View of Toronto skyline through ice.

WHO CALLS THE SHOTS?

THE (UN)USUAL SUSPECTS IN URBAN EXTREME WEATHER RESILIENCE

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Abstract

Climate change is causing extreme weather events to be more severe and to happen more frequently, and will be a powerful force in shaping cities in the future. What used to be a 100-year event can now be as frequent as every decade. Recent events, such as Toronto's flash flood in July 2013, and Hurricane Sandy in Calgary, have shown that these events can have a major social, economic, and environmental toll on cities, since many places are not yet prepared to address and quickly bounce back from these events. As Canada's economic hub and largest city, Toronto is relatively well-positioned to address climate change and extreme weather resilience. Because extreme weather events have impacts in many dimensions of urban life, many stakeholders can play a role in helping to build resilience to these events. This study explores the roles of different stakeholders, and the unique opportunities, risks, and challenges they face in building resilience to climate change and extreme weather events. Interviews conducted in Toronto in Winter/Spring 2015 with 14 stakeholders from government, private sector, and not-for-profit organizations reveal that Toronto stakeholders are dealing with issues of uncertainty and mixed messages around the urgency of climate change and extreme weather. In addition, some organizations are pointing fingers, claiming that others should be the ones to drive change. Recommendations for governments, private sector stakeholders, communities, and not-for-profit organizations are provided as a first step in helping to bridge the gaps in knowledge and understanding of climate change and extreme weather, and aim to help each stakeholder group build on their opportunities and work collaboratively to create more resilient cities.

Key words: climate change, extreme weather, resilience, stakeholders, collaboration, Canada, Toronto

Résumé

Les changements climatiques engendrent des événements météorologiques extrêmes qui sont amenés à être de plus en plus fréquents et sévères. Indéniablement, ces phénomènes météorologiques façonneront les villes de demain. Auparavant, les évènements météorologiques extrêmes se produisaient qu'une seule fois par siècle. Maintenant, ils surviennent une fois par décennie. Quelques évènements récents, comme l'inondation subite de Toronto en juillet 2013 et l'ouragan Sandy à Calgary, ont démontré que les évènements météorologiques extrêmes peuvent engendrer un coût social, économique et environnemental très important pour les villes, et ce, particulièrement pour les villes sans plan d'intervention pour répondre et récupérer rapidement d'un tel évènement.

En tant que centre économique du Canada et métropole du pays, la ville de Toronto est relativement bien placée pour lutter contre les changements climatiques et accroitre sa capacité de résilience envers les phénomènes météorologiques extrêmes. Puisque les phénomènes météorologiques extrêmes ont des répercussions sur plusieurs dimensions de la vie urbaine, de nombreux intervenants peuvent participer à la quête de résilience en cas d'évènements météorologiques extrêmes. Ce projet de recherche vise à explorer les rôles des divers intervenants, les opportunités, les risques et les défis qu'ils rencontrent dans leur quête pour améliorer la résilience de Toronto envers les évènements météorologiques extrêmes causés par les changements climatiques. Les quatorze entrevues réalisées à Toronto, durant l'hiver et le printemps 2015, en compagnie de divers intervenants provenant du milieu gouvernemental, du secteur privé ou travaillant pour des organisations sans but lucratif ont révélées qu'un certain niveau d'incertitude existe parmi ces derniers concernant l'urgence d'agir pour lutter contre les changements climatiques et les évènements météorologiques extrêmes en raison des messages contradictoires véhiculés par les autorités. De plus, certains intervenants blâment d'autres organisations pour l'inaction actuelle et prétendent que la tâche d'initier le changement ne leur revient pas. Cette recherche propose des recommandations qui, nous espérons, permettront aux gouvernements, aux intervenants du secteur privé, aux communautés et aux organisations à but non lucratif de combler le fossé manifeste qui existe entre eux concernant la compréhension des enjeux du phénomène des changements climatiques et des évènements météorologiques extrêmes. Les recommandations ont aussi pour objectif d'augmenter la collaboration entre les intervenants.

Mots clés: Changement climatique, températures extrêmes, résilience, parties prenantes, collaboration, Canada, Toronto

Glossary of Acronyms

CIP	Canadian Institute of Planners
CPAP	Climate Change Adaptation Project
FCM	Federation of Canadian Municipalities
GHG	greenhouse gas
ICLEI	Local Governments for Sustainability
IPCC	Intergovernmental Panel on Climate Change
NRCan	Natural Resources Canada
PCP	FCM and ICLEI's Partners for Climate Protection program
TRCA	Toronto and Region Conservation Authority
UNEP	United Nations Environment Programme
UNFCCC	United Nations Framework Convention on Climate Change
WWP	WeatherWise Partnership

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Severe thunderstorm in Toronto, 2015   *Source: www.globalnews.ca*

1.   INTRODUCTION

Climate change is causing extreme weather events to become more frequent and more severe. A storm of such extreme intensity that used to strike just once every 100 years can now occur as frequently as every decade. Recent local events, such as Toronto's flash flood in July 2013, Hurricane Sandy in Calgary, and the North American ice storm of 2013, have shown that extreme weather events can have a major toll on urban life. On the social front, there are impacts to service continuity, homelessness, job security, access to food, and more. Economic impacts include infrastructure damage, and loss of business/competitiveness. On the environment side, climate change and extreme weather can increase pollution, damage wildlife, and affect food production. Many places are not yet prepared to address and quickly bounce back from these events.

Climate change and extreme weather events have impacts in many dimensions of urban life, and many different stakeholders can play a role in helping to build resilience to these events. Governments at all levels can play a significant role in building resilience by providing a progressive regulatory and policy framework, producing adaptation and mitigation plans, investing in critical infrastructure improvements, educating the public, and caring for vulnerable populations, among other responsibilities (City of Toronto, 2014). The private sector, with access to private funds and the ability to innovate and scale up ideas, is increasingly seeing that they have a role to play in improving climate change resilience, particularly in order to reduce disruption to businesses, and increase competitiveness (The Rockefeller Foundation, 2014). In particular, the insurance sector feels the immediate impacts of climate change and extreme weather events, and may have a role to play in mitigating those impacts (Botzen, van den Bergh, & Bouwer, 2010). Another large group of stakeholders are not-for-profit organizations and local community groups, who typically are responsible for acting on behalf of the communities of interest they represent. These organizations are often nimble, have extremely motivated and passionate members and stakeholders, and can generate bold ideas for action.

However, these stakeholders and others face a number of barriers and challenges to building resilience to extreme weather events. For example, while the qualitative impacts of climate change and extreme weather events are relatively easy to document, quantitative impacts are more difficult to accurately estimate (Hunt & Watkiss, 2010; Bouwer, 2013), making it difficult for cities to predict future impacts and justify actions to mitigate them (Chagnon, 2003). In addition, risks and uncertainties of climate change and extreme weather events are often abstract (Pidgeon, 2012), and many stakeholders have a limited understanding of climate risks and limited capacity to address those risks (Hunt & Watkiss, 2010). Not-for-profit organizations may be undeterred by issues of uncertainty, however, they face challenges in

development and implementation of projects as they are often dependent on governments and private sector organizations for funding and other resources. Finally, governments hold powerful tools that can be used to adapt to or mitigate effects of climate change, but the short-term and cyclical nature of the electoral cycle also presents challenges of shifting priorities and short-term horizons (Burch, 2010; De Sherbinin, Schiller & Pulsipher, 2007).

Fortunately, many major cities have or are developing plans to respond to issues related to climate change. The city scale is becoming recognized as a level at which mitigation and adaptation measures can be very effective, because climate change and extreme weather risks can be grounded at a scale that is relevant to public and private agents who can make decisions and implement responses (Hunt & Watkiss, 2010). In recent years, interdisciplinary partnerships and increased stakeholder engagement have resulted in great progress in climate change adaptation/mitigation research (Botzen, van den Bergh, & Bouwer, 2010; Brennan, 2010; Changnon, 2003; Hunt & Watkiss, 2010), and these multi-sectoral and interdisciplinary partnerships are gaining traction. For example, the WeatherWise Partnership in Toronto has brought together public, private (primarily insurance), and not-for-profit representatives to engage in a discussion of the extreme weather resiliency of Ontario's electrical sector. Other networks like Ouranos, in Quebec, and the Clinton Climate Initiative C40 network, have also engaged stakeholders in discussion and initiatives to address extreme weather impacts.

This research explores the roles of various stakeholders in building urban resilience to climate change and extreme weather, including consideration of each stakeholder's particular opportunities, risks, and challenges. The research looks at the Canadian context, with a particular focus on Toronto, to identify the key drivers of change, gaps in understanding, and ways in which stakeholders can collaborate to overcome dominant barriers, leverage opportunities, and improve a city's resilience.

This study entails a thorough review of the Canadian regulatory framework for environmental issues, as well as an exploration of stakeholder dynamics in Canada and identification of global best practices for addressing climate change and extreme weather resilience. A qualitative case study of the City of Toronto dives deeper into the complexities of the situation in one particular city. Through interviews with 14 representatives of key stakeholders in Toronto, the author gains a rich understanding of the unique opportunities, challenges, misunderstandings, and gaps that stakeholders face in their efforts to build resilience to climate change and extreme weather events. These key findings are analyzed, and recommendations for government and other stakeholders are presented in the final chapter.

The Arctic sea ice could disappear in summer by 2016.   *Source: NASA Climate 365 Project*

2. CLIMATE CHANGE & EXTREME WEATHER

2.1. Climate change

The earth provides resources and ecosystems for trillions of organisms to thrive, and has done this efficiently for more than 3.8 billion years. Humans have only been around for the blink of an eye – fossil evidence suggests modern humans evolved around 200,000 years ago, and modern civilization is only about 6,000 years old. In this short time, human activity has contributed significantly to the state of the environment. Today, we are faced with major sustainability challenges as the effects of our overconsumption contribute to the acceleration of global warming.
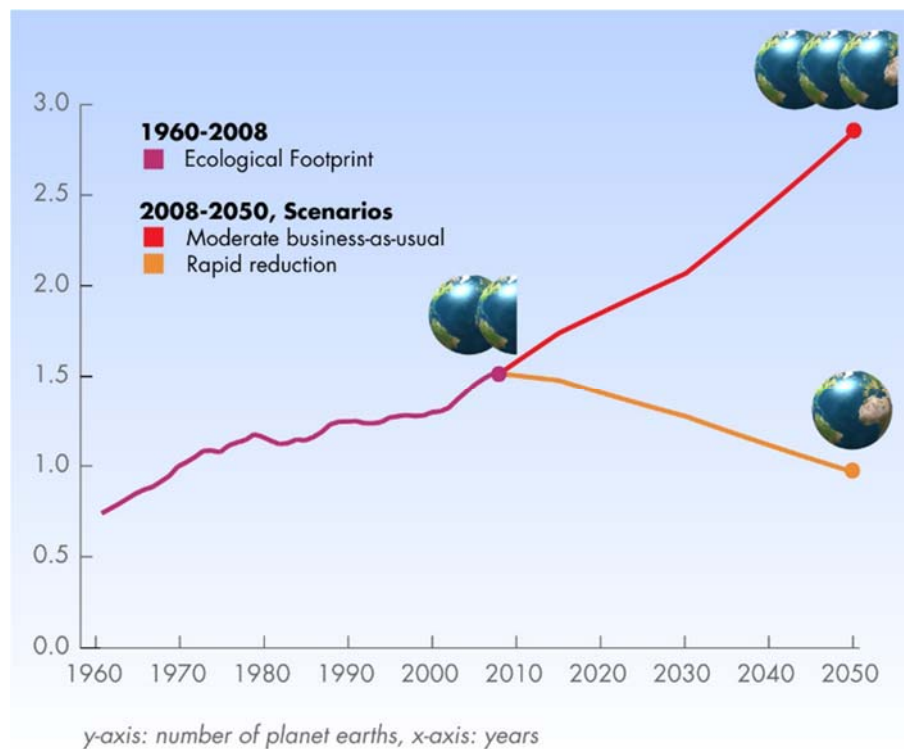
Our global population requires the resources of one and a half earths, which means that it takes the earth one year and six months to regenerate what we use in just one year. Moderate UN scenarios suggest that if trends continue, this requirement is projected to rise to nearly three earths by 2050 (see Figure 1) (Global Footprint Network, 2014).

Figure 1. Global footprint projections.   *Source: Global Footprint Network, 2014*

According to the Intergovernmental Panel on Climate Change (IPCC), the "warming of the climate system is unequivocal, and since the 1950s, many of the observed changes are unprecedented over decades to millennia" (IPCC, 2014: p. 1). In Canada, average land temperatures have increased by 1.5°C over the last six decades (Warren & Lemmen, 2014), about twice that of the global (Hartmann, Klein Tank & Rusticucci, 2013, as cited in Warren & Lemmen, 2014).

Globally, the impacts of this climate change manifest themselves in many ways, including collapsing fisheries, diminishing forest cover, shrinking glaciers, depletion of fresh water systems, shifting

ecosystems, resource conflicts, mass migrations, famine, disease, and extreme weather events such as more frequent wildfires, longer periods of drought, and more frequent and severe rain, wind, snow, and ice storms (Warren & Lemmen, 2014). In Canada, climate change has resulted in an overall wetter country, with more heavy rainfall, increases in extreme heat, and declines in snow and ice cover (City of Toronto, 2011; Federation of Canadian Municipalities, 2009). However, it is important to note that there is considerable variability across the country - southern Canada has seen annual precipitation rise by between 5 and 35 percent since 1900, whereas the Prairies and eastern Arctic has seen a decrease of 1-2 percent per decade (City of Toronto, 2011). In addition, cities tend to experience higher temperatures than rural areas, and coastal regions are more vulnerable to sea level rise (Berry, Clake, Fleury, & Parker, 2014). Natural Resources Canada (NRCan) has identified six broad regions of Canada, and the general climate change impacts and challenges each region faces; even within these regions, however, there will be variability from local weather patterns, topography, local bodies of water, built environment, among other factors (Warren et al., 2007).

2.2. The urgent need for action

Globally, there is an upward trend in weather-related loss events (Leviäkangas & Michaelides, 2014) (Figure 3). The general consensus among researchers is that societies should be prepared for severe weather and related effects (Leviäkangas & Michaelides, 2014). As the issue becomes more urgent, scientists are now talking about the climate tipping points, which are points at which the climate "tips" from one stable state to another - points at which climate change becomes irreversible. Most discussions and actions around climate change have been on the mitigation side. However, global GHG reduction targets that are currently in place are not enough to prevent dangerous climate changes - aggressive cuts in carbon dioxide emissions, and changes at all scales are needed (Pidgeon, 2012). The IPCC projects that even with the mitigation efforts currently in place, there will be further climate shifts, including thawing of permafrost regions, more frequent heat extremes and heavy precipitation, and rising sea levels (IPCC, 2014).

It is clear that additional efforts are needed. In the last couple years, there has been a shift in focus from mitigation to adaptation (Davoudi, Crawford, & Mehmood, 2009). However, it is important that the adaptation measures that are adopted are within the mitigation umbrella. Local and regional jurisdictions are well-positioned to address climate change and extreme weather from an adaptation perspective, and as the effects of climate change and extreme weather become more frequent and intense, these

jurisdictions are increasingly becoming recognized as important players in climate change and extreme weather action.

2.3. Extreme weather events

Extreme weather events are part of the natural climate cycle, and civilizations have weathered storms for centuries. In most of the developed world, infrastructure is built to withstand most weather conditions, but is vulnerable to effects of extreme weather events (Hunt & Watkiss, 2010). Using the example of transportation, engineers have historically designed transportation infrastructure to withstand storms that have a probability of occurring once or twice every hundred years (National Research Council, 2008). The difference now is that these "hundred year storms" can now occur as frequently as every decade. Increased frequency and severity of extreme weather events means that historical data are no longer a reliable predictor of future events. According to the IPCC, these changes in the frequency, intensity, spatial extent, duration, and timing of extreme weather events can have severe impacts on individuals and communities around the world (IPCC, 2012). In addition, other factors, such as denser populations and the general trend of urban migration have made the potential impact of these weather events much greater. According to David MacLeod, Senior Environmental Specialist at the City of Toronto, the city is seeing a "triple threat": higher concentrations of population, an aging population, and a huge infrastructure deficit (D. MacLeod, personal communication, Feb 12, 2015). As a result, extreme weather is a key concern for Canada (Warren & Lemmen, 2014).

In Canada, we expect climate change to bring warmer weather to the country overall, with possible colder conditions in some locations. Heat waves will be longer, more frequent, and more severe, causing increased drought in some areas, and affecting water supplies and agricultural production (Berry et al., 2014). The increase in heat and drought will likely contribute to an increased numbers of wildfires. In contrast, there will be rising sea levels, coastal instability, and heavier and more severe rainstorms, causing mudslides and extreme floods (Warren & Lemmen, 2014). A study of the Toronto region's future weather and climate drivers predicts that average annual temperatures are projected to increase by 4.4° by the 2040-2049 period, with less snow and more rain in the winters, and more precipitation in general over the year. However, the future will see a smaller number of storm events, with each producing a higher amount of precipitation, increasing the likeliness of floods (City of Toronto, 2011).

Extreme weather events generally result in huge economic costs. Besides damage to hard infrastructure, extreme weather events can impact businesses, interrupt trade and public services, decrease accessibility, increase public health issues, damage personal property, destroy food supplies, and more. In 2011,

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Canadian insurance companies paid out $1.7 billion for property damage associated with wildfires alone (see Figure 2). It is projected that this record will be broken as insured losses from the 2013 floods in Alberta and Toronto are finalized (Warren & Lemmen, 2014). Globally, costs of insured damage from extreme weather events are projected to increase. For instance, the Association of British Insurers projects that by the 2080's, costs associated with insured damage due to extreme storms will rise by: 75% in the USA alone; 65% in Japan, and 5% in Europe (Hunt & Watkiss, 2010).
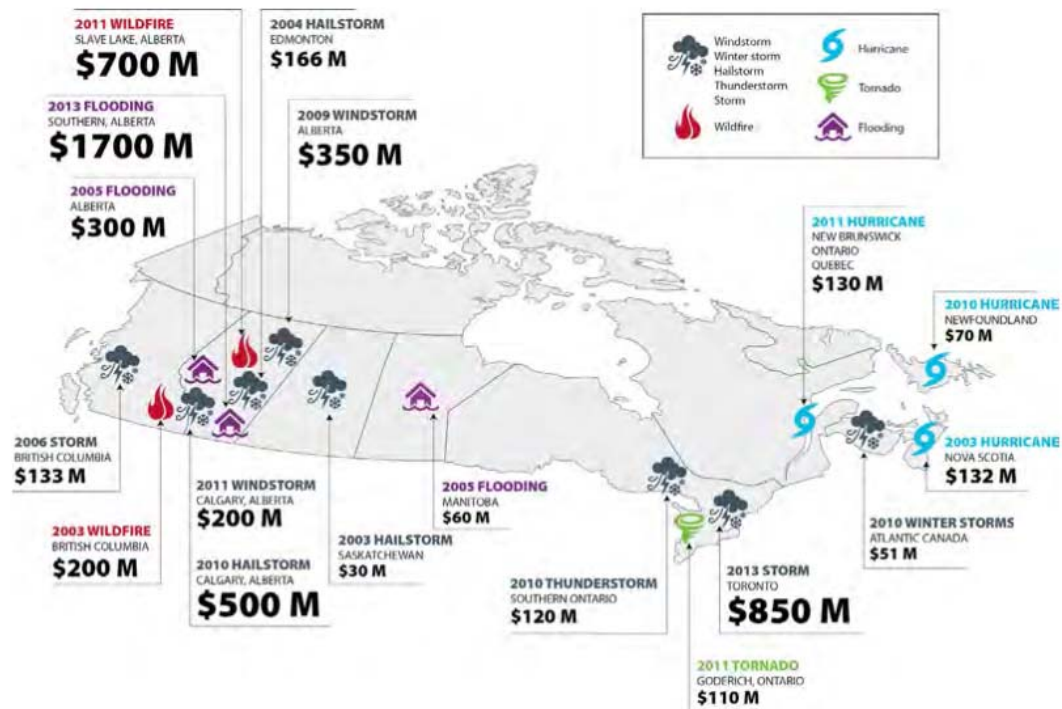
Figure 2. Examples of insured losses from extreme weather events in Canada.   *Source: F.J. Warren & Lemmen, 2014*

Extreme weather events can have economic impacts, but they can also hit populations in other ways. Extreme heat events in Europe (2003) and Russia (2010) caused an estimated 125,000 deaths (Berry et al., 2014). Fortunately, in most developed countries and cities, this type of human loss is not common. Other effects include heat-related illnesses, respiratory and cardiovascular disorders, changed patterns of illnesses, psychological health effects - including mental health and stress-related illnesses - as well as illnesses due to water and food shortages or contamination. It is common for extreme weather events to temporarily or permanently displace populations (Berry et al., 2014). Extreme weather events can also cause service disruptions, including delays in emergency services, shifting flow patterns for

hydroelectricity generation, utility and telecommunications disruptions, transportation delays, disruptions to business and trade, as well as changes to biodiversity.
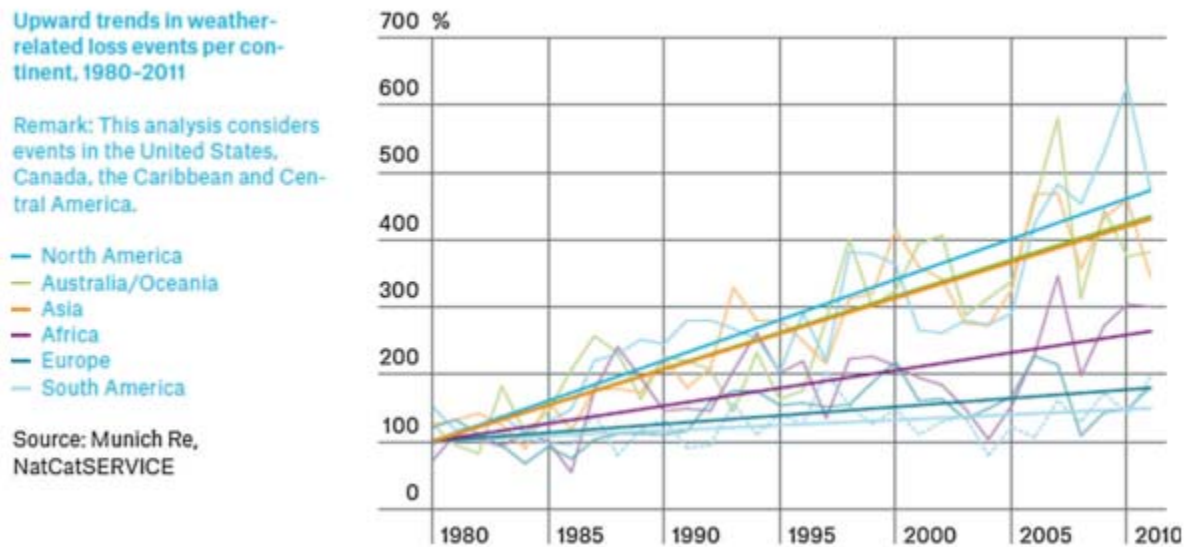
Figure 3. A global upward trend in weather-related loss events.   *Source: Leviäkangas & Michaelides, 2014*

2.4. Approaches to addressing climate change: mitigation vs. adaptation

Governments and organizations have typically taken two approaches to addressing the issues and increasing resilience to climate change and extreme weather: mitigation and adaptation. Mitigation generally refers to efforts that are taken to minimize the magnitude or rate of climate change and its impacts. Mitigation efforts generally involve reduction in human emissions of greenhouse gases (GHGs) – switching to low-carbon energy sources, or expanding forests – and can have positive global environmental impacts (Brennan, 2010). In Canada, many provinces and municipalities have already done work in regards to mitigation. In 2003, coal made up 25 percent of Ontario's power supply. In 2007, the province passed legislation that committed to phasing out all coal-fired power plants by the end of 2014. In April 2014, Ontario's last coal-fired power plant burned its final supply of coal, and switched to biomass, a renewable source. With this, the province became the first jurisdiction in North America to completely eliminate coal as a source of electricity (Ontario Ministry of Energy, 2015). With mitigation, the costs are local, and the benefits are global.

Adaptation generally refers to efforts to address the impacts of climate change that are already unavoidable (Davoudi et al., 2009), and tends to benefit only the local environment in which the

adaptation measure is put in place (Brennan, 2010). For climate change mitigation to be effective, global collaborative efforts are required (Davoudi et al., 2009). Some climate scientists argue that mitigation efforts should take priority over adaptation, and that adaptation measures that do not "directly and immediately facilitate mitigation" are arguably ineffective in the long run (Davoudi et al., 2009). However, this does not mean that the two approaches are mutually exclusive. On the contrary, they are very complementary approaches. Actions can support both mitigation and adaptation at the same time (Federation of Canadian Municipalities, 2009).

In the past, governments and organizations have tended to focus their efforts on the mitigation side of climate change. However, as the taboo on adaptation is slowly being lifted (Buuren, Eshuis, & Vliet, 2015), there is now a shift in focus from mitigation to adaptation (Davoudi et al., 2009). Jurisdictions use a combination of mitigation and adaptation measures in order to reduce vulnerability and increase their resilience to the impacts of climate change and extreme weather events. Jurisdictions with greater adaptive capacity or greater ability to adapt within a changing environment are more able to implement measures to improve resiliency.

2.5. Stakeholders in climate change and extreme weather events

Climate change and extreme weather events affect almost everyone, whether directly (e.g., loss of life, damage to property) or indirectly (e.g., health impacts from ecological changes). People commonly think of governments at various levels as having the primary responsibility of building a city's resilience to extreme weather events (The Rockefeller Foundation, 2014b), and it is easy to see why. Governments hold powerful tools that can be used to adapt to or mitigate effects of climate change at a broad level. However, the short-term and cyclical nature of the electoral cycle presents challenges of shifting priorities and short-term horizons (Burch, 2010; De Sherbinin, Schiller & Pulsipher, 2007). Many other stakeholders are also in a position take action to help strengthen a city's resilience to extreme weather events.

Some city functions are managed not by government, but by private corporations. Most business leaders believe that climate change and extreme weather events could hamper the ability of businesses to operate successfully. The private sector is well-positioned to take a key role for two primary reasons: access to private funds, and the ability to innovate and scale up smart ideas quickly (The Rockefeller Foundation, 2014a). Not-for-profit organizations can also play a role. Because they are responsible primarily to themselves and the communities of interest they represent, they are able to generate bold ideas. However, they may face challenges in development or implementation of projects, as they are dependent on funding from other organizations, which is often variable, and usually minimal (with the

exception of the largest not-for-profits). Each major sector faces a unique set of opportunities and challenges when it comes to building a city's resilience to extreme weather events. As later chapters will show, these differences become more complex as one begins to break down these major sectors into specific stakeholder groups.

There are a number of common barriers and challenges to building resilience to extreme weather events. As an example, qualitative impacts of climate change and extreme weather events are relatively easy to document, while quantitative impacts are more difficult to accurately estimate (Hunt & Watkiss, 2010; Bouwer, 2013), making it difficult for cities to predict future impacts and justify actions to mitigate them (Chagnon, 2003). In addition, risks and uncertainties of climate change and extreme weather events can be abstract (Pidgeon, 2012), and many stakeholders have a limited understanding of climate risks, and limited capacity to address those risks (Hunt & Watkiss, 2010). Finally, while efforts to build resilience are undertaken in many cities, cross-sectoral impacts of climate change risks are not yet fully recognized (Hunt & Watkiss, 2010).

Fortunately, many major cities are developing plans to respond to issues related to climate change. The city scale is becoming recognized as a level at which mitigation and adaptation measures can be very effective; climate change and extreme weather risks can be grounded at a scale that is relevant to public and private agents who can make decisions and implement responses (Hunt & Watkiss, 2010). In recent years, interdisciplinary partnerships and increased stakeholder engagement have resulted in great progress in climate change adaptation/mitigation research (Botzen, van den Bergh, & Bouwer, 2010; Brennan, 2010; Changnon, 2003; Hunt & Watkiss, 2010), and these multi-sectoral and interdisciplinary partnerships are gaining traction. Toronto's WeatherWise Partnership has brought together public, private, and not-for-profit representatives to engage in a discussion of the extreme weather resiliency of Ontario's electrical sector. Other networks like Ouranos, in Quebec, and the Clinton Climate Initiative C40 network have also engaged stakeholders in discussion and initiatives to address extreme weather impacts.

2.6. Summary

This chapter explored the general issues and impacts of climate change and extreme weather, and the major stakeholders affected and/or involved. Key points include:

- **Human contribution to climate change:** Human activity has contributed significantly to the state of the environment, and we now face major sustainability challenges.

- **Climate change impacts in Canada:** In Canada, climate change has resulted in an overall wetter country, with more heavy rainfall, increases in extreme heat, and declines in snow and ice cover.

- **Extreme weather impacts:**
  - Extreme weather events can cause damages that can be incredibly costly, and globally, costs of insured damage from extreme weather events are projected to increase.
  - Extreme weather events can also have other impacts, including impacts to public health, service disruptions, transportation delays, and changes to biodiversity.

- **Mitigation vs. Adaptation:** These are two approaches to addressing climate change and extreme weather. Mitigation refers to efforts to minimize the magnitude or rate of climate change and its impacts, while adaptation generally refers to efforts to address the impacts of climate change that are already unavoidable. Jurisdictions use a combination of mitigation and adaptation measures to reduce their vulnerability and increase their resilience to climate change and extreme weather.

- **Responsibility:** People commonly think of governments as having the primary responsibility of building a city's resilience to climate change and extreme weather events. However, these events affect almost everyone, and many stakeholders are able to take action to help strengthen a city's resilience.

The next chapter will cover the research design and methodology, as well as benefits of this research to planners, policy-makers, decision-makers, and communities.

3. RESEARCH DESIGN

3.1. Research objective

Extreme weather events will play a powerful role in shaping cities in the future. Many stakeholders are engaged in facing the challenges, barriers, and opportunities when it comes to building urban resilience to the increased frequency and intensity of extreme weather events. This report will explore the roles of various stakeholders in building urban resilience to climate change and extreme weather events in the Canadian context (with a focus on Toronto), and attempt to identify the key drivers of change, gaps in understanding, as well as ways in which stakeholders can collaborate to overcome dominant barriers, leverage opportunities, and improve a city's resilience.

3.2. Research questions

This study asks the following central questions:

1. What are the key drivers of change when it comes to decisions around climate change and extreme weather resilience?
2. How can key stakeholders collaborate to overcome dominant barriers, leverage opportunities, and improve a city's resilience to climate change and extreme weather events?

3.3. Structure of this report

Chapter 2 introduces the issue and focus of this research, and Chapter 3 defines the design of the research project. Chapter 4 begins with a broad overview of the regulatory planning framework and multi-stakeholder dynamics in Canada, as well as global best practices. Chapter 5 is an in-depth, qualitative case study of the city of Toronto, informed by interviews with 14 representatives of key stakeholders in Toronto, and includes an analysis of the major themes uncovered through the interviews and other research. The final chapter presents recommendations for government and other stakeholders.

3.4. Methodology

This study begins with a literature review to provide a broad overview of five key dimensions in building urban resilience to extreme weather events:

1. The regulatory planning framework, as it relates to planning for climate change and extreme weather events
2. Opportunities within major stakeholder groups
3. Risks and challenges facing major stakeholders groups
4. Multi-stakeholder dynamics in Canada
5. Best practices in collaborative efforts to build urban resilience to extreme weather events

While this report considers academic perspectives on and theories of collaborative action as a means to address climate change and extreme weather, this research is concerned with how the theory translates into action (or not). Therefore, a significant portion of the literature review is focused on gray literature such as the websites and reports produced by various organizations, networks, and partnerships.

An in-depth study of the City of Toronto's practices and processes related to building resilience to extreme weather was conducted. Toronto was selected for several reasons. With a population of more than 2.6 million, it is Canada's most populous city, and the fourth most populous in North America. At the municipal level, city officials have been thinking about climate change and extreme weather for a relatively long time, and the City has published relevant reports and plans for nearly a decade. One of Canada's most sophisticated conservation authorities, the Toronto Region Conservation Authority, has also been active in the region for more than half a century. Given the recent extreme weather events such as the July 2013 flood and the December 2013 ice storm, there is renewed interest on the topic of climate change and extreme weather resilience.

The author began the study of the City of Toronto's practices and processes by drawing on existing written documentation from the City, research institutions, not-for-profit organizations, private corporations, and media. Next, the author conducted interviews with 14 individuals to better understand the perspectives and roles of different organizations and sectors in building resilience to climate change and extreme weather. Stakeholders interviewed include representatives from government, academia, construction/development/engineering, not-for-profit organizations, insurance, and community groups, and were selected based on demonstrated leadership and innovation in sustainability practices and climate change awareness. As findings emerged in earlier interviews, they were shared with those interviewed later on in the process. An analysis of the findings reveal areas in which Toronto stakeholders are making positive impacts, where there are gaps in theoretical understanding of stakeholder roles in building extreme weather resilience, where there is room for improvement, and what the drivers of activity are. This analysis is synthesized in the final chapter, which presents recommendations to help stakeholders in Toronto and other Canadian cities address barriers and work together more effectively to increase urban resilience to extreme weather events.

3.5. Data sources

The data for this study consist of primary and secondary sources, and make use of the considerable literature available on the topics of climate change and extreme weather resilience, including peer-

reviewed articles, grey literature published by governments and other organizations, books, websites, and newspapers. Primary data were gathered through a series of interviews with representatives of key stakeholders. Efforts were made to secure interviews with senior level decision-makers within organizations, who had direct experience addressing climate change and/or extreme weather issues. Many of the people interviewed were individuals responsible for environmental or sustainability issues within their organizations. Interviews were between 30 and 60 minutes in length, and conducted either over the phone or in person. In two separate cases, interviews with two individuals from the same organization were conducted at the same time.

3.6. Limitations of this study

It should be noted that this study faced some limitations. First, the research and interviews focus on the City of Toronto, which is part of the Greater Toronto Area, a much larger metropolitan area that includes 24 other municipalities, and an additional 3.4 million people. The City of Toronto is an economic hub, drawing nearly half a million people from the surrounding region day. As a result, it is important to consider the issues and impacts that affect the region as a whole.

Second, the short time-frame for the study (one semester) restricted the number of interviews that could be carried out. In total 14 stakeholders were interviewed for the study. There was good representation of interview participants from across the public, private, non-for-profit, and community sectors, but representation within sectors was limited. Additionally, this study did not engage representatives from the provincial or federal levels of governments, or elected officials. Representation of private sector actors included individuals from construction/development/engineering, law, insurance, and real estate. Representation was most often at the organization or firm level, with only one interview with an association representative. As a result, outcomes of the interviews may paint a fairly detailed picture of an organization or firm's experience with climate change and extreme weather issues, but may not reflect the experiences and opinions of the sector as a whole.

Third, because those who were willing to participate in this study were individuals and organizations who were already aware of the issue, or people who were otherwise personally dedicated to the issue, this study does not capture the challenges faced and posed by individuals and organizations who are not engaged in climate change and extreme weather issues.

Finally, the rapid pace of change around this topic proved to be a challenge. Climate change and extreme weather resilience is a "hot topic" for many cities and regions, and the issue is evolving even as you read

this report. Many of the people interviewed for this study made references to impending changes, or advised the researcher to "keep an eye out" for things they could not yet disclose, but would become public in a short time.

3.7. Value of this research

3.7.1. Planners, policymakers, other decision-makers

This project aims to identify some of the challenges facing key stakeholders who are or should be engaged in improving urban resilience to climate change and extreme weather events. The interviews and findings will help planners and policymakers understand the complexity of the relationships, and the different roles each stakeholder plays, including their particular motivations, opportunities, barriers, and challenges. While the case study focuses on the City of Toronto, it is based on a solid understanding of the regulatory framework and multi-stakeholder dynamics in Canada. Planners and policymakers from across the country can use the lessons learned to understand how different stakeholder groups can and do influence each other. With this knowledge, they can craft policy recommendations aimed at engaging the key drivers of action, and assemble and engage collaborative stakeholder networks to advance resilience efforts.

3.7.2. Communities

This project has potential to benefit communities. By outlining a framework through which different stakeholders or actors play a role in increasing resilience to extreme weather events, efforts can be undertaken to minimize adverse impacts, and improve community resilience to these events. The analysis highlights motivations, opportunities, barriers, and challenges faced by various groups. This knowledge can help communities target their outreach and activities, and accelerate and augment initiatives to improve community resilience.

Dust storm in Phoenix, Arizona.

4. UNCOVERING THE STATE OF URBAN RESILIENCE TO CLIMATE CHANGE & EXTREME WEATHER

4.1. Understanding different approaches and the current regulatory framework

4.1.1. What is resilience?

In some ways, "resilience" is beginning to replace "sustainability" in everyday discourse, but among scholars, there is still debate over the meaning of the term (Davoudi et al., 2012). The word resilience comes from the Latin root *resi-lire,* which means to spring back. The word was first used to describe the characteristics of a spring, the stability of materials, and their resistance to external shocks (Davoudi et al., 2012). It was not until the 1960s that the word was used in ecology. Holling (1996: p. 33) defines ecological resilience as "the magnitude of the disturbance that can be absorbed before the system changes its structure". Adger (2003: p. 1), adds that it focuses on "the ability to persist and the ability to adapt". Davoudi et al., (2012: p. 332), question the outcome of resilience – "if resilience is mostly about preserving what we have and recovering to where we were, then surely a first pertinent question must be: [is what we have] worth preserving, and to what do we want to 'recover'?" This study uses a simple definition of resilience, and looks at resilience as a city or jurisdiction's ability to avoid or bounce back from an adverse event such as an extreme weather event.

4.1.2. Current regulatory framework for addressing climate change and extreme weather

Around the world, governments are responsible for creating regulatory frameworks to guide change and direct actions towards addressing climate change and extreme weather impacts. In Canada, there are three levels of government: federal, provincial, and municipal. Some responsibilities, such as agriculture and natural resources, are shared between the federal and provincial governments, while others are divided. The federal government has authority over areas of law that affect the whole country, including national defense, banking, and telecommunications. Provincial governments are responsible for different areas, including environment, energy production, and health care. Municipal governments are responsible for administration of a specific municipality, and have authority over things like water and sewer services, city parks, fire prevention, public transportation, building permits, and zoning. This section will explore the regulatory framework and climate change and extreme weather initaitives in place within and between each level of government.

Global

The federal government participates in global climate change mitigation programs, treaties and initiatives. The Montreal Protocol is an international treaty that aims to protect the ozone layer by phasing out production of substances that are responsible for ozone depletion. Since its adoption in 1989, there has been a sharp decrease in substances that deplete the ozone (Epstein, Pérez, Schoon, & Meek, 2013).

Globally, 98 percent of ozone harming substances have since been phased out, and is regularly referred to as the most successful treaty in UN history (UNEP, 2012). In Canada, over 400,000 tonnes of ozone depleting substances were phased out under the Montreal Protocol (Government of Canada, 2015a).

The United Nations Framework Convention on Climate Change (UNFCCC), which came into force in 1994, is an international environmental treaty with 165 signatories. The treaty was established to "stabilize GHG concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system" (article 2) (United Nations, 1992). This means that GHG concentrations need to be lowered to a level where ecosystems can naturally adapt to climate change. As part of Canada's participation in the treaty, Canada committed to reporting on its actions and progress towards meeting its commitments, supporting developing countries in their efforts, and conducting scientific observations of the world climate system (Government of Canada, 2012). The treaty does not set binding limits on GHG emissions for individual countries, but provides a framework for negotiating specific international treaties or protocols, including the Copenhagen Accord, and the Kyoto Protocol, which came into force in 2005. The Kyoto Protocol recognizes that developed countries are principally responsible for the current high levels of GHG in the atmosphere, and places a greater obligation on those nations to reduce GHG emission levels (United Nations Framework Convention on Climate Change, 2014). In 2005, as part of its participation in the Protocol, Canada committed to reducing its GHG emissions to 6 percent below 1990 levels by 2012. However, in 2012, Canada formally withdrew from the Protocol without meeting its target (Environment Canada, 2013a). In fact, at the time of withdrawal, the country's emissions were more than 30 percent above the target, and staying in the Protocol would have forced Canada to purchase nearly $14 billion in international carbon credits (Curry & McCarthy, 2011). The Conservative government cited several reasons for withdrawal from the Protocol, among them, the facts that:

1. The previous Liberal government agreed to the targets without adopting an action plan (Curry & McCarthy, 2011); and
2. The world's two largest emitters, China and the United States, did not sign the Protocol (Curry & McCarthy, 2011).

The Copenhagen Accord was introduced at the UNFCCC conference in 2009, and has engaged countries that produce over 80 percent of global GHG emissions, including the United States, China, and Canada. Canada, for its part, has committed to reducing its GHG emissions by 17 percent, from 2005 levels. The government also pledged to provide $1.2 billion from 2010 to 2012 to help developing countries address climate change (Government of Canada, 2014).

Canada is a strong supporter and participant in the United IPCC, an international intergovernmental body that endeavours to provide the world with a scientific assessment of global climate change and its potential environmental and socio-economic impacts. The body itself does not produce research. Instead, thousands of scientists from around the world voluntarily contribute research, which is then reviewed and endorsed by IPCC-affiliated governments through a formal review process.

National

Within the federal government, Environment Canada is the department that takes the lead on climate change issues. Its responsibilities include putting emissions reductions regulations in place for each of the main sectors of Canada's economy, reporting current emissions and estimating future emissions (Government of Canada, 2014). In addition to leading international negotiations and policy coordination, as described in the previous section, Environment Canada develops domestic programs to help the country address climate change issues. Canada's Economic Action Plan includes several initiatives to help mitigate climate change, including the Clean Air Agenda, which advances international climate change actions (through participation in the UNFCCC), and the Clean Energy Fund, which provides nearly $795 million to support the advancement of clean energy technologies. Efforts on the adaptation side help address effects of climate change and extreme weather events. One example of this is the Building Canada Fund, an $8.8 billion fund established in 2007, to support national, regional, and local infrastructure priorities. According to the federal government, Canada's Action on Climate Change includes four areas:

1. Reducing greenhouse gases, described in further detail below;
2. Helping Canadians adapt to climate change, with $148.8 million investment from 2011 to 2016, to support federal adaptation programs;
3. Creating areas of alignment with the United States, since Canada's economy is integrated with the United States; and
4. Being part of a global solution (e.g., participation in the UNFCCC).

In 2009, Canada formalized its commitment to the Copenhagen Accord in its 2010-2013 Sustainable Development Strategy, with inclusion of a target to reduce GHG emissions by 17 percent from 2005 levels, by 2020 (Government of Canada, 2014). This commitment has since been reinforced by Prime Minister Stephen Harper and other ministers. However, there is skepticism amongst environmentalists, oil company experts, academics, and other experts, that the government's plan will achieve the target (Macdonald, Monstadt, & Kern, 2013; Makja, 2012). Many believe that proposed actions do not adequately support the target. The federal government proposed a sector-by-sector regulatory approach

to reduce GHG emissions. However, to date, only three federal regulations are in place: 1) addressing renewable fuels (2010); 2) addressing emissions from electricity (2012); and 3) transportation (2014). According to Scott Vaughan, commissioner of the environment and sustainable development, given current trends, not only will we fail to reach the 17 percent reduction target by 2020, but GHG emissions are set to rise by 7.5 percent (Vaughan, 2012). Other reports are more optimistic - one suggests that existing federal and provincial programs will achieve half of the 17 percent reduction goal (Macdonald et al., 2013), but the popular sentiment is that the target will not be met.

Other assessments of the federal government's climate change programs suggest that the government is not seriously addressing its responsibility to act on this critical issue. In addition to withdrawing from the Kyoto Protocol, threatening developing countries with pulling international development assistance if they did not agree with Canada's position on the Protocol, and not implementing appropriate plans and actions to support committed GHG reduction (for the Copenhagen Accord), the Canadian government has refused to regulate industrial pollution until legislation is in place in the United States (Holmes, 2012). In 2011, Vaughan reported that the federal government's strategy is "disjointed, confused and non-transparent", and that overall, policies are now about 90 percent weaker in 2011 than they were in 2007 (Fitzpatrick, 2011; Vaughan, 2011).

Provincial

Provincial and municipal leaders are beginning to assume responsibility and take action, despite the federal government's failure to "pull its weight" on the climate change issue. Provincial governments control important aspects of climate and energy policy, including building codes, land use policies, and electricity supply decisions, and can therefore play an influential role in building resilience to climate change and extreme weather events. Canada has 10 provinces and three territories, many of which have implemented, or are in the process of implementing, policies and programs designed to address climate change. In 2012, the David Suzuki Foundation produced a report assessing and comparing provincial climate change plans, and found that the degree of effectiveness of various policies, programs, and targets varies across the country (Holmes, 2012).

Some provinces are establishing clear and ambitious climate change policies. Quebec and British Columbia have introduced economic incentives to shift to cleaner sources of energy, through implementation of carbon taxes (the Northwest Territories is also considering this), and Quebec's move to cap and reduce industrial emissions. In Ontario, the Green Energy Act has resulted in billions of dollars in investment in clean energy production and jobs. Nova Scotia has capped its electricity emissions, which are responsible

for almost half of the province's emissions. Ontario, New Brunswick, and Manitoba have begun shutting down polluting power plants – as mentioned earlier, Ontario became the first North American jurisdiction in North America to completely eliminate coal as a power supply. Six provinces and territories have strengthened their building codes to make new buildings more energy efficient (Holmes, 2012).

Other provinces are lagging behind in their efforts. Alberta and Saskatchewan are actually going backwards, by investing heavily in polluting industries. Between 1990 and 2009, Canada's GHG emissions increased by 17 percent, with the majority of the increases coming from those two provinces (Holmes, 2012). In addition, emissions from oil sands are projected to triple in the next decade unless drastic changes are made (Droitsch, Huot, & Partington, 2010). Table 1 provides a ranking of provincial and territorial climate change policies in 2011, as assessed by researchers at the David Suzuki Foundation. Table 2 breaks down and compares climate change policies and programs by province and territory.

Table 1. 2011 ranking of provincial/territorial climate change policies

Best	None
Very good	Ontario
	Quebec
	British Columbia
Good	Nova Scotia
	Prince Edward Island
Fair	Manitoba
	New Brunswick
	Northwest Territories
Poor	Newfoundland and Labrador
	Nunavut
	Yukon
Worst	Alberta
	Saskatchewan

Source: Holmes, 2012: p. 13

		Y=Yes	N=No		A=Announced but not yet implemented			NA=Not applicable					
ACTION PLAN AND POLICIES — MITIGATION	**BC**	**AB**	**SK**	**MB**	**ON**	**QC**	**NB**	**PEI**	**NS**	**NL**	**YK**	**NWT**	**NUN**
Has a current climate change action plan?	Y	Y	A	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Set emission reduction targets comparable to Kyoto?	N	N	N	Y	N	Y	N	N	N	N	N	N	N
Has set 2° C above pre-industrial temperatures as the upper limit for average global warming?	N	N	N	N	N	Y	N	N	N	N	N	N	N
Addressed emissions from sector with highest emissions?	Y	N	N	N	N	N	N	N	Y	N	N	N	N
Addressed emissions from sector with fastest-growing emissions?	Y	N	A	N	Y	N	N	N	Y	N	N	N	N
Has a broad-based carbon pricing policy (carbon tax or cap-and-trade)?	Y	N	N	N	A	A	N	N	N	N	N	N	N
Has meaningful energy efficiency, conservation and renewable energy policies?	Y	N	Y	Y	Y	Y	N	Y	Y	N	A	N	N
Has strong building code for energy efficiency?	A	N	N	Y	Y	A	N	N	Y	N	A	N	N
Has meaningful transportation policies?	A	N	N	N	N	N	N	N	N	N	N	N	N
Has policies that address urban sprawl?	Y	N	N	N	Y	A	N	N	N	N	N	NA	NA
Has meaningful policies to address emissions from industry?	Y	N	A	N	A	A	N	NA	N	N	N	N	N
Has a program to address emissions from government?	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Has a policy or program to protect natural carbon stores in forests and peatlands?	N	N	N	N	Y	N	N	Y	N	N	N	N	N
Uses the full suite of policy instruments, including regulations and disincentives?	Y	N	N	N	Y	N	N	N	A	N	N	N	N
Has reduced emissions since 1990?	N	N	N	N	Y	Y	N	Y	N	N	Y	NA	NA
Has reduced emissions 2006–2009?	Y	N	N	Y	Y	Y	Y	Y	N	N	Y	Y	N
Reduced emissions in 2009?[a]	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
CLIMATE CHANGE ADAPTATION													
Has a meaningful plan to adapt to climate change impacts?	Y	N	A	N	Y	Y	A	A	N	N	N	A	Y
Has a science advisory body that advises government on adaptation to climate change?	Y	N	N	N	Y	Y	N	N	N	N	Y	N	N
GOVERNANCE AND ACCOUNTABILITY													
Has established a cross-governmental climate change secretariat?	Y	N	A	N	Y	Y	Y	N	Y	Y	A	N	N
Reports on actions and outcomes from climate action plan?	Y	Y	N	N	Y	Y	Y	N	Y	N	Y	A	A

Municipal

Federal and provincial governments have an important role to play when it comes to climate change. However, as Table 2 reflects, they are predominantly on the mitigation side. Since adaptation efforts tend to benefit the local environment in which the measure is put in place (Brennan, 2010), municipalities can play a significant role in climate change adaptation. The city scale is increasingly becoming recognized as a scale at which there is great opportunity to make issues truly relevant to the private and public agents who can implement responses (Burch, 2010; Hunt & Watkiss, 2010). Like the federal and provincial governments, municipal governments have certain tools, including creation of by-laws, incentives, policies, programs and official plans.

In 2009, the Federation of Canadian Municipalities published a report on the Partners for Climate Protection (PCP) program, a program launched in partnership with ICLEI – Local Governments for Sustainability. The report outlined the various impacts of climate change on municipalities, and the need for municipal action. Over 180 Canadian municipal governments are involved in the PCP program, which uses a five-milestone framework to guide communities in assessing and reducing GHG emissions (Federation of Canadian Municipalities, 2009). Numerous municipalities are already taking steps to assess their vulnerability to climate change and create adaptation plans. Many of those initial municipal efforts were triggered by a multi-year project launched by Natural Resources Canada and the Canadian Institute of Planners (CIP). The project produced an official CIP policy on climate change (more on page 77), case studies, and workshops. More and more municipalities are now recognizing the importance of addressing climate change and extreme weather; however, municipal adaptation strategies are still at an early stage. There is no consistent approach, and there are limited resources and tools to help municipalities assess vulnerabilities (Federation of Canadian Municipalities, 2009). Examples of municipal efforts include:

- Several cities, including Halifax and Toronto, have published detailed assessments of climate risks and potential impacts for their communities;
- Delta, with the University of British Columbia, has investigated the risk of sea-level rise for its community;
- Toronto convened the WeatherWise Partnership, a cross-sectoral group of more than 50 leaders, with a goal of prioritizing and addressing extreme weather impacts;
- Globally, Vancouver and Toronto are members of the C40 Cities Climate Leadership Group (C40), a network of megacities taking action to reduce GHG emissions (detailed in section 4.4.2).

In theory, government policies and strategies should be coordinated at all levels to help reach targets and maximise efficiency and effectiveness of programs. In practice, challenges and barriers lead to fragmented activities and ineffective policies. Additionally, it is interesting to note that even within the realm of municipalities, the range of influence over various issues and areas can be highly variable, as demonstrated in Figure 4.
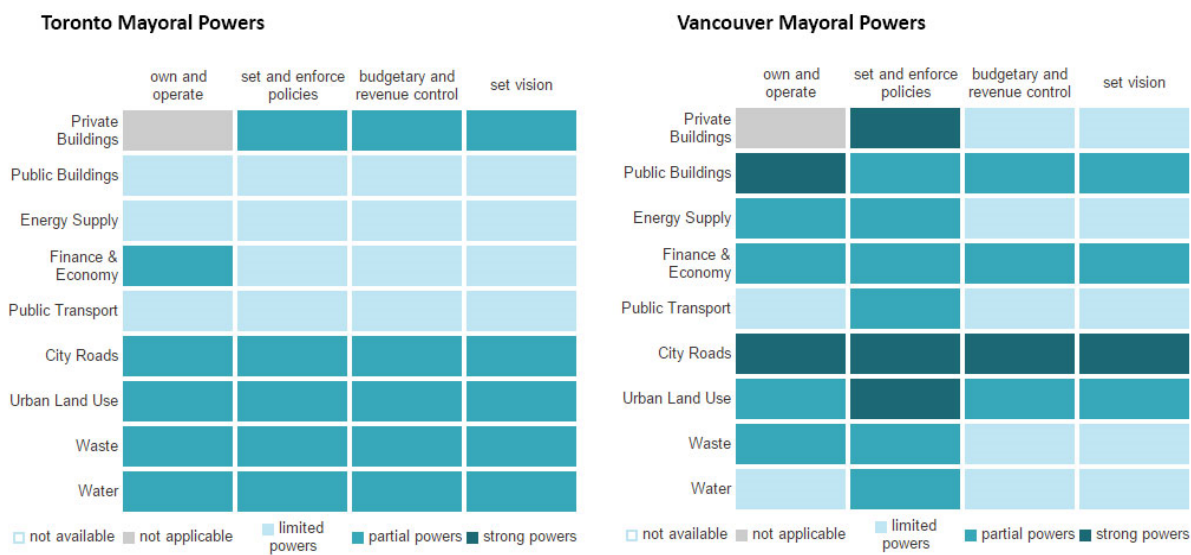

Toronto Mayoral Powers

	own and operate	set and enforce policies	budgetary and revenue control	set vision
Private Buildings				
Public Buildings				
Energy Supply				
Finance & Economy				
Public Transport				
City Roads				
Urban Land Use				
Waste				
Water				

not available | not applicable | limited powers | partial powers | strong powers

Vancouver Mayoral Powers

	own and operate	set and enforce policies	budgetary and revenue control	set vision
Private Buildings				
Public Buildings				
Energy Supply				
Finance & Economy				
Public Transport				
City Roads				
Urban Land Use				
Waste				
Water				

not available | not applicable | limited powers | partial powers | strong powers

Figure 4. Variability in mayoral powers in two Canadian municipalities.   *Source: C40 Cities, 2015*

4.2. Understanding the opportunities

4.2.1. General opportunities for a city

Resilience to climate change and extreme weather presents many opportunities for cities. Not only do resilient cities provide safe environments for their residents and businesses, and help ensure their prosperity, a city's exceptional resilience can also be an attractor for businesses, investments, and people. The Grosvenor Group, a U.K.-based property group that has invested in and developed real estate globally for the last 60 years, recently acknowledged that a city's resilience and vulnerability play a great role in the success of the company's long-term investments (Grosvenor Group, 2014). Resilience is now a variable that the company considers when it makes decisions about where to invest and where to develop new real estate. Canada is a relatively resilient country, compared globally. In fact, the top three cities ranked in the Grosvenor Group research are Canadian: Toronto, Vancouver, and Calgary (Grosvenor Group, 2014). This resilience is a value for businesses and residents, who have safe and more stable environments, with fewer risks to their health, security, prosperity, and well-being.

Some professionals working closely on these issues in Toronto have noted that there has been more recognition of the urgency and legitimacy of climate change and extreme weather over the last few years (P. Koval, personal communication, Feb 20, 2015). The extreme weather events of the last few years have brought the urgency of the issue to the forefront. This is important because as some researchers have found, the more people perceive a greater possibility of extreme weather, the more they will be willing to do to mitigate those effects (Jones, Davies, & Macdonald, 2012).

The public, private, and not-for-profit sectors are all uniquely positioned to address climate change and extreme weather resilience. The following sections will explore the opportunities within each sector.

4.2.2. The public sector

The public sector plays an important role in establishing an appropriate regulatory framework for addressing climate change, and possesses many tools for change, including cap and trade, taxes, non-price regulations, energy efficiency policies, transmissions planning, building codes, and more (Brennan, 2010). Because governments have the ability to shape the environment in many different ways, they can play an important role in preparing the environment to respond to future climate change and extreme weather impacts. The federal government has the ability to regulate pollution and GHG emissions, and provincial governments are responsible for natural resource management, electricity sectors, and have the ability to legislate building codes. According to a 2012 report from the David Suzuki Foundation, "all major sources of emissions contributing to climate change can be addressed through both federal and provincial policies" (Holmes, 2012: p. 8).

> **Box 1. Vancouver: Investing in critical infrastructure**
>
> City inhabitants depend on infrastructure to provide essential services, even during extreme weather events. The City of Vancouver has a city-wide water plan and a power back-up plan to minimize disruptions to its water supply and electrical power. The City is working to replace and maintain its sewer pipes, to help manage stormwater drainage. It is also undertaking the mapping of existing and possible urban tree canopies, and proposing strategies to increase coverage (City of Toronto, 2014).

Federal and provincial governments are primarily addressing mitigation, while municipal governments are well-suited to undertake adaptation measures to address climate change and extreme weather resilience. Formal and informal networks have been established to help cities share best practices with one another. Examples of these networks include:

- The Federation of Canadian Municipalities and ICLEI's Partners for Climate Protection Program
- Quebec's Ouranos
- The Clean Air Partnership's Alliance for Resilient Cities
- C40 Cities Climate Leadership Group

Around the world, many best practices showcase the great opportunities available to the public sector. Some of the cities with the strongest climate change resilience initiatives include New York City, San Francisco, Chicago, Seattle/King County, Calgary, and Vancouver. Some best practices from these cities include developing and monitoring performance indicators, analyzing cost of inaction, investing in critical infrastructure, updating building regulations and land use planning principles, caring for vulnerable populations, protecting and restoring natural systems, collaboration, and education/outreach (City of Toronto, 2014).

> **Box 2. King County: Flood Buyout and Home Elevation Program**
>
> King County, to which Seattle belongs, has a Flood Buyout program, which is designed to purchase homes through the voluntary sale of homes in areas that are at high risk of floods or serious erosion. Not only does this help residents in vulnerable areas, but it also helps the county reduce costs related to emergency response actions. As an added bonus, it also creates open spaces, and improves flood storage and conveyance (City of Toronto, 2014).

> **Box 3. San Francisco: Social media savvy.**
>
> San Francisco takes advantage of the social media reach, and uses a blog, Facebook, Twitter, smartphone app, and online quiz to educate and motivate the public to take important steps to advance their personal resilience. The Department of Emergency Management has also created an emergency preparedness hub, called SF72, which uses a website and brochures to provide information on how to stay connected and be prepared in the event of an emergency (City of Toronto, 2014).

4.2.3. The private sector

Private corporations manage a large portion of a city's functions (The Rockefeller Foundation, 2014a). The private sector cannot "make the rules" by creating policies and regulations. However, it can take action in some areas where governments may be more limited, and determine the solutions that are needed. The government can then follow by implementing those governing rules (B. Feltmate, personal communication, Feb 26, 2015).

A recent survey of global business leaders found that 90 percent believe they have a role to play in improving climate change resilience, particularly to reduce disruptions to businesses and increase competitiveness (The Rockefeller Foundation, 2014a), especially since climate change and extreme weather issues have become more important and urgent in the public eye in recent years.

The private sector is able to access private funds, and it has the ability to innovate and scale up ideas relatively quickly (The Rockefeller Foundation, 2014a). Insurance companies in particular have a great incentive to become drivers in climate change and extreme weather resilience, since damages to the built environment and infrastructure can result in enormous insurance payouts, as discussed in section 2.3. Insurance companies can work with governments to push for new policies, or provide incentives to people and organizations who have taken steps towards climate change adaptation (Botzen, van den Bergh, & Bouwer, 2010).

One of the main drivers of action for the private sector is competition. While reputation no longer ranks as one of the top reasons for action within the private sector (The Rockefeller Foundation, 2014b), competition is still an important factor, as demonstrated by the growing demand for corporate social responsibility reporting. To some organizations, climate change and extreme weather resilience may be seen more as risk mitigation than corporate social responsibility, however, either way, good performance and a proactive stance could be a competitive edge, as demonstrated by the Grosvenor Group's research on resilient cities (Grosvenor Group, 2014)(also see section 4.2.1).

4.2.4. Not-for-profit

The not-for-profit sector has a number of key opportunities and advantages. Because they are mission- or cause-oriented, the people involved in the organizations tend to be passionate and committed to advancing the organization's missions (Hall et al., 2003). Because of the nature of the organizations, they generally are not seen as competitors to the public and private sector, but rather as complementary entities. This complementarity allows them access to key leaders in business, labour, and government, and gives them the ability to build and leverage relationships across sectors and organizations to achieve their goals (Hall et al., 2003). In Toronto, it was the Greater Toronto CivicAction Alliance's position as a neutral, unaffiliated party that allowed them to bring competitors (e.g., Canada's five national banks) and competing interests (private developers, banks, governments, utilities, etc.) to the same table, and engage them in a discussion about collaborative action to reduce commercial building energy use in Toronto. The result of this was the creation of a regional energy reduction challenge called the Race to Reduce.[1]

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[1] From 2008 to 2013, the author managed the Race to Reduce program at the Greater Toronto CivicAction Alliance.

4.3. Understanding the risks and challenges

4.3.1. General risks and challenges

As mentioned in section 2.3, climate change and extreme weather present a number of risks to cities, including damage to infrastructure and personal property, destruction of food supplies, increase in public health issues, disruptions of essential services, transportation delays, disruptions to business and trade, and much more.

Canadian cities are well-positioned to take action on climate change and extreme weather. However, they still face many challenges, including regulatory, structural/operational, behavioural, and contextual challenges (Burch, 2010). As noted by many researchers, one of the general challenges is limited information about economic impacts and adaptation processes. On the data side, there is a need to quantify potential future losses from extreme weather events. However, climate scientists currently lack a common analytical framework for quantifying potential losses, which presents a barrier when it comes to implementing actions to address impacts of extreme weather events (i.e., if we are unable to quantify the impacts, then actions to address them cannot be justified) (Bouwer, 2013; Changnon Jr., 2003). On the operationalization side, more information is needed about how to govern climate change adaptation effectively – e.g., how to mainstream adaptation into various policy areas, how to mobilize private actors, and how to connect short and long term policy goals (Buuren et al., 2015).

Most organizations did not systematically consider climate change and extreme weather impacts as part of their regular planning until fairly recently, even though issues of climate change and extreme weather events have been around for decades. Some cities are only just starting to assess vulnerabilities to climate change and extreme weather, and to develop adaptation plans. Many more have yet to start. Publicly listed organizations and some privately-held companies have started corporate social responsibility programs over the last decade. Over 7,000 organizations worldwide participate in the sustainability reporting through the Global Reporting Initiative, a non-profit organization that has developed a comprehensive, and globally accepted sustainability reporting framework; the number of organizations reporting grows annually (Global Reporting Initiative, 2015). Organizations are usually motivated by benefits to the bottom line, but there are also positive effects to society and to the environment. However, climate change and extreme weather impacts are only addressed through corporate social responsibility if the impacts are "material" to the reporting organization. In general, sustainability practices are not yet part of business as usual, since breaking from routinized practices is generally considered to be costly, increasing economic risks, decreasing predictability, and requiring more thought

(Buuren et al., 2015). Progressive organizations, according to Burch (2010), do allocate a special position or department to address sustainability issues. The effectiveness of these positions or department varies by organization, but one great challenge is that these roles are generally poorly integrated into the organizational structure, and do not have decision-making or business planning powers (personal communication, July 2014).

Climate change and extreme weather events affect actors and stakeholders in different ways. Challenges are complex and differ between different actors and stakeholders (Buuren et al., 2015). Some actors may even stand to benefit from such impacts, such as those involved in rebuilding efforts following disasters (The Rockefeller Foundation, 2014a). The following sections will break down some of the specific risks and challenges experienced by stakeholders in three broad sectors: public, private, and not-for-profit.

4.3.2. The public sector

The public sector is responsible for ensuring the basic well-being of citizens and businesses, and plays an important role in establishing an appropriate regulatory framework for addressing climate change, as demonstrated in section 4.1.2. Some of the risks faced by the public sector include infrastructure damage and repair/replacement costs, disruptions to essential and emergency services, long term economic and environmental changes, impacts to public health, and legal liability issues.

The sector in general is equipped with tools that can help set the stage for addressing climate change, such as policies, incentives, and plans, but it still faces a number of challenges, including ineffective tools, political cycles, and fragmentation of government. A common expression or tactic, in business and politics, is to reach for the "low hanging fruit". This refers to the practice of setting or identifying the easily attainable goals that can provide "quick wins" with minimal effort. This practice is useful in providing quick results and accomplishments to provide further motivation for continued work, but if not combined with goals that are longer-term and more ambitious, can be ineffective. In terms of climate change and extreme weather resilience, governments tend to:

1. Rely on tools that have are generally less effective, such as voluntary programs and subsidies;
2. Focus on the easy measures, like setting policy targets and drafting vague plans that target only government GHG emissions but not private sector behaviour; and
3. Ignore the difficult but necessary measures, which can create positive behavioural changes, but may take much longer to implement, such as road pricing and adopting rigorous green building codes (Richardson, 2012).

One reason for this pattern may be the structure of the electoral system itself. Climate change and extreme weather adaptation/resiliency are long-term issues requiring measures with long-term horizons. However, politicians typically operate on short-term horizons (De Sherbinin, Schiller, & Pulsipher, 2007). This pattern has two key effects:

1. **Progress on initiatives, policies, and resources put in place by a government may be reversed or even eliminated by a new incoming government.** For seven years, Toronto had a mayor, David Miller, who prioritized environmental issues. He advocated for better public transit - with the introduction of Transit City, a plan in collaboration with the Toronto Transit Commission, including development of seven priority public transit corridors - introduced a multi-million dollar "clean and beautiful" city initiative, and unveiled aggressive plans to reduce the city's GHG emissions. When Mayor Rob Ford came into office in 2010, he attempted to cancel the Transit City project[2], at a cost of $49 million, and reduced funding in the Toronto Environment Office, among other measures. Not only do actions like this reverse years of progress, but they can be costly.

2. As noted earlier in this section, **politicians are likely to adopt the "low hanging fruit" in their election campaigns, rather than advocate for more effective, but perhaps controversial, measures.** As an example, congestion pricing is a tool that has been effective in influencing travel behaviour and reducing GHG emissions in places like Singapore and London, UK (Bhatt, Higgins, & Berg, 2008). In order to help build "political will" and support for unpopular, controversial effective measures, such as congestion pricing, Toronto region not-for-profit CivicAction introduced the Your32 campaign, whereby individuals holding and running for political office were invited to pledge their support for new tools to improve the transportation system, *without being specific about the types of tool each individual supported.* 187 regional elected officials supported the campaign (Greater Toronto CivicAction Alliance, 2014). However, had the campaign advocated specifically for congestion pricing tools, rather than mix congestion pricing with other more palatable tools, it is unlikely that many politicians would have publicly endorsed the campaign for fear of losing voters.

A final major challenge is the fragmentation and lack of coordination between and within the various levels of government. Each of the eleven federal and provincial governments is acting almost completely alone (Macdonald et al., 2013). As such, it does not make economic sense for any one government to

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[2] Parts of the Transit City plan were eventually incorporated into the Province's MoveOntario 2020 proposal.

invest heavily in mitigation efforts (whose benefits have a wider geographic impact), since there is no guarantee other governments will reciprocate (Macdonald et al., 2013). One factor that potentially stands in the way of a nationally coordinated climate change strategy is the lack of strong progressive leadership on this issue by the federal government. Individually, some provinces are "stepping up to the plate", but others are not. Another factor may be that mitigation and adaptation costs vary drastically throughout the country (Macdonald et al., 2013), based on contributions to GHG emission. As Figure 5 and Figure 6 show, provincial and territorial contributions to GHG are unbalanced.

Figure 5. Changes in provincial GHG emissions since 1990 (metric tonnes C02e).   *Source: Holmes, 2012: p. 7*
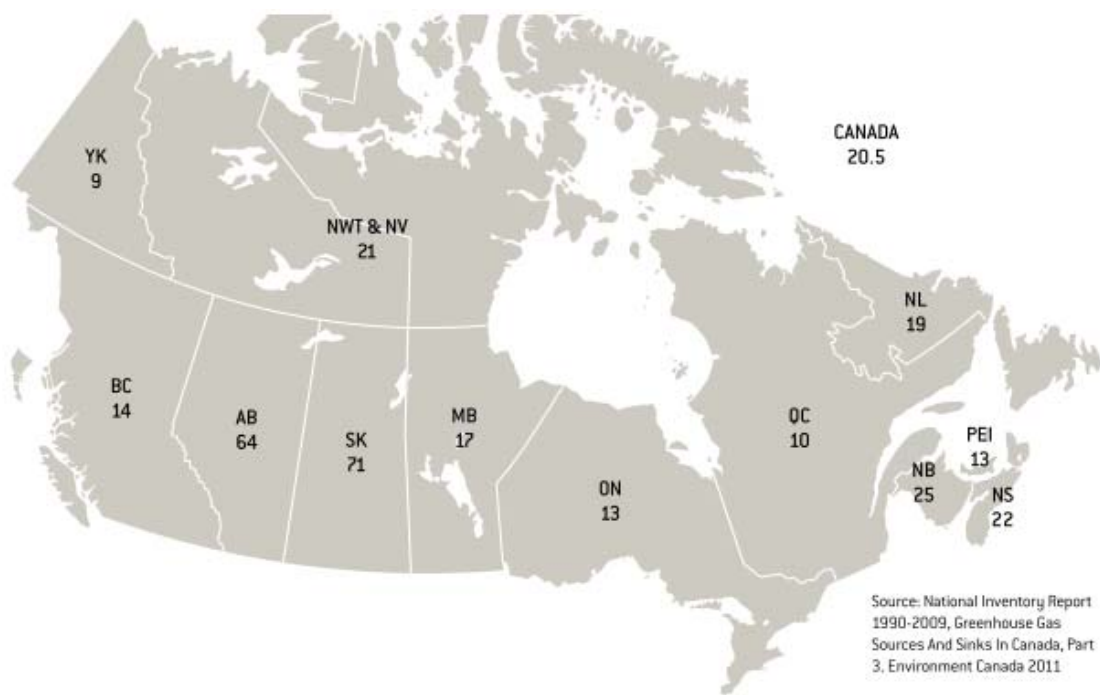
Figure 6. Per capita GHG emissions, 2009 (metric tonnes of CO2e).   *Source: Holmes, 2012: p. 9*

4.3.3. The private sector

Historically, responsibility for climate change adaptation and extreme weather resilience of cities has rested with the public sector. However, because businesses face a number of risks with the changing climate and increase in extreme weather events, the private sector is increasingly seeing that they have a role to play in improving climate change resilience (The Rockefeller Foundation, 2014b). Climate change and extreme weather risks to businesses include disruptions to business as usual, interruptions to energy and water supplies, supply chain impacts, as well as economic impacts during and after events. According to a 2014 Rockefeller Foundation survey of 248 executives at companies around the world, executives from 79 percent of cities surveyed believe that warming temperatures could hamper the ability of businesses to operate successfully in their cities (The Rockefeller Foundation, 2014a). Representatives of many organizations within the private sector are beginning to realize the importance of the issue and envisage a role for their organizations in building resilience to future impacts of climate change and extreme weather events. They are open to collaboration, but still see the biggest role resting with policy-makers (The Rockefeller Foundation, 2014a). The private sector also faces challenges when it comes to building resilience to climate change and extreme weather, but they are different from the public sector.

One of the biggest challenges to action is that the private sector is still largely driven by self-interest (e.g., productivity, competitiveness, bottom line, etc.). As a whole, the sector is not yet assuming responsibility

for the loss of livelihoods, illnesses related to extreme weather, or increased vulnerability of communities, although there is discussion that they should also be accountable.[3] Private sector actors see this as the responsibility of the government (The Rockefeller Foundation, 2014b), and their own role as to be responsive to their own stakeholders, who are typically not the community at large.

Different actors within the private sector have different impacts on the environment, and are affected by climate change and extreme weather events in different ways. This unequal distribution of risks and impacts may affect their willingness to take action. For instance, risks to the insurance industry are much higher and more direct than for other industries, which may prompt insurance to be active players (Botzen et al., 2010). Likewise, as disruptions to electricity and water supplies are a major risk to businesses, communities, and the general operation of a city (The Rockefeller Foundation, 2014b), utility companies face enormous pressure to act (Greater Toronto CivicAction Alliance, 2012). As with the examples of the imbalance in GHG emissions between provinces, demonstrated in Figure 5 and Figure 6, some industries are greater contributors to GHG emissions than others, creating negative externalities that all stakeholders need to address. In the absence of public pressure and regulations, and a general unwillingness to act on the part of the GHG producers, achieving greater resilience to climate change and extreme weather events will prove to be a challenge.

4.3.4. Not-for-profit

There are countless organizations in the not-for-profit sector whose missions are to address climate change and extreme weather. These organizations are driven by people who are passionate about the issues they work in support for. As a whole, Canada's not-for-profit and voluntary sector accounts for 8.5 percent of the nation's gross domestic product (Hall, Barr, Easwaramoorthy, Sokolowski, & Salamon, 2005). Not-for-profit organizations are generally responsible to their cause, their supporters, and their communities of interest, rather than to the population at large. They often have the support of governments and private organizations, in the forms of grant and subsidy programs, as well as in-kind support and donations. As a result, they may be more nimble, be able to take bolder initiatives, and act more quickly on issues than governments and some private sector organizations. Combined, these

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[3] During one of the author's interviews, the interviewee mentioned Blue Dot, a project of the David Suzuki Foundation (personal communication, K. Nasmith, Apr 4, 2015). The Blue Dot project is a movement by people across Canada who want the right to breathe fresh air, drink clean water, and eat healthy food to be legally recognized at all levels of government. If the Canadian Charter of Rights and Freedoms was to be amended to recognize the aforementioned rights, then all governments and organizations would have a responsibility to ensure the sustainability and livelihoods of Canadian communities.

qualities mean that the not-for-profit sector has an ability to make a significant environmental impact. Many of the risks faced by the private sector are shared with the not-for-profit sector, such as disruptions to their operations, and interruptions to energy and water supplies. However, because of the nature of the sector, it also faces some unique challenges, including financial capacity, resource capacity, and structural capacity (Hall et al., 2003).

The ability of not-for-profit organizations to carry out research and implement projects can depend highly on funding. Their funding is often unstable, and is sometimes delivered through membership fees or via a for-profit arm of the organization. Often, not-for-profit and voluntary organizations are at the mercy of donations and grants from private corporations or governments (Hall et al., 2005), and are at risk when governments undergo funding cutbacks (Hall et al., 2003). A challenge for not-for-profit organizations is that they face administrative and resource burdens that are associated with acquiring and reporting on funding (Hall et al., 2005). The processes to apply for and secure government funding are long, and even after funding is secured, organizations need to provide regular reports to show that progress on milestones is being made. In addition, some larger not-for-profit organizations bring on specialized staff *specifically* for the purpose of writing and managing grants. This places additional strain on these organizations and may instead hamper their abilities to fulfill their missions.

Many not-for-profit organizations operate on shoestring budgets and rely heavily on volunteer resources in order to fulfill their missions, and this requires capacity to recruit, train, and manage qualified volunteers (Hall et al., 2003). One study of Canadian not-for-profits found that volunteers typically prefer short-term assignments, and are less committed to their voluntary activities than in the past (Hall et al., 2003), which may lead to higher turnover, requiring not-for-profit organizations to devote even more resources into their volunteer programs. Not-for-profit organizations face shortages of paid staff with specialized skills who can manage the volunteer recruitment/training programs, secure funding, and run initiatives. This staffing gap can lead to recruitment and retention problems, which, according to the same study, are some of the most significant issues for many of the study participants (Hall et al., 2003).

Financial and resource limitations can affect a not-for-profit organization's capacity to function effectively. Without core funding and stable, long-term funding, organizations spend resources to seek funding, and are unable to devote resources to develop organizational vision and strategic planning to address their mandates. Without sufficient resource capacity, not-for-profit organizations are not able to carry out planning, development, and implementation of projects to further their goals.

As sections 4.2 and 4.3 demonstrate, the opportunities, risks, and challenges to climate change and extreme weather are complex and vary significantly amongst the three major sectors. When different stakeholders combine their respective strengths and weaknesses, effective collaborations can be born.

4.4. Collaborative efforts on climate change and extreme weather issues

4.4.1. Why collaborate?

Climate change and extreme weather events do not respect geographic, political or other boundaries defined by society, and ramifications stretch across policy domains and institutional levels (Buuren et al., 2015). Climate change affects almost everyone, either directly or indirectly, and there are many interdependencies between city inhabitants, the built environment, its hinterland, and the wider global economic and social context (Hunt & Watkiss, 2010). Therefore, in order to effectively build resilience to climate change and extreme weather events, collaboration amongst many stakeholders is required.

A recent study by Hunt and Watkiss (2010) examined literature and case studies of climate change impacts and adaptation in cities around the world, and found that the cities that are generally relatively advanced in their assessments of climate risks and adaptation, such as London and New York, had higher levels of stakeholder engagement in the early stages in their risk assessments. By working together, stakeholders can combine their various strengths and areas of opportunity, and eliminate or minimize barriers and challenges. For instance, municipalities have tools, but can only do so much to mitigate or adapt to climate change (Burch, 2010). Table 3 was compiled by the author, based on a literature review as well as the author's own experience working on collaborative projects with organizations from the public, private, and not-for-profit sectors. The table highlights some of the characteristics of all three sectors, as they relate to decisions in climate change and extreme weather issues. As shown, each sector holds certain strengths, and its weaknesses are complemented by opportunities in other sectors.

Fortunately, governments and industry around the world are increasingly pursuing collaborative approaches to climate change adaptation (Warren & Lemmen, 2014), and some progress is being made (Buuren et al., 2015; Changnon Jr., 2003). The next section will describe some of these efforts as they are experienced in Canada.

Table 3. Characteristics of the public, private, and not-for-profit sectors, in climate change and extreme weather.

	Public sector	**Private sector**	**Not-for-profit**
Scope	Usually broad	Local or global	Local or global
Funding	Varies, usually good access to different sources of funds through taxes and fees	Varies, usually high	Varies, usually minimal
Responsible to	Citizens, different levels of government	Stakeholders/ Funders	Themselves/ communities of interests
Decision-making model	Based on elections, democratic support	Senior decision-maker(s), such as a board, executive committee, or individual	Network of individuals with similar interests
Tools	Cap and trade, taxes, non-price regulations, policies, building codes, etc.	Advocacy, voluntary programs	Advocacy, voluntary programs
Boldness of action	Usually less bold, challenging, broad issues	Can be bold, but grounded in reality of stakeholders and funders	Can have very bold ideas, but perhaps not in actions, due to low funding or support
Speed of action	Usually slow - bureaucracies can slow implementation	Can act quickly, responds to the market	Varies – depends on resources and funding
Communities impacted	Usually very large impact that affects many people	Can be small or large depending on the project	Usually impacts a more focused or specific community of interest

Source: Author

4.4.2. Multi-stakeholder dynamics in Canada

Over the last couple decades, multi-stakeholder partnerships and networks have been formed in Canada to address the effects of climate change and extreme weather. While the scope, stakeholders, and mandates vary across organizations, one thing is clear – most stakeholders see the benefits of working across organizations and sectors, and are capitalizing on these opportunities to work towards more effective solutions to address climate change and extreme weather. Some of the networks include actors from across the country, and even from around the world, while others are more geographically focused.

Some are driven by powerful stakeholders such as governments, while others are driven by the private sector, academia, and through grassroots initiatives.

C40 Climate Leadership Group

The C40 Climate Leadership Group (C40) is a network of megacities from around the world that are committed to addressing climate change by reducing GHG emissions and climate risks. In 2005, London Mayor Ken Livingstone convened representatives from 18 megacities to pursue action and cooperation to reduce GHG emissions. At the time, a handful of mayors around the world were working in isolation to make their cities more sustainable. This initial meeting resulted in creation of C40, which today has more than 70 megacity members, representing more than half a billion citizens around the world (see Figure 7). The C40 creates a forum where cities can collaborate, share knowledge, and drive meaningful, measurable, and sustainable action on climate change. Two Canadian cities are members of the network: Vancouver as an Innovator City, and Toronto as a Megacity. Typically municipalities are the key bodies participating in the network. However, for a period of time, leadership change in Toronto led to funding cuts and resource shortages (as described on page 44), and not-for-profit organization CivicAction became the key liaison representing Toronto.
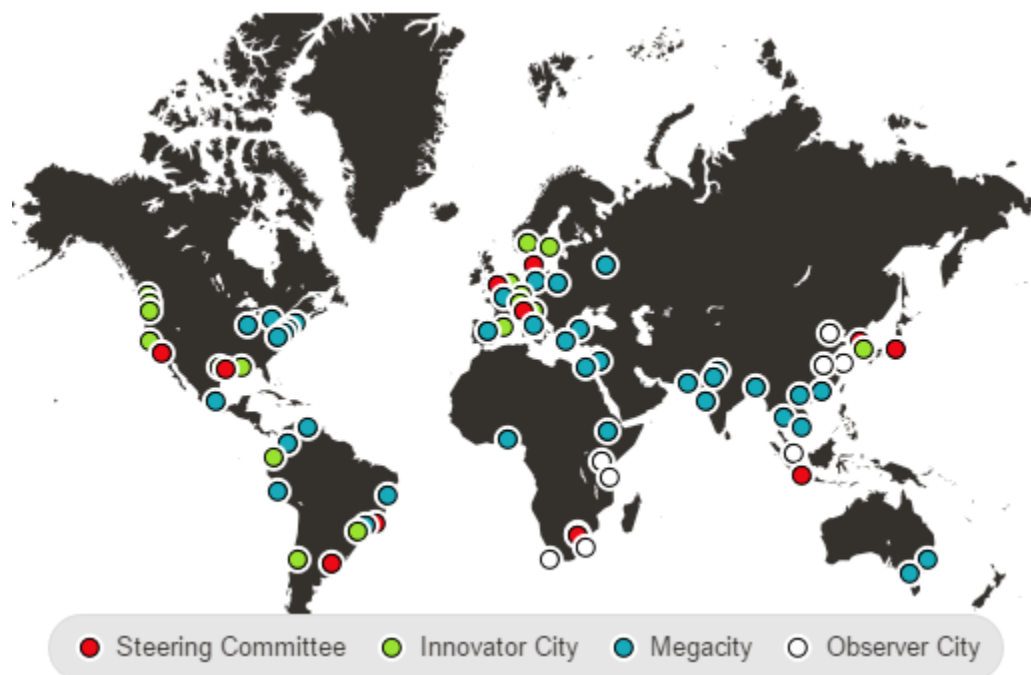

Figure 7. C40 Climate Leadership Group member cities.   *Source: C40 Cities, 2015*

Partners for Climate Protection (PCP) program

The Partners for Climate Protection (PCP) Program is a joint initiative between the Federation of Canadian Municipalities (FCM) and ICLEI – Local Governments for Sustainability, started in 1994. It is a network of over 250 municipal governments across Canada that have committed to reducing GHGs to help address climate change. The program provides participating municipalities with a five-milestone framework to guide communities in assessing and reducing GHG emissions (Federation of Canadian Municipalities, 2009). As the Canadian component of ICLEI's Cities for Climate Protection network, it is part of a global network involving over 1,100 communities.

Climate Change Adaptation Project (CCAP)

The previously described multi-stakeholder programs/networks primarily involve municipal/government stakeholders. The Climate Change Adaptation Project (CCAP), launched in 2010 and championed by Intact Financial Corporation and the University of Waterloo, brings together more than 80 experts from diverse backgrounds, including academia, law, banking, insurance, NGOs, Aboriginal communities, utilities, and more, to focus on Canada's climate change adaptation priorities (University of Waterloo, 2012). In June 2014, they launched a national initiative involving the implementation of 20 climate change adaptation projects designed to reduce the physical, financial, and social impacts of extreme weather events (University of Waterloo, 2014). The projects, which will be carried out in Alberta, British Columbia, Nova Scotia, Ontario, and Quebec, will showcase viable and cost-effective adaptation solutions that can be replicated in communities across the country (University of Waterloo, 2014).

Ouranos

Based in Quebec, Ouranos is a consortium on regional climatology and adaptation to climate change. The consortium was created in 2001, as a joint initiative between the Quebec government, Hydro-Québec, and Environment Canada, with funding from Valorisation-Recherche-Québec, an investment corporation set up by the Government of Quebec to stimulate academic research and increase benefits to society in Quebec. Ouranos' vision is to mesh climate science with the adaptation needs of society, in order to help society adapt to increasing climate change. To date, there are 14 members, and five affiliated members. Members include various Quebec government departments, utilities, Environment Canada, universities, and one private corporation.

The WeatherWise Partnership (WWP)

In 2011, the City of Toronto and the Greater Toronto CivicAction Alliance convened the WeatherWise Partnership (WWP), a group of more than 50 public, private, and not-for-profit organizations from across

the Toronto region that had already begun working to protect the region's residents, organizations, infrastructure, and environment from extreme weather (Greater Toronto CivicAction Alliance, 2012). The WWP's first task was to identify risks and prioritize areas for action and investment. Continuity of electrical power during extreme weather events was identified by the WWP as a top priority, with transportation, telecommunications, and food being recognized as secondary priorities. The WWP convened several meetings with key stakeholders in the electricity sector. However, due to limited resources, the meetings were unable to continue as planned. While the WWP is no longer active as a committee, the City of Toronto has continued to drive work under the banner of the WeatherWise Partnership.

Project Neutral (PN)

Project Neutral began as a project of the Emerging Leaders Network (a program of the Greater Toronto CivicAction Alliance), and is now a project of Tides Canada Initiatives. The project aims to work with homeowners, neighbourhoods, municipalities, and the energy sector to support local and national GHG reduction efforts, and help communities transition to carbon neutrality (Project Neutral, 2015). It was launched in two Toronto communities in 2010 - Riverdale and The Junction - and later in Guelph. A key component of the project is the annual Household Carbon Footprint Survey, which has been completed by more than 1,000 households since 2010. 80 percent of households that have consistently completed the survey from 2010 to 2013 have seen an average 20 percent reduction in GHG per household (Project Neutral, 2015).

Summary of stakeholder dynamics

As this section has demonstrated, there is no shortage of stakeholder desire to work collaboratively. All of the networks and groups discussed so far have engaged multiple stakeholders from at least one, but usually more sectors, in order to make advancements and build communities and cities that are more climate resilient. However, as Table 4 shows, the range of stakeholders engaged by each group or network varies significantly. While some, such as the C40 Climate Leadership Group and the Partners for Climate Protection program, include stakeholders from just one or two sectors (in these cases, municipalities), others try to broaden their representation and reach by including stakeholders from a diverse range of sectors.

Group/network		Stakeholders							
		Fed.	Prov.	Mun.	Utilities	Not-for-profit	Private	Academic	Community
Group/network	C40					Occasional			
	PCP								
	CCAP								
	Ouranos								
	WWP	Inactive	Inactive		Inactive	Inactive	Inactive	Inactive	
	PN								

4.5. Summary

This chapter has explored the state of urban resilience to climate change and extreme weather. The following ideas were discussed:

- **Mitigation and adaptation:** Two main approaches to addressing climate change are mitigation and adaptation. Past efforts, particularly efforts at larger scales, have focused mainly on mitigation. However, there is now a shift from mitigation to adaptation, and cities are increasingly becoming recognized as jurisdictions that can play a greater role.

- **Canadian regulatory framework:** Canada has a complex regulatory framework that involves three levels of government. This chapter gave an overview of some of the climate change programs and regulations at the global, national, provincial, and municipal levels.

- **Opportunities, challenges, and barriers to action:** Broad groups of stakeholders were also introduced in this chapter, and the various opportunities, challenges, and barriers to action faced by each stakeholder group were explored. Differences and complementarities were summarized in Table 3.

- **Collaborative efforts**: The chapter was brought to a close with a review of a handful of existing collaborative efforts that tackle climate change and extreme weather issues, as well as a brief analysis of each collaborative group/network's stakeholder engagement.

The next chapter will look at Toronto's experience in addressing climate change and extreme weather issues, with particular focus on the last three points.

Toronto under an extreme cold weather alert.   *Source: www.citynews.ca*

5. BUILDING RESILIENCE IN TORONTO

5.1. Introduction

This chapter presents a study of Toronto, Canada, with a focus on the range of stakeholders involved and the particular opportunities and challenges they face individually and collectively as they work to build climate change and extreme weather resilience. Toronto has a population of more than 2.6 million (nearly 5.6 million in the total Greater Toronto area) as of the 2011 census, and the largest city in Canada. The city is also an economic hub for the country, as home to the Toronto Stock Exchange, and with headquarters of Canada's five largest banks and many large Canadian and multinational corporations in its central business district. A handful of organizations have been looking at climate change and extreme weather issues for some time, but recent extreme weather events, such as the flood in July 2013, which is listed by the Insurance Bureau of Canada as Ontario's most costly natural disaster (Mills, 2013), and the ice storm in December 2013, which left hundreds of thousands without power for days, and even weeks, has renewed interest in understanding and addressing the issue.

From February to May 2015, the author conducted interviews with 14 people in Toronto, representing a range of stakeholders involved in, or affected by, extreme weather. Organizations consulted include: the municipal government (secretariat); engineering/construction/development; law firms; academics; conservation authority; not-for-profits; and a community group. A complete list of individuals interviewed can be found in the appendix.

The interviews shed new light on some of the challenges faced in dealing with climate change and extreme weather resilience. Toronto is fortunate in that over the last half century, and particularly the last decade, some organizations and individuals have devoted significant attention to climate change and extreme weather impacts and preparation in the city. Organizations and communities within the city have also have a wealth of experience in working collaboratively across sectors, as evidenced by projects like Project Neutral, Race to Reduce, and the WeatherWise Partnership. However, when it comes to addressing climate change and extreme weather resilience, organizations in the city still face challenges and barriers. These can be grouped into three main themes:

1. Uncertainty about climate change and extreme weather
2. Mixed messages around the risks and urgency of the issue
3. Pointing fingers

The remaining sections of this chapter will explore these themes.

5.2. Toronto as a leader

5.2.1. Setting the stage for a resilient city

Toronto has been preparing to be more resilient to extreme flooding events for more than half a century. The Toronto and Region Conservation Authority (TRCA) was founded in 1957 as a merger of four Toronto-area authorities, after the deaths and damages of Hurricane Hazel in 1954. At the time, it was not a surprise that the storm was coming – what was a surprise to the city and the conservation authorities were the on-the-ground implications. According to Brian Denney, CEO of the TRCA, early conservation reports of the 1950's dealt with the realities of flooding situations, but after Hurricane Hazel, the emphasis on being prepared for extreme weather started to evolve (B. Denney, personal communication, Apr 17, 2015). Among other things, the organization helps interpret the climate change and extreme weather risks to the region, maintains a comprehensive record of floodplain maps and data, and has helped create development controls to prevent development in vulnerable areas (B. Denney, personal communication, Apr 17, 2015).

For the last decade, the City of Toronto has "had a radar" on climate change and extreme weather. In 2007, Toronto's City Council unanimously adopted Toronto's *Climate Change Action Plan,* a plan which set bold targets for the reduction of GHG emissions, and outlined actions for the City and its residents, businesses and communities to reduce emissions, clean the air, and create a sustainable energy future. This was followed up in 2008, with *Ahead of the Storm: Preparing Toronto for Climate Change*, a document that describes a series of short- and long-term actions for a comprehensive climate adaptation strategy for Toronto. In April 2011, the City released an update, providing a summary of the projects and programs that the City had undertaken in support of climate change adaptation. While the update contained a list of 76 programs or action, the City acknowledged that many of the actions were pursued with climate change adaptation as a "co-benefit". In other words, adaptation was not the primary motivation for the action, but instead was a secondary benefit. Later that year, the City commissioned SENES Consultants to undertake a study to help the city better understand what projections on future climate mean, in order to guide the City in making investment and budgetary decisions on infrastructure and service provision responsibilities. The results were documented in the December 2011 report, *Toronto's Future Weather and Climate Driver Study*. In 2013 and 2014 respectively, the Toronto City Council adopted the reports, *Resilient City: Preparing for Extreme Weather*, and *Resilient City – Preparing for a Changing Climate*. Also in 2014, the City released a staff report titled *Best Practices in Climate Resilience from Six North American Cities,* which highlighted best practices of six cities known to have strong initiatives in the field of climate

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change resilience and adaptation. In 2011, the City, along with the Greater Toronto CivicAction Alliance, convened the WeatherWise Partnership (see page 52). The group of more than 50 public, private, and not-for-profit organizations included representatives from all key stakeholders[4], and worked to identify and prioritize areas for action and investment. However, limited resources at the City has meant that discussions and initiatives with these stakeholders has been limited.

Table 5. Summary of climate change and extreme weather reports released by City of Toronto.

2007	Climate Change Action Plan
2008	Ahead of the Storm: Preparing Toronto for Climate Change
2008	Report on Public Engagement on Climate Change Adaptation
2011	Toronto's Adaptation Actions (April 2011 update)
2011	Toronto's Future Weather and Climate Driver Study
2013	Resilient City: Preparing for Extreme Weather Events
2014	Resilient City – Preparing for a Changing Climate
2014	Best Practices on Climate Resilience from Six North American Cities

Source: City of Toronto

Most of the interview participants felt that Toronto is in a fairly good position with regards to its preparations and actions towards climate change and extreme weather resilience, although most did not feel that Toronto is currently a leader on the global scale. According to Doug Webber, Executive Vice President at Halsall, and Director of Sustainability for the Canadian division of Halsall's parent company Parsons Brinckerhoff, if climate change and extreme weather resilience can be framed as a financial issue, stakeholders can use it as an attracting feature for financial (and other) companies, proactively identify areas for improvement, and devise plans to address those areas. In doing so, it would then have a competitive advantage in terms of attracting residents, tourists, businesses, investments (D. Webber, personal communication, Feb 20, 2015).

5.2.2. A solid foundation of collaboration

Collaborative models bring together different stakeholders to address issues by sharing skills, resources, and best practices. Many organizations in Toronto have experience in working collaboratively within and

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[4] All stakeholders required for the purposes of the WeatherWise Partnership were present and willing to participate in discussions. However, in a later project organized by the City of Toronto, critical infrastructure groups were surveyed on their ability to continue their operations under an extended power disruption, and the City was unable to get any responses from fuel providers (D. MacLeod, personal communication, Feb 12, 2015)

across sectors in order to achieve goals. CivicAction is an organization that is built on the premise that urban issues can be addressed most effectively through cross-sectoral multi-stakeholder collaboration. Through various collaborations, organizations in Toronto have successfully tackled issues ranging from diversity in leadership to traffic congestion, to green procurement, and more. Organizations in Toronto are eager to continue working together to solve problem and advance issues. This section highlights some successes and lessons learned from various collaborative projects. These lessons can be applied to future collaborations dealing with climate change and extreme weather resilience.

Multi-stakeholder engagement

The unique characteristics of each type of stakeholder presents different sets of opportunities and challenges to action (see Table 3). These differences and resulting complementarities are an illustration of why engaging stakeholders from multiple organizations and sectors is beneficial to making progress on an issue. For example, as discussed previously, governments have the ability to use tools and policies to make broad regulatory changes that can be enforced, but because of the breadth of impact, numbers of people and organizations involved, election and voting considerations, etc., their actions are typically less bold and more incremental than those of other actors. Private and not-for-profit organizations, in contrast, do not have the ability to create regulations or enforceable policies. However, because they work on different scales than governments, and with different stakeholders, they are able to implement bolder, sometimes ground-breaking actions. This is just one example of how different organizations can be complementary within a collaborative model. According to Richardson, interactions among and between different levels of government, various jurisdictions w/in a level of government, non-profit organizations, business associations, community groups is essential to the adoption of local climate change actions has been; this is a multi-level governance approach (Richardson, 2012:69).

Neutral convenor

Some collaborative groups or networks are convened by government or single major body, like the United Nations Environment Programme. Some, such as the C40 Climate Leadership Group, are composed of elected peer members. Others are single organizations, like Project Neutral and Race to Reduce, or partnerships of several organizations, for instance, PCP and CCAP. For a collaborative model to be effective, especially collaborative groups or networks that bring together competing organizations or interests, it may be helpful for stakeholders to be convened by a neutral party without a vested interest in the outcome of the collaboration. Because of the nature of this requirement, the convenor will usually be a not-for-profit organization or government. CivicAction was the neutral party that convened the

stakeholders for the Race to Reduce. As Linda Mantia, founding Co-Chair of the Race to Reduce, said, "It was a very daring thing to put competing landlords and tenants in the same room together and expect them to share their ideas, and issues" (Greater Toronto CivicAction Alliance, 2013: p. 5). CivicAction was able to do just that by creating a neutral platform to engage key leaders in business, labour, and government, and by creating a space where all stakeholders felt that their needs, challenges, and opportunities were being recognized and addressed in a fair manner. CivicAction has been convening stakeholders around various issues for years, and its position as a neutral party has proven effective. Shortly after the Race to Reduce launched, the City of Toronto wanted to convene members to start the WeatherWise Partnership, and they reached out to CivicAction to help bring stakeholders to the table (L. Domenico, personal communication, Feb 19, 2015).

Complementary interests or visions

Collaborative approaches involve multiple stakeholders who often have different motives for engaging in the effort. For example, the Race to Reduce had an overarching goal of improving the environment by reducing energy use in the Toronto region. However, participating stakeholders were involved for different internal reasons. The Province of Ontario and the Ontario Power Authority were motivated by the Province's public commitment to decommission all coal-fired power plants by the end of 2014 (Ontario Ministry of Energy, 2015). To do this, they needed to reduce peak electricity use in the province, and found that support of the Race to Reduce would be one way to achieve that goal. Electrical and gas utilities were encouraged to meet targets for their respective demand management programs. Private sector participants had very different motivations. Commercial building landlords participated because they wanted to remain competitive to attract high quality tenants to their buildings, while tenants participated to 1) push their landlords to create better environments in their buildings, and 2) increase their attractiveness to employees and clients. Municipalities participated to demonstrate to their constituents that they were leaders, and consultants engaged to contribute technical expertise and provide advice to participating commercial buildings, thus generating business for themselves. As this example shows, while each stakeholder may have a different motive for engagement, the complementarity of those motives created an environment where all stakeholders felt that they would benefit from participating.

Strong leadership

As important as it is to engage a range of stakeholders who are affected by or can influence an issue, it is equally crucial that the individuals representing the engaged stakeholders be in leadership roles, and that they have the capacity to make key decisions and/or influence outcomes at their own organizations, especially if the collaborative group is action-oriented. The core leadership group that drove the creation of the Race to Reduce was made up of 50 senior leaders from the various stakeholder organizations. Within the organizations, CivicAction targeted individuals with titles such as President, Senior Vice President, Senior Director, Chief Sustainability Officer, and

> **Box 4. What happens when the right leadership is not engaged?**
>
> Around 2009, CivicAction convened a multi-stakeholder group around the topic of green procurement (sustainable purchasing practices for businesses). Senior leaders responsible for procurement were engaged. However, it was quickly discovered that while the procurement executives were extremely knowledgeable of the topic at hand, and had good ideas on how to make improvements to procurement practice, the decisions required for this group to take action often rested with different departments (often real estate). Thus, the outcomes of the green procurement leadership group were more on the research side (production of case studies, creation of a hub to share resources) and resulted in very little action.

Partner, who represented the real estate or sustainability divisions within their respective organizations. Not only did these individuals have influence within their own organizations, but they did with each other as well. According to some members of the leadership group, the opportunity to be part of a group with such seniority and influence was a major driver for their regular engagement in the group's activities.

Having the right information

It is important that stakeholders have the information they need to make decisions. In the case of the Race to Reduce, participants were generally well aware of the commercial building sector's impact on the environment. To persuade stakeholders to take action, CivicAction worked with stakeholders and technical experts to develop and promote a few key tools. The first of these was a business case for landlords and tenants of commercial buildings, to show how taking action to reduce energy use would have positive impacts to their triple bottom line. Second, throughout the challenge, CivicAction worked with participants to compile case studies highlighting successes to share with other participants. Third, CivicAction created a series of toolkits to help participants implement collaborative energy reduction actions, including toolkits for participants to conduct midnight audits of their spaces and for landlords and tenants to work together to create green leases. Finally, and perhaps most importantly, participants stated that a major barrier to action was the lack of a standard tool to measure progress across portfolios, between competitors, and across geographic regions. CivicAction consulted extensively with the members

of the core leadership group to select and champion a standard tool/methodology to benchmark building performance and measure progress.

5.3. Challenges and barriers

It is clear from the interviews and the literature that although the City of Toronto and the Toronto Region Conservation Authority are active in the area of climate change and extreme weather resilience, there are still challenges with uncertainty, mixed messages, and pointing fingers.

5.3.1. Uncertainty

The first challenge is that there is a general sense of uncertainty regarding climate change and extreme weather. Uncertainty plays a role in three ways: psychologically or cognitively, economically, and politically.

Psychological or cognitive uncertainty

Climate science and information about climate change and extreme weather risks are rapidly changing as we gain more knowledge about potential future impacts. Some researchers suggest that humans, as a species, find it very difficult to perceive risks, and generally are only concerned with issues with which they have had direct experience (D. Webber, personal communication, Feb 20, 2015). While this perception is not confirmed in Canada, it is well-supported in international studies. A survey conducted in the U.K. in November 2009 showed that only 76 percent of respondents were very or fairly concerned about climate change, down from 81 percent in August 2006 (Pidgeon, 2012). Similar trends were also reported in other parts of Europe, the United States, and worldwide (Pidgeon, 2012). According to Jason Thistlethwaite, Assistant Professor at the University of Waterloo and Director of the Climate Change Adaptation Project (Canada), without direct, personal experience, and certainty that something will happen at a certain time, change is hard: "[extreme weather is] going to happen sometime, but we don't know when, and we don't really know what's going to happen, so it's very difficult to motivate anybody to do anything" (J. Thistlethwaite, personal communication, Feb 26, 2015).

Shifting perceptions

Attitudes and psychological/cognitive uncertainty are beginning to shift now, as knowledge on climate change and extreme weather evolves and the data become more plentiful. Most of the people interviewed had either direct or indirect experience with this psychological or cognitive uncertainty, and some reported seeing changes even in short timeframes of five to ten years. Pat Koval is a partner at Torys LLP, and while her work is not exclusively focused on climate law, she framed the legal sector's role in the

issue as one of helping all stakeholders understand climate law and their respective legal liabilities. She has given dozens of presentations to municipal representatives and private sector participants, and has found that over the last five years, resistance from her audiences has gone down, partly due to the growth in and acceptance of recent climate change data (P. Koval, personal communication, Feb 20, 2015). Blair Feltmate, Associate Professor, Program Director Sustainability Practice at the University of Waterloo and Chair of the Climate Change Adaptation Project (Canada), shared a personal anecdote. Because of his expertise and his work on the climate change issue in Canada, he is frequently invited to speak at various events. His talks focus on climate change, extreme weather, adaptation, and the need to take action on adaptation within cities (both natural and physical infrastructure). He said that five or six years ago, the reception was lukewarm, with about half the audience accepting the relevance of the topic, and half not thinking it was relevant. At a recent talk, a couple people in the audience began to question the challenge of climate change and extreme weather events, and their legitimacy, and they were, in effect, booed out of the room by the rest of the audience (B. Feltmate, personal communication, Feb 20, 2015). This general sentiment of a shift in thinking on climate change and extreme weather was consistent amongst those interviewed for this study.

Economic uncertainty

In terms of economic uncertainty, there are two dimensions:

1. Unclear and inaccessible data on vulnerabilities and impacts
2. Return on investments

Unclear and inaccessible data

There are still gaps in our knowledge about climate change and extreme weather. The rate of climate change and increasing frequency and intensity of extreme weather events has meant that historical data are no longer reliable predictors of future events (IPCC, 2012). Climate scientists have developed many different climate models attempting to predict future climate changes. Climate models are extremely complex, and consider factors such as region, seasons, radiation, aerosols, clouds, precipitation, temperatures, oceans, soil moisture, permafrost, and large scale phenomena (e.g., tropical cyclones, jet streams, convergences, etc.). Because of this complexity, most climate models are global or regional in scale (City of Toronto, 2011), and can give a good indication of general trends and impacts that are predicted. However, because there can be great variations in climate change conditions even within regions (see section 2.1), cities relying on the larger-scale models still face some degree of uncertainty in the projections. The City's 2011 *Future Weather and Climate Driver Study*, a 328 page document, helps to

improve the level of certainty regarding the magnitude of climate change. As a result, the city is better guided in its investments and adjustments related to climate change adaptation. Many cities, however, are not able to commission studies to assess their specific climate drivers and risks. This inability to quantify and predict future risks can make it difficult for organizations or jurisdictions to justify actions to mitigate impacts (Changnon Jr., 2003).

Another example of a gap in data is in floodplain mapping. The TRCA maintains comprehensive floodplain maps for the Toronto region. For most of the rest of Ontario, conservation authorities (which are unique to Ontario) maintain floodplain maps. There are delays in updates of floodplain mapping by conservation authorities due to lack of adequate funding, and some parts of Ontario do not even have conservation authorities. Across Canada, floodplain management is done by different organizations (and some by municipalities) with different levels of expertise, leading to outdated floodplain maps. This gap in data has implications for location decisions (e.g., developers may unknowingly build on floodplains, people and businesses may not know they are located in vulnerable areas until it is too late), investment decisions (e.g., people or organizations may decide not to invest in precautions because they are unaware of the exposed risks), and insurance decisions (detailed in section 5.3.2). Fortunately, Public Safety Canada has proposed a National Floodplain Management Framework through an assessment of the state of floodplain mapping across Canada (C. Sharma, personal communication, Apr 17, 2015).

Many others, including community organizations and students, are doing work to address urban resilience to climate change and extreme weather. One issue that they face is the availability and consistency of data. David Kossowsky is a Master of Landscape Architecture student at the University of Toronto, who is working on an inter-university project aimed at identifying vulnerable areas in the Toronto region in order to design solutions to improve their resiliency. In the initial stages of the project, his team faced significant challenges in obtaining the appropriate data sets to do the required analysis, often because data are not available or complete. Some regional municipalities have open data (Toronto, Peel, Halton, and York Regions), but the types of data that are available are inconsistent across regions, sometimes incomplete, and often the datasets required for analysis are not available for open access, making regional risk analysis a difficult task for those who do not "own" the information (D. Kossowsky, personal communication, May 5, 2015).

Return on investments

Finally, the steps that are necessary to improve resiliency to climate change and extreme weather all require investments of some kind, whether it is financial investment in infrastructure upgrades, resource

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investments for planning and policy changes (such as updating restrictions in land use planning), or investments in public awareness campaigns that push for a change in behaviour or proactive action of some kind, clear and conscious decisions must be taken. Blair Feltmate and Jason Thistlethwaite from the University of Waterloo argue that the difficulty in this is that we do not yet know the returns on investments from those types of actions (B. Feltmate and J. Thistletwaite, personal communication, Feb 26, 2015), again, making it difficult to justify significant actions or investments.

Political uncertainty

On the political front, there are several factors that contribute to uncertainty.

1. Political fragmentation
2. Design of disaster relief/recovery programs
3. Funding
4. Leadership change

Political fragmentation

As noted in section 4.3.2, political fragmentation can be a barrier to greater progress on climate change and extreme weather resilience. Several of those who were interviewed felt that the government as a whole should and could play a significant role in building resilience, but were unclear about the roles and responsibilities of each level of government, and how they worked together. Each level of government has responsibility over different (and sometimes overlapping) areas, as explained briefly in section 4.1.2. Because of this, it can be beneficial to have a nationally coordinated, progressive climate change and extreme weather strategy. However, appropriate leadership is lacking, particularly at the federal level. The current conservative government, led by Prime Minister Stephen Harper, has strong views when it comes to issues of climate change, environment, and sustainability. Unfortunately, those views have resulted in clear inaction, and lack of progressive policies to drive change. As Jason Thistlethwaite puts it, "the last time the federal government played an active role in promoting disaster resiliency was the Flood Disaster Reduction Program" (started in 1975) (J. Thistlethwaite, personal communication, Feb 26, 2015). This program ensured that provinces had the capacity to assess their risks and vulnerabilities, for example, by creating floodplain maps to enforce land use restrictions on municipalities and improve awareness. Through the program, over 900 communities were mapped and designated, and many communities across the country were actually zoned on the basis of these maps (Environment Canada, 2013b). Unfortunately, funding for the program was cancelled while former Prime Minister Jean Chrétien was in office (J. Thistlethwaite, personal communication, Feb 26, 2015).

Today, the federal government has Canada's Action on Climate Change, which aims to reduce GHG emissions, help Canadians adapt to a changing climate, conduct world-class research to inform decision-making and the development of policies and program, and provide leadership in international climate change efforts. Through Action on Climate Change, $148.8 million will be invested over five years (beginning 2011) to support federal adaptation programs. Additionally, as mentioned on page 65, Public Safety Canada has assessed state of floodplain mapping across Canada.

However, there is still a lack of a coordinated federal climate change and extreme weather resilience strategy to guide provincial and municipal actions. One example of how this lack of overall strategy is manifested is in how the various provincial governments have chosen to address GHGs (or not). On April 23, 2015, Ontario released its 2015 budget, and announced that the province would move forward with a cap-and-trade system as its carbon pricing mechanism (Province of Ontario, 2015), joining Quebec and California in the Western Climate Initiative. The Province of British Columbia manages GHGs with a carbon tax. Other provinces do not have systems in place to manage or limit GHG emissions, which is problematic, especially considering the fact that some of Canada's highest emitters (see Figure 5 and Figure 6) are not participating in either scheme. When provincial and territorial leaders met in Quebec City in April to discuss an environmentally responsible Canadian energy strategy, the only premier absent from the discussions was Alberta premier Jim Prentice. When Ontario Premier Kathleen Wynne signed the cap-and-trade deal with Quebec, she called on the federal government to step up and provide leadership – "I believe that having a federal partner that isn't standing on the sidelines, that is engaged in the discussion, will help" (Vendeville, 2015). Quebec Premier Philippe Couillard invited provinces to ramp up their efforts to fight climate change, and also called on the federal government to co-operate with the provinces (Vendeville, 2015). Steven Guibeault, co-founder and senior director of Montreal-based environmental group Équiterre, said that "we can't hope to exploit our full potential with an empty chair, which is what's happening now in the federal government" (Vendeville, 2015).

Lack of integration into key decision-making documents

A lawyer who specializes in climate law lamented that climate change adaptation has not been fully integrated into the key acts governing municipal decision-making (climate lawyer, personal communication, Apr 17, 2015). In Ontario, this includes documents such as the municipal act, the planning act, and other associated regional plan documents. In the absence of this information, some lawyers may not realize that climate change adaptation needs to be taken into consideration.

In the event of large-scale natural disaster, the federal government provides financial assistance to provincial and territorial governments through the Disaster Financial Assistance Arrangements (DFAA) program, which is administered by Public Safety Canada. Since the program's inception, it has paid out more than $3.4 billion in post-disaster assistance to provinces and territories with the costs of response and of "returning infrastructure and personal property to pre-disaster condition", as noted on Public Safety Canada's web page for the program (Public Safety Canada, 2014). The problem with this program requirement, according to Jason Thistlethwaite, is that it "doesn't do anything for the type of disaster you could see in the future" from a climate or extreme weather perspective. Even in February 2015, when the program was updated for the first time in 44 years, this element of the program remained unchanged. This issue is not unique to Canada. Often, following disasters, repairs and reconstruction are completed to simply restore damaged property to pre-disaster conditions, even though reconstruction periods offer the most economically and practically feasible opportunities to create improvements and build resilience to future climate change and extreme weather events (J. Thistlethwaite, personal communication, Feb 26, 2015).

Funding

As David MacLeod, Senior Environmental Specialist at the City of Toronto, noted, the city's limited resources to address environment, climate change, and extreme weather issues has meant that even though a committee of more than 50 senior stakeholder representatives (the WeatherWise Partnership) has been convened, formal activities for the committee have been put on hold. Lack of funding and other resources severely limit the progress that can be made in building resilience to climate change and extreme weather. Infrastructure Canada has a Building Canada Fund, which was established to make investments into public infrastructure owned by provincial, territorial, and municipal governments. For municipal infrastructure projects, costs were shared on a one-third basis – with one third paid each by the municipal, provincial, and federal government. However, the issue with the fund is there is no portion of the fund earmarked for disaster resiliency projects (J. Thistlethwaite, personal communication, Feb 26, 2015).

Under Canada's Economic Action Plan 2014, the federal government committed to providing $200 million over five years (starting in 2015-16), to develop a National Disaster Mitigation Program, mainly focused on flood mitigation. This funding is equivalent to $5.63 per capita[5], over five years. As a contrasting

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[5] Based on Statistics Canada 2014 population estimate of 35.5 million

example, in 2010, the United Kingdom committed more than £2 billion (nearly $3.7 billion CAD, or $57.70 per capita[6]) to support flood and coastal erosion adaption. Clearly, this illustrates the discrepancy between the will and the means for municipalities and other organizations to implement resiliency measures.

Leadership change

Some of those interviewed, particularly those representing the private sector, remarked that election concerns are undoubtedly factors in decision-making. On one hand, politicians must balance a number of factors when developing their election platforms, or making decisions on policies, which can have a number of potentially negative outcomes, including reversal or elimination of a policy or program, or adoption of "low hanging fruit" – initiatives that are easy and politically popular, but often ineffective (see page 44). On the other hand, election concerns may provide the prompts or incentives that can push some politicians to create positive action towards climate change and extreme weather resiliency. A final concern regarding leadership change is that municipalities have legal liabilities regarding climate change and extreme weather impacts. This legal liability means that elected representatives must be conscious about the public image that their decisions and policies convey (P. Koval, personal communication, Feb 20, 2015). In other words, elected representatives should be seen as accountable, proactive, and sensitive to the impacts of climate change and extreme weather. As a result, municipal leaders are motivated to take actions to show that they are not negligent, but in fact progressive, in order get re-elected.

5.3.2. Mixed messages around risks and urgency

Canada's property and casualty insurers paid out $3.2 billion for the extreme weather events in Canada in 2013, including the Calgary and Toronto floods in the summer, and the ice storm in December - a record amount in claims (Nelson, 2014). Amongst all those who were interviewed, there is a general consensus that insurance companies are well aware of climate change and extreme weather issues, that the industry as a whole faces great risks, and that they are taking significant action to mitigate those risks. However, the actions that they are taking to mitigate their own risks may have the unintended consequences of miscommunicating or misrepresenting the risks to their clients or the general public.

Property and casualty insurance policies are influenced by many factors, including past claims, projected risks, level of detail and accuracy of data regarding vulnerabilities, and location. Among the many things insurance companies are doing to mitigate their risks, the main actions are:

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[6] Based on United Kingdom Office for National Statistics mid-2013 estimate population of 64.1 million

1. **Raising premiums**: Insurance companies can raise the cost of insurance premiums to help recover the rising cost of claims. However, by doing so, they can risk losing clients, or having their pricing regulated by government (J. Thistlethwaite, personal communication, Feb 26, 2015). Instead of raising premiums, some companies may instead raise the deductible, which would only allow clients to receive payouts for more destructive events where the damage is higher than the deductible (manager of sustainability at an insurance company, personal communication, Apr 9, 2015). Insurers in Florida have recently started to price their premiums using a new model called near-term modelling (instead of pricing based on past 100 years, they consider only the last 10 years). This has led to a 40 to 50 percent increase in premium rates (J. Thistlethwaite, personal communication, Feb 26, 2015). If insurers began to price using future climate models instead of pricing based on past events, the increase in rates would be even greater.

2. **Increasing exclusions**: Instead of raising premiums or deductibles, some insurance companies are increasing exclusions (manager of sustainability at an insurance company, personal communication, Apr 9, 2015). In other words, they are placing greater limitations on the types of events or damages that are covered by insurance. For example, almost no insurance companies are willing to provide coverage for overland flooding, which is viewed as a great risk. However, although increasing exclusions may reduce the risk exposure for the insurance companies themselves, it increases the risks for communities, and may not be the best solution (manager of sustainability at an insurance company, personal communication, Apr 9, 2015).

3. **"Reloading" premiums**: Some companies are now "reloading" premiums. This means that instead of targeting the most vulnerable or at-risk properties with increased premiums, insurance companies share the increase across a wide pool of people, and by doing so spread the risk of the most vulnerable to a broader community (J. Thistlethwaite, personal communication, Feb 26, 2015). The reasons for "reloading" can vary, and can stem from a desire to avoid the risks associated with raising premiums, deductibles, and exclusions, to simply being unclear on the exact risks and vulnerabilities faced by specific communities and individuals (see page 70) for discussion on unclear, incomplete, and inaccessible data). In some cases, for example, where floodplain maps are incomplete, insurance companies simply do not have the information required to determine, with a high level of confidence, which areas or properties are the most vulnerable or at risk, and would be forced to "reload" premiums out of necessity.

This method of "reloading" can be misinterpreted by some. For example, a private sector interviewee shared that he believes insurance companies are good indicators of the importance and urgency of the

climate change and extreme weather issues. He explained his understanding in the following way (private sector representative, personal communication, Feb 20, 2015):

1. Insurance companies are exposed to extremely high risks from climate change and extreme weather damages. The sector's survival depends on its ability to accurately perceive and mitigate those risks.
2. Therefore, they must have extremely intelligent and capable researchers scrutinizing the issue.
3. Insurance premiums have not been raised "significantly", which must mean that insurance companies do not yet view climate change and extreme weather as a high risk, urgent issue.

Many other interviewees disagreed with this reading of insurance premium pricing, and were adamant that insurance companies are very active in this space. However, based on this interview, it is clear that insurance companies' actions and inactions can run the risk of being misinterpreted or misunderstood.

5.3.3. Pointing fingers

Amongst the stakeholders who were interviewed for this study, there was agreement that each and every stakeholder has a role to play, and can contribute to greater climate change and extreme weather resilience in different ways, given each organization's unique position, risks, challenges, and opportunities. However, in an effort to drill down and identify the key drivers of activity, the researcher asked interviewees to identify the sector, organization, or group they believed should be playing a driving role in building urban resilience to climate change and extreme weather events. Between the broad categories of stakeholders, some important differences in opinion emerged.
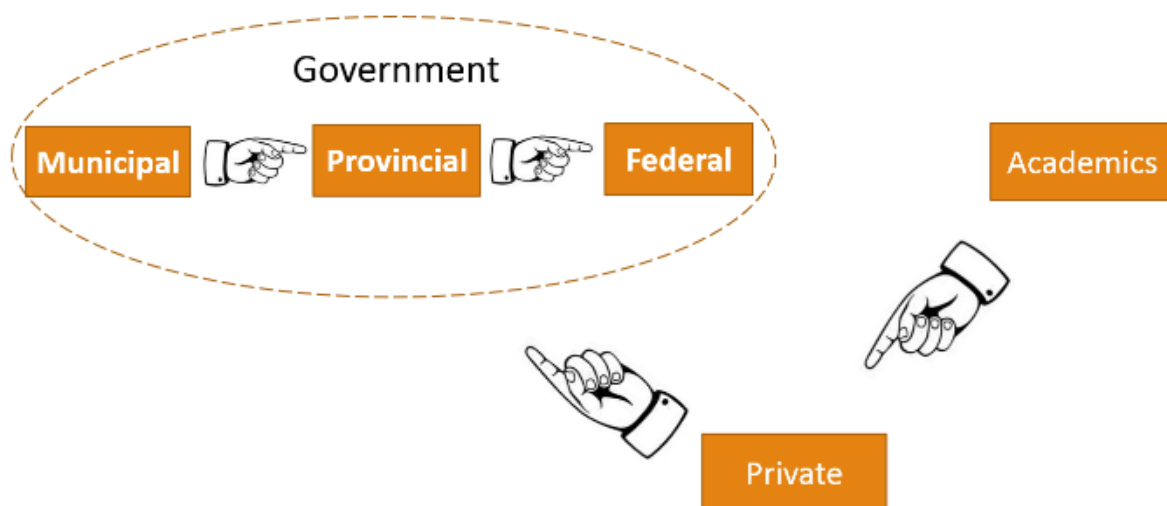

Figure 8. Simple diagram showing select stakeholders and the parties they believe should be playing a driving role in building resilience to climate change and extreme weather.   *Source: Author*

Government position: According to the City of Toronto, the City is doing what they can with the limited resources available to them, and the Province needs to step up and take a leading role (although David MacLeod did feel that Glen Murray, Ontario's Minister of Environment and Climate Change, is taking positive steps) (D. MacLeod, personal communication, Feb 12, 2015). As mentioned earlier in this chapter, the provinces feel that more support, coordination, and leadership is required from the federal government.

Private sector position: The government (referring particularly to the city, but also including the provincial and federal levels) has a responsibility to its citizens. What's more, they have the necessary tools to make and enforce broad regulatory changes, and to create incentives for private sector participation. The private sector is responsible to their stakeholders, although some organizations will do what they can to advance climate change and extreme weather resiliency, as long as it helps, or at the very least, does not hurt, their businesses. Private sector stakeholders emphasized the importance of remaining competitive in the market, something that is difficult[7] if only they (or a few organizations) embrace climate change and extreme weather resilience, while others do not.

Academic position: From a theoretical standpoint, Blair Feltmate agreed that the public sector is in the best position to drive change, because of it has the ability to "set the rules" with plans, regulations, legislations, etc. However, a number of factors (among them, limited resources, and some of the challenges described in sections 4.3.2 and 5.3), mean that the private sector will have to take a driving role. Although the private sector cannot "make the rules" (as discussed in section 4.3.3), they can determine the solutions, and set the stage for government policies and regulations.

5.4. Summary

It is clear that the issue of climate change and extreme weather resilience is extremely complex, and there are many hurdles to overcome. Some of the issues highlighted can be addressed relatively easily, with simple policies or changes, while others will require more concerted efforts, coordination, and collaboration. The following ideas were discussed:

- **Toronto as a leader:** In many ways, Toronto is well prepared to address climate change and extreme weather issues. In addition to being ranked as one of the world's most resilient cities,

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[7] Although they acknowledged that commitment to building climate change and extreme weather resilience is ultimately beneficial in the long term when it comes to business longevity, image, and competitiveness, they cited difficulty because of the investments of time, financial, and other resources required in the shorter term.

interviews secondary research shows that the City and some other organizations have long been assessing the situation and developing plans to build Toronto's resilience. Organizations in Toronto also have a track record of working collaboratively to achieve goals or solve various issues. This chapter discussed some of the qualities or elements that are present in effective collaborative models.

- **Challenges and barriers:** Organizations in Toronto well-positioned to address climate change and extreme weather resilience, and they are doing many things right. However, as the interviews revealed, they also face some challenges: uncertainty about climate change and extreme weather; mixed messages around the risks and urgency of the issue; and sectors pointing the finger at each other about who should take the driving role in building resilience to climate change and extreme weather.

With these opportunities, challenges, and barriers in mind, the next chapter will introduce some policy recommendations for governments, as well as actions that other stakeholders can take.

6. RECOMMENDATIONS

6.1. Introduction

This study has shed light on the various stakeholders involved in or affected by climate change and extreme weather, as well as the unique position, challenges, and opportunities that each stakeholder faces. As chapter 4 illustrated, relationships, interactions, and influences between stakeholders are incredibly complex, and key players point fingers at each other about who should be in the "driver's seat" on this issue. However, most interviewees agree that all stakeholders need to be more accountable and work together more effectively in order to make progress on building resilience to climate change and extreme weather events. Accountability can come through in many different ways, some of which are described in the recommendations below.

Multi-stakeholder engagement is happening, at many different levels, as described in section 4.4.2. While there are still some uncertainties, there is, for the most part, a shared interest or vision to reduce the negative impacts of future climate change and extreme weather events. The areas that could benefit from greater attention are the role of a neutral convenor, strong leadership, and ensuring that the right information is available. The following recommendations aim to fill those gaps.

6.2. Recommendations for government

As explained in previous chapters, government has a key role to play in helping to build urban resilience to climate change and extreme weather. Based on the challenges uncovered and detailed in this study, the following actions or policy changes are recommended:

1

Issue	Political fragmentation has led to uncoordinated policies and actions amongst the various levels of government.	
Recommendation	**Improve political cohesion and strengthen leadership by developing a progressive, nationally coordinated climate change and extreme weather strategy.**	
Key stakeholders	Federal government (leadership), Provincial governments (collaboration and support)	
Why is this good?	• Unified vision and strategy to address climate change and extreme weather. • More efficient use and distribution of resources. • Promotes sharing of success, best practices, and lessons. • Ability to address challenges at a larger scale; potentially bigger impact.	
Considerations	• Unified vision and strategy involves more actors and can increase bureaucracy. Can potentially slow or stall activities. • Strong leadership is not always progressive leadership. Federal government needs to provide direction that will help build resilience. • Some provinces may feel that a nationally coordinated strategy is intruding on their jurisdiction. • The adaptation measures that are needed vary greatly between and within provinces. Some provinces will require much larger investments to make change.	

Political fragmentation can be a barrier to greater progress on climate change and extreme weather resilience. In the absence of a nationally coordinated climate change and extreme weather strategy, federal, provincial and territorial governments are acting independently. For example, some provinces have implemented carbon pricing mechanisms. However, they have elected to use different tools. Other

provinces do not even have systems in place to manage or limit GHG emissions (see page 67 for details). A nationally coordinated climate change and extreme weather strategy can provide direction to provinces, territories, regions, and municipalities, and can help advance efforts to build resilience.

Variations in GHG emissions, infrastructure, funding, policies, etc., across the country means that higher investments are required to make change in some parts of the country, particularly Alberta and Saskatchewan (Figure 5 and Figure 6). The federal strategy should recognize these differences. Stronger progressive leadership at the federal level could help to create a more coordinated strategy that can lead to faster progress and greater results. As several provincial premiers mentioned (see page 67), provinces are currently acting independently, and while some are taking leadership, the full potential of those actions cannot be explored without federal leadership to guide the conversation and bring all the provinces and territories on board.

2	Issue	Climate change adaptation is not fulsomely integrated into key acts governing municipal decision-making.
	Recommendation	**Explicitly integrate climate change adaptation as an objective in municipal decision-making documents such as the municipal act, planning act, and other associated regional planning documents.**
	Key stakeholders	Municipal, regional, and provincial governments
	Why is this good?	• Explicit integration of climate change adaptation as an objective in decision-making documents will help ensure that the issue will be addressed through direct actions and policies.
	Considerations	• With some lingering uncertainty of future climate change and extreme weather impacts, some jurisdictions may be wary of making it an explicit objective.

A lawyer who specializes in climate law lamented that climate change adaptation has not been fully integrated into the key acts governing municipal decision-making (see page 67). In the absence of this information, some lawyers may not realize that climate change adaptation needs to be taken into consideration. Governments should ensure that climate change adaptation is integrated as an explicit objective into all documents that have a role in provincial and municipal decision-making. This recommendation aligns with the approach recommended by the CIP's National Policy on Climate Change,

which, among other things, championed the integration of climate change actions in long-range planning activities (Canadian Institute of Planners, 2007).

3	Issue	Disaster relief and recovery programs are currently not designed to improve resilience to future climate change and extreme weather conditions, and the current level of funding provided for initiatives is relatively small.
	Recommendation	**Improve programs, incentives, and funding for climate change and extreme weather resilience activities.**
	Key stakeholders	Federal and provincial governments
	Why is this good?	• Encourages actions with longer-term visions of resilience, rather than a "band-aid" approach that only helps with short-term recovery. • More efficient use of resources – although resilience projects may require a greater up-front investment, there will be long-term benefits (i.e. instead of rebuilding/repairing a bridge after each extreme weather event, a more resilient bridge may withstand many extreme weather events). • More funding to support current initiatives, and promote the development of further programs.
	Considerations	• Taking resilience into considerations in post-disaster projects requires investments in design, engineering, planning, etc. More expensive than to simply re-build infrastructure. • Need to balance funding for other programs, and/or generate new tools to raise funds.

Current disaster recovery programs provide financial assistance to provincial and territorial governments to return infrastructure and personal property to pre-disaster condition (see page 68). This type of program can help with recovery in the short term, but does not build resilience to future events. Federal and provincial governments should revisit the design of those programs with a longer term vision, and take advantage of the opportunities that post-disaster reconstruction periods can bring. The programs should not simply restore or reconstruct an area to its pre-disaster condition, but that they should also make improvements, so that the area is more resilient to future impacts of climate change and extreme weather. In addition, further support should be provided for existing external programs. For example,

working with Project Neutral, the municipal government and utility companies could work out a way to transfer benefits directly to program participants.[8]

Considering the importance and urgency of this issue, its strong links to the economy (as described in chapter 4), and the fact that a strong economy is Canada's priority, it is recommended that significant additional funding be allocated to the National Disaster Mitigation Program (see page 68).

This research has highlighted the important role that insurance companies can play in driving resilience (see pages 40 and 69). Governments can work with insurance companies to design/develop new programs and policies.

4	Issue	Some organizations have misinterpreted information and actions from other organizations, and believe that urgency of climate change and extreme weather are not urgent issues.
	Recommendation	**Communicate risks and vulnerabilities of climate change and extreme weather events.**
	Key stakeholders	All levels of government, as well as private sector and not-for-profit organizations that are addressing the issue.
	Why is this good?	• Better education and more awareness of risks and vulnerabilities can motivate more stakeholders to take action. Interviewees who regularly give presentations about climate risks reported a more positive reception of the message over time.
	Considerations	• Difficult to identify the actions or messages that are being misinterpreted, and the reasons for misinterpretation. • It is difficult for humans to perceive and personalize risks, especially if they have not had recent direct experience with that risk.

The example of potential mixed messages presented by insurance companies (section 5.3.2) makes clear the importance of clearly and effectively communicating the risks and urgency around climate change and extreme weather events. As noted on page 63, psychological or cognitive uncertainty is one challenge faced by many people. As a species, humans find it difficult to perceive risks, especially abstract risks they

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[8] Many participants are already committed to sustainability as a lifestyle, but seeing direct benefits would help encourage more people within communities to participate.

have not been directly exposed to. This uncertainty may lead to some people or organizations misinterpreting information or actions from other organizations, leading to complacency or the sense that there is no issue to address. This can result in inaction – or worse, actions that can worsen the situation. Effective communication and advocacy from governments and other sources of information can properly convey the sense of urgency, which can justify the need for action. Governments have excellent outlets to promote this type of information, and can start by highlighting the issue as a key government priority.

5	Issue	External stakeholders attempting to conduct research to further climate change and extreme weather resilience face challenges in accessing and gathering data required for analysis.
	Recommendation	**Improve access to data, and improve consistency in datasets across municipalities.**
	Key stakeholders	Municipal governments and regional jurisdictions, Federal government
	Why is this good?	• With consistent and comparable datasets across municipal boundaries, researchers will be able to more easily conduct regional analyses related to climate change and extreme weather. • Will also benefit researchers studying other urban issues. • Clear, up-to-date data will help researchers identify issues and gaps, and recommend appropriate actions.
	Considerations	• Data collection, cleansing, sorting, distribution, etc. can be expensive. Issues of ownership and funding. • A lot of data are collected and owned by private organizations. • Local and regional differences (by-laws, policies, regulation, processes) may restrict the degree to which data can be collected and/or be consistent across municipalities.

External researchers who are working to address urban resilience to climate change and extreme weather find that it is difficult to obtain the datasets to complete the analyses. Municipalities and other jurisdictions should increase access to important data on the city, built and natural environments, operations, services, and policies in order to enable further study by others engaged in the urban environment (e.g., students, professors, community groups, etc.).

The Government of Canada has an Action Plan on Open Government, in which many provinces and municipalities across the country are participating. This plan is part of the federal government's efforts to foster greater openness and accountability, drive innovation and economic opportunities, and create a more cost effective, efficient, and responsive government (Government of Canada, 2015b). There are three streams within the plan, one of which is for open data, defined as "making raw data available in machine-readable formats to citizens, governments, not-for-profit and private sector organizations to leverage it in innovative and value-added ways" (Government of Canada, 2015b). While this plan is a very positive starting point, there are still some challenges.
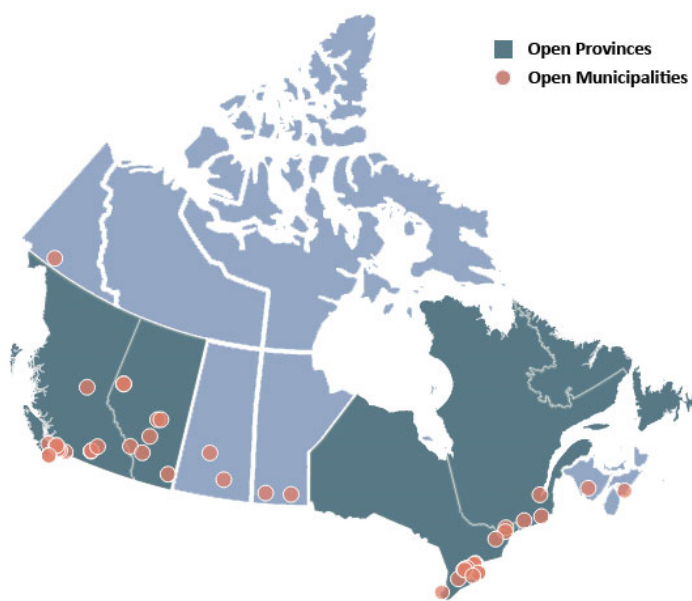

Figure 9. Map of open data in Canada.   *Source: Government of Canada, 2015b*

Figure 9 shows participation in the Open Government program to date. Five provincial governments and 49 municipalities or regional governments are participating in the program, with open data catalogues of their own. However, there are still some clear gaps in access to data. While the number of municipalities and regional governments adopting open data policies has been steadily increasing, the federal government can take steps to encourage greater participation and make more data freely available to the public. Possible methods include providing financial incentives to municipalities to create open data catalogues, creating toolkits to assist municipalities with the process, or implementing legislation to require a minimum level of participation in the program.

A second issue identified by an interviewee is that even where open data is available, it is inconsistent between municipalities (D. Kossowsky, personal communication, May 5, 2015). Municipalities and regions may have different datasets, metrics, or methods of collection. This inconsistency leads to a gap in data, especially when conducting analyses across municipal boundaries.[9] Researchers conducting regional analyses prefer data that are compatible across municipal boundaries. The federal government can assist in improving this issue by developing standard requirements for a basic open data catalogue, listing basic datasets that should be provided (particularly those that are critical for climate change and extreme weather analysis), and recommending basic formats or attributes for those datasets.

6.3. Other recommendations

The previous recommendations were aimed at government, but there are many actions that others in the private and not-for-profit sectors, as well as communities and individuals can take.

1	Issue	Individuals often underestimate the impact that they can make, and believe that they are "just one person" or "just one organization".
	Recommendation	**Increase awareness about how individual actions impact the larger community.**
	Key stakeholders	Private sector and not-for-profit organizations
	Why is this good?	• Can help people and organizations internalize the issue. • Seeing a contribution to the larger community can be a motivator, especially for those who are results-oriented.
	Considerations	• Not the "biggest bang for the buck". Rather than large, sweeping policies that affect a wider group of stakeholders, this method targets stakeholders at a much smaller scale. • Can be resource- and time-intensive, especially for the not-for-profit organizations that are usually at the helm of projects that engage stakeholders at this smaller scale.

Initiatives like Project Neutral are engaging people and communities in creating more sustainable and resilient places, starting at the household level. Individuals and households who are already participating

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[9] It is important to conduct research and analysis across boundaries. As mentioned on page 49, climate change and extreme weather events do not respect geographic, political, or other boundaries.

clearly see the benefit in their engagement, but can be difficult for others to comprehend how an individual's actions (regarding their own behaviour, property, etc.) can impact the larger community. Organizations running projects like this should endeavour to document this impact, and publicise it, in order to help people understand their impact and incentivize greater participation.

2	Issue	All stakeholders need to take more accountability and work together more effectively in order to build more resilient cities
	Recommendation	**Take responsible action to build resilience to climate change and extreme weather.**
	Key stakeholders	All
	Why is this good?	• Mutual accountability means that everyone is taking responsibility for future climate change and extreme weather resilience. • People will not feel as if they are tackling the issue alone. • Increased dialog and collaboration can lead to more sharing of ideas and successes, which can further motivate action.
	Considerations	• Need to first educate people and organizations on the range of responsible actions that can be taken. • People need to feel and believe that others are also taking accountability.

Most interviewees agree that pointing fingers is not a solution, and that all stakeholders need to be more accountable and work together more effectively in order to build more resilient cities (see page 75). With the knowledge of the risks and vulnerabilities presented by climate change and extreme weather, and awareness of how individual actions can positively impact the larger community (page 82), individuals, households, and businesses should take responsible action that is within the realm of their capabilities, in order to help build the resilience of the city.

The ways that these responsible actions can be put into practice are varied, and can include the following:

o Making investments in the home or business to reduce damages in future events (such as installing backwater valves, minimizing non-permeable surfaces, and landscaping to assist with stormwater drainage).

o Participating in local community and private sector programs aimed at building resilience to future climate change and extreme weather events.

o Helping to give politicians the political will to act by advocating for government action and leadership.

3	Issue	Many government programs that are currently in place do not adequately address the issue of resilience to future climate changes and extreme weather events.
	Recommendation	**Create a voluntary private sector program.**
	Key stakeholders	Private sector and not-for-profit organizations (leadership), all levels of government (support)
	Why is this good?	• Program can be designed with private sector motives in mind. • Private sector usually has high level of access to funding. • Private sector can act quickly and take bold actions. • Private sector reception to a proposed public policy can be tested.
	Considerations	• Public sector stakeholders should participate in these voluntary programs, and make note of feedback from private sector participants. • A neutral convenor (rather than a private sector organization) should take the lead in coordinating, to avoid the risk of the program being seen as benefitting any single organization. • Requires a high level of coordination and agreement between participating stakeholders.

Many government programs that are currently in place do not adequately address the issue of resilience to future climate changes and extreme weather events, as noted on page 68. The private sector characteristics identified in Table 3, as well as the successful case of the Race to Reduce indicate that the sector may be well-positioned to make change where the public sector is less able. The Race to Reduce has been successful in shifting attitudes, behaviours, and market dynamics around energy use and sustainability. Similar voluntary private sector programs can be developed for climate change and extreme weather resilience.

Voluntary private sector programs can incentivize greater participation and accelerate action because they are designed with private sector motives in mind, and build on shared or complementary interests (page 61). Voluntary private sector programs can also pave the way for government policies and regulations by offering a platform to test potentially unpopular policies. This way, policy ideas can be

tested and refined, and go through several iterations to find something that will work effectively. In the early days of the Race to Reduce, public sector stakeholders wanted to explore with private sector stakeholders the idea of mandatory building labelling, which has been implemented in Australia and several places in Europe.[10] The private sector stakeholders were unwilling to even broach such a topic. However, as the program progressed, and participants were seeing the benefits of the program and of working together, they began to welcome the idea of mandatory building labelling. In the same way, a voluntary private sector program aimed at climate change and extreme weather resiliency (and convened and implemented by a neutral not-for-profit organization with the support of the private sector), can be the first step towards discussion of currently politically unpopular, but very necessary, steps.

6.4. Conclusion

Extreme weather events will play a powerful role in shaping cities in the future. Multiple stakeholders engage in facing the multiple challenges, barriers, and opportunities when it comes to building urban resilience to the increased frequency and intensity of extreme weather events. This study has looked at the roles of different stakeholders in building urban resilience to climate change and extreme weather events, and identified some of the unique motivations, opportunities, barriers, and challenges faced by each stakeholder.

Toronto is ranked by the Grosvenor Group, 2014 as the world's second least vulnerable and second most adaptive city, and is fortunate to be well-positioned to address future impacts of climate change and extreme weather. However, even though some work is being undertaken by various stakeholders to help build Toronto's resilience, secondary research and interviews with more than a dozen representatives of key stakeholder groups revealed that stakeholders still face a number of challenges. Organized broadly by themes, these challenges are:

- General uncertainty about climate change and extreme weather
- Mixed messages around the risks and urgency of the issue
- Pointing fingers about who should be taking the driving role in advancing the issue.

It is clear that many organizations are beginning to recognize the risks associated with climate change and extreme weather, and some are starting to take steps towards building resilience. Many respondents and

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[10] Labelling is the practice of rating building performance on a pre-established scale, signifying a building's relative sustainability. Popular labelling systems include FSC for wood and paper products, Energy Star for electronics and other products, and LEED and BOMA BESt for buildings.

organizations are acting on this issue in different ways, from advancing knowledge on the topic, to convening forums and discussion groups, to working on-the-ground with individuals and organizations, to developing programs and policies. In order to truly make significant progress towards greater resiliency, however, organizations and individuals will need to stop pointing fingers about leadership, and will need to take accountability for the issue and work together for an improved future for the city. There is a need for greater coordination and collaboration, and to erase some of the uncertainties surrounding this issue. The recommendations that are presented in this report are a first step to addressing the challenges that have been identified.

6.5. Next steps

The recommendations outlined in this report are very high-level, and further analysis should be conducted in order to identify the most effective concrete actions that can be taken by each stakeholder. Finally, given the important roles of the federal government and of insurance companies, future studies can take a deeper dive into those sectors, to better understand the complexities and nuances of their motivations, challenges, opportunities, and relationships with other stakeholders.

Appendix – Interviews

The following people kindly supported this research by participating in interviews with the author:

- Brian Denney, Chief Executive Officer, Toronto and Region Conservation Authority
- Leslie Domenico, Program Manager, CivicAction
- Blair Feltmate, Associate Professor, Program Director Sustainability Practice, University of Waterloo; Chair, Climate Change Adaptation Project Canada
- David Kossowsky, Master of Landscape Architecture Student, University of Toronto
- Pat Koval, Partner, Torys LLP
- David MacLeod, Senior Environmental Specialist, City of Toronto
- Karen Nasmith, Director and Co-Founder, Project Neutral
- Chandra Sharma, Director, Watershed Strategies, Toronto and Region Conservation Authority
- Jason Thistlethwaite, Assistant Professor, University of Waterloo; Director, Climate Change Adaptation Project Canada
- Doug Webber, Executive Vice President, Halsall Associates; President, Loop Initiatives; Director of Sustainability, Canadian division of Parsons Brinckerhoff

Individuals from the following groups were also interviewed. However, they wished to remain anonymous:

- Managing Director in the construction/development/engineering industry
- Manager at an insurance company
- Climate lawyer
- Director of an industry association

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