

Weathering the Storm: Integrating Climate Resilience Into Real Assets Investing

Introduction

As climate change impacts intensify around the world, so too do the economic impacts. Corporations, communities and investors worldwide face both acute risks from single severe weather events such as droughts, floods or hurricanes, and chronic risks from long-term changes in natural cycles and weather patterns.¹ Sectors built on physical assets, including real estate and infrastructure, are on the frontline of these climate impacts, posing challenges for real assets investors.

A New Operating Reality

Amid rising average global temperatures, severe weather events have become increasingly frequent and destructive. For many places, long-term climate impacts like sea level rise are combining with changing land use patterns, such as urbanization, to exacerbate risks to the built environment.

The results can be costly. According to the National Oceanic and Atmospheric Administration, since the 1980s, the number of inflation-adjusted billion-dollar weather and climate disaster events in the U.S. per decade grew from 28 during the 1980s to 91 from 2010 to 2017. Meanwhile, the average annual costs rose from \$16.7 billion in the 1980s to \$80.5 billion from 2010 to 2017. In 2017 alone, the United States experienced 16 weather and climate disasters with losses greater than \$1 billion, costing the economy a record \$309 billion.²

While not every event can be directly linked to climate change, its impact is increasingly clear. For example, researchers found that climate change likely increased Hurricane Harvey's record rainfall intensity by at least 20 percent.³ The impact on the Houston area's housing and infrastructure was profound, with nearly 800,000 people in need of assistance in the weeks and months that followed.⁴

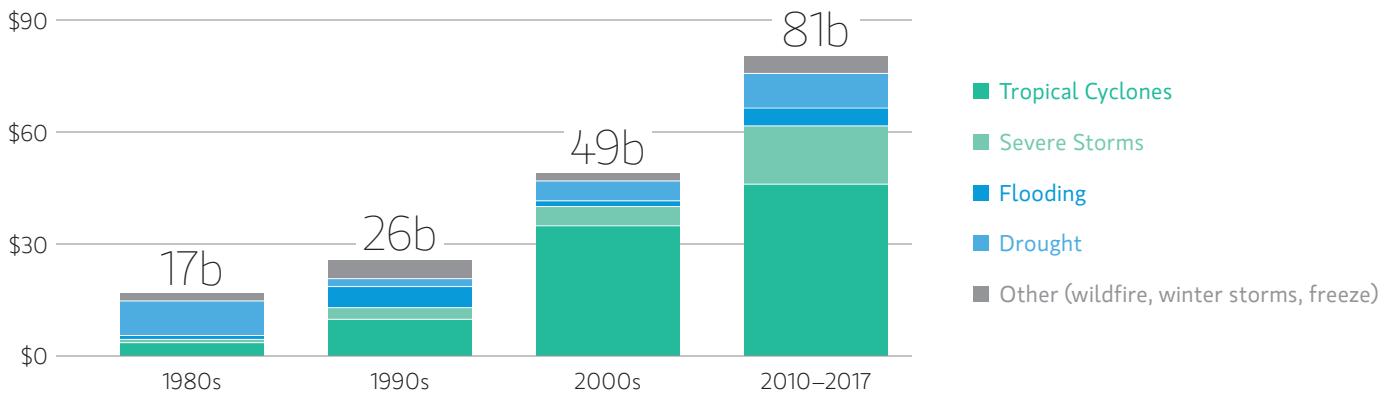
Facing such risks, cities and states globally have begun to adopt policies, programs and investments to mitigate and adapt to climate change, including by making infrastructure and buildings more resilient. Companies have been following suit, seeing the benefits to be gained from anticipating, responding to and recovering from climate risks and impacts. Investors in real assets are also compelled to act on the risk and opportunities afforded by adapting to a climate-changed world.

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Average Annual Cost of Natural Disasters

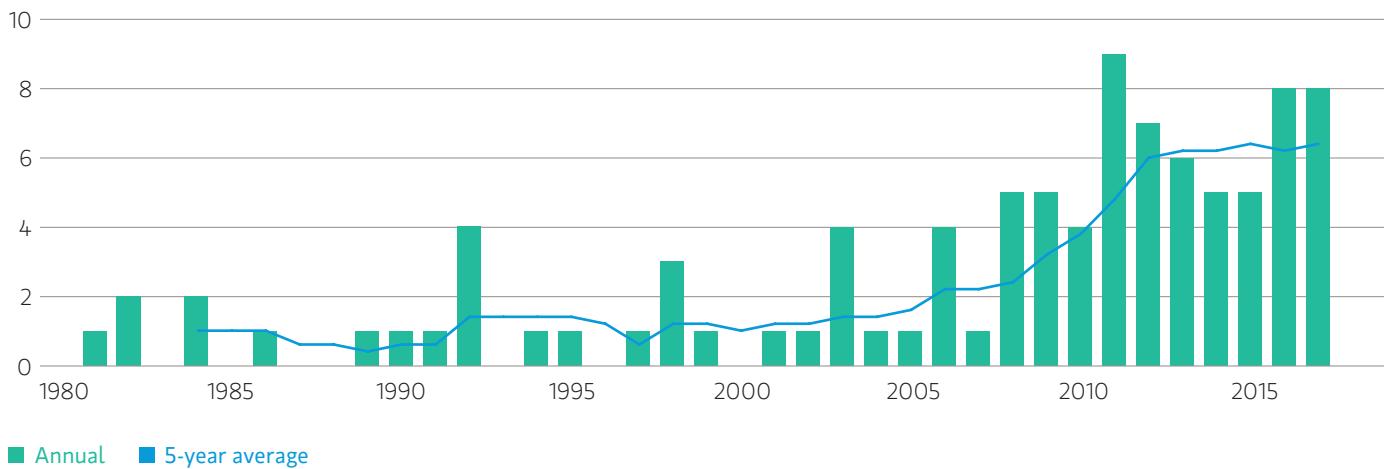
FIGURE 1
Inflation-Adjusted Cost, Disasters Exceeding \$1 Bn in Impact
 USD Bn, by Decade



Source: NOAA National Centers for Environmental Information (NCEI) U.S. Billion-Dollar Weather and Climate Disasters (2018).
<https://www.ncdc.noaa.gov/billions/>

Annual Severe Storm Events, 1980–2017

FIGURE 2
Severe Storms Exceeding \$1 Bn in Impact, Inflation-Adjusted
 Annual and 5-Year Average



Source: NOAA National Centers for Environmental Information (NCEI) U.S. Billion-Dollar Weather and Climate Disasters (2018).
<https://www.ncdc.noaa.gov/billions/>

Resilience and Real Assets

Climate resilience is fast becoming an investment imperative in real assets, where investments are often held for 10 years or more. In 2017, property and infrastructure damage from natural disasters accounted for an estimated \$220 billion,⁵ or two-thirds, of \$330 billion in global economic losses.⁶ Recognizing the need for investment in infrastructure globally, the UN Sustainable Development Goals have defined resilient infrastructure as a global imperative (Goal 9).

Beyond purchasing insurance, however, not all investors with significant real-asset portfolio exposure are managing the long-term risks associated with these investments.⁸ In failing to understand this exposure, they not only ignore growing risk, but also miss out on the potential high returns of resilience efforts. These can include cost reductions (lower operating costs and averted damage), revenue growth (enhanced reputation, increased occupancy rates) and higher asset value.⁹

Faced with the prospect of more frequent billion-dollar weather events, how should real assets investors protect their investments with respect to climate resilience?

In this paper, Morgan Stanley Real Assets proposes a dual approach: first, assessing risk, and second, optimizing assets for climate resilience. Achieving these goals will require scrutinizing assets' exposure and vulnerability to climate impacts as well as employing multiple defenses to minimize disruption to buildings and infrastructure. The next two sections provide a roadmap for maximizing resilience through a combination of due diligence, forward-looking design, proactive disruption management and thoughtful divesting of certain assets.

Investing in climate-resilient portfolios will require trade-offs and judgment calls. For example, coastal locations that make highly attractive real estate investments are also very vulnerable to climate impacts related to rising sea levels. A World Bank/OECD study of the coastal cities most at risk from flooding is a case in point, including such major markets as Miami, New York, Boston, Osaka, Guangzhou and Mumbai.¹⁰

Similarly, a planned new building in a location such as a flood plain that is insurable today may not be insurable two decades down the road, leaving investors at risk of substantial future diminution in value. Depending on the asset, in some cases, the return will be worth the risk and investors can pursue ways to fortify it. In others, divestment from certain markets or of specific assets may ultimately be the soundest option.

Investors in infrastructure assets will face similar choices in the years ahead, since airports, cell towers and oil and gas pipelines are often located in areas at increasing risks from flooding, severe storms and extreme heat. For example, the European Commission's Joint Research Center predicts that damage costs from natural disasters to critical infrastructure including transport systems, energy generation plants and water supply networks could triple to €9.3 billion per year across the EU by the 2020s.¹¹

At the same time, investments in resilient real estate and infrastructure may offer prospects for improved financial returns. A comprehensive evaluation of climate risk can help real assets investors accurately weigh risks and returns.

Balancing resilience concerns and market attractiveness will be an important focus for investors and fund managers as they increasingly apply a climate lens to their investments. Many of the most core real estate markets in the United States and globally are in coastal areas subject to sea level rise, hurricanes and storm surges. But an investor that only considers climate risk may miss valuable market opportunities. A careful analysis of risk and returns is central to climate-resilient investing.

Defining Resilience

Resilience is an organization's ability to prepare, plan for, respond to and recover from adverse natural or human-caused events. Stresses can arise at the national, regional, city, submarket, asset, business or investment level, and can encompass multiple types of threat.

Resilient organizations enhance their adaptive capacity by making changes in processes, practices or structures to moderate or offset potential damages, or to take advantage of opportunities associated with changes in climate.⁷

In this paper, resilience refers solely to climate and other environmental-related risks.

A Balancing Act

Carefully weighing risk, resilience and potential returns in tandem allows investors to identify attractive, climate resilient real estate markets in a more comprehensive way than considering metrics in isolation. For example, the University of California Berkeley's Resilience Capacity Index, a 12-metric average that quantifies the resilience capacity of 361 U.S. metropolitan statistical areas, includes preferences for higher homeownership rates, overall housing affordability and the share of the metro population in place for at least a year. Although these metrics help to prioritize stability, they may not correlate as well with income growth and total returns.

When these resilience scores are plotted against trailing 20-year real estate returns for 46 U.S. markets (measured by the NCREIF Property Index), we see the correlation is (0.23).¹² The most resilient cities do not always offer the highest returns to real estate investors. A narrow view of only resilience OR returns could guide investors to different real estate markets, while an analysis of both can highlight cities that are attractive on both dimensions.

Resiliency Capacity Index Negatively Correlated With Property Returns

FIGURE 3
Trailing 20 Years
% Total Return p.a., Unlevered



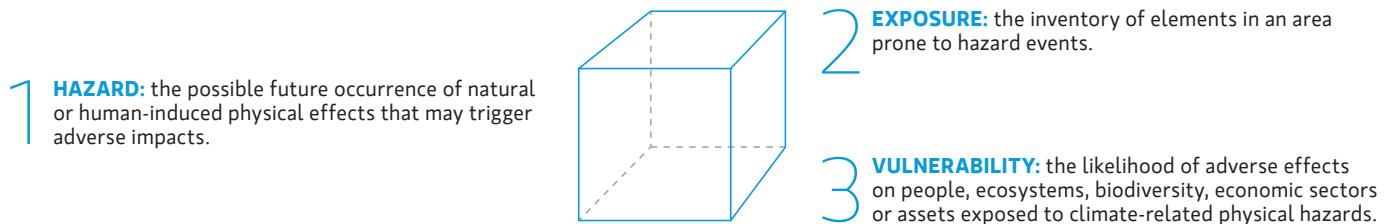
Source: NCREIF, University of California Berkeley, University at Buffalo Regional Institute, MSREI Strategy calculations, as of April 2018.

Assessing Climate Risk for Real Assets: A Three-Dimensional Approach

Against this backdrop, how can investors begin to evaluate real assets for climate risks and potential opportunities? A systematic approach, aimed at mitigating potential risks while maximizing opportunity, requires paying close attention to investment opportunities in a three-dimensional way.

A Three-Dimensional Approach to Assessing Climate Risk

FIGURE 4



Hazard

When looking at any given market from a climate impact perspective, investors should first ascertain the likely hazards the area faces. What types of extreme events can occur? What is the likelihood, given climate models, of a hazard occurring, and over what time horizon?

Climate-related hazards can take many forms and be deeply interrelated. As the climate changes in new and unpredictable ways, certain changes may set off feedback loops. Warming temperatures accelerate sea level rise both through glacial melting and thermal expansion. Droughts can exacerbate wildfires, which in turn can contribute to the frequency and severity of landslides. Current insurance models account for historical patterns, but those models may not apply in a changing climate. Investors should consider how those hazards will change over time as well as how they are related.

Exposure

After establishing potential hazards, investors should evaluate the exposure to expected climate impacts faced by their investments. Does a market or asset lie directly in the path of one or more potential hazards? To what extent are buildings and infrastructure situated in areas exposed to acute climate-related events or slow-build impacts?

For example, more than 60 percent of the world's population lives in Asia, and more than half of Asians live near the coast, making their property and infrastructure directly exposed to sea-level rise.¹³ In the United States, Hurricane Sandy offers a prime example of the kind of acute damage to which rising sea levels can contribute, when peak storm surges caused more than \$70 billion worth of damage in New York and New Jersey.¹⁴

Due to sea level rise, storm surges are an estimated eight inches higher than in 1900.¹⁵ According to Lloyd's of London, the 20cm rise in sea level at the tip of Manhattan since the 1950s has increased insured losses in New York by 30 percent.¹⁶ Given the longevity of many real assets, taking long-term climate modeling into account is critical to sound risk assessment. For such information, investors can turn to publicly available data sources such as the U.S. Climate Resilience Toolkit. Maintained by U.S. government agencies, the portal provides current conditions, short-term forecasts and longer-term projections for 2035 and 2060, under varying climatological models. The maps in Figure 5 show the potential increase in intensity across U.S. markets of one-in-100 year storms in 2035 and 2060.

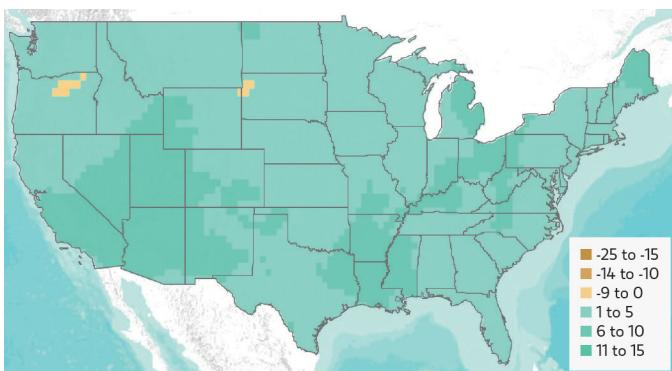
Such predictions, and their implications for real assets, are also complicated by the extent to which the international community reduces greenhouse gas emissions in the coming decades. By 2070, \$35 trillion in real estate assets will be at risk if the world does not change its current carbon emissions trajectory, according to the UN Framework Convention on Climate Change (UNFCCC).¹⁸

At the asset level, investors should consider the relative exposure of a specific asset given local conditions. For example, in a market at high risk of flooding from sea level rise, is a specific property coastal or inland? Does it sit above sea level or below? Investors have traditionally relied on insurance to reduce exposure to risks, and will continue to do so as the climate changes. With the insurance industry facing increasingly unsustainable climate-related losses, however, the old models will no longer suffice. Insurance models will need to assess risk in a changing climate, and investors can work with insurers to find the way forward (see the Role of Insurance).

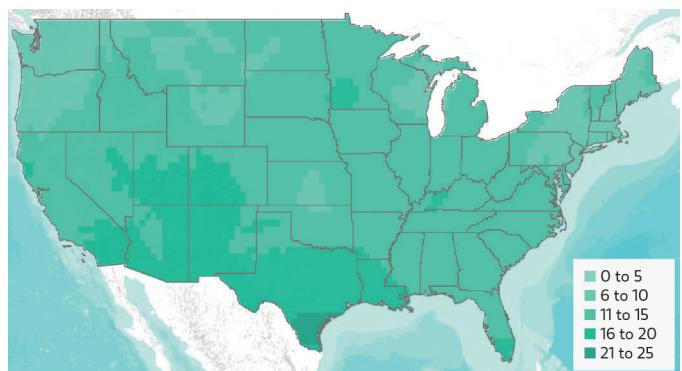
Projected Change in 100-Year Storm Intensity (%)

FIGURE 5

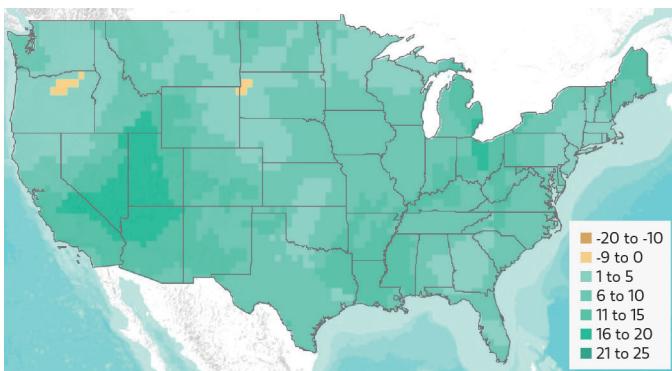
2035 (Less Stormy Scenario)



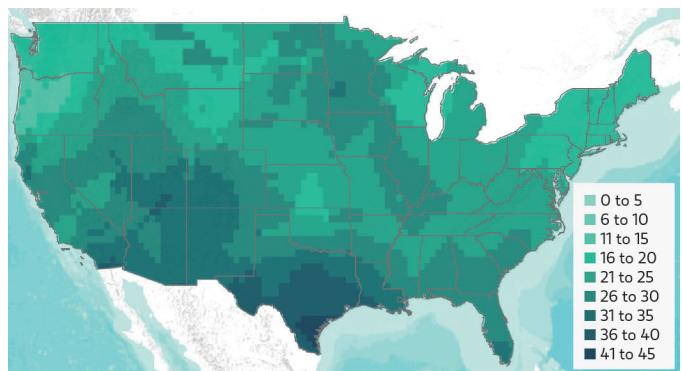
2035 (Stormy Scenario)



2060 (Less Stormy Scenario)



2060 (Stormy Scenario)

Source: U.S. EPA, CREAT Climate Scenarios Projection Map, as of March 2018.¹⁷

Vulnerability

Once hazard and exposure—today and in the future—are established, the final element of climate risk assessment is to ascertain vulnerability. How prepared are the local community, infrastructure and government to respond to disasters? What is the likelihood of people, ecosystems, economic sectors, supply chains or local businesses to suffer adverse effects from climate-related physical hazards, and how might these affect real assets investments? At a national level, macroeconomic capacity can make investments in real assets less risky. For example, countries with "a higher literacy rate, better institutions, higher per capita income, higher

degree of openness to trade, and higher levels of government spending" are better able to withstand and recover from natural disasters.¹⁹ Similarly, abundance of financial capital, in the form of deeper domestic credit markets and foreign exchange resources, can speed recovery.

At the city level, investors can look to collaborations and analyses of resilience for guidance. For example, the Rockefeller Foundation's 100 Resilient Cities program acts as a clearinghouse for best practices in urban resilience, working with mayor's offices of 100 cities worldwide. Participating cities commit to addressing a range of social and environmental challenges; those committing to address climate change reflect

The Role of Insurance in Managing Climate Risk

Real assets investors rely on insurance to help mitigate climate-related risk. Paying insurance premiums to enable rebuilding after extreme weather events, for example, enables investors to support otherwise attractive property markets in regions with high climate risk exposure.

However, today's insurance models are becoming outdated and unsustainable as climate risks intensify and the cost of losses grows. The \$330 billion in global natural catastrophe insured and uninsured losses in 2017 was the second highest annual total to date (after \$354 billion in 2011), while the total insured losses set a new record, at \$135 billion.²²

Given that historical data may not accurately benchmark future risk, pricing climate risk into property insurance premiums is difficult and poses a challenge to current insurance practices. The implications are twofold: climate risk today may be underpriced by insurance markets, and as models begin to price climate risk more accurately, premiums may rise and, in some cases, assets may become uninsurable.

The United Nations Environment Programme (UNEP) Finance Initiative established the Principles for Sustainable Insurance in 2012, to develop a common framework for the industry to address environmental, social and governance opportunities, including the risks of climate change. They guide insurers to embed environmental criteria into decision-making across business, including in risk management and underwriting processes, which, in time, will necessitate a more direct approach to pricing climate risk. More than 83 organizations have adopted the Principles, which represent more than 20 percent of global insurance premiums.²³

Investors can play an active role in how all this unfolds by working with insurers to bolster the resilience of real estate and infrastructure, to prevent jumps in premiums and to preserve the long-term insurability of their most at-risk assets. Some insurers are now developing rating systems for real estate and infrastructure around asset exposure and vulnerability to severe weather events and other climate-related hazards.²⁴ By applying a ratings approach, insurers would foster best practices in terms of building design and preparedness by real asset owners, bringing benefits to investors and communities. Insurers could also offer the ability to insure a set of assets as a geographically diversified portfolio, rather than at the single asset level, enabling a more diversified approach to managing climate risk.

To help keep premiums down and incentivize climate resilience improvements, real assets investors can also press insurers for multi-year insurance contracts that reflect their commitments. The chief research officer of insurance brokerage, RMS, has signaled that insurers "would be prepared to invest in risk reduction if they knew someone guaranteed to stay insuring with them—as through some multi-year insurance contract."²⁵

By partnering with the insurance industry as it evolves to more effectively price the risks of climate change to real assets, investors can help shape a more sustainable and resilient path forward.

a global network including London, Santiago and Los Angeles.²⁰ Resilience analyses, such as the Resilience Capacity Index (see A Balancing Act) consider the ways that socioeconomic and environmental factors come together to promote resilience. As resilience relates to a specific asset, which characteristics make it vulnerable in an extreme event? To answer this question, investors evaluate every relevant aspect of their investment. When was the asset built and with what materials? What types of tenants and uses occupy the space? Does the property have storm windows and drains in place? If the location is flood-prone, is the electrical equipment in the

basement, which would make it vulnerable to damage and longer disruption, or on the rooftop?

Such details can make a significant difference to damages and costs from a weather or climate event. For example, a mixed-use project in Boston that incorporated resilience features including elevated mechanical systems, seawalls and saltwater-tolerant landscaping found 2 to 18 percent higher rents and reduced its actuarial flood-loss expectancy by 90 percent.²¹ By ascertaining the extent to which an asset is prepared for a changing climate, investors can make informed decisions on whether current or future investments are sound.

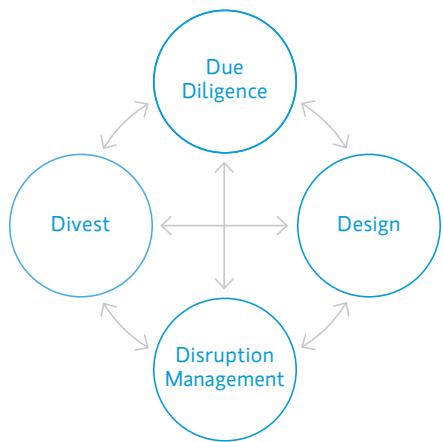
Building Climate Resilience Across a Real Asset's Lifecycle

Once investors understand the risks to current or potential real assets investments presented by climate hazards, exposure and vulnerability, how can they act on them?

Morgan Stanley Real Assets believes that considering resilience across an asset's lifecycle can help investors and asset managers make better decisions, minimize risk and capture the opportunities that climate-resilient buildings and infrastructure will increasingly offer.

A Lifecycle Approach to Managing Climate Risk

FIGURE 6



Due Diligence

The first step is for property or infrastructure investors to apply due diligence criteria to climate hazards, exposure and vulnerability as they would with other risk factors such as financial, economic and political circumstances. Due diligence in a climate context involves a three-step process: identify risks, determine potential outcome severity and recommend actions to improve the property's resilience to the identified threats. This revolves around the concept that prior to investment, establishing a baseline set of resilience standards should be considered. In identifying risks, investors should first consider market-level conditions, including potential exposure to any and all severe weather events, other geological and climate change-related hazards and non-climate-related conditions that can exacerbate damage. As previously noted, historical baselines may not fully measure future conditions, so analysis should incorporate publicly available data sources such as the U.S. Climate Resilience Toolkit.

If investors green light an investment, they should gauge the building, pipeline or facility's ability to withstand the identified threats and recover operations after suffering damage, as well as its ability to withstand longer-term changes in climate systems. This view of resilience can be taken through the engineering lens of the "four Rs"—robustness, redundancy, resourcefulness and rapidity (the speed of response to disruptions).²⁶ Where investors find gaps or vulnerabilities in emergency and resilience management, they can take action to protect their assets.

Assess market and asset climate risks during **due diligence**.

Incorporate resilient **design** elements during construction or retrofits to address vulnerabilities.

Be proactive about **disruption management** to prepare for and adapt to extreme events before they occur.

Consider partial or full **divestment** during ongoing asset management where investment risks outweigh opportunity.

Due diligence supports sound investing by determining the approximate costs associated with options to improve the asset's resilience to identified threats. These can be significant—for seismic property retrofits, for example, the city of Santa Monica, California, enacted programs with costs to building owners estimated at up to \$50 to \$100 per square foot for concrete and steel buildings, and \$5,000 to \$10,000 per unit for wood apartment buildings.²⁷ Careful consideration of the costs involved to enhance resilience is essential at all stages of the investment cycle, especially given the expectation that climate hazards and resulting impacts will intensify over time.

Design

Once an investment is made, investors can address asset-level vulnerabilities by implementing design improvements that enhance climate resilience by addressing robustness and redundancy. As the risks to real assets from extreme weather and ongoing climate change become clearer, resilient design is a focus area for the sector, with industry-wide best practices and standards being adopted and developed for both new construction and for retrofits.

For investors, using such standards and credentials can provide useful guidance in designing a new asset or retrofitting an existing one. Credentials can also offer positive brand opportunities and can bring benefits beyond those triggered if a climate event strikes and resilience measures are in place.

Design Credentials

There are a range of credentials programs investors can look to for guidance on environmental design and resilience. Some of the most widely recognized credentials include:

RELi: In November 2017, U.S. Green Building Council (USGBC) introduced a new resilient design rating system known as RELi, a tool for assessing building and community resilience to severe weather and climate events. RELi builds on LEED guidelines piloted in 2015, which included planning for climate change and emergencies, designating and designing for a building's top three hazards, and establishing design of "passive survivability"—a property's ability to tolerate long-term interruption of power, heating fuel or water.

PEER certification: USGBC also offers sustainability and resilience infrastructure credentials for power networks and microgrids through its PEER certification (Performance Excellence in Electricity Renewal).

Global Real Estate Sustainability Benchmark (GRESB):

GRESB measures real estate and infrastructure companies' sustainability performance, including a new resilience module in 2018.

Envision: For infrastructure assets, the Institute for Sustainable Infrastructure offers the Envision credential which includes climate and risk as one of five sustainability categories.²⁹ Companies are rated on factors including resiliency criteria, creating a climate impact assessment and adaptation plan, and designing measures that safeguard against natural hazards, promote long-term resilience and adaptive capability, and avoid traps and vulnerabilities.

The Urban Land Institute's Ten Principles for Building Resilience offer best practices for incorporating resilience into real assets by taking a view of economic, environmental and social factors together.

Meanwhile the National Institute of Building Sciences has documented the costs and benefits of designing new buildings that are more robust to climate change. In a 2017 report, its researchers found that investing in hazard mitigation measures that exceed relevant requirements of the International Code Council's 2015 model building codes could save \$4 for every \$1 spent.²⁸

Enhancing robustness and redundancy requires designing, building and renovating assets with specific hazards in mind. Climate change may increase the frequency and severity of extreme temperatures—both hot and cold. Buildings at risk of heatwave-triggered power outages can support redundancy by upgrading back-up generator capacity. Orienting and shading

buildings to reduce heating and cooling needs, or installing glazed glass, operable windows or super-insulated building envelopes can enhance energy efficiency and make a building more robust to extreme temperatures. Moving power lines below ground and upgrading insulation can protect local electricity grids during heatwaves (as well as storms and earthquakes). Water system upgrades can help prevent against cooling water shortages for facilities such as power plants.

For assets vulnerable to impacts from droughts, buildings can install drought-tolerant landscaping and make use of rainwater/graywater collection and reuse systems. Natural landscaping and rooftop gardens can also help reduce cooling loads in regions where drought is exacerbated by heat waves.

To withstand flooding conditions from storm surges, heavy rain or rising sea levels, asset managers can raise mechanical equipment and backup generators above ground level to help minimize power interruptions. Backup power systems can also keep interiors air-conditioned, reducing the chance of mold or mildew developing during power interruption. Landscaping with native plants, bioswales and raised berms can help protect against storm surges and tides and absorb stormwater runoff.³⁰

Storm surges and flooding are often accompanied by high-wind conditions during hurricanes or typhoons. Storm-rated wind-resistant windows prevent damage by withstanding the stress of high winds or impact from projectiles.

Designated refuge areas or interior rooms can protect building occupants by providing shelter during storms.

Infrastructure assets are designed with lifespans of several decades or more, and will accordingly need to adapt to long-term changes in climate systems and the frequency of extreme weather events over time. For example, airport runways, roads and rail transport in regions faced with intensifying heatwaves will likely need to be designed to tolerate greater heat. Bridges and oil and gas pipelines may need modifications to withstand more frequent flooding and support redundancy in the case of an event. Flood barriers are already in use to protect London and coastlines in the Netherlands, and are due to be implemented in Venice during 2018. In the coming decades, such defenses may also be needed in U.S. Eastern seaboard cities such as Boston and New York.

Communications infrastructure is of critical importance during and after an extreme weather event, yet these systems themselves are vulnerable to damage. Redundant systems can help ensure continuity and thereby enable other community response systems to mobilize quickly. For example, as wireless telecommunications networks can be vulnerable to damage from hurricanes, flooding and earthquakes, networks can build in redundant data centers and alternative fiber rings, which would allow continued operations even if the main systems are disrupted.

Investors who keep on top of design modifications and best practices for resilient infrastructure will not only protect against risk, but may see the value of their assets rise as demand grows for services such as continuously available electricity and air conditioning in a changing climate.

DESIGNING FOR THE FUTURE

Designing for resilience will also be an iterative process. As the scope and frequency of climate events change, design standards and best practices will evolve. In designing for today, best practice considers projections for mean sea level and the likelihood of 10-year, 50-year and 100-year storms in the future. These parameters, however, may evolve depending on how climate change impacts play out in the coming decades. This obviously affects new construction, requiring investors to consider leading edge design features and standards in order to safeguard assets against unknowable future threats.

Designing for future use also requires consideration of the ways that individuals and communities will use infrastructure, buildings and real assets in the future. In designing systems intended to last for 10, 20 or 50+ years, climate-aware investors should consider the ways that systems can and will change. Advances in fuel sources, communications networks and distribution systems have the potential to impact how today's infrastructure investments are used in the future. How and where those investments are made can impact the ability of a community to respond to climate events—both the ability to access critical resources and the speed of response.

Lincoln Road Retail, Miami: Resilience in Action

Every year, millions of tourists visit Miami, Florida, from all over the world, drawn to beautiful beaches, a booming nightlife and a rich cultural history. Business is thriving as well, with annual business establishment growth of 2 percent from 2010–2015, more than double the national average.³¹ Amidst the glitz and glamour, it's easy to forget that Miami is one of the United States' most at-risk cities in the face of climate change. Miami's overall costs to coastal property from sea-level rise through 2100 are modeled at roughly \$80 billion, the second highest in the United States after Tampa.³²

At the heart of South Beach sits Lincoln Road, a popular shopping and tourism district. Across all phases of the investment lifecycle, it is important to consider climate risk and put systems in place to increase the property's resilience to climate change.



DUE DILIGENCE: Due diligence research and analysis identified sea level rise and hurricanes as potential threats to Lincoln Road, but also took into account the potential returns of owning and operating a retail property in one of the United States' most popular markets for dining and entertainment. In the end, investors might determine the benefits of investing in the property outweigh the risks and focus on designing and managing the building with resilience in mind.



DESIGN: The retail buildings at Lincoln Road include robust design features like impact windows and raised grading to withstand heavy winds and debris as well as flooding. Mechanical equipment is raised above ground level to prevent water damage. The city has existing plans to upgrade stormwater drains to mitigate flooding. During severe storms, flood panels can be used to help prevent damage to facilities and to tenants' merchandise.



DISRUPTION MANAGEMENT: Perhaps most important are the systems in place at Lincoln Road that ensure resourcefulness and rapidity in the event of an emergency. Emergency response plans are pre-established with clear lines of authority for decision-making and spending. Duplicate copies of emergency plans are stored offsite in the event that the facilities cannot be accessed or electronic systems are down. On site, critical resources and supplies, including emergency contact lists, are stored in easily and safely accessible locations on upper floors, enabling personnel to carry out response plans uninterrupted. Shelter in place protocols are established as well, to ensure that anyone left on site can remain safe during a storm and after, in the event that roads or bridges are inaccessible.

The site manager has pre-established contracts in place with key suppliers to repair and replace buildings or equipment quickly and cost-effectively. Facilities staff help carry out emergency plans; they are hired on a contract basis so additional support can be brought in as needed.

In short, while Lincoln Road may be exposed and vulnerable to climate-related hazards such as hurricanes, careful planning across the investment lifecycle means assessing climate risks, establishing a resilience strategy and helping protect the site against physical and safety risks in the event of an emergency.

Additionally, both near- and long-term resilience measures for any real asset could be blunted if the local government's approach to managing climate risk is inadequate. This means that investors should be evaluating not only the design of their own assets, but also the potential need for upgrades to surrounding infrastructure, such as roads, water systems, sewers and electrical lines. Infrastructure systems are often interrelated, and the resilience of a single asset is dependent on the ability of the surrounding infrastructure to anticipate, withstand and respond to adverse events. For a real assets investor, the more effective and long-lasting that municipal resilience policies are, the better.

Disruption Management

The third phase in the roadmap for investors to build real assets resilience is proactive disruption management. This involves creating systems and processes that ensure resourcefulness and rapidity as part of business continuity planning.

While some disruption is inevitable during severe weather events, effective real asset management considers resilience before, during and after such disasters, which can make a big difference to the human and economic consequences.

Before an event is on the radar, pre-establishing contract terms and obligations with key suppliers will prove valuable in the aftermath of extreme weather events, since taking bids on repair or replacement after the storm drives up costs and exacerbates delays. Pre-positioning supplies and readying a detailed list of potential contacts are also important to have in place ahead of time. Because roads and bridges are at risk in extreme weather events, key personnel could have difficulty reaching the site. Advance planning is helpful to prepare for such a possibility, and provisions to shelter in place along with backup personnel and off-site duplicate, hard-copy records may be useful. By considering the ways that resources can be accessed and mobilized ahead of time, investors can thereby enhance the rapidity of a disaster response.

In immediate recovery from severe weather events, the focus should be on sustaining life and then restoring facility operations to full capacity. With these addressed, design and disruption management are iteratively connected. Some missed imperatives in minimizing disruption may be obvious, while others could be uncovered by thorough after-the-fact briefing. Additional resiliency measures can then be assessed and ideally put in place.

Divest

In balancing resilience concerns, market attractiveness and cost/benefit analysis, investors may conclude that a potential or current asset does not meet the necessary thresholds or criteria to justify an investment. Where returns no longer balance with risks, investors or fund managers may opt to divest. Such decisions may be made as a result of due diligence, or during ongoing assessment and review of a portfolio or an individual asset's performance.

Alternatively, investors may choose to set gating criteria for resilience measures for an asset, a market or both. Investors planning for climate resilience can take lessons from other types of natural phenomena, such as seismic activity. Where baseline criteria are not met, it is important to evaluate the costs of necessary upgrades, and if feasible, make the improvements. These standards help avoid investing in real estate with lateral load-resistance and other metrics below pre-agreed criteria to withstand earthquakes.

Given the long duration of real asset lifecycles and intensifying climate hazards, investors should thoughtfully consider climate risk at all stages of an investment, continually making decisions about design, disruption management and divestment that enable them to build and manage a resilient portfolio for the long term.

Conclusion

This brief highlights the necessity for real assets investors to evaluate and act on climate risk to safeguard their investments. It also showcases the financial and reputational opportunities that resilient property and infrastructure can offer.

As populations continue to urbanize, real asset value will become ever more concentrated in urban centers, which in turn will become the frontline for climate resilience and adaptation. By conducting due diligence, pursuing design that prepares for a climate-changed world, and working with insurers, municipal

authorities and other stakeholders to promote resilience, investors can play an important role in this evolution. Below, we suggest actionable questions that can serve as a starting point for assessing and building climate resilience at each stage of a real asset's lifecycle.

Key Questions for Building Climate Resilience

DUE DILIGENCE

1. How will climate change and severe weather affect the asset?
2. How resilient is the surrounding community and/or infrastructure?

DESIGN

1. How will the design influence the resilience of the asset to acute and long-term risks?
2. How do resilience upgrades or credentials impact the cost of my insurance premiums or value of an asset?

DISRUPTION MANAGEMENT

1. In the event of an emergency, with what companies, government agencies and individuals does the property's management need to have established relationships/agreements?
2. Who has decision-making authority during an emergency situation? If that person is unavailable, what is the chain of command?

DIVEST

1. How often should investors reevaluate portfolios for climate risk?
2. At what point does an asset become uninsurable?

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