Pitfalls & Mitigants of Climate Assessment Software

Recommendations for Evaluating U.S. Commercial Real Estate Climate Exposure

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Executive Summary

- To identify climate risks and determine mitigation strategies, investors and asset managers can use climate-modeling software tools for both asset- and portfolio-level analyses.
- While software tools are effective for screening baseline physical risks, a deeper analysis of property-specific characteristics and community-level resilience efforts are necessary to fully assess the material physical risks posed by climate change.
- In this paper, we will explore ways to mitigate the shortfalls in software tools.

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Acute and Chronic Climate Hazards

Physical climate risk incorporates two broad hazard categorizations: acute and chronic. Climate risk software and analysis tools typically forecast each hazard individually and across multiple timeframes and scenarios.

	Acute Risks	Chronic Risks
Definitions	Risks that are event-driven, including increased severity of extreme weather events.	Risks resulting from longer-term shifts in climate patterns.
Hazard Examples	• Wildfires • Floods • Storm surge • Hurricanes and Typhoons	• Heat Stress • Cold Stress • Drought • Sea Level Rise

Evaluating Risk with Future-Looking Projections

Various sectors within the real estate industry rely on different models and data sources to assess climate risk.

Early physical risk assessments were performed by property insurers to determine protection against catastrophic risk from extreme weather events. For this analysis, insurers complete event-based modeling, which includes an analysis of historical events through tools such as FEMA[1] flood maps, as well as a review of historical weather patterns. Although these tools are useful for assessing past damage and identifying current physical risks, they often do not account for changing climate conditions that will drive future risks.

Today's climate-change modeling tools used by asset managers and sustainability professionals take a forward-looking approach, projecting future scenarios over time to evaluate the impacts of climate change. These models typically integrate climate change scenarios such as the IPCC's[2] Shared Socioeconomic Pathways (SSPs)[3] or Representative Concentration Pathways (RCPs)[4] to assess each hazard under different climate-change scenarios over time.

Both historical and forward-looking approaches to measuring physical risks are valuable, but confusion can arise when insurers and underwriters focus on historical data, while asset managers and sustainability professionals consider future scenarios. This trend is changing as some insurers have developed models that incorporate RCPs or SSPs and assess impact at various periods of time, up to 2100.

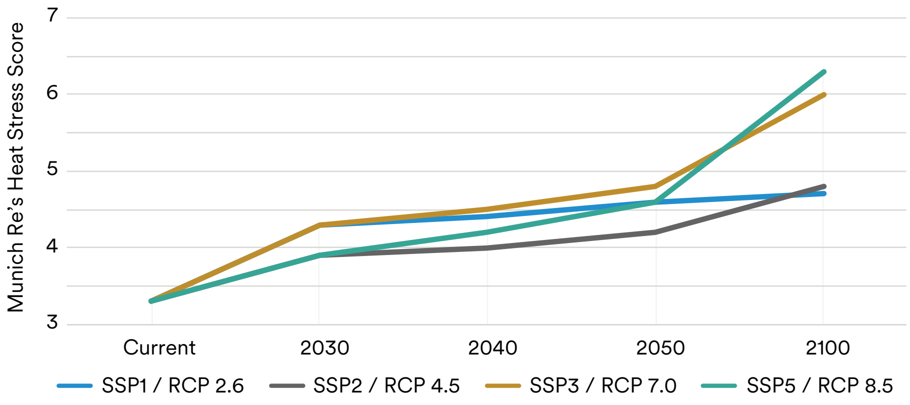
Challenges

Aside from accounting for the differing perspectives offered by the backward- and forward-looking approaches, the forward-looking modeling tools adopted by asset managers today present additional challenges, including:

1. **Information Overload:** Oftentimes, an analysis presents ratings for properties at multiple SSP/RCP values, as well as different timelines for each type of chronic and acute risk. Asset managers can be left perplexed when determining which SSP/RCP value and timeline to focus on and how best to translate those results into a mitigation strategy. Additionally, it may be unclear whether it is best to assign a risk value to an asset based on the results of each chronic and acute risk or on an aggregation of the full results.

   The graph below demonstrates different increases in heat stress to an asset over time, depending on the SSP/RCP climate scenario. Higher SSP or RCP values indicate higher global surface temperatures.

   Comparison of Relative Heat Stress Risk to a Case Study Asset in Different Climate Scenarios Over Time



   Source: Munich Re's Location Risk Intelligence Platform

   Munich Re's Heat Stress Score is the categorized average of select parameters[5] normalized onto a 0-10 scale.

2. **Conflicting Information**: With the increase in proprietary risk-modeling software, the predictions offered by software tools can vary widely. This is covered in the Urban Land Institute's *How to Choose, Use, and Better Understand Climate-Risk Analytics* publication, which discusses how seven assets tested for risks using three separate modeling tools resulted in inconsistent outcomes.[6]
3. **Property-Specific Details and Characteristics:** While models have been developed to assess the climate risks specific to a certain location, software programs are often unable to differentiate risk depending on property-specific details and characteristics such as unique resilient or vulnerable qualities of each building. This will be discussed in more detail later.
4. **Location accuracy, point vs. polygon locations and map resolution score variation:** Current geocoding capabilities of the software platforms present limitations. Address searches may not ping the exact location of the building, instead displaying results for a point on the street beside the building, or a parking or landscaped area. Furthermore, properties are typically scored with a single point rather than the whole footprint of the

building. When one point represents a whole building, it presents challenges for hazards with significant meter-to-meter variation. For example, with flood risk, if one corner of the building is at high risk of flooding while the rest of the building is not, pinging a point on top of that corner will provide a higher risk score than pinging a different point on the same building. While polygon search is possible, it is difficult to scale across a portfolio.

5. **Impact on cash flow, value and hold:** A property may be at risk during the current hold or during a future hold. Property owners can explore mitigation strategies or may decide to let a future owner assess the risk at a later date and determine if mitigation is still necessary or financially feasible. Because buyers typically run a physical risk analysis during diligence, an asset that scores high physical risk in 15 or 25 years may be discounted by the buyer through capital expense costs or a higher reversion capitalization rate, either of which results in a lower property value.

Development of a Physical Risk Assessment and Mitigation Strategy

Despite the various challenges noted above, software modeling tools remain valuable. They offer big-picture portfolio risk assessments for quickly identifying possible risks and for screening potential equity acquisitions and loan originations as part of due diligence. To balance the broad nature of the risk scores from these software tools, a physical risk assessment and mitigation strategy should include the following additional steps to create a holistic approach.

1. Create an inventory of property-specific details and characteristics.
2. Consider the surrounding built environment.
3. Research community or regional resilience efforts.

Property-Specific Details and Characteristics

Physical attributes specific to individual assets can indicate the level of intervention and capital planning that is necessary to ensure resilience. For instance, two adjacent office properties may be located in a high-risk flood zone and earn the same score when assessed using climate-modeling software. However, one office building may have been designed with its critical electrical and HVAC equipment located in a basement below grade, while the other may have its critical equipment in a penthouse central plant above the 100-year flood zone and have incorporated backup power supplies that do not rely on the local grid. Similarly, an assessment could offer the same scores for two buildings located in the same hurricane-prone area, even if one has vintage jalousie windows, while the other has windows rated to withstand multiple 100-year hurricane events.

The Built Environment

Certain aspects of the built environment can affect a building's vulnerability to different climate risk hazards. Taking into account a building's surroundings is important context for understanding an asset's level of risk, resilience and potential mitigation strategies. An analysis should consider large built environment features such as levees, public transportation infrastructure and nearby buildings that can redirect the flow of flood waters or provide shade to the property. To assess potential vulnerability of nearby buildings to precipitation stress and flash floods, surrounding features to take stock of include paved roads, which are impermeable to rainwater, and parks with plants and landscape, which are able to absorb stormwater runoff. In addition to providing shade and reducing runoff, a dense urban tree canopy can also reduce a building's vulnerability to heat stress.

Beyond asset-specific built environment features, jurisdictional-level resilience plans may help to protect assets from the physical risks of climate change. Understanding these plans and whether they benefit an asset requires research. Denver, for instance, has emerged as one of the most climate-resilient cities in the United States.[7] One effort that the city is undertaking includes the Cherry Creek Restoration Project, which aims to restore a one-mile stretch of the Cherry Creek corridor by addressing severe erosion issues. This will provide improved flood protection, reducing flood risks to nearby properties, and offer community benefits such as improved water quality and increased tree canopy.[8]

Community Resilience Efforts

While some cities are adopting resiliency strategies, the Carbon Disclosure Project found in a survey of 800 cities that 43 percent of cities do not have the budget or resources available to adapt to anticipated future climate events.[9] While this paper has largely focused on the impacts that physical risks could pose to an asset directly, a prudent researcher will consider the indirect impacts of such events. These may be challenging to forecast and therefore can be misjudged. For example, in 2020, McKinsey Global Institute modeled expected changes in flooding due to climate change in Bristol, England. In their analysis, the one area central to the headquarters of multiple corporations remained physically unharmed, yet critical routes required for travel to-and-from the area were jeopardized.[10] While the actual properties in this area could remain physically unharmed, they could risk high vacancy due to a future accessibility issue. This is an example of how assets in markets with high exposure to physical risk need to consider every component of how these risks could impact cash flow and, therefore, value. Property revenues can suffer when tenants opt to relocate to less risky markets, and property expenses can increase through investment in mitigation strategies.

Case Studies

The case studies below provide examples of the research required to categorize a property's climate risk, once flagged by the climate-risk software tools.

Plano, TX, Retail Shopping Center

The asset team for a retail shopping center in Plano, Texas was alerted to the property's high exposure to flood risk. A further analysis was undertaken to research historical flood patterns, elevation and the local community's mitigation efforts. This research, which was simply performed via a Google search, uncovered physical mitigation measures already in place, including the construction of a nearby flood wall and levee that were not identified in the climate-modeling tool. Although the asset was rated "high-risk" by the model, further analysis suggested the model may not be accurately taking these other factors into consideration.

Washington, D.C., Office Property

An asset manager was notified via multiple climate-risk modeling tools that two adjacent office assets located in Washington, D.C. were at an extremely high flood risk with a 99% chance of flood occurring at the properties within the next 30 years. Further analysis determined that the topographic data built into the different tools was likely outdated and included the condition of the site at the time of the properties' construction. The models indicated a 30-foot elevation discrepancy at the sites, which was indicative of a deep excavation pit that had been in place during construction. After review, the risk level was downgraded.

Post-Analysis Strategy

While these examples display false-positive findings regarding the actual physical risks, similar results cannot be assumed for all assets. The following strategies can occur following an asset's analysis.

1. **Planning for capital expenditures**. Assess the amount of capital needed to mitigate or improve a property's physical attributes to make the asset climate-change ready. This analysis should also consider the costs associated with inaction, including costs for repairs, potential downtime and higher insurance premiums.
2. **Evaluating property insurance**. Work with insurers to expand existing coverage if necessary. Determine the risk of coverage availability, if located in an area at risk to the halting of new policy sales.
3. **Adjusting exit and reversion cap rates**. In the absence of a mitigation strategy, exit capitalization rates may require adjustment to reflect increased risk resulting from some combination of mitigation costs and impacts on current and future occupants.

Moving Forward

Discussion of climate-change-related risks to real estate is accelerating. Although, post-election, federal actions may be postponed, the trend is likely to continue at the state and local level as new reporting requirements mandate the disclosure of material impacts from potential climate risks. We believe the following trends will persist:

1. **Improvement in tools used for climate risk identification:** Most climate risk software tools available to commercial real estate professionals have been in use for less than a decade. Improvements may include more regular geographic and geospatial information updates, inclusion of more built environment features and a better database of local mitigation projects. We also expect that AI will accelerate the improvement of the tools' abilities to assess a broader scope. For example, assessing a community's entire built and natural environment to incorporate the impacts of local physical features on a property's flood risk score.
2. **Greater consistency in the classifying and underwriting of physical risks:** While many leading firms incorporate some form of analysis into their underwriting of physical risks, there is a general lack of consistency in strategies used. Over time, there may be more agreement about best practices for SSP/RCP values and risk indicators. Additionally, new approaches used to underwrite capital expenditures for resiliency purposes may be available.
3. **Regular disclosure of physical risks:** With the increase in regulatory frameworks and with more firms adopting strategies concerning physical risk, moving forward, a risk evaluation may be more likely to be disclosed in offering memorandums and incorporated into property valuations. We anticipate that the SEC's[11] required reporting on material climate risks may not survive ongoing legal challenges. However, some jurisdictions may require the disclosure

of property physical risk scores, similar to reporting on transition risks through building-performance-standards disclosures.

4. **Greater investment in municipal resilience efforts:** Investments in mitigation and resilience require funding. With the passing of the Bipartisan Infrastructure Law in 2021, approximately $47 billion was specifically allocated for resilience and climate-related programs. We anticipate future government funding streams will continue to support these jurisdictional efforts.

Conclusion

Developing a holistic risk assessment and management strategy requires more than a score from a database, it requires deeper research to understand a property's specific details and characteristics, the surrounding built environment and community resilience efforts.

Physical risk can impact an asset due to the need for mitigation, repair and insurance premiums. Assets can incur costs during their hold, and various climate scenarios can increase risk due to future impacts. This may be factored into current or future cash flows or to a reversion cap rate, impacting an asset's net present value.

The implications of physical risk from climate change have become a key consideration of real estate investors and asset managers. We anticipate that the software tools available for identifying physical climate risks will continue to become more sophisticated as data resources and processing capabilities increase, meeting demand as concern regarding climate risk continues to grow.

Endnotes

1 https://www.fema.gov/flood-maps
2 https://www.ipcc.ch/
3 https://www.ipcc-data.org/guidelines/pages/glossary/glossary_s.html
4 https://www.ipcc-data.org/guidelines/pages/glossary/glossary_r.html
5 Munich Re's Heat Stress Score Parameters: Annual Days In Heat Wave, Annual Maximum Temperature, Annual Mean Daily Maximum Temperature, Annual Days Above 40°C and Annual Tropical Nights
6 https://knowledge.uli.org/en/reports/research-reports/2022/how-to-choose-use-and-better-understand-climate-risk-analytics
7 https://milehighcre.com/denver-is-the-most-climate-resilient-city-in-the-u-s/
8 https://mhfd.org/residents/work-in-your-area/cherry-creek-restoration-project/
9 https://www.theguardian.com/environment/2021/may/12/one-in-four-cities-cannot-afford-climate-crisis-protection-measures-study
10 https://www.mckinsey.com/capabilities/sustainability/our-insights/can-coastal-cities-turn-the-tide-on-rising-flood-risk
11 https://www.sec.gov/newsroom/press-releases/2024-31

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