

Executive Summary

The Department of Energy (DOE) launched the Finance and Resilience Initiative in 2019. The main outcome of this work is the [Resilience Roadmap](#)—a set of resources and case studies designed to help commercial building owners measure, manage, and mitigate risks associated with climate change and resilience. This fact sheet introduces the Resilience Roadmap and reviews key concepts, with a focus on the business case for resilience. *The Challenges of Resilience* defines resilience and discusses recent trends in climate and weather risks. *Understanding and Measuring Risk* outlines key aspects of resilience risk and describes innovative tools and methodologies for measuring it. *Talking to Your CFO* discusses how to quantify and articulate the financial business case for resilience improvements in a way that stakeholders can easily understand. Finally, *Next Steps* describes where to go from here to begin building a resilience roadmap for your organization—including four other resources to help you get started.

This fact sheet was developed as part of a Better Buildings Financial Ally roundtable including partners, allies, and stakeholders.

Overview

Resilience is emerging as a critical issue for commercial building owners, particularly in light of recent disruptions from climate and weather events. Owners and operators of commercial buildings are placing a greater emphasis on improving the resilience of their assets and mitigating risk from natural disaster shocks and stressors. At the same time, investors and lenders are thinking more seriously about how to manage climate- and resilience-related risk across their lending and investment portfolios. Initiatives such as the [Task Force on Climate-Related Financial Disclosures \(TCFD\)](#) are beginning to make the financial implications of resilience risk more visible, but there is still a need for thought leadership on how to best assess, track, report, and mitigate resilience risks for commercial buildings and the financial products that support them.

Resilience and financial performance are closely linked. Investors, mortgage lenders, and insurers are increasingly realizing that resilience risk can have a meaningful impact on financial returns, and that managing this risk is a critical part of their fiduciary duty. Building owners are beginning to understand that improving resilience is not just a best practice but a growing requirement to preserve the value of their properties, protect occupants, and attract investment—particularly in risk-prone regions like coastal areas vulnerable to sea level rise or those at risk from wildfire. The project finance industry is rising to the challenge, offering new financial products designed to enable the rapid adoption of resilience improvements in buildings.

In response to these trends, DOE's Better Buildings Initiative launched the Finance and Resilience Initiative in 2019. This effort brings together Better Buildings financial allies, partners, and other stakeholders to foster clarity, collaboration, and guidance on emerging resilience issues and how they affect energy and financial performance in buildings. The main outcome of this work is the Resilience Roadmap—a set of resources and case studies designed to help commercial building owners develop a plan to measure, manage, and mitigate resilience risk.

This fact sheet and the Resilience Roadmap are intended for owners, operators, occupants, and investors in commercial buildings who want to understand and address emerging issues in resilience; however, the tools and insights discussed are applicable well beyond the commercial building sector.

The Challenges of Resilience

From 2017 to 2019, the U.S. experienced a historic number of weather and climate disasters. These events included droughts, floods, freezes, severe storms, tropical cyclones, and wildfires. According to the National Oceanic and Atmospheric Administration (NOAA), the cumulative cost of these disasters [exceeded \\$450 billion](#), a significant increase even from earlier in the decade. As described in the [National Climate Assessment](#), the frequency and severity of these disasters is expected to continue to increase.

Impacts from weather, climate, and other disasters can often be mitigated by improving building resilience. Resilience is defined as “the capacity of a community, business, or natural environment to prevent, withstand, respond to, and recover from a disruption.” While resilience can be considered to include broader issues such as terrorism and public health, the Resilience Roadmap focuses on climate resilience at the building level from threats such as hurricanes, floods, droughts, and fires, as well as other natural disasters such as earthquakes and tsunamis.

In the case of buildings, resilience projects typically take the form of retrofits that improve the envelope, structure, or systems of a building. Because energy is one of the more vulnerable aspects of building operation, these improvements often aim to make building energy systems more robust, independent, and efficient. See the [Financing and Implementing Resilience Improvements Fact Sheet](#) for a more detailed discussion of potential resilience improvements.

Resilience is a critical aspect of risk management that building owners, operators, and occupants should consider—particularly those located in areas prone to natural disasters. However, resilience improvements can be difficult to fund and implement. They often come with a significant upfront capital cost. While some projects—such as energy efficiency retrofits or on-site energy generation—generate immediate financial returns in the form of energy savings or improved building performance that can offset upfront cost, many do not. Therefore, the benefits of these projects may not be reflected in current cashflows, even if they do provide long-term value by preventing disaster losses and increasing occupant security. Some building owners—especially those with shorter hold periods—may not consider climate and resilience impacts to be a short-term risk worth the cost of investment, though that sentiment [is beginning to change](#). In addition, benefits of resilience may accrue to a different party than the one best able to execute on the improvements, so a more holistic look at the benefit-cost relationship is required.

Despite these challenges, there is growing evidence that owners who fail to take action to improve the resilience of their facilities are susceptible to a range of financial risks that could far surpass the costs associated with implementing resilience measures upfront. The sections below provide more detail on the financial value of resilience and how to begin developing a resilience management plan.

Understanding and Measuring Risk

An organization should first have a foundational understanding of the resilience risks facing its portfolio of buildings in order to manage and mitigate that risk. Portfolio risk assessments can help determine the types of risks that pose the greatest threat; specific regions, asset types, and individual assets that are most threatened; and overall portfolio risk exposure.

Resilience risks are often divided into two types: physical risks and transition risks. Physical risks directly impact a building’s structure and systems, such as damage from a catastrophic event. Transition risks include economic, regulatory, and other systemic risks associated with climate change and the shift to a low-carbon and climate resilient future. Transition risks are often less direct or obvious, and their financial implications may be difficult to measure.

Figure 1 below—developed by the Urban Land Institute—breaks down the types of physical and transition risks along with the potential financial impacts associated with each:

Figure 1: Physical and Transition Risks from Climate Change

	Category	Potential impact
Physical risks	Catastrophic events Extreme weather such as hurricanes and wildfires.	<ul style="list-style-type: none"> • Costs to repair or replace damaged or destroyed assets; value impairment • Property downtime and business disruption • Potential for increased insurance costs or reduced/no insurance availability
	Changes in weather patterns Gradual changes in temperature and precipitation—such as higher temperatures, rising sea levels, increasing frequency of heavy rain and wind, and decreased rainfall—which are likely to exaggerate the impact of catastrophic events.	<ul style="list-style-type: none"> • Increased wear and tear on or damage to buildings, leading to increasing maintenance costs • Increased operating costs due to need for more, or alternative resources (energy and/or water) to operate a building • Cost of investment in adaptation measures, such as elevating buildings or incorporating additional cooling methods • Potential for increased damages from catastrophic events • Potential for increased insurance costs or reduced/no insurance availability
Transition risks	Market The possibility that markets vulnerable to climate change will become less desirable over time. Rising capital costs to pay for building and maintaining infrastructure to manage climate risks.	<ul style="list-style-type: none"> • Reduced economic activity in vulnerable markets • Reduced occupier demand for properties • Reduced asset value • Potential for increased real estate taxes
	Policy and regulation Regulations to address climate change—e.g., climate risk disclosure, tougher building standards, carbon pricing, emissions caps, changes to subsidies—as well as changing policies for providing funding for infrastructure or rebuilding after major events.	<ul style="list-style-type: none"> • Increased cost of doing business due to new disclosure requirements and compliance measures • Increased taxes—both those resulting from public policies such as carbon taxes and those for funding adaptation infrastructure • Loss of subsidies or other funding opportunities • Additional capital investment to comply with stricter regulation
	Resource availability Changes in the availability of key resources such as energy and water, including water scarcity.	<ul style="list-style-type: none"> • Increased costs and reduced net operating income due to higher prices for water and energy • Additional capital expenditures to adapt buildings to operate with reduced/alternative resources
	Reputation and market position Growing stakeholder preference to work with companies incorporating climate risk into investment decisions, and consumer preference for real estate products incorporating climate mitigation.	<ul style="list-style-type: none"> • Risk to company brand and reputation if no action taken • Lower liquidity and/or reduced attractiveness of assets that have not incorporated climate mitigation

Source: https://europe.uli.org/wp-content/uploads/sites/127/2019/02/ULI_Heitman_Climate_Risk_Report_February_2019.pdf

Measuring resilience risk accurately requires an organization to understand which risks are material. Materiality is an accounting concept that is used to determine what is important enough to be included in or omitted from a financial statement. In the context of resilience, materiality refers to what aspects of an asset or portfolio are most susceptible to resilience risks and what the financial impact of business interruptions or losses could be. Initiatives such as [TCFD](#) are beginning to help organizations understand which issues are material on a sector-by-sector basis, and the [Materiality Map](#) from the Sustainability Accounting Standards Board (SASB) is an online tool that identifies Environmental, Social, and Governance (ESG) issues that are likely to financially affect companies by industry.

Owners, operators, and investors in commercial building portfolios may want to consider several key factors when assessing resilience risk in their portfolios:

- **Threat vs. vulnerability:** Threat refers to the various physical and transitional risks that could impact an asset, whereas vulnerability indicates how exposed an asset is and what the financial impact would be if a threat were to occur. When measuring risk, the first step is to understand likely threats, but these should be weighted and contextualized based on what a given asset or portfolio is actually vulnerable to. Assets with a high threat and vulnerability level will likely pose the biggest material risk, such as a mission-critical medical facility with dated structural components in an area prone to hurricanes or other major storms. Other assets might have lower vulnerability to the same threat, such as a hardened data center with built-in redundancy. While building owners can do little to control threat at the asset level, resilience strategies can reduce vulnerability and overall risk.
- **Portfolio segmentation:** When assessing risk, it is important to determine which assets in which locations are exposed to which risks. A portfolio segmentation exercise can help identify the threats and vulnerabilities that are most material and have the greatest financial implications. Common approaches include segmentation by risk type, property type, region, fund/portfolio, management company, and building age.
- **Appropriate risk thresholds:** Every asset and portfolio will carry some level of risk. Determining risk thresholds is key to understanding what level of risk is acceptable and which actions need to occur (if any) to reduce risk to an appropriate level. Thresholds can be defined in terms of financial value at risk, vulnerability of mission-critical operations, or other metrics.
- **Perceived vs. actual financial risk:** It is important to note that perceived risk is not always the same as actual risk. Stakeholders may undervalue risk (e.g. a property buyer not factoring in recent changes in hurricane likelihood), overvalue risk (e.g. insurance premiums increasing in an area that has recently experienced a catastrophe despite actual long-term risk remaining the same), or ignore risk altogether (e.g. a tenant that has not incorporated resilience risk when deciding where to site its operations). While actual risk is of greatest concern to commercial building owners and operators, markets can be influenced by perceived risk in the form of changes to liquidity, property valuation, and ability to attract and retain tenants.
- **Establishing KPIs and making a plan:** Key performance indicators (KPIs), such as risk scores by threat type or percentage of assets under management (AUM) exposed to a specific risk type or to an individual event (e.g. a single hurricane), can help organizations frame and compare risk in order to take action. The organization can then decide whether to mitigate the risk through resilience improvements, transfer the risk (e.g. sell the property, purchase insurance), or accept the risk. For additional guidance in implementing a resilience plan, see the [Creating a Resilience Risk Management Plan Fact Sheet](#).

Existing Tools and Methodologies

There are a variety of free tools and paid services available to help building owners assess resilience risks at both the asset and portfolio level. These tools and services vary in the specific risks they measure and the geographies they cover. Resilience risk service providers offer a variety of insights and solutions for building owners including:

- Climate data acquisition and analysis
- Risk modeling and scoring
- Economic impact assessments
- Consulting and advisory services

The industry is rapidly growing and evolving as new organizations enter the space and incumbents develop new climate and resilience offerings.

Several free websites offer resilience risk support through interactive maps, datasets, and resources:

- [U.S. Climate Resilience Toolkit](#) is a website designed to help people find and use tools, information, and subject matter expertise to build climate resilience. The Toolkit offers information from across the U.S. federal government in one easily accessible location.
- [Digital Coast](#) provides coastal data along with the tools, training, and information needed to make this data useful. Content comes from sources vetted by NOAA.

In addition to measuring risks across existing portfolios, many organizations are implementing resilience screening assessments in the due diligence process for property acquisitions, new construction, and major renovation. While risks such as flooding have long been included in due diligence, organizations are incorporating more factors specific to resilience risk into their assessments. One example is [LaSalle Investment Management's Cat Score tool](#), which assesses a potential acquisition's risk from several catastrophe categories and applies a numeric score to rank overall risk.

Industry Case Study

Principal Real Estate Investors engaged in a pilot to assess climate-related risks for assets in one of its funds to determine material risks and applicability across the fund and individual assets. Data produced from the pilot enabled Principal to provide property teams with risk information, better inform organizational policies and practices around resilience, and share resilience performance with investors. [Click here](#) to view the case study.

Talking to Your CFO

A critical first step in moving forward with a resilience management plan is to communicate the business case for resilience internally to team members responsible for making financial or budget decisions. While analysis of risks can provide insights into overall asset and portfolio vulnerability, the ability to measure and articulate the real-world financial impact of those risks ultimately enables action.

Translating categorical risk into quantifiable financial risk is key to getting stakeholder buy-in for improving resilience across a portfolio. Organizations can start by assessing the portion of AUM that is exposed to different types of resilience risk and analyzing the magnitude of threat to metrics like property value, net operating income, and other revenue streams. Operational risks such as increased insurance premiums, tenant occupancy fluctuations, and other potential risks should also be factored into financial assessments.

Organizations looking for more in-depth analysis can perform [value-at-risk \(VaR\) assessments](#) to take into account asset vulnerability by risk factor. Value-at-risk calculations can provide a more comprehensive insight into overall risk and specific risk factors to determine which assets have the most pressing resilience needs. Companies such as Carbon Delta are beginning to offer services to help organizations

determine VaR through advanced modeling.

Estimating resilience risk and potential financial impact is ultimately a probabilistic exercise. Organizations should plan for events that may not occur at all or that may be far worse than anticipated. For example, assets may be exposed to high-impact, low-probability events like strong hurricanes or severe floods that are less likely to occur but may wipe out much of an asset's value if they do. Conversely, assets may also be exposed to low-impact, high-probability events that will happen more frequently with less drastic consequences. There are also risks such as sea level rise that, unlike episodic risks, occur slowly over years or decades and typically cannot be transferred through traditional means such as insurance (for a more detailed discussion of insurance implications, see the [Managing Insurance Cost and Business Risk Fact Sheet](#)). It is unclear what physical and transition risks may look like 10 or 20 years in the future, and this uncertainty can be difficult to plan for. In addition, the risk of inaction on resilience is not only triggered by an event such as a storm or flood—investors, tenants, and other stakeholders are increasingly evaluating building owners' resilience preparedness and directing their business accordingly.

Many CFOs and other stakeholders who deal with regular cash flows are unused to this kind of probabilistic thinking, making it important to parse out the types of risk and discuss them separately. To assist in that conversation, Figure 2 maps the potential impacts of resilience risks onto a familiar template: a commercial building owner's financial statements. Assets, liabilities, income, and expenses may all be affected by climate change and other resilience risks. These potential impacts range from a reduction in liquidity to total asset loss, and from a reduction in rental income to an increase in insurance premiums. This figure illustrates how hypothetical and probabilistic risks can translate to real financial impacts.

Many of these climate and resilience risks can also be viewed as opportunities to implement improvements within the portfolio to increase asset value and revenue streams. According to an [analysis from FM Global](#), for every \$1 a company spends to protect structures from hurricane, wind, and flood damage, estimated loss exposures decrease by an average \$105 due to reduction in risk of property loss and business disruption. Assets that are more resilient are likely to have increased marketability to investors and potential tenants, leading to quick lease up and tenant retention. In addition to the financial benefits from avoided physical and transitional risk, many resilience improvements have co-benefits such as increased operational efficiency and addressed maintenance backlogs. As building codes continue to become more stringent, resilient assets are likely to improve compliance with current or future codes and regulations.

Figure 2: Impacts of Resilience Risks on Commercial Building Financial Statements



The Investor Perspective

ESG issues have become more important to investors over the past decade, and many investors are actively incorporating ESG into investment strategies. The [view of fiduciary duty is evolving](#) to incorporate ESG factors, and recent legal opinions and regulatory guidelines indicate that it is a violation of fiduciary duty to not consider these factors. After the surge of climate-related catastrophes in 2017 and 2018, investors are beginning to incorporate resilience risk into these ESG strategies. Investors may screen potential investments for ESG and resilience during diligence, offer preferred terms for more sustainable and resilient assets, and in some cases withhold investment from firms or assets that are deemed to be too unsustainable or risky. The [United Nations Principles for Responsible Investment \(PRI\)](#)—an international network of ESG-aligned investors with nearly \$90 trillion in AUM—indicated that [72% of participating members](#) are taking actions to address resilience risks and opportunities. Many investors are now asking organizations to publicly disclose resilience risks and opportunities that are material to business operation, often using frameworks such as [TCFD](#), [GRESB](#), [CDP](#), [SASB](#), [Global Reporting Initiative \(GRI\)](#), and others. For more information on disclosing resilience performance, see the [Benchmarking and Disclosing Resilience Performance Fact Sheet](#).

In addition, credit rating agencies such as Moody's and Standard & Poor's are beginning to [incorporate climate-related risks into their ratings](#), meaning that public and private sector debt issuers could have their credit grade reduced (or potentially increased) depending on how they manage resilience risk. The acquisition of climate data and risk firms by ratings agencies—such as Moody's [acquisition](#) of FourTwentySeven—is a strong sign they plan to use this type of risk data in their assessments to an increasing extent in future.

Next Steps

To learn more about best practices for measuring, managing, and mitigating financial resilience risk, consider these next steps:

- Review the additional Resilience Roadmap resources
 - [Managing Insurance Cost and Business Risk](#): This fact sheet discusses the role that the insurance industry plays in mitigating resilience risk and offers best practices for building owners to work effectively with insurers
 - [Financing and Implementing Resilience Projects](#): This fact sheet provides key considerations for implementing resilience improvements across a commercial building portfolio and evaluating financing options that can help overcome upfront costs and other common barriers to resilience
 - [Benchmarking and Disclosing Resilience Performance](#): This fact sheet provides an overview of the value of disclosing climate and resilience performance, how the various reporting approaches compare to one another, and where to begin
 - [Creating a Resilience Risk Management Plan](#): This plan outline provides an overview for how to implement an organizational resilience plan and key strategies or actions to consider putting into practice
- Research peers and competitors and how they are approaching resilience risk management
- Begin developing a resilience risk management plan for your organization
- Consider bringing climate risk expertise into your organization (e.g. staff, consultants, or partnerships)

Additional Resources

- [Better Buildings Efficiency-Resilience Nexus](#)
- [ULI Urban Resilience](#)
- [Principal Real Estate Investors Case Study](#)
- [LaSalle Investment Management's Cat Score](#)
- [SASB Materiality Map](#)
- [FM Global: Master the Disaster](#)
- [Harvard Business Review: The Investor Revolution](#)