BOMA Canada

2019 Resilience Brief

Is your building ready?

Resilience Brief

Addressing resilience in commercial real estate

We are proud to present our Resilience Brief—a tool to help building owners and managers begin to consider resilience and the potential risks imposed by extreme weather events.

Dear friends,

Extreme weather events have been expanding in both frequency and intensity over the years. Building owners and managers are correspondingly responding with resilience measures to protect their assets and occupants.

To create more awareness of the challenges and opportunities associated with making your building more resilient, BOMA Canada has created this Resilience Brief. We do this knowing that resilience is complex and extreme weather events can be difficult to predict. There is seldom, if ever, a one-size-fits-all approach, since so much depends upon a given building's physical location, topography and pre-existing design. But there are overarching approaches that building owners and managers can take to strengthen their assets and mitigate any risks from extreme weather.

Who should read this?

This brief is primarily intended for owners and managers of commercial real estate, and for anyone interested in how commercial building operations can be made more resilient to the effects of extreme weather. It is not intended to be comprehensive, nor does it take a prescriptive approach. However, we believe that anyone who works in, manages, or operates, commercial buildings would find the Resilience Brief valuable.

How should this brief be used?

This brief is intended to be an introduction to understanding resilience and extreme weather risks facing the commercial real estate industry. It contains a brief overview of resilience, while also providing more detailed information on resilience at the building level. The brief also offers essential adaptation strategies and potential next steps for building managers, operators and owners.

What's next?

This brief is a living document. We expect to update it constantly, as we learn more and more about how our industry can adapt to the challenges posed by extreme weather. We welcome your feedback. Look out for annual editions, in addition to other resilience-related products which are in the works, including an Assessment Protocol for Commercial Buildings which we expect to release in 2019.

We hope that you find our Resilience Brief useful, and that it can get you started on your journey to protect your building and occupants from extreme weather events.

Sincerely,

Benjamin Shinewald
President & CEO,
BOMA Canada

BOMA Canada

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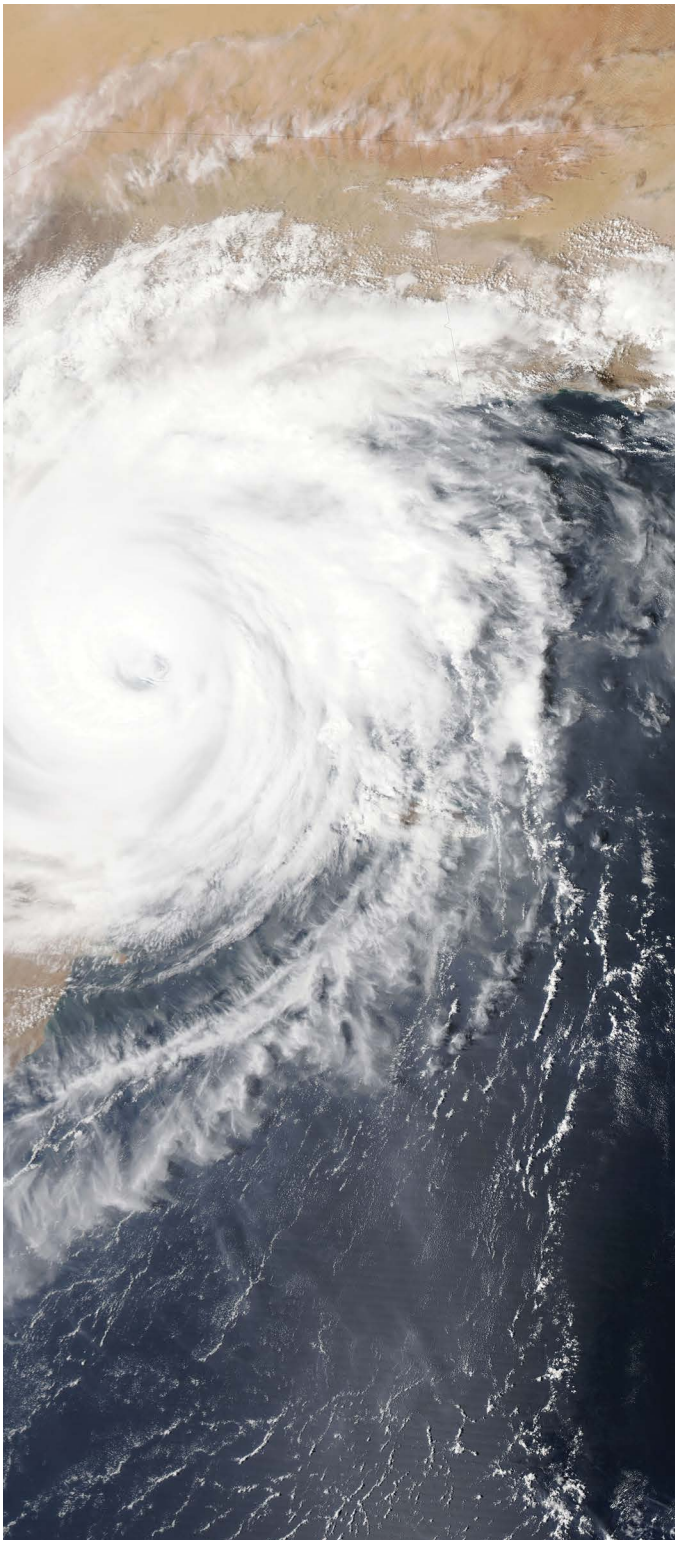

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A Call to Action

Leaders in commercial real estate (CRE) increasingly recognize the business risks posed by extreme weather. In response, they are beginning to protect their assets.

Of course, extreme weather events are nothing new in Canada. However, climate change is accelerating the pace of these incidents. Commercial real estate was on the front lines of events like the 2013 Calgary flood, the 2016 Fort McMurray wildfires and the 2018 New Brunswick and Toronto floods. Hundred-year floods are happening every few years.

The effects of climate change are already being felt throughout our sector. Buildings built to withstand infrequent extreme weather events now must withstand those same events, but on a much more frequent pace. Design and operations were focused on day-to-day occupant comfort, but now must increasingly focus on business continuity, safety and wellbeing, as extreme weather events threaten short- and long-term impairment, loss of structures and risks to health and human safety.

> “Tenants are beginning to ask building managers if their buildings are prepared for extreme weather.”

Key stakeholders are also taking notice. Tenants are beginning to ask building managers if their buildings are prepared for extreme weather, and some owners are asking the same of their third-party managers. Moreover, insurers are expected to adjust their premiums based on a building’s risk profile vis-à-vis extreme weather events. Resilience is, therefore, emerging not only as a key way to mitigate risk to capital investment, but also as a way to respond to market demand from varying stakeholders with increasing sophistication.

Extreme weather disruptions may be inevitable, but minimizing the risks from them and/or rebounding from them isn’t. Resilience is your first line of defence. With some smart planning, it is possible to prevent the effects of extreme weather from damaging your assets and, where this is simply impossible, you can still take steps today to help you not only bounce back quickly but also to stay ahead of the effects of extreme weather tomorrow.

This BOMA Canada Resilience Brief is a first step in helping our member firms begin their journey towards making their assets more resilient. To that end, BOMA is currently developing a National Resilience Strategy aimed at providing our members with knowledge and tools that they can use to make their assets more resilient to the effects of extreme weather and related events. Already, we have some elements for you in the works (see pages 13/14). And most importantly, in advancing this strategy, we will continue to work in close collaboration with our membership and with various levels of governments, academia and other key stakeholders to ensure that this work is as helpful and effective as possible.

What is Resilience?

For the purpose of this brief, BOMA Canada uses the following definition of resilience:

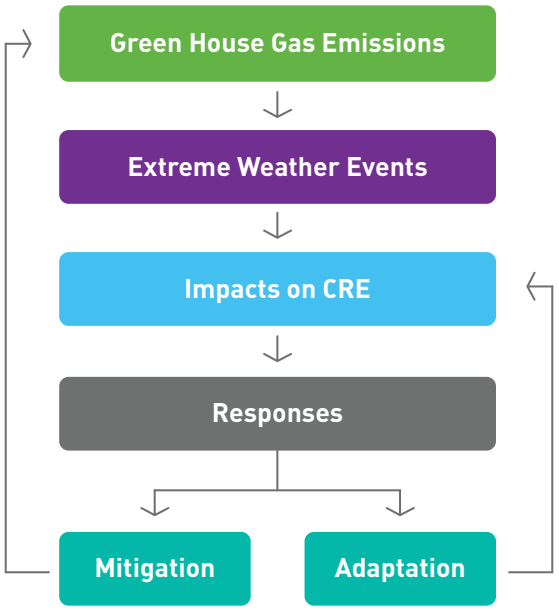
> Resilience is the ability to prepare and plan for adverse extreme weather events and to absorb, recover from and successfully adapt to disruptions.
>
> (adapted from Cutter et al., 2013)

Canadian commercial real estate (CRE) is beginning to grapple with the challenges of adapting to extreme weather by learning how to transform their assets. A culture of resiliency is starting to emerge, creating an industry-wide mindset not only to mitigate extreme weather events (such as reducing greenhouse gas or GHG emissions) but also to adapt to current and future extreme weather-related challenges (such as installing impact-resistant glass which can avoid exploding and imploding windows during a severe weather event). This shift would significantly assist in meeting the challenge of extreme weather events and existing building infrastructure. It would also situate Canadian CRE in a position of strength for the future, creating aspirational goals for individual buildings, firms and the broader industry to embrace. Thus, it is of paramount importance that Canadian CRE welcomes climate resilience—that it embraces a mindset, a willingness and an ability to prepare and plan for adverse extreme weather events, and to absorb, recover from and successfully adapt to such disruptions.

Climate resilience drives capacity to maintain function in the face of shocks and stressors imposed by a changing climate, while helping CRE firms adapt their business models to meet a changing world. In other words, it is not just about withstanding the elements, but it is also about benefiting from those shocks and stressors to come out on top against climatic events.

Figure 1

Mitigation and adaptation flow chart



Resilience at the Building Level

Climate Mitigation

- Tackling the cause of a changing climate. Includes measures that reduce or prevent GHG emissions that cause climate change.
- Example: Moving to renewable energy. Changing management practices to reduce energy consumption.

Climate Adaptation

- Tackling the current or expected impacts of climate change. These measures include making adjustments to current systems.
- Example: Adapting buildings and systems. Elevating buildings and key systems to avoid flooding from storms.

Climate Resilience

- The capacity of a system to
  1) absorb stress and maintain function in the face of climate change
  2) adapt, reorganize, and evolve to an improved state
- Example: Withstanding the adverse impacts of severe weather events

> BOMA members are generally already very successful in reducing their carbon footprint through BOMA BEST®.

Current climate vulnerabilities are requiring building owners and operators to make decisions which are informed by current and future climatic impacts. Extreme weather events can have numerous adverse effects on outputs including reduced availability of materials or resources (water, energy). A changing climate may also accelerate the deterioration of critical assets, and buildings and machinery may become more vulnerable to extreme events such as storms and floods. Extreme weather events present many different challenges to business in general, but the challenges to CRE are particularly significant. These challenges include:

- Risks to health and human safety
- Damage to or even destruction of CRE assets
- Temporary or permanent loss of use of CRE assets by tenants
- Potential legal liability from tenants, building guests, neighbours and others
- Loss of vital but external building or tenant services (e.g. water, power, phone lines, internet, etc.)
- Inability to access a building
- Reputational damage
- Sharply increased operations, maintenance and recovery costs
- Increased insurance premiums

These challenges impact the cost of operation and threaten the competitiveness of buildings and companies or delivery of essential services (Peace et al., 2013). The changing climate affects properties across all asset classes. Taking steps towards resilience is necessary for adapting to extreme weather events. To understand resilience in the context of CRE, building owners and managers must take into consideration the above mentioned asset level and business level challenges.

To some degree, extreme weather events are inevitable, and buildings are required to adapt to those irreversible effects (Sheffi, 2015). BOMA members are generally already very successful in reducing their carbon footprint through BOMA BEST®, and are now seeking for help in understanding the risks and opportunities of a changing climate and the tactics required to adapt.

As information and predictions on extreme weather and its impacts increase, and advice on how to adapt becomes more readily accessible, the evolution of resilience in buildings and management can begin to accelerate (Rockefeller Foundation, 2014). Companies are now considering climate risks that lie beyond immediate effects and threats to their business, and are realizing the long-term benefits of investing in resilience, such as increased competitiveness, productivity and efficiency. There are also positive benefits to employee health and reduction of absenteeism, which all contribute to long-term business success. Therefore, a strong business case is developing for resilience. In the short term, value comes from exploiting opportunities and strengthening their market positions. In the long term, incorporating climate change into capital investments will ensure continued performance reliability in the future (Rockefeller Foundation, 2014).

The C40 Cities Climate Leadership Group is an organization that connects over 90 cities focused on driving urban action to reduce GHG emissions and promote resilience practices. They have highlighted that buildings have begun to take climate resilience action in the following ways:

- Stormwater capture system
- Green roofs/walls
- Crisis management
- Flood mapping
- Tree planting and or creation of green spaces

Buildings have also taken steps to better understand the behaviour of occupants by analyzing their energy conservation patterns and how natural ventilation may improve building efficiency and occupant health. Applying occupant engagement strategies and educating tenants (sometimes called "building citizens") can improve day-to-day operations. A better understanding of the surrounding environment and occupants has enabled building managers to improve resilience (Hanamura, 2017).

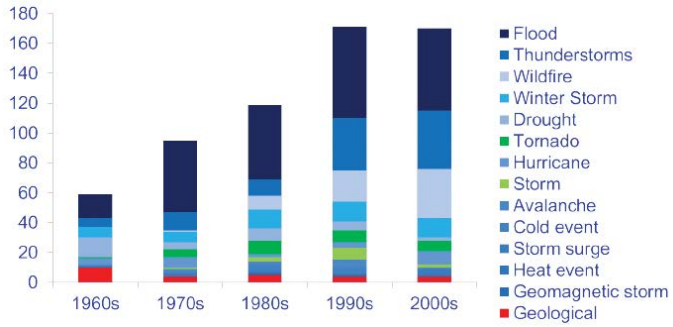
With all this in mind, the Canadian CRE industry must begin to consider the challenges and opportunities posed by climate adaptation into their day-to-day business. From the C-suite to the operational level, firms must understand the environmental risks in which their assets are situated, and the vulnerabilities their assets may face. Such risks may arise on a:

- Building-by-building basis, i.e. risks unique to the construction and/or operations of a given asset
- Portfolio-wide basis, i.e. risks arising out of policies and procedures that could impact how a portfolio of buildings can withstand extreme weather events
- District-wide basis, i.e. risks that arise from how neighbouring buildings interdependently rely on each other and adjacent infrastructure, such as utility services being delivered to a single central business district or transit systems operating in and around a given area

Generalizing current and future climate impacts on infrastructure in Canada proves challenging due to our geographical and socioeconomic diversity. The climate in Canada varies significantly across regions and from one season to another. However, regardless of this diversity, projections continue to depict increases in occurrences of heat waves, storm surge flooding, coastal erosion and forest fires to name a few (Boyle et al., 2013).

Figure 2 depicts the rise of Canadian disasters[1] over the years. And importantly, as shown in the graph below, approximately 40% of weather-related disasters across Canada involve water, whether it is flooding, storm surges, snowstorm, ice storms or thunderstorms.

Figure 2

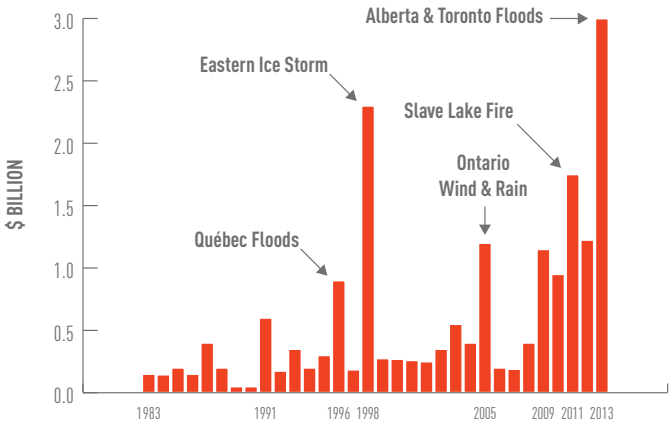


Source: McGilivray, 2016

It is also important to note the role of non-climatic factors in CRE resilience. Demographic shifts, demand for waterfront property, increasing urbanization in flood-prone regions, land use changes and population growth can all exacerbate the impacts of extreme weather events on infrastructure (Boyle et al., 2013). The interdependence of infrastructure systems further complicates the effects. Most systems are interconnected with other systems. Consequently, failure in one can lead to failure in others.

Figure 3 illustrates the dramatic costs associated with natural disasters in Canada. Between 1983 and 2008 the average economic cost per weather-related disaster was $400 million. From 2009 to 2013 the average economic cost increased by 150% to $1 billion (McGillivray, 2016).

Figure 3



"When it comes to resilience, we cannot be looking at the past as success. Just because your property has never flooded or had a weather-related problem does not mean it will be able to sustain the extremes that will be occurring going forward. Understanding your building's resilience means knowing at what point a given amount of rain, heat, wind is going to cause a challenge. It's about understanding how far you can stretch the elastic band."

– Jon Douglas, Director of Sustainability, Menkes Property Management Services Ltd.

[1] Disaster as defined by Public Safety Canada, must meet one or more of the following (i) 10 or more people killed (ii) 100 or more people affected/ injured/ infected/ evacuated/ or homeless (iii) an appeal for national/international assistance (iv) historical significance (v) significant damage/interruption of normal processes such that the community affected cannot recover on its own.

Adaptation Strategies

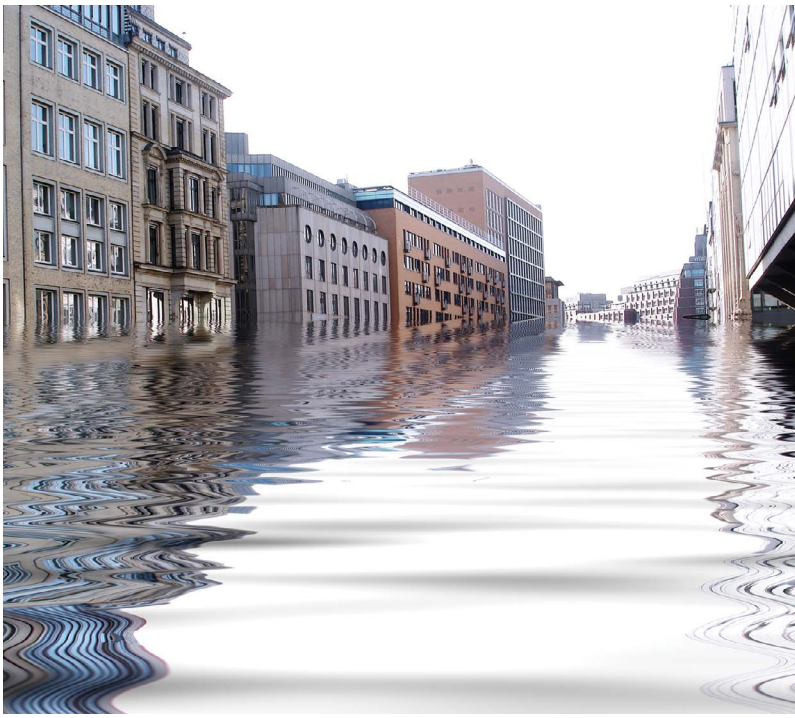
Sudden onset of extreme weather events such as the ones listed in Figure 3 represents various threats to the CRE industry. Below is a compilation of potential impacts at the building level and some adaptation strategies to consider when planning for resilience.

Extreme Precipitation and Flooding: Increased duration, intensity and frequency of precipitation events

- Flooding and inundation of low-lying lands and property causing an impact on soil surrounding the foundation which can lead to sewer back up
- Damage to piped water, sanitation drainage, and communication, power or gas lines
- Contamination of source drinking water due to pollution overflow
- Increased erosion impacting infrastructure functionality and increasing maintenance costs
- Road and transit closure due to flooding

Adaptation Strategies

- Conduct a local flood risk assessment to determine the minimum capacity of rain to flood entry points. Locate and assess each of the potential flood entry points.
- Assess perimeter of building and adjacent city streets to determine if any road construction or temporary metal road plates change storm water drainage.
- Determine water filtration capacity of exterior deck or terrace before backup occurs.
- If cisterns are present, determine the capacity of the overflow value.
- Retrofit with waterproof or water-resistant materials for flooring, foundation etc.
- Retrofit windows and doors on ground level to be watertight to prevent water or debris from entering the building.
- If retrofitting, consider relocating HVAC, plumbing, servers, and other critical infrastructure above the height of expected flood levels.
- Relocate sensitive documentation and/or server backups above water inundation levels, or consider offsite storage (in a flood-resistant location).
- Raise waste disposal and recycling above inundation levels.
- Pave a small raised ledge (similar to a speedbump) at the opening of the underground parking garage to prevent floodwaters from entering.
- Implement temporary flood barriers/berms that can be quickly assembled to protect buildings from flooding. Consider location of flood entry points, including exterior vent grates.
- Incorporate landscape features such as berms to provide natural barriers and use native plants to buffer and absorb excess water on-site.
- Retrofit elevators to include water detectors that stop the elevator above flood inundation levels.
- Implement alternative transit access points in the event that one mode of transportation is down.



Extreme Wind Events or Hurricanes: Increased duration, intensity and frequency of windstorm events

- Damage or loss of building infrastructure: Extreme wind events can cause damage to building façade and windows.
- Extreme wind can damage critical life-supporting systems such as water infrastructure and energy services.

Adaptation Strategies

- Conduct a short-term assessment to determine risk of extreme wind events or hurricanes.
- Install impact-resistant glass to avoid exploding or imploding windows and doors during high winds and flying debris.
- Invest in a desalination unit or underground water storage tank to provide potable water if needed for cooling towers.
- Implement on-site backup power capacity to help run air conditioning and other essential services.

Wildfire: Increased frequency and severity of wildfires due to increased summer temperatures

- Damage or loss of building infrastructure: Wildfire can cause water resistant soils (hydrophobic) that can increase the risk of flooding and erosion (Boyd, 2014).
- Land value can decrease to due burned landscape smoke damage.

Adaptation Strategies

- Conduct a short-term wildfire assessment to determine possible local risks and identify potential areas of concern.
- Create a building response plan in the event of nearby wildfires to minimize adverse effect on indoor air quality, such as prohibiting outdoor air intake to limit indoor air quality degradation and communicating with tenants to limit the opening of doors and windows.
- Retrofit with fire-resistant materials for roofing, siding, windows etc.
- Retrofit on-site emergency water supply for fire suppression.

Heatwaves and Extreme Temperature: Prolonged periods of abnormally hot weather

- Extreme temperatures can result in increased pressure on energy loads and shifting peak demand for cooling.
- Heat stress can cause decreased wellbeing of occupants and systems.
- There can be damage to the building's infrastructure and consequences of drying soil around the foundation.
- You could see an increase in demand for water supply.

Adaptation Strategies

- Conduct a short-term assessment to determine local heatwaves and extreme temperature risk and identify potential areas of concern.
- Stress test HVAC systems to determine threshold and duration of operation during extreme heatwaves and temperatures.
- Retrofit with appropriate wall and roof insulation to reduce heat penetration.
- Implement a green or brown roof to limit heat absorption.
- Install thermally reflective (high albedo) material for the roof and facades of buildings.
- Implement passive solar design.

> "BOMA Canada is responding to member demand by convening industry leaders to help the membership address the impacts of extreme weather."

Advancing Resilience in Canadian CRE: BOMA's Next Step

Resilience is being addressed in Canadian CRE today, but in some cases, it may be happening in silos and with a piecemeal approach. By bringing together asset managers, property managers, building operators, security professionals, emergency management professionals, sustainability professionals, risk managers, and others across the industry, we can foster an aligned, integrated, comprehensive approach to the challenge of extreme weather.

BOMA Canada is responding to member demand by convening industry leaders to help the membership address the impacts of extreme weather. Beyond creating this brief, which we expect to update annually, we are also currently developing an assessment protocol project that is intended to present a standard set of best practices and areas of assessment to assist buildings owners and managers to better understand their building with regards to resilience. We expect the protocol to be ready in 2019 and invite interested buildings to join a pilot, which is already underway.

Though it remains under discussion, early indications are that the forthcoming BOMA Canada Resilience Assessment Protocol may be based on the following three-part model. See Figure 4:

Figure 4

Future iterations of the assessment protocol will expand the scope and determine how buildings interact with their neighbourhoods and communities to increase their adaptation and resilience to extreme weather events.

- Construction features
- HVAC (primary heating and cooling)
- Electrical transformers/switchgear
- Communications systems
- Backup power
- Elevators
- Building documentation
- Waste disposal/collection

Though still in draft form, BOMA Canada's Resilience Assessment Protocol highlights the following areas of concern to business continuity and resilience in the face of adverse climate events:

- Hazardous materials
- Building condition and envelope
- Flooding and storm water management
- Snow and ice
- Heat island effect
- Demand response
- Occupants (travel, shelter and communication)
- Assessment and planning

BOMA local associations are also taking a proactive approach to addressing resilience in CRE.

BOMA TORONTO

As part of the 100RC initiative, Toronto's Resilience Office has a two-year mandate to develop a Resilience Strategy to help Toronto become more resilient. BOMA Toronto been invited to participate in the Resilient TO (RTO) initiative, and help develop this strategy for the CRE industry. As a member of the RTO Steering Committee (and under BOMA Canada's broader national strategy), the approach is twofold.

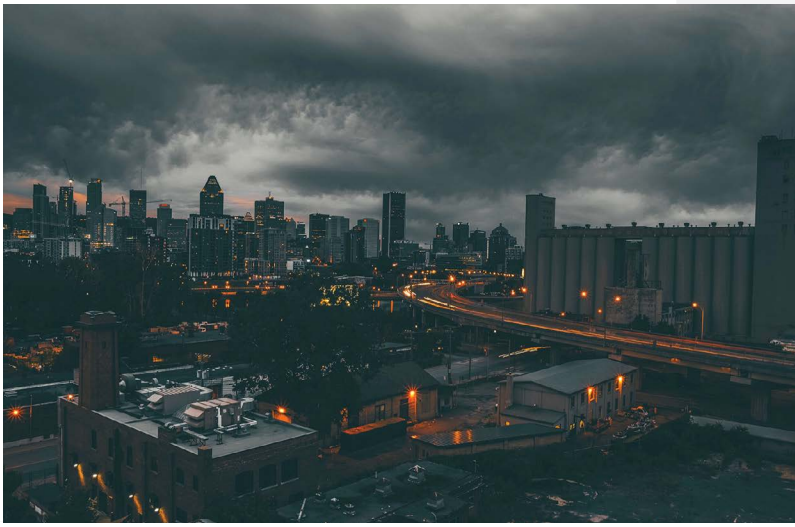
1) Create a Business Case for CRE Resilience. Develop a risk-based evaluation model that considers the influence of critical infrastructure on the building's capacity to operate, and the building's capacity to recover, should the utility from one or more critical infrastructure providers in the building be interrupted (a mathematical model with quantifiable and verifiable input and output). Once the risk exposure and the capacity to recover are determined, building owners and managers would need directions on how to manage and change input variables so that they could aim for the desired output that meets their business requirements. The extent to which the input variables are changed (or expected to change) would form the basis of users' resilience strategy and planning. The outcome would lead to a resilience strategy that aims to minimize risk exposure and maximize their ability to recover and achieve normal operational/performance level (or better) in the shortest possible time.

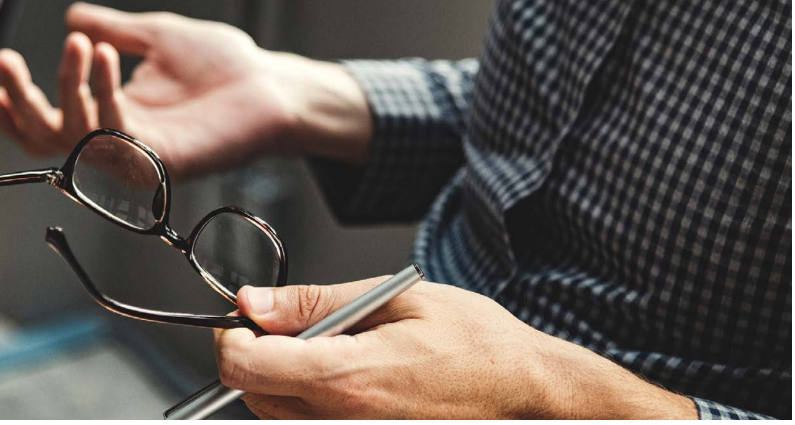
2) Develop a Building Infrastructure Resilience Planning Guide for Commercial Real Estate. The planning guide would include a set of best practices that could directly impact the outcome of (1). This supplemental guidance document would walk the owner from initial site selection and investment decision through to integrated design.

BOMA BRITISH COLUMBIA

BOMA British Columbia (BC) has implemented an emergency mass notification system for its members, called BOMA Alert. In the event of an emergency or natural disaster, the City of Vancouver Office of Emergency Services notifies BOMA BC with an update. BOMA BC then alerts its members and provides them with critical information for their staff, clients and visitors, potentially reducing the risk of property damage and/or loss of life.

BOMA BC is also partnering with the City of Victoria to create the first of BOMA BC's 2030 resiliency districts, where efforts will be made to increase the resiliency of the commercial building sector. Participants will commit to reducing energy consumption, but the work will also focus on accessibility improvements and seismic upgrades. The team hopes that by working collaboratively, negotiating shared service agreements and providing direct hands-on support from BOMA Energy Management staff, cost savings can also materialize.





Advancing Resilience in Your Building: Your Next Steps

Your next step is to better understand the extreme weather risks affecting your properties by creating your own resilience plan or protocol. A resilience plan is much more than just emergency preparedness or business continuity—it is the next level. Resilience planning takes a holistic approach to risk management and strives to minimize downtime by embedding resilience techniques into organizational and management processes.

Emergency Planning

- A course of action to mitigate the damage of potential events that could endanger an organization's ability to function

Disaster Planning

- A predefined plan for getting business back on track after a disruptive event and for protecting employees, tenants, suppliers and building guests during a disaster

Business Continuity Planning

- A management process that identifies risks, threats and vulnerabilities that could impact an organization's continued operation and then identifies measures to address those risks, threats and vulnerabilities

Resilience Planning

- Processes which increase the organization's capacity to anticipate disruptions, adapt to such events and create lasting value

For example, during some severe weather events, individuals may seek out shopping centers and other public buildings for refuge. Such buildings must be prepared for severe weather events and be ready both to ensure the safety of individuals in their properties and to safeguard tenant, owner and manager business continuity during these events.

In the final analysis, resilience planning is crucial for the continued operation of buildings in our changing climate. Start your plan, review your plan, test your plan. Look for annual updates to this brief and to the other BOMA Canada products that are underway. And be ready for the next extreme weather event... it is just around the corner.

Cities in the 100RC network such as Calgary, Montreal, Toronto and Vancouver are provided with the resources necessary to develop a roadmap to resilience along four main pathways:

- **Financial and logistical guidance** for establishing an innovative new position in city government, a Chief Resilience Officer, who will lead the city's resilience efforts;
- **Expert support** for the development of a robust Resilience Strategy;
- **Access to solutions, service providers, and partners** from the private, public and NGO sectors who can help them develop and implement their resilience strategies; and
- **Membership of a global network** of member cities who can learn from and help each other.

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