Sustainable1

Actionable Physical Climate Risk Intelligence for Mortgage Lenders

Calculating the Financial Impact of Physical Climate Risk Hazards: Extreme Temperatures, Drought, Coastal Flooding, Fluvial Flooding, Water Stress, Tropical Cyclones and Wildfires

TheClimateService now a part of S&P Global

Contents

01 Introduction

The Climate Service (TCS) Climanomics® Platform

A climate risk analytics software platform unparalleled in performance, scalability and ease-of-use powered by a team of climate scientists, technologists, economists, data scientists and finance professionals.

Seven climate hazards, including extreme temperatures, drought, coastal flooding, fluvial flooding, water stress, tropical cyclones and wildfires.

Four Representative Concentration Pathway (RCP) scenarios that explicitly explore the impact of different climate policies.

Financial impact estimates of total average annual loss for each decade out to 2100 under the four RCP scenarios.

Mortgage Lenders are Getting Serious about Climate Change

Real estate investments are uniquely vulnerable to climate change. The impacts of rising seas and storms alone could cost coastal cities $1 trillion U.S. each year by 2050, according to the Global Commission on Adaptation. More and more financial institutions are recognizing climate-related risks as important issues that need to be considered in investment and lending decision-making.

Given the volume of outstanding mortgages, climate change poses an enormous threat to financial institutions. TCS, now a part of S&P Global, developed the Climanomics platform to provide a rigorous, yet fast, bottom-up methodology to assess the potential financial impact of climate-related risks under different scenarios. The result? An estimate of the average annual financial loss for each asset (i.e., property) in a portfolio, alongside portfolio-level results.

02
Natural Disasters are on the Rise and Mortgages are Vulnerable

The world has witnessed an alarming increase in the number of extreme weather events in recent years. Indeed, the past 20 years saw a 74% increase in disasters linked to natural hazards compared to the prior two decades. This has resulted in 1.23 million lives claimed, 4 billion people affected and $2.7 trillion in global economic losses, according to the UN.[1]

Mortgage debt outstanding for one-to-four family residential properties[2] in the U.S. alone is estimated to be $12.388 trillion in 2022.[3] Add to this commercial properties, where U.S. sales volume reached a record $809 billion in 2021,[4] and the impact of physical climate risks on mortgage portfolios could be enormous. This includes acute climate hazards, such as increased flooding and storm surges from hurricanes and heat damage from wildfires.

Climate risk is currently hidden in mortgage portfolios, however, and needs to be revealed so that lenders with the highest levels of risk can manage it as soon as possible. While important for global and large mortgage lenders, this is also essential for regional lenders that may have highly concentrated portfolios with large potential exposure.

Get Ahead of Physical Climate Risks with the TCS Climanomics Platform

The Climanomics platform gives mortgage lenders a way to assess the potential financial impact of physical risks on their portfolios under different scenarios. Powered by a transparent methodology and rigorous science, the platform is used by the world's largest banks, asset managers, real estate investors, Fortune 500 firms and public bodies to support decision-making, auditing, reporting and more. A detailed bottom-up approach quantifies financial risks at the asset level, which are then aggregated to provide a clear picture across a portfolio, delivering a highly flexible approach for stress testing and other applications.

*"**Leads the pack with robust data and analytics capabilities.** TCS's platform covers a growing library of hazards and vulnerabilities charted out to the year 2100 to help risk managers understand the financial impacts of climate risks under different scenarios."*

– Leader of the Forrester New Wave™: Climate Risk Analytics, Q3 2020

03

Put a Price on the Impact of Physical Climate Risks on Mortgage Portfolios

The Climanomics platform quantifies physical risks in financial terms (i.e., average annual loss) in a way that is aligned with the recommendations of the Task Force on Climate-related Financial Disclosures (TCFD).

One-click Scenario Analysis

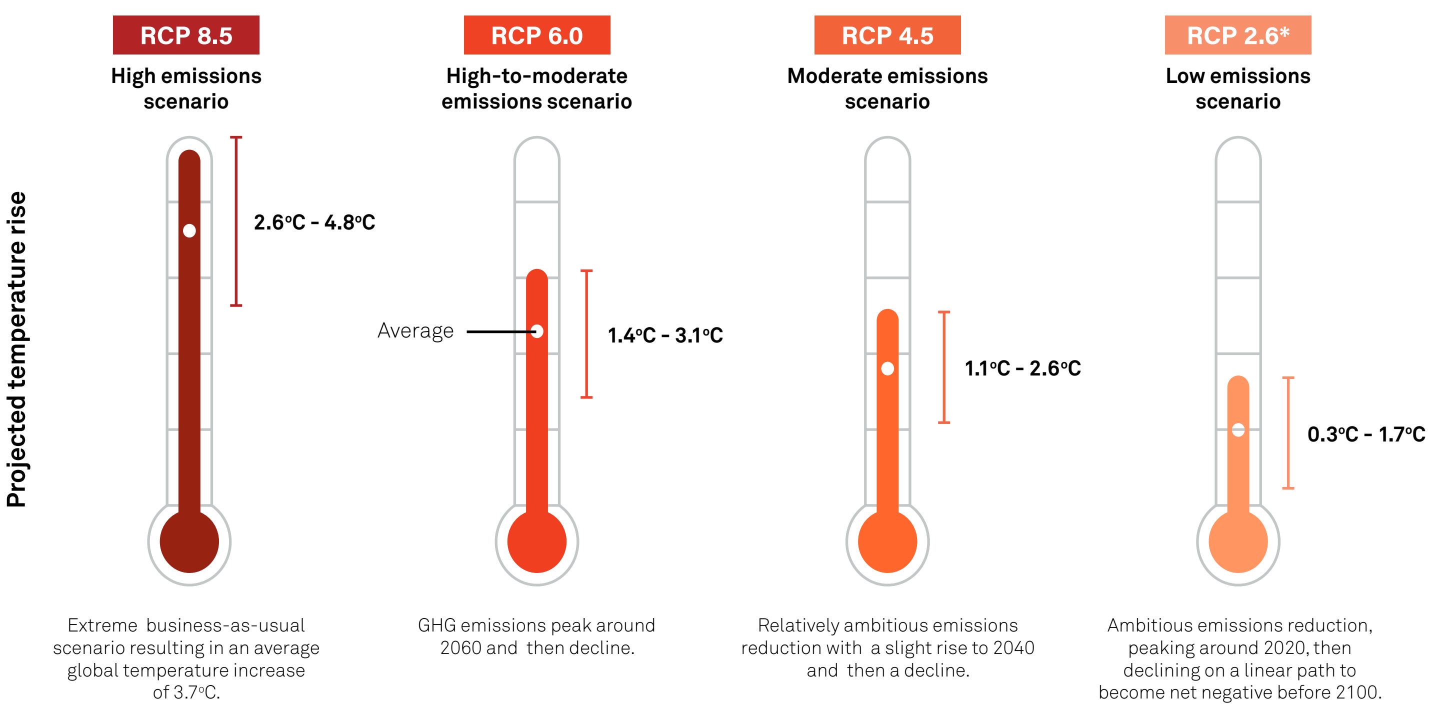
Scenario analysis provides actionable insights about potential future outcomes. TCS incorporates four climate scenarios based on the Representative Concentration Pathways (RCPs). An RCP is a greenhouse gas (GHG) concentration trajectory adopted by the Intergovernmental Panel on Climate Change (IPCC).

The pathways describe different climate futures, all of which are considered possible depending on the volume of GHGs emitted in the years to come. The four RCP scenarios available in Climanomics cover the future warming of 0.9-2.3ºC (RCP2.6), 1.7-3.2ºC (RCP4.5), 2.0-3.7ºC (RCP 6.0) and 3.2-5.4ºC (RCP8.5).

Figure 1

What are RCPs?

The RCPs were developed by the IPCC in 2014 to describe different futures based on a range of GHG concentration levels in the atmosphere, driven by economic activity, energy sources, population growth and other socio-economic factors.



*RCP2.6 is the only scenario that aligns to the Paris Agreement target to limit the average global temperature increase to well below 2°C.

Sources: IPCC, S&P Global Ratings.

Science-driven Insight on Future Hazard Exposure

TCS starts by utilizing publicly available raw climate data from sources such as NASA, the IPCC, the National Oceanic and Atmospheric Administration (NOAA), the World Wildlife Fund HydroBASINS and many more. The data may include information on factors such as temperature and precipitation.

This is used by expert TCS scientists to build and refine their own climate models for extreme temperatures, drought, coastal flooding, fluvial flooding, water stress, tropical cyclones and wildfires. For example, while precipitation is important for flooding, so is topography, land use and basin area, variables that are included in TCS's hazard models

An Assessment of Vulnerability

TCS has a growing library of proprietary impact functions that model the vulnerability of 230+ different asset types to climate-related hazards, based on a wide range of factors specific to each one. For example, the impact to a vineyard from temperature extremes will be different than the impact to a data center.

Figure 2

TCS Residential Mortgage Asset Types

- Single Family Housing - Rural
- Single Family Housing - Urban
- Multifamily Housing - Low-Rise or Garden Style/Rural
- Multifamily Housing - Low-Rise or Garden Style/Urban
- Condominium - Ground Floor/Rural
- Condominium - Ground Floor/Urban
- Condominium - Upper Story/Rural
- Condominium - Upper Story/Urban

A Financial Loss Calculation

Clients provide three details on each outstanding mortgage: (1) the specific type of asset (e.g., single- or multi-family, condominium or kind of commercial facility), (2) the location, and (3) the value of the property. To quantify the financial risk, it is important to determine how a hazard will affect an asset in a way that is financially material. For example, how will an increase in temperature impact cooling costs or a flood impact clean-up and repair costs? Of course, this will depend on the type of asset and if it is highly vulnerable or not.

Assessments of hazards and of vulnerabilities are considered for each asset to estimate the average annual loss associated with climate risk to provide an informative evaluation of exposure. These losses can be incorporated into credit models as lost income for the owner in order to stress test the outcomes. At some point, this loss could be a tipping point for the owner, increasing the likelihood of default on the mortgage. The total average annual loss is the sum of the financial impact of all hazards. This can be disaggregated by type of hazard and, within each hazard, by type of expense. The loss data is provided for each decade out to 2100 under the four RCP scenarios.

04

Identify, Manage and Disclose Physical Risks with Climanomics

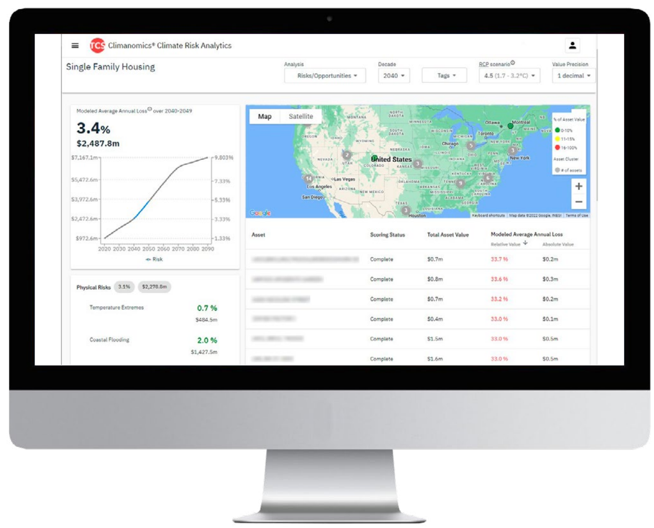
There is a widespread and growing need for a better understanding of the financial impact of climate change. Climanomics brings together TCS's expertise in science, finance and risk to give mortgage lenders:

- A simple, standardized way to evaluate the physical climate risks in their portfolios and drill down to discover what is causing the risk.
- Vulnerability analysis from the asset level up, paired with best-in-class climate modeling.
- Outputs in financial terms to help speed the transition to a low-carbon economy.
- An easy and secure platform for running scenario analysis and stress testing mortgage portfolios hosted on scalable, enterprise-grade AWS cloud infrastructure.

The platform delivers simple charts, graphs, narrative and data for export that provide insights into the location, severity and timing of climate-related risks.

Figure 3

Zero In on Physical Risks



Source: TCS Climanomics. For illustrative purposes only.

[1] "Human Costs of Disasters: An overview of the last 20 years", UN Office for Disaster Risk Reduction, www.undrr.org/media/48008/download.

[2]This means any real property primarily designed and used for residential occupancy of from one to four families, including a residential unit in a condominium if such unit is designed and used primarily for occupancy by one to four families, regardless of the total number of units in the condominium complex.

[3]MBA Mortgage Finance Forecast, March 21, 2022, https://www.mba.org/docs/default-source/research-and-forecasts/forecasts/mortgage-finance-forecast-mar-2022.pdf?sfvrsn=6949df81_1. Total one-to-four family originations and refinance share are MBA estimates. These exclude second mortgages and home equity loans. Mortgage rate forecast is based on Freddie Mac's 30-year fixed rate, which is based predominantly on home purchase transactions.

[4]"CRE loses luster as inflation hedge; CPPIB, Lennar unit form US$979M JV", S&P Global Market Intelligence, February 25, 2022, www.spglobal.com/marketintelligence/en/news-insights/latest-news-headlines/cre-loses-luster-as-inflation-hedge-cppib-lennar-unit-form-us-979m-jv-69066362.

Sustainable1

TheClimateService now a part of S&P Global

Contact us

If you are looking to learn more about Actionable Physical Climate Risk Intelligence for Mortgage Lenders click here and an ESG Specialist will assist you.

Americas – Sales
P: **+1-877-863-1306**
E: **market.intelligence@spglobal.com**

EMEA – Sales
P: **+44-20-7176-1234**
E: **market.intelligence@spglobal.com**

APAC – Sales
P: **+852 2533 3565**
E: **market.intelligence@spglobal.com**

About S&P Global Sustainable1
S&P Global Sustainable1 is the central source for sustainability intelligence from S&P Global. Sustainable1 matches customers with the ESG products, insights and solutions from across S&P Global's divisions to help meet their unique needs. Our comprehensive coverage across global markets combined with in-depth ESG intelligence provides financial institutions, corporations and governments an unmatched level of clarity and confidence to successfully navigate the transition to a sustainable future. Our data and well-informed point of view on critical topics like energy transition, climate resilience, positive impact and sustainable finance allow us to go deep on the details that define the big picture so customers can make decisions with conviction. To learn more about Sustainable1, visit http://www.spglobal.com/sustainable1.

About S&P Global
S&P Global (NYSE: SPGI) is the world's foremost provider of credit ratings, benchmarks and analytics in the global capital and commodity markets, offering ESG solutions, deep data and insights on critical economic, market and business factors. We've been providing essential intelligence that unlocks opportunity, fosters growth and accelerates progress for more than 160 years. Our divisions include S&P Dow Jones Indices, S&P Global Engineering Solutions, S&P Global Market Intelligence, S&P Global Mobility, S&P Global Commodity Insights, S&P Global Ratings and S&P Global Sustainable1. For more information, visit www.spglobal.com.