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**Partner Energy & ClimateCheck 2022 Whitepaper**

# Strategies for Assessing and Mitigating Potential Climate Risks in Commercial Real Estate


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# Introduction

Global warming and climate change have been in the public consciousness for decades now, but the solutions for how to mitigate the risks from climate change as well as the need to achieve net zero carbon have only gained momentum in recent years.

On a worldwide scale, the UN Climate Change Conference (COP26) took place in Glasgow in November 2021, where nearly 200 countries came together to discuss all aspects of climate change, including finding solutions and determining the next steps for slowing down the effects of global warming. One key agreement that rose from the conference was the need to provide assistance to developing countries to help "avert, minimize and address loss and damage associated with the adverse effects of climate change."[1]

Meanwhile in the US, the White House released an executive order in May 2021 on climate-related financial risks, recognizing the impact of climate risks on the entire U.S. financial system. This was followed up in October with "A Roadmap to Build A Climate-Resilient Economy", which aimed to "measure, disclose, manage and mitigate the systemic risks climate change poses to American families, businesses, and the economy."[2]

It is not possible to talk about climate risks without touching upon sustainability, which is why government agencies, business executives, and investors have also turned their attention to Environmental, Social, and Governance (ESG) policies when discussing the impacts of climate change. For example, ASTM International formed a task group in 2021 that looks specifically at ESG disclosures and how they relate to climate and community. And in March 2022, the Securities Exchange Commission finally released its proposed rules for climate-risk disclosures, which will require publicly traded companies to disclose to investors any risks associated with climate change, as well as report on their greenhouse gas (GHG) emissions.

Within the commercial real estate sector, climate change poses unique short and long-term challenges that will require a strategic multi-pronged approach to resolve. This paper focuses on the key strategies required to properly assess climate risks on commercial properties and provides an overview of risk mitigation, which should give owners, developers, and investors insights into the extent of the impact climate change may have on their assets.

# Climate Change Impacts on CRE

As average global temperatures have risen, there has also been an increase in the number of extreme weather events, such as floods, heat waves, drought, and rising sea levels. In 2020, NOAA's National Centers for Environmental Information released a report that confirmed there were a total of $22 billion-dollar weather and climate disasters in the United States, a historic record. These events ranged from tropical cyclones and severe storms to drought and wildfire.[3] Impressive as this figure sounds, it does not account for all the rest of the weather events that have occurred, some of which are more gradual changes that would still have a significant effect on properties.

Severe weather events such as flooding and wildfires pose obvious physical risks on assets, from damages that require repair to business disruption if a property is out of service. Increased stresses on the property such as high wind or increased precipitation may also require more frequent repairs due to wear and tear on equipment and materials. Aside from these physical risks, climate changes could also bring transition risks, which include lower valuation due to market preferences, increased costs in water and energy, and higher insurance premiums.

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[1] *https://www.un.org/en/climatechange/cop26*
[2] *https://www.whitehouse.gov/briefing-room/statements-releases/2021/10/15/fact-sheet-biden-administration-roadmap-to-build-an-economy-resilient-to-climate-change-impacts/*
[3] *https://www.climate.gov/disasters2020*

Due to all the possible short and long-term risks from climate change, there is increased focus on the importance of climate resilience, or the ability for a property to adapt to and withstand physical risks by retaining the same basic structure, function, and self-regulation. Adopting the right resilience measures ahead of time is crucial to protecting assets from vulnerabilities in the future that could have much higher costs.

But before adopting any measures, it is important to first assess all the potential risks to the property, and the key is using a tiered approach. This includes screening for regional climate risks as well as assessing site-specific characteristics that will pinpoint potential risks at the asset level. This method provides a more comprehensive assessment of the risks and is vital for implementing resilience measures later on.

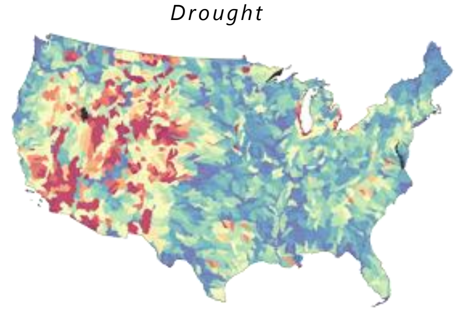
## How to Assess Potential Risks to CRE

### 1. Data Screening for Climate-Related Risks

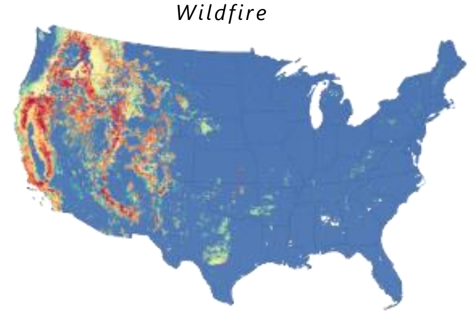
Screening for climate risks helps to identify the current and future vulnerabilities of CRE assets and guide the process of building resilience. Climate-related extreme weather can affect properties in many different ways, from fires to powerful storms and rising sea levels, so calculating potential damage from all hazardous event types is important. Once threats are identified, they can be appropriately addressed through mitigation strategies according to the type and level of risk of a property and which assets are most high-priority.

Climate risk assessment tools such as ClimateCheck® property reports can provide detailed estimates of current and future climate-related extreme weather risks for individual properties and real estate portfolios. This analysis can be performed within a property-specific parcel boundary for climate-change related risk. ClimateCheck climate risk reports present five categories of climate-related extreme weather risks. Each hazard's risk score is presented on a scale of 0 to 100, with 100 representing the highest level of risk relative to the entire conterminous United States. Risk metrics are computed in windows representing 5-year increments and are projected to 40 years in the future to provide a full picture of each peril.

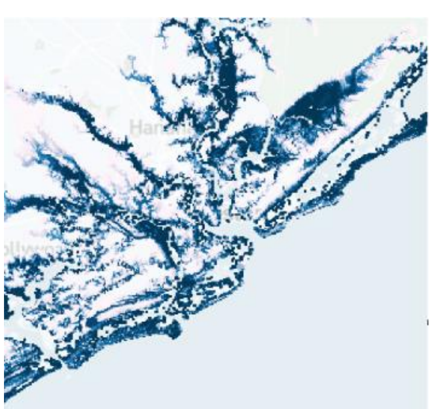
*Drought*



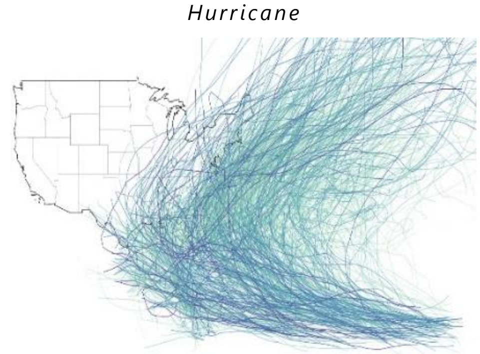
*Wildfire*



*Flood – Sea Level Rise*



*Hurricane*



**Hazard Analysis Methodology**

| Climate Hazard | Form of Analysis | Data Resolution |
|---|---|---|
| **Flood** | Probability and frequency of coastal flooding due to high tide and storm surge, surface/pluvial flooding due to extreme precipitation, and riverine/fluvial flooding. | 10m$^2$ |
| **Fire** | Average annual burn probability, flame length, and fire weather index | 30m$^2$ |
| **Heat** | Average annual extreme high temperature days | 3km$^2$ |
| **Storm** | Frequency and amount of extreme precipitation | 3km$^2$ |
| **Drought** | Water supply stress | Watershed |

ClimateCheck assesses risk for each hazard using the latest globally accepted climate science. Projections are aggregated from 27 models as part of the international Coupled Model Intercomparison Project (CMIP). ClimateCheck includes two different emissions scenarios, known as IPCC Representative Concentration Pathways (RCPs) 4.5 and 8.5 in its analysis, with the more conservative RCP8.5 as the default projection.

This climate assessment process puts risks like heat, drought, and storm patterns in the context of local averages. For example, a 100°F day would affect the communities and infrastructure of Seattle in a different way than Phoenix. In addition, it is useful to compare the level of individual property risk to overall county averages for risk in each of these locations. This percentage can indicate when a property is unusually exposed to risk in comparison to other local land and buildings.

**Example Heat Metrics for Phoenix vs Seattle**

| Phoenix Heat Metrics | Seattle Heat Metrics |
|---|---|
| A day above **110ºF** is considered hot for this location. | A day above **85ºF** is considered hot for this location. |
| Normally, you experience about **8 hot days per year**. Your forecast in 2050 is about **49 hot days per year**. | Normally, you experience about **8 hot days per year.** Your forecast in 2050 is about **28 hot days per year.** |
| Your temperature risk (79) is 16% higher than average for people in Maricopa County (68). | Your temperature risk (18) is 57% lower than average for people in King County (42). |

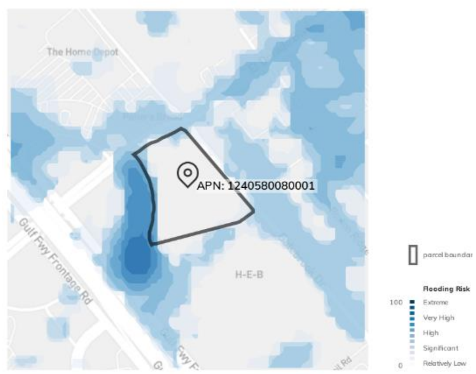
Climate threats can be highly localized to a specific area, especially flood and fire. Fire risk ratings can indicate where one property's surroundings pose lower risk, while the greater area is at higher risk because of proximity to a heavily wooded area. In areas of flood risk, subtle changes in elevation make a large difference on flood outcomes.

**Example of Flood vs Fire Map**

**Flood Map Example**

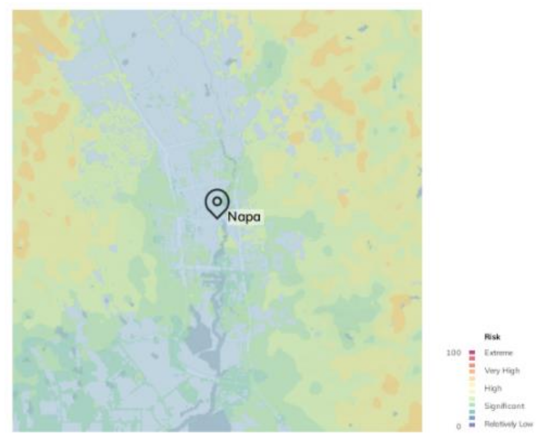
Parcel with local pluvial flooding, but minimal direct impact

Pluvial and Fluvial Flooding Risk Within 500m




**Fire Map Example**

Napa, CA, a high fire risk region, with less risk downtown.

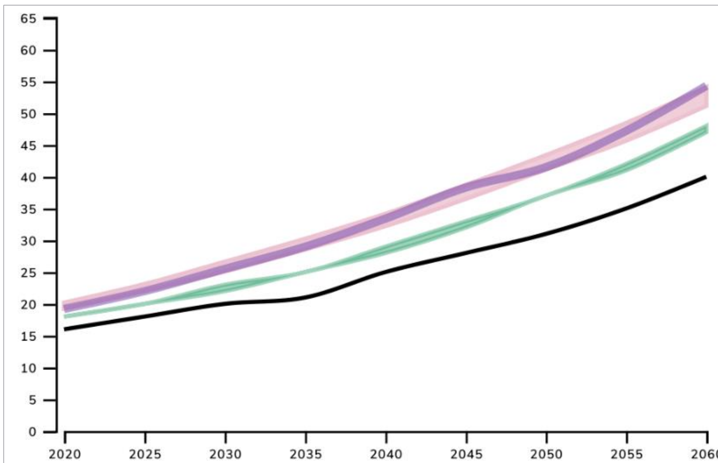



Assessing CRE risks also involves evaluating how the changing probability and intensity of weather events will affect real estate properties over the long-term. All ClimateCheck climate risk ratings are established using a baseline from data as far back as the mid-1900s. Projections for using these baselines for property, county, state, and national risk indicate different risk trajectories into the future, covering the timespan of a new 30-year mortgage and more. These projections of future climate risk also reflect how quickly risk will increase in a given area and how much risk will increase the costs of adjusting to climate change.

**Example of Future Climate Risk Projection for Single Property vs Averages**

Average Extremely Hot Days Per Year

| | 2020 | 2025 | 2030 | 2035 | 2040 | 2045 | 2050 | 2055 | 2060 |
|---|---|---|---|---|---|---|---|---|---|
| This Property | 16 | 18 | 20 | 21 | 25 | 28 | 31 | 35 | 40 |
| County Average‡ | 19 | 22 | 26 | 29 | 33 | 38 | 42 | 47 | 54 |
| NY Average‡ | 18 | 20 | 22 | 25 | 28 | 32 | 37 | 41 | 47 |
| U.S. Average‡* | 20 | 23 | 26 | 30 | 34 | 38 | 43 | 48 | 53 |




† colored area represents 40th-60th percentile scores for population.
‡ 50th percentile score for population.
* population in 48 conterminous U.S. states.

ClimateCheck property analysis can therefore help determine where to prioritize investment in mitigation measures for protection from projected future damages. Adaptations to specific types of climate risk can be used to make properties much more resilient to extreme weather hazards.

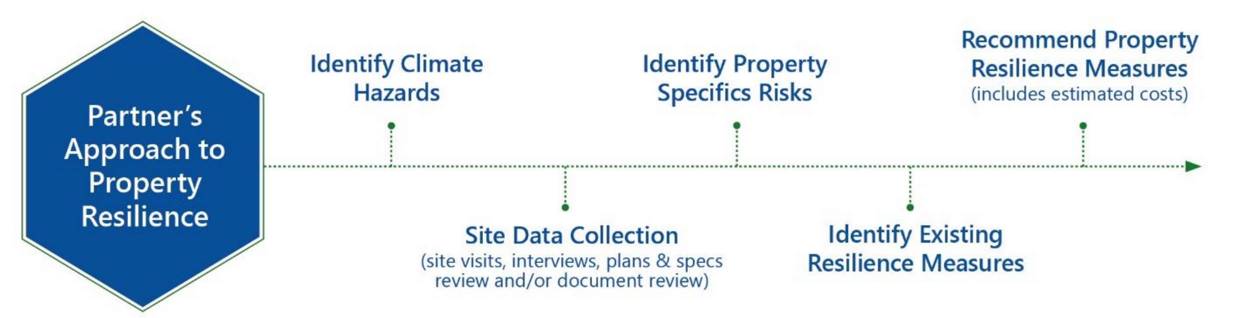
## 2. Site Specific Assessments

Climate risk data alone is not enough to determine which aspects of a property would actually be exposed to or may be affected by climate hazards. Therefore, property-specific assessments are necessary in order to pinpoint the exact equipment and materials on-site that would be susceptible to those previously identified climate risks. This property-specific risk assessment will determine the resilience measures that can be adopted for risk mitigation.

Other reports that can be integrated with a Property Resilience Assessment—whether it is during due diligence or for reevaluation of assets by owners—include Energy and Water Audits, Greenhouse Gas Emissions Inventories, and ESG Benchmarking Checklists[4]. These can be particularly helpful when owners are interested in making long-term investments in sustainability or have corporate ESG goals that will require the additional data.

*Resilience Assessment for Existing Properties*

**Partner Energy Approach to Property Resilience Assessment**




**Analyzing the Property's Existing Conditions**

To understand the potential risks that climate hazards may pose on a property requires understanding the property itself. This involves a site inspection, which provides the opportunity to observe the property and its building systems, as well as gather any relevant documentation pertaining to its current state.

During the site inspection, the assessor gathers information about the location, age, and capacity of the major building systems and back-up systems, as well as the conditions of the building envelope, emergency systems, and any other relevant information such as controls and operating schedules, and occupant needs.

Talking to the facility managers or key personnel working at the property provides additional information, such as whether there are any resilience measures already in place, protocols for scenarios such as flooding, any persistent issues already affecting the property, and how the building systems currently operate.

It is important to gather as much property data and documentation as possible. This may include as-built construction drawings, any previously completed energy audits, Property Condition Assessments, Insurance Risk Assessments, current utility usage and cost, as well as Operations and Maintenance schedules and manuals.

[4] *See Appendix for more.*

**Property Resiliency Measures**

After the property information has been gathered, the next step is to evaluate and prioritize the potential physical risks to the property and devise the proper resiliency measures, along with their costs and any added benefits to the property and occupants.

Property Resiliency Measures (PRMs) are categorized from high to low priority:

**Property Resilience Measure Priority Table**

| | High-cost damage per event | Medium-cost damage per event | Low-cost damage per event |
|---|---|---|---|
| **High frequency/intensity** | High Priority | High Priority | Medium Priority |
| **Medium frequency/intensity** | High Priority | Medium Priority | Low Priority |
| **Low frequency/intensity** | Medium Priority | Low Priority | Low Priority |

**Example of Recommended Property Resilience Measures by Priority**

| PRM Number | Measure | Physical Climate Risk | PRM Priority | Estimated Implementation Cost |
|---|---|---|---|---|
| **PRM 1** | **Emergency Response Plan**- Emergency Response Plans are the first step in reducing risk from natural disasters. To address climate risks, building owners, managers, and occupants should organize resources, assess risks, develop a plan, and implement the plan. Few organizations provide guidance on climate-specific risks; however, preparation for other possible events (e.g., wildfire, flood, tsunami) will help a facility and occupants to be more resilient to the effects of climate change. | All | High | $5,000 - $7,500 |
| **PRM 2** | **Secure rooftop HVAC equipment -** Fasteners, tie-downs, reinforcements, and anchors prevent roof mounted mechanical equipment from lifting and/or becoming loose during high wind events | High wind events | High | $15,000 - $25,000 |
| **PRM 3** | **Designated emergency cooling/heating room with back-up energy generator** - Building or retrofitting an indoor common area space that has separate HVAC, lighting, and hot water systems and is served by a back-up generator will allow occupants who are vulnerable to extreme temperatures a safe place to temporarily congregate during blackout or brownout events. | Temperature, High wind events, Flooding | High | $50,000 - $125,000 |
| **PRM 4** | **Stress test HVAC systems for extreme temperatures** - Stress testing a sample of HVAC systems will allow for a determination of threshold and duration of operation during extreme or prolonged temperature events. It will | Temperature | Medium | $5,000 - $10,000 |

| PRM Number | Measure | Physical Climate Risk | PRM Priority | Estimated Implementation Cost |
|---|---|---|---|---|
| | help inform if existing equipment can accommodate future increased cooling loads or if equipment capacity may need to be increased or building insulation levels reduced. | | | |
| **PRM 5** | **Watertight ground level windows and doors**- It is recommended to install or replace weather-stripping and if needed to make adjusted to door mounting systems to ensure that doors provide an air and watertight seal when closed. | Flooding | Medium | $2,000 - $5,000 |
| **PRM 6** | **Air filtration (MERV 13 or higher)-** Air filters rated MERV 13 or higher applied to the HVAC system can reduce both internal and external pollutants such as pollen, dust, dust mites, mold, and bacteria. | Air quality | Low | $4,000 - $6,000 |

Example of PRM analysis with a deeper dive into PRM 4 (see table above):

**Stress Test HVAC Systems for Extreme Temperatures**

| | |
|---|---|
| **Physical Risk Factor** | Temperature |
| **PRM Implementation Priority** | Medium |
| **Estimated Implementation Cost** | $5,000 - $10,000 |

***Existing Conditions:***
Existing HVAC systems are sized off historical weather data, which does not account for increasing temperatures due to climate change.

***Objective:***
To determine whether existing HVAC systems will be able to accommodate the increased demand of temperature rise. To inform whether system capacity should be increased upon failure of existing equipment.

***Description:***
Stress testing a sample of HVAC systems will allow for a determination of threshold and duration of operation during extreme or prolonged temperature events. Knowing if existing HVAC equipment can accommodate rising temperatures will inform whether the systems should be replaced with higher capacity equipment.

***Effects and Benefits:***
- Maintain occupant comfort in response to climate change
- Increased equipment reliability in response to climate change

### *Next Steps*

After the climate risks and asset-level assessments are completed, additional levels of assessments may be performed depending on corporate goals. Energy audits can provide further breakdown of the building's energy use, which will identify and provide any savings and cost analysis for practical measures. Retro-commissioning (RCx) measures can help improve the existing systems of the property, and since these are typically low- or no-cost, they yield quicker paybacks.

After all analyses are completed, the next step is implementing the recommended measures. The measures do not all need to be adopted at once, but can be selected as part of an overall mitigation strategy that considers risk-tolerance, budget, and age of existing systems. Once the measures have been implemented, verification ought to be performed to ensure the construction/installation of the measures match the specified performance levels intended.

### *Resilience for New Construction*

The main difference between adopting resiliency measures for a new construction versus existing buildings is that there are more opportunities to implement measures before a property is built. Resiliency measures can be recommended and implemented during the development stage, which would incur just an incremental cost that is added to the existing design.

Whereas when adopting resiliency measures for existing buildings, there may be feasibility issues, or an asset manager may want to wait to implement certain measures until the equipment in question reaches its end of useful life and must be replaced, which prolongs the risk exposure.

For example: a property in a high flood risk zone and has mechanical equipment located in the basement. If the property were under development, a recommended resiliency measure would be to install the critical mechanical equipment above predicted future flood levels, such as on the roof. However, if the property were an existing building, the asset manager might not be able to relocate that equipment to the roof if piping and other services cannot be rerouted.

## Conclusion

Currently, there lacks a standard in how climate change risks are rated in terms of severity and how potential damages and losses are calculated. The ASTM committee is working on developing a scale to measure and standardize climate hazards as part of their Standard Guide for Property Resilience Assessments. However, asset owners and managers can use available climate and property data now to address site-specific climate-related risks. Best practice is to begin assessing risks now, as more investors and government policies require businesses to address potential physical and financial risks. The first step asset owners and managers can take is to obtain a climate risk and property resilience assessment in order to ensure that mitigation measures are implemented before any damages are done.

# Appendix

## RELATED ASSESSMENTS

### Property Condition Assessment

A Property Condition Assessment or Report is when architects, engineers, and commercial building assessors evaluate the subject property in order to understand the condition of the building. A Property Condition Report is generated discussing each building system and its condition. The most important output of the Property Condition Assessment is the Immediate Repairs Table and the Replacement Reserve Table. This table is provided in the PCR and helps the client understand how the condition of the building will impact the asset's financial performance.

### Facility Condition Assessment

Facility Condition Assessments (FCA) are tools for owners of real estate portfolios to plan and prioritize short- and long-term investments in their facilities. FCAs help owners know the condition and value of their assets to guide resource planning and investment. They allow owners to understand and maintain the physical condition and value of their real estate portfolio, develop capital budgets, and prioritize resources.

### ESG Benchmarking Checklist

Partner Energy's ESG Benchmarking Checklist provides the owner or investor an understanding of how the asset performs against their ESG framework and goals. Partner Energy's data collection methodology may include a site visit, interviews, and document review. When done in conjunction with an energy audit or PCA, Partner Energy helps clients achieve significant cost and time savings by collecting all necessary data during just one site visit. The cumulative asset-level data from the checklists can show how the entire portfolio is performing and prioritize where to spend efforts to meet the company's ESG goals.

### Decarbonization Pathway

Partner Energy provides executable plans to get an asset or portfolio on track to meet its GHG reduction goals, whether it's to reach net zero or other targets. The decarbonization pathway takes into account the asset's energy efficiency, energy sources, grid energy sources, and company GHG reduction strategies.

### Energy and Water Audit

An energy and water audit is a comprehensive inspection, survey, and analysis of energy and water consumption of a building and its infrastructure. The completed audit report will establish a baseline consumption rate, quantify discrete energy and water usage, benchmark usage against similar facilities, identify building conditions that may cause excessive energy and water consumption, and recommend options to reduce consumption and estimated install costs.

### Greenhouse Gas Emissions Inventory

The Greenhouse Gas (GHG) Emissions Inventory is a systematic analysis of the asset's GHG emissions sources. The report drives emissions reductions and helps owners meet GHG reduction targets. The data can be benchmarked to show emission reductions year-over-year or used as a comparative tool between facilities, portfolios, and industry competitors. GHG emissions are categorized into three scopes: Scope 1 includes direct emissions from owned sources; Scope 2 includes indirect emissions from the generation of electricity, steam, heating and cooling; Scope 3 includes all indirect emissions from the business's value chain.