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Real Estate – US

REITs can manage climate risk, investments needed to address growing challenges

» **Climate risk exposure is manageable for the rated REITs, but will increase over time.** REITs withstood previous climate events without material losses or disruptions to their operations. However, we expect adverse trends in temperature and precipitation patterns through approximately mid-century and more frequent and extreme climate events such as hurricanes and floods. This means REITs' capital-intensive portfolios will become more vulnerable to climate change over time.

» **Increasing challenges will warrant additional investments in resiliency — and potentially portfolio reconfiguration.** While insurance has been an important risk mitigant for commercial real estate landlords over the last few years, the long-term trends warrant larger capital investments. REITs are investing in property level resource efficiency projects and other enhancements to protect their assets from damage during extreme weather events and control increase in operating costs.

» **Other influencing factors would be economic exposure, portfolio mix, contractual terms, local economic activity and infrastructure health.** How climate risks affect a particular REIT's credit metrics depend on the vulnerability of its specific properties. Pricing power, whereby the REIT could pass on increased costs to the tenants, and contractual terms that require tenants to fund capital improvements, reduce those climate risks. Vibrancy of the local economy and investment in infrastructure by the local governments and agencies also mitigate the risks.

» **Gradual shifts in temperature and precipitation patterns will affect most REIT portfolios over the long run; the geographic distribution also matters.** The large number of properties in metropolitan coastal markets in the Northeast and California mean water and heat stress are the most significant risk factors for the 15 REITs covered in this report. The REITs are generally less vulnerable to hurricanes and sea level rise, risks that are more critical for certain coastal markets. Most rated REITs are modestly exposed to flood risk, a hazard that has resulted in a few asset closures and post-event repairs in the last few years.

With location-based, capital-intensive business models, real estate companies inherently vulnerable to climate risks

Understanding climate-risk exposure is essential when evaluating the credit risk for the asset-heavy REIT business model that is defined by the geographic distribution of the assets. Storms and floods could meaningfully disrupt operations and pressure income immediately after an event, while gradual climate change trends like rising temperatures and sea levels are likely to weaken operating metrics, demand for real estate, and valuation over time.

The fundamental underpinning of the real estate business model is the ownership of a property that can be profitably leased to tenants for a period of time (ranging from daily lodging rentals to 30-year leases for some free-standing retail properties). Therefore, climate risks that could impair the profit potential of the property portfolio are an important consideration in assessing the credit of the landlord. REITs are operating companies that invest continually in their properties and change their portfolio mix based on market conditions, so analysis also must incorporate risk-mitigation activities at the asset level and net current exposure.

Some REITs covered in this report experienced modest disruptions to operations at a few properties following the significant storms over the last decade including Hurricanes Harvey, Irma and Maria in 2017, as well as Hurricane Sandy in 2012. However, aggregate profitability remained solid, required capital investments to rehabilitate the assets was moderate and the asset valuations held up.

The physical effects of climate change are largely locked in until about 2050, because historical greenhouse gas emissions will continue to influence climate significantly at least by mid-century, according to Moody's research, which draws significantly on our affiliate Four Twenty Seven's views on physical climate scenarios. Models generally predict an increase in the frequency and/or severity of many climate-related hazards, including increasing temperatures and water stress in many parts of the world. Extreme sea level events that occurred once per century are forecast to occur annually in many low-lying megacities and small islands by 2050. Furthermore, coastal hazards will intensify because of an increase in average storm intensity, magnitude of storm surge and precipitation rates of tropical cyclones. We expect these physical changes in climate over the next 30 years and beyond will create challenges for property owners. The potential for severe consequences in major metropolitan markets and other densely populated areas is an added risk for the rated REITs, which focus on those markets.

Climate change trends will affect REIT operations and capital costs over decades

The climate trends most relevant to the rated US REITs, such as higher rising surface temperatures and water scarcity, are the slow-moving but definitive in the longer-term and could weaken operating metrics and lease economics for most landlords. While operating margins are now generally stable, sustained increases in utility, insurance and maintenance costs will weigh on profitability. Asset type and portfolio mix will also affect income and value changes; for example lodging and multifamily assets would be relatively more affected by water scarcity. Meanwhile, climate events like hurricanes and storms would affect a smaller number of REITs with properties in locations with heightened risk.

A REIT's ability to sustain lease pricing and financial flexibility, as well as invest in assets or reconfigure its portfolio, will also influence how climate risk affects its credit profile. Rated REITs' superior asset quality, well-maintained properties, and hands-on property management, are valuable credit positives when tenants are making leasing decisions and considering the risk of disruption to their own operations. Landlords with a high proportion of net leases, or other provisions under which tenants bear the costs of utilities and insurance, would be less exposed to cost volatility. However tenants, in considering their aggregate leasing cost, will look to drive down net lease rental rates at lease renewal.

Declines in profitability because of cost increases or property level losses could prompt REITs to reevaluate their exposures in certain locations. Widespread dispositions or fire sales are unlikely, but we do expect progressive readjustments that take into consideration other longer-term trends and macroeconomic factors.

While REITs face intensifying climate hazards, the overall risks are mostly moderate

We looked at the distribution of risk for the five climate hazards included in the methodology from our affiliate Four Twenty Seven (See Appendix, Exhibit 11) — heat stress, water stress, floods, hurricanes, and sea-level rise — for 15 rated REITs across property types, different scales (measured in terms of gross assets) and portfolio mix (See Exhibit #1) We focused on risks stemming from those five factors, however, other hazards like wildfires and earthquakes will also affect REIT portfolios and credit profiles.

Exhibit 1

The rated REITs covered in this report are from different asset classes and own many types of properties

REIT	Ticker	Gross Assets (millions)	Property Type
Avalon Bay Communities (A3, Stable)	AVB	24,223	Multifamily
Boston Properties Limited Partnership (Baa1, Stable)	BXP	26,497	Office
Digital Realty Trust, L.P. (Baa2,Stable)	DLR	27,564	Data Center
Duke Realty Limited Partnership (Baa1, Stable)	DRE	9,875	Industrial
ERP Operating Limited Partnership (A3, Stable)	EQR	28,443	Multifamily
Federal Realty (A3, Negative)	FRT	8,990	Shopping Center
Franklin Street Properties Corp. (Baa3, Negative)	FSP	2,335	Office
Healthpeak Properties Inc. (Baa1, Negative)	PEAK	17,058	Healthcare
Kilroy Realty, L.P. (Baa2, Stable)	KRC	10,384	Office
National Retail Properties, Inc. (Baa1, Stable)	NNN	8,582	Net lease retail
Simon Property Group, L.P. (A2, Negative)	SPG	55,320	Malls/outlets
UDR, Inc (Baa1, Stable)	UDR	13,763	Multifamily
VICI Properties L.P. (Ba3, Negative)	VICI	13,274	Gaming
Vornado Realty L.P. (Baa2, Ratings under review)	VNO	25,252	Office
Welltower Inc. (Baa1, Negative)	WELL	39,081	Healthcare

Gross assets as of December 31, 2019
The analysis for Simon Property Group, Welltower and Digital Realty include their international properties
ERP Operating Limited Partnership is the primary operating subsidiary of the REIT, Equity Residential.
Source: Moody's Investors Service, Companies' SEC filings

We estimated a climate risk score for every asset in each REIT's portfolio. To better understand the risks to a REIT's credit metrics presented by these hazards, the scores are risk weighted by size of the asset (square feet/number of multifamily units) for 11 companies. The analysis for the other four — National Retail, Duke Realty, Welltower and Healthpeak— is based on asset count, a less-precise metric, but a close approximation of the mix in terms of size for diversified portfolios. When available, revenue or net operating income distributions are used to weight the scores, since they provide greater insight into any economic impact that could stem from disruption in asset operations.

Risk distribution at the hazard level is more relevant to the determination of credit risk exposure rather than averages because benign risk scores on a majority of the portfolio does not mitigate extreme risk in a small portion of the pool. For the same reason, the proportion of exposure that carries "high risk" and "red flag" scores is very significant.

Water and heat stress present the most significant challenges to most REIT portfolios we looked at, while sea level rise and hurricanes are the least worrisome risk factors (estimate based on aggregate red flag and high-risk exposures, see Exhibit # 2). This is not surprising given the relatively modest exposure to regions vulnerable to hurricanes and sea level rise. By the same token, elevated risk scores for the heat and water stress reflect the high geographic concentration in the coastal and large urban markets in the south.

Exhibit 2

	Average	
	Red Flags	High-Risk
Water Stress	7.5%	33.3%
Heat Stress	0.1%	30.2%
Floods	4.4%	13.4%
Hurricanes/Typhoons	0.7%	3.2%
Sea Level Rise	1.9%	0.0%

[1] Aggregate for all 15 REITs covered in the report
[2] Weighted by size at the REIT for 8 REITs (Boston Properties, Franklin Street Properties, Kilroy Realty, Vornado Realty, Simon Property, Federal Realty, Digital Realty and VICI), by units for 3 REITs (Avalon Bay, Equity Residential and UDR) and by count for 4 (Duke Realty, Healthpeak, National Retail, and Welltower)
Source: Four Twenty Seven framework, Moody's Investors Service, SNL Global Market Intelligence

Resiliency initiatives, insurance, climate risk in local community are also significant factors

Given that Four Twenty Seven's climate-risk scores are largely based on location of a property with some adjustments made based on property type, they do not consider asset-level resiliency enhancements. REITs have reduced the risk of operational disruption and substantial post-event repairs in markets where floods, hurricanes and sea level rise pose dangers by investing in resiliency projects.

Most REITs that own assets in flood-prone regions installed flood barriers and elevated building mechanicals. Other popular measures to manage flood risk include partially anchored flood barriers and reverse moats, while some companies have installed hurricane windows to protect against storms. In conjunction with improving the energy/other resource efficiencies of their portfolios, all the REITs we rate undertook resource audits to map usage and set goals. Cost-rationalization measures range from basic initiatives like energy-efficient fixtures to larger projects such as battery power storage, solar/cogeneration plants and commitments to procure renewable energy for some assets. The resiliency measures have not meaningfully affected the capital investment outlays, so far and the REITs evaluate these investments as they would any other.

As mentioned earlier, REIT portfolios are also modestly exposed to wildfire risk and their properties in California and other parts of the Northwest face earthquake risk. There have not been meaningful losses related to wildfires or earthquakes in the rated REIT segment in recent years, but the landlords invested in power sprinklers and fire retardant roofs to protect against the former risk and their newer assets in California are built to withstand significant seismic events.

Insurance proved important for the rated commercial real estate landlords in prior crises and would be a valuable tool in mitigating risk for the future too, although price increases and changes in policy terms could increase costs and/or risk retained by the REIT. Some other considerations in the assessment of risk protection provided by insurance include the timing mismatch between the term of the insurance contract, generally a year, and the asset ownership strategy, availability of supplemental coverage from FEMA and other agencies in certain markets, and exclusions of certain risks in policy coverage.

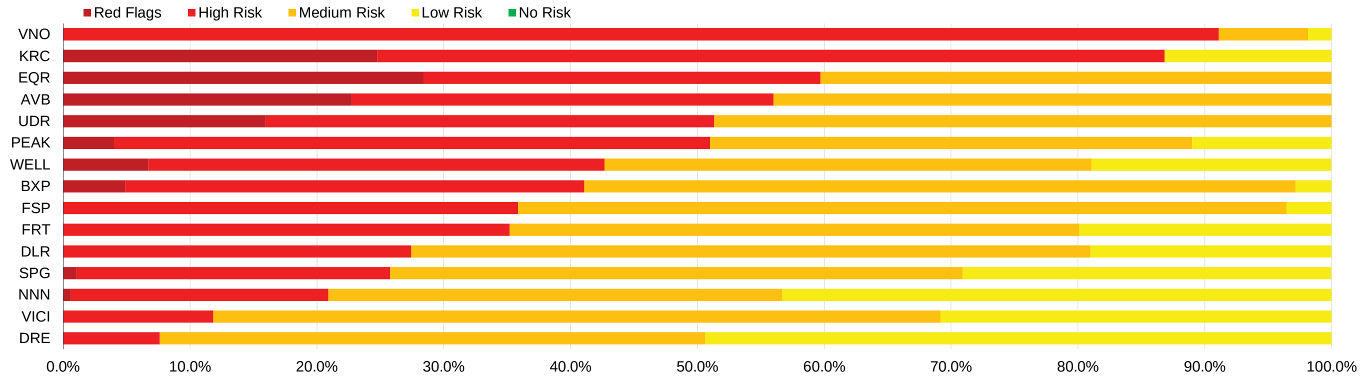
Macroeconomic factors — such as demographic trends, employment levels in the local community, and the financial position of the municipality that influences investment in infrastructure projects related to resiliency — can influence a REIT's climate risk. A couple of examples of recent local government projects include construction of sea walls in Staten Island, New York, and Foster City, California.

So far, REITs have not really used portfolio management as a tool to hedge against climate risk, but the potential for losses and costs has influenced their decision to sell some assets. Given the significance of location and related market intelligence in their business model, we believe REITs are unlikely to drastically alter portfolio mix within the decade. However, the increasing cost of operations and potential for damaging losses will likely affect portfolio strategy over time.

Water stress accounts for highest number of “red flag” risks — primarily in California and the Southwest

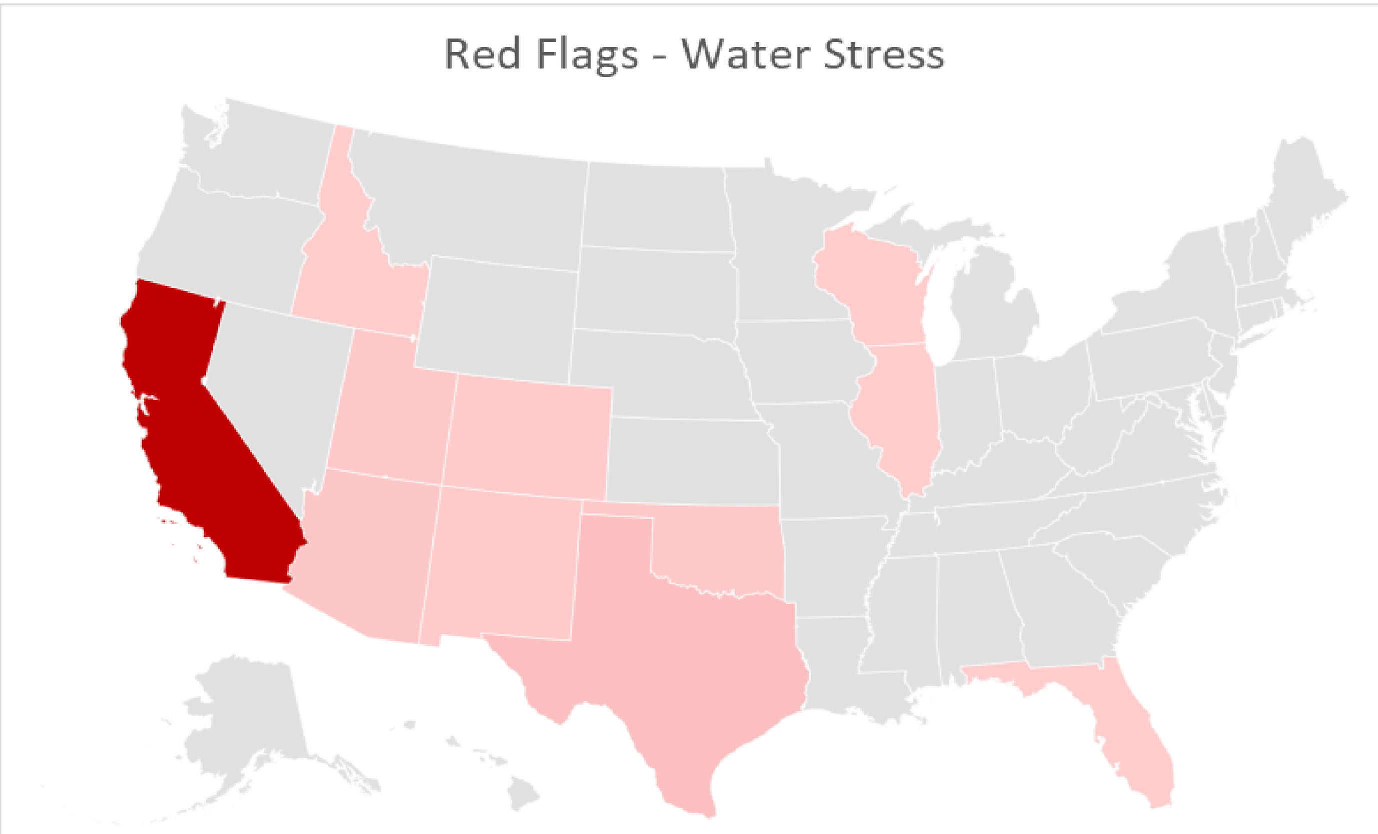
That there are six REITs in the group of 15 with high/red flagged water stress scores greater than 50% exemplifies the degree of risk related to this climate factor (see Exhibits 3 & 4). There are only two REITs with high/red-flag risk meaningfully below 20% in this cohort. All three REITs with over 20% red-flag concentration, Equity Residential, Kilroy Realty and Avalon Bay, have meaningful exposure to California.

Exhibit 3
Few REITs are immune to water stress



Four Twenty Seven leverages WRI Aqueduct's v2.1 data in its Water Stress scores, with current and future water stress accounting for 25% and 75% respectively of Water Stress scores. A switch to v3.0, which updates current but not projected water stress, would only modestly affect water stress scores for some REITs.
Source: Four Twenty Seven framework, Moody's Investors Service, SNL Global Market Intelligence

Exhibit 4
California accounts for most of the red-flagged risk



Source: Four Twenty Seven framework, Moody's Investors Service, SNL Global Market Intelligence

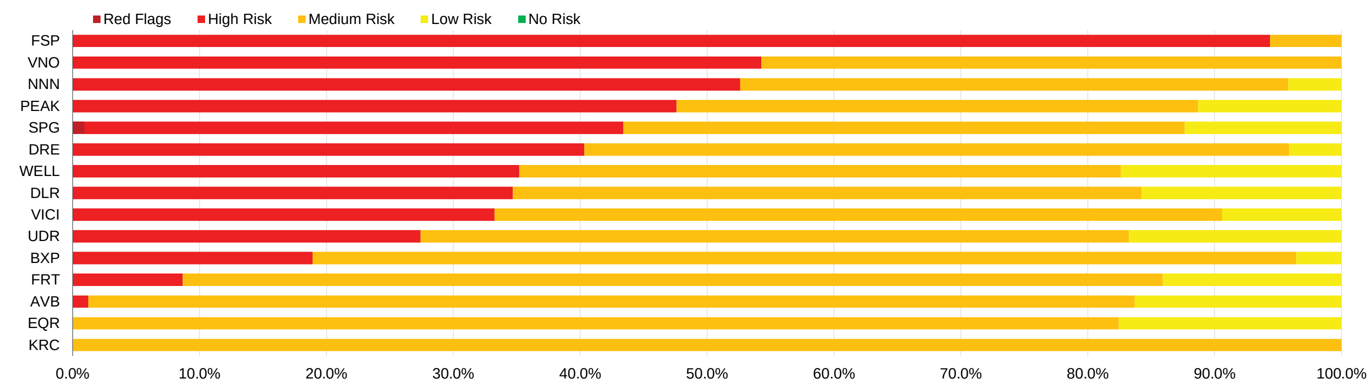
Most REITs have switched to more efficient plumbing fixtures and are also investing in water recycling at many properties. Stated goals for reduction in water consumption, like in the case for electricity and waste recycling, would however require additional capital spending.

Heat stress will lead to lower margins without significant resiliency investments

Heat stress is a material risk factor with over 30% concentration of red flag/high-risk scores for 9 of the 15 companies we reviewed, the exceptions are portfolios with significant concentration in California, the mid-Atlantic and some Northeast locations (see Exhibit 5). Over 50% of the portfolios of Franklin Street Properties, Vornado Realty and National Retail carry high-risk scores, a reflection of their portfolio mix and asset concentration.

Exhibit 5

Exposure to heat stress is high, although there are few red-flagged assets



Source: Four Twenty Seven framework, Moody's Investors Service, SNL Global Market Intelligence

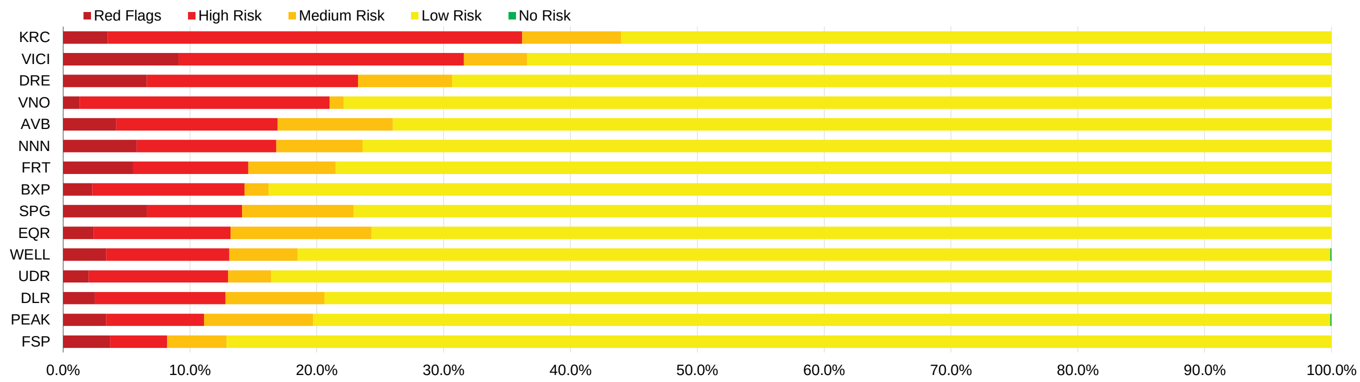
For most REITs, utility costs have been manageable, generally lower than some other operating expenses like real-estate taxes. However, the importance of improving energy efficiency is increasing with stricter regulatory guidelines in certain jurisdictions (such as Local Law 97 in New York City that requires existing large buildings to reduce greenhouse gas emissions) and the potential that REITs will not be able to pass on the costs related to higher utility rates to tenants. To their credit, the REITs' sustainability programs would likely reduce the strain on operating margins.

Risks from hurricanes, sea-level rise are modest, but flood risk exposure is meaningful for most REITs

High and red-flag flood risk scores for a meaningful portion of the sample pool can be explained by portfolio distributions that include some assets in metropolitan/coastal markets that face higher flood risk (see Exhibits 6 & 7). The red-flagged and high-risk flood risk scores for VICI Properties and Kilroy Realty, meanwhile, account for over 30% of their portfolios. Increased frequency and severity of extreme flooding has modestly affected property insurance costs in some markets and also affected real-estate values, primarily single-family homes, in some markets.

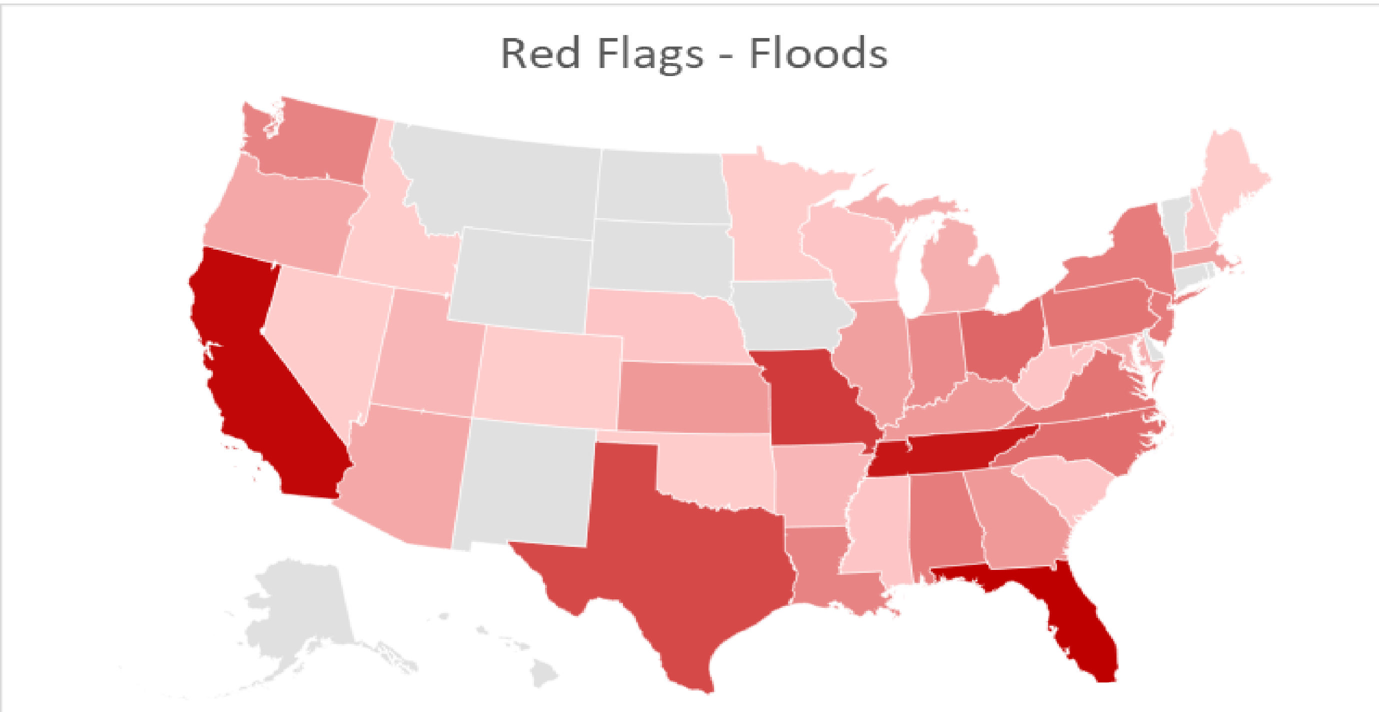
In the last few years the most significant flood events that affected the REIT portfolios resulted in operational disruptions for a few days. The effect on income ranged from negligible to modest on account of prompt repair and prior enhancements, such as elevated mechanicals, insurance coverage, and relatively stronger position of the REIT assets in the local market, that supported stable occupancy and pricing.

Exhibit 6
Flood risk is moderately high for a few REITs



Source: Four Twenty Seven framework, Moody's Investors Service, SNL Global Market Intelligence

Exhibit 7
Risk spread across many states



Source: Four Twenty Seven framework, Moody's Investors Service, SNL Global Market Intelligence

Less than 1% of the 7,400 assets reviewed have red-flagged hurricane scores and only two REITs — Simon Property and Duke Realty — covered in this report are exposed to a measurable extent. The exposure outcomes, including sizeable no-risk/low-risk buckets, largely reflect the geographic distribution of the assets (see Exhibit 8). Most REIT portfolios we analyzed own only a few properties in the vulnerable Southeast and Gulf of Mexico regions.

Some of the areas where Hurricane Laura caused damage recently, including the point of entry on the Texas-Louisiana border, are regions with the highest levels of hurricane risk as measured by Four Twenty Seven. However, with less than 50 properties (~0.5%) in Louisiana across all 15 REITs reviewed, losses are likely to be low.

Exhibit 8
Geographic mix reduces REITs' exposure to hurricane risk

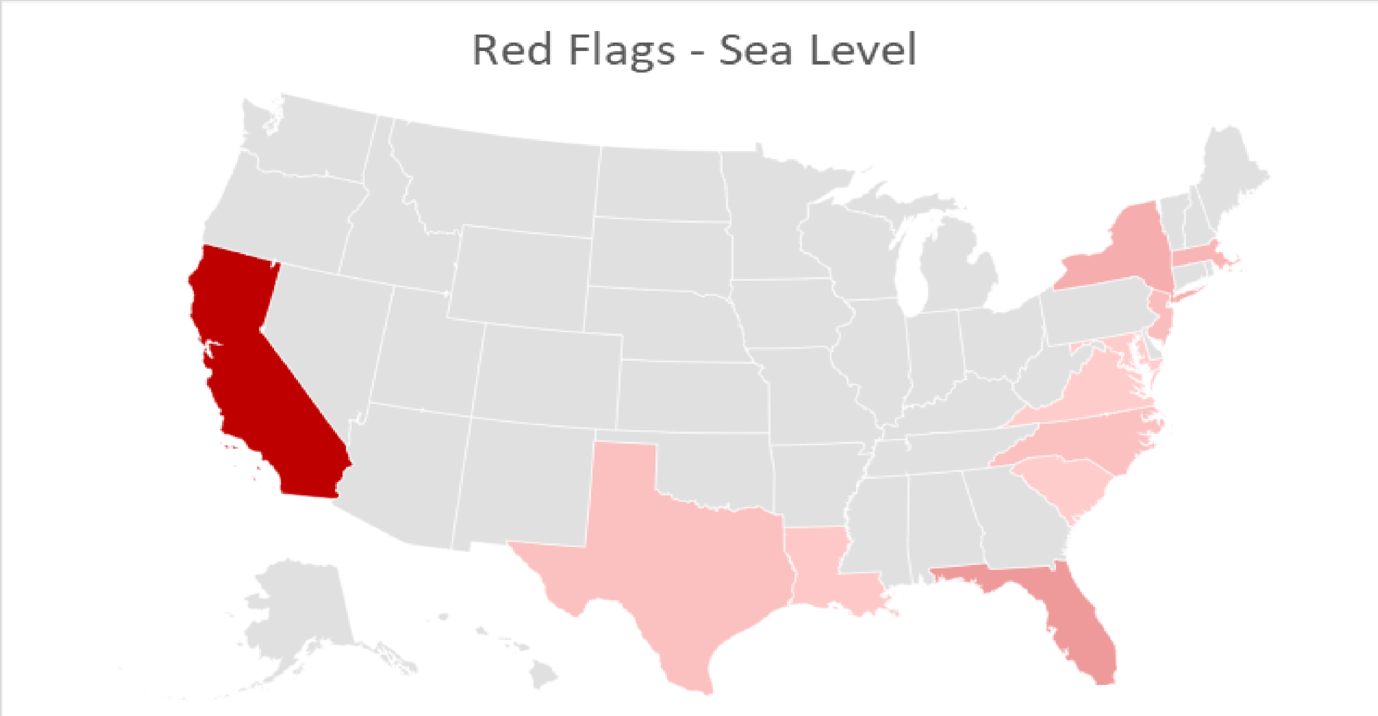
Source: Four Twenty Seven framework, Moody's Investors Service, SNL Global Market Intelligence

As can be expected for a risk factor that depends on proximity to a large water body, the risk distribution for sea level rise is barbelled. On average, over 90% of the assets evaluated have no/low risk, but there are three REIT portfolios — Vornado, Equity Residential and Healthpeak — that could face challenges. Most of the affected assets are in the New York metropolitan and San Francisco Bay markets (see Exhibits 9 & 10).

Exhibit 9
Aggregate exposure to high risk/red flags is lowest for sea-level risk

Source: Four Twenty Seven framework, Moody's Investors Service, SNL Global Market Intelligence

Exhibit 10
REIT assets in California, Florida, and New York are exposed rising sea levels



Source: Four Twenty Seven framework, Moody's Investors Service, SNL Global Market Intelligence

Appendix

Exhibit 11
Four Twenty Seven's physical climate risk categories

Hazard	Description of Hazard	No Risk Not exposed	Low Risk Not significantly exposed to historical or projected risks	Medium Risk Exposed to some historical and/or projected risks	High Risk Exposed today and exposure level is increasing	Red Flag Highly exposed to historical and/or projected risks, indicating high potential for negative impacts
Floods	Change in rainfall conditions and size and frequency of possible floods	N/A	Site likely not susceptible to inundation, but some future rainfall intensification expected	At least some susceptibility to flooding based on historical record or future rainfall intensification	Susceptible to some flooding and inundation during rainfall	Susceptible to high frequency and/or severe rainfall or riverine flooding during a 100-year flood event
Heat Stress	Increase in temperature	N/A	Warming, but changes in extremes are relatively less severe	Warming, though changes are within range of global average	Relatively high changes in extremes compared to global average	Exposed to some of the most severe changes in global heat extremes
Hurricanes	Exposure to past cyclones	No known historical occurrence	Cyclone activity possible, but frequency or severity of past storms were relatively minimal	Exposed to frequent and/or severe cyclone activity based on historical record	Situated in the regular path of cyclones	Situated in the regular path of cyclones, and severe cyclones are common
Sea Level	Heightened storm surge, augmented by sea level rise	Not coastal or near waterways hydrologically connected to the sea	Coastal and over 10 meters above sea level, flooding is unlikely	Coastal and under 10 meters above sea level; flooding possible	Susceptible to some degree of coastal flooding in 2040, though relative changes in flood frequency are small	Site never flooded historically, but it is susceptible to coastal floods in 2040
Water Stress	Change in water supply and demand	N/A	Water supply and/or demand changes relatively small	Water supply and/or demand changes likely to increase competition for water resources in the future	Current water stress is likely already high, and water supplies are diminishing	Competition for water resources is extreme, and future water supply failure is possible

Source: Four Twenty Seven

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