CBRE Research

RESILIENCE

& Property Management

GLOBAL | 2019

CBRE

INTRODUCTION

The resilience of property portfolios to environmental stresses is a growing concern for investors with a long-term horizon. And with the financial costs of environmental hazards apparently reaching new highs,[1] there is renewed focus on how assets can be made more resilient.

Property managers can play a key role in this effort. At the interface of tenants, investors, contractors and local authorities, they can influence how well a building is prepared for and recovers from a damaging environmental event. Property managers are on the front line of implementing any plans to increase a building's resilience.

This report details the findings of a six-month research study, including interviews with property managers, to understand current trends in the interpretation of resilience and the development of resilience strategies.[2]
The report is structured as follows:

- Resilience – an introduction to the concept
- Why have a resilience strategy?
- What are global investors doing about resilience?
- What are property managers doing about resilience?
- Conclusion

"Investors who are not thinking about [environmental] risks, or who view them as issues far off in the future, may need to recalibrate their expectations."

BlackRock, The Financial Times, April 4, 2019.

1 https://www.swissre.com/dam/jcr:2a4b927e-23bc-4b66-9cda-fdd60b729021/nr_20181218_sigma_estimates_for_2018.pdf
2 While this is not necessarily a representative sample, every effort was made to canvass a wide range of professionals actively involved in managing buildings, insuring them or procuring management services. Figure 5 gives an indication of the geographical spread of interviewees.

RESILIENCE

Resilience is defined as the ability to avoid or bounce back quickly from an adverse event.[3] For real estate investors, resilience allows buildings to sustain capital values and an uninterrupted flow of operating income, particularly following a catastrophic event. Commercial buildings are considered resilient if they can avoid significant damage from environmental shocks, such as floods and hurricanes, while continuing to provide an uninterrupted working environment and minimal disruption to business operations.[4]

Generally, resilience hinges on:

- A correct assessment of long-term risks. This involves extrapolating current trends to form a view of risks beyond 10 years, even if the results of this exercise are contrary to the dominant popular narrative, ideology or belief.
- A comprehensive building-level strategy to prepare for these risks.

"The market was hit by natural disasters including Californian wildfires, Typhoon Jebi in Japan and hurricanes Michael and Florence in the United States that resulted in big claims costing the market £2.9 billion last year, £1 billion higher than its long-term average."

The Times, March 27, 2019.

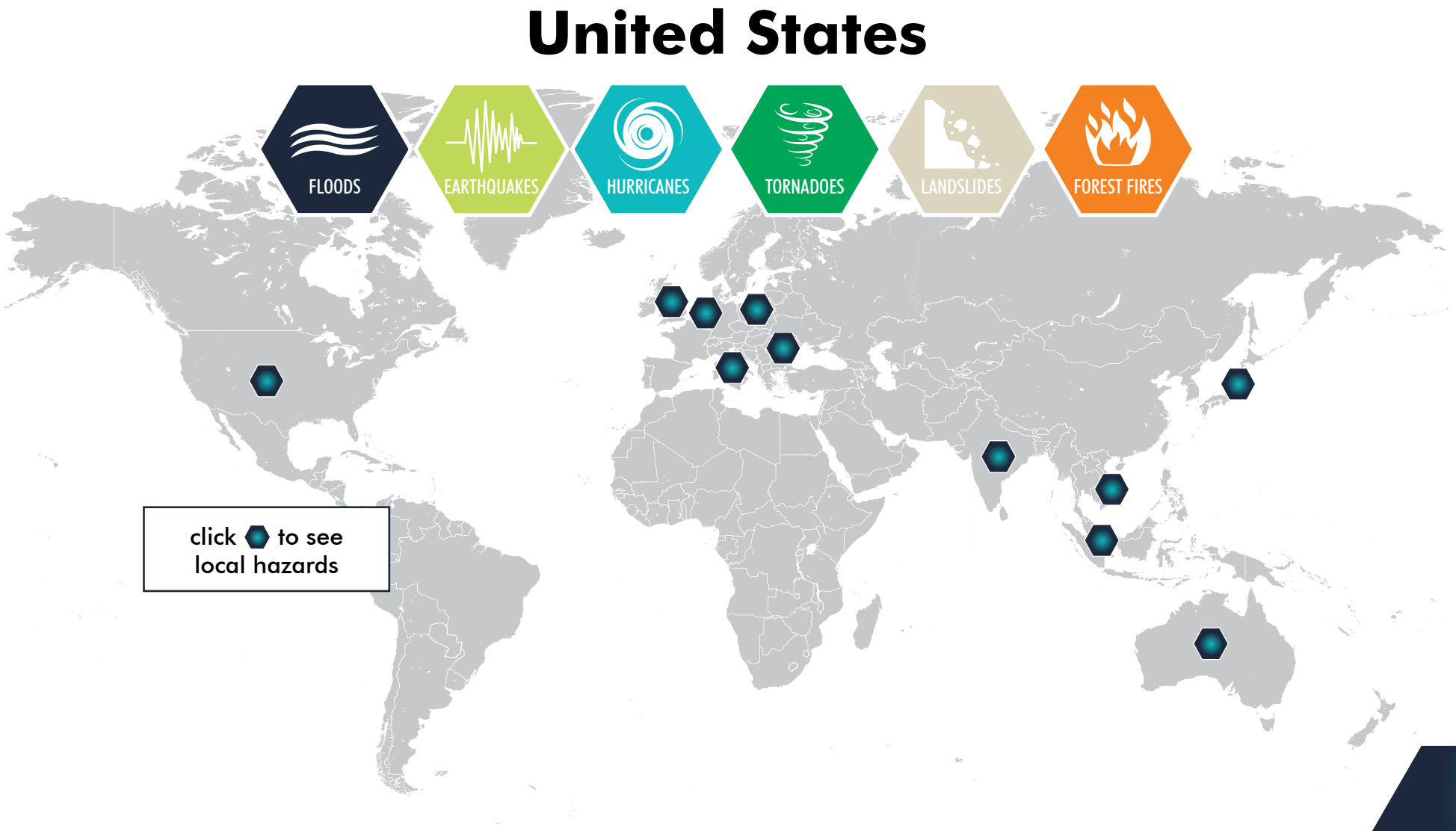
Figure 1: What is resilience?

Source: CBRE Research, 2019.

Long-term risk can be viewed in a variety of ways. It includes not only infrequent, high-impact events, but also risks that may be relatively low-impact now but are likely to increase in severity in the future, such as the effects of sea-level rise. Hazards also vary in terms of frequency and impact depending on location. For example, only 2% of the earthquakes in Japan every year are even perceptible by people.[5]

3 Grosvenor (2014) "Resilient Cities Research Report," http://www.grosvenor.com/news-views-research/research/2014/resilient-cities-research-report/
4 Grosvenor (2014) "Resilient Cities Research Report," http://www.grosvenor.com/news-views-research/research/2014/resilient-cities-research-report/
5 https://www.reuters.com/article/us-quake-japan-factbox/factbox-japans-many-earthquakes-idUST32929520070717

Figure 2: Potential damaging environmental events by country of property professional interviews



Note: Many risks are in local or regional markets only and not nationally. Does not include emerging risks.
Source: CBRE Research, 2019; CIA World Factbook, 2019; World Bank, 2019.

CASE STUDIES

Resilient Building Strategy 1:
Metropolitan Transportation Authority (MTA) Headquarters, Lower Manhattan, U.S.

In 2012, Superstorm Sandy caused flooding in many parts of New York and resulted in the closure of many buildings, including the MTA headquarters. Following this event, the MTA took steps to make its building more resilient. Essential equipment was moved to higher elevations to avoid inundation. Movable barriers were installed to keep floodwaters out, and pumps were installed in basement areas. In addition, the MTA improved the energy efficiency of the building by introducing more efficient lighting systems and occupancy sensors to turn lights off when spaces are unused. As a result, the building is 10% more energy-efficient and is fitted to withstand a one-in-500-year flood event.

Resilient Building Strategy 2:
Class A office park, New Delhi, India

New Delhi faces a variety of environmental issues. Rapid expansion of the city puts pressure on resources, particularly water and electricity, and exacerbates rapid water runoff after heavy rainfalls. To ensure the building's resilience, property managers installed standby irrigation pumps to improve drainage, connected electricity supply between buildings on the campus to even out highs and lows in the load, and added an air balancing system to existing air conditioning to ensure that comfortable temperatures are maintained throughout the buildings, especially during hotter periods in summer.

Resilience is not the same as sustainability

Sustainability means building-level measures to mitigate negative impacts on the environment. Sustainability measures can sometimes improve a building's resilience by reducing its consumption of resources, such as water or electricity supplies. Resilience, however, means the ability to survive an unexpected crisis and/or prolonged environmental stress such as sea-level rise, drought and rising temperatures.

WHY HAVE A RESILIENCE STRATEGY?

1. Risks are increasing

Natural hazards pose a big risk to property. In 2018 alone, hurricanes Michael and Florence wreaked significant property damage in the U.S. and typhoons Jebi, Mangkhut and Trami impacted properties throughout Asia. The World Economic Forum's "Global Risk Report" ranks extreme weather events, climate change and natural disasters as the top-three global risks in 2019.[6]

These risks affect properties through changing availability of water—damaging drainage and sewage infrastructure—and increased strain on building temperature regulation. There are also negative knock-on effects on public health and utilities costs, maintenance expenses, operating costs and, increasingly, property values. Properties in low-lying coastal areas are already selling at a 7% discount to those with less exposure to sea-level rise.[7] Recent research from BlackRock suggests that securities backed by commercial real estate mortgages will see average loss rates increase by 0.6% due to cash flow shortages after severe storms and floods.[8]

"Like last year, the losses from the 2018 series of events highlight the increasing vulnerability of the ever-growing concentration of humans and property values on coastlines and in the urban-wildlife interface."

Swiss Re, December 18, 2018.

As natural hazards increasingly hurt the bottom line for property owners and tenants, there is evidence that these risks are increasing:

- **Sea-level rise:** The National Oceanic and Atmospheric Administration (NOAA) estimates that since 1992 sea levels have risen 0.12 inches every year. As this trend continues, low-lying coastal properties will be at risk.

- **Flooding:** More development is occurring in flood-prone areas every year due to growing urban populations and the popularity of living close to the water. An estimated 10,000 new residential buildings each year are built in floodplains in the U.K., according to The Financial Times. In Mumbai, India, unabated construction on floodplains combined with heavier monsoon rains are increasing flood risk. Urbanization is exacerbating the issue by increasing rainfall runoff from more tarmac and concrete surfaces.[9]

- **Drought:** In some countries, property is at risk from lack of water. Following an extended period of drought in 2018, the city of Cape Town, South Africa came within weeks of its reservoir running completely dry. Crisis was averted through a combination of stringent water controls and campaigns to change citizens' water-use habits.[10] An estimated one in four major cities are "water-stressed,"[11] with Tokyo holding the title as the world's most water-stressed city.[12] With urbanization concentrating the demand for water, adequate water supply will become an increasingly important issue, focusing attention on reducing use not only by individuals but by the built environment.

Sea-level rise, flooding and drought are all examples of the increasing risk to property from natural hazards and property markets are already starting to price in this changing exposure.

6 http://www3.weforum.org/docs/WEF_Global_Risks_Report_2019.pdf
7 https://www.bloomberg.com/opinion/articles/2018-05-03/flood-risk-makes-coastal-real-estate-look-like-a-junk-bond
8 https://www.blackrock.com/us/individual/insights/blackrock-investment-institute/physical-climate-risks
9 https://pure.strath.ac.uk/ws/portalfiles/portal/69141748/McGrane_HSJ_201690_Impacts_of_urbanisation_on_hydrological_and_water_quality_dynamics.pdf
10 https://www.theguardian.com/world/2018/may/04/back-from-the-brink-how-cape-town-cracked-its-water-crisis
11 "Major cities" are defined as having over 750,000 people. "Water stressed" is defined as a ratio between water use and availability. For more information, see: https://www.sciencedirect.com/science/article/pii/S0959378014000880
12 https://www.sciencedirect.com/science/article/pii/S0959378014000880

2. Damage to property doesn't only cost the insurer

While insurance companies absorb most losses from property damage and business disruption, they do not mitigate all economic exposures. A sustained interruption in business activities can adversely affect investor confidence and company reputation in the long term. These impacts are not covered by insurers and explain why an estimated 40% to 60% of small businesses fail to reopen after a natural disaster.[13]

Some properties will not have enough insurance coverage given changing exposure to risk. 80% of commercial properties damaged by hurricanes Harvey and Irma in the U.S. were outside official flood zones, and therefore had insufficient flood insurance.[14]

The risks to real estate posed by natural disasters have both immediate and long-term pricing implications. Making investment decisions based on historic data without a view on how conditions may change is no longer enough to guarantee long-term asset security.

13 https://www.fmglobal.com/insights-and-impacts/2019/master-the-disaster
14 https://www.blackrock.com/us/individual/literature/whitepaper/bii-physical-climate-risks-april-2019.pdf

"A new U.N. report finds a dramatic increase in the amount of economic loss incurred from natural disasters during the past 20 years."

Voice of America, October 10, 2018.

GLOBAL INVESTORS ARE CHANGING THEIR APPROACH

CBRE Research interviewed six investors representing globally-active firms with more than $300 billion in assets under management and who are beginning to change processes to future-proof their portfolios.

Pre-acquisition due diligence

Investors are most attuned to resilience at the due-diligence stage. The focus of due diligence is on exposure to significant events that may reduce the value of the investment. As a rule, the process is carried out by third-party experts.

In some cases, local government enforces a certain minimum level of due diligence. For example, before development of a new building in Hong Kong can occur, the developer must conduct detailed risk assessments that can take up to a year to complete.

Due diligence also extends to the city itself. Several investors identify cities for investment based on commissioned research outlining city-level environmental vulnerability and ability to adapt. Cities that are both exposed to environmental hazard and have a poor ability to mitigate damage from that hazard are avoided.

Investors also view risk across different time frames. For long-term investors with a 10-year holding period or more, risks that could occur in a decade or longer are significant factors in the due-diligence process. For short-term investors, only risks that could happen within five years are worth considering.

Mitigating insurance claims

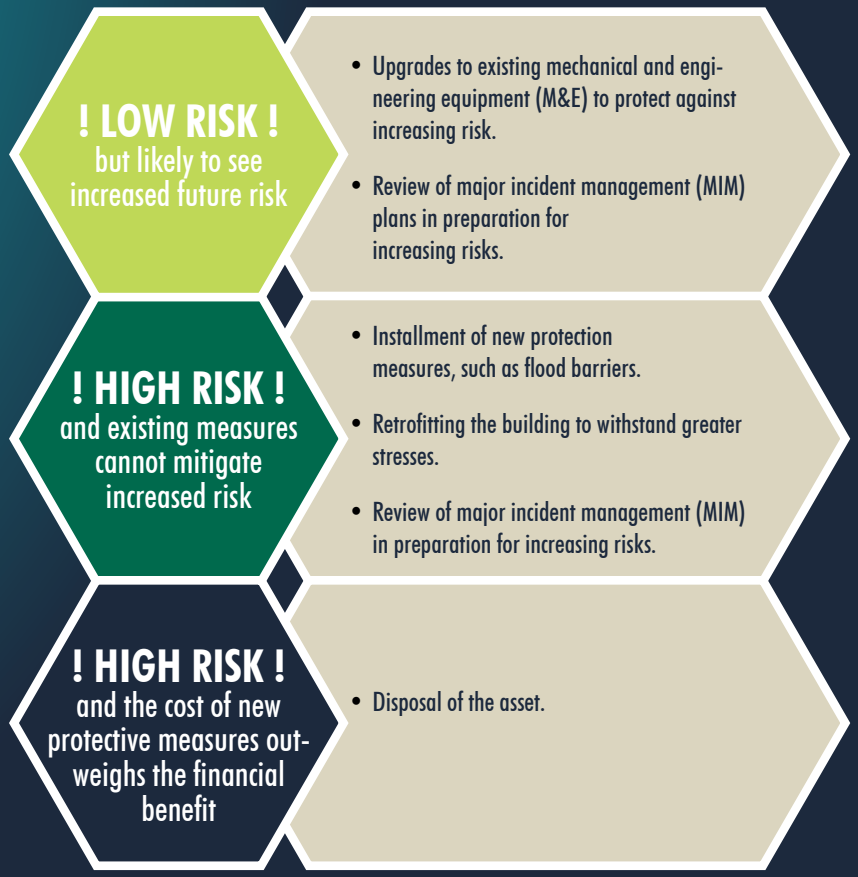
Investors are also working with insurers to understand asset-level risk. This may involve extensive modelling of various catastrophe scenarios. The aim is to not only gain the complete picture on potential risks to the building, but also reduce insurance premiums.

Review at portfolio level

Measuring resilience at the portfolio level is not yet established practice. All the firms interviewed had studies underway to better understand how exposed their portfolios are to environmental hazards, but none of them had completed the process.

Generally, investors are determining exposure to hazard on a building-by-building level across their portfolios to identify those that likely need some action taken depending on the severity of the potential risk.

Figure 3: Determining exposure at building level



Source: CBRE Research, 2019.

Reporting and disclosure

Real estate investors who demonstrate a market-leading approach are adopting new reporting standards on resilience.

GRESB is an investment industry-leading environmental, social and governance (ESG) benchmarking platform. By participating in GRESB, institutional investors can understand how well their assets and portfolios perform according to certain sustainability metrics. GRESB recently introduced a resilience module that is motivating some investors to think about how they address issues of resiliency and how they manage their exposure to environmental shocks.

Some investors feel the module is too process-focused and can become a "tick-box" exercise. A fund can perform well in the GRESB resilience module by providing good examples of process in managing resilience, despite a high level of exposure to hazard.

Investors are also utilizing the Task Force on Climate-related Financial Disclosure (TCFD). In some cases, using the TCFD's guidelines on climate-related disclosure is not voluntary. The UN now requires its Principles for Responsible Investment (PRI) signatories, consisting of 2,250 asset owners, investment managers and service providers, to report on how they have evaluated climate change risks in their portfolios.[15] The aim is to better price in climate change risk in financial markets.

15 https://www.ipe.com/news/esg/pri-signatories-must-report-climate-change-risks-from-2020/www.ipe.com/news/esg/pri-signatories-must-report-climate-change-risks-from-2020/10029579.fullarticle

A BIGGER ROLE FOR PROPERTY MANAGERS

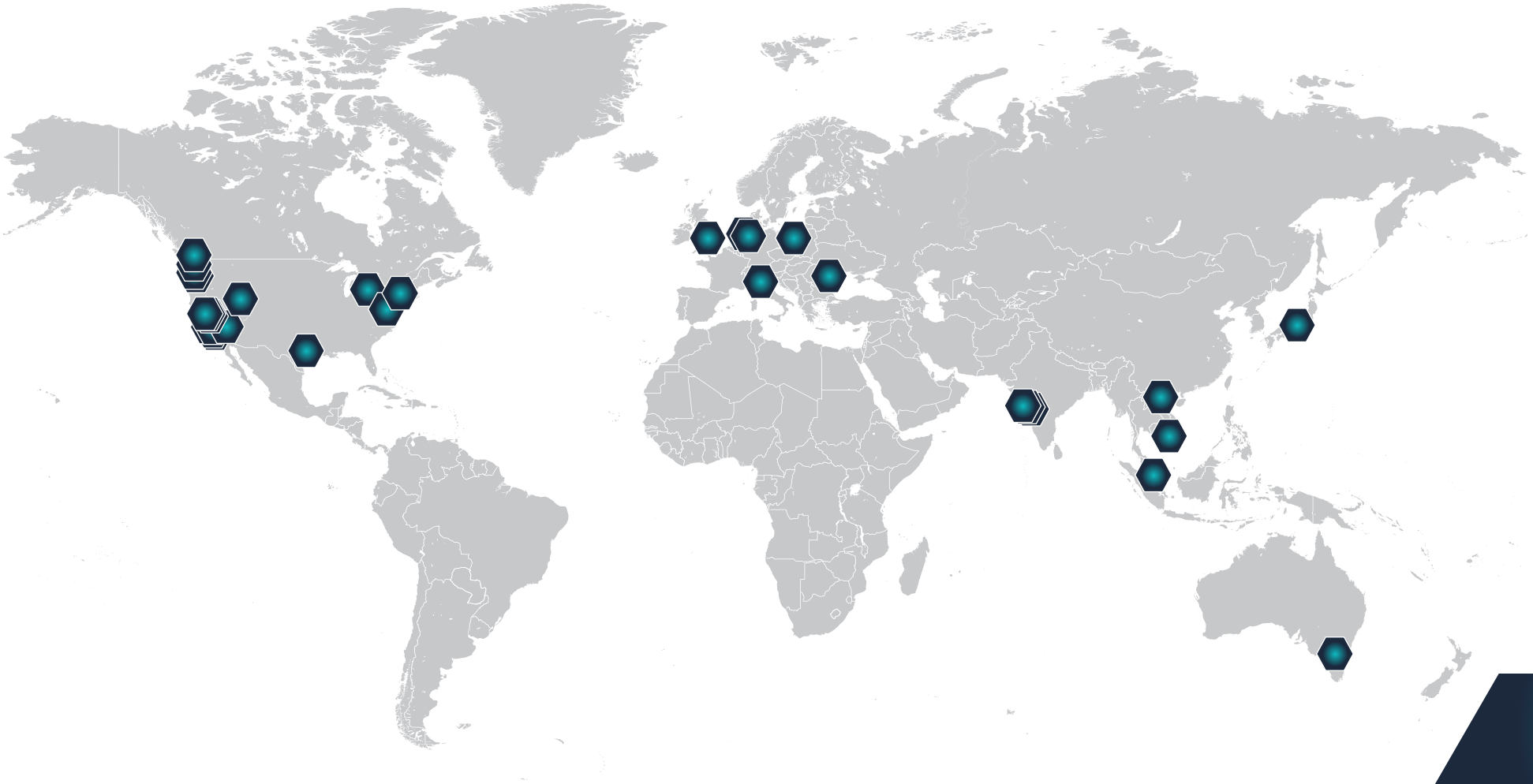
Property managers can play a key role in enhancing building-level resilience since they are at the interface of four significant interest groups: building owners, tenants, contractors and local authorities. The outcomes of property managers' daily interactions with these groups will ultimately have a significant bearing on the building's overall resilience and long-term performance for the building owner.

Figure 4: The role of property managers

Source: CBRE Research, 2019.

The following section outlines the findings of interviews with 38 property professionals globally, divided into current practice and future practice that could improve building resilience.

Figure 5: Locations of property professionals interviewed



Note: Survey participants included 20 property professionals in the U.S., 11 in APAC and seven in EMEA.
Source: CBRE Research, 2019.

Figure 6: Suggested property management practice before a damaging environmental event

16 http://www.world-nuclear.org/information-library/safety-and-security/safety-of-plants/fukushima-accident.aspx

Source: CBRE Research, 2019.

Figure 7: Suggested property management practice during a damaging environmental event

DURING AN EVENT

- Take measures to reduce the damage (providing it is safe to stay on site). During and for a week after one extreme rainfall event, property managers conducted floor-by-floor sweeps of the building several times a day to identify and reduce any water incursion.

- Liaise with emergency support teams to deal with issues as they arise. Some key assets will have an emergency support team on 24-hour call.

- Contact local authorities to make sure roadways to the building are clear for emergency support teams to arrive.

- Ensure that communication between property managers and emergency teams can take place even if mobile networks fail. During an earthquake or hurricane, telecommunications cabling can be damaged. Property managers in Houston therefore use walkie-talkies to communicate during an emergency.

Source: CBRE Research, 2019.

Figure 8: Suggested property management practice after a damaging environmental event

AFTER AN EVENT

- Assess whether a building is safe to re-enter.
- Partner with the building owner/asset manager to activate disaster recovery plans (DRPs).
- Assess damage. In Japan, building investigation teams are appointed to inspect the building for damage following an earthquake. Building information modelling can help this process[17] by showing how the building's structure and services work, and therefore what needs repairing and where.
- Assess whether current protection is sufficient to deal with future events.

17 https://www.designingbuildings.co.uk/wiki/Building_information_modelling_BIM

Source: CBRE Research, 2019.

What can property managers do more of to ensure building resilience?

Beyond existing practice, property managers can play a bigger role in enhancing resilience.

Use available data: Data on environmental hazards is becoming increasingly available from national and international sources. For example, Seattle has a GIS-based hazard mapping tool to raise awareness of any major hazard the city faces.[18] The U.K.'s Environment Agency provides free long-term flood risk assessments at postcode level. With greater awareness of the information available, property managers can be more proactive in responding to risks.

Use available tools more extensively: Data availability and the technology to use it is improving. Tools such as Asset View and Pulse facilitate securely storing documentation relating to building performance for easy reference. Asset IQ can be installed in a building to provide real-time information on energy consumption and recommend ways to make efficiencies.

Build relationships with local elected leadership: Engagement with local stakeholder groups is especially important to make buildings more resilient. A good relationship can result in property managers having a stronger voice in local decision-making and provision of services. To avoid disruption to power or water supply from public works, good communication with local authorities can mean managers receive early warning of any potential disruption to building services from public works projects.

Participate in national associations such as BOMA (U.S. Building Owners and Managers Association) to share knowledge and best practices.

Barriers to implementation

The most common obstacle to enhanced building resiliency is unsupportive building owners. Often, this is because their holding period is relatively short (five years or less). For these owners, preparing for a potential hazard outside the holding period makes little economic sense. To overcome these obstacles, property managers must persuade owners that lack of resilience is a threat to the property's market value.

The economic cycle can cause problems, even during an upcycle. Currently in the U.S., low levels of unemployment make hiring contractors and skilled tradespeople more of a challenge. Conversely, an economic downturn can reduce budget for building improvements. To overcome these obstacles, property managers must emphasize to owners that perceived long-term threats can happen at any time.

The final common cause of problems for property managers is the regulatory environment. Regulation can be over-protective, preventing property managers from implementing change. This may include enforcing complicated due diligence and risk assessment before minor projects can be carried out or dealing with a lengthy bureaucratic process to secure work permits.

18 http://seattlecitygis.maps.arcgis.com/apps/MapSeries/index.html?appid=0489a95dad4e42148dbef571076f9b5b

Sector-specific findings

Retail

Retail property can be particularly susceptible to damaging environmental events. Often occupying ground-level spaces, retail tends to be more exposed to flooding or sea-level rise. In addition, because retail depends on consumer traffic, if the shopping center or high street has been affected by flooding, for example, consumers can shop elsewhere or online. This is the experience of a group of shopping centers in northern Italy, where existing water drainage systems are struggling to keep the growing number of floods each year from disrupting trade.

Industrial

Fire risk is a substantial hazard for this type of property for three reasons:

1. Hot temperatures are required for some manufacturing processes.
2. The concentration of equipment within warehouses leads to fire risk from faulty electrical systems or poor servicing.
3. Industrial processes can cause a build-up of combustible dust that accelerates the spread of a fire.

Protecting industrial buildings from fire risk is consequently a key focus for industrial property managers.

Another issue for industrial buildings is flooding. While the obvious solution for property managers is to take measures to keep floodwaters out, in particularly flood-prone areas the best solution can be to merely ensure that flooding will not damage key equipment. For example, mechanical and engineering equipment can be raised above ground level.

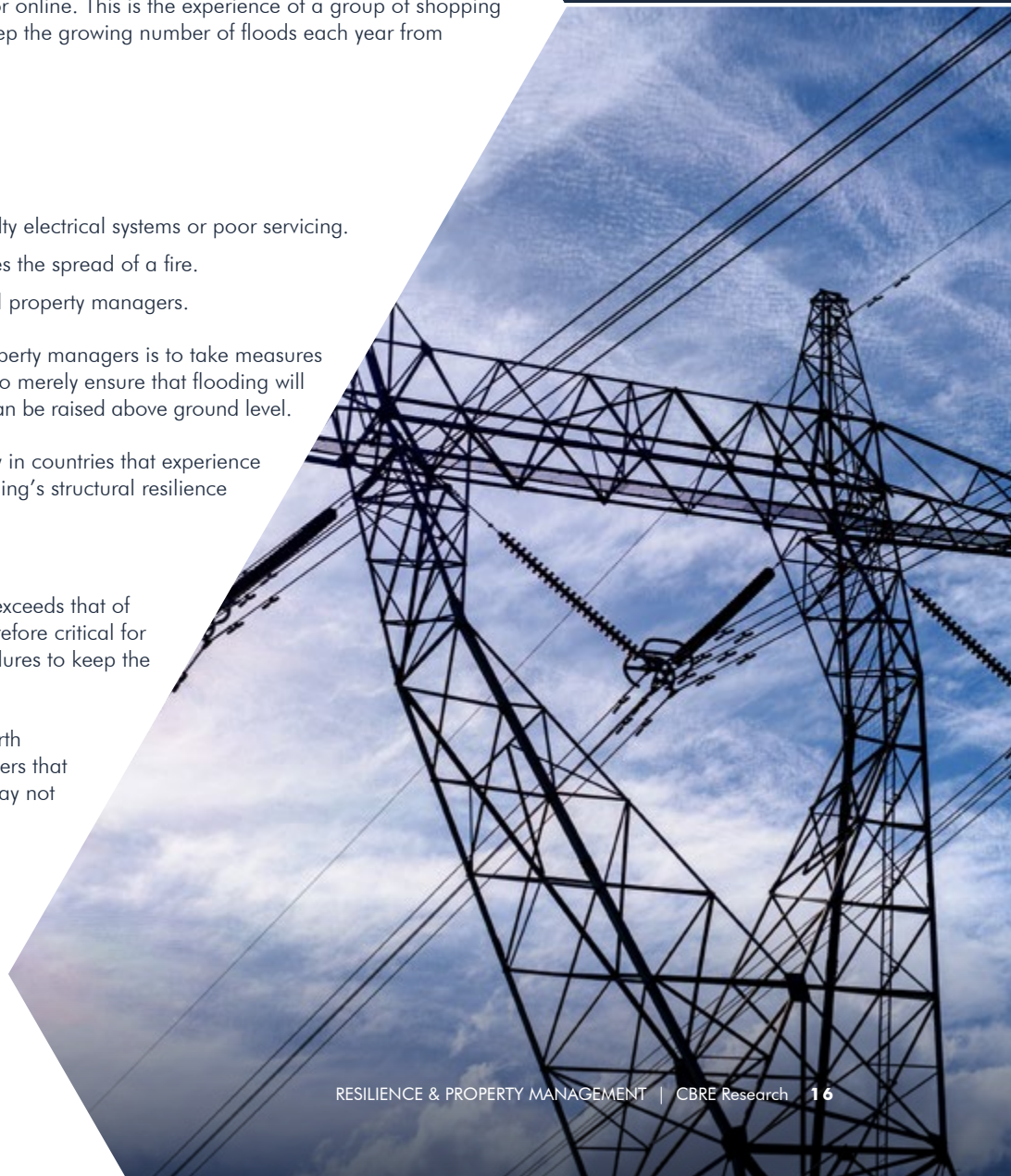
The relatively large roof areas of industrial buildings also pose concern, particularly in countries that experience high winds such as Vietnam, China, the Philippines, the U.S. and Mexico. The building's structural resilience will largely depend on the roof design.

Data centers

Data centers are both power-hungry (globally, the energy demand of data centres exceeds that of some countries, including Iran)[19] and are required to operate continuously. It is therefore critical for property managers to be aware of any potential environmental threats or power failures to keep the center running.

The energy needs of data centers also present an opportunity for innovation. In North Carolina, large tech companies have constructed solar farms adjacent to data centers that produce energy relatively cheaply and provide some backup power. Solar power may not be a fully reliable backup at this stage, but it helps to reduce the stress on the grid.

Data centers also require extensive cooling so servers do not overheat and cause system failures. The effectiveness of air conditioning in terms of temperature and humidity regulation is therefore another critical concern for the property manager.



19 https://www.nature.com/articles/d41586-018-06610-y

CONCLUSION

The environmental risks to property are changing. The evidence strongly, if not incontrovertibly, suggests that sea levels are rising, heat waves are intensifying and extreme weather events are increasingly common. To deal with this, leading investors are reviewing exposure of their assets to environmental risk more thoroughly. Many are performing this review at portfolio level. The goal is a good assessment of which assets are most and least at risk from environmental threats.

With investors taking increasing note of environmental risk, it is important for property managers to be proactive in enhancing building-level resilience. Interviews with property managers globally show that many of them are leading the charge by ensuring that tenants are well-prepared for likely risks.

Nevertheless, there are some best practices that could be more widely adopted. A clear example is using available information on likely exposure levels to better inform a response. Just because the last one-in-100-year flood was 10 years ago does not mean it will be another 90 years before the next. Although some property managers engage regularly with local elected leadership and stakeholder groups, this could be more widely practiced.

While there are many ways property managers can improve building resilience, progress can be impeded for several reasons—chiefly the outlook of the building owner. A proactive approach to property management will only succeed if the building owner has a long-term view.

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