Managing climate risk – a 21st century approach for commercial real estate investors

By Louis Wright and Zachary Marschik

Not only is real estate a major contributor to CO_2 emissions, as an asset class it is also suffering increasingly from the very natural disasters global warming brings about. With climate risk accelerating around the world, real estate investors need to consider the impact on their strategies. Read on to learn how we approach these growing challenges at Invesco Real Estate (IRE).

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Populations around the globe face heightening climate risk. In 2021 alone, the world witnessed severe flooding in Western Europe and China, ice storms in Texas and wildfires in California – all of which exacted enormous economic and human costs.

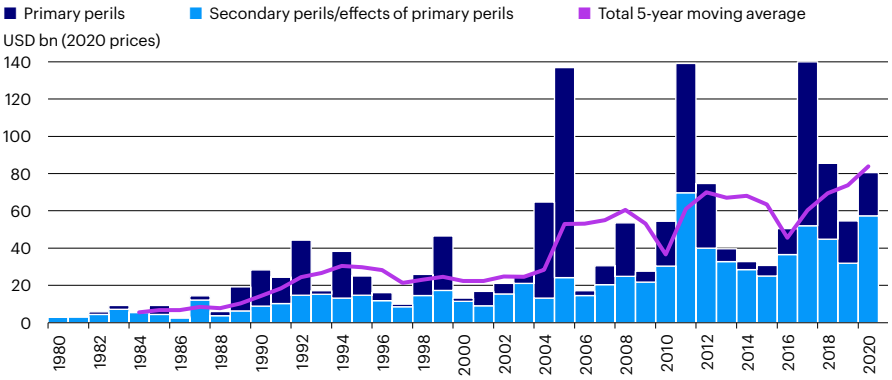
Re-insurance data highlights the increasing cost of such disasters: Global economic losses from natural and man-made catastrophes totaled USD 202 bn in 2020, up from USD 150 bn in 2019.[1] Figure 1 shows global losses broken down in line with the industry standard categorization of climate events into primary perils and secondary perils. Primary perils are natural disasters with known severe loss potential for the insurance industry, such as tropical cyclones or earthquakes, whereas secondary perils are smaller to moderate events or the secondary effects of a primary peril. Examples include river flooding, torrential rainfall, drought, wildfire, thunderstorms and tsunamis. Secondary perils are often not modeled and have historically received little monitoring from the insurance industry. Though the annual costs of both types of climate event are increasing, the share represented by secondary perils is growing.

The overwhelming majority of climate scientists and academics agree that global warming is caused by human activity.[2] As figure 2 shows, global temperature anomalies have risen considerably over the last 100 years, and there is consensus that this is the main reason for the rise in the frequency and severity of natural disasters. Though governments, not-for-profit organizations and the private sector have joined the fight against climate change, even the most drastic of interventions will require many years to reverse the global warming trend, and the cost of extreme weather is expected to continue climbing into the foreseeable future.

Real estate and the climate challenge

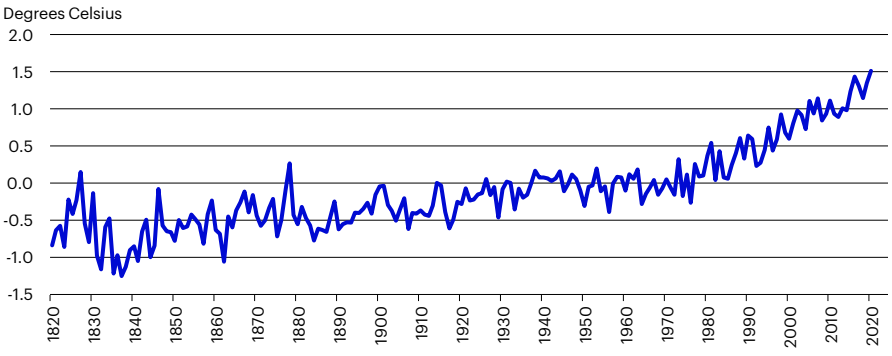
Real estate is a major contributor to global CO_2 emissions. In 2020, the built environment was estimated to be responsible for 75% of annual global greenhouse gas emissions,[3] with buildings alone accounting for about half of this amount.[4] Around 50% of emissions from new buildings are embedded in the construction materials. The other half arises from operation of the building.[5] This sets the real estate industry before the dual challenge of creating spaces that are more efficient in use while reducing the up-front carbon emissions involved in construction and refurbishment. This should be kept in mind as we concentrate on identifying climate risks for existing assets.

Figure 1
Global insured losses from climate events



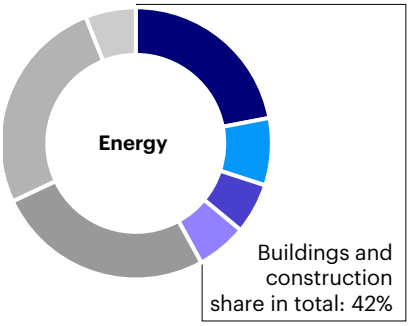
Source: Swiss RE (2021); "In 5 charts: natural catastrophes in a changing climate", https://www.swissre.com/risk-knowledge/mitigating-climate-risk/sigma-in-5-charts.html

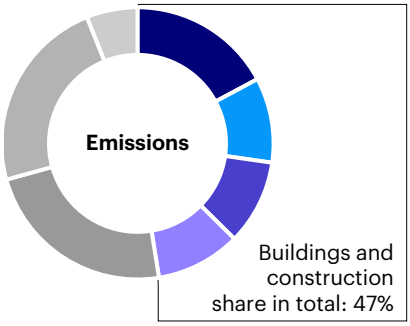
Figure 2
Annual global temperature anomalies since 1820



Source: Berkley Earth; temperature anomalies relative to the Jan 1951-Dec 1980 average.

Figure 3
Buildings and construction share of global energy and energy-related CO_2 emissions (2020)





	Energy	Emissions
Residential	22%	17%
Non-residential	8%	10%
Buildings construction industry	6%	10%
Other construction industry	6%	10%
Other industry	26%	23%
Transport	26%	23%
Other	6%	6%

Source: IEA (2021a).

Determining the the financial impacts of extreme weather on real estate is complex.

Financial impacts of climate risk on real estate

Determining the financial impact of extreme weather on real estate is complex and extends far beyond calculating the potential repair costs of a building. Climate risk can influence real estate pricing via various channels, with effects varying in severity and longevity. A recent United Nations Environment Programme Finance Initiative (UNEPFI) report presents a meta-analysis of research into such impacts as reduced rental income, longer re-leasing times, greater cash flow volatility, higher insurance costs, lower capital growth, higher financing rates and reduced liquidity for commercial properties (table 1). In the most severe cases, a property could become a stranded asset with its capital value reduced to zero.

The UNEPFI report found that the financial consequences of climate risk to real estate depend on multiple conditions. One key finding was that access to information on risks is a contributing factor in valuation and pricing, with evidence that better

Table 1
Potential effects of climate risk on commercial real estate asset performance

Broad impact	Transmission channel	Specific financial consequences
Effects on cash flow	Income	• Reduced rent from fall in demand • Reduced occupancy rate from fall in demand • Longer to re-let space/weaker tenants • Changes to feasible uses impacting on income
	Outgoings	• Increased operating costs (building services) • Increased capital costs (repair/restoration) • Higher insurance premiums to reflect higher risks • Higher property taxes (clean up and mitigation costs)
Effects on capitalization rate	Risk premiums	• Greater cash flow volatility • Reduced liquidity/saleability of asset • Reduced insurability of asset • Greater site and location risks
	Expected growth	• Reduced rental prospects for location • Increased depreciation for non-resilient buildings • Reduced future occupancy rates • Increased operating and capital costs, taxes, etc.
Effects on financing	Cost of finance	• Higher margins stemming from increased risk • Higher DSCRs to cover cash flow volatility
	Availability of finance	• Reduced willingness to lend in location • Lower amounts lent/more security sought • Fewer potential equity partners

Source: Clayton J, van de Wetering J, Sayce S & Devaney S (2021); UNEPFI report "Climate risk and commercial property values: a review and analysis of the literature".

information leads to greater awareness, acceptance and integration of climate impacts on transacted prices.

Measuring climate risk

Climate risk is not a singular metric, but refers to multiple, interacting risks that can compound and cascade, making it very difficult to estimate. Measuring climate risk requires quantifying both the likelihood and consequences of climate change in a particular location. Here, we focus on the physical elements of climate risk rather than 'transition risks', i.e., the potential costs from moving towards a less polluting, greener economy. Though still important, transition risks have fundamentally different characteristics to physical climate risks and should therefore be modeled and analyzed separately.

Assessing a specific location's vulnerability to future climate events has traditionally been the remit of a handful of highly skilled professionals such as actuaries or academics, and it required access to private datasets plugged into specialized software. But growing awareness of and interest in climate risk have broadened demand for these tools. Recent advancements in geospatial modeling techniques coupled with the emergence of open-source data and software has helped proliferate climate risk services available to businesses and organizations.

To understand the exposure of IRE's global property portfolio to climate change, we needed a tool with consistent and robust scoring across various countries, regions and sectors. Moody's ESG Solutions (previously Four Twenty Seven) is a leading provider of physical climate and environmental risk analysis with a climate risk application well-suited for a globally diversified asset manager like IRE.

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> Moody's methodology is deeply data driven.

Moody's methodology is deeply data driven and leverages large public and private databases to generate more than 25 underlying risk indicators, each linked to known business consequences of climate change. Scoring is forward looking and focuses on thresholds near the tail end of the risk distribution because such events are the most likely sources of disruption and damage – especially as extreme events grow in severity and/or frequency. High-level risk indicators in Moody's service include exposure to floods, heat stress, hurricanes and typhoons, sea level rise, water stress, wildfires, and also earthquakes (which are technically a geological hazard rather than a climate risk but have also been included due to increasing client demand).

Moody's risk scores are standardized (ranging from 0 to 100) and globally comparable. The assigned risk levels (none, low, medium, high, red flag) aid interpretability. For example, a flood risk score of 70/100 equates to a high risk level and means a location is susceptible to some flooding and inundation during rainfall or riverine flood events.

Subcategory metrics are also available, such as the expected flood return period (i.e., flood frequency in years), rainfall intensity and inundation level from a 1-in-100-year flood.

Democratizing climate risk data

The Moody's tool can be used to evaluate the climate risk of almost any location across the globe, including IRE's entire direct real estate holdings, which comprise more than 500 commercial assets across North America, Asia, Oceania and Europe.

Moody's subscription-based model allows users to generate location-specific climate risk scorecards. These reports are detailed and valuable, but optimizing their use at IRE required building additional tools to better visualize and disseminate the data. The information could not be easily accessed by the wider IRE teams who did not have a Moody's ESG login. So, in order to leverage the information for better investment and asset management decision making, we needed to democratize our climate risk process – in particular streamlining the delivery of information to teams involved in the appraisal of asset acquisitions (transaction teams) and those managing existing assets and funds (asset and fund managers).

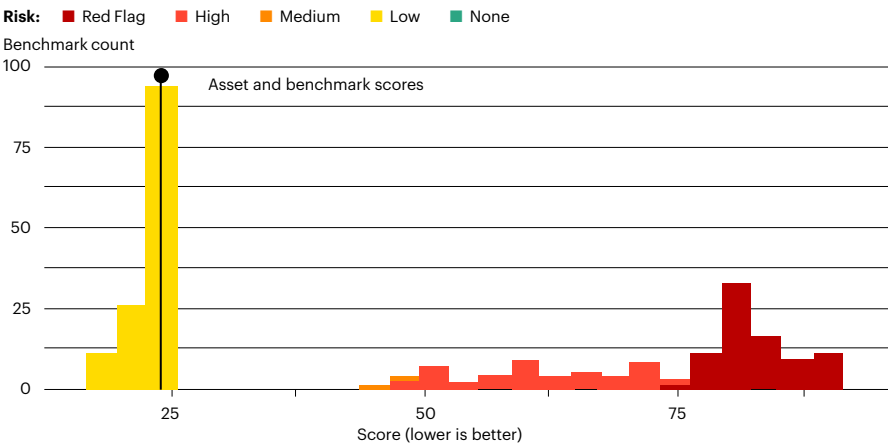
The solution found by IRE's Strategic Analytics team was a Climate Risk Dashboard, which links directly to Moody's database and allows users to instantly identify the climate risk exposure of each address they enter. The dashboard displays the risks pertaining to our portfolio assets and summarizes and filters risks by fund, using maps and charts to highlight key information.

Benchmarking asset risk

Investments do not happen in a vacuum. While the clear first step in contextualizing climate risk is to democratize the asset-level data, further understanding can be achieved by considering how one investment compares to another for insight into the relative risk. This can be done by benchmarking, or matching an asset's climate risk against other locations in the surrounding area. For instance, a well-located property with access to plenty of amenities might see its locational benefits outweigh its climate risk. However, it may still be more ideal to own a relatively less risky asset in the same area to minimize the climate risk while enjoying the benefits of the amenities.

Our benchmarking is achieved by utilizing Moody's ESG scoring on strategically generated sample points within a boundary of interest (submarket, block group, etc.). With a series of sample points now available, the scores can be summarized at the defined boundary levels, and scores of individual assets of interest can be placed within the distribution. Figure 4 shows a building in Tokyo and how its flood risk compares to the surrounding area. In this location, the low score conveys that the asset is not

Figure 4
A benchmarking example



Source: IRE Strategic Analytics.

> All areas with the largest wildfires had been properly scored as high-risk locations.

very exposed to flood risk. However, as the distribution in figure 4 shows, there are parts of Tokyo with high risk values, meaning that the sample building might be a well-positioned asset, close to amenities but far enough away from the low-lying areas to avoid being too risky.

Recent extreme weather events: Two case studies

Finally, we assess the validity and accuracy of Moody's ESG scores with the help of two case studies of recent climate events.

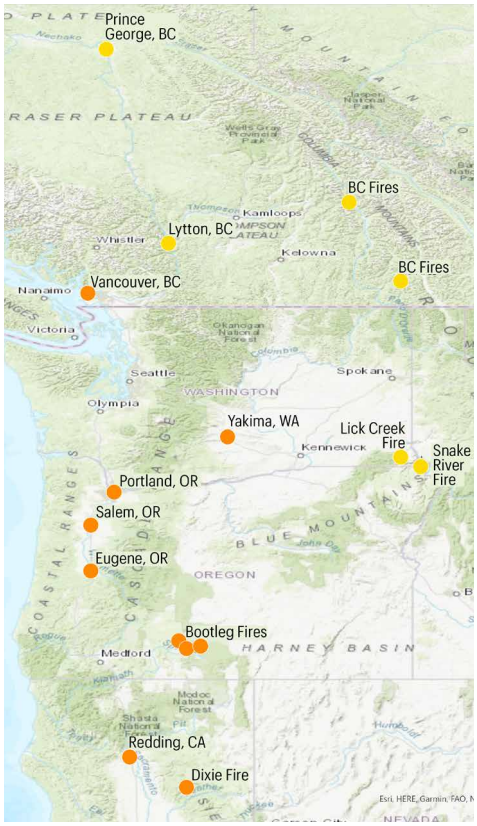
North American wildfires

In the summer of 2021, several areas in western North America experienced historic wildfires while much of the region experienced record high temperatures. To test the utility of the Moody's ESG scores using a real-world example, we looked at the Moody's wildfire scores for locations in the Pacific Northwest. The results proved encouragingly accurate: Apart from medium risk scores in British Columbia, all areas with the largest wildfires had been properly scored as high-risk locations (figure 5).

Figure 5
Moody's wildfire scores

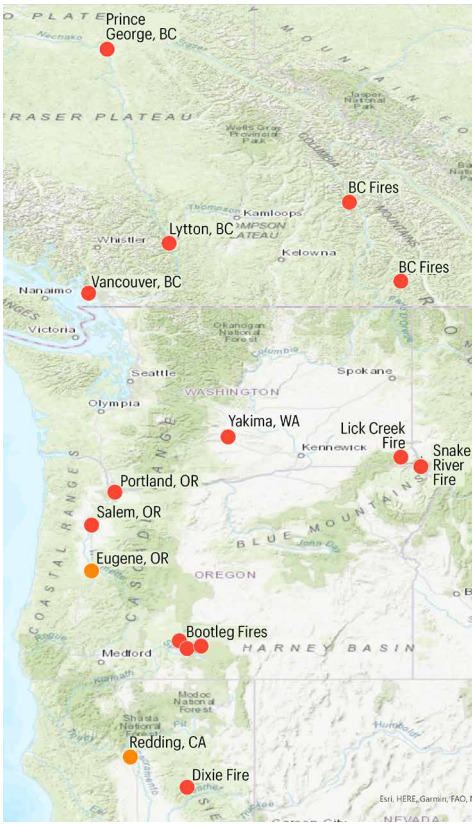
Source: IRE Strategic Analytics.

Figure 6
Moody's heat scores



Source: IRE Strategic Analytics.

Figure 7
Moody's future extreme temperatures sub-scores



Source: IRE Strategic Analytics.

Investors can no longer afford to leave climate risk information out of their decision making.

Additionally, we analyzed Moody's heat scores to see if the record-high temperatures were something that could have been foreseen. While overall heat scores (figure 6) did not seem to be good predictors, the subcategory score for future change in extreme temperatures (figure 7) seemed to provide a warning that extreme heat is only going to get worse. This sub-score provides valuable information for investors, and the high scores for future change are supported by the events of summer 2021.

European floods

In July 2021, a number of Western European countries experienced extreme flooding. Worst affected were Germany, Belgium, Netherlands and Austria. A total of 242 deaths are attributed to the flooding, of which 196 were in Germany. To test the validity of Moody's ESG scores, we sampled flood risk scores across five towns devastated by the floods (Schönau am Königssee, Hagen, Schuld and Bad Neuenahr in Germany, and Hallein in Austria). Unsurprisingly, each town had a large river running through its center. Almost all the sample points near a river and/or at relatively low elevation had a high or red flag risk level in Moody's scoring system. Equally, sample locations with medium-to-low flood risk were sufficiently distanced from a river and/or had much higher land elevations.

Conclusion

Many real estate investors still ignore extreme weather events as they are unpredictable and difficult to quantify. Nonetheless, climate-related events are expected to become more common and more severe, calling into question this style of approach: Investors can no longer afford to leave climate risk information out of their decision making. IRE's Climate Risk Dashboard is designed to deliver timely and reliable information to identify and mitigate, or completely avoid, potential climate risk exposure. This will ultimately help us better preserve and grow capital and deliver stronger and more secure returns for our clients.

Notes

1 Swiss RE (2021) Natural catastrophes in 2020: secondary perils in the spotlight, but don't forget primary-peril risks. Sigma 1/2021.
2 For instance, Carbon Brief (2021) Mapped: How climate change affects extreme weather around the world. https://www.carbonbrief.org/mapped-how-climate-change-affects-extreme-weather-around-the-world; NASA (2021) Scientific Consensus: Earth's Climate Is Warming. https://climate.nasa.gov/scientific-consensus/
3 Architecture 2030 (2021) The 2030 Challenge. https://architecture2030.org/2030_challenges/2030-challenge/
4 39% of CO2 emissions according to Architecture 2030; 37% of CO2 emissions and 36% of global energy consumption according to the UN Environment Programme.
5 World Green Building Council (2021) Beyond the Business Case report 2021. https://www.worldgbc.org/business-case

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