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CLIMATE CHANGE

Climate-Related Risk Data for Real Assets:

A Framework for Assessment

Because they invest in physical assets, often over long hold periods, real estate investors are on the front line of the impact of climate change. They rightly want to take a data-driven approach to managing their exposure to climate risk. Morgan Stanley Investment Management partnered with the Morgan Stanley Institute for Sustainable Investing to compare the outputs of select leading physical climate risk data providers and discovered highly varied results. The purpose of this report is two-fold: to provide real estate investors with a framework for assessing physical climate risk tools and to caution against taking a one-size-fits-all approach.

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CLIMATE-RELATED RISKS CAN BE CATEGORIZED AS PHYSICAL OR TRANSITION

PHYSICAL RISK
Physical risk is defined as potential loss caused by climate-related events. These can be acute or chronic.

TRANSITION RISK
Transition risk encompasses the risks stemming from the need to decarbonize in order to minimize global warming and reduce physical risks.

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Climate-related risks can be categorized as physical or transition,[1] and both can be challenging to quantify. Physical risk is defined as harm, damage or loss created by climate-related events. These events can be acute or chronic. Acute physical risks include rapid onset hazards such as hurricanes/cyclones, wildfires and floods, resulting from changes in natural weather cycles. Chronic physical risks result from climate patterns over longer periods of time and include hazards such as heatwaves, droughts and sea level rise. Both types of physical risks can result in large financial losses and impair asset values. Climate change is worsening the impacts of these physical risks in two ways: increasing the probability of events taking place and increasing the intensity of the events themselves.

Transition risk[2] encompasses the risks (e.g., policy-related, economic, legal and reputational) that arise from the necessity to decarbonize in order to minimize global warming and reduce physical risks in the long run. An example of a transition risk that impacts real estate investments is the need to comply with building performance standards that require building owners to meet certain carbon emissions reductions. For instance, New York City and the District of Columbia have passed laws on such standards to meet their overarching greenhouse gas (GHG) emissions reduction goals.

Raw climate data is often publicly available but requires expertise to extract and process into metrics that investment professionals can understand and integrate into their underwriting. The number of data providers specializing in climate-related risks is growing, on top of an existing ecosystem of catastrophe model vendors. The complexity of these models and the often-opaque nature of the methodologies underlying them can make selection challenging.

VENDOR LANDSCAPE

Given the probabilistic nature of physical climate risks, understanding and assessing risk exposure requires relying on complex scientific data that is often packaged and provided by third-party vendor models. These models can be classified in two broad categories: traditional catastrophe models, which have been in use by the insurance industry for several decades, and climate change models, which are newer entrants to the marketplace.

CATASTROPHE MODELS provide an assessment of physical risk based on historical patterns, covering a range of acute and chronic perils. These models use a combination of statistics, engineering and technology to simulate the impacts of a given peril for a specific asset's location to quantify the amount of damage or loss that might take place.

CLIMATE CHANGE MODELS attempt to forecast how acute and chronic physical risks will change over time, using forward-looking global and regional circulation models and scenario analysis. These models are derived from scientific research on changing weather patterns due to atmospheric forcing, and look out over 20, 50, or 100 years.

Vendor Comparison Findings

After conducting a market scan, we identified a subset of providers and tested their product by evaluating their methodologies, running a portfolio of representative properties through their tools and comparing the results. In the process we observed the following:

1

There was low correlation among results from different provider results (i.e., measures of climate impact and identification of most at risk properties). Providers offered a range of differing views on climate-related risk in our sample real estate portfolio. All highlighted specific risks—but not necessarily the same ones—so we had to conduct careful analysis to establish a comprehensive view.

2

Not all data providers include transition risk in their models. Assessing and quantifying transition risk can be challenging because it is forward-looking and encompasses a wide range of factors, such as the evolving policy response to addressing climate change. A robust assessment can best be accomplished through scenario analysis. Scenarios to consider include the potential adoption of carbon pricing, restrictions on fossil fuels, expanded use of renewable energy, innovation in technology and technology subsidies. Such scenarios feed through to real estate investor decision making through projections of future building energy costs and the capital expenditures needed to decarbonize buildings over certain time horizons.

3

Asset- and community-level resiliency measures (e.g., floodgates, pipe winterization, elevated and protected mechanical equipment, drought- and fire-resistant landscaping and architecture) are not incorporated into climate provider assessments, thus often overstating vulnerability.

4

Risk analysis only captures direct impacts and not the indirect impacts related to supply chains or the community implications of climate-related risks. For example, a city's fiscal condition as well as its resilience policies and strategies will likely impact its ability to make resilience-related investments.

The Challenge for Real Estate Investors

Increasingly, real estate investors are mindful of incorporating climate-related risk data into their due diligence during acquisition and asset management.

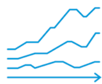
However, when it comes to including climate risks in underwriting, investors need a high degree of confidence in the data they use to measure those risks. Unfortunately, the low correlation in results among forward-looking data providers makes it challenging to rely on any one data provider without understanding the details of its methodology. Without nuanced appreciation of the details, investors could misinterpret their climate risk exposure.

Our Suggested Approach

Our findings are similar to concerns surfacing in peer-reviewed academic literature.[3] We believe that collaborating with data providers and seeking transparency on their methodologies is essential, and there is likely room for industry-wide efforts at harmonization. Below is a summary of key takeaways from our analysis, which we think investors should consider when evaluating data providers:

Use catastrophe (cat) risk models and climate models. Cat risk models—the industry-standard solution for insurers—emphasize today's risk exposure based on historical and statistical analyses; these are commonly used in real estate as well. However, climate models are a newer and evolving phenomenon, and they seek to predict future risk exposure based on scenarios modelling future weather patterns resulting from Representative Concentration Pathways (RCPs). Combining the two may provide added insight and strengthen risk management.

UNDERSTANDING REPRESENTATIVE CONCENTRATION PATHWAYS (RCP)



RCPs are scenarios that include time series of emissions and concentrations of GHGs, aerosols and chemically active gasses, as well as land use and land cover.[4] A given RCP represents just one of many possible scenarios leading to specific radiative forcing characteristics. And an RCP's pathway is its trajectory over time to reach a given long-term concentration outcome.[5] RCPs typically refer to the portion of the concentration pathway extending up to the year 2100 for which integrated assessment models have produced corresponding emission scenarios. Frequently cited scenarios include:

SCENARIO RCP 2.6: emissions begin to decline by 2020 and reach zero by 2100

SCENARIO RCP 4.5: emissions peak around 2040 before declining

SCENARIO RCP 6: emissions peak around 2080 and then decline

SCENARIO RCP 8.5: considered a worst-case scenario in which emissions continue to rise

Selecting the "right" data providers depends on your time horizon. Data provider climate models often consider different RCPs for GHG emissions with different reference years. (e.g., 2020, 2030, 2050 or 2100). For a real estate investor, depending on the type of investment—core or value add, considering longer-term time horizons may be important.

Know what hazards matter most to you. Data providers consider different types of hazards in their models (e.g., fluvial flooding, coastal flooding, sea-level rise, heat stress, cold waves, hurricanes and wild fires). Depending on a portfolio's geographic concentrations, certain models will be more or less relevant. For example, investors in real estate portfolios with significant coastal exposure may want to better understand their exposure to hurricanes, cyclones and potential sea level rise to mitigate potential losses and keep their insurance premiums at a minimum. On the other hand, investors in portfolios with greater inland exposure might be more interested in understanding their exposure to heat stress, heat waves and extreme cold. Periodic stress tests, evaluating potential impacts of tail risk events, may be warranted for such concentrations.

Do not forget about transition risks. Physical risk is especially important to real estate investors. However, the buildings and construction sector accounted for 39% of energy and process-related carbon dioxide (CO_2) emissions in 2018.[6] Reducing their carbon footprint in the coming decades will therefore be essential to meeting the emissions reduction targets set out in the Paris Agreement. Taken together, physical and transition risks can impact the net operating income and exit values of real estate investments, so a holistic assessment of all climate-related risks can help managers optimize investment returns.

Recognize that hazard classification is not the same across providers. Take heat stress, for example. Some providers consider heat stress in terms of the anticipated increase in annual maximum temperature, classifying the climatological situation on a scale. Others look at extreme heat by analyzing the change in the number of days per year in which the asset is exposed to extreme heat events (e.g., days above 100°F (38°C) and/or 110°F (43°C)). Thus, real estate investors should consider which hazards are incorporated into provider models and partner with those providers whose models are most relevant to their specific portfolios.

Altogether, a well-considered and data-driven assessment of physical and transition risk—leveraging analysis from carefully selected, and possibly multiple, data providers—can help real estate investors understand their portfolios' exposure to climate risk in a holistic way. We believe it can also help them make better-informed investment decisions, optimize capital expenditures and determine best-in-class operational practices. We hope that investors will find this framework for assessing data providers useful and that it may encourage them to increase the number of their data provider relationships.

About the Morgan Stanley Institute for Sustainable Investing

The Morgan Stanley Institute for Sustainable Investing is housed within the Global Sustainable Finance group and chaired by Morgan Stanley's Chairman and CEO, James Gorman. The Institute works to accelerate the global adoption of sustainable investing and finance strategies. Its Advisory Board, comprised of corporate, sustainability, academic and philanthropic leaders, helps ensure that our approach to sustainability and sustainable investing is comprehensive, rigorous and innovative. Morgan Stanley Investment Management leverages and benefits from Morgan Stanley's decade-plus commitment to sustainable finance. Positioned at the nexus of the firm's business units and the broader sustainable finance market, the Morgan Stanley Institute for Sustainable Investing serves as a unique resource and partner on innovation, knowledge sharing and thought leadership.

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Notes

1 For discussion of transition risk, see Morgan Stanley Institute for Sustainable Investing and Morgan Stanley Investment Management. "Climate Transition in a Portfolio Context: What Matters and What to Measure." June 23, 2020. https://www.morganstanley.com/ideas/climate-change-investing-decarbonization-metrics.

2 Morgan Stanley Institute for Sustainable Investing and Morgan Stanley Investment Management. "Climate Transition in a Portfolio Context: What Matters and What to Measure." June 23, 2020. https://www.morganstanley.com/ideas/climate-change-investing-decarbonization-metrics.

3 T., Pitman, A.J., Mackenzie, K. et al. 2021. "Business risk and the emergence of climate analytics." Nature Climate Change 11, 87–94.

4 Moss et al., 2008. "Towards New Scenarios for Analysis of Emissions, Climate Change, Impacts, and Response Strategies." Intergovernmental Panel on Climate Change, Geneva, 132 pp.

5 Moss et al., 2010. "The Next Generation of Scenarios for Climate Change Research and Assessment." Nature. 463 (7282):747-56.

6 https://www.iea.org/reports/global-status-report-for-buildings-and-construction-2019

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