



Climate change and commercial real estate

How resilient is your portfolio?

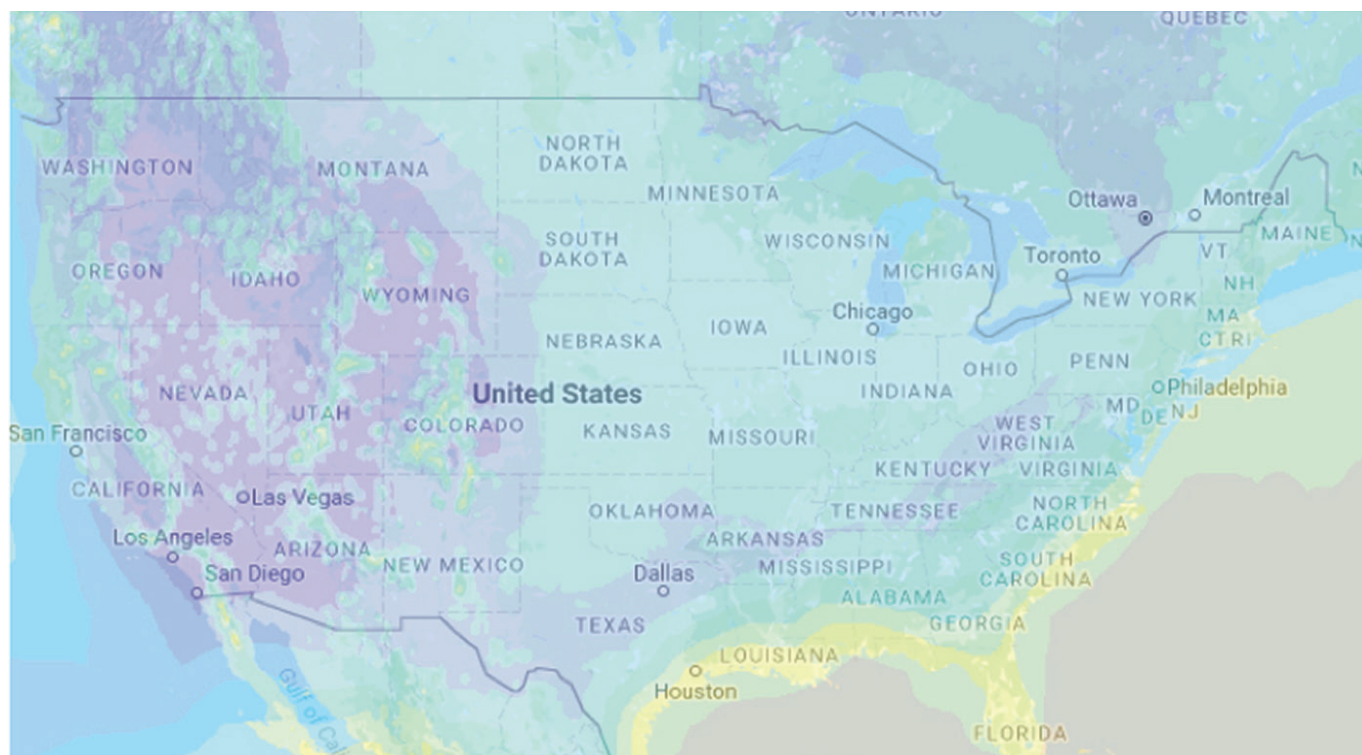
by Jeffrey Kanne, Darob Malek-Madani and Sam Bendix

Commercial real estate assets are developed and owned with the expectation of providing steady income and value increases over the course of decades. Wise owners invest in areas where governments are stable, the rule of law prevails, the economy is growing, and the infrastructure is well funded and maintained. But today, a wise investor also needs to assess the environmental resilience of investment locations, especially in light of climate change, which threatens to upend the stability of environmental conditions throughout the globe. To understand and quantify the risk our portfolios are exposed to on an absolute basis and relative to other institutional investors, National Real Estate Advisors created an

analytical tool to help us assess catastrophic risk related to climate change. In addition, we evaluated individual markets' climate resilience — in particular focusing on Miami and South Florida, where we believe the outsized risk from climate change ought to preclude institutional investment.

Risk management in a changing world

As detailed in “Risk analysis tool” (see page 53), this analytic tool allows us to quantify the risk associated with our investments, as well as compare that risk against a “model” institutional investment portfolio. This analysis tracks the risks associated with inland flooding, tornadoes and hurricanes, including coastal storm surge.



Hurricane risk distribution shaded by local wind speed records (Sources: Swiss Re, Lockton Cos.)

The results show the risk from hurricanes is by far the greatest of the three, and the metro area with the highest overall risk is Miami, which comprises 38 percent of the risk from these events but only 3 percent of the value of the model portfolio, according to analysis by the Lockton Cos. (see table below).

Although these risks are rare and often can be insured against, this benchmark analysis helps

us understand how the portfolio stands today and allows us to measure changes over time as climate change progresses and forces changes in insurance markets. Although property insurance appears at first to be one of the best defenses against the effects of environmental risks such as climate change, the industry is structured to deliver short-term protection against long-term risks. Although a property owner invests for decades, its insurance policies likely are active for only one year, while the insurance limits are likely sized to protect against events that occur every several hundred years. While this temporal disconnect is acceptable as long as the underlying risk does not change year to year, when it does change, as it will with climate change, the cost of insurance and the value of the property can change dramatically.

To make informed investment decisions in areas affected by these changing risks — particularly the risk from hurricanes and coastal flooding where the model portfolio shows the most exposure — it is vital to understand how climate change will impact the affected insurance and property markets. The stakes probably could not be higher in Miami and South Florida.

South Florida: a case study

Climate change is predicted to cause unprecedented environmental disruptions within the foreseeable future. Although there are many

Model portfolio: Largest markets by contribution to risk				
Market	Asset value (\$m)	% of total	Average annual loss	% of total
Miami	\$160.00	3%	\$767,000	38%
Houston	\$210.00	4%	\$278,000	14%
New York City	\$720.00	14%	\$231,000	11%
Dallas	\$230.00	4%	\$200,000	10%
Los Angeles	\$780.00	15%	\$112,000	6%
Boston	\$320.00	6%	\$68,000	3%
Washington, D.C.	\$500.00	10%	\$66,000	3%
Chicago	\$340.00	7%	\$41,000	2%
San Francisco	\$550.00	11%	\$25,000	1%
Seattle	\$240.00	5%	\$8,000	0%
Other	\$1,110.00	21%	\$232,000	11%
Total	\$5,200.00		\$2,020,000	

Sources: Lockton Cos., National Real Estate Advisors

Risk analysis tool

National Real Estate Advisors' analytic tool consists of a benchmark portfolio of 76 commercial property locations around the country, based on the NCREIF Property Index database and CoStar Group data. The benchmark is intended to be a "model" portfolio, with location, age, height and value distributions mirroring average NPI figures.

The model portfolio was sized to represent 1 percent of the value of the NPI. This total property value was then allocated to metro areas across the United States in proportion to their share of the total NPI. The number of properties to include in the portfolio was determined by the average size of properties within each metro area in the NPI. Locations within metro areas were narrowed down based on the total property value within each zip code in the NPI. Individual addresses for representative properties were selected randomly from the pool of existing commercial properties of more than 50,000 square feet in each selected zip code, based on CoStar data.

We evaluated this portfolio using catastrophic risk models typically used by insurance companies to understand the risk to the portfolio from inland floods, tornadoes and hurricanes — the frequency and severity of which will be altered by climate change.

The analysis predicts this model portfolio of institutional real estate risks losing a combined 1.4 percent of its value in hurricanes, floods and tornadoes, which have occurred on average every 250 years, as shown in the table below. This loss could be many times that amount if the properties carry debt. Furthermore, the table below shows approximately 80 percent of these potential losses stem from hurricanes in the Southeast — mostly in South Florida. (Analysis of the results of RMS and AIR models is courtesy of the Lockton Cos.)

When we compared the risk levels of the model portfolio with National Real Estate Advisor's current portfolios, we found the firm's portfolios had slightly less risk and more resilience. National's portfolios generally had higher inland flood risk as compared with the model but significantly less hurricane risk, resulting in approximately 15 percent less risk overall, based on average annual loss projections.

Much of the reason for this advantage was the fact our portfolios are disproportionately made up of newly constructed buildings, which likely are able to better withstand a hurricane or other events, combined with the fact we do not invest in South Florida, the area most at risk from hurricanes in the United States.

— Jeffrey Kanne, Darob Malek-Madani and Sam Bendix

Model portfolio: Risk analysis

Return period	AAL	% of total	250-yr PML	% of total
Hurricane	\$1,340,000	66%	\$61,460,000	82%
Tornado	\$240,000	12%	\$4,680,000	6%
Inland flood	\$440,000	22%	\$8,700,000	12%
Total loss	\$2,020,000		\$74,840,000	
Insured value	\$5,200,000,000		\$5,200,000,000	
AAL/PML as % of value		0.04%		1.4%

Note: AAL is the average annual loss resulting in the portfolio due to each risk category. PML is the probable maximum loss from a single event, in this case expected to occur every 250 years or that has a 0.4 percent chance of happening in any given year.

Sources: Lockton Cos., National Real Estate Advisors

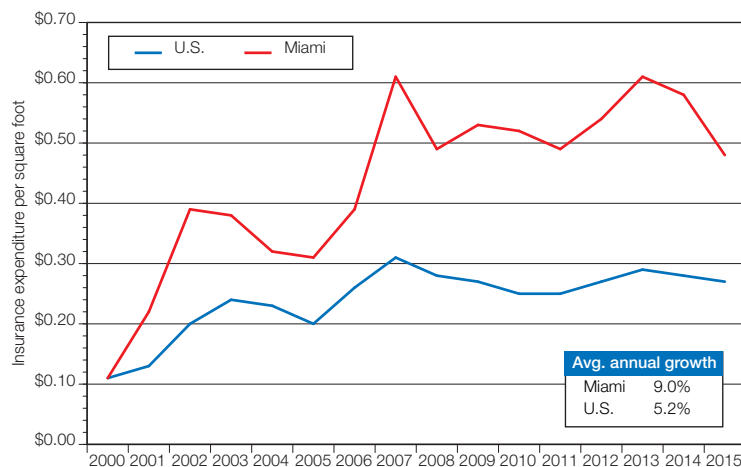
impacts of climate change, the most conspicuous is likely rising global sea level as polar ice sheets melt and the ocean warms and expands. Since 1900, sea level has risen several inches and is projected to rise another six feet by 2100, according to The National Oceanic and Atmospheric Administration. Of importance, any sea-level rise occurring this century is likely already "locked in," so even if global

greenhouse gas emissions are reduced to zero immediately, there will be a significant rise in sea level over the next century. In the United States, almost 8 million people currently are living within six feet of high tide and their property is likely to be inundated repeatedly over the coming decades. This risk is not evenly distributed along the coastline, as approximately half of these residents live in Florida alone,

noted Benjamin Strauss, Remik Ziemiński, Jeremy Weiss and Jonathan Overpeck in a 2012 issue of the scientific journal *Environmental Research Letters*. At particular risk is South Florida — with an average elevation of less than 10 feet — which is listed by the World Bank as the most economically vulnerable area in the United States and the second-most vulnerable in the world to climate change. This vulnerability stems not only from South Florida's low elevation but also its porous limestone bedrock — inhibiting seawall construction — and Miami's status as a global city, home to Fortune 500

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Rising insurance costs



Source: NCREIF Query Tool: Expense Detail search by MSA, National Council of Real Estate Investment Fiduciaries, as of Jan. 24, 2017

companies and billions of dollars in commercial real estate.

So far, South Florida remains a destination for institutional investment; however, climate change and the threat of rising sea levels compelled us to evaluate the viability of this market. As of Sept. 30, 2016, approximately 4 percent of NCREIF-tracked properties were in South Florida. At the same time, Miami had the largest percentage of commercial real estate under construction of any major city in the country, according to NCREIF. Since 2000, despite relatively little hurricane activity affecting the city, NCREIF data show insurance expenditures per square foot for commercial properties in the

Miami area have grown almost twice as fast as the national average, suggesting a change in the underlying risk profile and the beginning of transferring this risk to property owners, threatening the long-term viability of this market.

With base sea levels rising and storms predicted to get stronger, there is not a lot property owners can do on their own to protect their investments. Building owners can, and do, build wind-resistant buildings and move sensitive equipment to higher floors, but they cannot build seawalls and pumping stations that protect existing neighborhoods and critical infrastructure. South Florida, in particular, is geologically disadvantaged and almost entirely unable to mitigate the effects of rising seas and stronger storms. This is in contrast to other coastal cities that appear among the most at-risk cities in our analysis — such as Boston, Houston and New York City — which have average elevations dozens of feet above sea level and are built on foundations of impervious bedrock or soil more suited to building seawalls and levees, as noted in reporting by *The Boston Globe* and *Rolling Stone*. Though it will undoubtedly be expensive to protect these cities, it is at least possible. The risk from hurricanes currently makes up an outsized piece of the overall risk of our model portfolio, and more than half of that is based on locations in South Florida. As climate change advances, insurance will continue to become more expensive — eating away income — or unavailable, forcing the growing risk entirely onto building owners and occupants, inevitably leading to decreasing values.

Conclusion

Based on our analysis, National Real Estate Advisors does not invest in South Florida. In particular, we build new, modern buildings that are intended to cope with and are insured against the typical risks based on past events. We believe, however, buildings in South Florida, no matter how state-of-the-art, will neither be able to hold value nor contribute to a diversified portfolio as climate change continues to alter the region. In the future, National Real Estate Advisors will continually update its analysis of the model portfolio and evaluate individual markets that face outsized or increasing catastrophic risk due to climate change, making this environmental analysis a critical part of its underwriting and portfolio management processes. ♦

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