CHAPTER 1

The Climate Reality

KEY TAKEAWAYS

- Climate change is already affecting Brampton through increases in local flooding, snow, ice, and wind storms, hotter summers, and a rise of vector-borne diseases.
- The scientific community warns that the consequences of climate change for all living things will become more severe if the average global temperature continues to rise. Limiting global average temperatures to 1.5°C requires carbon emissions to be cut by at least 45% from 2010 levels by 2030, and to zero by mid-century.
- Canada is one of the top ten GHG emitters in the world and one of the top five emitters per capita.
- Along with 195 signatories, Canada committed through the U.N. Paris Climate Agreement to reduce its GHG emissions by 80% from 1990 by the year 2050.
- All levels of government, including the City of Brampton and the Region of Peel, have started to move on climate action; however, current data shows that an urgent response to climate change is needed now.
- The CEERP, as a climate mitigation plan, is Brampton's call to action for all sectors of the community to take steps that reduce our contributions to a changing climate.
- Working together, Brampton's residents, business, institutions, community organizations, and local governments can reduce the local impacts of climate change while maximizing on the opportunities and benefits of climate actions to create a healthier, stronger, and more resilient city.
- A full glossary of terms is available at the beginning of this report. Some of the key terms used in this chapter include: Greenhouse Gases (GHGs), Climate Mitigation, and Community Energy Planning.

1.0 The Climate Reality

Climate change is expected to be one of the biggest challenges in the 21st century, and is considered one of the greatest threats to our livelihoods, security, and well-being. An increase in atmospheric greenhouse gases (GHGs) is warming the planet, and as global temperatures rise, climate patterns around the world are changing. Impacts of climate change are already being experienced around the world, including in Canada.

Ontario is already experiencing the effects, such as more severe precipitation, snow, ice, and wind events, greater temperature fluctuations and extremes, changing species migration patterns, and an increase in the presence of vector-borne diseases (e.g. Lyme disease).

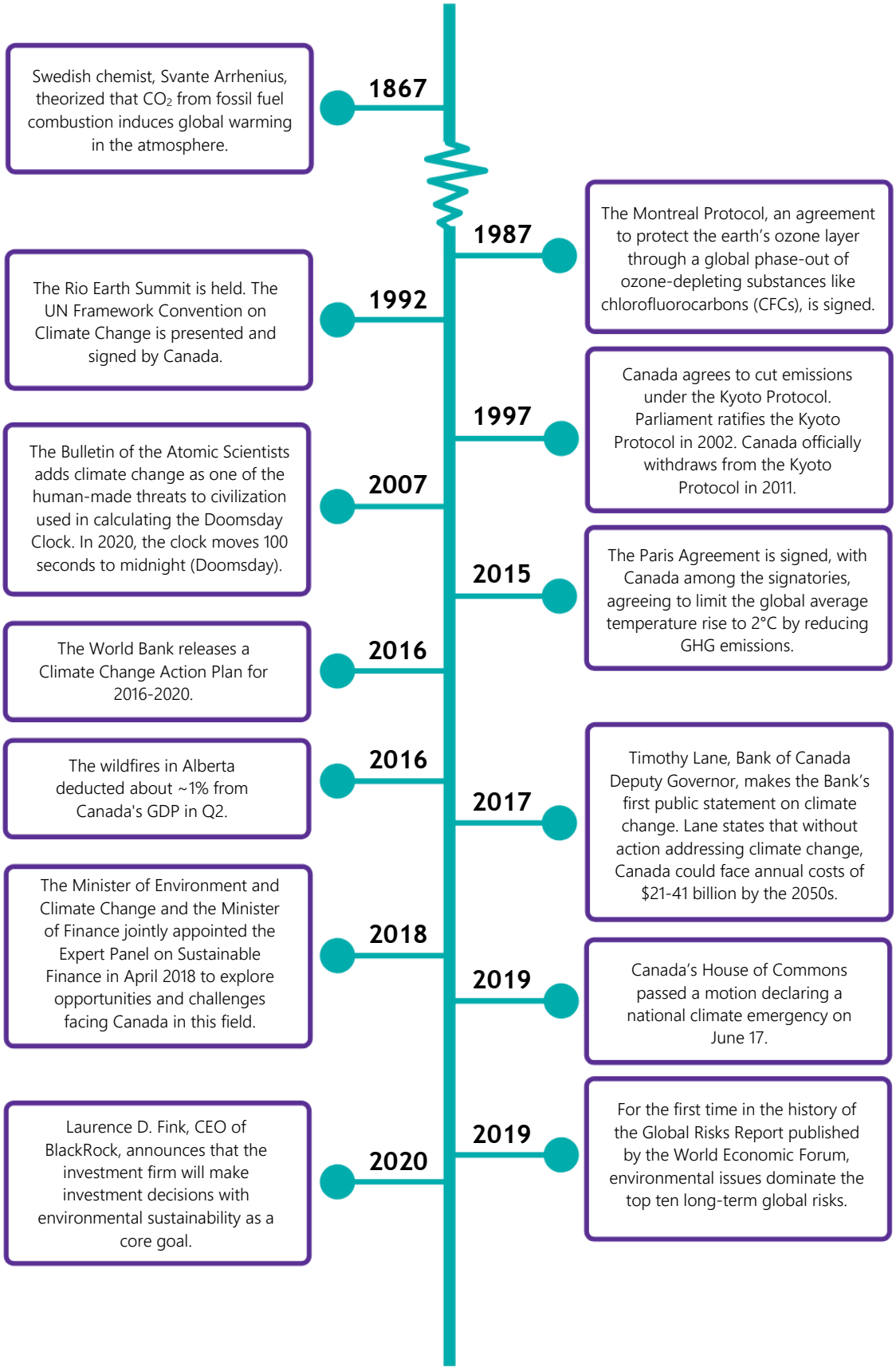
In the next quarter century, the types of impacts and their severity are expected to increase. These impacts all have economic, social, and environmental costs to municipalities and residents.

1.0.1 The Climate Emergency

Human activities, such as the burning of fossil fuels to power our homes, vehicles, and industrial processes, have contributed to the drastic increase in global GHG emissions. In 2015, the historic UN Paris Climate Agreement was signed by 195 countries with the central aim to strengthen the international response to the threat of climate change by keeping a global temperature rise to well below 2°C and to pursue efforts to limit the increase to 1.5°C. As one of the signatories, Canada committed to reducing its GHG emissions by 80% by the year 2050. This is a call to action for all sectors and levels of society – governments, business, civil society, and individuals.

As of early 2020, over 1,468 jurisdictions in 28 countries have declared a climate emergency, including 501 Canadian municipalities.[1] In June 2019, the City of Brampton bolstered their commitment to battling climate change when Council unanimously voted to declare a climate emergency, acknowledging that to address this crisis, we must urgently reduce carbon emissions and prepare for the consequences of a warming planet. The development of the Community Energy and Emission Reduction Plan (CEERP), a climate mitigation strategy, is one of the City of Brampton's response to this emergency. It is a plan that will establish a pathway for Brampton to reduce GHG emissions by at least 80% by 2050, from 2016 levels.

Climate Policy Snapshot



What is climate change?

An increase in atmospheric greenhouse gases (GHGs) is warming the planet. As global temperatures rise, climate patterns around the world are changing.

What are Greenhouse Gases (GHGs)?

A greenhouse gas is any gas that absorbs thermal radiation from the sun and emits it back into the earth's atmosphere, such as water vapour, carbon dioxide, methane, nitrous oxide, and ozone. Without them, the average temperature at the surface of our planet would be around -18 °C rather than 15°C.

Why is the average global temperature rising?

Human activities since the first industrial revolution have caused a 40% increase in carbon dioxide concentrations in the atmosphere.

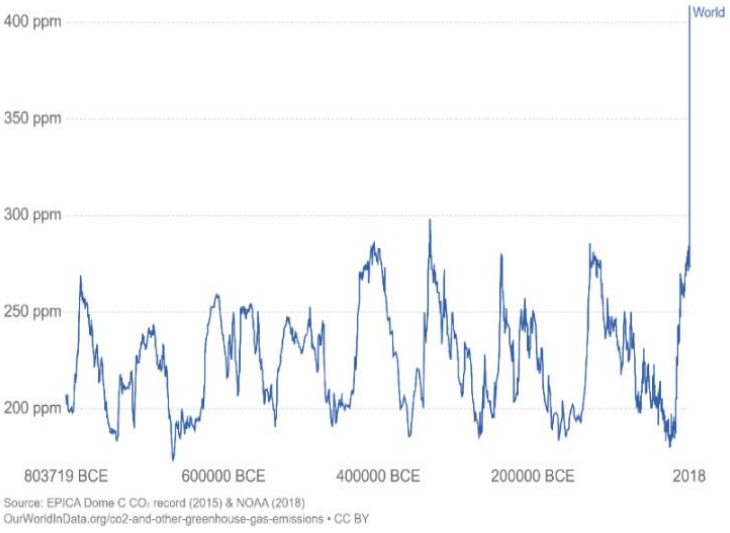
Why are higher Carbon Dioxide (CO_2) levels a concern?

The unprecedented rise in carbon dioxide levels is warming the planet. Global average temperatures are currently 1 °C warmer than the pre-industrial average.[2] Temperature increases are more pronounced in higher latitudes, such as in Canada, where temperature increases are up to twice the global average.

Temperature increases are changing climate patterns around the world. Canadians are already feeling the effects of a changing climate with an increase in the frequency and severity of floods, droughts, wildfires, diseases, and heatwaves.

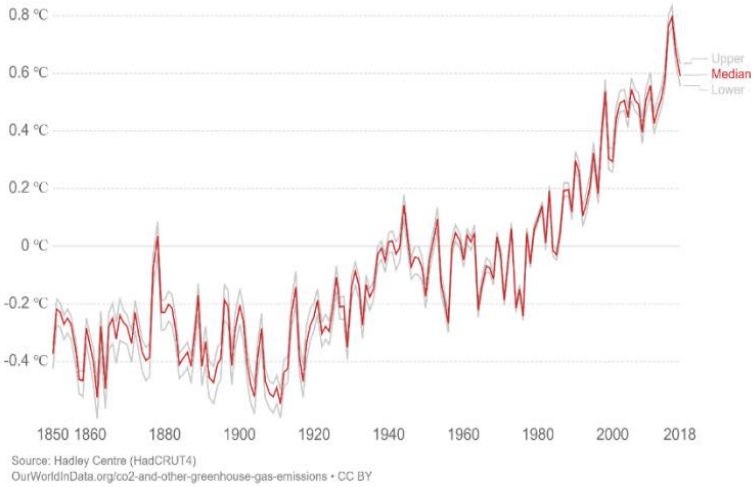
Scientists warn that the consequences of climate change for humans, animals, and plants will become more severe if the average global temperature continues to rise.[3] Carbon emissions would need to be cut by at least 45% by 2030 and be lowered to zero by mid-century, to keep temperatures within a 1.5 °C.[4]

Global Average Long-Term Atmospheric Concentrations of Carbon Dioxide



Measured in parts per million (ppm).

Global Average Land-Sea Temperature Anomaly Relative to the 1961 - 1990 Average Temperature



Measured in degrees Celsius (°C). The red lines represent the median average temperature change, and grey lines represent the upper and lower 95% confidence intervals.

What Will Climate Change Look Like in Brampton?

Changes	Effects	Community Impact
 Increase in average summer temperatures More frequent and longer heat waves	 Heat islands Health issues	Increased costs to cool buildings Increased healthcare costs Increased socioeconomic disparity
 Increase in rainfall More intense storms	 Flooding Erosion	Cost of disaster relief Cost of infrastructure upgrades Decrease in water quality Potential for loss of land Displacement of residents
 More unpredictable seasons	 Disrupted growing season Desertification of agricultural fields Disrupted season-dependent industries	Increased cost of food Increased food insecurity Reduced equity and health Disrupted economy More economic uncertainty
 Increase in winter storm severity	 Snow dumps Cold snaps	Cost of snow removal Higher infrastructure and maintenance costs Less economic activity Increase in social disparity Increase in energy use and associated costs
 Milder winters	 More disease-spreading pests survive More invasive species survive	More human diseases and illnesses Negative economic impact for industries (e.g. agriculture, lumber)
 Increase in average temperatures Changes to local climate	 Displacement and changes to geographic range of wildlife Changes in distribution of resources Changes in how species interact	More suitable habitat for invasive species Species extirpation or extinction Loss of ecosystem services Increase cost of local infrustructure and city services More human-animal interactions More disease outbreaks

1.0.2 A Climate Mitigation Strategy

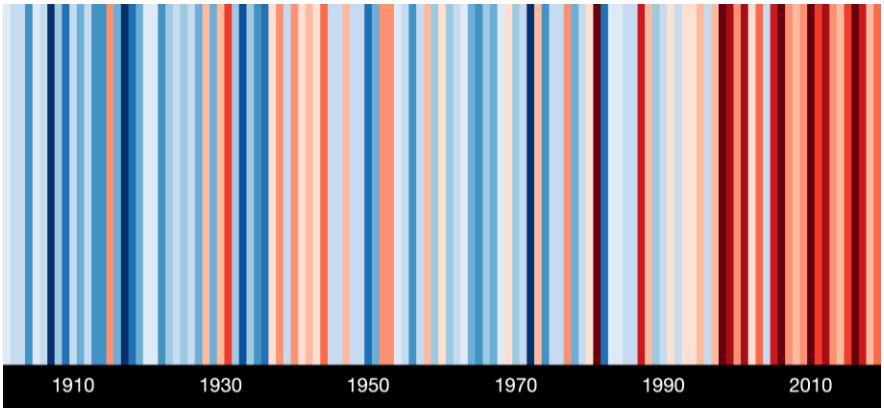
Globally, two types of measures have emerged in the search to address climate change and its impacts: climate mitigation and climate adaptation.

Climate mitigation focuses on decreasing the human-induced sources of climate change in order to reduce future impacts, such as minimizing the amount of GHG-emitting fossil fuels burned for energy or enhancing carbon sinks that store GHGs. The effects and benefits of climate mitigation measures are long-term, however, the more successful we are, the less severe future climate impacts will be to communities and the less costly adaptation measures will be.

The CEERP is Brampton's key mitigation strategy. Utilizing a community energy planning lens, the CEERP focuses on the neighbourhood and community-wide priorities and actions to mitigate climate change by reducing GHG emissions, increasing energy efficiency, ensuring energy security, creating economic advantage, and increasing Brampton's resilience to climate change.

Mitigation	Adaptation
Mitigation describes all actions taken by humankind to reduce emissions into the atmosphere.	Adaptation describes all actions taken by humankind to adjust to the impacts of a changing climate.
Mitigation: the causes of climate change are removed by reducing GHG emissions.	Adaptation: the impacts of climate change are met by adjusting to predicted impacts.
"Avoid the unmanageable..."	"... and manage the unavoidable."

Warming Stripes: Annual Average Temperature in Canada from 1901 to 2019 [5]



Representation of annual average temperatures in Canada from 1901 to 2019. Each stripe represents the average temperature over a year, with blue represent cooler temperatures and red representing warmer temperatures.

Sources of Greenhouse Gas Emissions

1.1 The Connection between Energy and GHG Emissions

A step towards addressing climate mitigation is understanding where GHG emissions come from. Naturally, carbon cycles through various stages and forms within our environment, from our planet's atmosphere to large deposits in the ground and back. Naturally occurring GHGs are part of this cycle; however, human activities have interrupted the natural balance of the carbon cycle leading to the significant increase of GHGs in our atmosphere and the subsequent warming of the planet.

GHG emissions can come from a variety of human-led activities, but are primarily an outcome of burning fossil fuels for energy to heat our homes, drive our cars, and run our factories. Other GHG contributors include human-created waste products, industrial and manufacturing processes and byproducts, agricultural practices, soil erosion, and land use changes such as deforestation.

The majority of human-created GHG emissions result from the energy needs of today's society. Globally, 78% of GHG emissions come from the production and consumption of energy. In Canada, this increases to 81%, while in Ontario, it is slightly under the global average at 75%.[6] The largest emitting sectors in Ontario include transportation (35% of total GHG emissions), residential and commercial buildings (21%), and heavy industries such as iron, steel, and chemical manufacturing (19%).

1.2 Climate Adaptation

Climate adaptation focuses on measures needed to adjust to life under a changing climate. It looks to reduce communities' vulnerability to future climate changes through measures, such as:

- managing climate-based risks like flooding and heat islands;
- planning more resilient communities and protecting the most vulnerable;
- utilizing the benefits of nature's multiple services to improve adaptation capacity;
- adjusting governance and best practices to meet and respond to current and future needs; and
- building community awareness of climate impacts.

Climate adaptation is outside the scope of the CEERP, however, many mitigation measures result in climate adaptation benefits as well. The development of a climate adaptation plan is considered the next step in the City of Brampton's overall climate action planning.

1.3 Why is Climate Change a Municipal Issue?

According to the Federation of Canadian Municipalities, 45% of national GHG emissions in Canada are under the direct or indirect control of municipal governments.[7]

The City has direct control over a range of everyday services that impact how energy is consumed, such as housing and transportation systems. The City controls where and how growth will occur through the designation of land and in the development and enforcement of zoning by-laws.

The City can develop land use policies and tools to mitigate climate change through increases in strategic urban density, mixed use developments, pedestrian-friendly subdivision design, and transit oriented development. The tools and policies are also linked to broader social goals of the municipality such as aging in place, affordable housing, and mobility hub/intensification studies and could include:

- targeted introduction of height/density bonusing;
- community improvement plans focusing on energy conservation (district energy, green roofs, solar);
- minimum/maximum zoning standards;
- incentive programs for specific development applications focusing on energy/emission reduction;
- web-based energy modelling of development applications; and
- incentive programs for developers/builders who exceed the Ontario Building Code.

Municipalities can play a significant role in realizing the co-benefits and opportunities of climate action in their area that address GHG emissions and social goals of affordable housing. They can bring agendas together, align Master Plans, and apply for federal and provincial funding sources to ensure "win-win" outcomes for the local community.

1.4 Climate Action

Considering 60% of energy consumption and over half of all GHGs in Canada are influenced by our communities – e.g. the transportation of people, goods, and services; the powering of local industry; and the heating, cooling and lighting of homes and buildings – all levels of government play a role in enabling local action on climate change.[8]

1.4.1 Federal Climate Action

Canada has the highest GHG emissions per capita of several world regions, and is often shown to be one of the top ten emitters in the world and within the top five emitters per capita.[9] Canada's economy is also significantly more carbon intense than global best practice (e.g. European Union and Japan), indicating an opportunity to use energy more efficiently and increase the supply of renewable energy sources.

As a signatory to the Paris Climate Agreement, the Government of Canada set a target to reduce GHG emissions by 80% below 1990 levels by 2050. In 2016, the Pan-Canadian Framework on Clean Growth and Climate was approved, which among other things put a price on carbon. Carbon pricing impacts energy decisions by making certain low-emission alternatives more appealing, and encourages the use and creation of more efficient energy systems and technologies. Funds collected through carbon pricing are reinvested into communities through funding local climate actions and activities. Federal funding has also been allocated to support local action on climate change, including funding through the Municipalities for Climate Innovation Program administered by the Federation of Canadian Municipalities.

1.4.2 Provincial Climate Action

The Province of Ontario has also committed to reducing GHG emissions to 30% below 2005 levels by 2030, as outlined in the Preserving and Protecting our Environment for Future Generations: A Made-in-Ontario Environment Plan released in 2018. For several years, changes in Provincial legislation have been mainstreaming energy and climate policy-making at the municipal level including:

Provincial Policy Statement

In 2014, the Provincial Policy Statement (PPS) on land use planning was updated to give direction on energy efficiency, renewable energy systems, alternative energy systems, and climate change. The most recent 2020 update to the PPS further directed municipalities to prepare for the impacts of a changing climate. It also continues to encourage transit-supportive development and intensification to improve the mix of employment and housing uses that will shorten commute journeys and decrease transportation congestion.

Regional Carbon Dioxide Intensity per Capita and per Gross Domestic Product[10]

Region	CO_2/Capita	CO_2/GDP
USA	100	100
Canada	103	107
European Union	43	62
Japan	61	67
China	46	332
India	11	299
World	30	149

Growth Plan for the Greater Golden Horseshoe

In 2017, the Growth Plan for the Greater Golden Horseshoe was updated to require upper-tier municipalities to include climate change targets, policies, and strategies in their official plans. The updated Growth Plan encourages the development of official plan policies that encourage energy conservation and efficiency, integrated waste management, renewable energy, alternative energy, and district energy systems.

Made-in-Ontario Environment Plan

In late 2018, the Provincial government released the Preserving and Protecting our Environment for Future Generations: A Made-in-Ontario Environment Plan to replace the previous government's Climate Change Action Plan. The Plan indicates the Provincial Government's intent to work with municipalities to develop climate and energy plans, and consult with them on tax policy options to make it easier for homeowners to increase energy efficiency and save money.

Municipal Act and Planning Act

Changes to Ontario's Municipal Act and Planning Act in 2017 increased municipal powers to combat climate change.

Ontario's Long-Term Energy Plan

The 2017 Long-Term Energy Plan: Delivering Fairness and Choice acknowledges the role of regional and community energy plans in meeting energy conservation targets and sustaining a reliable and secure supply for Ontario's energy customers.

Municipal Energy Plan Program

The Ministry of Energy, Northern Development and Mines' Municipal Energy Plan Program provides funds to municipal governments to complete or update a Municipal Energy Plan.[11] MEP funding supported the development of Brampton's CEERP.

1.4.3 Region of Peel Climate Action

The Region of Peel has established several policies that create an enabling environment for CEERP implementation, including:

Official Plan for the Region of Peel

The Region of Peel's Official Plan (December 2018 Office Consolidation) includes objectives to address energy and climate through land use planning, low carbon energy systems, and energy conservation. The Official Plan encourage area municipalities to incorporate policies on energy efficiency, district energy, renewable energy, low carbon vehicles, and building retrofits into their own Official Plans.

Peel Climate Change Strategy

The Peel Climate Change Strategy (2011) resulted from a partnership between the Region of Peel, City of Brampton, City of Mississauga, Town of Caledon, Credit Valley Conservation, and Toronto and Region Conservation Authority. The Strategy sets a long-term GHG reduction target of 80% below 1990 levels by 2050, and includes an action to "prepare a joint feasibility study to determine how to optimize the use of alternative energy sources through community energy planning and through pilots of district energy systems in Peel".

Climate Change Master Plan

The Region's Climate Change Master Plan: 2020-2030 (CCMP) sets forth directions for how the Region as a corporation will lead by example through the management of its assets, infrastructure, and services in a changing climate over the next decade. The Region will substantiate the influence necessary to support the community as it transforms in response to climate change. In doing so, the CCMP will complement and support the efforts of partners in the broader community. The Master Plan also establishes a corporate GHG emissions reduction target of 45% below 2010 levels by 2030.

Action 8 of the Region's CCMP calls for "Enabl[ing] alignment of Regional actions with the transition toward diversified and decentralized energy systems."

1.4.4 City of Brampton Climate Action

As a corporation, the City of Brampton has taken many actions to reduce GHG emissions, including through its role in managing the growth and development of the city. Several policies are supported and strengthened by the development of the CEERP.

City of Brampton Official Plan

The City of Brampton's Official Plan 2006 (September 2015 Office Consolidation) speaks to the importance of finding sustainable alternatives in order to conserve energy and reduce GHG emissions, including in its corporate operations. It provides support for sustainable development practices such as mixed-use, compact, and transit-oriented development and specifically supports the use of renewable and district energy systems in the city. The Official Plan also includes policies specific to energy and climate and refers to creating a long-term energy plan for the city's downtown. The Official Plan is currently in the process of being updated and is expected to take on a climate change lens.

Brampton Grow Green Environmental Master Plan

The Brampton Grow Green Environmental Master Plan aims to conserve, enhance, and balance the City's natural and built environments to create a healthier, resilient, and environmentally sustainable city. It provides goals, actions, and targets for improving Brampton's environmental performance in the areas of People, Air, Water, Land, Energy, and Waste. It establishes objectives to reduce impacts on air quality, including decreasing GHG emissions and reducing energy consumption, and manage the impact of energy usage on the environment. The Plan sets out supportive actions, including the development of a community energy plan and a GHG emissions reduction strategy.

Sustainable Communities Program: New Development

The Sustainable Communities Program: New Development promotes a comprehensive approach to planning, designing, and evaluating sustainability of new development. The program relies on three primary tools: the Sustainable Community Development Guidelines (SCDGs) to help guide sustainable design; the Sustainability Metrics and associated Sustainability Score; and Thresholds that provide quantitative measures and targets for sustainability performance of development proposals.

The program encourages energy conservation and clean energy production in a variety of ways, including but not limited to guidelines and metrics related to energy conservation, renewable energy production, district energy, electric vehicle charging infrastructure, green/white roofs, embodied energy, active transportation infrastructure, as well as complete and compact communities.

Brampton Grow Green Environmental Master Plan

In 2014, Brampton City Council adopted Brampton Grow Green, the City's first Environmental Master Plan (EMP). Brampton Grow Green directs the City's environmental sustainability approach around six core components of People, Air, Water, Land, Energy, and Waste, including goals, actions, and metrics for each. The EMP is considered the City's first climate change mitigation plan.

While conserving energy and reducing greenhouse gas emissions are embedded throughout the Brampton Grow Green EMP, they are primarily captured under the core components of Air and Energy. The goals and example actions are summarized below.

ENERGY

Goal: Reduce energy consumption and manage the impact of energy usage on our environment.

- Develop a comprehensive Energy Management Strategy for City building and facilities.
- Prepare a feasibility study for district energy opportunities in Brampton's Central Area.
- Work with Peel Climate Change Strategy (PCCS) partners to develop a Community Energy Plan.
- Develop a Renewable Energy Strategy for City buildings and facilities.
- Develop Official Plan policies to explicitly promote urban development forms and buildings that support reduced energy consumption and increased use of renewable energy.

AIR

Goal: Reduce impacts on air quality.

- Develop a Corporate GHG Emissions Reduction Strategy.
- Develop a Community GHG Reduction Strategy with PCCS partners.
- Work with PCCS partners to develop a comprehensive community education strategy to encourage GHG reductions.

The City of Brampton is undertaking a refresh of the Brampton Grow Green EMP Action Plan and Metrics, and this update will further recognize and reinforce the need for climate change mitigation and adaption at both the corporate and community level.

Energy and Emissions Management Plan 2019-2024

Brampton's corporate Energy and Emissions Management Plan 2019-2024: A Zero Carbon Transition aims to achieve a zero-carbon transition for the City's new and existing corporate facilities. It focuses on minimizing emissions and energy intensity and maximizing cost recovery within its facilities construction, management, and operations. Through this Plan, the City is working to reduce its own emissions, increase its energy efficiency, and lead by example. It also outlines major successes already achieved. The corporate has done significant work to reduce energy use and GHG emissions of its operations. Corporate contribution to community-wide energy use and emission is small.

Active Transportation Master Plan

In 2019, Council endorsed the Active Transportation Master Plan that includes goals and objectives for creating a pedestrian and cycling-friendly city. It aims to improve the safety of walking and cycling; provide options to all residents, including enhancing the accessibility of the transportation network; improve access to transit; and provide active transportation options for the first/last mile. By providing residents with more viable non-emitting transportation options, the Active Transportation Master Plan supports and assists in meeting the CERRP's energy and GHG emission reduction targets.

Transportation Master Plan

The Transportation Master Plan (2015) is the City's blueprint strategic transportation planning and direction for the future. The Plan provides a direction towards increasing the use of transit and active transportation within Brampton, which will reduce energy demands and total emissions as Brampton continues to grow. As the Plan is updated, it will further explore the role transportation can take in achieving our energy and emission targets.

Complete Streets Guidelines

The City of Brampton is currently developing Complete Streets Guidelines. Travel choices can have a significant impact on GHG emissions and energy consumption within a community. The safety, ease, and convenience of transportation modes greatly influence people's choice of transportation. Therefore, proper planning and design of our transportation networks are critical in creating viable, low emission alternatives of travel for residents such as transit, cycling, and walking. The Complete Streets Guidelines will address the safety, comfort, and accessibility of all users of streets and roads, not just the car.

Transit Investments

Between 2010 and 2019, Brampton created and expanded its Züm transit system, which connects the city with employment hubs elsewhere in Peel as well as in the cities of Vaughan and Toronto.

In 2015, the Government of Ontario announced funding for the Hurontario Light Rail Transit project along Hurontario Street from Port Credit in Mississauga to Steeles Avenue in Brampton. Construction of this $1.6 billion project is expected to be completed in 2024.

Climate Emergency Declaration

In June 2019, Brampton City Council voted unanimously to declare a climate emergency, joining close to 500 Canadian municipalities in expressing their commitment to act on lowering emissions.

Other City Initiatives

The City of Brampton has various ongoing initiatives that support the CEERP and reflect the City's actions on climate. Some of the most recent include:

- the electric bus pilot project;
- an accessibility app to encourage more riders to take transit;
- the One Million Trees Program; and
- the Brampton Eco Park Strategy.

1.4.5 Community Climate Action

Individuals, businesses, and civil society have also been taking steps to reduce GHG emissions by adopting new technologies and changing patterns of behaviour. While a full summary of these actions is beyond the scope of this report, the actions of Sheridan College are highlighted, considering their role as a founding partner of the CEERP and contributor of funding.

Sheridan College Integrated Energy and Climate Master Plan

Sheridan College has set ambitious energy and GHG reduction targets for the institution. Reinvestment in Sheridan's existing district energy systems at the Brampton and Oakville campuses is a major element of their Integrated Energy and Climate Master Plan. The reinvestment provides an opportunity for Sheridan to work with its local municipal partners to extend these existing systems outside of the campus borders and thereby support broader energy conservation and GHG reduction efforts at the community-wide scale.

Sheridan College is constructing a fully integrated, college-wide district energy network using global best practice. Their goal is to demonstrate that off-the-shelf design and expertise found in leading jurisdictions can be used to build an effective district energy system in Canada. Sheridan aims to be a leader for how district energy can be done successfully in this country, including being a role model for district energy systems and developing a living training laboratory to address common barriers to district energy.

1.5 Taking Action

Many municipalities and regional governments are developing climate Action Plans, and it is important that Brampton develops its own, locally relevant plan. Some municipalities are developing mitigation plans, while others are working towards adaptation plans.

Brampton's CEERP takes on a local lens to focus on community-wide priorities and actions to reduce GHG emissions, increase energy efficiency, ensure energy security, create economic advantage, and increase Brampton's resilience to climate change. The CEERP is considered a mitigation strategy and focuses on mitigation measures. However, mitigation and adaptation are closely linked, and measures for one may result in positive benefits for the other. Some actions within this plan may also facilitate climate adaptation, but an adaptation plan is considered the next phase in Brampton's climate Action Planning.

Notes

[1] Source: Climate Emergency Declaration, statistics retrieved February, 2010 from https://climateemergencydeclaration.org/climate-emergency-declarations-cover-15-million-citizens/

[2] Source: IPCC. (2018). Global Warming of 1.5°C. An IPCC Special Report on the impacts of global warming of 1.5°C above pre-industrial levels. In Press. https://www.ipcc.ch/site/assets/uploads/sites/2/2019/06/SR15_Full_Report_High_Res.pdf

[3] Sources: Buis, Alan. (2019). "A Degree of Concern: Why Global Temperatures Matter." NASA's Global Climate Change. https://climate.nasa.gov/news/2878/a-degree-of-concern-why-global-temperatures-matter/; U.N., 2019: Climate Change. https://www.un.org/en/sections/issues-depth/climate-change/; IPCC. (2013). Climate Change 2013: The Physical Science Basis. Cambridge University Press. https://www.ipcc.ch/report/ar5/wg1/

[4] Source: IPCC. (2018). Global Warming of 1.5°C. An IPCC Special Report on the impacts of global warming of 1.5°C above pre-industrial levels. In Press. https://www.ipcc.ch/site/assets/uploads/sites/2/2019/06/SR15_Full_Report_High_Res.pdf

[5] Image retrieved from Climate Lab Book. https://showyourstripes.info/

[6] Source: Environment and Climate Change Canada. (2018). National Inventory Report (NIR) 1990-2016: GHG sources and sinks in Canada. Annual submission of national GHG inventory to the United Nations Framework Convention on Climate Change (UNFCCC). https://www.canada.ca/content/dam/eccc/documents/pdf/climate-change/emissions-inventories-reporting/nir-executive-summary/National%20Inventory%20Report%20Executive%20Summary%202018.pdf

[7] Source: Federation of Canadian Municipalities. (2009). Act Locally: The Municipal Role in Fighting Climate Change. https://fcm.ca/sites/default/files/documents/resources/report/act-locally-municipal-role-fighting-climate-change.pdf

[8] Source: Quest. (2016). Community Energy Planning: The Value Proposition Environmental, Health and Economic Benefits. https://questcanada.org/wp-content/uploads/2018/08/Community-Energy-Planning-The-Value-Proposition_Full_Report_2016.pdf

[9] Source: BP. 2019. Statistical Review of World Energy 2019. 68th Edition. https://www.bp.com/content/dam/bp/business-sites/en/global/corporate/pdfs/energy-economics/statistical-review/bp-stats-review-2019-full-report.pdf

[10] Table data retrieved from 2017 International Energy Agency (IEA) data.

[11] A Municipal Energy Plan is the equivalent of a Community Energy Plan or a Community Energy and Emissions Reduction Plan.