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Measuring Metro-Level Environmental Risk in Commercial Real Estate

The events of the past year have brought environmental, social and governance (ESG) front of mind for investors and experts in commercial real estate. The growing number of weather-related disasters that produce billions of dollars of property damage, changes in work practices spurred by the COVID-19 pandemic, and recognition of the need for equity and diversity have created an urgency for businesses to act on ESG criteria.

This is not entirely new: Over the last decade or more, the industry has taken steps by implementing “green” construction standards, retrofitting buildings to reduce energy consumption, and developing other ESG strategies. But in this new environment as the world slowly emerges from a historical pandemic and a year of environmental and political turmoil, addressing ESG has taken on a newfound urgency.

In the U.S., for example, the new Biden administration has driven change from the top. After his inauguration in January 2021, President Biden immediately rejoined the Paris Agreement, a 2015 accord to reduce emissions and deal with the impact of climate change. He has instructed regulatory agencies to incorporate into reviews “the interests of future generations,” reversing the policies of the former president, whose regulatory efforts were geared at easing the compliance burden on business.

Biden also has proposed a \$2 trillion infrastructure package that will invest in technologies to reduce greenhouse gas emissions with a goal of eliminating power sector emissions by 2035. The bill would—among other things—facilitate installation of electric-vehicle charging stations, funds for energy-efficient housing and construction of new power lines. The size and scope of the package are being debated in Congress, with passage likely in the fall.

Federal agencies are taking the environment seriously. Treasury Secretary Janet Yellen has pledged to create a climate change task force, noting that it is an “existential threat” to the banking system. Regulators may, for example, require banks to account for

environmental risk as an element of forward-looking loss projections. Although concern for environmental, social and corporate governance is not entirely new in commercial real estate, 2020-21 might be remembered as the time when ESG came to the forefront of the industry.

This paper, which ranks metros by environmental risk, is one of a series of research papers Yardi Matrix is publishing that measure risks faced by commercial real estate investors. Over the last 18 months, we have also ranked metros by political risk and infrastructure. In a sense, this represents an interim step as we try to help investors determine how to measure metro risk in ways that go beyond basic real estate fundamentals. Later this year we plan to combine these metrics into an overall market attractiveness analysis.

Commercial Real Estate and ESG

Commercial real estate is mirroring concerns about the environment. Rating agencies have talked about taking climate change into account when grading bonds backed by real estate. Industry trade groups such as the Urban Land Institute, the National Multifamily Housing Council, NAREIM and the CRE Finance Council have created or expanded working groups to address environmental risk.

The recent 2021 AFIRE International Investor Survey shows that ESG is an increasingly urgent concern for global investors. A growing number are vetting investment managers to ensure that their dollars are being deployed by those that have concrete ESG policies. More than half of private equity commercial real estate capital raised between 2018 and 2020 went to managers with ESG strategies, according to Prequin. In 2021, a record 11 funds are being raised that list environmental "impact" as a component of strategy, per Prequin.

A recent survey by investment manager BlackRock of 425 investors that control \$25 trillion of assets found that 88% believe climate change is a risk and 75% plan to account for ESG risks in their portfolios. Collectively, the respondents expect to double their allocations to funds with ESG components by 2025. That sounds impressive, but slightly more than half of the investors surveyed also noted that the poor quality of data is a hindrance to sustainable investment practices.

"Leading real estate investment managers and institutional investors are increasingly recognizing climate risk as a core real estate issue that is beginning to affect their decisions at the market level as well as at the asset level," noted "Climate Risk and Real Estate: Emerging Practices for Market Assessment," a 2020 report by ULI and Heitman. "As this market-scale analysis of climate risks and cities' resilience strategies advances, investors will better assess both the economic impact of climate-related events and the cost and ability of cities to mitigate the impact of climate change through their resilience strategies."

Growing Environmental Risk

Scientists warn that environmental risk is increasing due to global warming, with the last seven years marking the hottest temperatures the earth has reached since the 1800s. The melting of polar ice caps has released water into the oceans, with climate scientists saying that coastlines are rising, hurricanes are becoming more frequent and intense, and droughts more common, leading to more risk of wildfires in dry areas. The unprecedented melting of Arctic sea ice is forecast to make coastal cities more vulnerable to flooding.

Whatever one makes of the science, property investors cannot ignore risks to the bottom line. Property damage caused by environmental events is increasing. More than 400 weather events caused

Metro Rankings: Natural Disasters

Market	State	Hurricanes Tornadoes Tropical Storms	Wildfires	Rising Sea Levels	OVERALL RATING – NATURAL DISASTERS
Atlanta	GA	3	3	3	3.0
Chicago	IL	3	3	3	3.0
Indianapolis	IN	3	3	3	3.0
Minneapolis	MN	3	3	3	3.0
Portland	OR	3	3	3	3.0
Salt Lake City	UT	3	3	3	3.0
Dallas	TX	2	3	3	2.7
Nashville	TN	2	3	3	2.7
Charlotte	NC	1	3	3	2.3
Denver	CO	3	1	3	2.3
Orlando	FL	1	3	3	2.3
Raleigh–Durham	NC	1	3	3	2.3
Seattle	WA	3	3	1	2.3
Washington DC		3	3	1	2.3
Austin	TX	2	1	3	2.0
Boston	MA	2	3	1	2.0
Los Angeles	CA	3	1	2	2.0
New York	NY	1	3	1	1.7
San Francisco	CA	3	1	1	1.7
Tampa	FL	1	3	1	1.7
Houston	TX	1	2	1	1.3

Source: Yardi Matrix

■ Above Average Environmental Risk

■ Average Environmental Risk

■ Below Average Environmental Risk

\$268 billion of damage globally in 2020, including a record \$63 billion caused by severe weather events, according to insurance broker Aon. Category 5 Hurricane Harvey caused \$125 billion of damage in Houston in 2017. Meanwhile, four of the five largest wildfires in California history have taken place in the last decade. Wildfires in the U.S. have caused more than \$10 billion of damage in three of the past four years, Aon said.

Investors must consider a property's ability to perform under extreme climate scenarios and metro-level risk. With that in mind, Yardi Matrix has developed a scorecard for 21 large U.S. metros, using 11 metrics in four categories to create a metro-level analysis of environmental risk. The categories are natural disasters, air pollution, water quality and the response by state and local governments. We assigned grades in each category, below

average for the least risk, average for moderate risk and above average for the most risk. We then totaled the grades and came up with scores in each category and the overall environmental risk. A snapshot of our analysis follows.

Natural Disasters

Properties are at greater risk in markets subject to natural disasters such as hurricanes, tropical storms or tornadoes, wildfires caused by extreme heat and drought, and potential for flooding caused by rising sea levels. Wildfires cause massive property damage, particularly on the West Coast, making it expensive to insure assets in fire-prone areas.

■ *Hurricanes/Tropical Storms/Tornadoes:* We looked at the number of hurricanes and tropical storms that occurred in each metro over the last

Metro Rankings: Pollution

Market	State	Air Quality	Toxic Chemicals Pesticides	Water Pollution	OVERALL RATING – POLLUTION
Orlando	FL	2	3	3	2.7
San Francisco	CA	2	3	3	2.7
Tampa	FL	2	3	3	2.7
Austin	TX	2	3	2	2.3
Boston	MA	2	3	2	2.3
Denver	CO	1	3	2	2.0
Los Angeles	CA	1	3	2	2.0
New York	NY	2	2	2	2.0
Raleigh–Durham	NC	1	3	2	2.0
Seattle	WA	2	2	2	2.0
Atlanta	GA	2	1	2	1.7
Charlotte	NC	1	2	2	1.7
Chicago	IL	2	2	1	1.7
Dallas	TX	2	2	1	1.7
Minneapolis	MN	2	1	2	1.7
Nashville	TN	2	1	2	1.7
Portland	OR	1	1	3	1.7
Washington DC		2	2	1	1.7
Houston	TX	2	1	1	1.3
Indianapolis	IN	1	1	2	1.3
Salt Lake City	UT	1	1	1	1.0

Source: Yardi Matrix

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100 years, using data from the National Oceanic and Atmospheric Administration (NOAA). This metric was then combined with the average annual number of tornadoes by state, using data from the Storm Prediction Center.

■ **Wildfires:** The wildfire data came from a ULI report titled "Firebreak Wildfire Resilience Strategies for Real Estate," which used data adapted from Verisk. States were ranked by the number of properties at risk from wildfires. We also considered a metro's ability to implement strategies to combat fire risk, including wildfire protection plans, urban forestry and landscaping ordinances, and wildfire hazard assessments.

■ **Rising Sea Levels:** Data came from ArcGIS, a geographic information system software

maintained by the Environmental Systems Research Institute, which is a supplier of GIS mapping software. ArcGIS measured the cumulative changes in relative sea level from 1960 to 2018. Cities where sea-level change was 2 inches or less were rated by Yardi as below average risk, metros where sea level changed by 2-4 inches were rated as average risk, and cities where the sea level rose more than 4.0 inches were rated as above average risk.

Pollution

Areas with air or water pollution will become unattractive as places to live and work, impacting the value and livability of properties, contributing to potentially unhealthy indoor air, and creating maintenance and financial obligations

Metro Rankings: Water Quality

Market	State	Water Supply: Quantity & Quality	Condition of Water Infrastructure	OVERALL RATING – WATER QUALITY
Orlando	FL	3	3	3.0
San Francisco	CA	3	2	2.5
Tampa	FL	2	3	2.5
Austin	TX	3	2	2.5
Boston	MA	2	2	2.0
Denver	CO	3	1	2.0
Los Angeles	CA	1	3	2.0
New York	NY	1	3	2.0
Raleigh–Durham	NC	2	2	2.0
Seattle	WA	2	2	2.0
Atlanta	GA	3	1	2.0
Charlotte	NC	1	3	2.0
Chicago	IL	2	2	2.0
Dallas	TX	3	1	2.0
Minneapolis	MN	2	2	2.0
Nashville	TN	1	2	1.5
Portland	OR	1	1	1.0
Washington DC		1	1	1.0
Houston	TX	1	1	1.0
Indianapolis	IN	1	1	1.0
Salt Lake City	UT	1	1	1.0

Source: Yardi Matrix

■ Above Average Environmental Risk

■ Average Environmental Risk

■ Below Average Environmental Risk

for operators. Plus, the remediation of polluted commercial sites is expensive and difficult.

■ **Air Quality:** A metro’s air-quality grade was based on the average number of days per year in each market where the U.S. Environmental Protection Agency’s Air Quality Index was at the “unhealthy for sensitive groups” level or worse from 2016 to 2020.

■ **Toxic Chemicals/Pesticides:** Each market was graded based on two different toxic pollutant metrics: 1) the amount of toxic chemicals released into the metro’s environment in 2019 (including air, water, land and off-site releases), and 2) the average state rate of pesticide exposures from 2008 through 2017.

■ **Water Pollution:** Water pollution can damage properties and incur hefty costs. Clean water can be expensive in polluted areas. Water pollution grades were based on the number of unsafe contaminants detected in the metros’ largest local water utility system.

Water Quality

The quantity and quality of the water supply is an important element of growth potential, particularly for metros in arid regions. The condition of each city’s water infrastructure—such as distribution pipelines, sewer systems and treatment plants—is an element of risk. Inadequate and deteriorating water infrastructure intensifies the effects of storm damage and creates physical

Metro Rankings: State and Local Government Investment

Market	State	State Hazard Mitigation Plan	Billion-Dollar Weather & Climate Disaster Cost per Million Residents	Unfunded Pension Liability	OVERALL RATING – STATE & LOCAL GOVERNMENT
Minneapolis	MN	3	3	3	3.0
San Francisco	CA	3	3	3	3.0
Boston	MA	3	3	2	2.7
Indianapolis	IN	2	3	3	2.7
Los Angeles	CA	3	3	2	2.7
Portland	OR	3	3	2	2.7
Salt Lake City	UT	2	3	3	2.7
Washington DC		3	3	2	2.7
Atlanta	GA	2	3	2	2.3
Charlotte	NC	2	2	3	2.3
Denver	CO	3	2	2	2.3
New York	NY	3	2	2	2.3
Orlando	FL	2	2	3	2.3
Raleigh–Durham	NC	2	2	3	2.3
Seattle	WA	3	3	1	2.3
Chicago	IL	2	3	1	2.0
Nashville	TN	2	2	2	2.0
Houston	TX	1	1	3	1.7
Tampa	FL	2	2	1	1.7
Dallas	TX	1	1	2	1.3
Austin	TX	1	1	1	1.0

Source: Yardi Matrix

■ Above Average Environmental Risk

■ Average Environmental Risk

■ Below Average Environmental Risk

risks, including flooding from sewer overflows and poor drainage. Infrastructure failures also affect businesses that use water for industrial purposes, support functions, facility operations and as product ingredients.

■ *Water Supply Quantity & Quality:* Markets were graded based on the local water supply's quantity and quality, including potential risks such as shortages and contaminants.

■ *Condition of Existing Water Infrastructure:* Markets were graded based on the condition and vulnerability of the local water infrastructure, including the structural reliability, failure events and need for replacement of lead pipelines.

State and Local Government Investment

The willingness and ability of states and cities to adopt, fund and implement mitigation plans is crucial. The annual average of billion-dollar disasters in the U.S. more than doubled to 16 between 2016 and 2020, up from an average of seven the prior 40 years. These disasters cause deaths and have significant economic effects on the areas impacted.

In this category we measure whether states have plans for environmental risk and whether they may have the means to implement those plans. States should take seriously the Federal Emergency Management Agency's (FEMA)

Metro Rankings: Overall Environmental Risk Grades

Market	State	OVERALL RATING– NAT. DISASTERS	OVERALL RATING– POLLUTION	OVERALL RATING– WATER QUALITY	OVERALL RATING– STATE & LOCAL GOV.	OVERALL RATING– ALL 4 CATEGORIES
Boston	MA	1	3	3	3	2.5
Indianapolis	IN	3	1	3	3	2.5
Minneapolis	MN	3	2	2	3	2.5
Portland	OR	3	2	2	3	2.5
Chicago	IL	3	2	2	2	2.3
Denver	CO	2	2	3	2	2.3
Salt Lake City	UT	3	1	2	3	2.3
Washington DC		2	2	2	3	2.3
Atlanta	GA	3	2	1	2	2.0
Charlotte	NC	2	2	2	2	2.0
Nashville	TN	2	2	2	2	2.0
New York	NY	1	2	3	2	2.0
Orlando	FL	2	3	1	2	2.0
Raleigh–Durham	NC	2	2	2	2	2.0
San Francisco	CA	1	3	1	3	2.0
Seattle	WA	2	2	2	2	2.0
Dallas	TX	2	2	2	1	1.8
Los Angeles	CA	1	2	1	3	1.8
Tampa	FL	1	3	2	1	1.8
Austin	TX	1	3	1	1	1.5
Houston	TX	1	1	1	1	1.0

Source: Yardi Matrix

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assistance in developing State Hazard Mitigation Plans (SHMPs) to recognize and plan for climate change.

■ *State Hazard Mitigation Plan:* Our grade in this category is based on the Columbia Law School’s Sabin Center for Climate Change Law report titled “State Hazard Mitigation Plans & Climate Change: Rating the States 2019 Update.” The report ranks the mitigation plans (SHMPs) in five categories, with the lowest grades for those that did not recognize climate change or did so inaccurately and the highest grades for states that are actively planning for climate change.

■ *State Billion-Dollar Weather and Climate Disaster Cost per Million Residents:* Markets were graded based on a report from NOAA titled “Billion-Dollar Weather and Climate Disaster: Overview,” which ranks states on the total cost of climate disasters per million residents from 1980 to 2020.

■ *Unfunded Pension Liability:* States and cities that have large unfunded liabilities may be constrained in their ability to fund mitigation to environmental risk. Data for each state’s unfunded pension liability was taken from Pew Charitable Trust’s report titled “The State Pension Funding Gap: 2018.”

Final Grades: Action Counts

Based on our methodology, four metros stood out as having the least environmental risk: Boston, Indianapolis, Minneapolis and Portland. The commonality for all was being in states that are taking environmental risk seriously. Boston and Indianapolis received the highest grades in three categories and the lowest grade in one, while Minneapolis and Portland received high marks for government action and propensity for natural disasters and middle grades for pollution and water quality.

The five lowest-ranked metros include three in Texas (Houston, Austin and Dallas), along with Tampa and Los Angeles. The Texas metros' grades were dragged down by low scores in the "natural disasters" and "government response" categories. Both of those problems were on display in the severe winter storm in February 2021 that led to the deaths of more than 150 state residents, according to the Texas Department of Health and Human Services. Meanwhile, 4.5 million residents lost power, food and water shortages were widespread, and property damages exceeded \$20 billion.

The Texas storms are a demonstration of the stakes. Texas has reaped the benefits of deregulation and low taxes/utility costs, but utility providers' lack of investment to winterize the power grid left the state unprepared to handle extreme weather. Without collective action to mitigate environmental risk, such disasters with high damages will recur.

Starting the Conversation

Our rankings are not meant as investment advice about any metro or property. ESG is a complicated topic that encompasses a wide range of specialties. We did not address strategies to reduce energy consumption in individual properties and portfolios, or technology that is being developed to assess and improve energy consumption. Reducing water and utility bills is a cost-efficient way for property owners to cut expenses and increase profits and asset values.

Data in this emerging field remains difficult to obtain and measure. Concerns about the ability of financial firms to assess environmental risk has spawned a new cottage industry of consultants that are attempting to gather and analyze environmental data and translate the impact on markets and individual buildings. The field is in its infancy, with better data and metrics yet to come.

Some will no doubt question the categories we chose, the methods we used to grade metros, or what constitutes a proper response to environmental risk. This is our intention. Our rankings are not meant as a final word on the topic, but rather, a first attempt to understand the issues and develop a model for how to approach the topic—which is of increasing importance for commercial real estate. We encourage all to develop their own views about which metrics will have the most impact on the property sector and the appropriate response for how to deal with ESG.

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