oil & gas assets in our energy portfolio would lose value because of a carbon price or tax and how that would impact clients' credit quality. This analysis found that larger companies would not be significantly affected in their ability to repay loans, but smaller service providers could be at risk if the price of oil continues to remain low, which has left some smaller producers more financially vulnerable, and if regulatory risks are not carefully managed.

Even though Citi has evaluated climate risks for years, climate scenario analysis is a new area of climate risk analysis for Citi. In the spirit of the UNEP FI pilot, Citi offers this report to help other companies consider how to undertake this analysis.

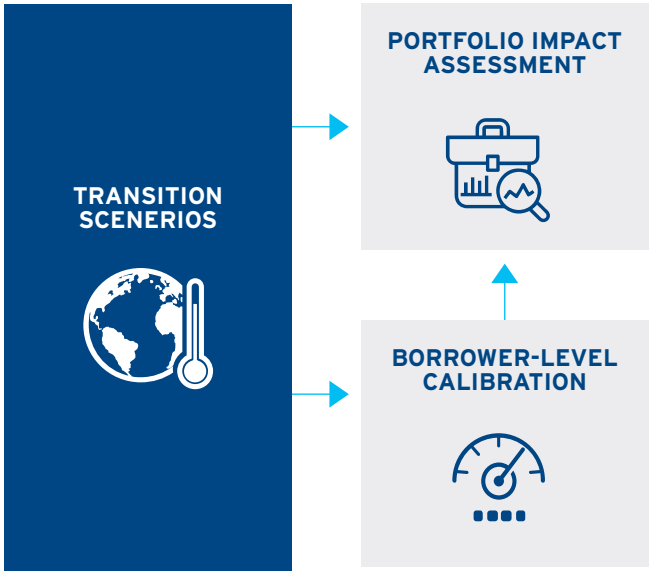
Transition Risk Analysis

Transition Risk Methodology

After considering several different options, the UNEP FI pilot group settled on an integrated approach to assessing potential transition risks and opportunities that is both top-down (looking at sector-level portfolio impacts) and bottom-up (looking at borrower-level impacts). The three modules of the methodology – (1) transition scenarios, (2) portfolio impact assessment and (3) borrower level calibration – are highlighted below. More information about the methodology and the modules, including the group's rationale for choosing a combined top-down and bottom-up approach, can be found in Chapter 2 of the UNEP FI report, Extending Our Horizons.

This three-module approach, although subject to limitations, allows for flexibility to assess different sectors with the ultimate goal of providing climate-related disclosures that are comparable across financial institutions. By combining these three modules in the scenario analysis, Citi was able to assess and improve our understanding of certain aspects of potential climate risks and opportunities related to our portfolios and how we can improve upon the approach for future climate scenario analyses.

Overview of the transition risk modules



Source: UNEP FI Report - Extending Our Horizons

Transition scenarios describe an evolving economic environment in a consistent manner across time, sectors and geographies. Scenarios provide detailed outputs which help assess the economic impact on sectors.

Borrower-level calibration addresses the lack of empirical data on corporate exposure to transition risk by using industry experts and tailored assessment to estimate the scenario's impact on individual borrowers. Calibration specifies the relationship between economic scenarios and credit outcomes.

Portfolio impact assessment uses a systematic and repeatable approach to extrapolate the risk assessed by the other modules (i.e., transition scenarios and borrower-level calibration) to the remainder of the portfolio.

Transition scenarios: Transition scenarios provide important insights about certain aspects of possible futures. However, these scenarios have limitations, including the lack of specific quantifications needed to understand scenario impacts at a company level. Additionally, transition scenarios are oriented toward use in macroeconomic and policy assessment environments, not toward use in financial analysis, and must be adapted and translated into financial terms.

Portfolio impact assessment: The lack of historical precedent for climate change in banks' stress testing increases the difficulty and subjectivity of stress testing and scenario analysis that financial institutions can undertake. New data, tools, additional expertise, better integration with transition scenario outputs and extensive iterative analysis are required to better understand the potential linkages between transition risks and credit quality within different sectors and subsectors.

Borrower-level calibration: There is currently little data at the borrower level regarding climate-related risks and opportunities, and relying on an assessment at the borrower level by bank experts is difficult to scale and not comparable across banks. As part of the UNEP FI pilot and going forward, Citi has and will continue to use the information available at the borrower level to assess potential financial impacts under different climate scenarios. As companies disclose more climate-related information, Citi expects that banks' assessments of borrowers' risks from climate change will continue to improve.

Oliver Wyman developed a transition risk tool for the pilot group that used borrower-level calibration points to calculate the scenario-implied probability of default and expected loss to the portfolio under different transition scenarios. Oliver Wyman adapted the scenario outputs from climate models into financial terms by translating those outputs into four key risk factors — direct emissions costs, indirect emissions costs, revenues and capital expenditures — that drive changes to the financial performance of companies. Citi considered the climate scenario outputs (such as price and energy mix) and these risk factors in our assessment of borrower-level risks for a sample of borrowers for each segment of our portfolio to understand potential transition risks and used the tool to project the impacts on our portfolio. For more information, see the UNEP FI report, **Extending Our Horizons**.

Citi used the UNEP FI pilot's integrated approach, adapted to Citi's situation and the data available to Citi, in performing a sensitivity analysis of transition risks and opportunities for borrowers in our North America oil & gas and U.S. utilities sectors. We understand that, as a member of the pilot program, our role is not only to understand the conceivable outcomes from scenario analysis in relation to our business but also to understand and relay to others the limitations and obstacles we encountered in conducting our analysis and recommendations for improving on scenario analysis in the future.

Per the UNEP FI pilot methodology, we evaluated portfolio-level risks through a quantitative assessment of whether individual segments of the portfolios would be more sensitive to transition risks and present a higher risk of default. As noted in the UNEP FI report on transition risks, the translation of model outputs (in the form of carbon prices and demand projections) to portfolio risk evaluations requires a significant level of expertise and judgment to evaluate how portfolio companies may respond to transition risks. Citi engaged a broad range of experts across our risk management and industry banking teams to ensure that this portfolio-level analysis was informed by the judgement of these groups and was based upon reasonable assumptions of how portfolio companies might respond to transition risks.

TRANSITION SCENARIOS

There are numerous pathways to reach a particular temperature warming scenario, such as a 2°C scenario, and different climate models have different assumptions, drivers and levels of granularity. While the methodology developed by the UNEP FI pilot group and Oliver Wyman is compatible with different climate scenario sources, the group decided to pilot the methodology using specific scenarios. In order to conduct climate scenario analysis, the pilot group needed climate transition scenarios that were appropriate for financial analysis and that met the requirements we had established for the project, including a number of different macroeconomic, energy-related and sector specific variables. To identify the most appropriate climate scenarios, we undertook a thorough review of a number of different climate models and scenarios and assessed their usefulness for financial analysis based on the requirements we had established and the following criteria:

- The availability of scenario data for the three temperature warming scenarios of interest
- The coverage of the sectors and subsectors where we expect transition risk to be most material
- The coverage of different regions of the world where the banks in the UNEP FI pilot group operate

Our review encompassed the landscape of climate models, including integrated assessment models (IAMS) and models from the International Energy Agency (IEA), International Renewable Energy Agency (IRENA), and the Deep Decarbonization Pathways Project (DDPP). Given the pilot group's requirements, which included the availability of a 1.5°C scenario and coverage of the agricultural sector, we selected two IAMs that most closely met the project's criteria and requirements — REMIND-MAgPIE (REMIND) from PIK and MESSAGE-Globiom (MESSAGE) from IIASA — for use in the pilot. The scenarios derived from these climate models are widely used around the world for policy and other analyses, including by the IPCC in its recent special report, **Global Warming of 1.5°C**. As the vast majority of climate models, including these models, were not originally developed for use in financial analysis, the pilot group further collaborated with the developers of these two models at PIK and IIASA to get access to additional variables and increase data availability.

THE REMIND MODEL

In conducting the transition scenario analysis as part of the UNEP FI pilot project, Citi used the 1.5°C, 2°C and 4°C scenarios from the REMIND model developed within the **CD-LINKS project**. The CD-LINKS project explores the complex interplay between climate actions and development at the global and national levels. We will consider using the MESSAGE model along with other models and scenarios in future analyses as the methodology the pilot group has developed is compatible with other climate scenario sources.

The REMIND model uses the Shared Socioeconomic Pathways, Representative Concentration Pathways ("SSP-RCP") scenario framework, which was developed for analysis in the IPCC and provides a combination of socioeconomic and emissions pathway assumptions to develop different climate scenarios. Researchers have developed five Shared Socioeconomic Pathways (SSPs) that narrate different socioeconomic futures that have implications for the challenge of climate change mitigation and adaptation.

The REMIND CD-LINKS scenarios used for this report represent SSP2, which describes a "middle of the road" world where social, economic and technological trends do not shift markedly from historical patterns and there is a medium level of challenges to climate mitigation and adaptation. It combines the socioeconomic assumptions from SSP2 with different representative concentration pathways (RCPs), which are based on varying levels of greenhouse gas emissions concentrations, to develop scenarios for different temperature warming targets. A summary of the assumptions is provided below.

REMIND Model Assumptions

Description

Transition risk occurs in a "middle-of-the-road" world where social, economic, and technological trends do not significantly vary from historical patterns. Current policies are continued until 2020, at which point a carbon price begins to be implemented at a level that ensures the world does not exceed 1.5°C or 2°C warming depending on the scenario.

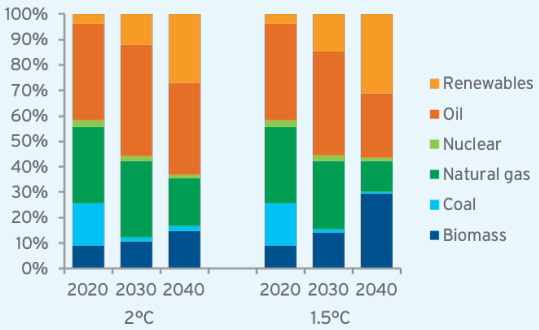
Socio-economics

- Population peaks at 9.5 billion people in 2070
- GDP continues to grow, with average global income increasing by a factor of 6 by 2100
- Developing countries achieve significant economic growth, reaching current OECD average income levels in the second half of the century

Energy

- Use of fossil fuels continues throughout the century, although at declining rates, with the exception of coal, which rapidly declines to under 2% of the total energy mix by 2030
- Oil demand remains steady through 2030 due to growing demand for liquid fuels in the transport sector, whose growth does not peak until 2035 in the 2°C scenario and 2030 in the 1.5°C scenario
- Reverse emissions technologies and carbon sequestration through land use are critical in mitigating the cost of carbon and reducing emissions
- Use of renewable energy increases, accelerating rapidly after 2030 through transmission, distribution and storage investments
- Biofuels see demand increases, particularly in the second half of the century

U.S. Primary Energy Mix

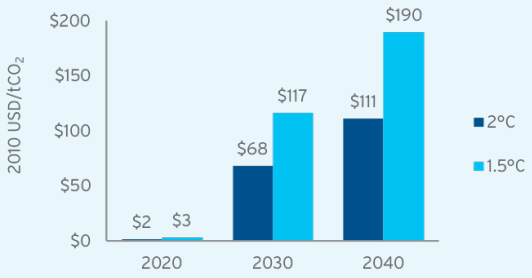


Source: Potsdam Institute for Climate Impact Research

Policy

- A global carbon price implemented after 2020 is the sole policy instrument for transition risk in the energy end-use sectors
- The given carbon price is assumed to be the same across all regions, though regions have differing economic responses to prices

Global Carbon Price



Source: Potsdam Institute for Climate Impact Research

Utilities Transition Scenario Analysis

Citi's pilot transition risk analysis for the utilities sector included 39 companies in the U.S. covered by the U.S. Power Sector team. These companies included both regulated utilities and independent power producers, representing approximately $10 billion in exposure as of December 2017 and 30% of our global exposure to the power sector.

Consistent with the approach recommended in the UNEP FI pilot, we divided our U.S. utilities portfolio into four segments based on whether they are regulated or not and the carbon intensity of their generation assets:

- **Regulated Heavy Carbon**: primarily regulated utilities with significant generation assets for whom fossil fuel generation represents greater than half of their generation portfolio
- **Regulated Low Carbon**: primarily transmission & distribution companies with low fossil fuel generation
- **Unregulated Heavy Carbon**: primarily independent power generation companies with significant fossil fuel generation, including significant coal-fired generation or peak gas-fired assets
- **Unregulated Low Carbon**: primarily independent power generation companies with significant renewable energy or efficient gas-fired assets

Approximately 75% of Citi's exposure in the U.S. utilities portfolio is to regulated utilities, and approximately 60% of Citi's exposure in this portfolio is to heavy carbon companies.

As explained in more detail below, the scenario analysis suggests greater impacts on the utility sector than on the oil & gas sector. The REMIND model's CD-LINKS scenarios use a global carbon price, which is assumed to be paid by the companies that use fossil fuels and emit greenhouse gases. Accordingly, under the scenarios, utilities are directly impacted by the price of carbon, whereas oil & gas producers are indirectly impacted through the reduction in fossil fuel demand caused by carbon prices. Utilities would face the choice of making capital expenditures to generate less carbon or absorb losses from carbon pricing, which increases over time. These impacts are likely to have the most significant negative effect on utilities in the Unregulated Heavy Carbon segment, with higher carbon intensity and less ability to pass along the new costs to customers.

Key Scenario Assumptions

Citi's scenario analyses relied on the assumptions and outputs of the REMIND model's CD-LINKS 1.5°C and 2°C scenarios. There are a few assumptions in the REMIND CD-LINKS 1.5°C and 2°C scenarios that were key drivers of results in our portfolio-level risk analysis for the utilities sector:

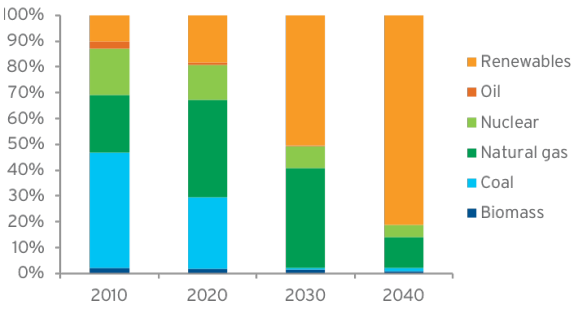
1. The scenarios assume a global carbon price will be implemented to reduce carbon emissions. In the 2°C scenario, there is a global carbon price per ton of carbon dioxide of $68 (2010 USD) in 2030 that increases to $111 in 2040. In the 1.5°C scenario, the global carbon price is even higher, at $117 in 2030 and $190 in 2040. This assumption adds to the operating costs of utilities, particularly in the Heavy Carbon segments. Utilities can reduce some of the costs from a carbon price by investing in capital expenditures for renewable generation and other low-carbon technologies.

2. The scenarios assume that carbon capture and storage (CCS) technologies will become commercially viable, available and in use after 2030 to mitigate fossil fuel emissions. For utilities that continue to be reliant on fossil fuel generation, are able to withstand the net income erosion until such technologies become available and have the financial strength or regulatory support to afford the acquisition of such technologies, this assumption helps to lower direct emissions costs due to a carbon price. Citi recognizes that this assumption requires rapid acceleration in CCS technology development, beyond what is feasible today.

3. The scenarios assume that electricity prices will increase due to growing adoption of electric vehicles and greater electrification of the transport sector, which drive up demand for electricity. This assumption benefits utilities in both the Regulated and Unregulated segments by increasing revenues.

4. The scenarios assume a different fuel mix for electric generation in 2030 and 2040 than today. This implies the utilities sector will need to make significant capital expenditures to transition away from coal to renewables.

U.S. Electricity - Fuel Sources



Source: Potsdam Institute for Climate Impact Research

Citi did not independently analyze the potential viability of the assumptions under the REMIND model's scenarios.

Citi applied the borrower-level calibration methodology developed by the UNEP FI pilot group in partnership with Oliver Wyman. A subset of the 39 companies considered in this analysis was used to calibrate the relative sensitivity of each of the four above-mentioned industry segments to the key transition risk factors identified in the pilot: direct emissions costs, indirect emissions costs, revenues and low-carbon capital expenditures. We utilized the transition risk tool developed by Oliver Wyman to calculate the scenario-implied probability of default for Citi's portfolio based on the borrower-level calibration points.

Findings

In the utilities transition analysis, a few important differentiating factors impacted the potential financial performance of the companies under the climate scenarios explored, enabling some companies to manage the transition more successfully. An obvious differentiator is whether a utility is heavy or low carbon, as utilities with a lower carbon footprint will be less impacted by carbon prices. Another key differentiating factor between companies in the utilities industry and their potential resiliency to climate transition risks is whether they are regulated utilities. Regulated utilities (both low carbon and heavy carbon) may have the ability to pass on costs to customers whereas companies in the Unregulated segments are subject to competitive market dynamics and may be unable to pass on costs associated with carbon or capital expenditure investments. Because of this, we segmented the companies in the portfolio using these factors and analyzed companies within each segment differently with regard to potential transition impacts to their financial position and portfolio strength.

Within a segment, a key factor in a company's financial resiliency to transition risks is its current credit rating. Companies that started out with higher credit ratings were shown to have a larger financial cushion to absorb the costs of transition risks and maintain a better scenario-implied credit rating by the time that carbon prices were fully implemented in 2030 and 2040 than companies that started out with lower credit ratings.

As expected, due to these factors, the greatest impacts under the transition scenarios are to the Unregulated Heavy Carbon segment. Unregulated companies in our portfolio tend to have a lower starting credit rating. In addition, Unregulated Heavy Carbon companies are also expected to face bigger transition risks related to carbon price or capital expenditure costs or both, yet are unable to pass these costs to customers.

Under the REMIND CD-LINKS 2°C scenario in 2030 and 2040, Regulated Heavy Carbon companies faced higher emissions costs and required greater capital expenditures than Low Carbon companies, but their transition risk was mitigated by their potential ability to pass on such costs to ratepayers over the same timeframe as such costs were assumed to increase. These companies experienced a scenario-implied downward credit rating migration of one to two notches, depending on their current credit rating. Unregulated Heavy Carbon companies, which cannot pass on costs to ratepayers, experienced a two to three notch downward migration to their scenario-implied credit rating. These companies were assumed to incur increasingly higher leverage to invest in low-carbon capital expenditures until 2030, and experienced greater

deterioration in debt service coverage due to higher emission costs and higher debt service.

In 2030 and 2040, under the REMIND CD-LINKS 2°C scenario, Regulated Low Carbon companies that currently have an investment grade rating maintained their scenario-implied investment grade credit rating. Highly-rated, non-investment grade Regulated Low Carbon companies experienced a one notch downward migration to their scenario-implied credit rating, implying they would still be able to access U.S. Leveraged Finance credit markets. Unregulated Low Carbon companies would experience a scenario-implied downward credit rating migration of one to two notches, similar to Regulated Heavy Carbon companies. While they had lower emissions costs and capital expenditures requirements than Regulated Heavy Carbon companies, they did not have the ability to pass on such costs to ratepayers through tariff increases over time. However, some of the costs faced by both Unregulated Low Carbon and Unregulated High Carbon companies were offset by higher expected revenues. They were assumed to benefit from the higher power prices projected in the scenarios, as carbon prices would increase the marginal cost of generating power and there was higher demand for electricity from electrification of the transport sector, leading to higher power prices.

Historically, it has been difficult to anticipate the pace of adoption of new technologies. For example, many entities have underestimated how quickly renewable energy would grow and there are numerous other instances where experts have failed to anticipate the rapid growth of disruptive technologies. This matters because the rate at which policies and technologies shift can have an effect on companies' credit ratings as it affects their ability to adapt and act. Rapid change may prevent some companies from implementing strategies to mitigate climate risk and capitalize on climate opportunities while rewarding others that are able to capitalize on potential opportunities quickly. The utilities sector has been steadily moving away from reliance on fossil fuels and investing in renewable energy generation as it becomes more competitive with conventional fuels. Citi has been helping our clients finance this energy transition. We expect to see this trend continue and will continue our engagement with clients to help them invest in low-carbon technologies that reduce their exposure to transition risks.

Oil & Gas Transition Scenario Analysis

For our oil & gas pilot, Citi focused on our North American exploration and production (E&P) portfolio in our institutional franchise, which included 88 companies based in the U.S. and Canada. Citi categorized the companies in this portfolio into four segments based on their drilling and extraction methodologies:

- **Conventional:** companies that use traditional drilling methods
- **Shale:** companies that extract oil & gas from shale or use non-conventional means
- **Offshore:** companies that drill oil & gas below the seabed
- **Multi-segment:** companies using multiple production methodologies

The companies in our North American E&P portfolio accounted for a combined total of approximately $13 billion in exposure for Citi as of November 2017. This represents the majority of Citi's global E&P exposure, at nearly 80%. Shale companies made up the largest segment of this portfolio, accounting for over half of the companies and nearly half of our exposure. Multi-segment companies are larger and have more diversified assets. While they represented only a small percentage of the companies in our North American E&P portfolio, they too also accounted for nearly half of Citi's exposure. Conventional and offshore companies comprised about a quarter of the companies in this portfolio and a small fraction of our exposure.

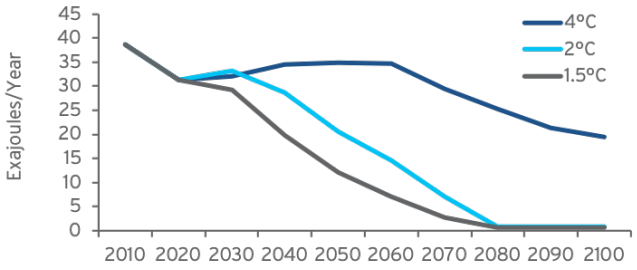
As explained in more detail below, Citi's pilot analysis did not find the potential for significant transition risks in our oil & gas portfolio in 2030 and 2040. This is likely due to a combination of factors, including the relatively long time horizons over which transition impacts are experienced and assumptions in the underlying modeling regarding future demand for oil & gas during this time period. In the REMIND model's CD-LINKS scenarios, demand and prices for fossil fuels remain close to current levels through 2030, leading to limited impact on the credit quality of a portfolio like Citi's North American E&P portfolio.

Key Scenario Assumptions

Citi's oil & gas transition scenario analysis also relied on the assumptions and outputs of the REMIND model's CD-LINKS 1.5°C and 2°C scenarios, which we described earlier. However, the scenario assumptions that are important to consider when evaluating the results of a portfolio-level risk analysis for the oil & gas sector are different than those for the utilities sector or have different implications for the oil & gas sector:

1. In the scenarios, oil & gas serve as short-term substitute fuels as the world quickly transitions away from coal. In addition, demand for transportation grows rapidly and oil is assumed to remain an important transport fuel that is not easily substituted in the short-term. Consequently, under the 2°C scenario, U.S. oil demand increases between 2020 and 2030 and first starts to fall between 2030 and 2040. Even in a 1.5°C scenario, oil demand remains relatively robust and does not fall sharply until after 2030.

U.S. Oil Demand



Source: Potsdam Institute for Climate Impact Research

2. The scenarios assume that carbon capture and storage (CCS) technologies become commercially viable, available and in use after 2030 to mitigate fossil fuel emissions. One consequence of this assumption is that demand for fossil fuels declines more slowly than would be the case without the successful development of such technologies. As we noted earlier, this assumption requires rapid acceleration in CCS technology development, beyond what is feasible today.

3. The scenarios assume that the spot price of oil & gas remains robust and even increases in 2030 and 2040 in most of the scenarios analyzed, with the exception of natural gas in the 2030 timeframe under a 1.5°C scenario as compared to the possible price in 2020.

Oil historical and scenario projected U.S. spot price (2010 USD / BBOE)

	2010	2020	2030	2040
4°C (baseline)	$60.60	$71.56	$84.74	$93.06
2°C	$60.60	$71.56	$83.87	$88.86
1.5°C	$60.60	$71.56	$77.82	$79.40

Natural gas historical and scenario projected U.S. spot price (2010 USD / MMBTU)

	2010	2020	2030	2040
4°C (baseline)	$6.56	$7.16	$7.77	$8.39
2°C	$6.56	$7.16	$7.32	$7.39
1.5°C	$6.56	$7.16	$7.11	$7.22

Source: Potsdam Institute for Climate Impact Research

Citi did not independently analyze the potential viability of the assumptions under the REMIND model's scenarios. We note only that the projected futures in these scenarios are a limited set of the countless possibilities of how the future of energy demand and prices may evolve.

Findings

In applying the REMIND CD-LINKS 2°C scenario and the UNEP FI pilot methodology to calculate the change in scenario-implied probability of default from transition risk, Citi estimates that the impacts to our North American E&P portfolio would be limited in 2030 and 2040. These results are driven by the model scenario assumptions. Climate transition scenarios, such as the ones we used for our analysis, generally assume an orderly low-carbon transition to minimize disruptions to the economy.

The REMIND CD-LINKS scenario assumptions that we highlighted — which resulted in relatively robust oil & gas demand and prices in the short to medium term — limited the potential transition risks and impacts to the oil & gas sector in the timeframe that we explored. If Citi were to test other scenarios that limit warming to within 2°C that have less conservative assumptions for coal reduction (i.e., less reduction in coal, which would reduce the demand for oil & gas as short term fuel substitutes) and carbon sequestration, we could potentially see stronger impacts on oil & gas companies' credit ratings as the demand and price of oil & gas would need to decrease more to achieve the same temperature target.

Under the assumptions in the REMIND CD-LINKS 1.5°C scenario, there are potential impacts in certain segments of our oil & gas portfolio. Companies with the highest marginal operating costs would be the first to be impacted due to lower oil & gas prices in this scenario and higher carbon prices. Generally, in North America, offshore companies have the highest production costs, followed by shale and then conventional. Consequently, under this scenario, transition risks start emerging for offshore companies between 2020 and 2030 that may result in a slight deterioration to their credit rating of one notch for offshore companies during this period. Between 2030 and 2040, demand for oil & gas would then decline sharply, causing a more significant difference in projected oil & gas prices between the 1.5°C and 4°C (business-as-usual) scenarios. By 2040, under the 1.5°C scenario, a broader range of higher-cost producers may be adversely impacted. During this period, while we do not expect to see changes to the credit ratings of clients in the conventional segment since they are the most efficient producers, other client segments could see a downward migration of their scenario-implied credit ratings by one to two notches.

Of course, credit ratings can also be affected by the actions that companies take in response to lower prices and demand to manage their operating margins, liquidity and leverage. Citi analyzed the most recent decline in oil prices in 2014 to 2017, when oil prices fell drastically from an average of approximately $100 per barrel during the 2011 to 2014 boom to an average of approximately $50 per barrel from 2014 to 2017, and assessed how companies responded to lower prices and demand. During that period of decline, margin compression led companies to develop better drilling and production technologies that reduced operating and breakeven costs. However, it is unclear whether companies would be able to adapt these kinds of mitigating measures if longer-term demand and price were to decline.

The velocity of change in energy prices is a factor we usually consider in our credit analysis. However, the REMIND model does not provide specific information regarding the rate of transition in energy demand and prices year-to-year. A rapid shift in policies or the rapid adoption of disruptive new technologies that negatively impacts energy prices or demand may increase transition risks and would have a higher likelihood of affecting clients' credit quality, as it limits companies' ability to respond and adapt to the changes.

Due to the assumptions discussed above, the scenarios we analyzed project limited impacts for companies within the oil & gas sector for the time periods we assessed (2030 and 2040). Impacts would likely become more severe over time as demand for oil & gas is projected to fall sharply after 2040 in both the 1.5°C and 2°C scenarios. Citi plans to continue assessing climate-related scenario data and developing our internal expertise. The internal capabilities to conduct climate scenario analysis that we have developed through the pilot project serve as an important foundation upon which we will build. Furthermore, the transition risk methodology that we co-developed as a part of the UNEP FI pilot group and used in this analysis is compatible with other scenarios. This will allow us to conduct more robust scenario analysis for the sectors considered in this report as well as other sectors in our portfolio in the future using the REMIND model or other climate models.

Physical Risk Analysis

Physical Risk Methodology

The UNEP FI pilot group worked with Acclimatise to develop a physical risk methodology for the energy sector that looks at how incremental changes in climate and changes in extreme events can affect the productivity, revenue and costs of borrowers within the sector, and ultimately their probability of default. More information about the methodology can be found in Chapter 2 of the UNEP FI report, **Navigating a New Climate**.

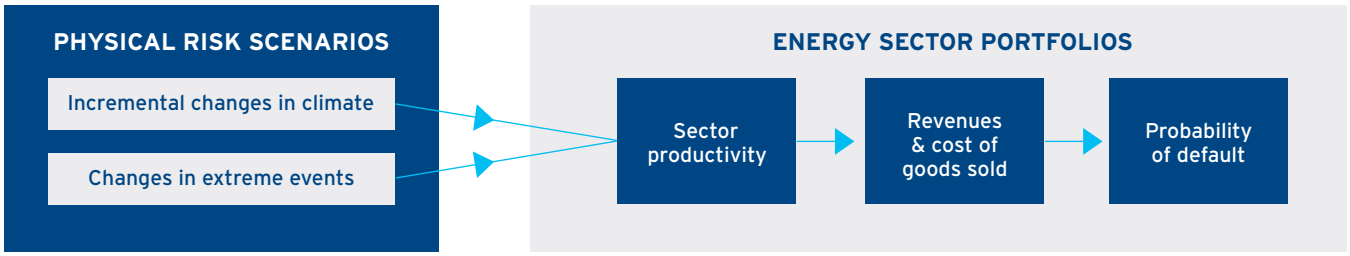
To calculate the impacts of climate change on productivity, the UNEP FI pilot group relied on peer-reviewed literature for the change in productivity due to incremental climate change and on empirical evidence for production losses due to extreme weather events. Given the uncertainties in climate models and sector impact models, where there was a range of potential changes in productivity, Citi used the worst case change to minimize our risk of underestimating the potential impacts of physical risks on our portfolio.

Since physical climate risks can vary greatly based on location, to understand the potential impacts of physical risks to a potential borrower, the risks must be assessed for each asset within a borrower's portfolio. This requires gathering asset-level data that includes information on an asset's location and capacity. We estimated the potential change in production from incremental climate change and extreme weather events for each asset within a borrower's portfolio based on the climate risks it would be exposed to given its location. We then aggregated the change in production across all of the assets within the borrower's portfolio to assess the overall potential financial impacts to the borrower's revenue, equity and credit rating.

Utilities Physical Risk Analysis

Citi piloted the physical risk methodology on our U.S. utilities portfolio. For this analysis, we started with the same set of 39 companies we examined in the utilities transition risk pilot. However, only 24 companies were ultimately included in the pilot physical risk analysis based on the availability of asset-level data. The sample included both regulated and unregulated utilities, most of which had a mix of generation and transmission & distribution. We based our assessment of the impacts of incremental climate change on projections of changes in power plant production, and our assessment of the impacts of extreme weather events by projecting losses due to downtime after such events.

Physical Risk Methodology



Source: UNEP FI Report - Navigating a New Climate

Methodology

We needed a mix of climate and client data to analyze physical risk. The types of data we gathered and used, including their sources, are highlighted below.

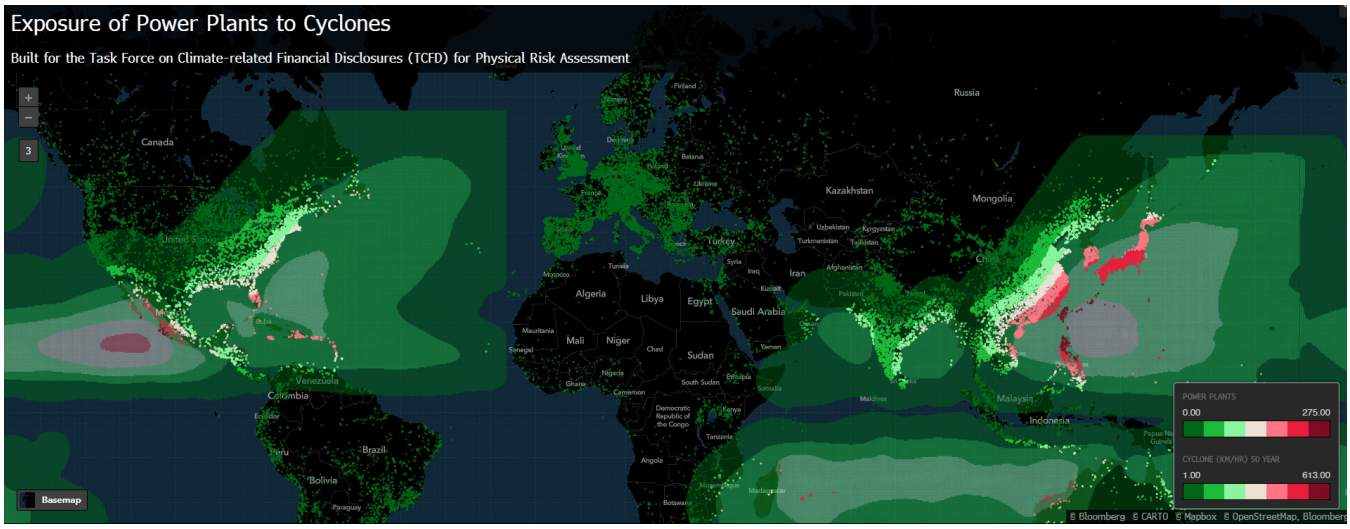
Bloomberg collaborated with the UNEP FI pilot group to provide a data solution that reduced the challenge of gathering climate data and asset-level data for the physical risk analysis. Bloomberg consolidated climate data and asset-level global power generation data into a dataset called Power Plants Climate in Bloomberg MAPS. This enabled us to use Bloomberg MAPS to quickly and efficiently access much of the data we needed. In addition, Bloomberg MAPS allowed us to visually overlay climate data and asset-level data to understand our exposure to various climate risks.

In the analysis, we considered three types of extreme weather events – cyclone, excessive heat and storm surge – and incremental climate change. Cyclones and storm surge both have the potential to impact power plants by disrupting operations during extreme weather events and post-event downtime while necessary repairs are made. Excessive heat, on the other hand, is a chronic stressor that can reduce the operational efficiency of power plants. Since our analysis, Bloomberg MAPS has incorporated additional extreme weather hazards that were not available at the time we conducted our analysis.

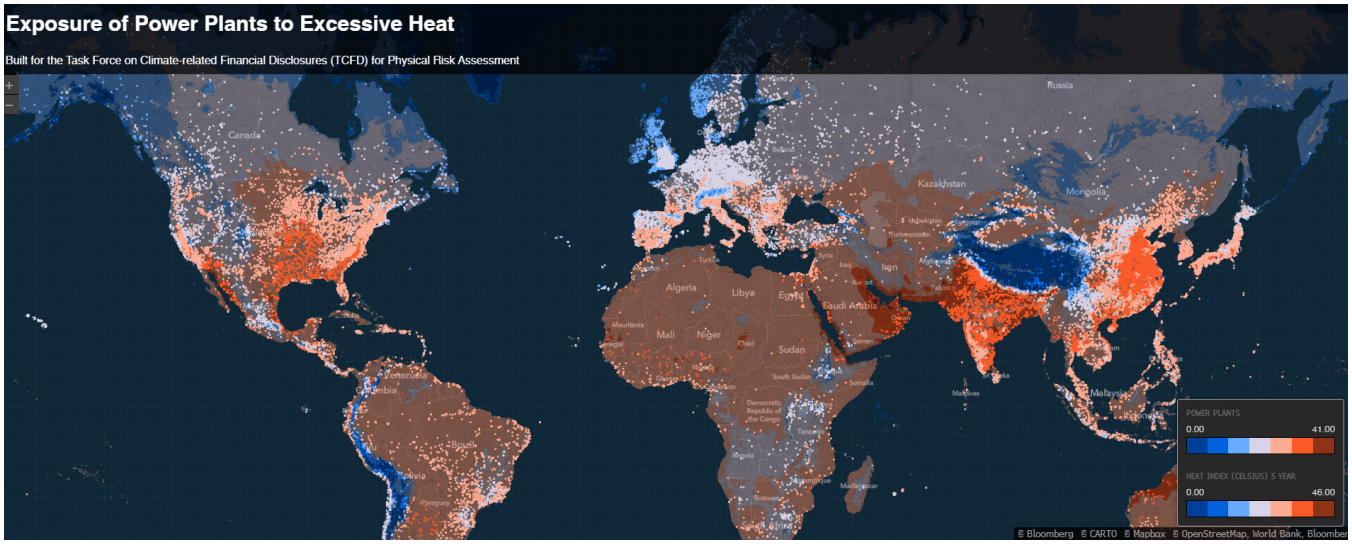
Physical Risk Analysis - Data & Sources

DATA	SOURCE
Climate data, including data on extreme weather frequency and incremental (chronic) climate change.	We accessed climate data from a database prepared by Bloomberg. The climate data in Bloomberg comes from a variety of sources, including Think Hazard, UNEP Grid and Acclimatise.
Client data, including asset-level data such as location, generation type and generation capacity.	We accessed asset-level data on utilities from a database prepared by Bloomberg. Other client data came from internal sources and external data providers including SNL Financial.
Climate change factors to predict future probability of extreme weather events.	Acclimatise provided the change factors based on scientific studies of potential change in future extreme weather probability.
Impacts of climate on the sector, including how it affects production, output and facility downtime.	Climate impact data came from Acclimatise's analysis of scientific studies regarding extreme weather events and their effect on downtime to utilities, and Acclimatise's analysis of scientific studies on incremental changes in climate (such as rising temperatures and changes in precipitation patterns).

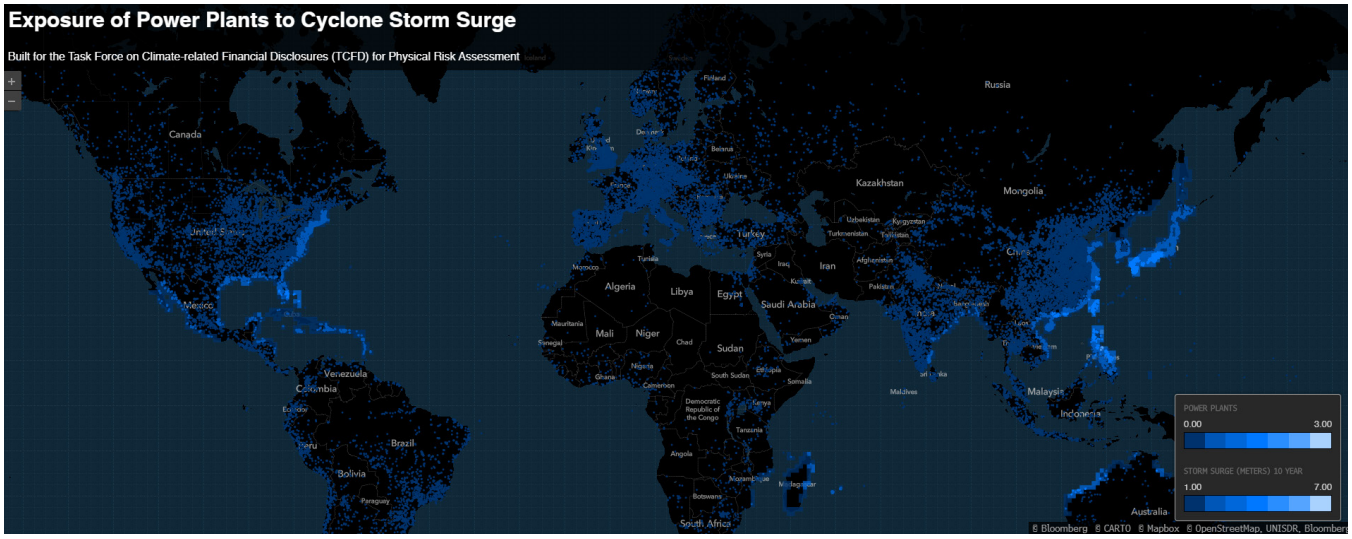
Extreme Weather Risks for Global Power Plants in Bloomberg MAPS



Source: Bloomberg



Source: Bloomberg



Source: Bloomberg

Citi analyzed physical climate risks under a 2°C scenario that corresponded to IPCC RCP 2.6 (often described as a pathway that provides a good case for limiting climate change impacts) and a 4°C scenario that corresponded to IPCC RCP 8.5 using data from scientific studies of climate and potential climate impacts (e.g., availability of water on power production in the future) under those warming scenarios. We did not use the REMIND model's climate transition scenarios since the assumptions and outputs of those scenarios (e.g., fuel prices and demand) are not relevant for analyzing physical risks.

Using the data discussed above and the UNEP FI pilot methodology developed in partnership with Acclimatise, Citi calculated the impacts of incremental climate change and extreme weather events on the production capacity of our clients and then translated that into the potential impacts on our clients' revenue and equity.

For incremental climate change, we considered how expected changes in climate factors such as precipitation and temperature may affect the future productivity of thermal and hydropower plants based on data provided by Acclimatise that is sourced from peer-reviewed scientific literature. We assumed a one-to-one relationship between productivity decline and revenue (e.g., if the productivity of a plant falls by one percent, revenue falls by one percent).

For extreme weather impacts, we calculated the potential period of inoperability if an event occurred at an asset's location based on the asset type (e.g., fossil fuel generation, nuclear generation or hydropower generation) and assumed a one-to-one correlation between days of operation and revenue (e.g., if a plant is not operational for one percent of the year, revenue is reduced by one percent).

Citi took the current baseline extreme event risk (based on historical records and present day projections) at an asset's location from the climate data and applied a "worst case change factor" (i.e., the largest production losses) for extreme event frequency based on scientific studies provided by Acclimatise. This allowed us to consider different possible futures related to extreme weather events and their impacts.

CAUSES OF LOSS UNDER PHYSICAL RISK SCENARIO ANALYSIS

The pilot physical risk analysis considered two important types of risks: incremental losses in production due to changes in the climate (e.g., increased temperatures, changes in water availability) and downtime due to extreme weather events.

Incremental Risks: Climate change will, among other things, impact average global temperatures, precipitation patterns and sea levels. These factors represent changes in state that in many cases are best viewed as gradual, incremental changes that manifest as chronic stressors. These stressors can cause losses over time due to changes in ambient operating conditions. For example, if power plant operations rely upon cooling water intakes and the water bodies where their intakes are located increase in temperature, they will lose cooling efficiency, reducing the overall operational efficiency of the plant.

Extreme Weather Events: Climate change is projected to impact the frequency and severity of extreme weather events, increasing the magnitude of disaster losses. Extreme events are best characterized as irregular occurrences that are acute stressors. In the aftermath of an extreme weather event, power producers will face downtime while key facilities and infrastructure are rebuilt or repaired.

Findings

Under the 2°C scenario, production for the utilities we analyzed may decline between 9.5% and 15.1% due to physical climate risks, with an average decline of 11% by 2040. Under the 4°C scenario, production from generation may decline between 10.7% and 15.1% due to physical climate risks, with an average decline of 13.2% by 2040.

Our analysis found that the majority of the impacts under either scenario are associated with incremental climate change rather than extreme weather events, which garner greater attention due to the severe impacts they can cause. Under the different warming scenarios, it is widely accepted in the scientific community that extreme weather events will likely increase in frequency and severity; however, the overall probability of extreme weather events is still relatively low, so the probability of extreme weather impacting assets included in our analysis was commensurately low. On the other hand, incremental changes in climate such as rising temperatures and changes in precipitation are already underway and can lead to chronic problems that have long-term implications on the financial performance of borrowers.

We applied the average projected production declines to three regulated utilities and three independent power producers that are representative of the U.S. utilities portfolio to examine the potential impacts of physical climate risks in 2040. This analysis assumed that financials of the portfolio companies would stay constant at 2017 levels. We concluded that without incremental investments to address physical climate risks, the scenario-implied credit ratings of over half of the utilities analyzed would be reduced by one notch under both the 2°C and 4°C scenarios. Since warming targets are for this century, temperatures do not significantly diverge between the 2°C and 4°C scenarios until after the 2040 time period. As a result, when looking at the credit impacts to our portfolio in 2040, we did not see a difference between the two scenarios.

We encountered limitations using the data and methodology described above, including the following:

- At the time of analysis, Citi did not have data on the potential impacts of drought, wildfire and river

flooding. We plan to consider these types of physical risks in the future as data becomes available.

- Citi did not have data to consider damage to assets or other secondary impacts.
- We recognize that some of the simplifying assumptions that we used are not representative of how physical risks may affect clients. For example, most power plants are not fully utilized all of the time. If an extreme weather event were to occur, the impacts of downtime may be less severe for clients that are able to shift production to other facilities. We currently do not have data on asset utilization and clients' ability to shift production after an extreme weather event, so we assumed any downtime would correspond to a one-to-one decline in revenues.
- We did not consider how insurance may mitigate the risks from downtime and the costs of asset damage. As damage and losses from climate change increase, premiums will likely increase and may even become prohibitively expensive. In addition, as risks increase, certain policies that exist today may no longer be available in the future. Hence, we did not assume that insurance would mitigate risks in our physical risk analysis.
- We did not consider clients' investments in climate adaptation measures at their sites and facilities, which may reduce or prevent physical risk impacts, as we did not have this information.

Changes in climate are already underway and projected to grow if we do not take actions to reduce emissions. Significant attention has been paid to emissions reduction and decarbonization, but climate mitigation and adaptation are also critical. In addition to helping clients manage transition risks through financing renewable energy, energy efficiency and other low-carbon technologies, Citi sees an opportunity to help clients become more climate resilient by providing financing solutions for climate adaptation. One example of a financial product for physical risk is catastrophe bonds, which help spread the risk of disaster events to investors and help to raise money in case of a disaster such as a hurricane. We are committed to engaging with clients to manage their physical climate risks through investments that reduce their vulnerabilities to changes in climate.

SECTION 3:

Implementing the TCFD Recommendations

We believe that the value of climate scenario analysis is not in the final outcome but in understanding the ***sensitivities to climate risks and opportunities*** and the ***range of possible outcomes*** for risk management and strategic planning.

Our engagement in the UNEP FI pilot gave us the opportunity to reflect on the steps that we have taken to understand and manage climate-related risks and take advantage of climate-related opportunities. The pilot project required collaboration across numerous teams within the bank, enabling us to raise climate awareness across the company. We also used this opportunity to think critically about our current practices in relation to the TCFD recommendations: (1) Governance, (2) Strategy, (3) Risk Management and (4) Metrics and Targets. In this section, we highlight some of the steps that Citi has taken and areas that Citi will continue to assess to increase our climate resiliency.

As noted in the UNEP FI reports, one of the unique issues with the assessment of climate risk in the financial services sector is that the time horizons for lending – typically less than five years – are much shorter than the time periods over which climate risks are anticipated to result in material financial impacts on portfolio companies. Climate change risks are expected to manifest themselves over decades and accelerate beyond the 2040 time frame. As such, Citi foresees opportunities to manage our climate risks by continuing to engage with clients on climate risks and scenarios, and managing our lending portfolios to be responsive to changes in climate-related risks and opportunities over time. For example, Citi has made a commitment to reduce our global credit exposure to coal mining companies. As we look at our client relationships and lending portfolios going forward, our goal is, through client engagement and due diligence, to support our clients as they transition and manage risks and opportunities by integrating climate assessments into our overall risk management practices.

Governance

The TCFD recommends that companies disclose information about their current governance structure for assessing climate-related risks and opportunities.

Board Oversight

Citi actively manages how climate change factors into our decisions and who in our corporate structure is responsible for climate-related decisions. Given the importance of this topic, the Citi Board of Directors provides oversight of climate change through our Nomination, Governance and Public Affairs Committee (NGPAC), with ample support from management and other business units.

The Committee oversees our global citizenship and sustainability activities and performance, including as related to climate change. Examples of the initiatives the Committee oversees include our $100 Billion Environmental Finance Goal and the decision to prepare this report. For more information on the roles and responsibilities of the committee, please see our NGPAC Charter.

Senior Management Responsibilities

At the senior executive level, corporate citizenship at Citi is led by the Director of Corporate Citizenship. The Director provides progress reports to the NGPAC at least annually on issues, trends and results pertaining to some of the company's most important citizenship and sustainability issues. The progress reports include updates on the implementation of Citi's Sustainable Progress Strategy, which focuses on climate change and other sustainability

issues, and our global and regional sustainability initiatives.

The Global Head of Sustainability oversees Citi's **Sustainable Progress Strategy** and also collaborates with a range of senior leaders to enable the development and implementation of climate-related metrics and targets, as well as other goals and programs that generate a positive impact on society.

The Environmental and Social Advisory Council (ESAC), a senior executive level advisory council, provides guidance on environmental and social issues related to global business activities, including advising on the Sustainable Progress Strategy. The Council is chaired by a senior executive in our Institutional Clients Group and includes executives from our Banking, Risk, Public Affairs, Operations, Corporate Sustainability and Environmental and Social Risk Management (ESRM) groups. Our ESAC holds meetings approximately three times per year. Citi also has a cross-functional Climate and Sustainability Council, based in London, focused specifically on our sustainability performance in Europe, the Middle East and Africa.

Business Unit Responsibilities

Citi's Corporate Sustainability team is responsible for managing Citi's overarching Sustainable Progress Strategy in partnership with business units across the bank. Our ESRM team manages our **ESRM Policy**, which governs our review and approval of client transactions in environmentally and/or socially sensitive sectors, and guides client engagement on environmental and social risks and mitigation measures. Our Corporate Realty Services group also has a specialized sustainability team that manages our environmental footprint and green building goals, and our Enterprise Supply Chain team oversees supply chain sustainability. These specialized teams sit within their respective business units, ensuring ownership of sustainability goals throughout the company. Citi's banking and financing teams also work with clients to address climate change issues and to facilitate contributions to our $100 Billion Environmental Finance Goal.

Strategy

Regarding climate-related strategy, the TCFD recommends that companies disclose the results of scenario analysis and how companies integrate climate risks and opportunities into their decisions over different time horizons. The results of Citi's most recent climate scenario analysis are provided in Section 2 of this report.

As referenced previously, Citi's comprehensive, firm-wide **Sustainable Progress Strategy** includes climate change as a priority thematic area. Our Sustainable Progress Strategy is aligned with Citi's mission to serve as a trusted partner to our clients by responsibly providing financial services that enable growth and economic progress and guides our work to conduct business in a way that creates value for our company and for future generations. On the financing side, we partner with clients to finance and facilitate environmental solutions that reduce the impacts of climate change and manage the environmental and social risks and impacts associated with our products and services. On the operational side, we actively manage our global facilities and supply chain to reduce our emissions and minimize our climate impacts. Stakeholder engagement and reporting are central to our sustainability efforts, and we emphasize transparency and open engagement with clients, investors, suppliers, employees and other stakeholders.

As a financial institution, Citi's ability to adapt to the changing environment — with respect to the climate, our company's business and the context in which we operate — is one of our greatest strengths. Citi has historically focused our resources on assessing potential risks and opportunities related to many different aspects of our business in the short- and medium-term, including climate-related risks and opportunities. Citi's definition for the short- and medium-term is consistent with the accepted definition of credit horizons for term lending, which ranges from 1 to 5 years. Citi does consider longer time horizons as well, sometimes up to 100 years, which is very different than the time horizon for Citi's loans, when assessing climate change impacts and potential future risks. Even though these longer time horizon analyses may not have immediate impacts on decision making, they could influence long term strategic planning. For a more complete discussion of these aspects and others of Citi's current sustainability activities, including those to address climate change, refer to Citi's latest **Global Citizenship Report**.

Citi will continue to contribute to the conversation on climate disclosures. We will both improve our internal

expertise in this area and engage with climate modelers and other experts to help them adapt their work for use in financial decision-making. One of the greatest challenges that Citi faced in conducting the scenario analysis for this report was the interplay between climate models and Citi's internal risk management processes, tools and models. Citi learned that climate scenarios need to be better adapted to financial analysis by considering potential climate-related implications on shorter timeframes.

Management of Climate Risks and Opportunities

The TCFD recommendations on climate risk and opportunity management focus on the processes companies have in place to address climate-related risks and opportunities.

Citi manages climate-related risks and opportunities through our $100 Billion Environmental Finance Goal and the implementation of our ESRM Policy, which integrates climate risk assessment into project-related financings and includes sector-specific policies for coal mining, forestry, oil & gas and palm oil. In addition, the climate risk analyses that Citi conducts, including climate scenario analysis, provide Citi with a better understanding of how to engage with clients in various sectors on climate-related transition and physical risks and opportunities. We are actively pursuing business opportunities in partnership with our clients, who are developing solutions to address issues such as climate change, and investing in infrastructure and new technologies for climate resilience, adaptation and mitigation. Our $100 Billion Environmental Finance Goal is one example of how we support investments in renewable energy, energy efficiency, green infrastructure and other related activities. We work with clients to assess their vulnerability to climate change, reduce their carbon footprint, implement adaptation measures and finance low-carbon initiatives in the energy and other sectors. More information is available in the ESRM and Environmental Finance sections of our annual Global Citizenship Report.

Citi has strategies and plans in place to address the risks that climate poses to our operations. In addition to mitigating our transition risks through the use of renewable energy and improved energy efficiency throughout our global operations, our operations, crisis management and business continuity teams help us monitor, prepare for and respond to a range of issues, including extreme weather events that have the potential to disrupt our operations. Citi operates in nearly 100 countries and we know that our facilities may be exposed to a wide range of physical climate risks that vary based on the location of each facility. We have invested in climate adaptation solutions in a number of critical facilities in order to increase resiliency. Our crisis management team has action plans to address immediate risks and support our employees and customers before, during and after adverse events. Our business continuity team also has plans in place to help Citi resume business operations as quickly as possible in the aftermath of an extreme climate event.

Metrics and Targets

The TCFD recommends that companies disclose various aspects of their methodologies for computing and tracking goals related to climate risks and opportunities. For well over a decade, Citi has been compiling and disclosing climate-related metrics and targets. Citi plans to continue to refine our processes for identifying relevant climate metrics and targets and sharing them with others.

Citi sets targets and uses metrics to help us monitor and manage our climate change strategy. Through our $100 Billion Environmental Finance Goal, we have committed to working with our clients to finance climate change and environmental solutions. In addition, we have set ambitious climate-related goals to minimize the impacts of our own operations. We publicly report on our progress toward these goals through a variety of metrics and targets annually in our Global Citizenship Report.

Operations

Citi reports our Scope 1, Scope 2 and a portion of Scope 3 greenhouse gas emissions in our annual Global Citizenship Report. We began reporting on the direct environmental impacts (Scope 1 and Scope 2) of our operations in 2002. We follow the GHG Protocol Corporate Standard and Scope 2 Guidance for measuring and reporting both market-based and location-based Scope 1 and Scope 2 greenhouse gas emissions. We also report Scope 3 CO_2 emissions from employee air and train travel and project financed thermal power plants in our Global Citizenship Report.

Environmental Impact Report

PROGRESS AGAINST 2020 GOALS*

100%	30%	30%	33%	60%	10%
use of renewable energy for facilities globally	reduction in energy consumption *(compared with 2005 baseline)*	reduction in water consumption *(compared with 2005 baseline)*	of global real estate portfolio LEED-certified	diversion rate of waste to landfill *(compared with 2005 baseline)*	of water used coming from reclaimed or recycled sources
PROGRESS 18.3%	PROGRESS 29.9%	PROGRESS 29.0%	PROGRESS 21.8%	PROGRESS 61.8%	PROGRESS 5.8%

**As of year-end 2017.*

Energy	2017
SCOPE 1 - ENERGY CONSUMED	
Natural Gas (GWh)	64
Fuel Oil (GWh)	29
Total Energy Consumed	**93**
SCOPE 2 - ENERGY PURCHASED	
Electricity (GWh)	1,426
District Heating (Steam & Chilled Water) (GWh)	55
Total Energy Purchased	**1,481**
TOTAL ENERGY	**1,574**

For the latest reporting and more details on our environmental performance for operations, see our annual Global Citizenship Report.

CO_2e Emissions	2017
SCOPE 1 & 2 - EMISSIONS	
Direct CO_2e (GHG Scope 1) (mt)	21,097
Indirect CO_2e (GHG Scope 2) (mt)	700,252
Total CO_2e (mt)	**721,349**
RECs or Other Energy Attribute Certificates Purchased (mt)	102,067
Net CO_2e (mt)	**619,282**
SCOPE 3 - EMISSIONS	
Business Travel	
Business Air Travel (mt)	151,112
Business Train Travel (mt)	209
Thermal Power	
30-Year Plant Life (mmt)	18.1
60-Year Plant Life (mmt)	36.2

Environmental Finance

Citi first established an environmental financing target in 2007, with a goal to direct $50 billion to activities that mitigate climate change. After achieving that goal early in 2013, we announced a new $100 Billion Environmental Finance Goal in 2015 to finance and facilitate environmental solutions to reduce climate change impacts and benefit society. We report annually on our progress towards our goal and the environmental and social impacts associated with our environmental financing activities in our Global Citizenship Report. In 2017, we released a supplemental report, Sustainable Growth at Citi, to provide a more detailed look into the financial accounting methodology, environmental criteria, and impact measurement framework of the $100 Billion Environmental Finance Goal.

Citi is on track to meet our climate-related targets. We will continue to set new goals and report new metrics as the need and opportunity arises to help us manage our climate change risks, opportunities and responsibilities. We will also continue to evaluate how we can create new and better metrics and targets to review and report on our climate-related strategy as it evolves.

$100 Billion Environmental Finance Goal

WE PROVIDED $57 BILLION IN ENVIRONMENTAL FINANCING BETWEEN 2014-2017:

Renewable Energy	$36.3B
Water Quality & Conservation	$6.3B
Sustainable Transportation	$5.1B
Green Building	$2.0B
Energy Efficiency	$0.8B
Clean Technology	$0.3B

OUR FINANCING RESULTED IN MEASURABLE IMPACTS:

4.5 mt CO_2e

GHG emissions avoided

2,329 MW

New renewable energy capacity added

For the latest reporting and more details on our progress towards our $100 Billion Environmental Finance Goal, see our annual Global Citizenship Report.

SECTION 4:

Looking Forward

Our experience with the UNEP FI pilot gave us important insights that will help to inform our strategy going forward into 2019 and beyond. Citi acknowledges the risks highlighted by the IPCC's recent Special Report, *Global Warming of 1.5°C*, and recognizes the urgent need to keep warming below 2°C with a goal to limiting it to 1.5°C.

Given this imperative, Citi understands that even though our pilot scenario analysis exercise did not indicate that climate change will pose material financial risks to our business in 2030 and 2040, this was not an exhaustive or conclusive analysis. Regardless, we must take action today to do our part to avoid the worst potential impacts of climate change. To enable this transition, we must work closely with our clients in climate-exposed sectors to help them transition and become more resilient through enhanced climate adaptation and mitigation measures.

This pilot analysis highlighted several difficult challenges associated with conducting climate scenario analysis and understanding climate-related risks that we will need to address:

- Long-term climate projections tend to be inaccurate. This is made even more challenging by the fact that climate risks and impacts are expected to accelerate and get worse over time. Non-linearity is hard to capture and forecast with the currently-available tools for climate risk assessment.
- There are significant data gaps, including data on the linkage between climate risk and credit quality and asset-level data on asset utilization and climate mitigation factors at a facility.
- Climate impacts can be very local and affect different geographies and sectors differently. This will require more granular data at the local and asset level.
- Climate-related losses may be due to indirect, second-order impacts, such as impacts on critical infrastructure or the supply chain, not just direct impacts. This is hard to measure and estimate at this time and will require additional data.

It will take time and collaboration with stakeholders for us to find solutions to these challenges, but we are committed to building upon the pilot project and further implementing the TCFD recommendations. Some potential next steps we are exploring include:

- Conducting climate scenario analysis on other sectors and/or geographies
- Exploring and potentially testing other methodologies, models, tools and scenarios that have been developed by third parties
- Continuing to collaborate with UNEP FI and the pilot group to refine the transition risk and physical risk methodologies that we have developed
- Engaging with clients and other stakeholders to further our collective understanding of climate risks and opportunities, particularly in the supply chain
- Engaging with clients to support investments in climate change solutions for climate adaptation and/or mitigation
- Working with stakeholders to improve data availability and fill data gaps
- Working with climate modelers to adapt climate scenarios for financial analysis

- Assessing if and how internal processes may need to be modified to further integrate climate risks and opportunities
- Working with internal quantitative analysis and modeling teams to develop a plan for internal integration of climate risks and opportunities into existing models and tools
- Engaging with investors to understand areas for improved disclosures
- Engaging with Board committees and senior management on climate-related risks and opportunities

Citi is also considering how our internal risk management processes can account for climate model outputs. Among the options Citi is considering is how to adapt existing tools and models that predict loss likelihood and loss severity so that those tools and models can be utilized to understand the impacts of climate risk factors in addition to macroeconomic factors. Another option that could be viable is to model the linkages between climate risk factors and company fundamentals. For this type of borrower-level assessment to become a reality, the companies in our lending portfolios will need to continue to adopt the recommendations of the TCFD and disclose more climate-related information.

We will continue evaluating approaches to understanding climate risks and opportunities and ways to enhance our climate-related disclosures. We plan to engage investors, key stakeholders and internal experts within Citi to determine the best approach for Citi going forward.

FOR YOUR REFERENCE

Citi has published the following materials relevant to our sustainability initiatives, which serve as additional background on our climate-related activities.

Annual Global Citizenship Report: Corporate citizenship activities and performance for the calendar year.

Environmental and Social Policy Framework: Describes Citi's key environmental and social policies, programs and initiatives globally and guides our daily business decisions.

Sustainable Growth at Citi: Progress and impacts of Citi's $100 Billion Environmental Finance Goal.

Five-Year Sustainable Progress Strategy: Business drivers for sustainability in priority thematic areas of Climate Change, Sustainable Cities, and People and Communities.

ESRM Policy: Illustrative summary of steps taken in a typical Citi project-related finance transaction.

NGPAC Charter: Charter of the NGPAC, a board committee which oversees our global citizenship and sustainability activities and performance.

Form 10-K Annual Report: Annual report required by the U.S. Securities and Exchange Commission, which gives a comprehensive summary of our financial performance and risks related to our business.

Forward-Looking Statements

Certain statements in this report may be "forward-looking statements." These statements are based on management's current expectations and are subject to uncertainty and changes in circumstances. These statements are not guarantees of future results or occurrences. Actual results and financial condition may differ materially from those included in these statements due to a variety of factors, including, among others, global socio-demographic and economic trends, energy prices, technological innovations, climate-related conditions and weather events, legislative and regulatory changes and other unforeseen events or conditions, and the precautionary statements included in this report and those contained in Citi's filings with the Securities and Exchange Commission (SEC). Any forward-looking statements made by or on behalf of Citi speak only as to the date they are made, and Citi does not undertake to update forward-looking statements to reflect the impact of circumstances or events that arise after the date the forward-looking statements were made. In addition, while this report describes potential future events that may be significant, the significance of those potential events should not be read as equating to materiality as the concept is used in Citi's filings with the SEC.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