CLIMATE READY BRAMPTON

A Climate Change Adaptation Plan for the City of Brampton

DRAFT

BRAMPTON

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CLIMATE CHANGE ART COMPETITION

From February 15 to March 31, 2023, the City of Brampton hosted a Climate Change Art Competition, whereby individuals were asked to submit their artwork (i.e. drawings, paintings, and photos) to demonstrate what a climate resilient future would look like to them in 2050.

The following drawing was developed by Khloe J., depicting a bright, sustainable, clean and green Brampton in the future.

LAND ACKNOWLEDGEMENT

Placeholder

MESSAGE FROM THE STAKEHOLDER WORKING GROUP

Placeholder

ACKNOWLEDGEMENTS

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STAKEHOLDER WORKING GROUP

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PROJECT TEAM

The Project Management Team members provided essential guidance:

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The Sustainability Solutions Group consulting team worked on the analytical background, which contributed to the development of Climate Ready Brampton.

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DISCLAIMER

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EXECUTIVE SUMMARY

Brampton will be a climate leader fostering resilient, low-carbon, and adaptable communities with thriving natural systems, climate-ready infrastructure, and a robust economy, that advances equity, innovation, and quality of life both now and for future generations.

Climate Ready Brampton is a forward-looking plan to address the anticipated impacts of climate change on our communities, infrastructure, economy, and natural systems. While reducing greenhouse gasses is more important now than ever, simultaneously addressing climate adaptation is a critical priority due to the accelerating impacts of climate change. We are already feeling these effects in Brampton through warmer winters, increased rainfall, and extreme events like flooding and heat waves.

By 2070, Brampton is expected to become warmer, wetter, and wilder. Average temperatures are expected to rise significantly, leading to milder winters, increased temperature variability, and more extreme heat days in the summer (e.g., days where temperatures exceed 30°C). Annual precipitation will increase, and we will experience more intense rainfall events. As temperatures continue to rise, more snow may turn to rain in the winter, heightening flood risks across the city. With a wilder climate, extreme weather events, such as heatwaves, storms, tornadoes, and extreme wind events, are expected to become more frequent. These changes will result in widespread impacts such as property damage, threats to health and safety, loss of natural systems, and impacts to our local economy. By taking action now to prepare for future climate impacts, Brampton and its communities will be well-equipped to handle these changes, developing the resilience to bounce back from adverse climate impacts.

To guide the implementation of Climate Ready Brampton, the City developed six key goals:

1. Brampton is adaptable to future climate change impacts, which are predicted using the best available science and climate data.
2. The most vulnerable people, communities, and places are prioritized for climate action.
3. Climate resilience is the new normal, where the City, its partners, neighbourhoods and generations work together to protect each other.
4. The economy of Brampton thrives as people, businesses and industries are prepared for climate emergencies and longer-term climatic changes.
5. Strong partnerships enhance efficient and effective climate resilience action.
6. Measurable, clear targets guide the work of climate adaptation, and progress is transparently reported.

To support the Vision and Goals of Climate Ready Brampton, a series of Themes were created to coordinate efforts based on key sectors. Each theme also includes specific objectives to illustrate what it means to be a resilient Brampton. These objectives form the basis for all actions designed to reduce risks from future climate hazards.

CLIMATE READY BRAMPTON THEMES

Collaborative Leadership	Local governments are critical in addressing the climate crisis. Integrating climate considerations into all levels of decision-making, planning, and budgeting and increasing staff awareness on climate adaptation and resilience on an ongoing basis will ensure that all projects integrate climate considerations at the City. **Objectives** • Municipal staff are prepared, informed and have all required tools. • The City is a leader in climate resilience.
Protected and Connected People	Climate adaptation is closely tied to improving the health and well-being of residents, especially vulnerable populations such as low-income groups, seniors, and people with disabilities. Ensuring people are protected during extreme weather events and can access critical resources is essential. A diverse city like Brampton requires an inclusive approach, engaging all sectors of the community to strengthen social connections and enhance resilience.

	Objectives • Emergency planning ensures people are prepared for climate disasters. • Equity-deserving people are prioritized. • Moving about the city is simple and safe in all conditions.
Resilient Infrastructure and Buildings	The city's infrastructure is vulnerable to climate change, with risks such as flooding, extreme heat, and freeze-thaw cycles that will damage roads, bridges, and energy systems. As the population grows, it is essential to plan and design infrastructure with climate resilience in mind to minimize disruptions and ensure the city can cope with future climate impacts. **Objectives:** • Essential infrastructure is resilient. • The community is safe in their daily life. • Businesses, commercial buildings, and institutional buildings are resilient. • New construction is built to withstand climate impacts. • Existing buildings are upgraded to increase resilience and withstand climate impacts.
Resilient and Healthy Natural Systems	The city's natural systems are vital for providing ecosystem services like air quality, water filtration, and flood control. These systems are at risk from climate change but can be protected and enhanced to provide ongoing community benefits. Resilient natural systems can better absorb climate impacts, such as extreme weather events and temperature fluctuations, and support biodiversity. **Objectives:** • Naturalized spaces help protect Brampton from climate impacts. • The natural heritage system is healthy and intact.
Community Involvement and Communications	Successful climate adaptation requires strong community engagement. Communication efforts should be inclusive, ensuring diverse populations have access to resources and are prepared for climate emergencies. Empowering residents to take action fosters resilience and strengthens the city's collective response to climate change. **Objectives:** • The community is involved in climate action. • Brampton is prepared for climate emergencies. • Emergency communications keep the community safe.

SECTION 1

INTRODUCTION

Our climate is already changing. Global temperatures are rising due to human activities, namely the burning of fossil fuels, which is resulting in a build-up of greenhouse gasses in the atmosphere. This is affecting our weather, buildings, infrastructure, environment, economy, and human health. Unless significant global efforts are undertaken to reduce greenhouse gas emissions, climate change will have serious and continued impacts on Brampton.

The Intergovernmental Panel on Climate Change, the international body of climate scientists and experts with the United Nations, has concluded with certainty that the Earth's climate system has been warming at alarming rates over the last few decades, mainly due to the anthropogenic emissions of greenhouse gases such as carbon dioxide (IPCC, 2023). These human influences are associated with warmer atmospheric temperatures, changes in precipitation, reductions in snow and ice, changes to water cycles, and more extreme weather events across Canada (Bush and Lemmen, 2019). These changes will continue to significantly affect all of Canada's communities at the local scale.

Canada is already warming at twice the rate than the rest of the globe. In Ontario, these impacts are already being felt and will continue to influence communities across the province. Warming temperatures, increasing precipitation, and more extreme weather events are all expected to increase throughout the end of the century (McDermid et al., 2015)

In Canada, over 80% of the population lives in urban areas. Municipalities are 'ground zero' for the impacts of climate change. The systems, infrastructure, and population characteristics that contribute to a functioning city are dynamic and often interconnected; failure of one system can have cascading effects on the failure of another system. For example, localized flooding can cause stormwater infrastructure to become overwhelmed, leading to disruptions on our road network (e.g., road closures, washout conditions, road blockages), leading to slippery conditions that in turn impact our emergency services. These impacts, if not managed, can have substantial economic, environmental, and social consequences.

In Brampton, these changes are already having a significant impact on our communities and will continue to be felt in the future. Warmer air temperatures, increased precipitation, and more extreme weather events are all expected to increase by the end of the century. These changes will result in impacts including increased flooding, more heatwaves, infrastructure damage, threats to human health and safety, and loss of ecosystems and habitats, to name a few.

While climate change efforts are underway at both the national and provincial levels, municipalities are also at the frontlines in the fight against climate change. Ensuring we design, construct and manage our cities to be resilient to future climate impacts plays a critical role in creating healthy, resilient and sustainable communities. As a municipality, Brampton also plays a key role in educating and empowering residents to take action and implement a range of measures that can both directly and indirectly influence individual behaviours and decision-making.

When examining the multitude of risks that climate change poses, taking urgent action to avert and manage its most dramatic impacts is critical for the City of Brampton. Actions aimed at enhancing Brampton's resilience, while also reducing greenhouse gas emissions will help to ensure the long-term economic, social, and environmental vitality of the City. Achieving climate resilience in Brampton will require a transformative, 'all-hands-on-deck' approach.

Climate Ready Brampton represents the first iteration of Brampton's climate change journey. It will be a living document that will be revisited and updated as new information becomes available and as adaptation planning and actions evolve.

CLIMATE ADAPTATION VS. MITIGATION

Historically, much of the work on climate change has focused on climate mitigation. Climate mitigation is focused on reducing the amount of greenhouse gasses (GHG) that are released into the atmosphere and removing them from the atmosphere where possible. This work is essential to preventing further increases in greenhouse gas emissions that contribute to future climate impacts (e.g., further temperature increases).

Climate adaptation refers to actions that are taken to address the impacts of climate change and responds to the local risks and opportunities climate change may bring. It focuses on identifying what the climate hazards are and developing actions that increase our resilience to future impacts and our ability to avoid catastrophic damage, loss of life, or serious impact to the environment, economy and other social systems. This work is essential to minimize the future impacts of climate change, build capacity to respond and recover, and have the resilience to build back better.

Climate change mitigation and adaptation are two interconnected approaches that are crucial for addressing the climate crisis (Figure 1). While they each have distinct goals and strategies, their combined efforts are essential for effectively managing the impacts of climate change and ensuring the long-term sustainability of ecosystems, economies, and societies.

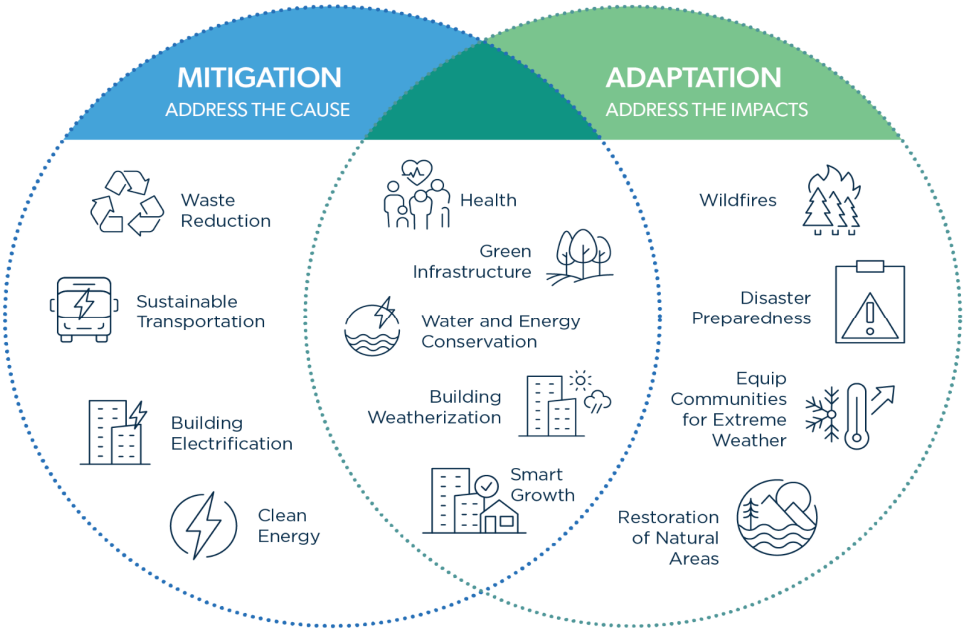


Figure 1: Adaptation vs Mitigation

Addressing climate adaptation and mitigation simultaneously maximizes efficiencies and co-benefits and avoids adaptive or mitigating actions that result in co-harms. The benefits of simultaneously addressing climate adaptation and mitigation include the following:

1. Identifying actions where adaptation and mitigation can work together to create comprehensive benefits to the community (e.g., low carbon and resilient energy systems, improved human health, enhanced natural systems, etc.)
2. Identifying and avoiding potential co-harms. For example, adaptation planning might identify the need for supplemental electricity generation, but mitigation planning shows that back-up diesel generators work against overall climate action. In this case, consideration can be given to low carbon generators that both provide electrical generation without increasing greenhouse gas emissions.
3. Avoiding lock-in [1] by implementing adaptation measures to protect and secure current infrastructure while working to reduce the global impacts of climate change, reducing the need for expensive upgrades and adaptation measures. For example, updating a natural gas furnace to an air source heat pump.
4. Maximizing the economic benefits through job creation, efficient planning, and enhanced energy security.
5. Aligning efforts to avoid duplication as much as possible. Climate plans, policies and programs, initiatives, funding, and implementation strategies for both mitigation and adaptation should be reviewed holistically, to maximize efficiencies and allow Brampton to shift more quickly to implementing its Community Energy Emissions Reduction Plan and Climate Ready Brampton.

[1] 'Lock-in' refers to making decisions that inadvertently commit the community to continuing to emit greenhouse gases. For example, choosing to replace a broken furnace with a new natural gas furnace commits the owner to continuing to use natural gas for the lifetime of the new furnace, unless they choose to invest in replacing it earlier.

SECTION 2

RESPONDING TO THE CLIMATE CRISIS

It is widely acknowledged that climate mitigation efforts are more important now than ever before (to limit the extent of climate change). At the same time, the increasing impacts we are experiencing and will continue to face in the future make climate adaptation urgent as well.

The City of Brampton has been actively working to address climate change for over a decade. Brampton's Grow Green Environmental Master Plan (EMP), first released in 2015, forms the backbone for climate action at the City. Through its vision of conserving, enhancing, and balancing our natural and built environments to create a healthy, sustainable and resilient Brampton, the City has undertaken and continues to implement adaptation actions.

In 2019, the City of Brampton Council unanimously declared a climate emergency. This motion recognized climate change as an immediate threat to the City, its residents, natural systems, and economy, and strengthened our commitment to reducing greenhouse gas emission and adapting to future climate impacts.

To achieve low-carbon, resilient communities, Brampton has been undertaking actions related to both climate mitigation and adaptation. In 2020, the City released its Community Energy and Emissions Reduction Plan (CEERP), setting the goal of eliminating 80% of greenhouse gas emissions by 2050. The CEERP also highlights the need to increase energy security to ensure Brampton's communities are resilient to future impacts.

Ensuring we design our city to account for climate change is essential. Our 2040 Vision, Corporate Strategic Plan, and Brampton Plan (Official Plan), highlight climate change as a key priority. For example, Brampton Plan features a section on Climate Change and Sustainability, including policies related to climate-ready communities, infrastructure and buildings.

Other programs and initiatives that have integrated climate change considerations include the Sustainable New Communities Program (i.e., green development standards), Brampton's Stormwater Charge, Corporate Asset Management Plan, Brampton Mobility Plan, Eco Park Strategy, and Riverwalk (Figure 2).

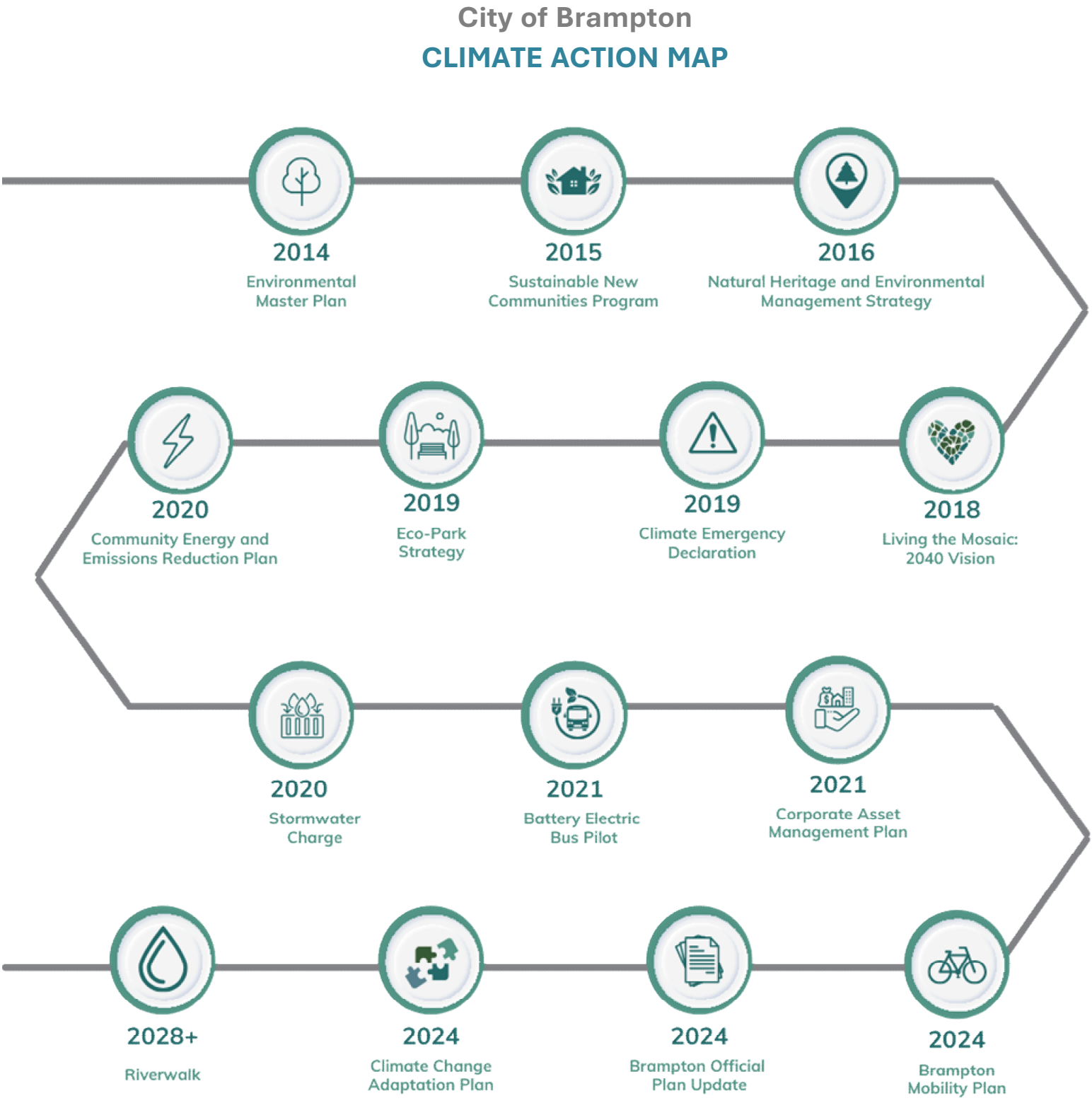


Figure 2: Timeline of Brampton's Climate Actions

At the community scale, the Sustainable Neighbourhood Action Plan (SNAP) program, in partnership with the Toronto and Region Conservation Authority (TRCA) and Credit Valley Conservation Authority (CVC) has been an important driver for climate action in key areas of the city. The SNAP program helps to accelerate the creation of sustainable neighbourhoods in older urban areas by providing neighbourhood-based solutions and implementation actions.

The City of Brampton is also a member of the Global Covenant of Mayors for Climate and Energy, and the Clean Air Partnership. Participation and collaboration in these organizations provides opportunities to share and gain expertise, build capacity, and assemble resources. They also provide municipalities with a stronger collective voice to influence governments and shape climate adaptation policies.

Image 1: Community planting in Eastbourne Park as part of the Bramalea SNAP (Sustainable Neighbourhood Action Program)

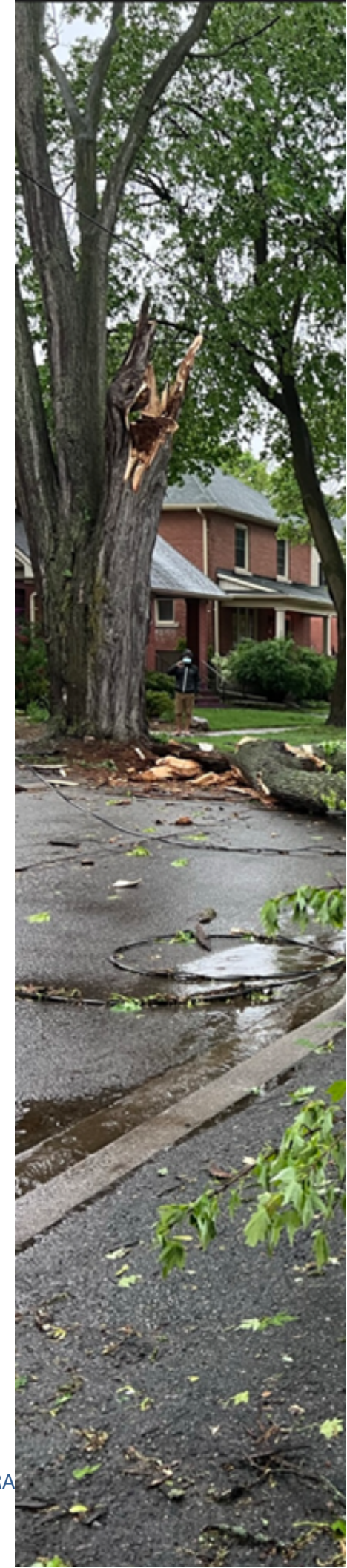
CLIMATE READY BRAMPTON: A COMMUNITY PLAN

Recognizing the urgency of the climate crisis, Climate Ready Brampton is the next phase of Brampton's work to reduce the severity of climate change and adapt to the unavoidable impacts. Climate Ready Brampton is a forward-looking community and corporate plan that will address the anticipated impacts of climate change on our communities, natural systems, infrastructure, and economy. It includes actions aimed at both reducing climate change risks and vulnerabilities while also building resiliency. As our most vulnerable communities, people, and places are often the ones who experience the greatest climate impacts, this plan prioritizes actions for the areas and groups most vulnerable.

Climate Ready Brampton recognizes the importance of simultaneously addressing both adaptation and mitigation. This plan identifies actions that can provide co-benefits to ensure a more comprehensive approach in addressing the climate crisis. This will also allow the city to leverage synergies with its Community Energy and Emissions Reduction Plan.

Climate Ready Brampton was developed using the most current climate data and is based on climate adaptation planning best practices related. The Plan was also reviewed by subject-matter experts who provided input and validated the information contained within this Plan.

To ensure the success of Climate Ready Brampton, this plan will require the leadership, community support and partnership of all individuals including stakeholders, residents and other levels of government.



SECTION 3

THE APPROACH

The process to develop Climate Ready Brampton has been extensive, involving hundreds of people, technical climate modeling, and several studies. Climate change adaptation planning is complex, and requires the expertise, analysis and review of climate information.

AN INFORMED APPROACH

Climate Ready Brampton was developed following adaptation planning best practices, including the methodology and commitments from the International Council for Local Environmental Initiatives (ICLEI) Building Adaptive and Resilient Communities and the Global Covenant of Mayors for Climate and Energy (GCOM). The Plan is informed by a systematic combination of technical modelling, analytical assessments of climate data and impacts, and comprehensive engagement with the City, the community, and relevant experts.

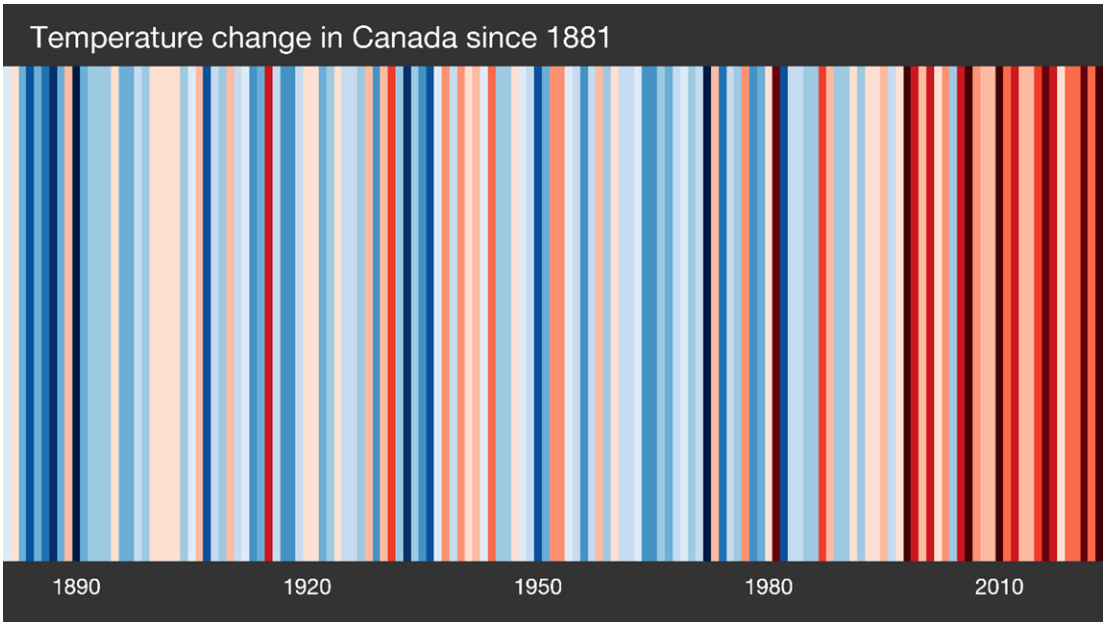


Image 2: Temperature changes in Canada since 1881 (Hawkins, 2024)

The adaptation planning process for Climate Ready Brampton can be grouped into three key phases: research and investigation, plan development, and implementation.

Phase 1: Research and Investigation

This phase involved detailed research and analysis including:

- Understanding how Brampton's climate has changed over the last 75 years
- Analyzing future climate change projections and scenarios
- Reviewing best practices in climate adaptation planning practices and actions
- Assessing Brampton's current and future climate change risks and vulnerabilities
- Evaluating and mapping the impacts of these climate risks and vulnerabilities on the built environment, social, environmental, and economic systems
- Use the ScenaAdaptation model to analyze the impacts of climate change under two specific future scenarios: one where today's decisions are held constant, and one where climate adaptation is prioritized
- Delivering a series of workshops for internal staff, external stakeholders and subject matter experts to review and assess the levels of risk and vulnerabilities
- Conducting an economic analysis to understand the financial damages from certain climate impacts (e.g., flooding)
- Developing adapted scenarios to demonstrate what a future climate ready Brampton could look like if key adaptation measures are implemented.

Phase 2: Plan Development

This phase involved the development of the overall vision and framework for Climate Ready Brampton including:

- Developing the vision, principles, goals, themes and objectives
- Identifying and prioritizing adaptation actions
- Examining the cost of doing nothing and the costs to implement adaptation actions
- Establishing performance targets
- Recommending external collaboration and partnership approaches
- Developing a framework for monitoring and reporting.

Phase 3: Implementation

This phase will be an ongoing component of Climate Ready Brampton and the work that has been accomplished to date. Implementation of Climate Ready Brampton will include regular monitoring and reporting to track progress on its implementation and evaluate the effectiveness of the adaptation actions. This will allow Brampton to update the Plan as new climate information and best practices are made available.

Figure 3: Climate Change Adaptation Plan Process

ANALYSIS OF HAZARDS, RISKS AND VULNERABILITY

Understanding how to adapt to climate change requires an assessment of how climate change is anticipated to change the frequency and severity of future extreme weather events, and what the potential impacts are. To achieve this, a Climate Change Risk and Vulnerability Assessment was undertaken for Climate Ready Brampton. The findings from the Risk and Vulnerability Assessment were then used to identify and prioritize adaptation actions.

This Assessment included a science-based, quantitative and qualitative approach. To determine the risks associated with climate change, risk is calculated as a combination of the threat likelihood, vulnerability, and the consequence. (see Figure 4).

Figure 4: Calculating Climate Risk

The **threat likelihood** evaluates how likely a risk (e.g., flooding) is to occur and how it may be impacted by climate change. It analyzes the extent of the threat and its anticipated frequency.

Vulnerability considers the overall ability to withstand the impact of the hazard, the sensitivity of the population to the impacts of the hazard, and components of the built environment that may leave the community susceptible to impact.

Lastly, **consequence** identifies damage, disruption to service, personal injury, and other direct and indirect impacts.

The consequence and vulnerability are combined to give a **risk score** for each climate hazard by sector.

For Brampton, climate risk was assessed for five sectors:

Table 1: Sectors used in Assessment

Sector	What is included
Environment	All areas of the city designated or planned as open space and natural environment. This sector includes natural assets such as stormwater management ponds, natural heritage, open space, and parks.
Community	Residents, visitors and workers, and residential structures.
Economy	Local businesses and commercial and industrial organizations.
Critical Infrastructure and Essential Services	A critical service or structure in the community, the loss of which causes cascading system-wide failures.
Municipal Facilities, Assets and Personnel	Residents, visitors and workers, and residential structures.

Image 3: Cassie Campbell Community Centre

The Climate Change Risk and Vulnerability Assessment identified key climate risks and priority areas for adaptation action. Table 2 presents the top climate change risks in Brampton.

Table 2: Top Five Climate Hazards in Brampton

Hazard	Description
Riverine Flooding	Riverine flooding occurs when there is excessive rainfall over an extended time period, which causes rivers or creeks to overflow.
Local Flooding	Local flooding includes both basement flooding, where groundwater seeps into basements, and road overtopping, where roads are flooded.
Extreme Heat	Extreme heat is a period of high heat (e.g., days where temperatures are above 30°C).
Biodiversity Change	Biodiversity change refer to shifts in the species composition or types of ecosystem or ecoregion found in the area. This analysis focused on invasive species and diseases, as well as stresses to the urban and park ecosystem.
Extreme Weather Events (e.g., wind storms and tornadoes)	Extreme wind events resulting from shifting atmospheric pressures, damaging trees, buildings, electrical infrastructure, and other assets.

The results of the climate risk assessment provided a comprehensive understanding of how, when, where and what parts of the community experience stress and strain during and after an event. This knowledge was then used to develop a suite of adaptation actions that work together to protect the community of Brampton from climate change and ensure everyone is prepared for emergency events and the changing environment.

Image 4: Trying to stay cool on hot summer's day.

CLIMATE ADAPTATION MODELLING

To supplement the risk assessment, a spatial adaptation model, ScenaAdaptation, was used to explore the interaction between community assets and climate hazards in Brampton. ScenaAdaptation is a model that integrates community assets (i.e. population, the built environment, and natural systems) and simulates future land development by location. The model replicates existing and future climate hazards based on climate data projections. The model integrates both the future land development and climate hazards to quantify the risk posed by the hazards in terms of damage to physical assets and impact to population.

For Brampton, three hazards (riverine flooding, local flooding, and extreme heat) were modelled based on three scenarios:

Present Day Scenario	Business-as-Planned (BAP) 2070 Scenario	Adapted 2070 Scenario
To demonstrate what the City's current climate risks and hazards look like, risks were quantified using demographic, land-use, infrastructure, and hazard data for 2021 as a base year.	Extended the present-day scenario into the future using population and employment projections, existing land use plans as well as future hazard characteristics to demonstrate what a business-as-usual scenario looks like. The BAP is based on a high emissions scenario	Adds adaptation actions (e.g., floodproofing buildings and tree planting) on top of the Business as Planned scenario to showcase what a resilient Brampton could look like.

Together, these scenarios clarified:

- Where within Brampton hazard impacts will occur,
- How they will change over time due to climate trends and community growth, and
- How these impacts may be reduced with intervention.

Image 5: Flooding in Eldorado Park

ENGAGEMENT IN CLIMATE READY BRAMPTON

Climate Ready Brampton is a community plan that has been developed with the input of hundreds of individuals. Over the last two years, the City has been working closely with expert stakeholders and subject matter experts to seek advice during the development of the Plan. The City also engaged First Nation communities, Brampton residents, businesses and youth to get their input on adaptation efforts being undertaken in the community and actions they would like to see in Climate Ready Brampton.

The City convened a Technical Advisory Team and a Steering Committee, made up of staff across various departments to serve in an advisory role on the development of Climate Ready Brampton. The Technical Advisory Team and Steering Committee met several times over the course of the project, providing input on key phases of work and deliverables, as well as action development and prioritization. This includes the visioning, climate risk assessment, and
action planning stages.

A Stakeholder Working Group, consisting of community partners and stakeholders was also convened. Similar to the Technical Advisory Team and Steering Committee, this group met several times over the course of the project, providing input on key deliverables and action development and prioritization. Members from a range or organizations participated in the Group, including Conservation Authorities (TRCA, CVC), academic organizations, school board, utility and telecommunication companies, development industry, Brampton Board of Trade, environmental organizations, and other community organizations.

Engagement with First Nation communities was an important aspect in the development of this plan. The City met with Six Nations of the Grand River at the onset of the project as well as during the development of the draft Plan to seek input on the draft actions as well as the vision, goals, and objectives.

Through a variety of public engagement events, the City heard from over 800 residents about what they want to see in Climate Ready Brampton. A series of creative engagement sessions were developed to get the community talking about climate change and ways residents can take action in preparing for future climate impacts. A variety of activities were hosted over the course of the Plan's development as outlined in Table 3 below.

Table 3: Climate Engagement in Brampton

Event	Description or Purpose
Climate Change Survey	Online survey to better understand how climate change is impacting those who live or work in Brampton.
Climate Change Art Competition	City-wide art competition to showcase what a resilient Brampton could look like in 2070.
Climate Change Exhibition	Hosted as part of the Earth Day Celebration Event in 2023, the Exhibition featured a series of informational panels along with the artwork produced through the Climate Change Art Competition.
Pop-Up Events	Participation in several Farmers' Markets to promote and seek input on Climate Ready Brampton as well as a pop-up events at Shoppers World and Bramalea City Centre, and the Downtown Revitalization Open House.
Recreation Centres	Engagement at locations across the City including Gore Meadows, Paul Palleschi, Susan Fennell and Cassie Campbell Recreation Centres to increase awareness and to seek input on Climate Ready Brampton.

Throughout September and October 2024, City staff engaged the public more broadly to get a better understanding of what actions residents would like to see in Climate Ready Brampton, and what tools, resources and supports they might require to take action on an individual level. Throughout this period, the City received 100's of responses and spoke to over 400 residents through the pop-up events and targeted recreation centre engagement events.

Residents were clear in what they wanted to see in Climate Ready Brampton including:

- Tools and resources to prepare for future extreme weather events
- Creating and preserving natural spaces that provide cooling and shade, particularly during extreme heat events
- Reducing the impacts of flooding on the community
- Creating healthy and sustainable communities where everyone has access to services, particularly those vulnerable to climate change

SECTION 4

CLIMATE SCIENCE & PROJECTIONS

Around the world, there is scientific consensus that our climate is changing. This can be seen through the rising temperatures, increased precipitation, and increase in the frequency of extreme weather events. Based on recent climate information, Environment and Climate Change Canada estimates that Canada is warming at twice the rate as the rest of the world.

Brampton has already begun to feel the impacts of climate change, including increased flooding and extreme rainfall, ice storms, and some of the hottest summers on record (see Figure 5).

In 2013, both a severe thunderstorm and an ice storm struck Brampton. The severe thunderstorm flooded portions of the 400-series highways, and transmission stations, causing power outages in large parts of Brampton. Later that year, the ice storm caused severe property and tree damage, along with power outages that left 20,000 people without power for several days. These two events alone resulted in over $300 million in property, tree, and infrastructure damage.

Weather vs. Climate

Weather refers to the atmospheric conditions we are all familiar with, including events such as rain, snow, and temperature that occur over a shorter period of time, such as days.

Climate describes the atmospheric conditions over longer periods of time, such as months, years or decades.

Climate Change refers to the long-term changes to climate variables, typically assessed over 30-year periods.

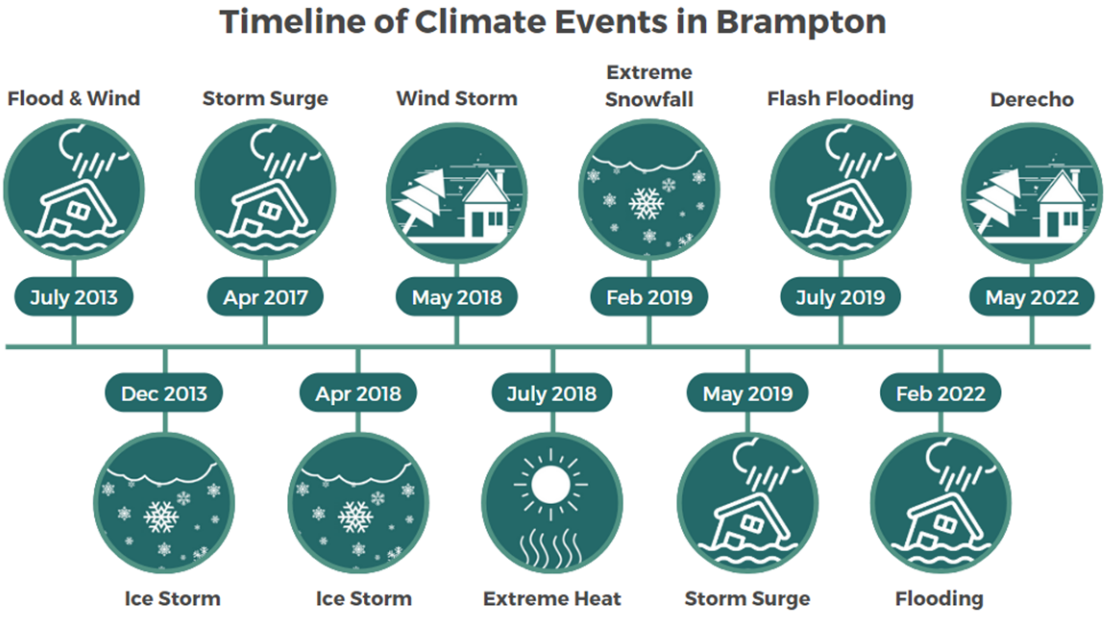


Figure 5: Timeline of Climate Events

In 2018, Brampton experienced a severe windstorm, with winds reaching up to 90 km per hour, uprooting trees and causing infrastructure damage across the city. This single windstorm resulted in $380 million worth of damage and 3 fatalities in Ontario.

More recently, in 2022, the city saw two extreme weather events: the Churchville flooding, and the derecho (extreme wind) event. The Churchville flooding in early 2022 caused the evacuation of over 100 homes along the Credit River, while the derecho event caused power outages, road closures and active City response to monitor and clean up conditions. These two events caused almost $750 million in damages.

Events of this nature have become the new normal, creating new pressures around infrastructure planning and management, emergency services, property maintenance, service delivery, human health and safety, as well as economic prosperity in Brampton.

The Insurance Bureau of Canada highlights the most recent 2024 summer flooding event in Southern Ontario which caused over $7 billion of insured losses alone (Weltman, 2024). In 2022 and 2023, severe weather events caused over $3.1 million in insured damages across Canada. These costs do not take into account the uninsured losses, which are assumed to be double that of insured losses. The Canadian Climate Institute notes that for every dollar associated with insured losses, two dollars are spent on uninsured damages, which are borne directly by households and taxpayers. As the frequency and intensity of these extreme weather events continues to rise, these costs will also rise, directly impacting the ability for communities to bounce back from extreme weather events.

FUTURE CLIMATE CONDITIONS

To assess future changes in climate for the City of Brampton, climate change models used by the Intergovernmental Panel on Climate Change, combined with a variety of scientific information available on Environment and Climate Change Canada's ClimateData.ca portal and the Region of Peel's climate change projections (2016) were used to determine what the trends for specific climate variables and impacts would be (see Table 4). These trends were analyzed using a 'Business as Usual' (i.e., high emissions) scenario, whereby greenhouse gas emissions continue to rise based on the current trajectory. These studies found that by 2070, Brampton will become warmer, wetter and wilder.

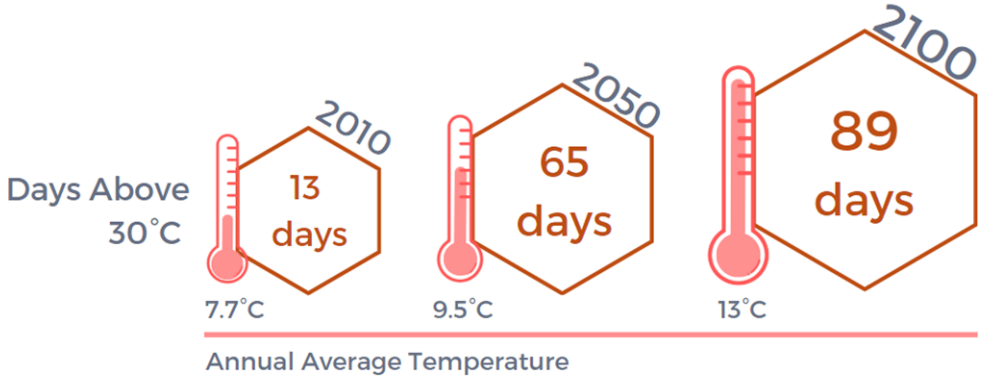
Table 4: Summary of Climate Variables Assessed

Climate Variables Assessed	
Temperature	• Average Temperature (°C) • Maximum Temperature (°C) • Minimum Temperature (°C) • Extreme Heat (days/year) • Extreme Cold (days/year) • Total Annual Consecutive Dry Days
Precipitation	• Annual Precipitation (mm/year) • Maximum 1-day Precipitation (mm) • Maximum 5-day Precipitation (mm)
Extreme Weather	• Annual Freeze-Thaw Cycles • Annual Ice Days • Annual Frost Days
Ecosystem Changes	• Growing Degree Days (Base 10°C) • Corn Heat Units

Warmer:

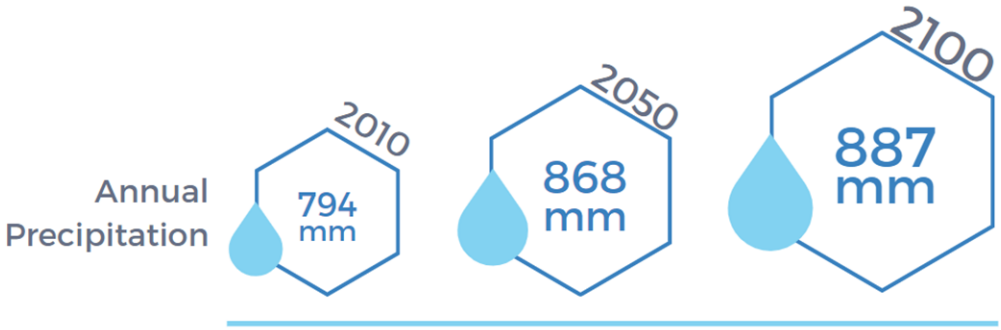
Brampton can expect to see average temperatures increase across all seasons in the future. Average daily temperatures under the high emissions scenario are expected to increase from 8°C currently to 14.5°C by 2070. These changes will result in higher minimum temperatures, particularly during the winter season, causing greater winter variability. Brampton is also expected to experience more extreme heat in the future. The number of extreme heat days (i.e., days above 30°C) is expected to increase from 20 days currently to more than 90 days by 2070.

It is important to note that even though temperatures are expected to increase in the future and minimum temperatures may not be as cold as previously experienced, Brampton will continue to experience periods of cold weather.



Wetter:

By 2070, Brampton's precipitation patterns are expected to change. Unlike temperature, which is expected to increase across all seasons, precipitation is expected to fluctuate. This means more precipitation during the winter months, while summers will see less. Overall, total precipitation is expected to increase both annually and during extreme rainfall events. By 2070, Brampton will see approximately 100 mm more precipitation annually, increasing from 794 mm historically, to 887 mm by the 2070s. Brampton will also see an increase in one-day maximum precipitation from roughly 60 mm/day historically to over 70 mm/day by the 2070s. As temperatures rise, the timing, amount, and type of precipitation may shift. For example, snowfall may change to rainfall during the winter months, increasing the potential for flooding across the city.



Wilder:

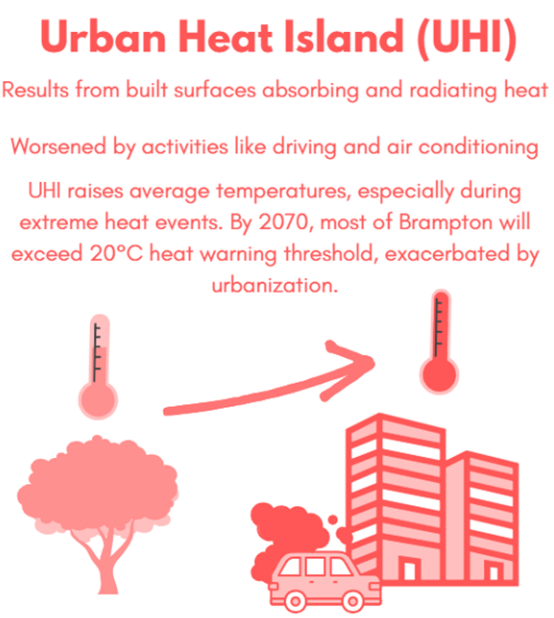
As temperatures continue to rise and there is more energy in the atmosphere, it is expected that by 2070, extreme weather events such as storms and heat waves, along with the frequency of thunderstorms, tornadoes, and extreme wind events will also increase. In cases where the climate models were unable to predict specific future weather events, additional research and analysis was undertaken to determine the expected trend (i.e., frequency of an event).

CLIMATE CHANGE IMPACTS

The changes in climate outlined in the previous section will have a significant impact on the social, environmental, and economic health of Brampton. The impacts presented below are based on scientific research and the outcomes developed through Brampton's Climate Change Risk and Vulnerability Assessment. This assessment identified the top five climate-related risks for Brampton including riverine flooding, local flooding, extreme heat, biodiversity change, and extreme weather events. The following discusses the consequences of the impacts which require adaptation planning.

Human Health Impacts

Climate change will have a significant impact on public health, primarily by exacerbating existing health concerns (Berry & Schnitter, 2022). Some of these impacts may include physical impacts such as the increasing likelihood of injury and death due to extreme weather events. Other impacts may include the increased risk of vector-borne diseases (e.g., Lyme disease), heat stroke, heart attacks, asthma, respiratory infections, to name a few. Climate change will also have a direct impact on the mental health in Brampton. For example, severe flooding events can cause anxiety, depression, and trauma for individuals who may struggle with the aftermath of the damages. Others may experience stress due to the disruptions, the loss of property, or the challenges associated with insurance claims and repairs.



> The impacts of climate change will disproportionately impact certain populations.

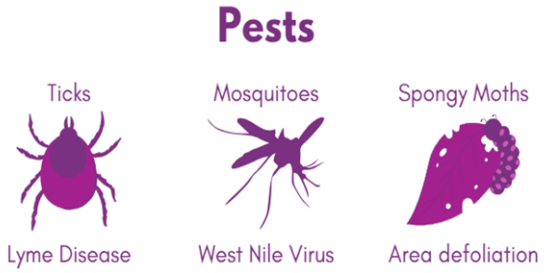
The impacts of climate change will disproportionately impact certain populations including Indigenous, Black, and People of Colour (IBPOC), women, children youth, older adults, low-income individuals, people experiencing homelessness, people living with pre-existing physical and mental health conditions, and certain occupational groups. A person's vulnerability to climate change is influenced by their physical abilities and socioeconomic factors, which has a direct impact on human health. Those who experience more than one factor are considered more vulnerable.

- Older people (over 65) are often at greater risk of negative impacts due to physical disabilities, reduced mobility, and a greater need to access medicine and medical equipment. They may have pre-existing health conditions that increase their vulnerability and may experience social isolation.

- Children (0-4yrs) are at a higher risk as they depend on their parents or guardians to ensure their health and safety and are limited in their ability to adapt to changing climates.
- Race and ethnicity are common social determinants of health due to colonial policies and the current structural, political, cultural, and economic power imbalances that impact their adaptive capacity. Systemic racism influences people's living and working conditions daily.
- Socioeconomic factors (e.g., low-income, under-housed, and homelessness), along with language barriers can also prevent individuals from accessing critical services and supports such as medical care.
- Renters and tenants are particularly vulnerable as they lack the decision-making authority and financial resources to improve the safety of their homes.
- Those who work outside and people experiencing homelessness are also at greater risk from extreme weather events (e.g., heatwaves) as they are exposed to climate hazards for extended periods of time with limited access to spaces with reprieve (e.g., extreme heat can lead to health impacts such as heat strokes, heat exhaustion, and dehydration).

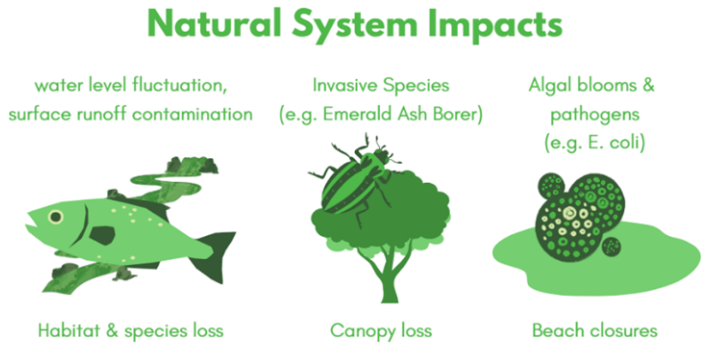
Environmental Impacts

Climate change will have long lasting, global impacts on our natural systems and ecosystems. Brampton is fortunate to have natural systems that comprise of a diversity of species, forests, wetlands, lakes, and streams, which provide a range of environmental and social benefits such as clean water, shade, recreational areas and activities, erosion control, and climate regulation. However, climate change is already impacting our natural systems and will continue to do so in the future.



Climate change can cause direct impacts to species (e.g., changes to their populations, distribution and abundance), along with changes to our water quality and quantity, pest outbreaks and diseases (e.g., Emerald Ash Borer), and can degrade soils which reduces the vegetation's ability to grow. It can also exacerbate existing stressors such as biodiversity, habitat loss and fragmentation, and loss of ecosystems.

While natural systems in Brampton may experience longer growing seasons, these benefits to the natural systems will be offset by the increase in pests and diseases, extreme heat, changes in freeze-thaw cycles, and more.



Infrastructure Impacts

Cities around the world are heavily dependent on built infrastructure systems such as transportation, buildings, water, electricity, and information communication technologies. Impacts to these systems from climate events can be significant, causing cascading impacts. For example, extreme weather events such as ice storms and windstorms have the ability to knock out power across the City. Without backup power, many individuals are left stranded and are unable to shelter in place. During an extreme heat event, those without access to air conditioning or cooling centres may experience adverse health impacts. Extreme weather events (e.g., flooding, extreme heat) as well as freeze-thaw cycles can also cause premature deterioration of roads and bridges, requiring increased maintenance and repairs, and overall shortening the lifespan of these assets.

The population of Brampton is expected to increase to one million people by 2050 while employment is forecasted to grow to 350,000 jobs by 2050. This growth will require additional infrastructure and buildings. As most of Brampton's existing infrastructure was designed based on historical climate conditions, climate change creates a risk to the integrity of that infrastructure and Brampton's ability to provide reliable services.

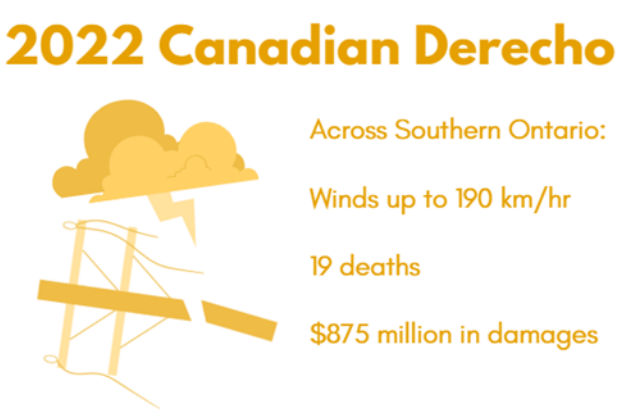
Recent climate events offer insight into the nature of those risks. Exposure to high water depths during extreme flooding events may damage assets, resulting in repair or replacement expenses, or even the permanent loss of those assets. Extreme flooding can also increase runoff and erosion, causing washouts on roads and bridges. Increases in freeze-thaw cycles cause infrastructure to deteriorate faster, increasing maintenance requirements. More frequent extreme heat events damage roads, railways, sidewalks and underground infrastructure. These events also strain the energy supply due to increased use of air conditioning.

Since infrastructure assets have long lifespans (e.g., 50 to 100 years), and are often exposed to many climate conditions, ensuring infrastructure can withstand future impacts is critical. Due to the age and use of infrastructure, along with the projected increases in growth over the next 20 years in Brampton, much of the existing infrastructure is vulnerable to the impacts of climate change. Future infrastructure investments must prioritize resilience if we are to achieve a Climate Ready Brampton.

> Extreme weather and rapid changes to Canada's climate present a profound risk to both public safety and reliability of Canada's infrastructure. Infrastructure owners need the capacity and knowledge to assess the climate vulnerability of new and existing infrastructure to plan and manage potential extreme weather impacts" – Engineers Canada

Economic Impacts

Climate change will have significant implications on global and local economies. Over the course of the 21st century, climate change is anticipated to erode food security, slow down economic growth, and make poverty reduction more difficult (WEF, 2024). In 2024, the World Economic Forum identified extreme weather events as the top global risk over the next 10 years, making it a priority for all economies. This is followed by critical changes to our Earth systems, biodiversity loss and ecosystem collapse, and natural resource shortages (ibid).



Climate change impacts on the economy, such as damages and disruptions from extreme weather events, loss of productivity and services, as well as health concerns have financial, economic, and social implications on Brampton. Based on the analysis completed as part of Climate Ready Brampton, it is anticipated that frequent flooding events alone will result in $1.6 Billion worth of damages in the future. A single rare flooding event will result in $10 Million worth of disruption for businesses. While further analysis will be needed to determine the social and infrastructure costs associated with climate change that also directly impact Brampton's economy, based on the Canadian Climate Institute's Climate Change and Health Report (2021), it is estimated that under a high emissions scenario, heat-related productivity losses in Canada will result in $15 Billion worth of damages, $8.5 Billion in heat-related deaths, and $866 Million in illnesses. The costs of climate change on Canada's infrastructure is estimated to approach $1.2 Billion per year over the course of the next 30 years (CCI, 2022).

Frequent flooding events in Brampton alone will result in $1.6 Billion worth of damages in the future.

By investing in climate adaptation and resilience Brampton can reduce its exposure to climate risks, lower the social and GDP costs, and improve investor confidence as well as credit ratings. This in turn will improve Brampton's ability to adapt to changing climates and promote economic resilience. As noted by the National Round Table on the Environment and Economy, being proactive in implementing adaptation measures now is more economic than restoring or rebuilding infrastructure once an event has occurred (Boyd & Markandya, 2021). For example, building a house or a bridge that is climate ready for the duration of its lifecycle will only add 0% to 5% to construction costs, compared to the costs post damage. It is also worth noting that homes and infrastructure that aren't climate ready face increasing maintenance costs for the remaining life of the assets.

THE OPPORTUNITIES TO ADAPT

While the focus of adaptation planning has primarily centered around reducing the level of risk, building resilience also provides Brampton with many opportunities. Some of these opportunities may include:

- Creating more complete, healthy communities by increasing the use of active transportation and public transportation across the city
- Improving opportunities for people to access important services (e.g., more heating/cooling centres, water features, natural systems, etc.)
- Increasing tourism and recreational activities across the city
- Allowing for local businesses to thrive, while also attracting new businesses
- Extending the length of the growing season which can allow for more local food production and agriculture (e.g., community gardens)

This Plan integrates both the impacts and opportunities to create a pathway that leverages existing information, tools and resources where possible, to build Brampton's climate resilience.

THE COST OF ACTION AND INACTION

As the impacts of climate change continue to increase, so will the costs. By taking action now and investing in climate resilience, the City can avoid paying for costly infrastructure upgrades, save money, and direct funds towards building climate ready communities. Taking action will also protect people, natural systems, infrastructure, and the economy from impacts both now and in the future. Public Safety Canada estimates that for every dollar invested in climate change adaptation now, it will save up to $15, including both direct and indirect economy-wide benefits (Government of Canada, 2024). To demonstrate what the costs of action and inaction would be, Table 5 compares the cost of damages alongside the cost of implementing adaptation actions. Costs were developed using both a business as usual (high emissions) scenario as well as an adapted scenario which integrates a series of adaptation actions identified in this Plan.

Table 5: Comparison of damages and human impacts from climate hazards to the cost of implementing adaptation actions.

	Riverine Flooding	Local Flooding	Extreme Heat
Present Day Damages ($ million)	$2,989	$119	NA
Business as Usual 2070 Damages ($ million)	$4,718	$119	NA

Adapted 2070 Damages ($ million)	$273	$18	NA
Avoided Damages ($ million)	$3,126	$101	NA
Cost of Implementation ($ million)	$126	$3	-$623[2]
Return on Investment ($ million)	**$1,070**	**$98**	**NA**
Present Day People at Risk	20,675	5,341	389,289
Business as Usual 2070 People at Risk	80,489	5,341	1,017,959
Adapted 2070 People at Risk	964	0	5,227
People Protected	**79,526**	**5,341**	**1,013,000**

The financial impacts analyzed include damage to buildings (i.e., damage to structures and their contents) as well as the cost of disruptions to businesses. This was calculated for both riverine flooding, and basement flooding. Under the adapted scenario, costs to retrofit buildings and the installation of backflow preventer valves are also included. Further analysis will need to be undertaken in the future to determine the costs associated with damage to infrastructure and human health impacts.

Costs to implement this plan, including developing new programs and policies, launching pilot projects, retrofitting municipal buildings for climate resilience, retrofitting homes and businesses for energy efficiency and climate resilience, and protecting the natural heritage system, have been identified at a high level in the Implementation Strategy (see Section 6).

[2] Installing a white roof on residential buildings presents no additional cost, as similar materials are used, but in different colours. Commercial buildings with flat roofs present a cost savings, as the white roofing materials are less expensive than traditional materials. Tree planting costs are included in this summary calculation.

SECTION 5

A VISION FOR THE FUTURE

Brampton will be a climate leader fostering resilient, low-carbon, and adaptable communities, with thriving natural systems, climate-ready infrastructure, and a robust economy that advances equity, innovation, and quality of life both now and for future generations.

A PATH TO RESILIENCE

Turning Brampton's Climate Ready vision into a reality will require city-wide coordination and participation. Creating a comprehensive pathway to achieving this Vision is supported by:

- Establishing a set of **goals** to guide City and community decision-making towards long-term resilience, and ensure Brampton achieves its Vision.
- Organizing action into **themes** to identify synergies and ensure coordination across the community.
- Identifying specific **objectives** and **actions** as detailed next steps to implement Climate Ready Brampton

Figure 6: The elements of Climate Ready Brampton

GOALS

To guide the implementation of Climate Ready Brampton, the City has developed six key goals:

1. Brampton is adaptable to future climate change impacts, which are predicted using the best available science and climate data.
2. The most vulnerable people, communities, and places are prioritized for climate action.
3. Climate resilience is the new normal, where the City, its partners, neighbourhoods and generations work together to protect each other.
4. The economy of Brampton thrives as people, businesses and industries are prepared for climate emergencies and longer-term climatic changes.
5. Strong partnerships enhance efficient and effective climate resilience action.
6. Measurable, clear targets guide the work of climate adaptation, and progress is transparently reported.

THEMES

To support the Vision and Goals of Climate Ready Brampton, a series of Themes were created to coordinate efforts based on key sectors which include

1. Collaborative Leadership,
2. Protected and Connected People,
3. Resilient and Healthy Natural Systems,
4. Resilient Infrastructure, and
5. Community Involvement and Communication

Each theme also includes specific objectives to illustrate what it means to be a resilient Brampton. These objectives form the basis for all actions designed to reduce risks from future climate hazards.

THEME 1: COLLABORATIVE LEADERSHIP

Climate change is a global challenge, but its impacts are felt most strongly at the local level. Municipal governments are the closest to its people, places, and ecosystems affected by a changing climate, and are often the first responders to local emergencies and challenges. Municipalities are ideally positioned to realize the co-benefits of climate action, such as local economic development, lower disaster recovery costs, and improved public health. As a result, municipalities have been at the front line of action to both mitigate and adapt to climate change. The adoption and implementation of Climate Ready Brampton is a crucial next step in Brampton's commitment to tackle climate change and foster resilient communities.

For climate action to be successful, municipal leadership is essential. The City must take a lead role in supporting Brampton's resilience and adaptation efforts and lead by example. This will require teamwork across City departments, and support from other levels of government and community partners to ensure that this work is coordinated across the entire city. Success will hinge on the City's ability to incorporate climate change into all levels of decision-making, budgeting, and planning processes. This will also require all staff to be aware of and understand how to integrate climate considerations into their projects. By demonstrating a 'whole-organization approach' to climate adaptation, Brampton can be a leader and a model for residents, business, institutions, and other municipalities.

OBJECTIVE 1: THE CITY IS A LEADER IN CLIMATE RESILIENCE

The City will demonstrate leadership by comprehensively integrating climate adaptation into all planning, decision making, and operations. This will be supported by actions such as:

- Integrate a 'climate change lens' into budgeting processes, procurement procedures, and asset management;
- Informed decision-making with the use of the latest climate data and projections; and
- Ensure all reports to Council include discussion of climate risks and associated adaptation strategy.

OBJECTIVE 2: MUNICIPAL STAFF ARE PREPARED, INFORMED AND HAVE ALL REQUIRED TOOLS

The City recognizes that a fundamental enabler of climate adaptation action is an informed, resourced, collaborative, and empowered staff. Municipal staff will coordinate across departments to share resources, information, challenges, and solutions. Increasing staff knowledge of climate change and adaptation through ongoing training will ensure Brampton is working with the best

information available, and that staff can integrate climate change implications into their work. Each department should conduct risk and vulnerability assessments to help prioritize projects and guide budgeting. Additional measures outlined in the action plan include:

- Reviewing municipal asset insurance to ensure it is appropriate for future hazards; and,
- Updating PPE budgets and policies to ensure staff have adequate protective equipment and practices to ensure their safety in dangerous weather.

EQUITY CONSIDERATIONS

Integrating an equity lens into adaptation actions is essential to ensure the City is developing programs, plans, policies and initiatives that everyone can benefit from. Including those most affected by climate change requires careful engagement and meeting people in the community. Increasing the diversity of municipal staff working on climate change will help to ensure multiple perspectives are considered in decision-making.

Action to reduce climate risk can be expensive. Therefore, any programs and plans should include considerations to reduce financial barriers to participation.

CO-BENEFITS

For the City of Brampton, implementing actions identified within this theme will result in both climate adaptation and mitigation benefits.

Many of the actions including the development of a climate lens and integration of climate considerations into all decision-making and budgeting processes, must be examined holistically.

By integrating both the climate adaptation and mitigation lens into all projects, the City will be able to advance low-carbon, resilient communities more efficiently and effectively.

TRACKING METRICS

- Number of plans, programs, policies, and municipal initiatives with climate adaptation integration
- Number of staff trained to integrate climate change adaptation and mitigation
- Number of community members participating in climate action programs and events

TARGETS

→ 100% by 2028

→ 100% of municipal staff to have undergone training by 2028; All new staff will have training as part of onboarding by 2026

→ 10% increase from the baseline (2024 year)

THEME 2: PROTECTED AND CONNECTED PEOPLE

Given the breadth of physical and mental impacts on human health from climate change, there is a concerted effort within this plan to understand the disproportionate impacts on vulnerable populations, including low-income people, people of colour, single-parent households, seniors, youth, and people living with disabilities. This focus ensures that actions meet the specific needs of the diverse Brampton community and that communities are prepared for climate change.

At the heart of Brampton's climate adaptation initiatives lies the strength of human connections. By fostering relationships that transcend racial, cultural, and socio-economic barriers, the community bolsters its adaptive capacity and creates a collaborative response for climate resilience. The City will engage multi-sectoral perspectives, voices and partnerships to help identify vulnerabilities and leverage our strengths, building a robust social fabric that enhances our collective ability to recover and thrive in the face of climate change. Prioritizing the communities and those most vulnerable to climate impacts will help to ensure that everyone benefits from the adaptation measures.

The City of Brampton proudly stands as the fourth-largest city in Ontario and one of the fastest growing in Canada. A multi-cultural hub, Brampton is home to the third-largest immigrant population in Ontario. Brampton's mosaic is shaped by its Indigenous ancestry (including First Nations, Métis, and Inuit), large ethnic-minority populations, and high rates of fluency particularly in Punjabi, Hindi, and Urdu. This remarkable diversity underscores the need for a proactive and equitable approach to climate adaptation, ensuring that diverse voices and perspectives are included in collective efforts to protect the community.

OBJECTIVE 1: EQUITY-DESERVING GROUPS ARE PRIORITIZED

Ensuring Brampton's communities are protected from the impacts of climate change requires an inclusive approach that considers the unique needs of different communities, including vulnerable populations. By focusing on the lived realities of climate-vulnerable populations, Brampton will build solutions that reflect and meet the unique needs of its diverse communities. This approach not only strengthens climate resilience but also fosters social equity, ensuring every resident can meaningfully participate in and lead climate action.

This objective prioritizes the protection of people and resources within the community. This includes actions such as:

- Updating cooling center strategies to provide additional extended hours;
- Establishing minimum shade standards for public spaces;
- Developing a building cooling bylaw; and
- Undertaking additional tree planting in priority areas.

OBJECTIVE 2: MOVING AROUND THE CITY IS SAFE AND SIMPLE IN ALL CONDITIONS

This objective focuses on protecting people while on the move during extreme weather events by enhancing transit safety and accessibility across the city. These actions will make Brampton a safer, more resilient city where everyone can move about with confidence in all conditions. Key measures include:

- Developing an early warning system to help residents avoid hazardous roads,
- Expanding Brampton Transit services to ensure access to shelters and cooling centers,
- Enhancing transit hubs and bus stops with shading, shelter, and green roofs where possible, providing comfort and safety during adverse weather conditions.

OBJECTIVE 3: EMERGENCY PLANNING ENSURES PEOPLE ARE PREPARED FOR CLIMATE DISASTERS

Objective 3 focuses on preparing Brampton's community for climate-related emergencies. A key aspect of this objective is strengthening Brampton's response capabilities to ensure that the City is adequately prepared with all the tools and resources to help communities prepare for and bounce back from climate-related disasters. Some actions include:

- Updating emergency management plans and providing climate-focused scenario training for responders
- Work with utility providers to enhance telecommunications backup systems to maintain reliable connectivity during emergencies
- Support Peel Public Health in increasing community awareness of the health risks associated with climate change such as vector-borne diseases and provide support to programs aimed at offering shelter for vulnerable populations during extreme weather
- Provide timely and relevant information to residents and local businesses through a variety of resources
- Require Heat Management Plans for outdoor events.

EQUITY CONSIDERATIONS

Noting that some segments of the population are more exposed to extreme weather events or are under-equipped to respond and recover, this plan prioritizes vulnerable populations to ensure that actions are targeted towards those who experience the brunt of climate impacts. This includes measures to protect the broader community when outdoors.

CO-BENEFITS

While actions within this theme primarily focus on emergency preparedness, opportunities exist to provide climate mitigation co-benefits as well. For example, by prioritizing equity-deserving groups, actions such as tree planting in priority neighbourhoods provide both a cooling benefit, but also help to support carbon sequestration.

TRACKING METRICS

- Number of priority neighbourhoods with access to heating/cooling shelters
- Percent of shade canopy in public spaces
- Number of water features available
- Number of households with climate emergency plans in place

TARGETS

→ 100% by 2030

→ Tree canopy increased by 80% in priority areas by 2040

→ To be determined

→ 10% annual increase in positive responses to surveys

THEME 3: RESILIENT INFRASTRUCTURE AND BUILDINGS

Brampton's infrastructure includes physical structures such as stormwater management, water and wastewater treatment, energy production and distribution, and the movement of goods and people. Residential, commercial, institutional and industrial buildings in Brampton provide housing, places of work, and economic activity. Given the interdependence among infrastructure systems, damage from climate change and extreme weather events can produce significant cascading impacts with wide-ranging social and economic implications. For instance, damage to roads and bridges, or public transit can prevent people from getting to work, accessing healthcare, or other daily activities.

Despite facing significant climate risks, improving infrastructure is also one of a community's best ways to improve its resilience. This requires considering climate impacts when planning, designing, maintaining, and upgrading infrastructure and buildings. The objectives presented in this section comprise actions that promote the safety and well being of the community, and increase the adaptive capacity of essential infrastructure, homes, and buildings.

OBJECTIVE 1: ESSENTIAL INFRASTRUCTURE IS RESILIENT

The actions under this objective focus on making both existing and new essential infrastructure resilient to future climate impacts. This includes actions such as:

- Upgrading existing stormwater infrastructure and culverts to handle larger flows and frequencies of flooding
- Safeguarding Brampton's energy systems to be resilient to extreme weather events
- Reducing travel disruptions due to damaged or blocked roads, and
- Ensuring that all neighbourhoods have access to emergency water supplies during extreme heat or drought events.

OBJECTIVE 2: THE COMMUNITY IS SAFE IN THEIR DAILY LIFE

Climate change impacts on infrastructure can have a direct impact on community safety and well-being. Some parts of Brampton are more vulnerable to flooding and extreme heat, often due to past land use decisions and/ or geographic features. Actions under this objective will reduce the potential damage from flooding and ensure the City's infrastructure is resilient to withstand future extreme weather events. This includes actions such as:

- Integrating climate change projections into floodplain modelling
- Updating zoning by-laws to consider climate-related vulnerabilities
- Implementing green infrastructure flood mitigation measures
- Increasing community-scale energy generation and storage

OBJECTIVE 3: BUILDINGS AND HOMES ARE CLIMATE PROOF

Resilient and safe shelter is important during extreme weather. These spaces protect community health and safety and provide access to employment. Buildings and homes designed with future climate impacts in mind will be resistant to temperature and weather extremes, improve occupant safety, and experience less damage from severe weather.

Brampton's aging buildings also represent an urgent priority for the city's resilience. Many of these buildings and homes may still have their original heating systems and windows, making them inefficient and susceptible to failure. They may also lack back-up power, meaning that heat, water, elevators, and lighting will not work during an extended power failure. For residents of apartment buildings, lack of air conditioning may cause dwelling units to reach unhealthy levels in hot weather. Since the built environment is typically long-lasting, it is important to act now to avoid poor outcomes in the future. Avoiding risk exposure is the cheapest and most effective adaptation option for new developments.

This objective will improve climate resilience for homes and buildings through actions such as:

- Updating design standards to ensure new development addresses climate impacts,
- Reviewing and updating Brampton's Sustainable New Communities Program,
- Integrating adaptation measures into a retrofit program,
- Promoting enhanced building codes, and
- Exploring opportunities to reduce flood risk in new developments.

EQUITY CONSIDERATIONS

Resilience requires that essential infrastructure operate predictably, reliably, and securely in all communities, fairly and equitably, including those with existing infrastructure gaps and those with infrastructure at highest risk of climate impacts.

Neighbourhoods with high percentages of vulnerable people, or areas with little to no air conditioning, will require assistance sooner than others during extreme heat events. The City will need to identify high-priority neighbourhoods where these occurrences may exist, and ensure plans prioritize infrastructure upgrades or installation in areas.

CO-BENEFITS

Resilient infrastructure provides significant opportunities to both adapt to climate impacts, while also supporting the reduction in greenhouse gas emissions. Buildings (both new and existing) that are designed or retrofitted to be climate proof allow for better indoor air quality, improved energy-efficiency, lower heating and cooling costs, and less fuel use and greenhouse gas emissions.

Other actions identified under this theme such as the development of more resilient energy systems also help to support both mitigation and adaptation efforts. Distributed energy storage solutions such as batteries can reduce peak demand from the electricity grid. This helps ensure power utilities are not overwhelmed with demand during extreme weather, reduces the need to increase feeder line capacity, and allows utilities to make less use of natural gas.

TRACKING METRICS	TARGETS
• Number of new buildings constructed that achieve ‘Gold’ in the Sustainable New Communities Program	→ 50% by 2040
• Percentage of roof area with green or white roofs	→ To be determined
• Percentage of impervious surfaces;	→ 50% of all developments met the highest level metric for stormwater management in the Sustainable New Communities Program by 2040
• Number or length of infrastructure elements replaced	→ To be determined (based on updated 2025 Asset Management Plans)
• Length of protected power lines.	→ 100% of all new developments by 2035 → Retrofits: to be determined, in conjunction with utility planning

THEME 4: RESILIENT AND HEALTHY NATURAL SYSTEMS

Brampton's natural systems include a diverse range of wetlands, lakes, rivers and streams, valleylands, woodlands, and meadows which support wildlife and plants. It also includes our urban forest, such as urban trees and green infrastructure along boulevards. These natural systems are vulnerable to changes in climate and can impact soil conditions, growing seasons, ice conditions and the addition of new pests and diseases to name a few. Brampton will need to proactively manage these ecosystems so they continue to support local biodiversity, and provide green spaces to the community.

The health of natural systems in Brampton is directly related to environmental conditions, meaning that they will be directly impacted by climate change. More frequent and severe storms, and heavy rainfall can drown vegetation and damage tree limbs with high winds. Intense storms can also overwhelm existing watercourses, eroding banks, washing away vegetation, and removing habitat for other species. Changes in climate conditions will allow invasive species to survive and out-compete native species, bringing with them new diseases and challenges.

Image 6: The Credit River

Having resilient and healthy natural systems provides direct benefits to the community through ecosystem services such as improved air quality, shade and temperature moderation, and water filtration. Natural systems like wetlands and floodplains also provide areas for rainwater infiltration, which stores water during large rain events, decreasing the likelihood of flooding. In addition, they provide homes and food sources for wildlife and plant species and provide recreational and spiritual places for community members.

By protecting and enhancing our natural systems to be resilient to climate change, Brampton's natural systems will be able to adapt more quickly to these changes and bounce back after extreme weather events. Ensuring that the natural systems are managed, and maintained with climate change in mind will ensure that Brampton can continue to enjoy the benefits they provide well into the future.

OBJECTIVE 1: NATURALIZED SPACES HELP PROTECT BRAMPTON FROM CLIMATE IMPACTS

This objective aims to ensure that Brampton's natural systems are protected and enhanced to withstand future climate impacts to protect Brampton's communities. This includes managing them to keep them healthy and thriving, so they can provide the maximum benefits for as long as possible. Actions in this objective include:

- Setting overall natural cover targets based on the Risk and Vulnerability Assessment
- Updating the City's Natural Heritage and Environmental Management Strategy to account for climate change
- Exploring opportunities to acquire natural heritage lands for climate adaptation purposes
- Creating an open data portal that showcases green infrastructure across the city

OBJECTIVE 2: NATURAL SYSTEMS ARE HEALTHY AND INTACT

Ensuring that natural systems within Brampton are healthy and intact requires an assessment and understanding of their current state and how climate change is projected to impact them in the future. From there, natural assets can be monitored and managed to ensure their continued health, to identify threats early, and to restore and enhance them as needed. Actions under this objective include:

- Update the Urban Forest Management Plan to account for climate change
- Integrate natural assets into Asset Management Plans
- Develop studies (e.g., wetland health and restoration, ecological corridor connectivity, soil health study) to better understand and maximize conditions for natural systems
- Undertake a tree canopy cover assessment and developing a tree canopy cover policy
- Implement the recommendations of studies and undertaking 'on the ground' action (e.g., tree planting along watercourses)

EQUITY CONSIDERATIONS

Urban trees provide cooling effects in dense urban areas. Giving people access to natural spaces provides physical and mental health benefits, and expanding the network of natural systems allows more people to access these benefits. Ensuring that locations with less canopy cover, or with less access to natural spaces are prioritized in high priority neighbourhoods will allow more people to experience the benefits of temperature regulation and improved air quality.

CO-BENEFITS

Natural systems provide significant co-benefits to our communities. Not only do they help support communities in adapting to the impacts of climate change, they also play a key role in our efforts to mitigate greenhouse gas emissions through carbon sequestration. The actions identified in this section will help to increase the carbon sequestration capacity of our natural systems, while also improving the overall adaptive capacity of our natural systems.

TRACKING METRICS

- Number of restoration activities completed
- Percentage of canopy cover in high-heat areas
- Percentage of canopy cover across the city
- Invasive species counts
- Survivorship of urban tree species

TARGETS

→ Number of restoration activities is constant or increasing annually (2024 baseline)

→ 80% tree canopy cover in high-heat areas by 2040

→ To be determined, in consultation with conservation authorities

→ To be determined, in consultation with Invasive Species Management Plan

→ 95% of newly planted trees survive for 15 years

THEME 5: COMMUNITY INVOLVEMENT AND COMMUNICATIONS

Communities that are climate-prepared generate change by participating in climate change adaptation. Communication programs and incentives for resilience should be tailored to the diverse audiences in Brampton, be grounded in equity, and draw on best practices to prepare residents for climate emergencies. This can be achieved through long-term, meaningful collaboration with First Nations communities, equity-deserving groups, Brampton residents, businesses, and non-profit organizations. Strong engagement with the community will help create a sense of trust and empowerment in the face of climate change.

Existing emergency communications will need to be expanded to include proactive and accessible community educational resources. This will assist with mobilizing communities to take tangible climate action such as home improvements, energy efficiency, and flood-proofing measures to live more sustainably. As individuals and communities build and strengthen their climate resilience, Brampton will become an inclusive, equitable, and resilient city.

Collaboration with community-based organizations and initiatives are critical for advancing climate adaptation in Brampton, and for supporting municipal leadership with this work. Partnering with community groups, places of worship, and not-for-profits to increase climate adaptation literacy, facilitate public dialogue, problem-solve, implement solutions, monitor outcomes, and support one-another will all help move the whole community forward. The City's leadership will be demonstrated through collaborative governance that fosters trust and capacity at the grass-roots level.

OBJECTIVE 1: BRAMPTON IS PREPARED FOR CLIMATE EMERGENCIES

When preparing for climate emergencies, Brampton must make climate adaptation and emergency preparedness accessible to all. While all members of the community will experience the impacts of climate change, being prepared is particularly important for safeguarding Brampton's seniors, youth, newcomers, and other vulnerable populations.

To strive towards equitable climate work, the Plan includes actions such as:

- Integrating climate change and emergency preparedness into the City's Inclusion, Diversity, Equity, and Anti-Racism (IDEA) initiatives and
- Developing a climate equity checklist to account for vulnerable populations. Residential incentives can provide accessible multi-lingual information, and encourage the adoption of flood-proofing and low-carbon energy retrofits. These actions can have massive climate resilience benefits for individuals and their communities.

OBJECTIVE 2: EMERGENCY COMMUNICATIONS KEEP THE COMMUNITY SAFE

In emergency events, clear, accurate and accessible information and communication is critical to ensuring the community knows what to do, where to go, and how they can access the resources they need. To keep the community safe, this objective includes actions such as:

- Developing an Emergency Communications Strategy,
- Implementing the emergency communications recommendations by prioritizing high risk neighbourhoods
- Creating a publicly accessible map that highlights the location of water features (e.g., water fountains, splash pads, cooling centres, etc.)

OBJECTIVE 3: THE COMMUNITY IS INVOLVED IN CLIMATE ACTION

The impacts of climate change are evident across many aspects of our city including where people live, work and play. For climate action to be successful, an 'all-hands-on-deck' approach, with active community involvement is required. This can be achieved through continuous engagement with the public, which will help to inform them of the issues, change attitudes and perceptions, and allow for social change that focuses on a collective response to climate change. The City will also need to provide the community with the tools and resources to undertake individual climate action. To achieve this, the City will need to build on its existing partnerships, while also establishing, expanding and strengthening collaboration throughout the community. Each individual plays a vital role in helping Brampton become climate resilient.

The City has identified a range of actions that will help support and strengthen community involvement in climate action. Some of these actions include:

- Seeking meaningful engagement with First Nations communities
- Establishing and enhancing connections with grassroot organizations and non-profits
- Developing a Home Preparedness Education Program
- Creating community education and awareness programs and toolkits

EQUITY CONSIDERATIONS

Community involvement must be accessible, inclusive, and equitable, to ensure people are empowered to participate. Many actions in this theme will help Brampton reach the community meaningfully and support the participation of as many residents as possible.

CO-BENEFITS

Community involvement in climate action must address both mitigation and adaptation if Brampton is to successfully create low-carbon resilient communities. This means that public engagement will need to examine climate change holistically, to ensure the community understands how to best address climate change at the local level.

TRACKING METRICS	TARGETS
• Number of stormwater storage interventions installed.	→ 90% of homes at risk of basement flooding have backflow preventers by 2030; 100% by 2035
• Number of resilient retrofits completed	→ 100% of existing dwellings by 2035
• Number of collaborative projects with an equity checklist.	→ 100% by 2026
• Number of locations with free emergency water supply.	→ To be determined, based on needs assessment
• Number of community partnerships for resilience engagement.	→ Number should be stable or increasing annually (2024 baseline)

SECTION 6

CLIMATE READY FOR THE FUTURE

Climate Ready Brampton represents the next step in Brampton's journey towards climate readiness and climate change mitigation. The completion of this plan is the starting point for Brampton's adaptation journey. This commitment promises a future that is green, safe, and equitable.

This vision cannot be completed by the City alone. It requires the support of the community, the Region, the Province, and those who call Brampton home. The journey together will be challenging, innovative, and at times feel overwhelming. But by focusing on collective successes, the immediate next steps on this pathway to resilience will become clear. By working together, we can pave that pathway towards a Climate Ready Brampton.

This work shows us that the decisions we make today will affect us well into the future. By making climate-ready choices we can reduce costs, protect lives and livelihoods, and make Brampton a thriving hub of climate resilience. Brampton can be a leader in climate readiness, showing the pathway for others to follow.

IMPLEMENTATION STRATEGY

Core Component and Objective

The Core Components are the five specific themes highlighted within this report which feature supporting actions that the City of Brampton aims to accomplish over the next five to ten years.

1. Municipal Leadership,
2. Protected and Connected People,
3. Resilient and Healthy Natural Systems,
4. Resilient Infrastructure, and
5. Community Involvement and Communication

Action Characterization

Each of the actions identified in the Implementation Strategy can be categorized into one of the following types of actions:

- Plans and Studies: Undertake research or planning projects
- Policies, Guidelines, and Standards: Create or update rules and regulations
- Procedures: Establish new ways of doing business or updating existing procedures
- Programs and Initiatives: Update or create new programs and initiatives
- Plan and Study Implementation: Implementing the findings of plans and studies
- Partnerships and Engagement: Collaborate with stakeholders to advance climate action and help advocate to other levels of government to support local climate action

Timeline

The actions listed in the Implementation Strategy provide a clear roadmap for how the City will improve its resiliency over the course of the next five to ten years. All actions have a corresponding timeline (i.e., short-, medium-, and long-term). These are defined as follows:

- Short Term: 1 to 3 years
- Medium Term: 4 to 7 years
- Long Term: 7+ years
- Ongoing: Actions occurring on an ongoing basis

Cost

For each action, the estimated cost has been characterized based on the following scale:

- Low Cost: $0-$100,000
- Medium Cost: $100,000-$500,000
- High Cost: $500,000+

Please note, actions identified as plans and studies are identified as low or medium costs. The cost of implementing the results of the studies is highlighted as a separate category. In many instances, the results of the studies have not yet been completed, and as such, an estimated cost for implementation is to be determined.

Roles and Responsibilities

Roles and responsibilities (i.e., leads, supports, and additional stakeholders) have been identified for each action to provide ownership and oversight throughout the implementation process.

Image 7: Wading pool at Chinguacousy Park

COLLABORATIVE LEADERSHIP					
Brampton is prepared for climate emergencies					
Action	Timeline	Cost	City Lead	Partners	Mitigation Co-Benefits
Sustainable Procurement: Upgrade the sustainable procurement strategy to include climate change adaptation and mitigation, including the incorporation of climate impacts into the design and renewal of assets. ✚	Short	$	Purchasing		+
Climate Lens in Budgeting: Integrate climate resilience into the priority-based budgeting process and reflect the findings from the Asset Management Plans.	Short	$	Finance		
Climate Lens in Asset Management: Integrate climate risk into the development of Asset Management Plans	Short	$	Corp Asset Mngmt		
Use climate science and evidence-based decision-making: Incorporate up-to-date climate projections into City planning, policies, programs and infrastructure. ✚	Short	$	All		+
Climate Reporting to Council: Ensure reports to Council include an assessment of climate risk and adaptation strategies through the integration of a "Climate Implications" section. ✚	Short	$	Env Planning	Clean Air Partnership	+
Update Adaptation Plan: Review and update the Adaptation Plan every five years	Ongoing	$	Env Planning		
Climate Risk Officer: Assign a City staff member to track the most current climate indicators and methods, and other information for assessing future climate risk.	Short	$	Env Planning		
Municipal staff are prepared, informed and have all required tools					
Department needs during Extreme Weather: Regularly review and update operational needs of all departments to ensure adequate preparedness for inclement weather and extreme weather conditions.	Ongoing	$	All		

Cross-department Climate Risks Coordination: Conduct an internal stakeholder mapping exercise to identify cross-departmental coordination and how the roles/responsibilities of departments are impacted by implementing climate change adaption actions.	Short	$	Env Planning		
Train Staff on Climate Adaptation: Increase staff awareness on climate change adaptation and resilience through ongoing training, workshops and the annual Climate Change Seminar Series. ✚	Short	$	Env Planning		+
Support Staff Analyzing Project Climate Risk: Empower and provide support to staff on analyzing climate risk in their projects through knowledge exchange activities (e.g., Climate Change Hub, peer-to-peer, learning sessions, workshops, etc.) ✚	Ongoing	$	Env Planning		+
City Department Risk and Vulnerability Assessments: Develop detailed departmental risk and vulnerability assessments to help prioritize City projects and inform budgets (e.g., stormwater, parks, recreation, roads, etc.)	Ongoing	$	All		
Review of Insurance for Municipal Assets	Ongoing	$	Insurance & Risk Mngmt		
PPE Budgeting for Extreme Weather: Explore opportunities for updating departmental budgets regarding personal protective equipment (PPE) and clothing to decrease weather-related exposure and risk (e.g., cooling vests, insect-repellant clothing, etc.)	Short	$	All		

PROTECTED AND CONNECTED PEOPLE					
Emergency planning ensures people are prepared for climate disasters					
Action	Timeline	Cost	City Lead	Partners	Mitigation Co-Benefits
Review and Update Emergency Management Plans: Update the City's Emergency Management Plans to account for impacts of climate change.	Ongoing	$	Emerg Mngmt	Region of Peel	
Scenario Training of Climate Hazards: Update scenario training to account for future climate change projections.	Ongoing	$	Emerg Mngmt	Region of Peel	
Review and Update Emergency Telecommunications: Consult with utilities regarding the enhancement of backup systems for telecommunication outages (i.e. internet, phone lines, cellular)	Ongoing	$	Emerg Mngmt	Utilities, Region of Peel	
Climate Toolkit for Local Businesses: Inform private businesses/employers about the City's Adaptation Plan and the importance of future-proofing for climate change. This can include empowering businesses and organizations by providing them with resources, such as a toolkit on climate risk reduction.	Short	$	Economic Dev	Region of Peel, Cnsrvtn Authorities	
Online Resilience Hub: Provide an online portal for the public to access climate adaptation-related resources and to track progress on the implementation of the Adaptation Plan.	Short	$	Env Planning		
Vector-Borne Disease Management: Support Peel Public Health with the development and dissemination of resources for residents on the increased exposure to Lyme disease, West Nile virus and other potential vector-borne diseases due to climate change.	Short	$	Env Planning	Region of Peel	
Moving about the city is simple and safe in all conditions					
Traffic Routing during Extreme Weather Closures: Implement an early warning system that notifies residents where roads may be susceptible to damage in advance of an	Short	$	Emerg Mgmt	Region of Peel	+

extreme weather event, to ease traffic congestion and the likelihood of accidents on roads (extreme weather events may cause low visibility and slippery conditions) ✚					
Discourage Personal Vehicle Use during Inclement Weather: Continue expanding Brampton Transit services across the city to ensure that individuals who do not have access to personal vehicles can access emergency shelter and/or heating/cooling centres during extreme weather events.	Short	$	Transit	Metrolinx, Province, Federal	
Free Fare during Extreme Weather: Reduce the risk of exposure to extreme weather events by providing free fare to encourage people to travel by transit (where possible) to emergency shelter or heating/cooling facilities, and offering work-from-home options. ✚	Long	$$$	Transit	Metrolinx, Province, Federal	+
Shelter and Shade at Transit Hubs: Ensure transit hubs (bus and bike) and bus stops have adequate shading and shelter, and provide green roofs where possible.	Short	$$$	Transit		
Equity-deserving people are prioritized					
Outdoor Work Recommendations: Provide educational materials for businesses/employers with outdoor workers that include tips for reducing outdoor workers' exposure to extreme weather conditions (heat, cold, wind, etc.)	Short	$	Economic Dev		
Disaster Outreach Teams: Collaborate with Peel Public Health and non-profits to support the establishment of outreach teams that focus on vulnerable, homeless and under-housed individuals during extreme weather events.	Short	$	Emerg Mngmt	Region of Peel Province, Federal	
Continue to maintain and update list of Emergency Shelters: Continually review and update City-owned and operated buildings that can function as emergency shelters and/or heating and cooling centres	Ongoing	$	Emerg Mgmt		
Expand the Brampton Lighthouse Project: Scale-up the Lighthouse Project through enhanced collaboration with Faith-based organizations, other community groups, organizations and businesses.	Short	$	Emerg Mgmt		
Update Cooling Centres Strategy: Reduce exposure to extreme heat by: • Reviewing and updating existing strategies for when and how City facilities are open to the public for daytime cooling.	Short	$$	Emerg Mgmt		

• Reviewing and updating the annual schedule to determine when cooling centres are anticipated to be operational (e.g., open earlier in the year and closing later due to warming weather) • Ensuring schedules account for unseasonable temperatures • Reviewing the minimum temperature to open a Cooling Centre based on future climate projections • Reviewing the maximum temperature to re-open a Cooling Centre in off-season events.					
Minimum Shading Standard for Public Spaces: Create a policy or design guideline for public spaces to incorporate shade structures, and set a minimum shaded area standard for public spaces.	Short	$	Int City Planning	Region of Peel	
Building Cooling By-law: Establish a by-law to ensure landlords of rented or leased dwelling units provide adequate heating and cooling in all areas of the dwelling unit	Medium	$$	Enf & By-law Services	Region of Peel	
Solar PV and Shading: Develop a demonstration project to showcase a shaded area with combined solar PV, to highlight the benefits of a self-sustaining system that does not contribute to a spike in energy demands and builds resilience. ✚	Medium	$$	Parks Plng, Dev & Cptl Delivery	Region of Peel, Cnsrvtn Authorities	+
Tree Planting within Outdoor Recreational Spaces: Increase planting of shade trees alongside trails, sidewalks, and outdoor sports fields/facilities to provide cooling benefits. ✚	Ongoing	$	Urban Forestry		+
Update the Parks and Recreation Master Plan (PRMP): Review and update the PRMP to integrate future climate projections, address climate risks, and prioritize initiatives to highly vulnerable areas (e.g., ensure existing and new trails can withstand future climate impacts)	Medium	$	Recreation		
Heat Management Plan for Public Spaces: Develop a Terms of Reference for Heat Management Plans for all public events and events hosted on City-owned lands	Short	$	Tourism & Events		
Implement Heat Management Plan for Public Spaces: Require a heat management plan for all public events and events hosted on City-owned lands, which will aim to	Short	$	Tourism & Events		

ensure that all groups hosting and participating in events on public lands are informed of where shaded spaces are located					
Water Feature Season Extension: Review and update the operating hours for splash pads to allow extended hours for heat relief as temperatures continue to rise. This should also be applied to other water features such as water fountains.	Short	$$	Recreation		
Splash Pads: Construct splash pads in high priority locations (i.e., areas most impacted by extreme heat) based on the findings of the detailed risk assessment	Medium	$$$	Parks Plng, Dev & Cptl Delivery		
Implementation of Energy Incentives: Commence implementation of resilient energy efficiency incentives through a home retrofit program to neighbourhoods at highest risk of climate impacts (e.g., extreme heat)	Medium	$$$	Env Planning	CCET	
Urban Agriculture Strategy: Develop an urban agriculture strategy to improve the city's adaptive capacity by enhancing local food supply. The Strategy should consider the following: • Utilizing urban agriculture to expand green-space • Scaling up Brampton's Farmer's Markets • Expanding community gardens • Roof-top gardens and greenhouses • Indoor farming • An urban bee hive policy/by-law	Short	$	Parks Plng, Dev & Cptl Delivery		

RESILIENT HEALTHY NATURAL SYSTEMS					
Naturalized spaces help protect Brampton from climate impacts					
Action	Timeline	Cost	City Lead	Partners	Mitigation Co-Benefits
Natural Heritage and Environment Management Strategy (NHEMS): Update the NHEMS to account for future climate projections and ensure natural heritage areas are conserved and managed to maximum ecological health	Short	$$	Env Planning	Cnsrvtn Authorities	
Green Infrastructure Open Data: Add green infrastructure data to the City's Geohub for public access	Medium	$$	Strmwtr Programs		+
Natural Cover: Set an overall natural cover target of 60% as per the City's Risk and Vulnerability Assessment	Short	$	Env Planning	Cnsrvtn Authorities	
Greenland Securement Program: Explore opportunities to acquire natural heritage lands for climate adaptation purposes (e.g., flood risk reduction) through the Peel Greenlands Securement Program	Ongoing	$$$	Env Planning		
The natural heritage system is healthy and intact					
Update the Urban Forest Management Plan (UFMP): Update the City's UFMP to account for climate change including but not limited to: • Integrate of climate change considerations • Monitor and manage climate-related risks to trees • Monitor canopy cover • Identifying climate resilient tree species and other vegetation species	Ongoing	$	Parks Plng, Dev & Cptl Delivery	Cnsrvtn Authorities	
Natural Heritage Asset Management: Integrate natural assets into the City's Asset Management Plans to ensure they are protected from future climate impacts and can continue to provide essential services.	Short	$	Asset Mgmt		

Wetlands Health & Restoration Study: Undertake a study that evaluates the health of wetlands within Brampton, identifies high-functioning wetlands that can contribute to nature-based solutions for flood management (where applicable), and prioritizes restoration for these assets to improve resilience	Medium	$	Env Planning	Cnsrvtn Authorities	
Wetland Health & Restoration Implementation: Implement the recommendations of the Wetlands Health and Restoration Study in partnership with local Conservation Authorities	Medium	$$	Env Planning	Cnsrvtn Authorities	
Ecological Corridor Connectivity Strategy: Develop an Ecological Corridor Connectivity Strategy to: • Improve connectivity between natural heritage features • Increase the core habitat and reduce edge conditions of woodlands, wetlands, riverine, and meadow habitats Maximize conditions for terrestrial wildlife passage	Short	$$	Env Planning	Cnsrvtn Authorities	
Invasive Species Management Plan: Develop an Invasive Species Management Plan that considers the following: • Threat Assessment: develop climate risks and threats • Monitoring Equipment: Require the purchase of monitoring supplies and equipment • Response Team: (citizen science) to distribute and monitor invasive species traps and report back to the City • Natural Heritage Management: Investigate opportunities to require invasive species management plans for development proposals that contain or are adjacent to natural heritage areas Staff Education: Provide an invasive species internal education program for staff with a focus on the Early Detection and Distribution Mapping System	Medium	$	Horticult.	Cnsrvtn Authorities	
Tree Canopy Cover Policy: Develop a policy to support the health of existing tree canopy coverage with a target to increase tree canopy by 80% in locations where temperatures go above 20°C and an overall urban canopy cover of 40% by 2070 based on the findings of the Risk and Vulnerability Assessment	Long	$$	Parks Plng, Dev & Cptl Delivery	Cnsrvtn Authorities	+

Tree Canopy Cover Assessment: Undertake an assessment of the City's current canopy cover (~7.5% as of 2024) to inform updates to the City's Natural Heritage and Environment Management Strategy and Urban Forest Management Plan	Short	$	Parks Plng, Dev & Cptl Delivery	Cnsrvtn Authorities	+
Tree Health Management: Review and update current tree management processes to ensure young trees thrive in a changing climate	Medium	$$	Parks Plng, Dev & Cptl Delivery	Cnsrvtn Authorities	+
Tree Planting along Watercourses: Increase planting of shade trees around creeks to maintain or improve water temperatures, based on historical data of the watercourses (e.g., cool vs. warm water).	Medium	$$	Parks Plng, Dev & Cptl Delivery	Cnsrvtn Authorities	+
Tree Planting in New Development: Update tree planting and soil volume standards for new developments to reflect climate-based targets	Medium	$	Env Planning	Cnsrvtn Authorities	

RESILIENT INFRASTRUCTURE					
Action	Time	Cost	City Lead	Partners	Mitigation Co-Benefits
Buildings and Homes are Climate Proof					
Promote Enhanced Building Codes: Lobby the Provincial and Federal governments to enhance building code requirements to ensure they account for climate change impacts (e.g., frequency and severity of extreme weather, energy efficiency, etc.) ✚	Ongoing	$	Int City Planning	Clean Air Partnership	+
Integrating Adaptation Measures into a Retrofit Program: Integrate adaptation retrofits into a home energy retrofit program, as outlined in the City's Community Energy Emissions Reduction Plan (CEERP), to maximize co-benefits	Medium	$$$	Env Planning	CCET	
The community is safe in their daily life					
Minimize Hardscaping: Reduce ponding, runoff, and flooding in urban areas by increasing the percentage of permeable surface required on properties based on property type (e.g. residential, ICI) through the Zoning By-Law	Medium	$	Strmwtr Programs	Cnsrvtn Authorities	
Buildings and Homes are Climate Proof					
Flood Vegetative Buffers: Investigate opportunities to enhance vegetative buffers around watercourses to reduce future flood risk ✚	Medium	$	Env Planning	Cnsrvtn Authorities	+
Integrate Adaptation into the Sustainable New Communities Program (SNCP): Update the SNCP to include additional climate change adaptation metrics required for climate risk reduction in new development. ✚	Long	$	Env Planning	Dvlpmnt Industry	+
Mandate Adaptation Metrics through the Sustainable New Communities Program: Explore opportunities to make key adaptation metrics related to climate risk reduction mandatory for new development proposals.	Medium	$	Env Planning	Dvlpmnt Industry	

Updating City Design Standards: Update design standards (e.g., engineering standards, Intense-Duration-Frequency Curves, etc.) to account for future climate change risks and ensure development addresses extreme weather events. ✚	Medium	$$	Env Plannin		+
Green Infrastructure Standards: Develop green infrastructure design standards that integrate climate risk.	Short	$$	Strmwtr Programs		
Green Roof Strategy: Require all new buildings to implement a green roof. In cases where green roofs are not feasible, a white roof or blue roof will be considered.	Short	$	Env Plannin		
The community is safe in their daily life					
Green Infrastructure Study: Undertake a study to identify opportunities for green infrastructure across the City, including key locations for implementation and feasibility.	Short	$	Strmwtr Programs		
Update Zoning By-law: Review current zoning by-law and flood risk areas identified in the Climate Change Risk and Vulnerability Assessment to inform future updates to the zoning by-law.	Ongoing	$	Int City Planning		
Climate Change in Flood Models: Advocate for the integration of climate projections into floodplain modelling	Ongoing	$	Env Engnrng		
Cost-Analysis for Flood Mitigation: Undertake a flood mitigation cost-analysis to assess flood management interventions with detailed calibration in neighbourhoods identified as being at risk of flooding. The results will be integrated into the City's Asset Management Plans and other relevant programs.	Short	$	Strmwtr Programs		
Implement Solutions for Flood Mitigation: Commence implementation of the solutions identified in the Flood Mitigation Cost-Analysis study.	Medium	$$$	Strmwtr Programs		
Flood Mitigation Demos: Identify a City-owned property for use as a demonstration site to showcase flood mitigation measures to the public (e.g., downspout disconnection, sump pumps, other flood-proofing measures)	Long	$$$	Strmwtr Programs	Cnsrvtn Authorities	
Drainage Solutions Study: Investigate drainage solutions for community recreation areas and sports fields that are impacted by flooding to avoid loss of recreational and economic development opportunities	Short	$	Parks Plng, Dev & Cptl Delivery		

Community-scale Energy Generation and Storage Study: Undertake studies to assess opportunities for community-scale renewable energy, energy storage and district energy, including microgrids to help optimize the power system and ensure reliable energy to communities.	Medium	$$$	Env Planning	CCET, Utilities, Dvlpmnt Industry	
Road Flooding Communications: Review and update communication protocols to the public related to road flooding	Short	$	Emerg Mgmt	Cnsrvtn Authorities	
Essential infrastructure is resilient					
Emergency Water Supply Program: Identify locations for emergency water supply (e.g., temporary water stations, fountains, etc.) based on areas with high percentages of equity-deserving populations and proximity to gathering places/high-traffic outdoor spaces. Water supply features should be implemented every 800m within neighbourhoods and 400m for identified high-priority neighbourhoods based on the findings of a detailed risk assessment	Short	$$		Region of Peel	
Culvert Replacement Study: Alongside the development of the Stormwater Asset Management Plan, assess current culvert conditions and replacement schedules, taking into account climate risks to determine high-priority culvert replacements and needs for re-sizing.	Short	$	Strmwtr Programs	Region of Peel, Cnsrvtn Authorities	
Culvert Replacement Sizing: Establish a standard definition for right-sized culvert replacement (e.g., 1.2x 1:100 year event for major systems and 1:10 for minor systems) into asset management planning and budgeting, as opposed to one-for-one replacements.	Medium	$$$	Strmwtr Programs	Region of Peel, Cnsrvtn Authorities	
Stormwater Sewer Replacement: Alongside the development of the Stormwater Asset Management Plan, review and update current storm sewer replacement schedules that takes into account future climate risk, determines high priority replacements and replacement details, and complete an aligned costing study	Short	$$	Strmwtr Programs	Region of Peel, Cnsrvtn Authorities	
Stormwater Sewer Replacement Sizing: Establish a standard definition for right-sized storm sewer replacement into asset management planning and budgeting, as opposed to one-for-one replacements.	Medium	$$$	Strmwtr Programs	Region of Peel, Cnsrvtn Authorities	

Energy Resilience during Extreme Weather: consult with utilities to ensure critical infrastructure like power utilities are resilient and will not be impacted during an extreme weather event. Where possible explore options for redundancy and backup systems	Medium	$$$	Emerg Mgmt	Utilities	+
Burying power lines: Require new development, and where applicable and feasible, upgrade older neighborhoods to bury power lines and limit the risk of energy insecurity during extreme weather events.	Long	$$$		Utilities	
Back-up Power Generation: Explore opportunities to upgrade existing backup generators at City facilities to alternative low carbon backup generation and ensure all new city facilities implement a low carbon backup generation.	Medium	$$$	Energy Mgmt	Utilities	
Local Flooding on High-Risk Roads: Reduce travel disruptions due to transportation routes damaged or blocked by conditions of an extreme weather event	Short	$	Roads Op		

COMMUNITY INVOLVEMENT AND COMMUNICATION					
Action	Timeline	Cost	City Lead	Partners	Mitigation Co-Benefits
Brampton is prepared for climate emergencies					
Integrate Emergency Preparedness into IDEA: Integrate climate change and emergency preparedness in the City's IDEA (Inclusion, Diversity, Equity, and Anti-Racism) initiatives.	Short	$	Equity Office	Region of Peel	
Define 'Equity-Seeking' Population with Brampton Equity Office: Expand the definition for equity-deserving populations to include individuals at increased risk for health problems and health disparities due to extreme weather events.	Short	$	Equity Office	Cnsrvtn Authorities	
Develop Climate Equity Checklist: Develop a climate equity checklist to ensure plans and projects identify and help protect Brampton's most vulnerable populations, which should be used alongside any decision-making process to improve equitable outcomes.	Short	$	Equity Office	Region of Peel, Cnsrvtn Authorities	
Incentivize Stormwater Storage: Develop an incentive program for residents to implement flood-proofing measures on their property (e.g., downspout disconnection, sump pumps, rain barrels, native species planting, grass swales, etc.)	Short ✚	$$	Strmwtr Programs	Cnsrvtn Authorities	+
Incentives for Resilient Energy Systems: Develop incentive program for residents to undertake resilient, low-carbon energy retrofits. For example, providing incentives to residents to install heat pumps and energy storage increase energy efficiency, maintain energy demand, lower energy costs, and provide greater thermal comfort.	Medium ✚	$$$	Env Planning	CCET, Cnsrvtn Authorities	+
Emergency communications keep the community safe					
Emergency Communications Audit: Review communication protocols and procedures to ensure emergency communications are based on best practice and up-to-date climate information, and identify if new communications tools are needed (e.g., an app that alerts residents of climate- and weather-related risks and closures)	Short	$	Emerg Mgmt	Cnsrvtn Authorities	

Emergency Communications Strategy: Update the communications strategy to ensure it reflects the education needs, preferred public communications platforms (e.g., apps, phone notifications, social media, etc.) of the public for extreme weather events and natural hazards, and outlines proactive educational approaches.	Medium	$	Emerg Mgmt	Region of Peel	
Emergency Communications Implementation: Prioritize high risk neighbourhoods when implementing emergency communications.	Short	$$	Emerg Mgmt	Region of Peel, Cnsrvtn Authorities	
Mapping Water Feature Locations: Create a publicly accessible map that highlights the location of public water fountains, splash pads, and cooling centres. The map will be reviewed and updated annually.	Short	$	Env Planning		
The community is involved in climate action					
Integrate Climate Change into the Youth Advisory Circle (YAC) mandate: Incorporate climate change into the terms of reference/charters of the YAC	Short	$	Youth Progs & Intvs		
Seek Meaningful Engagement with First Nations Communities: Undertake meaningful engagement and collaboration with First Nations Communities on climate adaptation projects.	Medium	$	All		
Relationships with Grassroots & Non-Profits: Improve adaptive capacity by establishing and enhancing social connections throughout the community	Ongoing	$	Env Planning		
Home Preparedness Education Program: Create a program that informs building owners, homeowners and renters about actions they can take to improve their climate resilience (e.g., property/home improvements, extreme weather events and emergency preparedness) and be prepared for inclement weather. Examples include: • Guidance for selecting general contractors for home and roof repairs • Hurricane straps and roof-to-wall connector for new residential construction	Short	$	Env Planning	Cnsrvtn Authorit., Research inst (e.g. INTACT Centre)	

Community Education for High-Risk Neighbourhoods: Prioritize high-risk neighbourhoods during rollout of climate change preparedness education and awareness programs.	Short	$	Env Planning		
Climate Conversation Toolkit: Offer a toolkit that provides residents with a guide to talk about climate change, adaptation and resiliency with their families, friends, and neighbours.	Short	$	Env Planning	Cnsrvtn Authorit.	
Community Tree Planting: Continue to host community tree planting events and seek opportunities to further enhance public engagement, including education and awareness around the impacts of climate change on trees and their benefits	Ongoing +	$	Parks Plng, Dev & Cptl Delivery	Cnsrvtn Authorit., Region of Peel, School Boards	+

REFERENCES

Auld, H., Switzman, H., Comer, N., Eng, S., Hazen, S., and Milner, G. 2016. Climate Trends and Future Projections in the Region of Peel. Ontario Climate Consortium: Toronto, ON: pp.103

Berry, P., & Schnitter, R. (2022). *Health of Canadians in a Changing Climate: Advancing our Knowledge for Action*. Government of Canada. Available online: https://changingclimate.ca/site/assets/uploads/sites/5/2022/02/CCHA-REPORT-EN.pdf

Boyd, R. and Markandya, A. (2021). *Canada in a Changing Climate: National Issues Report*. Government of Canada. Available online:

Bush et. al. (2019*). Canada in a Changing Climate Report – Executive Summary*. Environment and Climate Change Canada. Available online: https://changingclimate.ca/site/assets/uploads/sites/2/2020/06/CCCR_FULLREPORT-EN-FINAL.pdf

Canadian Climate Institute. (2021). *Damage Control: Reducing the Costs of Climate Change Impacts in Canada*. Available online: https://climateinstitute.ca/wp-content/uploads/2022/09/Damage-Control_-EN_0927.pdf

Engineers Canada. (n.d.). *Climate Change and Extreme Weather Events*. Available online: https://engineerscanada.ca/sites/default/files/public-policy/climatechange-en.pdf

Environment and Climate Change Canada. 2024. *Climate Data for a Resilient Canada*. Climatedata.ca

Government of Canada. (2024). National Adaptation Strategy. Available online https://www.canada.ca/en/services/environment/weather/climatechange/climate-plan/national-adaptation-strategy/action-plan.html

Weltman, B. (2024, September). Summer 2024 shatters records for severe weather damage: Over $7 billion in insured losses from floods, fires and hailstorms. *Insurance Bureau of Canada*.

Intergovernmental Panel on Climate Change. (2023). Climate Change 2023: Synthesis Report – Summary for Policymakers. Available online: https://www.ipcc.ch/report/ar6/syr/downloads/report/IPCC_AR6_SYR_SPM.pdf

McDermid, J., Fera, S., Hogg, A. (2015). *Climate change projections for Ontario: An updated synthesis for policymakers and planners*. Ministry of Natural Resources and Forestry, 40p.

World Economic Forum. (2024). *The Global Risks Report 2024*. Available online: https://www3.weforum.org/docs/WEF_The_Global_Risks_Report_2024.pdf