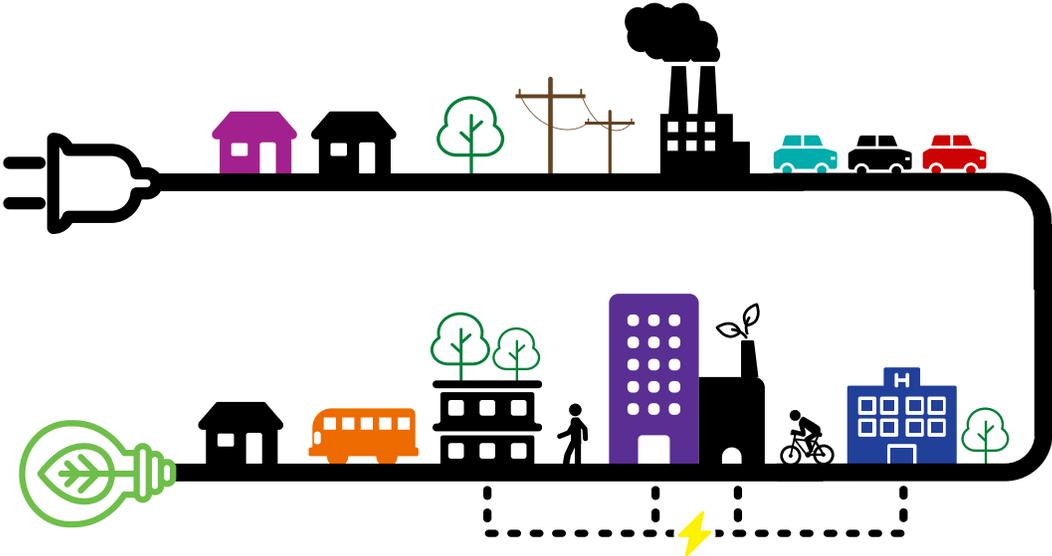


OUR 2040 ENERGY TRANSITION

Community Energy and Emissions
Reduction Plan



Message from the Community Task Force Co-Chairs

Many municipalities are developing Climate Action Plans, and it is important that Brampton develop its own, locally relevant plan. As Co-Chairs of the City of Brampton's Community Energy and Emissions Reduction Plan Community Task Force, we are pleased to submit Our 2040 Energy Transition: Community Energy and Emissions Reduction Plan.

Brampton has responded to the climate change crisis with municipal leadership by developing the Brampton 2040 Vision, declaring a climate emergency, and joining the Global Covenant of Mayors for Climate and Energy.

The Community Energy and Emissions Reduction Plan (CEERP) is another step forward in environmental leadership on behalf of the residents of Brampton. This Community Energy and Emissions Reduction Plan is Brampton's first, and sets clear targets for energy and greenhouse gas (GHG) emission reductions and clear actions for achieving those results, all the while targeting improved economic prosperity for the City's residents, businesses and institutions.

The CEERP is a reflection of the work put in by the Community Task Force members listed below, who have developed a Vision for an energy future that is clean, sustainable, and resilient, and supports the Brampton 2040 Vision.

Addressing the Climate Change Emergency requires an urban and energy transition and coordinated and collective effort within Brampton that will involve the City, residents, business, agencies, and institutions.

The COVID-19 pandemic has taught us about the urgency of taking swift action. If we wait to see further impacts of climate change, it will be too late to stop them and Brampton will not realize the economic, social, and environmental benefits of proactive action.

We want to thank all that contributed their time and effort to this important project and hope that the CEERP provides residents of Brampton with a sustainable plan to meet their energy and emission reduction needs over the next twenty years.

Thank you,

Dave Kapil
Chair, New Brampton

Hassaan Khan
Area General Manager, Performance Infrastructure Canada
Johnson Controls Canada L.P.

Acknowledgements: We Would Like to Thank...

The following Community Task Force Members who provided their time, commitment, and invaluable contributions:

City Councillor Doug Whillans	Herb Sinnock, Sheridan College
Erika Lontoc, Enbridge Gas Distribution	Stuart Craig, Riocan
Brad Cobbledick, Brampton Brick	Eddie Camilleri, William Osler Health Centre
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Rebecca Winters, Region of Peel	Margaret Knowles, Morguard Investments Limited
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The Project Management Team members who provided guidance:

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The consulting team who worked on the analytical background which contributed to the development of the CEERP:

Garforth International LLC. RJ Kerr + Associates Bremer Energy Consulting Services, Inc Karen Farbridge & Associates

The following funding providers:

Sheridan College City of Brampton Ontario Ministry of Energy, Northern Development and Mines

Table of Contents

Glossary	i
Executive Summary	1
Context.....	2
Introduction.....	6
The Plan.....	7
Vision.....	8
Principles.....	8
Goals.....	9
Strategic Directions.....	10
Objectives and 2041 Targets.....	10
Priority Projects: 2020 – 2025.....	12
Action Plan.....	13
Governance and Oversight of Implementation.....	13
Conclusion.....	13
Chapter 1: The Climate Reality	14
1.0 The Climate Reality.....	15
1.1 The Connection between Energy and GHG Emissions.....	21
1.2 Climate Adaptation.....	21
1.3 Why is Climate Change a Municipal Issue?.....	21
1.4 Climate Action.....	22
1.5 Taking Action.....	26
Chapter 2: Energy Transitions	28
2.0 Energy Transitions.....	29
2.1 The Latest Energy Transition.....	34
2.2 Urbanization.....	37
Chapter 3: The Opportunity of a Century	43
3.0 Building a Community Energy and Emissions Reduction Plan.....	44
3.1 What is the Community Energy and Emissions Reduction Plan.....	44
3.2 Seizing Opportunity.....	44
3.3 Working Together.....	48
3.4 The CEERP Planning Process.....	49
Chapter 4: Brampton Today	51
4.0 How Brampton Uses Energy.....	52
4.1 Brampton’s Energy Use: Baseline and Base Case	55
4.2 Brampton’s Energy Related Emissions.....	58
4.3 Brampton’s Energy and Water Costs.....	59
4.4 Benchmarking How Do We Compare Globally and Locally?.....	60
4.5 Summary of Findings.....	61
Chapter 5: Brampton’s Community Energy & Emissions Reduction Plan	64
5.0 Community Energy and Emissions Reduction Plan	65
5.1 Vision.....	68
5.2 Guiding Principles.....	68
5.3 Goals.....	69
5.4 Strategic Directions.....	72
5.5 Objectives and 2041 Targets.....	83
5.6 Priority Projects: 2020 – 2025.....	87
5.7 CEERP Actions.....	90
5.8 Roles: Working Together.....	101
5.9 Getting There.....	109
5.10 Monitoring and Evaluating to 2025.....	112
5.11 Conclusion.....	114
Appendices	116

Glossary

Base Case – a ‘business-as-usual’ projection of Brampton’s energy future.

Baseline – energy use or emissions at a certain point in time. A 2016 Baseline was chosen for the Community Energy and Emissions Reduction Plan to align with the 2016 Census.

Carbon Footprint – the amount of greenhouse gases (GHGs) released due to an activity, event, organization, person, etc., considering all relevant sources, sinks, and storage, and expressed as a carbon dioxide (CO₂) equivalent. An individual or organization’s carbon footprint is the total amount of GHGs released from supporting their needs, lifestyle, and daily life choices.

Carbon neutrality – achieving net-zero carbon dioxide (CO₂) emissions by balancing CO₂ emissions with CO₂ emissions removal, or eliminating CO₂ emissions altogether.

Carbon sinks and sequestration – the capture and storage of carbon dioxide (CO₂), through means such as urban forestry, urban farming, green roofs, naturalization, and natural heritage conservation. This can result in other energy-related benefits like the ambient climatic effects that shade, solar energy reflection, and transpiration provide. Community energy planning often does not include measures that sequester CO₂ through green infrastructure.

Centralized Energy Systems – supply of energy through large-scale energy generation infrastructure that delivers energy via a vast distribution network, often far from the point of use.

Climate Mitigation – decreasing the human-induced sources of climate change to reduce future impacts, such as minimizing the amount of greenhouse gas (GHG)-emitting fossil fuels burned for energy or enhancing carbon sinks that store GHGs.

Cogeneration or Combined Heat and Power – an energy efficient technology that generates electricity and captures heat, which would otherwise be wasted (e.g. steam or hot water), to provide useful thermal energy that can be used for space heating, cooling, domestic hot water, and industrial processes. Combined heat and power systems produce electricity and thermal energy from a single fuel source (e.g. natural gas, biomass). When electricity is generated in large scale regional gas-fired power plants, as much as 60% of the energy value is lost, mostly as heat at the point of generation and the remainder during transmission. This inefficiency can be addressed by generating electricity within the community and capturing the heat for use in a district energy system.

Conversion (energy)/transformation – the process of changing one type of energy to another (e.g. wind (mechanical energy) to electricity, electricity to heat (thermal energy)). From energy source to site use, energy can undergo multiple transformations. During each energy conversion, an amount of energy is lost through heat (waste waste).

Community – in the context of community energy planning, the word “community” is meant to be inclusive of all people, groups, and stakeholders that share the common attribute of being inhabitants of Brampton and direct and indirect consumers of energy.

Community Energy Plan(ning) – a data-informed approach to understanding where and how energy is used and greenhouse gas (GHG) emissions released in a community to identify local opportunities and priorities for increasing energy efficiency, reducing GHG emissions, and lowering energy costs. The Community Energy and Emissions Reduction Plan is Brampton’s community energy plan.

Community Improvement Plan – a tool that allows a municipality to direct funds and implement policy initiatives toward a specifically defined area.

Community Task Force – a team of community champions and principal advisors for the Community Energy and Emissions Reduction Plan.

Decentralized/Distributed Energy Systems – small-scale energy generation, operation, and/or energy storage used to provide an alternative to or an enhancement of the traditional electric power grid.

Deep Decarbonization – measures to significantly reduce and/or sequester carbon dioxide (CO₂) emissions, with an ultimate objective of zero carbon dioxide emissions.

District energy – supplying thermal energy (heating and/or cooling) to multiple buildings from a central plant or from several interconnected but distributed plants. Thermal energy is conveyed with water through a close network of pre-insulated pipes to meet end-users’ need for cooling, heating and domestic hot water. Historically, steam networks have been used and are still used in some older systems. A district energy system is comprised of three subsystems, which include the collection and/or generation of thermal energy, the distribution of that thermal energy from the plant(s) to end-users, and the transfer of the thermal energy to the energy consumer.

Efficiency Case – considers how different combinations of measures can impact the projection of Brampton’s energy future.

Energy Efficiency – using less energy to perform the same task and eliminating energy waste.

Energy Performance Labels – measure and display the energy efficiency and environmental impact (e.g. greenhouse gas emissions) of an item, such as a home, building, appliances, etc.

Energy Security – maintaining an adequate and resilient supply of energy (electricity, liquid fuel, and gas) while also addressing issues of affordability, accessibility, and reliability.

Energy Transition – a major and long term structural change in energy systems, often including a significant transformation in how energy is sourced, distributed, and/or utilized.

Framing Goals – established at the beginning of the analytical process of the CEERP, and used to evaluate the performance of the Base Case and Efficiency Case simulations.

Gigajoule (GJ) – a unit of measurement of energy. One gigajoule is equivalent to one billion joules.

Global Best Practice – method or technique that is generally accepted as superior to the alternatives because it produces results that are superior to those achieved by other means. For community energy planning, global best practice is achieved in Northern Europe/Nordic countries, where municipalities have taken the lead in developing and implementing community energy plans that result in order of magnitude improvements in energy efficiency and over 50% reductions in per capita GHG emissions.

Greenfield – undeveloped land, typically dominated by agriculture, open space, and or natural heritage features.

Greenhouse Gases (GHGs) – any gas that absorbs thermal radiation from the sun and emits it back into the earth’s atmosphere, such as include 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.

Home and Building – Homes refers to all residential buildings. Buildings refer to all other types of building structures (e.g. commercial, facilities, institutional, storage, business etc.)

Integrated Energy Master Plan (IEMP) – the equivalent of a Community Energy and Emissions Reduction Plan but developed at the scale of a portfolio of properties, neighbourhood, or subdivision.

Latest Energy Transition – the current energy transition underway being driven by the decarbonization and the localized distribution of energy.

Modal Split – the percentage share of travelers or goods using a particular type of transportation type, or the number of trips using said type (e.g. 10% cycling, 50% single-passenger car, 5% walking, 35% transit).

Near-net-zero (NNZ) Neighbourhood – areas where little or no energy is drawn from the electricity grid or from pipelines, and little or no greenhouse gas (GHG) emissions are released.

Non-GHG Emitting Sources – sources of energy that do not produce greenhouse gas (GHG) (e.g. nuclear, hydro, wind, solar, geothermal).

Project Working Team – comprised of representatives from the City of Brampton, Sheridan College, and the consulting team led by Garforth International LLC, and headed the analytical and engagement processes for the CEERP.

Provincial Growth Plan – the Growth Plan for the Great Golden Horseshoe establishes population and employment targets for 2041 for all municipalities within the region. Municipal official plans must be in conformity with these targets.

Resiliency – the ability to prepare for, absorb, and recover from future shocks (economic, environmental, social, and institutional). Resilient cities promote sustainable development, well-being, and inclusive growth. The CEERP contributes to overall community resiliency by addressing increasing consumer concerns about energy affordability, accessibility, and reliability.

Site Energy – considers the energy use at the meter by end-users (e.g. homes, buildings, industry, and transportation).

Source Energy – considers all energy flows from production to end-use.

Standardized Retrofits – a consistent set of modifications to existing buildings designed to improve energy efficiency or decrease energy demand.

Sustainability – meeting the needs of the present without compromising the ability of future generations by creating and maintaining the conditions under which people (social), economies (economic), and the environment (environment) can exist in productive harmony.

Thermal Utility - a district energy network is typically run as a thermal utility by a company that operates all the plants and networks, ensures service quality, and manages the metering and billing of the heating and cooling services. The network allows for economies of scale, since the generation of heat in a few larger plants is more efficient than having many boilers, each heating their individual building. It also enables valuable energy currently wasted in electricity generation, as well as industrial and other processes to be cheaply captured and delivered to other consumers.

Tonne – a metric tonne, equivalent to 1000 kilograms (kg) or 2204.6 pounds (lbs).

Transmission (energy) – the movement or delivery of energy from its point of generation to point of consumer/site use, and usually referring to the transmission of electricity across specialized cables or structures.

Urbanization – the growth of cities and towns driven by a rise of population and the increasing share of people living in urban centers.

Urban Centre – an urban area with a high population density.

COMMUNITY ENERGY & EMISSIONS REDUCTION PLAN

Executive Summary



Context

Climate change is a threat to all life on the planet and to people's livelihoods. To address this crisis, we must urgently reduce carbon emissions and prepare for the consequences of a warming planet. Ontario has already seen these consequences through the increasing severity of rain, snow, ice and wind events, greater temperature fluctuations and extremes, changing wildlife migration patterns, and the growing presence of vector-borne diseases. In the next quarter century, it is expected that the types of climate change impacts and their severity will increase. These impacts all come at a significant cost to municipalities, residents, and businesses, and inaction will be expensive.

A global shift towards a low-carbon economy is underway, primarily motivated by the urgent need to address the mounting risks and impacts of climate change. A transformation in our urban and energy systems towards low or zero carbon systems is needed to address this climate emergency. This transformation will see changes in how we design our cities and neighbourhoods, how people and goods travel, the supply and distribution of our energy needs, how we build our homes and buildings, the production and supply of goods and services, how we manage our waste, and more. A clean energy and urban transition is already underway, locally and globally. With the Brampton 2040 Vision and the Community Energy and Emissions Reduction Plan (CEERP), Brampton is positioning itself well to address the climate emergency. However, acceleration is needed to reduce the cost of climate change inaction, and fully realize the economic, social and environmental opportunities of this transition.

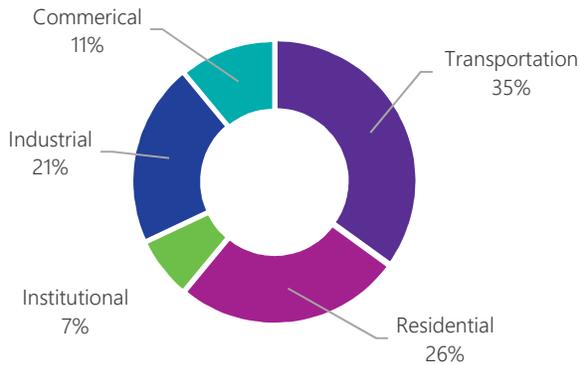
A significant economic opportunity exists to make a clean energy transition. Eliminating wasted energy and localizing energy production will provide an enhanced economy in Brampton. This will directly contribute to more localized jobs, higher property values, lower property taxes, and lower costs of living over the long-run. Currently, not only is a good portion of energy wasted by inefficiency, but the majority of dollars spent on energy end up in the pockets of other communities. This reveals a significant economic opportunity for Brampton to capitalize on by working to retain and recirculate more of these energy dollars within the community, leading to the creation of more local jobs, new industries and economies, greater savings for local business operations, and more affordable living for residents.

“This is not just about coping with climate change, but prospering through it.”

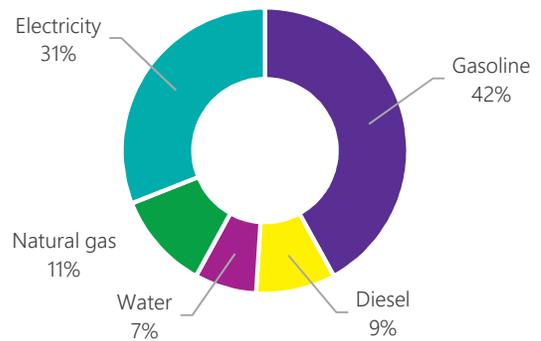
- Canada's National Round Table on the Environment and the Economy, 2012



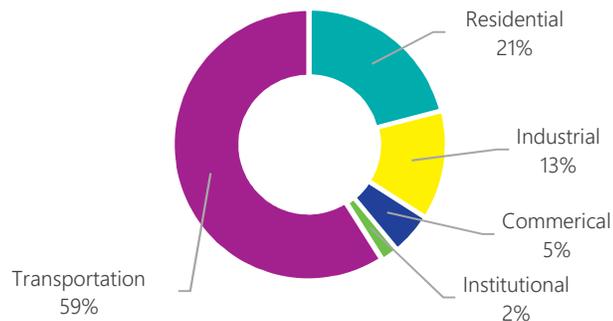
Brampton Source Energy Use by Sector, 2016



Brampton Energy Costs by Utility, 2016



Brampton Emissions by Sector, 2016



Brampton's Community Energy and Emissions Reduction Plan establishes an evidence-based strategy to reduce emissions in Brampton

In 2015, the Paris Agreement, a historic international agreement, was signed in Paris by 195 countries to hold “the increase in the global average temperature to well below 2°C above pre-industrial levels and to pursue efforts to limit the temperature increase to 1.5°C above pre-industrial levels, recognizing that this would significantly reduce the risks and impacts of climate change.”

Since then, over 1,468 jurisdictions in 28 countries have declared a climate emergency, including 501 Canadian municipalities. In June 2019, Brampton City Council voted unanimously to declare a climate emergency. The Region of Peel, in solidarity with its local municipalities, also declared a climate emergency in October 2019. This is a call to action for all sectors of society – government, business, the community and individuals.

Considering 60% of energy consumption and over half of all greenhouse gases (GHG) in Canada are influenced by communities - for instance, 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 are enabling local action on climate change. As a signatory to the Paris Climate Agreement, the Canadian federal government set a target to reduce national GHG emissions by 80% below 1990 levels by 2050. In 2016, the Pan-Canadian Framework on Clean Growth and Climate was approved. Putting a price on carbon has been an important part of the Government of Canada's Climate Action Plan. The Province of Ontario has also committed to reducing GHG emissions to 30% below 2005 levels by 2030 and in 2018 released Preserving and Protecting our Environment for Future Generations: A Made-in-Ontario Environment Plan.

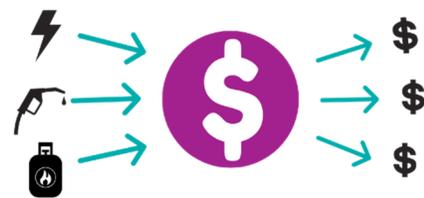
Addressing climate change is accelerating a shift by communities to also examine the challenge of a clean energy transition and to create community energy plans. Over 400 Canadian communities have developed community energy plans to establish local priorities for reducing energy use and energy-related emissions.

The Community Energy and Emissions Reduction Plan establishes an integrated strategy that allows Brampton to benefit economically from its energy transition.

Reducing climate change helps capitalize on multiple benefits, such as health and wellness, social equity, environment and economic opportunities, and is one of several reasons driving communities to undertake energy planning. Communities must ensure they are well positioned to manage the risks and opportunities associated with the current global energy transition, one that is moving towards a more distributed energy system. Action on climate change is one central factor towards this transition. Other factors include the:

- decreasing costs for technologies that generate and distribute energy locally;
- convergence of communication and energy technologies, commonly referred to as “smart-grid”;
- growing systemic inefficiencies in our current centralized energy system; and
- need to increase community resiliency by addressing escalating concerns about energy security, which includes consumer issues of affordability, accessibility and reliability.

**Our community spends
\$1.8 billion
on energy each year**



**\$1.4 billion
of these energy
dollars currently
leave the community**

Community energy transformation creates significant local economic development opportunities. For instance, local job creation occurs in three ways:

1. direct jobs are created by businesses that support energy efficiency improvements (e.g. construction trades), or design and build and/or operate local supply and distribution systems;
2. indirect jobs are created in supply chains that deliver goods and services to businesses in the direct job category; and
3. induced jobs are created when the newly-hired workers in direct or indirect jobs spend their new earnings on goods and services in the community.

The provision of competitive and reliable energy services also serves to attract and retain investment in all community sectors.

The Community Energy and Emissions Reduction Plan establishes an aligned strategy that supports the Brampton 2040 Vision: Living the Mosaic.

Municipal governments are responsible for managing the growth and development of their communities. They have a key role in ensuring the establishment of compact, mixed-use, walkable, and transit-friendly cities. Analysis from the International Energy Agency states that governments directly or indirectly drive more than 70% of global energy investments, and that they have a historic opportunity to steer those investments onto a more sustainable path.

Brampton's population is expected to grow from 600,000 to 900,000 by 2041. This rapid urbanization puts pressure on municipal leaders who must manage the growth and development of the community while protecting residents' quality of life. Planning and designing smart, transit-orientated, energy efficient communities helps reduce these pressures by supporting Brampton's economic development, quality of life and social equity while addressing climate change.

In 2017 and 2018, the City engaged thousands of Brampton citizens in the development of a transformative community vision that advocates for compact, mixed-use, walkable, and transit-friendly neighbourhoods in an exceptional urban experience. The Brampton 2040 Vision: Living the Mosaic is

a bold new vision for the future of Brampton. Central to the Vision are seven ambitious vision statements dealing with sustainability and the environment, transportation, creating and retaining jobs, recreation, health, social issues, and arts and culture.

The CEERP relates to more than just the Sustainability and Environment statement of the Brampton 2040 Vision. It links to most aspects from the other Vision statements, such as sustainable urban places, complete neighbourhoods, an interconnected green park network, denser urban and town centres, local jobs, and an integrated transportation contributing to civic sustainability with an emphasis on walking, cycling, and transit.

Introduction

Community energy planning considers all local energy movement that impacts activities within a community, including supply, distribution, and end-use. Brampton's Community Energy and Emissions Reduction Plan (CEERP) was initiated to combine efforts of the municipality, local utilities, and community stakeholders to create a roadmap to improve energy efficiency, reduce GHG emissions, ensure energy security, create economic advantage, and increase resilience to climate change.

The City of Brampton and Sheridan College came together to facilitate the development of the CEERP. They convened a Community Task Force to provide governance and oversight of the planning process. The Community Task Force represented many different community stakeholders within Brampton, representing a cross-section of local business, energy, public sector and environmental organizations.

The City also secured funding from the Government of Ontario to support the planning of this Strategy. Both the City of Brampton and Sheridan College contributed funding towards the completion of the CEERP and assigned staff to a Project Working Team to support the Community Task Force.

The Project Working Team (PWT), consisting of City representatives and an external consulting team, managed the CEERP planning process.

Guided by an Engagement Plan, various channels were developed to engage the appropriate stakeholders and community-at-large to inform, consult, and involve them in the development of the CEERP. More details on engagement are found in the 2019 Engagement Plan Report.

The results of the analytical work that led to the development of the preferred overall strategy are summarized in this report and found in more detail in the 2019 CEERP Analytical Report.



Community Task Force



The Plan

The strategy presented in the CEERP is the road map to achieve a clean, sustainable, and resilient energy future in Brampton and is based on:

- understanding Brampton's Baseline and Base Case for energy use and energy-related emissions;
- understanding Brampton's population and employment growth;
- community engagement;
- results of simulations of Brampton's growth employing several efficiency measures (see 2019 Analytical Report for more details); and
- global best practice and assessment of local opportunities.

The preferred strategy is based on a framework that aligns:

- one vision;
- six principles organized under four categories;
- three goals;
- seven strategic directions;
- 24 objectives and targets; and
- six priority projects for the first five years.

The Community Task Force recognizes that successful implementation of the strategy will require all sectors of Brampton's society to undertake activities aligned with the six Priority Projects. The primary aspiration of the CEERP is to shape Brampton's energy future by creating the right conditions for public and private sector community action. The roles of different private and public sectors in achieving the CEERP Goals and Objectives are explored in Chapter 5.

The CEERP contains an Action Plan that will be pursued to support the implementation of the Priority Projects (see Chapter 5, Section 5.7).

The Community Task Force acknowledges that energy and climate policies are changing rapidly as governments respond to both local and international pressure to reduce GHG emissions. The market will also continue to innovate, and more cost-effective technologies will emerge to accelerate the uptake of low-carbon local energy supply and distribution technologies designed for rapidly urbanizing communities like Brampton. Consequently, the Task Force recommends a review and update of the CEERP, as appropriate, every five years.

Brampton's energy future is clean, sustainable, resilient, and supports the Brampton 2040 Vision.

Vision

The Community Task Force approved the following CEERP vision statement: *Brampton's energy future is clean, sustainable, and resilient and supports the Brampton 2040 Vision.*

Principles

The Community Task Force approved six principles to guide the strategic implementation and to ensure decision making conforms to the long-term vision of the CEERP. The principles shaped the formation of goals, objectives, and targets and helped prioritize actions.

Environmental

- Work towards climate neutrality.

Energy

- Benchmark energy performance against global best practices.

Economic

- All energy-related public and private sector investments will meet acceptable risk-adjusted returns.
- Energy costs will be competitive compared to comparable North American communities.
- Local employment will be generated.

Reliability

- Energy systems will be designed to meet the challenges of changing user expectations, climate uncertainty, and new technology options.

Goals

The Community Task Force approved three goals, based on the assessment of local energy and emissions data (where Brampton is today) relative to global best practice (where Brampton could be). The Task Force chose realistic over aspirational goals, while still recognizing that the goals will require regular updates to adapt to changes in climate policy, energy policy, and global best practice.



Energy

Based on global best-practices, reduce community-wide energy end use by at least 50% from 2016 levels by 2041.



Emissions

Reduce community-wide emissions by 50% from 2016 levels by 2041, and establish a pathway to reduce emissions by at least 80% by 2050 to meet or exceed federal and provincial targets.



Economic

Retain at least \$26 billion in cumulative energy costs within the community by 2041.

Strategic Directions

The Community Task Force approved seven strategic directions, which reflect Brampton’s urban and energy transition, as well as the Brampton 2040 Vision.



Objectives and 2041 Targets

The Community Task Force approved objectives and targets which reflect the preferred scenario and the measures considered in the energy efficiency simulations.

Strategic Direction	#	Objective	2041 Target
Green Communities	1A	Achieve near net-zero communities	Attain near net-zero GHG emissions for new communities in Heritage Heights and new buildings in Town Centres, and Major Urban Growth Areas
	1B	Policy is aligned	Complete all policy updates as identified in the Action Plan and its subsequent updates
	1C	Establish Major Growth Areas and Town Centres	Meet the Brampton 2040 Major Growth Areas and Town Centres density and job targets (to be revised through the OP Review process)
Transportation Efficiency	2A	Reduce average trip length	Reduce average trip length by 3.75% for light-duty vehicles from 2016 levels
	2B	Increase trips by walking and cycling	Increase the share of passenger kilometres travelled walking and cycling to 7%
	2C	Increase trips by Brampton Transit	Increase the share of passenger kilometres travelled by Brampton Transit to 9.0%

	2D	Increase trips by GO Transit	Increase the share of passenger kilometres travelled by GO Train to 8.5%
	2E	Increase use of electric vehicles	Increase electric share of light-duty vehicles to 22% and heavy-duty vehicles to 7%
	2F	Increase efficiency of vehicles	Increase efficiency of gas/diesel vehicles by 36% and electric vehicles by 20% from 2016 levels
Home and Building Efficiency	3A	Increase efficiency of existing homes	Achieve a 35% residential sector efficiency gain from 2016 levels by retrofitting 80% of existing homes
	3B	Increase efficiency of other existing buildings	Achieve a 22% commercial and institutional sector efficiency gain from 2016 levels by retrofitting 60% of existing buildings
	3C	Increase delivered efficiency of new property	Achieve a 17% Ontario Building Code efficiency gain from 2016 levels
	3D	Increase water efficiency of existing homes and buildings	Achieve a 34% water efficiency gain from 2016 levels
Local Energy Supply and Distribution	4A	Implement district energy in high growth districts with a mix of combined heat and power and other low-carbon heating and cooling sources	Serve 70% of existing high growth Energy Planning Districts and 80% of new high growth Energy Planning Districts with district energy
	4B	Install solar hot water in stable residential areas (low growth districts)	Serve 10% of hot water and heating needs in homes not served by district energy with solar hot water
	4C	Generate significant amounts of solar power installed on suitable rooftops and other locations	Supply 8% of Brampton's electricity needs with locally generated solar power
Industrial Efficiency	5A	Proliferate best practice to all local industry	Achieve a 20% industrial sector efficiency gain from 2016 levels
Green Infrastructure	6A	Expand the Urban forest	Plant 1 million trees by 2040
	6B	Increase restoration of natural heritage system	Increase restoration and enhancement management to 45ha/year
	6C	Integrate natural assets into the City's asset management program	Determine a dollar value for the City's natural assets
Communications, Engagement, and Monitoring	7A	Increase awareness of the importance of energy planning among residents and businesses	Establish a Community Organization (e.g. CCET) to engage in ongoing outreach and education
	7B	Engage with businesses, non-profits, institutions, residents, utilities	At minimum engage with: large energy users, Brampton Board of Trade, Sheridan College, Ryerson University, Algoma University, BILD, Enbridge Gas, and Alectra Utilities

	7C	Partner with other municipalities and levels of government	At minimum, partner with neighbouring municipalities and the Region of Peel
	7D	Integrate with corporate performance metrics (KPI)	Establish a community GHG emissions and energy efficiency target on the Corporate Performance Dashboard and update regularly
	7E	Establishment of self-supporting Community Organization (e.g. CCET) that is focused on delivering community energy planning excellence	Attain recognition as a regional centre for energy excellence

Priority Projects: 2020 - 2025

The Community Task Force approved six priority projects for the next five years.

1. Ensure the City of Brampton policies and programs align with supporting the CEERP Objectives and Targets.
2. Establish a system to deliver standardized retrofits to Brampton homeowners.
3. Update the Transportation and Transit Master Plan (TTMP) to reflect complete streets and the integrated nature of mobility and built form.
4. Integrate District Energy Systems in appropriate locations within the City of Brampton.
5. Develop Integrated Energy Master Plans for public facilities and private development.
6. Establish a community organization to lead the development and implementation of select priority projects.

The rationale for these six priority projects is provided in Chapter 5, Section 5.6.

Action Plan

Beyond the Priority Projects, the CEERP outlines additional actions to take in order to ensure the Plan's objectives and targets are met. These are on-going, short, medium, or long-term actions based on the goals and strategies. The Action Plan is in Chapter 5 (Section 5.7) of the report.

Governance and Oversight of Implementation

Individual and independent action on climate change has been and will continue to be important. However, the scale of actions necessary to address the climate emergency and energy transition require coordinated and collective effort within Brampton and will need to involve the City, residents, businesses, agencies, and institutions to accelerate market transformation.

To ensure that the CEERP does not 'sit on a shelf' and implementation of the 2020-2025 Priority Projects is achieved and sustained, it is necessary for the City to consider identifying and dedicating resources to oversee, coordinate, implement, and report on the overall progress of achieving the Plan's targets.

The establishment of an independent community organization to work in parallel with the City's efforts to implement the CEERP is one way to accelerate, organize, and commence collective actions within the community. The Brampton 2040 Vision recommended the establishment of such an organization, called the Institute for Sustainable Brampton (ISB), which would facilitate "public-private actions to position Brampton in the vanguard of suburban sustainability."

In the fall of 2019, the City initiated a process to define a framework for a Community Organization. Through this process the Community Task Force and stakeholders, alongside the City, Region of Peel, and Sheridan College, developed a mandate for the ISB that focuses on achieving Brampton's urban and energy transition. As such, this Community Organization would be renamed the "Centre for Community Energy Transformation" (CCET) and could serve as a hub for coordinating and reporting on the progress made in implementing select CEERP community priority projects.

Conclusion

Brampton is well positioned to be a leader in North America in this global urban and energy transition. The Brampton 2040 Vision has set the foundation for the urban change needed to succeed in this transition. By adopting the CEERP, Brampton will be joining the ranks of the global community of cities taking a leadership role in the fight against climate change and preparing for the opportunities provided by the energy transition underway. As a leader, Brampton can set an example of how a suburban city can come out economically stronger and improve resident's quality of life while successfully combating climate change.

The CEERP provides a more sustainable, urban, and vibrant future for our city, aligned with nature and "one planet" living. Our diverse community is energized and ready to take action towards energy and emissions reduction. The power of connections and our partnerships will allow us to work towards our vision of an energy future that is clean, sustainable, resilient, and supports the Brampton 2040 Vision. As Brampton moves towards achieving the economic, emissions, and energy savings goals of the CEERP, we also need to look beyond our targets to work towards eventual climate neutrality.

At the time of writing this report, the Covid-19 pandemic was occurring. It has shown us a glimpse of the impacts future climate threats could have on our communities. It has taught about the urgency of taking swift action collectively and the vital need to build resilient communities. If we wait to see further impacts of climate change, it will be too late.

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.

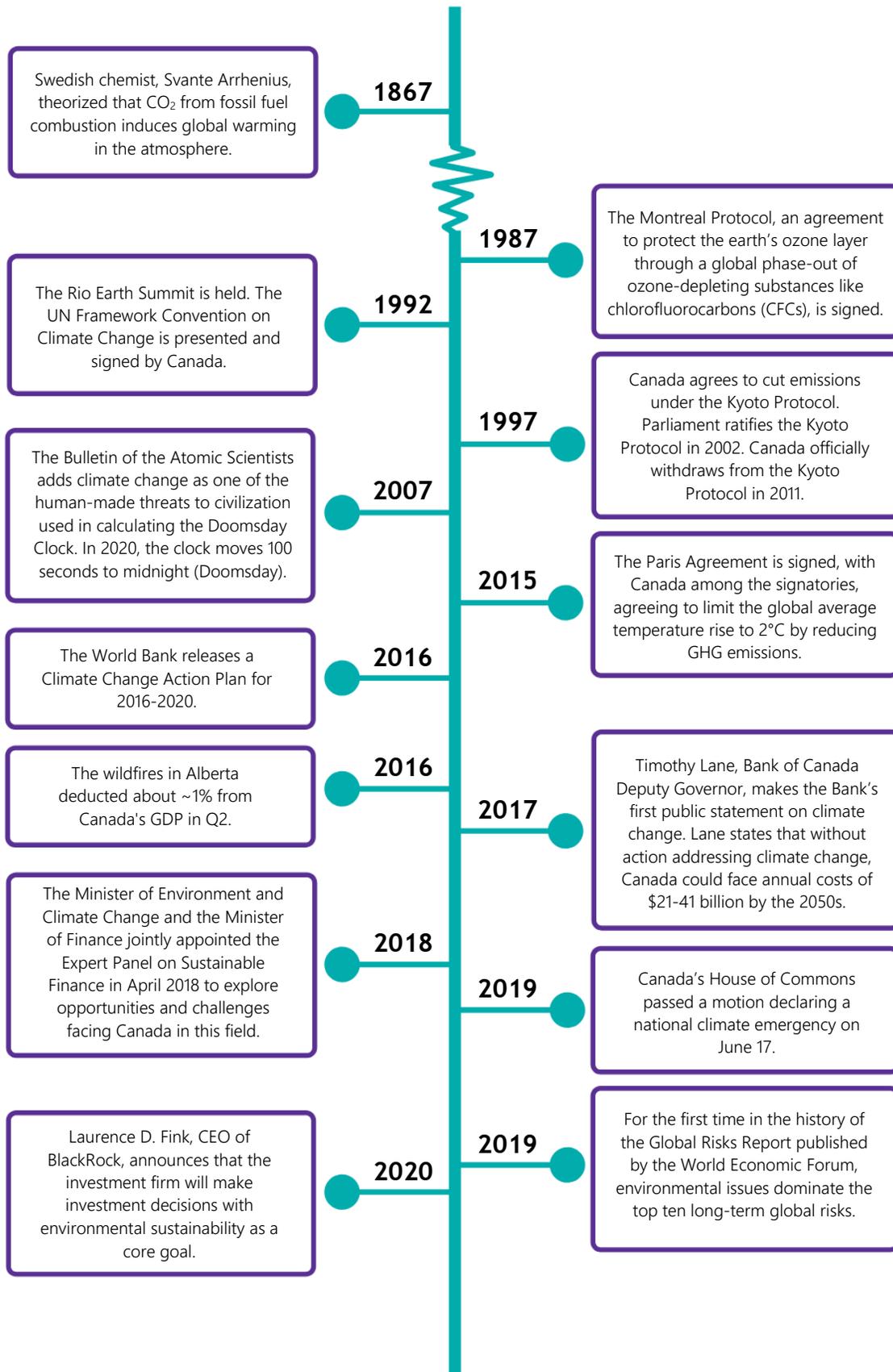
1.0.1 The Climate Emergency

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.

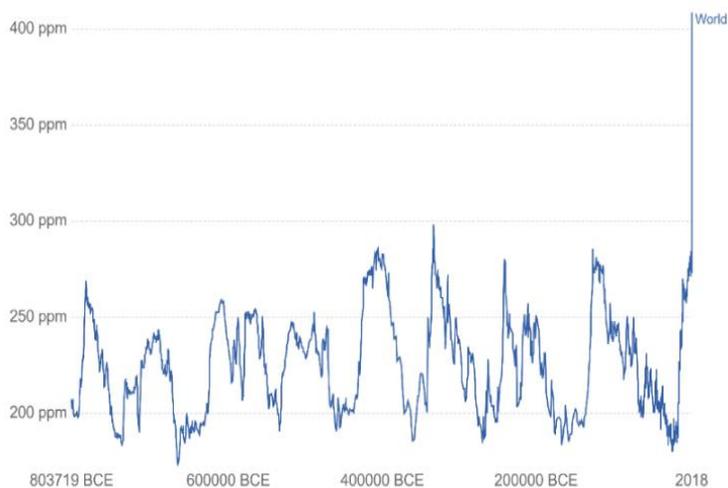
Why are higher Carbon Dioxide (CO₂) levels a concern?

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.

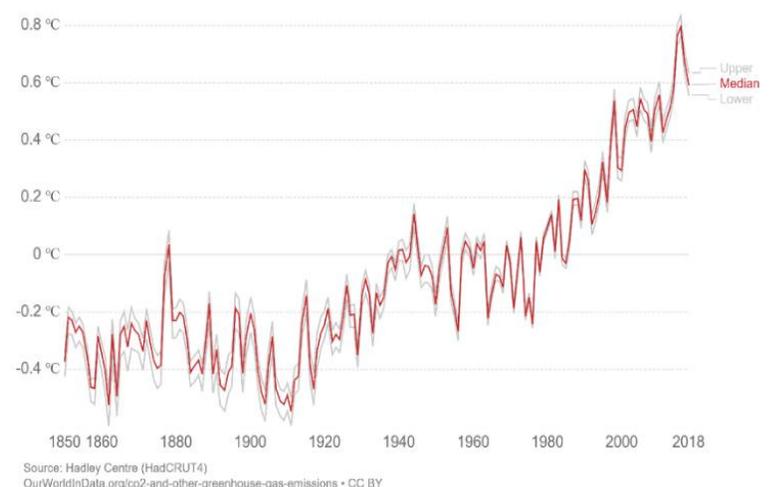
Scientists warn that the consequences of climate change for humans, animals, and plants will become more severe if the average global temperature continues to rise.³ Carbon emissions would need to be cut by at least 45% by 2030 and be lowered to zero by mid-century, to keep temperatures within a 1.5°C .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 ($^{\circ}\text{C}$). 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 infrastructure 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.

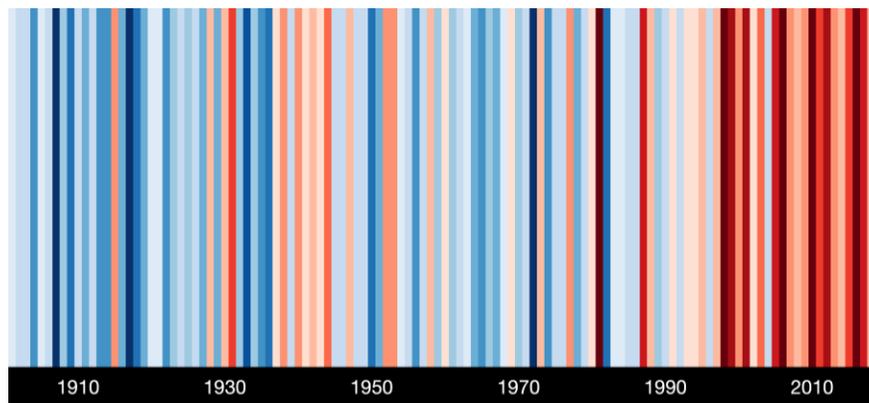
Climate mitigation focuses on decreasing the human-induced sources of climate change in order to reduce future impacts, such as minimizing the amount of GHG-emitting fossil fuels burned for energy or enhancing carbon sinks that store GHGs. The effects and benefits of climate mitigation measures are long-term,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



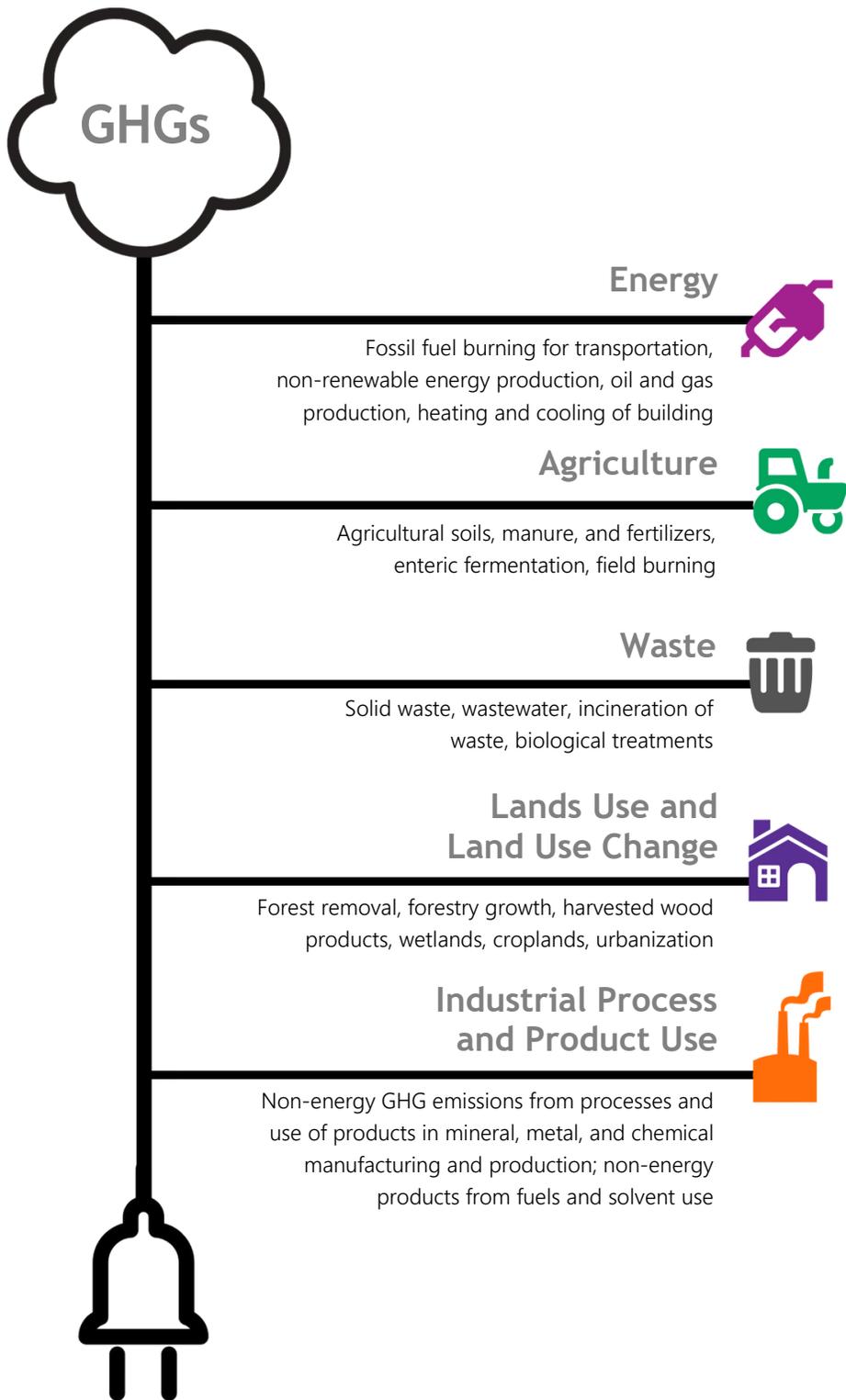
Mitigation	Adaptation
Mitigation describes all actions taken by humankind to reduce emissions into the atmosphere.	Adaptation describes all actions taken by humankind to adjust to the impacts of a changing climate.
Mitigation: the causes of climate change are removed by reducing GHG emissions.	Adaptation: 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 Product¹⁰

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 adaptation 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.

CHAPTER 2

Energy Transitions

Brampton's Urban & Energy Evolution

KEY TAKEAWAYS

- Climate change is one of many reasons to develop a Community Energy and Emissions Reduction Plan. Another reason is ensuring Brampton is well positioned to manage the opportunities and risks associated with the modern energy transition underway.
- Energy transitions are not new - Ontario has already experienced two energy transition since European settlement: 1) the wide use of coal and steam power, and 2) the move to centralized energy systems and use of fossil fuels. Both brought on significant economic growth and quality of life improvements.
- Brampton's reliance on a centralized energy system results in the loss of significant local economic opportunities. Today, Brampton spends over \$1.8 billion on its energy as a community, and almost 80% of those energy dollars leave the city to support the economic development of other communities that house power plants and refineries.
- The growing reliance on fossil fuels in these centralized systems is also contributing to the current global climate emergency. Today, Ontario relies on fossil fuels to meet 75% of its energy needs associated with electricity, natural gas, and gasoline and diesel.
- The latest global energy transition is being driven by two main factors: decarbonization and the localized distribution of energy.
- Urbanization has been a driving force of shaping Ontario's and Brampton's energy systems and use.
- Seen through an energy lens, the Brampton 2040 Vision is a community energy plan. The CEERP supports the Vision, providing a roadmap that takes us steps closer to achieving it.
- Community energy planning involves establishing local priorities for reducing energy use and energy-related emissions through approaches such as distributed energy systems, decarbonization of energy sources, energy technologies, green infrastructure, sustainable transportation options, well-designed complete communities, and local jobs.
- A full glossary of terms is available at the beginning of this report. Some of the key terms used in this chapter include: Energy Transition, Latest Energy Transition, Centralized Energy Systems, Decentralized/Distributed Energy Systems, and Urbanization.



Looking east on Queen St. at Main St. ¹

2.0 Energy Transitions

Climate change is one of many reasons to undertake a community energy plan. Another reason is ensuring Brampton is positioned to manage the risks and opportunities associated with the latest energy transition.

The last two centuries have seen several energy transformations in Ontario and Brampton. Each time, the resulting impact on the life of citizens and businesses has been immense. Evidence of these transformations can be seen in Brampton's urban and natural environment.

2.0.1 History of Energy Transitions in Ontario

Energy transitions are not new, and Ontario has experienced two major energy transitions since European settlement.²

Indigenous Peoples Relationship with Energy^{3,4}

The relationship the Indigenous peoples in Ontario had with energy before European settlement varied greatly between tribes, however, relationships were closely tied to the land and its practical application to survival. In its many sources and applications, energy use often had deeply ingrained cultural and spiritual significance.

In its application for livelihood, fire was often utilized for heat to stay warm, cooking, and the preservation of food through smoking. The type of sources of fuel used for each application was shaped by generations of knowledge and observations, and was often guided by spiritual traditions and teachings.

Fire also greatly impacted the landscape, significantly affecting the location and type of resources available. Indeed, there are indications that certain tribes may have used fire intentionally to modify or manage their landscapes and resources. Other sources of energy came through the use of existing resources and systems already naturally present, such as using rivers for transportation, or dogs to help carry loads.

The area known as Brampton today is the traditional territories of the Anishinabek, Huron-Wendat, Haudenosaunee, and Ojibway/Chippewa.

Pre-industrial Energy System

Early European settlers in Upper Canada relied on a pre-industrial system for their energy comprised primarily of burning wood for heat, using work animals, and harnessing the movement of water to grind grain and saw logs.

The reliance on wood for fuel and building material was one of the causes behind Brampton losing almost 90% of its woodland cover by the early 1900s. Today, some of the traditional territories of remnants of this pre-European landscape are found in Brampton's valleys and woodlands.

Reliance on animal and human power also resulted in walkable hamlets that formed the basis of economic and social centres for local residents.

First Energy Transition: Coal and Steam Power

The first energy transition in Ontario and Brampton was fueled by the introduction of coal-fired steam engines in the mid-1800s. By the end of the 1800s, U.S. coal and local steam engines powered most of Ontario's industrial growth.

The introduction of steam engines and railroads offered economic and social opportunities and challenges to Brampton's hamlets. Goods, once produced for local markets, could now be imported from large urban centres and the world. Brampton's cut-flower industry was quick to seize this opportunity to become the Common Wealth's largest producer of cut roses, leading Brampton to be known as the Flower Town.

However, by the turn of the century rising coal prices and coal shortages were threatening local prosperity. Municipal politicians and boards of trade began to turn their attention towards the promise of a new energy technology - electricity.

Second Energy Transition: Centralized Electricity and Fossil Fuels

The first time the movement of water was used to produce electricity in Canada was at Chaudière Falls in 1881, which powered streetlights and local mills in Ottawa. Subsequently, electricity companies sprung up across Ontario. By the early 1900s, most of Ontario's electrical systems were owned by municipal governments eager to expand service to more homes and businesses. Demand for electricity increased and to meet that need, 14 Ontario towns formed the "Power for the People" movement. These local leaders were instrumental in the formation of the Hydro-Electric Power Commission of Ontario. Sir Adam Beck, the commission's first chairman, was an early champion of centralized power as the Mayor of London, Ontario. Abundant and cheap hydroelectric power from Niagara arrived in Ontario homes for the first time in 1910.



Brampton received electricity for the first time in 1886 when a 2,200 volt electrical line was built to connect downtown Brampton to the McMurchy woolen mill and generating station along the Credit River in Huttonville, lighting the first electrical street lamp in Brampton.

The centralization of electricity came to Brampton in February 1912, when Brampton taxpayers voted to allow the Hydro-Electric Power Commission to purchase Mr. McMurchy's rights to the electricity supply in Brampton "to prevent needless competition". This move led to the creation of the Brampton Hydro-Electric Power Commission.

Another key aspect of this second energy transition was the availability of fossil fuels. In the late 1800s, Brampton used natural gas to light its streets and coal to heat homes. It wasn't until the late 1950s that engineering breakthroughs facilitated the widespread use of natural gas for home heating and industry. Today, the majority of homes in Brampton use natural gas as their primary source of heating.

The widespread availability of fossil fuels also supported the monumental growth in the use of personal automobiles in the 20th century. The introduction of the personal automobile led to a significant transformation of the built environment, creating communities focused around the use of a car.

District Heating Powers Flower Town⁵

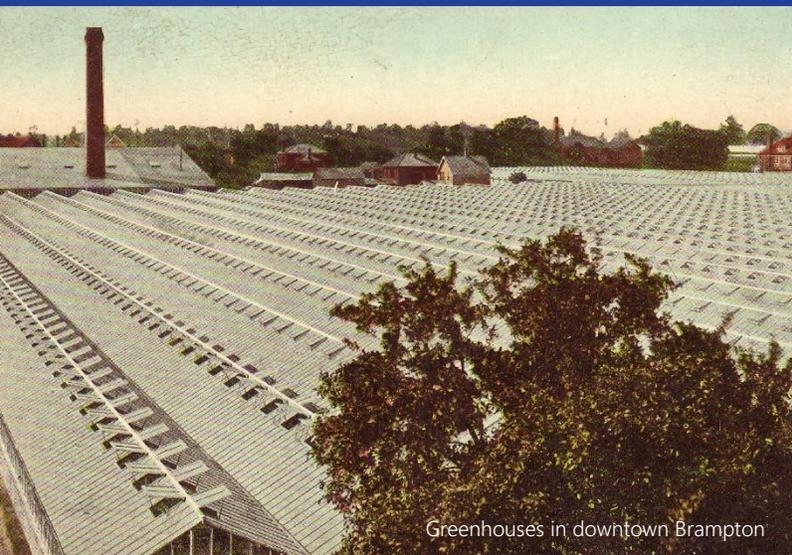
From 1915 to 1960, Brampton was known internationally as “The Flower Town of Canada”. During this time there were over 48 nurseries in Downtown Brampton devoted to growing hothouse flowers. The Dale Estate was known as having the third largest number of greenhouses in the world.

To heat these greenhouses, the growers joined forces to build Brampton’s first district heating system, which relied on a network of underground pipes and shafts to deliver heat to the greenhouses.

At its peak, the district heating system required approximately 6,000 to 19,000 tons of coal annually. Some estimates suggest there were over 100 miles of steam pipes under Brampton.

A 300-foot chimney, once a local landmark, was constructed for this heating plant to push the coal fumes high into the air.

In addition, several homes were added to the system including the Dale homes. Altogether, a total of 15 homes were heated by the district heat system. In the years after WWII, the company converted the boilers to oil. This transition was more efficient and improved Brampton’s air quality. At this time seven boilers were installed, burning 15,000 gallons of oil daily, or approximately three million gallons a year, with a capacity of 7000 HP.



Greenhouses in downtown Brampton

With each energy transition, communities have become less involved and less aware of where their energy comes from and how it is produced. Each energy transition resulted in changes to the urban landscape as increased energy inputs allowed cities to grow, gave people more freedom to travel more frequently and farther, and provided businesses the ability to trade over wider distances.

Ontario’s Current Energy System

The result of the last energy transition has been a complete centralization of Ontario’s current energy system. In Brampton, electricity, home heating, and gasoline are produced elsewhere in a centralized power station or refinery and distributed to the city through a network of wires and pipelines.

This centralization of power has powered both Ontario’s and Brampton’s economic and urban growth, but reliance on fossil fuels is also contributing to the current global climate emergency. Today, Ontario relies on fossil fuels to meet 75% of its energy needs associated with electricity, natural gas (home heating) and gasoline and diesel (cars and trucks).

In addition, Brampton’s reliance on this centralized system results in the loss of significant local economic opportunities. In the past, energy production required local businesses and workers, which fed the local economy. Today, almost 80% of Brampton’s energy dollars leave the city to support the economic development of other communities that house power plants and refineries.

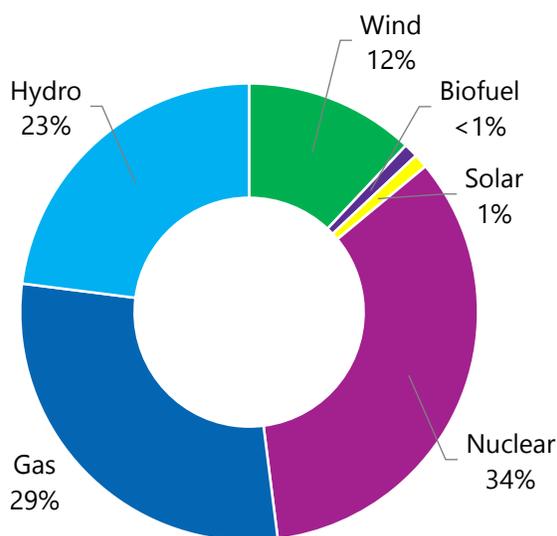
Electricity

Ontario’s electricity mix in early 2020 was 34% nuclear, 29% natural gas, 23% hydro, 12% wind, 1% solar, and <1% biofuel. However, in 2016, approximately 90% of Ontario’s electricity came from non-GHG emitting sources, and up until the 1950s, Ontario’s electricity system was almost 100 percent renewable hydroelectric power.^{6,7}

The centralization of the electricity system and the introduction of non-renewable energy sources (i.e. fossil fuel and nuclear) to meet the demands of increasing population, industrialization and urbanization has had two consequences:

1. the creation of waste by-products, including GHG emissions and nuclear waste; and
2. increased system losses from conversion and transmission.

2020 Installed Energy Capacity by Fuel Type on Ontario's Transmission System⁸



Nuclear	13,009 MW
Gas/Oil	11,270 MW
Hydro	9,065 MW
Wind	4,486 MW
Biofuel	295 MW
Solar	478 MW

In 2014, Ontario completed the closure or conversion of all coal-fired power plants to natural gas, which resulted in several environmental and health benefits, including a significant reduction of GHG emissions.⁹ It also resulted in cleaner air. For example, in 2005, there were 53 smog days recorded in Toronto, but ten years later, in 2015 with comparable temperatures, there were none recorded.¹⁰

Natural gas

Natural gas is a non-renewable energy source that is used primarily to heat homes and domestic water. It is also a primary energy source for industrial steam and process heat. As noted above, about 29% of Ontario's electricity generation currently comes from natural gas.

Most of Ontario's natural gas comes from outside the province, mainly from western Canada, and has been delivered by interprovincial pipelines since 1958. Natural gas used for home heating and industrial processes is a major contributor to GHG emissions in the Greater Toronto Area (GTA).

Gasoline and diesel

Gasoline and diesel are nonrenewable sources of energy that are primarily used as engine fuel for various types of transportation vehicles. In Brampton, automobiles are used for over 80% of trips in the city, including commuting to work and to the grocery store.

Gasoline and diesel used in the transportation sectors are mostly sourced from crude oil, almost all of which come from outside Ontario, exported from western Canada, the Atlantic offshore, and the United States. Gasoline and diesel use in cars and trucks is a significant contributor to GHG emissions in Brampton and the GTA.

Brampton's Energy Milestones



1873

Brampton is incorporated as a town. Most homes are heated by local wood or coal imported from the United States. Streetlights were powered by natural gas. Transportation was mostly by foot, but richer residents might use a horse or bike.



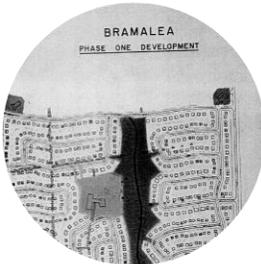
1886

Electricity arrives in Brampton when a 2,200 volt electrical line was built to connect downtown Brampton to the McMurphy woolen mill and generating station along the Credit River in Huttonville.



Early 1900s

Brampton sees its first district heating system to heat the ever-growing greenhouses in the town. By 1929, the district heating system had approximately 160 km of steam pipes, six furnaces, and used 18,000 tons of coal each year.



Early 1960s

Bramalea, one of Canada's first master planned communities, is developed. Marketed as a "new town", Bramalea was built with a mix of residential areas, commercial and industrial uses and green space, but most residents still had to primarily rely on their cars to commute to work.



1945

After World War II, urban sprawl begins in Brampton. New neighbourhoods are built to be car dependent and rely on large roads and highways. This was aided by the second energy transition that provided centralized energy systems and the wide availability of fossil fuels. Sprawl continues into the 21st century.



1912

Although electricity first came to Brampton in 1886, Brampton voted to become part of the Ontario Hydro-Electric Power Commission power grid. Can you spot Brampton on this old power grid map?



2019

Between 2015 and 2019, Brampton Transit ridership increases by 50% from 1.6 million to 2.4 million rides per month. Despite this, 80% of trips are taken by car.



2041

Brampton's population is projected to grow by 300,000 for a total of 900,000 by 2041. If the current suburban form is replicated to accommodate this growth, Brampton will face significant economic, social, and environmental issues.

2.1 The Latest Energy Transition

The latest energy transition is being driven by two main factors: decarbonization and localized distribution of energy. In some regions of the world, notably in Nordic countries, this energy transition has been going on since the 1970s. In other regions, such as North America, the transition commenced only in the last decade. According to the 2019 Global Trends in Renewable Energy Investment report, renewable energy capacity quadrupled across the planet over the last ten years.¹¹

To take advantage of this latest energy transition, Canadian communities are beginning to assert themselves in energy planning. By being proactive, these communities are trying to get ahead of the energy transition to reap the associated economic, social, and environmental benefits.

2.1.1 Decarbonized Energy System

The primary driver of the latest energy transition is the changing social values that are increasingly demanding more efforts to reduce global GHG emissions. In 2019, Brampton Council joined almost 1,468 jurisdictions in 28 countries in declaring a climate emergency and recognizing the need to dramatically reduce GHG emissions in the next 10 to 20 years to keep global warming below 1.5°C. To meet this goal, the energy transition needs to include a deep decarbonization of the energy system, which involves shifting away from the use of GHG-emitting fuels (e.g. gasoline, natural gas, coal) and towards the consumption of carbon neutral fuels (e.g. wind, solar, nuclear, hydro).

Global energy demand has doubled since 1980 as populations grow, nations develop, and fuels become more accessible and tradable. Global carbon emissions have increased by 52% in the past 25 years. Canada's emissions have increased by 33% over the same period.¹²

While Canada only generates 1.7% of global GHG emissions, the Organization for Economic Co-operation and Development (OECD) notes Canada's status as one of the most GHG emission-intensive economies in the world, and the fourth largest emitter of GHGs in the group of OECD nations. The Conference Board of Canada ranks Canada in last place compared to 17 peer countries for energy intensity, and assigns Canada a "D" grade for its energy intensity and GHG emissions.¹³

The Conference Board of Canada gives Ontario a grade of "B" with 12.6 tonnes of GHG emission per capita compared to the Canadian average of 20.7 tonnes of GHG emissions per capita. Since 2005, Ontario has reduced its GHG emissions by 22%, while the rest of Canada's emissions rose by 6%. Most of Ontario's GHG reductions can be attributed to the closing of coal plants.

However, being a leader in Canada does not mean that much, since Canada's energy use per Gross Domestic Product (GDP) is higher than the USA, European Union, and Japan. If Brampton wants to be a global leader in energy efficiency and reducing GHG emissions, it needs to adopt global best practices in energy production and efficiency. This will help the city realize significant competitive economic advantages, including competitive energy costs, energy reliability, and an increase in quality of life.

Carbon Dioxide Emissions per Capital¹⁴

Region	CO ₂ /Capita
USA	100
Canada	124
European Union	69
Japan	57
China	243
India	270
World	140

2.1.2 Distributed Energy Systems

The latest energy transition calls for more localized and renewable non-GHG energy sources. Distributed Energy Systems (DES) involve the local generation and operation of energy (e.g. solar panels on buildings, micro generators, heat waste power, district energy systems, etc.) often close or next to its point of use.

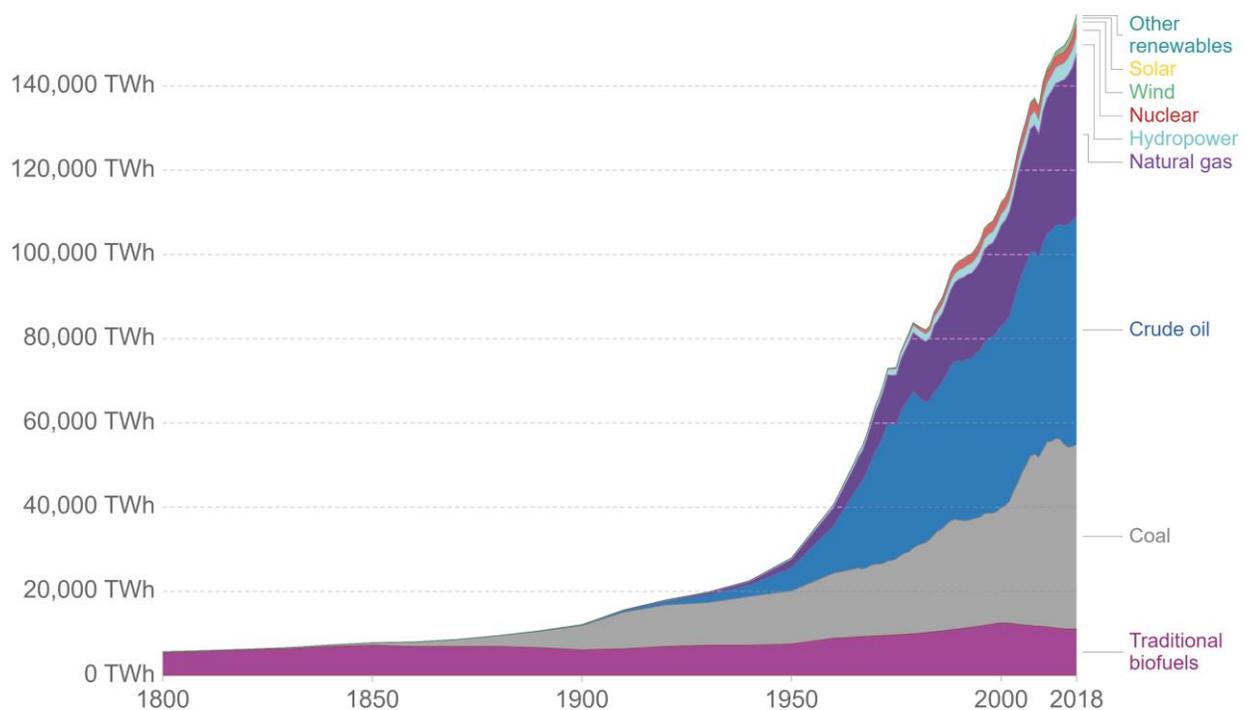
According to Ontario's Independent Electricity System Operation (IESO), "one of the most significant changes to electricity systems around the world has been the rapid expansion of distributed energy resources (DERs)".¹⁵ DERs can include solar panels, combined heat and power plants, electricity storage, small natural gas-fueled generators, electric vehicles, and controllable loads, such as HVAC systems and electric water heaters.

IESO defines DERs as electricity-producing resources or controllable loads that are connected to a local distribution system or connected to a host facility within the local distribution system. These resources are typically smaller in scale than the traditional generation facilities that serve most of Ontario's demand.¹⁶

While the rise of Distributed Energy Systems is being driven by climate change concerns, a confluence of other developments are making the transition more feasible, such as:

- a rise in cost-effective technologies for generating and distributing energy locally;
- the convergence of communication and energy technologies;
- systemic inefficiencies that have grown over time in our current centralized energy system; and
- growing concerns about energy security, which includes consumer issues of affordability, accessibility and reliability.

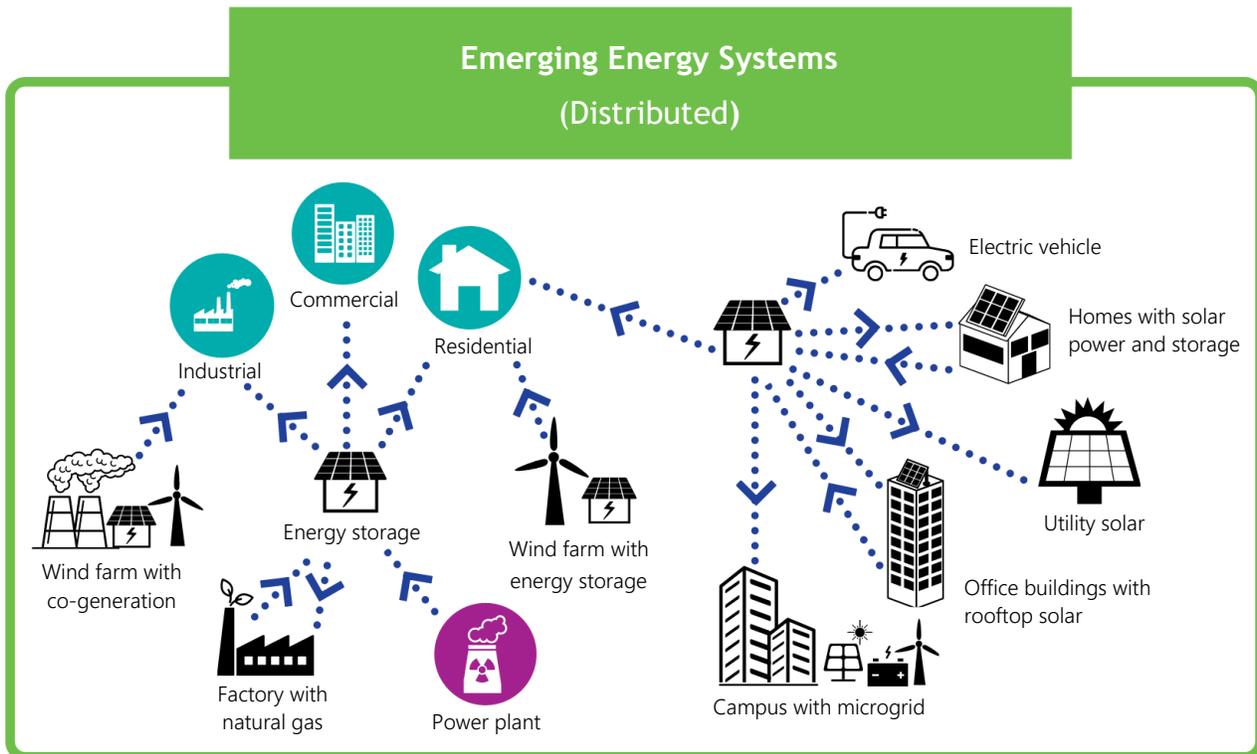
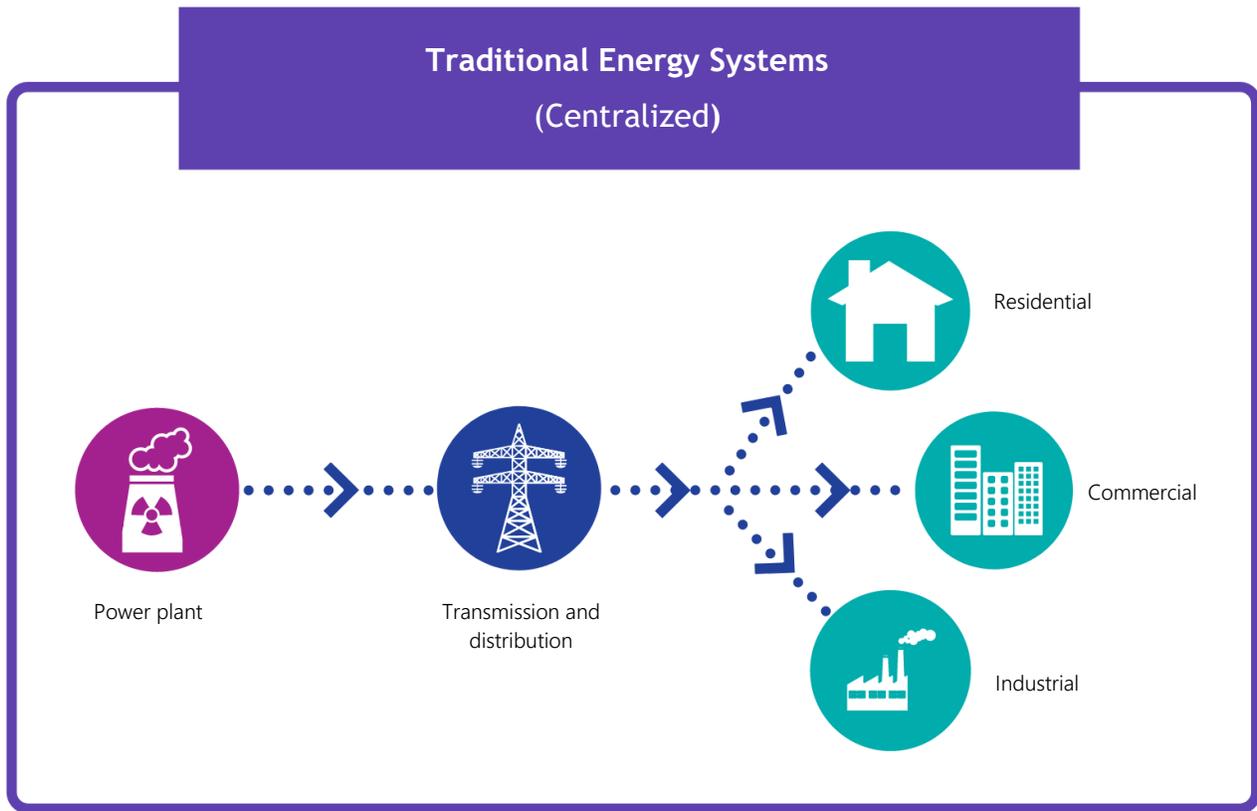
Growth in Global Primary Energy Consumption from 1800 to 2017 (Terawatt Hours per Year)¹⁷



Source: Vaclav Smil (2017) and BP Statistical Review of World Energy

CC BY

Traditional Versus Emerging Energy Systems



2.1.3 Community Energy Planning

In some regions of the world, this next energy transition has been going on for 50 years, as the oil crises of the 1970s revealed how vulnerable world economies were to fluctuations in global oil supply. In Canada, this transition is just starting. In the last decade, over 400 Canadian communities have developed community energy plans that establish local priorities for reducing energy use and energy-related emissions.

Copenhagen, Denmark is one region that is considered a global leader in community energy planning. In 1973, Copenhagen exclusively relied on fossil fuels to heat its homes and drive its cars. Overnight, in October 1973, when the Organization for Arab Petroleum Exporter Countries declared an oil embargo, Copenhagen residents faced a substantial increase in home heating and transportation costs.

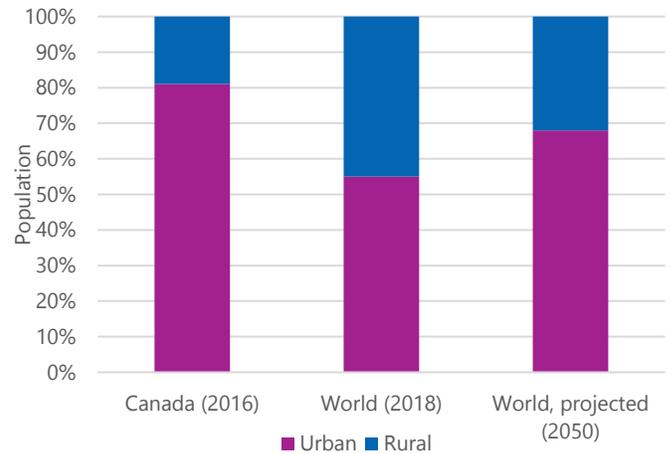
In response, Copenhagen focused its energy planning efforts on establishing a comprehensive district energy strategy and home insulation program. In addition, Copenhagen began to transform its transportation system, placing greater emphasis on sustainable modes of transportation like cycling and transit. Today, Copenhagen has set the goal of becoming the world's first carbon-neutral city by 2025.

Denmark and other Nordic countries are leaders in the latest energy transition, and are exporting their energy technologies and expertise around the world. In 2019, the City of Brampton hosted Nordic City Solutions to help inform the future development of Bramalea and Uptown Brampton urban centres. Nordic City Solutions is a public-private platform facilitated by the five Nordic governments of Denmark, Finland, Iceland, Norway, and Sweden.

The Nordic workshops, which looked at pursuing a path towards lower GHG emissions and a more energy conscious and resilient city, were part of a strategic partnership with the City of Brampton based on the Nordic strengths around sustainability and the Brampton 2040 Vision. Two key lessons for Brampton emerged from the workshops:

1. municipal governments have a key role in creating the conditions to accelerate the next energy transition; and
2. it is vitally important to engage businesses and citizens in planning, building, and operating the energy transition.

Proportion of Population Living in Urban Areas



2.2 Urbanization

Global urbanization is proceeding at an unprecedented rate. More than half of the world's population lives in urban centres. By 2050, it is expected to reach two thirds, and more urban areas and infrastructure will be built than currently exists.

Nationally, more than 8 out of 10 Canadians live in urban or suburban areas, and this ratio is expected to increase. By contrast, in 1851, nearly 9 out of 10 Canadians lived in rural areas. At that time, the Canadian economy was based more on the primary sector, led by agriculture and the exploitation of natural resources, such as wood or coal.¹⁸

Early Canadian communities were limited in size and wealth by their local energy resources. Typical communities relied on the surrounding forest for home heating and hydroelectric power from dammed rivers for industrial power.

To overcome these growth limits, communities began to search for alternatives, which usually meant importing external energy inputs. This search resulted in the first and second energy transitions described earlier. With a cheap infusion of imported coal, then centralized electricity and imported natural gas and gasoline, Canada experienced a dramatic increase in the size and shape of its communities.

In southern Ontario, hamlets, towns, and cities grew to become the sprawling modern Greater Toronto Area, with millions of citizens and jobs. The modern city is planned, designed, and constructed around a vast network of roads and highways to facilitate the movement of vehicles running on imported gasoline.

Eventually, all of this sprawling growth led to significant economic, social, and environmental impacts, including but not limited to congestion, intensive energy demands, loss of energy dollars, and a significant rise in GHG emissions.

2.2.1 Brampton's Urban History

Brampton was incorporated as a town in 1873. At the time, it mostly served as a service and retail area for the surrounding agricultural communities. Most homes were heated by local wood sources or coal imported from the United States. During this period, towns and cities were dirty places due to the burning of coal and wood to fuel local power plants and factories, and the use of wood stoves that buildings.

To escape Toronto's foul air, wealthy residents fled to the outskirts and established Toronto's first suburbs, such as the Annex and Yorkville. This flight from Toronto's core was facilitated by new electric streetcars and bicycles.

The area known as Brampton today contained a bustling downtown and a dozen or so small hamlets that served local agricultural communities. Water was sourced locally, either from the ground or from a nearby river. If the river was large enough, it was dammed to produce energy for the local industry.

Almost all jobs at this time were locally accessible by foot, horse, or bicycle. Transportation between towns and cities was slow and uncomfortable.

After the Second World War, there was a drastic change in Brampton's hamlets and towns. The personal automobile gave residents the ability to live and work in separate, distant places. Single-family homes on large "green" lots were constructed to accommodate the post-war baby boom.

As it became widely adopted, and as the costs and infrastructure improved, the personal automobile offered city dwellers the opportunity to move away from their local job and the associated city smog for new "greener" suburbs.

In the early 1960s, the development of Bramalea commenced, Canada's first satellite city and one of the earliest master-planned communities. It was planned as an innovative "new town", a self-sustaining community outside the city. It was a community planned, designed, and constructed around widespread automobile use.

The automobile focused model of development expanded across Brampton and the Greater Toronto Area and was aided by the second energy transition that provided a



Edenridge Dr. in Bramalea, 1969

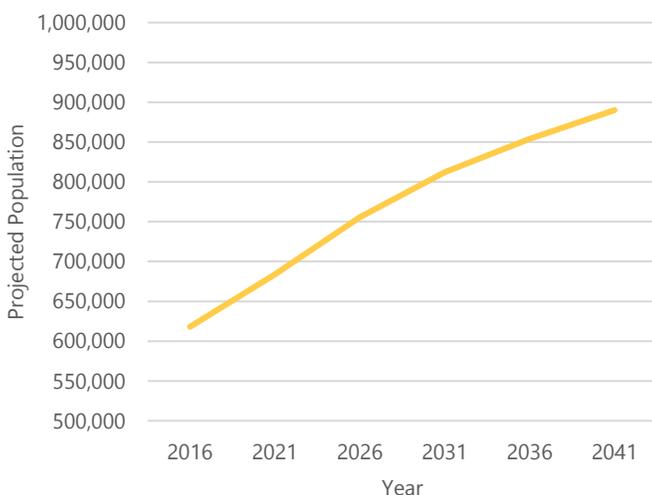
centralized electricity system and imported fossil fuels. The GTA transformed into a vast region containing sprawling communities connected by an immense network of roads with each city blending into each other.

Today, the GTA sprawls across 7000 km² and has a population of about 6 million. Within this vast region, Brampton is now 260 km² with a population of 600,000, and considered a modern suburban city characterized by the widespread use of the automobile, segregated land uses, low densities, and single-detached homes.

This postwar modern urban form is resulting in several economic, social, and environmental issues that threaten the future prosperity of this region and the globe. It is energy inefficient, costing each Brampton resident an average of \$3000 in gasoline, electricity, and heating costs, annually. It is also responsible for 60% of Brampton's GHG emissions. According to a 2009 study by the OECD, the annual economic cost of congestion in the GTA is \$3.3 billion. The financial impacts on the region ballooned by an additional \$7.8 billion when productivity and health care costs were considered.¹⁹

By 2041, Brampton's population is projected to grow by 300,000 for a total population of 900,000. If the current urban form is continued to accommodate this growth, Brampton will be faced with significantly more economic, social, and environmental issues.

Brampton Population Forecast, 2016-2041²⁰



Brampton 2040 Vision: Living the Mosaic

In 2017, Brampton's Council directed staff to look at the city in a more holistic approach to envision a future Brampton in 2040 and beyond. The City sought the expertise of Larry Beasley, a world renowned planner and global urban visionary, to develop a Vision for what Brampton will become in the next 20 years.

Developing the Brampton 2040 Vision involved the City's largest engagement campaign to date, which included over 90 engagement events such as an interactive website, targeted workshops/focus groups, participation at community events, a children's drawing contest, and two intensive public workshops.

Feedback from the community was foundational for transforming ideas into a vision. The Brampton 2040 Vision is a conceptual document that reflects the principles of the community and the objectives of what Brampton needs to achieve in order to become an innovative and forward thinking suburb.

Unanimously approved in 2018, the "Brampton 2040 Vision: Living the Mosaic" consolidates the aspirations of more than 13,000 members of the community who devoted their days, nights and weekends to participate in envisioning a future Brampton. This is a vision for the people, by the people.



Brampton 2040 Vision: Vision Statements



Notes

¹ Archival images sourced from the Peel Art Gallery, Museum & Archives, and the Toronto Public Library.

² Content for the section on Energy Transitions is largely drawn from the curriculum of the Energy Conscious Community: A Professional Development Course for Planners.

³ Source: Miller, A.M and Davidson-Hunt, I. (2010). Fire, Agency and Scale in the Creation of Aboriginal Cultural Landscapes. *Human Ecology* 38:401-414. https://www.lakeheadu.ca/sites/default/files/uploads/53/outlines/2014-15/NECU5311/MillerDavidsonHunt_2010_HE_FireAgencyScale.pdf

⁴ Source: Sayles, J. S., and Mulrennan M. E. (2010). Securing a future: Cree hunters' resistance and flexibility to environmental changes, Wemindji, James Bay. *Ecology and Society* 15(4): 22. <https://www.ecologyandsociety.org/vol15/iss4/art22/>

⁵ Source: O'Hara, D. (2007). *Acres of Glass: the Story of the Dale Estate and How Brampton Become "The Flower Town of Canada"*. Toronto: Eastendbooks.

⁶ Source: The Conference Board of Canada. (2019). *Powering Down Emissions: Case Studies of Electricity Generation in Three Provinces Report*. <https://www.conferenceboard.ca/e-library/abstract.aspx?did=10308>

⁷ Source: IESO. (2016). *Year-end Data, 2016*. ieso. <http://www.ieso.ca/en/Corporate-IESO/Media/Year-End-Data/2016>

⁸ Source: IESO. (n.d.). "Ontario's Supply Mix". ieso. Retrieved April, 2020 from <http://www.ieso.ca/en/Learn/Ontario-Supply-Mix/Ontario-Energy-Capacity>

⁹ Source: CAPE. (2017). "Ontario's Coal Plant Phase-out Produced Many Health and Environmental Benefits". CAPE. <https://cape.ca/ontarios-coal-plant-phase-out-produced-many-health-and-environmental-benefits/>

¹⁰ Source: CBC News. (June 8th, 2017). "Smog study shows 'significant decreases' in pollutants in Ontario". CBC. Retrieved from: <https://www.cbc.ca/news/canada/windsor/smog-study-shows-significant-decreases-in-pollutants-in-ontario-1.4151183>

¹¹ Source: Frankfurt School – UNEP Collaborating Centre for Climate & Sustainable Energy Finance. (2019). *Global Trends in Renewable Energy Investment 2019*. https://www.fs-unep-centre.org/wp-content/uploads/2019/11/GTR_2019.pdf

¹² Source: National Energy Board. (2019). *Historical and Future Changes to Energy Systems update*. Federal Government of Canada. <https://www.cer-rec.gc.ca/nrg/ntgrtd/mrkt/cndsnrgtrnstn/cndsnrgtrnstn-eng.pdf>

¹³ Source: National Energy Board. (2019). *Historical and Future Changes to Energy Systems update*. Federal Government of Canada. <https://www.cer-rec.gc.ca/nrg/ntgrtd/mrkt/cndsnrgtrnstn/cndsnrgtrnstn-eng.pdf>

¹⁴ Derived from International Energy Agency 2017 data.

¹⁵ Source: IESO. (n.d.). "Distributed Energy Resources". ieso. Retrieved September, 2019 from <http://www.ieso.ca/en/Learn/Ontario-Power-System/A-Smarter-Grid/Distributed-Energy-Resources>

¹⁶ Source: IESO. (n.d.). "Distributed Energy Resources". ieso. Retrieved September, 2019 from <http://www.ieso.ca/en/Learn/Ontario-Power-System/A-Smarter-Grid/Distributed-Energy-Resources>

¹⁷ Source: Ritchie, H. and Roser, M. (2020). "Energy". Our World In Data. <https://ourworldindata.org/energy>

¹⁸ Source: Statistics Canada. (2015). "Canada's rural population since 1851". https://www12.statcan.gc.ca/census-recensement/2011/as-sa/98-310-x/98-310-x2011003_2-eng.cfm

¹⁹ Source: Wood, T. (2016) "The Real Cost of Congestion in Toronto." Torontoist. <https://torontoist.com/2016/09/the-real-cost-of-congestion-in-toronto/>

²⁰ Source: City of Brampton. (2018). *Population Growth*. City Dashboard. Retrieved on April, 2020 from <https://geohub.brampton.ca/pages/urban-form-population>

CHAPTER 3

The Opportunity of a Century

Benefits and Opportunities of Energy and Emissions Planning

KEY TAKEAWAYS

- The energy transition offers untapped opportunities and the CEERP lays out a path to realize the benefits of this latest energy transformation.
- The CEERP is a comprehensive plan to drive innovation, employment, and economic development, and simultaneously support environmental and social goals.
- Its implementation will keep more energy dollars within the community and increase local jobs by spurring local energy investments and improving local energy efficiency.
- It will also result in multiple health benefits and quality of life enhancements for local residents, such as improved local air quality, more active lifestyle choices, more socially connected community, and reduction in health-related issues from climate change (e.g. heat waves, vector borne diseases).
- The CEERP advances social equity in Brampton through social benefits such as more affordable living, housing choices, accessible transportation options, accessibility to services, and comfortable homes and buildings.
- The CEERP will provide direct local environmental benefits in both the short and long term, such as cleaner air and water, greener streets, lower GHG emissions, and the reduction in severity of impacts from climate change.
- Realizing these community benefits requires combined efforts of the City, federal, provincial, and regional governments, institutions, local utilities, businesses, developers, community stakeholders, and residents.
- The CEERP is the collaborative effort of the City of Brampton, Sheridan College, and the Community Task Force, with funding support from the Province of Ontario.
- A full glossary of terms is available at the beginning of this report. Some of the key terms used in this chapter include: Latest Energy Transition.



3.0 Building a Community Energy and Emissions Reduction Plan

Through the approval of the Brampton Grow Green Environmental Master Plan, and more recently the 2018 - 2022 Term of Council priorities, Brampton Council directed staff to develop a Community Energy and Emissions Reduction Plan. The CEERP aims to improve energy efficiency, reduce GHG emissions, ensure energy security, create economic advantage, and increase the city's resilience to climate change.

This is the City's first comprehensive plan to address these issues. It integrates efforts of the municipality, local utilities, and community stakeholders to set out and implement priority projects from 2020-2025.

3.1 What is the Community Energy and Emissions Reduction Plan?

The CEERP is a comprehensive plan to drive innovation, employment, and economic development, while at the same time achieve environmental and social goals.

3.1.1 Energy Related Emissions

Community energy planning places emphasis on reducing energy related emissions. Energy related emissions arise

from the heating and cooling of our homes and buildings, the powering of industries, and the movement of people and goods. Community energy planning may also consider measures that address non-energy related sources of emissions, like local opportunities for waste-to-energy or methane-to-energy.¹

3.1.2 Energy Costs

Community energy planning also identifies opportunities to keep energy dollars local by promoting energy conservation and efficiency as well as opportunities for local energy supply and distribution. In the long term, community energy plans can also reduce energy costs for residents.

3.2 Seizing Opportunity

The modern energy transition promoted in the CEERP is a source of untapped opportunities and a vital step in our energy evolution. The CEERP allows us to fully capitalize on the multiple potential benefits available through this transition such as economic, health and wellness, social equity, and environmental improvements.

3.2.1 Economic Benefits

Each new energy transition comes with significant potential to generate economic opportunities. Currently, the

community of Brampton spends over \$1.8 billion annually on energy. Of those energy dollars, \$1.4 billion leaves the community. This implies significant unrealized economic potential that the community can tap into. The CEERP can keep more energy dollars within the community by spurring local energy investments and improving local energy efficiency.

The CEERP helps identify where and how local energy investments can provide the greatest opportunity for Brampton’s local economy such as investing in the local generation and distribution of energy, manufacturing of energy technologies and infrastructure, and retrofitting of buildings.

In turn, new jobs and skills will be needed to support the businesses and organizations driving the implementation of the CEERP, such as knowledge and skills in home retrofits and infrastructure development to facilitate distributed energy systems. From post-secondary institutions (education for skills) to manufacturing (energy/construction technology and materials) to construction (installing retrofits), retrofitting buildings for energy efficiency can stimulate local economy and job growth.

Thirty percent of the energy users pay for is lost before it reaches end use. By increasing energy efficiency in our energy systems and at user end, it will help reduce energy waste and lead to lower energy costs.



The more energy-related goods and services are provided by our community, the more energy dollars and benefits re-circulate within the Brampton's economies and industries, creating a ripple effect of benefits throughout the whole community.

In addition to helping keep dollars within the community, more local jobs and new sources of income can be realized. As local industries establish themselves within Brampton, expertise, materials, and technologies will need to be sourced. By situating Brampton as a leader in this energy transition, we will increase the benefits of establishing these markets by creating a competitive edge. Additionally, building a more energy-efficient and cleaner city would provide advantages that would motivate businesses to locate to Brampton.

3.2.2 Health and Quality of Life

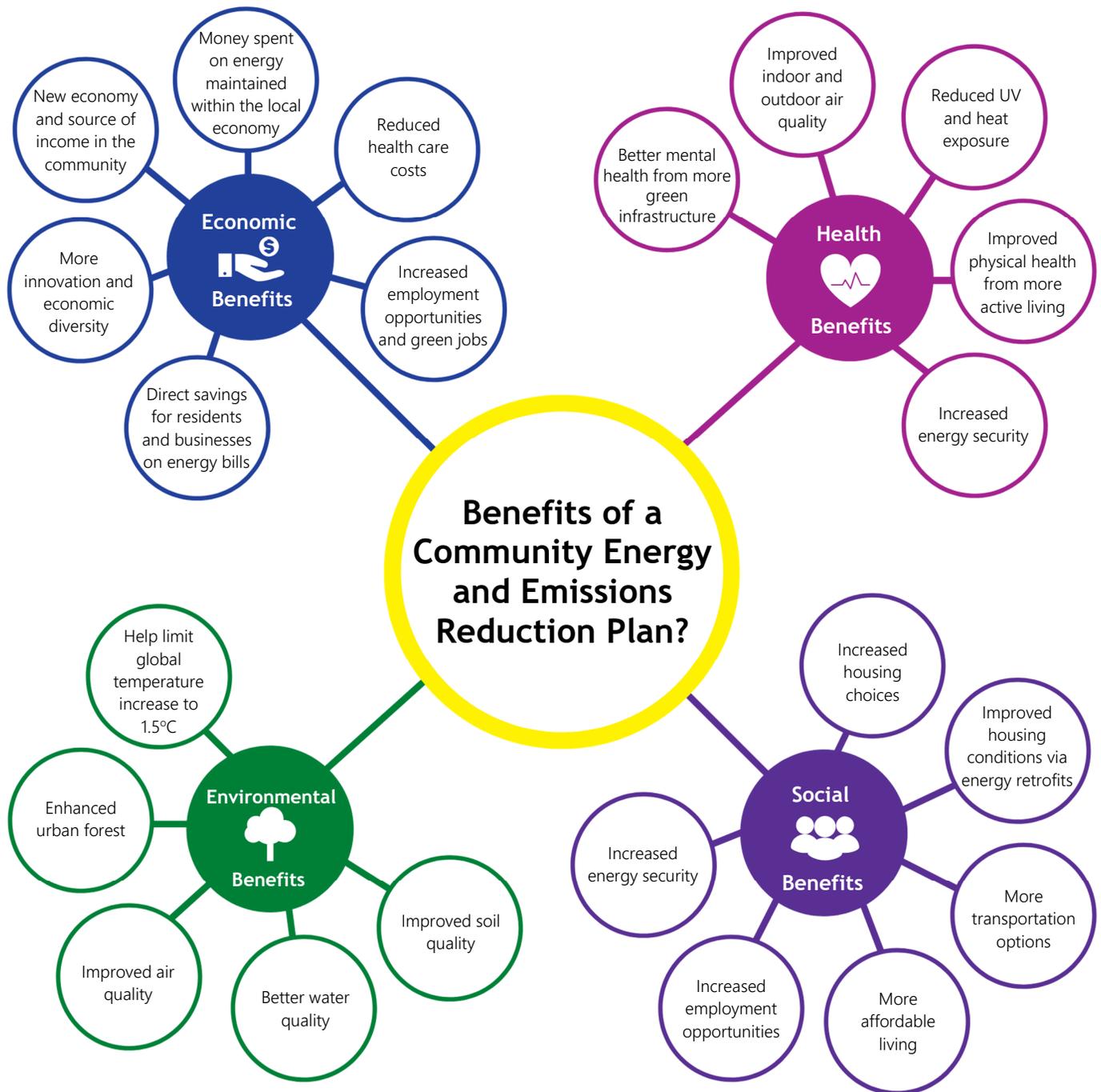
Energy use reduction and efficiency coupled with lower emissions result in a range of health benefits and overall quality of life improvements for local residents. Less GHG emissions can improve local air quality. Communities planned with energy efficiency in mind result in neighbourhoods that promote active living and foster social cohesion, which contribute to physical and mental health. Furthermore, retrofitting buildings for energy efficiency can drastically improve indoor air quality and thermal comfort for occupants. The integration of green infrastructure provides additional health benefits by reducing the impacts of climate events, such as heatwaves.

3.2.3 Social Equity

Social equity and climate equity are increasingly becoming integrated, especially in plans like the CEERP addressing both energy and GHGs. This integration speaks to the principle of promoting solutions that give equal opportunity for everyone to benefit from investments in climate change mitigation/adaptation and energy system transformation, while ensuring marginalized or vulnerable populations do not bare an unequal burden.

Ensuring that all Brampton residents have equal access to the benefits of community energy planning is a critical component of the success and lasting benefits of the CEERP. Social equity is instrumental to long term prosperity within communities.





“Canadian communities have untapped opportunities to strengthen local economics, reduce current and future energy costs and GHG emissions, and create jobs by investing in smarter and more integrated approaches to energy use at the local level.”

- QUEST (Canadian smart energy NGO)

3.2.4 Environmental Benefits

The next energy transition has the potential for significant environmental gains. Though a key goal of the CEERP is to contribute toward global efforts to limit temperature rise to 1.5°C, this also brings many long and short term local environmental gains such as cleaner air, green streets, and cleaner water. These benefits are generally a result of reduced emissions and the increase in green infrastructure within the community resulting from CEERP actions.

3.2.5 Community Transformation

With the initiation of its first Community Energy and Emissions Reduction Plan, Brampton is following in the path of world energy leaders endeavoring to reap the environmental, social, health, and economic benefits of the next energy transition. This is done by ensuring reliable, cost-competitive energy services for residents and businesses.

To be a leader in this energy transition of deep decarbonization and distributed energy, Brampton will need to initiate a transformation that involves well-designed communities, including;

- more investment in sustainable transportation options;
- a shift away from natural gas as a primary source of home heating;
- more efficient homes;
- more use of cleaner and electric vehicles;
- more walkable and mixed-use communities;
- more housing choices, such as low and mid-rise options;
- more local jobs; and
- more trees.

3.3 Working Together

Achieving these community benefits requires combined efforts of the municipality, federal, provincial, and regional governments, institutions, local utilities, businesses, developers, community stakeholders, and residents.

Collaboration and shared efforts were the main ingredients that launched the development of the CEERP. The Plan was initiated when the City of Brampton and Sheridan College came together with a common purpose. They organized a Community Task Force representing community stakeholders to provide governance and oversight of the

planning process. This Task Force consists of 28 individuals from 20 different stakeholders representing a diverse range of sectors who have come together to help create and champion the CEERP.

The City secured funding from the Government of Ontario to support the planning of the CEERP. Both the City of Brampton and Sheridan College contributed funding towards the completion of the CEERP and assigned staff to a Project Working Team to support the Community Task Force.

The successful implementation of the CEERP will require the combined efforts of all community sectors. Section 5.8 in Chapter 5 further defines the roles each community sector will need to play. Additionally, the Action Plan in Section 5.7 identifies the leads for each action of the CEERP.

The establishment of the Task Force and building more partnerships was the first milestone in this journey together. The creation of a Community Organization will be the next.

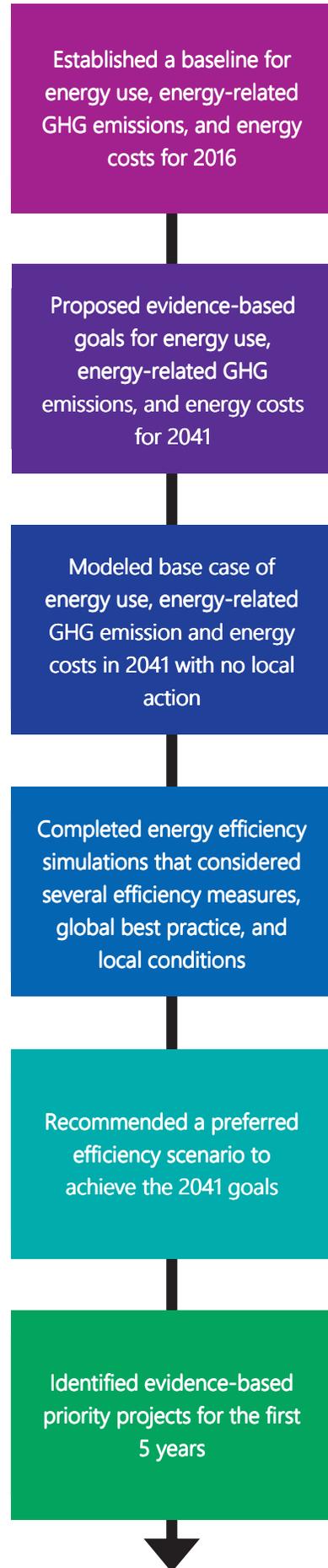
Global Covenant of Mayors

In 2019, the City joined the Global Covenant of Mayors (GCoM) for Climate and Energy, which is a first of its kind and largest global alliance of cities leading the fight against climate change with over 9000 municipalities participating worldwide. The GCoM supports ambitious, locally relevant solutions. Collaboration across multiple levels of government results in increased sharing of city-level data and fosters momentum for investment in low carbon municipal operations and infrastructure. As part of GCoM, Brampton was selected to participate in the Showcase Cities, which provides the City with technical support and access to networking opportunities.

The GCoM framework includes three levels: "Commitment", "Mitigation" (Inventory, Target, Plan), and "Adaptation" (Assessment, Goal, Plan). The CEERP will allow Brampton to achieve the "Mitigation" level.

3.4 The CEERP Planning Process

To achieve the benefits and opportunities offered through community energy planning, the CEERP planning process employed six key steps summarized to the right.



Notes

¹Non-energy related measures can include anaerobic composting, landfill gas capture, and methane capture at wastewater treatment facilities.

CHAPTER 4

Brampton Today

Living the Mosaic

KEY TAKEAWAYS

- The CEERP planning process began with understanding where Brampton was starting from in 2016 (Baseline) and where it would be in 2041 if no coordinated action is taken (Base Case; business as usual).
- Transportation is currently Brampton's biggest GHG emitter, energy user, and community cost, followed by the residential, industrial, commercial, and institutional sectors, respectively.
- The community of Brampton spent \$1.8 billion on energy and water in 2016, and at least \$1.4 billion of those energy dollars left the community in payment for energy services to companies located outside of the city.
- Thirty percent of energy paid for by Brampton users is lost during energy conversion and transmission.
- Brampton's population and the workforce are expected to increase by 51% and 73%, respectively, by 2041.
- If we continue with business as usual, by 2041 Brampton's emissions will increase by 13% and remain twice that of global best practice, energy use will increase by almost 30%, and energy costs will increase by over 200%.
- A full glossary of terms is available at the beginning of this report. Some of the key terms used in this chapter include: Latest Energy Transition, and Deep Decarbonization.



4.0 How Brampton Uses Energy

Brampton's largest users of energy are transportation and residential buildings, with the transportation sector representing 35% and the residential sector representing 26% of source energy use. In Brampton, 65% of dwellings are considered low density, and the remainder medium density.

In Brampton, 80% of trips are done using single occupant vehicles, and according to the 2016 Census data, over 50% of Brampton's employed labor force commute more than 30 minutes to work. This is a result of Brampton's low activity rate and its built form being dominated by low density and separated uses. Together, these issues cause more residents to commute to jobs outside Brampton and drive for daily errands, which increases traffic congestion and the city's GHG emissions.

Brampton's activity rate, or the ratio of residents to jobs within the city, is 34%. That is, there are only enough jobs in Brampton to employ 34% of its residents. This is a low activity when compared to neighbouring municipalities (Mississauga - 60%, Vaughan - 50%, and Caledon - 50%).

Furthermore, compared to older city forms, where walking was the primary mode of transportation, Brampton occupies a vast area. For example, Copenhagen, which has the same population as Brampton, takes up only 30% of the land area (88 km²) of Brampton's 266 km².

4.01 Residential

People need buildings to live, learn, work, and play in, and these buildings use energy. Houses and buildings account for 44% of Brampton's energy use and 28% of its GHG emissions.

According to Statistics Canada, the majority of people in Brampton live in single-detached homes. Just over 51% of private dwellings in Brampton are single detached homes, while 21.9% are apartments, 13.7% are semi-detached and 12.3% are row houses.

As such, increasing residential energy efficiency is critical to achieving CEERP goals and addressing the climate emergency. While new construction methods result in better energy efficiency than previous methods, the majority (52%) of Brampton's neighbourhoods were

ENERGY, EMISSIONS, AND BRAMPTON



9th

LARGEST CITY IN CANADA

2nd

FASTEST GROWING CITY IN CANADA

650,000

RESIDENTS

~14,000

NEW RESIDENTS EACH YEAR

HOUSING STOCK



65% LOW DENSITY

52% SINGLE DETACHED
13% SEMI DETACHED



35% HIGH DENSITY

22% APARTMENTS
13% ROW HOUSES

ACTIVITY RATE

34%

THAT MEANS THERE ARE ONLY ENOUGH JOBS IN BRAMPTON FOR 34% OF ITS POPULATION

METHOD OF TRANSPORTATION



65%

PRIVATE AUTOMOBILE



8%

PUBLIC TRANSIT



18%

CARPPOOLING

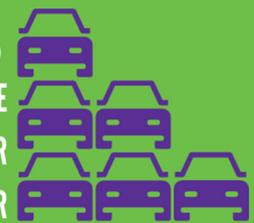


2.5%

WALKING AND CYCLING

54.6%

OF PEOPLE IN BRAMPTON HAVE A COMMUTE OF HALF AN HOUR OR LONGER



HOW DOES ALL OF THIS EFFECT BRAMPTON'S GREENHOUSE GAS EMISSIONS AND ENERGY USE?



OUR COMMUNITY SPENDS **\$1.8 BILLION** ON ENERGY EACH YEAR

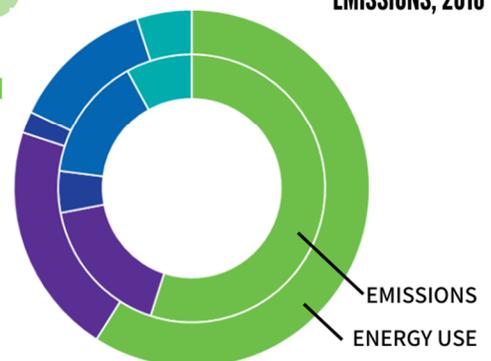
\$1.4 BILLION OF THOSE ENERGY DOLLARS LEAVE THE COMMUNITY

27%

OF THE ENERGY WE BUY DOES NOT REACH US DUE TO SYSTEM LOSSES



BRAMPTON'S ENERGY USE AND EMISSIONS, 2016

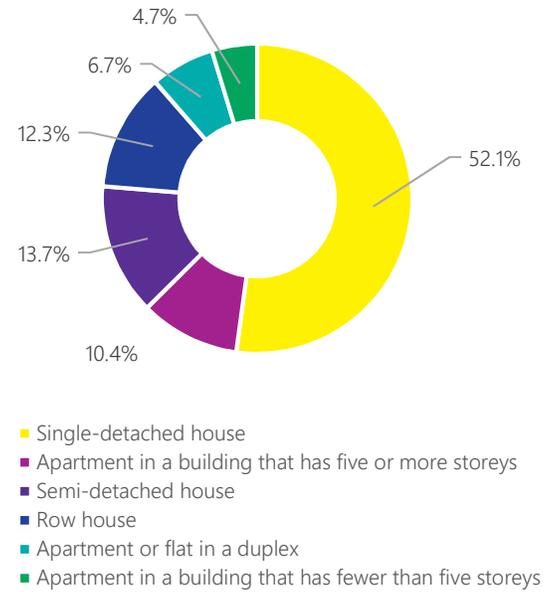


registered prior to 1989. Older homes use more energy and produce more emissions than newer homes, as older Ontario Building Codes did not consider energy efficiency. At the most basic level, these homes are likely lacking proper insulation and/or experiencing air leakage around windows and doors.

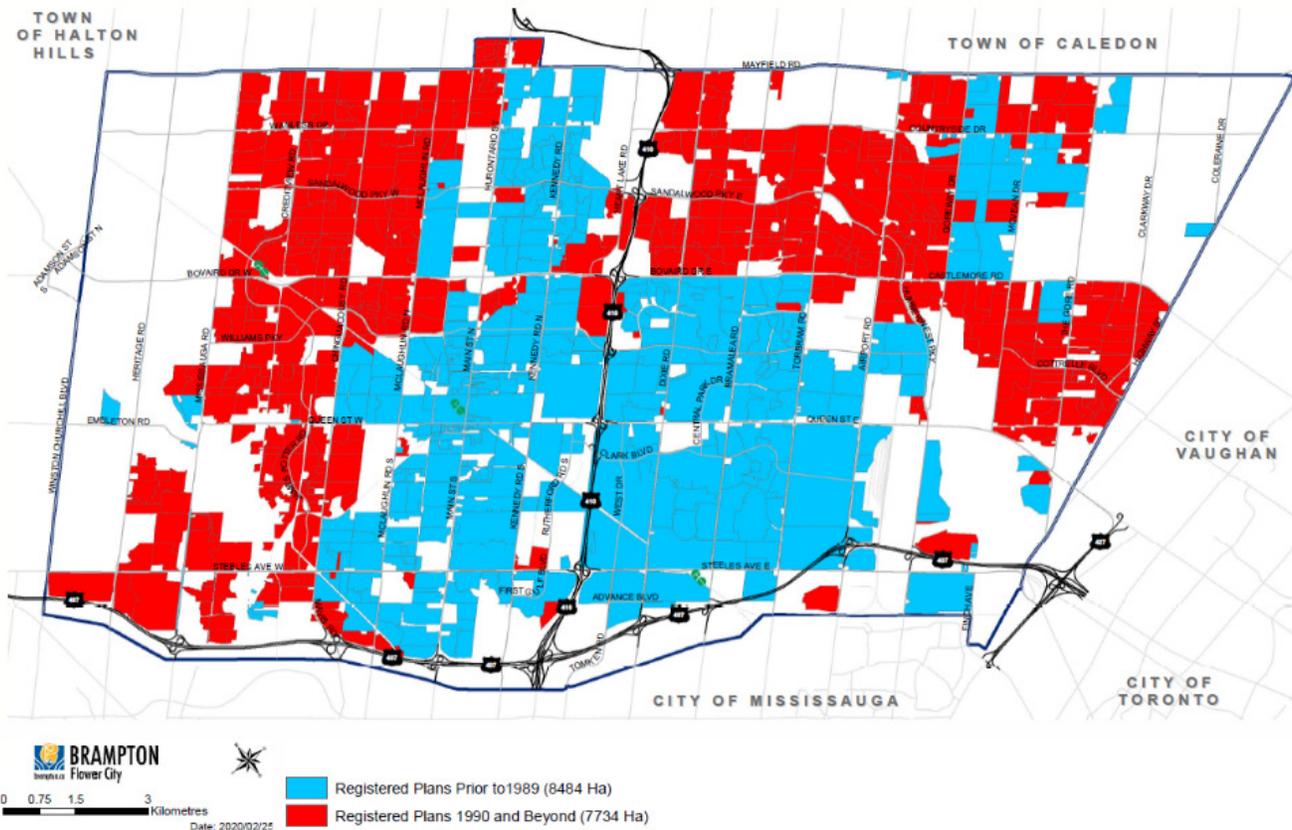
4.0.2 Transportation

Brampton is largely car-dependent and transportation accounts for almost 60% of community-wide GHG emissions and 50% of the total dollars spent on energy. For the most part, Brampton’s growth has occurred as a typical automobile-oriented suburban form, characterized by separated land uses, low-density residential communities, large format retail, abundant parking, and a transportation network made up of wide arterial roads. This urban form that separates land uses does not encourage walking and cycling, making access to employment and commercial areas by active modes challenging.

Dwelling Types in Brampton, 2016



Registered Plans of Subdivision in Brampton



This urban form is, in part, a result of Brampton’s main employment types. Approximately one in every four jobs in Brampton is in either part of the goods movement, warehousing, or the manufacturing sectors. These industries require large plots of land across vast spaces and a road network that can accommodate trucking.

In addition to these challenges, Brampton has other physical features, including two 400-series highways, two rail corridors, and a number of watercourses and utility corridors. These features can act as major barriers for active transportation users unless specific connectivity along and across them can be accommodated.

4.1 Brampton’s Energy Use: Baseline and Base Case

In order to understand where we can be more energy efficient and cut emissions, we need to know how much energy we are using and where we are using it. The following section provides the details of Brampton’s energy use, including:

- where Brampton was starting from in 2016 (Baseline); and
- where Brampton would be in 2041¹ without any coordinated climate change mitigation or energy efficiency actions (i.e. business as usual, Base Case).

The following is a summary of the main findings for Brampton’s:

1. energy use,
2. water use,
3. energy-related emissions, and
4. energy and water costs.

4.1.1 Energy Use

In 2016, Brampton’s total source and site energy use were 92 million gigajoules and 67 million gigajoules, respectively. Site energy use in Brampton was 109 gigajoules per capita. The transportation sector represented 35% of source energy use, the residential sector represented 26%, and the industrial, commercial, and institutional sectors combined represented 39%.

System losses accounted for approximately 30% of source energy use. System losses occur when one form of energy is converted to another (e.g. natural gas used to generate electricity) or when energy is moved from one location to another (transmission). This highlights the importance of considering efficiency solutions that will also address system losses.

By 2041, Brampton’s population and workforce are expected to increase by 51% and 73%, respectively, which is estimated to increase source energy use by 28% and site energy use by 26%, during this time.

How Much is a Gigajoule?

1 Gigajoule (GJ) = 1,000,000,000 Joules (J)

That’s enough energy to....

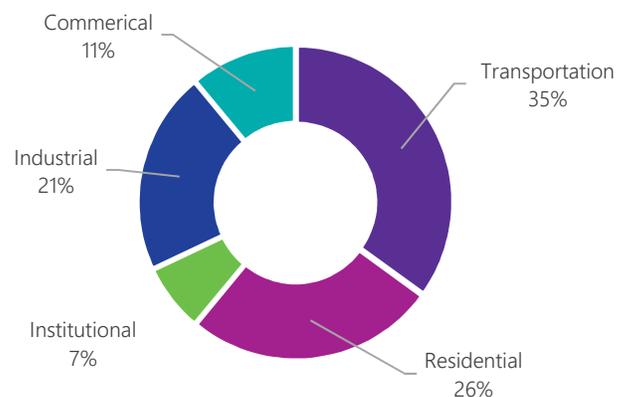
Make 1000 pots of coffee
(that’s 4286 medium cups
of coffee)



Keep a 60-watt light bulb
running continuously for six
months



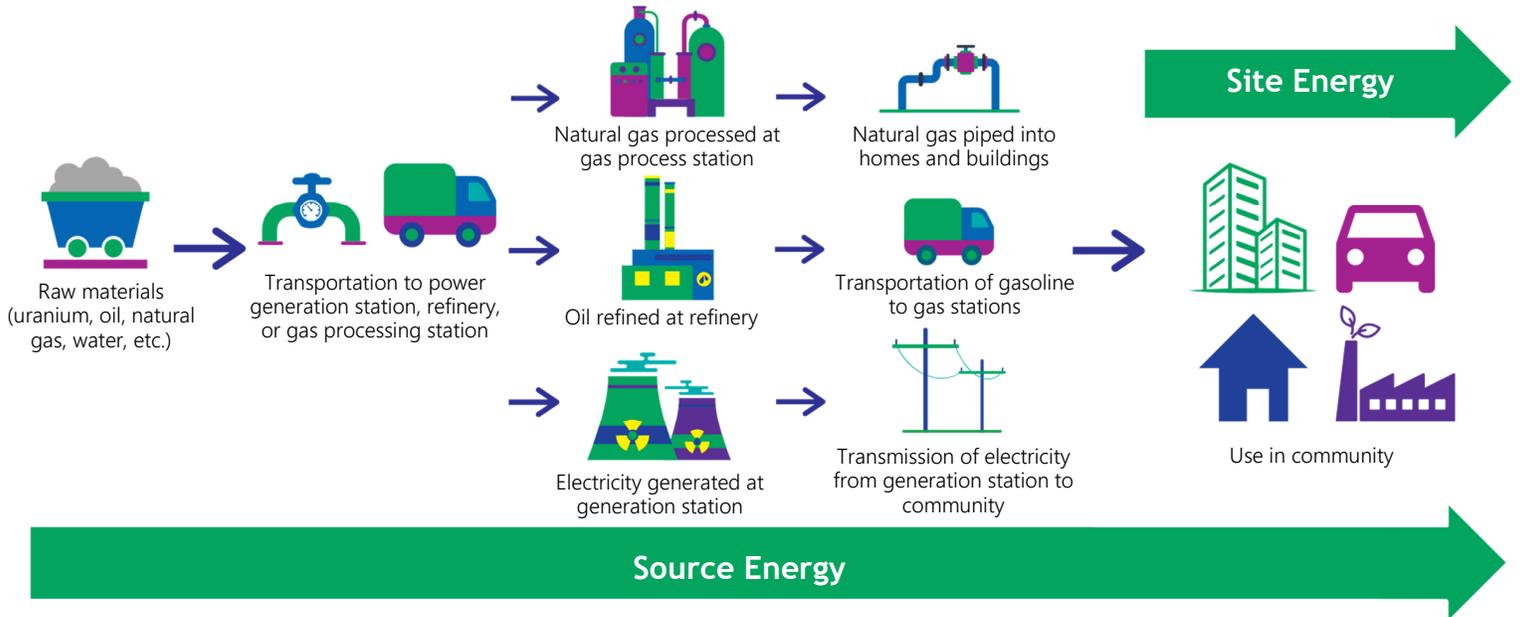
Brampton Source Energy Use by Sector, 2016



What is the Difference between Source and Site Energy and Why Does it Matter?

Site energy refers to the energy purchased by consumers at the utility meter or gas pump. Source energy not only considers the energy purchased at the utility meter or gas pump but all the energy required in production and distribution to consumers.

As consumers, we tend to think that the emissions and costs associated with the energy we consume is limited to what we purchase at the utility meter or gas pump. However, there are considerable upstream emissions and costs associated with our sources of energy, and community energy planning can identify local opportunities to reduce them. Therefore, it is important to consider source energy demand when making energy planning decisions that focus on reducing GHG emissions.

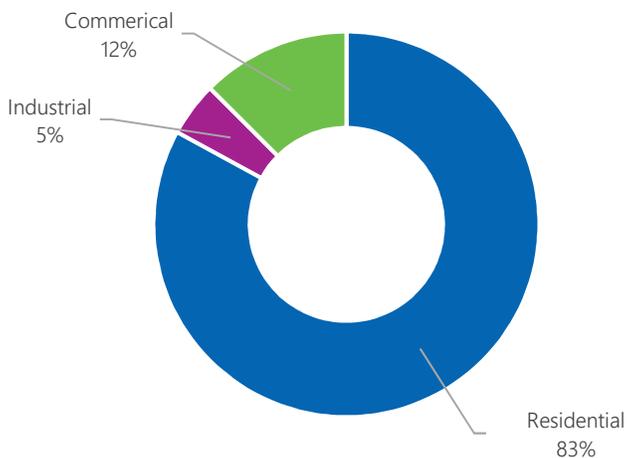


4.1.3. Brampton's Water Use

The residential sector accounts for almost three quarters (73%) of the water consumption in Brampton. The industrial sector represents 4%, and the commercial sector 23% of water use in the community. In 2041, water consumption will increase based on anticipated population and employment growth. The Base Case assumes water use in existing homes and buildings is constant, while new homes and buildings are projected to be 20% more efficient with current and future enhancements to the Ontario Building Code.

The relationship between water and energy production is extremely close and co-dependent. It takes a massive amount of water to generate energy, and it takes a huge quantity of energy to process water so that it can be utilized by humans for drinking and other purposes.² Therefore, it is important that water and energy policies are not developed in isolation from each other.

**Water Use in Brampton by Sector,
2016**



“Without enough water, you can’t have power; without enough power, you can’t have water.”

- Sunpower (solar energy company and innovator)



4.2 Brampton's Energy-Related Emissions

4.2.1 Brampton Emissions by Sector

In 2016, Brampton's GHG emissions were 3.5 million tonnes, or 5.6 tonnes for every Brampton resident. Transportation accounted for almost 60% of emissions, while the residential sector accounted for 21%. The industrial, commercial, and institutional sectors accounted for the remaining 19% of the emissions.

4.2.2 Brampton Emissions by Utility Type

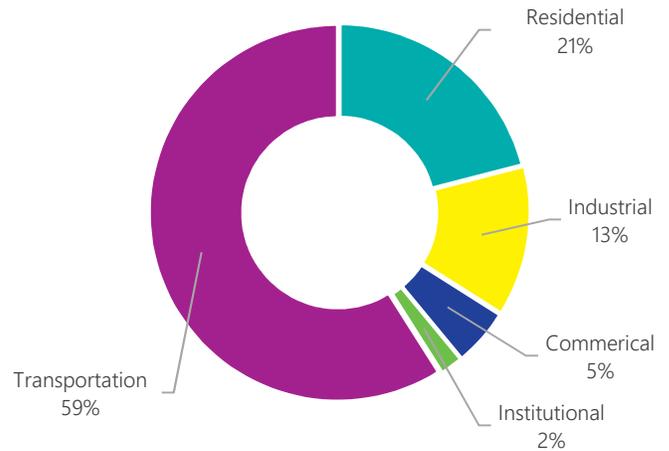
In 2016, the use of natural gas contributed 38% of Brampton's GHG emissions, while the use of gasoline and diesel contributed 59%. Only 3% of emissions arise from the community's use of electricity.

This data underscores the need to build compact communities that will support transit and active transportation, as well as the need to address heating, which is the primary use of natural gas in buildings.

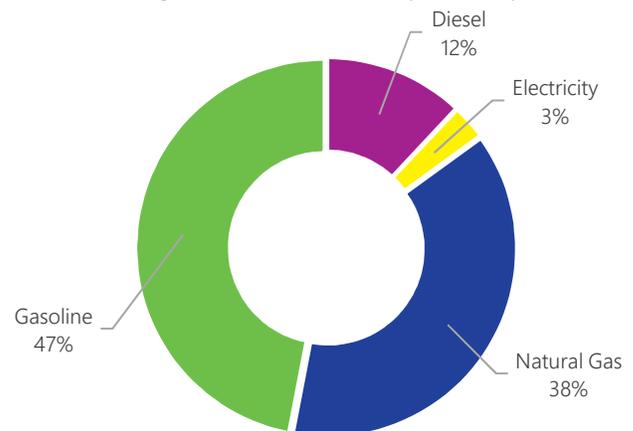
Despite population and employment growth, increases in GHG emissions are expected to be relatively moderate, at approximately a 13% increase by 2041. This is reflected in the Brampton Base Case scenario that projects improvements in average vehicle efficiency, more efficient new construction, and reduction in the carbon intensity of the natural gas grid.³ However, Brampton's Base Case emissions remain approximately twice the global best practice and ten times the Government of Canada's target for 2050 based on the Paris Climate Agreement.

The effects of a warming climate will also impact the energy use and energy reliability profile of the community. Obvious examples include increased demand for air conditioning and less demand for space heating, with collateral impacts on energy supply and distribution demands. These are not factored into the Base Case outlook.

Brampton Emissions by Sector, 2016



Brampton Emissions by Utility, 2016



4.3 Brampton's Energy and Water Costs

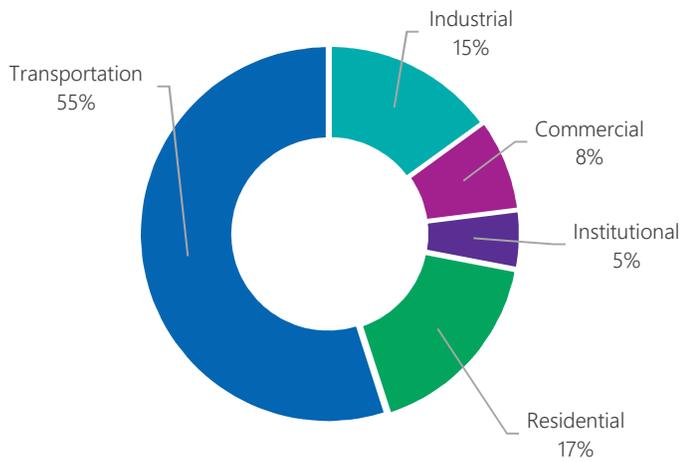
The community of Brampton spent \$1.8 billion on energy and water in 2016. At least \$1.4 billion of those energy dollars left the community in payment for energy services located in other jurisdictions.

4.3.1 Brampton Energy and Water Costs by Sector

In 2016, gasoline and diesel (transportation fuel) accounted for 55% of energy costs, while electricity accounted for 31%. Natural gas use only represented 13% of total energy costs, which presents a key obstacle to meaningful action on reducing GHG emissions associated with residential heating.

Approximately 30% of the energy that the community of Brampton pays for does not reach the end-user. This energy is primarily lost as heat when one form of energy is converted to another and through transmission and distribution. Electricity accounts for most of this loss.

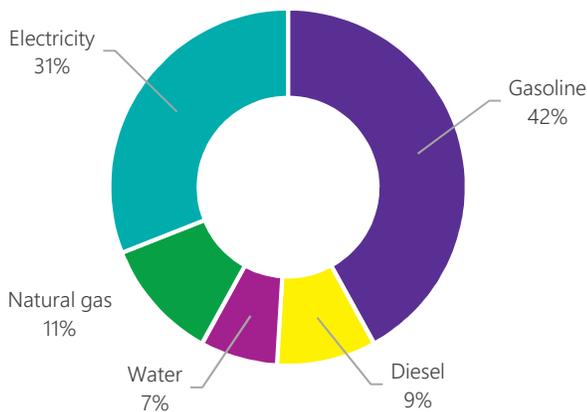
Brampton Energy and Water Costs by Sector, 2016



4.3.2 Brampton Energy Costs by Utility Type

Energy costs are projected to increase by a range of 200% to 410% by 2041 (see the CEERP Analytical Report⁴ for more details). These increases reflect both higher prices, as well as population and employment growth. If energy prices are held at 2016 levels, the overall increase would be 68%.

Brampton Energy Costs by Utility, 2016



4.4 Benchmarking: How Do We Compare Globally and Locally?

One of the principles approved by the Community Task Force for developing the CEERP is to work toward global best practices.

On average, buildings in Brampton are approximately half as efficient as global benchmarks - a likely outcome of cheap oil and gas and less action on climate change.

Energy use per Brampton home is 2% less than the provincial average, but 40% higher than the Danish average.⁵ Denmark is widely recognized as having one of the most efficient housing stocks due to the early adoption of efficient new construction and retrofit standards with regular updates.

Energy use in Brampton’s residential sector per square metre is 37% lower than the Canadian average, due to Brampton having a higher percentage of smaller, newer homes relative to Ontario and the rest of Canada.⁶ However, Brampton’s residential sector per square metre is more than twice that of a German A-rated home. German A-rated homes are above local code and represent a significant portion of the new construction market in Germany.⁷

Local, Provincial, National, and Global Comparison of Energy Use and GHG Emissions⁸

Indicator	Brampton Baseline	Canada Average	Ontario Average	Comparable Best Practice
Energy use/household (Gigajoule - GJ)	99	106	107	68
Residential sector energy use per metre ² (GJ)	0.6	0.79	N/A	0.29
Non-residential sector energy use per meter ² (GJ)	1.4	1.65	N/A	0.72
Emission per capita (tonnes carbon dioxide equivalent - CO ₂ e)	5.6	9.7	6.2	3.5

Energy use in Brampton's commercial and institutional buildings per square metre is 37% higher than the Canadian average.⁹ They are also more than twice the German average.¹⁰ However, generalized comparisons in this sector are always challenging due to the mix of uses, property type, data quality, and climate.

GHG emissions per capita in Brampton is 40% less than the national average and 25% less than the provincial average.¹¹ However, this is approximately twice that of the City of Copenhagen, widely recognized as a global benchmark.¹² Brampton's current level is about ten times the Government of Canada's target for 2050 based on the Paris Climate Agreement. Water use per home is about 5% above the Ontario average and 7% above the national average when adjusted for household size.¹³

Comparing Apple to Oranges: Benchmarking to Neighbouring Cities

Benchmarking GHG emissions and energy use to other local cities, towns, or regions can be a challenge due to the wide variety of calculation methods used and the diversity in built form and land uses seen between cities. Total GHG emissions and energy use or per capita outputs do not reflect the differences between cities, and as such may not be ideal for comparisons. For example, the presence of heavy manufacturing, cement plants, airports, or other high emitters in a city that also services multiple surrounding cities, may heavily skew the host municipality's GHG emissions, while unduly, reflect positively on the surrounding cities that rely on it.

4.5 Summary of Findings

The following is a summary of the main Base Case findings for source energy, site energy, emissions, and energy costs for Brampton in 2041.¹⁴ The table that follows provides a summary of modelled changes between 2016 and 2041. These findings demonstrate the opportunity for the CEERP to have positive economic, social, and environmental impacts in Brampton.

Energy Consumption

By 2041, population and employment growth are estimated to increase site energy use by 26% and source energy use by 28%. Both the population and the workforce are expected to increase by 51% and 73%, respectively, during this time.

GHG Emissions

Despite high population and employment growth, increases in GHG emissions are expected to be relatively moderate (approximately a 13% increase) by 2041. This is due to a projected increase in vehicle efficiency and reduction in the carbon intensity of the natural gas grid (note: this does not include pipeline leaks). However, emissions in Brampton, remain approximately twice the global best practice and ten times the Government of Canada target for 2050 based on the Paris Climate Agreement.

Energy Costs

Energy costs are estimated to increase by a range of 200% to 410% by 2041. These increases reflect both higher prices as well as population and employment growth. If energy prices are held at 2016 levels, the overall increase would be 68%.

Summary of Projected Changes in Brampton Energy Use, Energy Costs, and GHG Emissions

2016 Baseline	2041 Base Case
Brampton used 92 million gigajoules of energy.	Growth in population and employment increase energy use by about 30%.
The transportation sector represented 35% of source energy use. The residential sector represented 26% of source energy use, and the industrial, commercial, and institutional sectors represented 39% of source energy use.	No material change.
On average, homes and buildings in Brampton are approximately half as efficient as global benchmarks.	Gap widens against global best practice.
Systemic and end-user inefficiencies represent approximately half of the total energy use in Brampton.	No material change.
The City of Brampton's corporate source energy use for facilities, transit, and municipal fleet represents 1.88% of the community's source energy use.	No material change.
On average, Brampton residents release 5.6 tonnes of GHG emissions per capita each year.	Reduces to 4.4 tonnes per capita due to a projected increase in vehicle efficiency, a reduction of carbon intensity of the natural gas grid, and higher efficiency of new homes and buildings.
Emissions are twice global best practice and 10 times what is needed to meet the Paris Climate Agreement's goals.	No material change.
\$1.8 billion spent on electricity, natural gas, gasoline, and diesel within the community.	Spending is estimated to increase to \$5.4 billion (low risk) to \$9.4 billion (high risk).
Less than 22% of the money spent on energy remained in the Brampton economy.	No material change.

Notes

¹ While much of the literature around energy and emissions planning uses a time horizon of 2050, the City's Official Plan and other master plans are aligned with the Provincial Growth Plan for the Greater Golden Horseshoe Area, which assigns regional population growth targets to 2041.

² Sunpower. (February 17, 2017). "Understanding the essential relationship between water and energy production". <https://businessfeed.sunpower.com/articles/understanding-the-essential-relationship-between-water-and-energy-production>

³ Exclusive of pipeline leaks.

⁴ Community Energy and Emissions Plan Analytical Report. (2020). City of Brampton

⁵ Determined from data retrieved from the Danish Energy Agency and Statistics Canada.

⁶ Determined from data retrieved from Statistics Canada plus the average home estimates.

⁷ KfW Effizienzhaus 70 ("Efficiency House") using typical average of 75kW.

⁸ Benchmarks attributed to Brampton in this table are sourced from Canada and Ontario inventories made available through the United Nations Framework Convention on Climate Change (UNFCCC). Factors included in the Canadian/Ontario UNFCC inventories that are NOT included in the community inventory are: Petroleum Refining Industries, Mining and Upstream Oil and Gas Production, Agriculture and Forestry, Domestic Aviation, Off-Road Agriculture and Forestry Transportation, Off-Road Mining and Construction Transportation and Pipeline Transportation. Factors included in the Canadian/Ontario UNFCC inventories that are PARTIALLY included in the community inventory are: Manufacturing Industries, HDV Gasoline Trucks, HDV Diesel Trucks and Railways. In order to allow for comparison, all benchmarks provided (national, provincial, municipal) reflect these adjusted criteria; therefore, the resulting benchmarks provided in the table will, by definition, be less than those provided by the UN.

⁹ Determined from data retrieved from Natural Resource Canada 2014 Building Surveys, <https://www.nrcan.gc.ca/energy-efficiency/energy-star-benchmarking-commercial-and-institutional-buildings/energy-benchmarking-technical-information/building-energy-use-surveys/19454>

¹⁰ Determined from data retrieved from the Federal Statistical Office of Germany (Destatis) and the Working Group Energy Balances (AGEB) an energy market research group set up by several major German energy industry associations and economic research institutes.

¹¹ Determined from data retrieved from Canada's UNFCCC national and provincial inventories adjusted for municipal equivalent.

¹² City of Copenhagen. (2016). Copenhagen Climate Projects - 2016 Annual Report. <https://international.kk.dk/artikel/carbon-neutral-capital>

¹³ Determined from data retrieved from the Environment Canada and Statistics Canada.

CHAPTER 5

Brampton's Community Energy & Emissions Reduction Plan

Securing Our Future

KEY TAKEAWAYS

- Community Energy Planning is an evidence-based approach to understanding where and how energy is used and emissions released in a community to identify local opportunities and priorities for increasing energy efficiency, reducing GHG emissions, and lowering energy costs.
- The CEERP Framework is endorsed and recommended by the Community Task Force.
- The CEERP Energy Goal is to reduce community-wide energy end use by at least 50% from 2016 levels by 2041.
- The CEERP Emissions Goal is to reduce community-wide emissions by 50% from 2016 levels by 2041, and to establish a pathway to reduce emissions by at least 80% in 2050 to meet or exceed federal and provincial targets.
- The CEERP Economic Goal is to retain at least \$26 billion in cumulative energy costs within the community by 2041.
- Twenty-four objectives organized around seven strategic directions are identified that, if realized, will lead to the successful achievement of the three CEERP Goals.
- Six priority projects were identified as critical projects for the next five years.
- Each sector of the community (i.e. municipal governments, utilities, industry, businesses, institutions, development, community organizations, and residents) have a role to play in the successful implementation of the CEERP.
- To ensure that the CEERP does not “sit on a shelf” and implementation of the 2020-2025 priority projects are achieved and sustained, dedicated resources are needed to coordinate, oversee, and report on overall progress. These resources range from political, regional, municipal, and community stakeholders to individuals.
- A full glossary of terms is available at the beginning of this report. Some of the key terms used in this chapter include: Latest Energy Transition, and Carbon Neutrality.



5.0 Community Energy and Emissions Reduction Plan

Community energy planning is an evidence-based approach for understanding where and how energy is used and emissions released in a community to identify local opportunities and priorities for increasing energy efficiency, reducing GHG emissions, and lowering energy costs.

The CEERP is driven by the following energy and data realities and context:

- an urgent response to climate change is needed now (Chapter 1);
- a global energy transition is currently underway (Chapter 2);
- major energy transitions have happened before, resulting in vast societal improvements (Chapter 2);
- there are significant economic and social opportunities in the modern energy transition (Chapter 3);
- community energy planning helps take advantage of opportunities during this energy transition and mitigate present and future risks (Chapter 3);
- there are multiple benefits to robust community energy planning and climate mitigation actions (Chapters 1-3);
- currently, Brampton's largest GHG emitter, energy user, and community cost is transportation, followed by the residential, industrial, commercial, and institutional sectors (Chapter 4);
- in the Base Case (i.e. if no coordinated action is taken), it is estimated that Brampton's emissions will continue to be twice that of global best practice, energy use will increase by almost 30%, and energy costs will increase more than 200% by 2041 (Chapter 4); and
- it will take the combined effort of all community sectors in Brampton to successfully undertake this energy transition and mitigate climate risks (Chapters 1-5).

An energy and emissions reduction strategy allows Brampton to address the above, and create a roadmap to achieve a clean, sustainable, and resilient energy future.

The Plan was developed for Brampton based on:

- knowledge of Brampton’s Baseline and Base Case;
- an understanding of Brampton’s population and employment growth;
- community engagement;
- the results of simulations employing several efficiency measures (refer to the 2019 Analytical Report for more details);
- global best practice, and
- an assessment of local opportunities.

The Community Task Force was instrumental in the development of the Plan, and endorsed the final framework. As part of the development of the CEERP, the Community Task Force:

1. met monthly over a course of eight months;
2. identified key opportunities in the city;
3. shaped and vetted the CEERP framework;
4. communicated to their respective communities about the CEERP and provided input from them;
5. reviewed and provided input in the actions; and
6. reviewed and endorsed the final CEERP document.

Successful implementation of the Plan will require all parts of Brampton to undertake dozens of activities aligned with the priority projects. The primary aim of the CEERP is to shape Brampton’s energy future by creating the right conditions for public and private sector community action.

Activities required to support the implementation of the Priority Projects are in the Action Plan (see Section 5.7).

Energy and climate policies are changing rapidly, as governments respond to international pressure to reduce GHG emissions. Therefore, the market will continue to innovate, and more cost-effective technologies will emerge to accelerate the uptake of low-carbon local energy supply and distribution technologies designed for rapidly urbanizing communities like Brampton. Therefore, the strategy should be reviewed and updated, as appropriate, every five years. The Community Task Force developed and endorsed the following framework.



**Brampton's energy future is
clean, sustainable, resilient,
and supports the
Brampton 2040 Vision.**



5.1 Vision

The CEERP is driven by the following vision statement:

Brampton's energy future is clean, sustainable, resilient, and supports the Brampton 2040 Vision.

5.2 Guiding Principles

Guiding principles are a set of core values that guide decision-making. They ensure decisions are made in a responsible and sustainable manner that do not deviate from the long-term vision of the CEERP. They direct the formation of goals, objectives, and targets and help prioritize actions. Guiding principles should be followed in every step of the Plan and its implementation and be a lens through which all decisions are made.

A sustainable community energy system balances opportunities to benefit the economic, social, and environmental future of Brampton. The following principles were used to develop the CEERP goals and will be used to guide the implementation of the Community Energy and Emissions Reduction Plan.

Environmental

- Work towards climate neutrality.

Energy

- Benchmark energy performance against global best practices.

Economic

- All energy-related public and private sector investments will meet acceptable risk-adjusted returns.
- Energy costs will be competitive compared to comparable North American communities.
- Local employment will be generated.

Reliability

- Energy systems will be designed to meet the challenges of changing user expectations, climate uncertainty, and new technology options.

5.3 Goals

The CEERP will shape Brampton's energy future by creating the right conditions for public and private sector community action. Three goals were established based on the assessment of local energy and emissions data (where Brampton is today) relative to global best practice (where Brampton could be). The Community Task Force chose realistic goals over aspirational goals, recognizing that the Plan will need to be updated regularly to adapt to changes in climate policy, energy policy, and global best practice. The CEERP goals are based on:

Energy

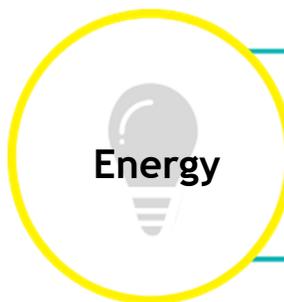
Energy is a vital component of our society. Its use has and continues to shape our communities, providing us many benefits but also current and future challenges. Through energy efficiency programs, consumers will realize substantial energy savings. These energy efficiency programs will identify opportunities for savings in the entire energy system, from supply, through distribution, and to end use. Rather than going to upstream energy suppliers, these energy dollars will remain in the community benefiting local consumers, improving housing affordability, and creating jobs.

Improving our energy efficiency can also increase energy security and improve our quality of life through more comfortable homes and buildings, cleaner air and more options and access to an active and connected lifestyle.

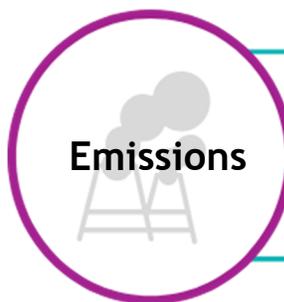
As we move through this energy transition, reducing energy use through energy efficiency will mitigate the risks and disadvantages while improving the opportunities and benefits for the local community.

Emissions

As we move into the future, our energy needs will only increase. However, GHG emissions have become a dangerous byproduct of our energy needs. One of the driving forces of the global energy transition is the need to reduce and transition away from energy sources that produce GHG emissions. Reducing Brampton's GHG emissions not only ensures that Brampton is doing its part in the fight against climate change, it also ensures we are keeping up with the current opportunities, expectations, and needs of local and global economies.



Based on global best-practices, reduce community-wide energy end use by at least 50% from 2016 levels by 2041.



Reduce community-wide emissions by 50% from 2016 levels by 2041, and establish a pathway to reduce emissions by at least 80% by 2050 to meet or exceed federal and provincial targets.



Retain at least \$26 billion in cumulative energy costs within the community by 2041.

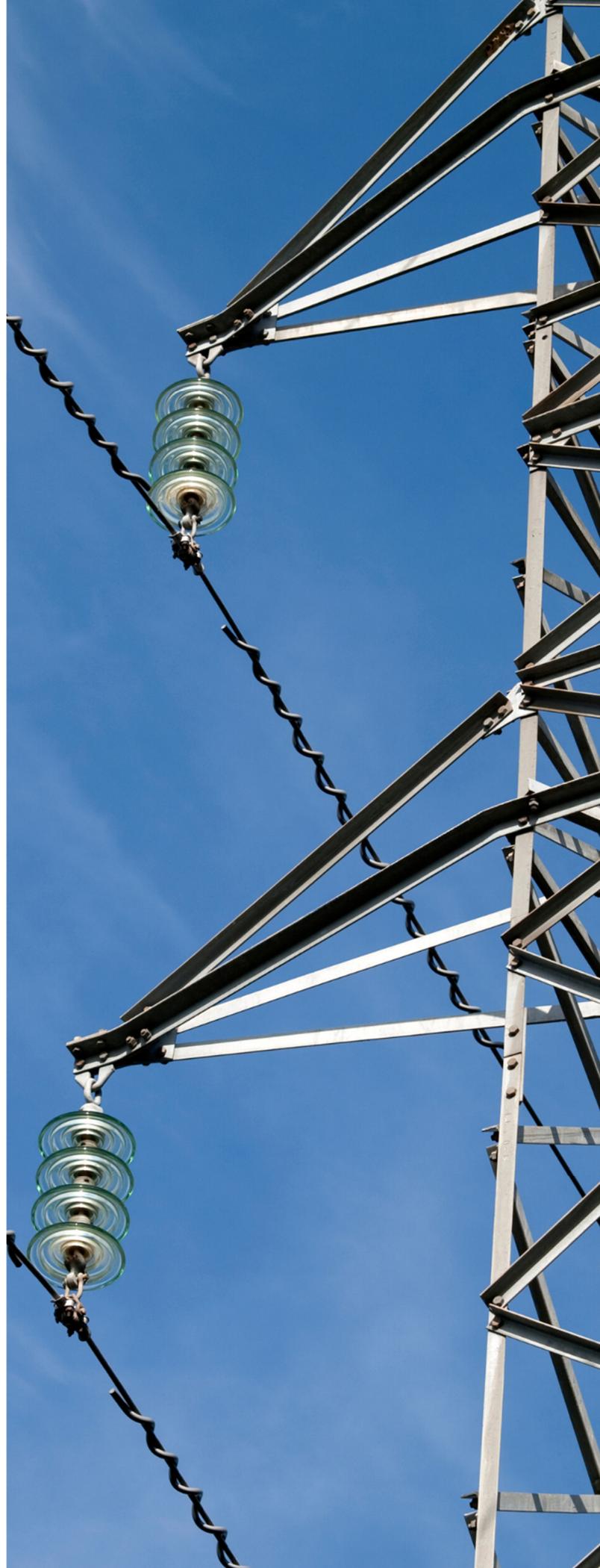
In Brampton, transportation and the residential sector account for the majority of emissions (60% and 21% respectively). The City of Brampton, in collaboration with the Region of Peel, has the ability to align policies and programs to plan, design, and develop green communities and encourage the adoption of low carbon transportation. This would help to achieve the objectives of reducing the average trip length and increasing the number of trips taken by walking, cycling, and transit, which will reduce GHG emissions emitted through transportation. Reducing emissions from the built environment will require retrofitting homes and buildings and consideration toward how local supply and distribution can improve the efficiency of neighbourhoods.

By working to meet the emission reduction goal of 50%, a pathway towards reducing emissions by at least 80% by 2050 is also being established. As new breakthroughs in technologies, policies, and tools arise, an 80% reduction within the next several decades will become more achievable. Regular updates of the CEERP will provide opportunities to continue to highlight policies, procedures, and initiatives that can reach a more aspiring goal. The actions outlined in the CEERP should be considered a minimum. When opportunities arise, additional and more ambitious actions should be pursued to stay true to the first CEERP principle of working towards climate neutrality.

Economy

Economic health has strong ties to community health and quality of life. This modern energy transition provides opportunities to improve both economic health and quality of life within Brampton. Incorporating an economic goal ensures that Brampton fully makes use of all the economic benefits available, and also creates further opportunities that will lead the city to an economically robust future.

The economic goal is based on implementation beginning in 2020 and on a more conservative low-price range of projected energy cost increases (see the 2019 Analytical Report for more detail). Should energy costs rise more quickly, the potential return to the community would be greater. Given the unpredictability of energy costs, this goal should be reviewed every five years and adjusted, if necessary, to reflect actual costs and more current forecasts.



What is Meant by Net-zero Emissions?

Attaining net-zero emissions means achieving a balance between GHG emissions released and GHG emissions removed from the atmosphere¹. Human-caused emissions, like those from vehicles that run on fossil fuels, are reduced as close to zero as possible, and any remaining emissions are balanced with an equivalent amount of GHG emission removal, for example, by restoring forests or by carbon capture technologies.

Challenges with Net-zero

Of the UN's 195 member nations, 67 have a net-zero emissions ambition in place. Of these countries, only 16 have developed roadmaps and intermediate targets, and only seven have instituted policy frameworks that could realistically support reaching the net-zero emissions goal.²

Nordic countries have been among the few to take truly decisive steps to achieve net-zero GHG emissions, which have been supported by favourable public opinion and social contexts.

Challenges associated with net-zero include³:

- demand for energy continues to increase due to population growth, and much of this demand is being met by high emission producing methods;
- growth in emissions-intensive industry sectors is projected to continue, such as cement (30% increase by 2040) and steel (10-15% increase by 2040). These sectors have few low-carbon alternatives, and those that exist are costly;
- transportation sectors are growing considerably, for example, freight demand is expected to triple by 2050, while aviation demand will likely double;
- consensus/cooperation among governments;
- resistance to undertake change in behavior; and
- required investment in Research & Development for low carbon technology.

The Community Task Force considered setting net-zero emissions as a goal in the CEERP. It was felt that at this time, a realistic roadmap could not be simulated to achieve this target. However; consensus was reached to include a goal to "reduce community-wide emissions by 50% in 2040 and to establish a pathway to reduce emissions by at least 80% in 2050 to meet or exceed federal and provincial targets." It is expected that as new opportunities appear, and new technologies become more widely available, this CEERP will evolve to support net-zero emissions. While the CEERP is not a net-zero plan, it does set targets that will contribute to the global climate change goals committed to by the Canadian federal government. Dealing with climate change will ultimately require net-zero GHG emissions over the course of this century, and Canada will need to transform all economic sectors, especially patterns of energy production and consumption, and make improvements to the way people live, work, play, and consume.⁴

5.4 Strategic Directions

The Strategic Directions are informed by the CEERP vision, principles, and goals and help structure the objectives, targets, and actions. They reflect Brampton's urban and energy transition, as well as the Brampton 2040 Vision. The seven strategic directions of the CEERP are:

5.4.1 Green Communities

Communities make up 60% of energy consumption and over half of all GHGs in Canada. The shape, structure, and form of a community greatly influences how and when energy is used. A green community focuses on improving the quality of life for residents and enabling more sustainable living through the application of environmentally-friendly strategies in every way feasible. Green communities incorporate features such as buildings constructed and insulated with recycled and/or biodegradable materials, transit-oriented development, mixed-use design, more housing choice, design that promotes active-living, circular economies, community gardens, and composting. They also provide general attention to using earth-friendly materials, products, and energy efficient appliances.

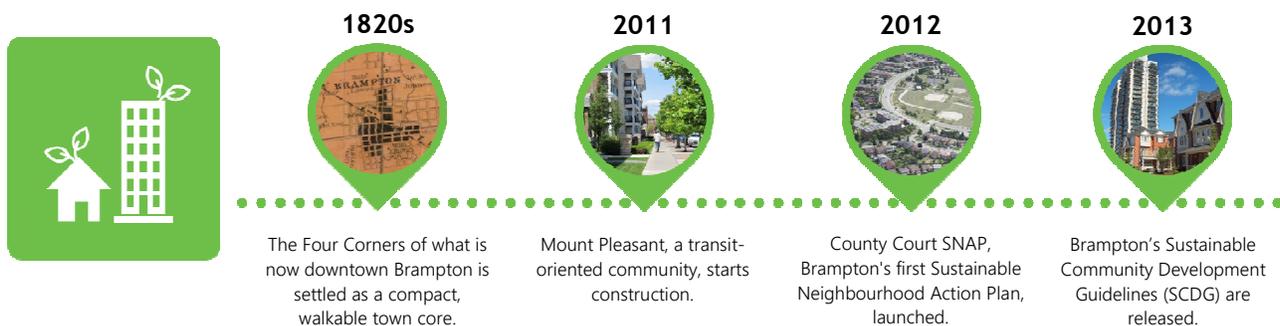
Green communities result in many co-benefits. For example, green communities improve air and water quality, and provide aesthetic, economic, and health benefits associated with incorporating more natural features and systems in our neighbourhoods. They also encourage a healthier lifestyle and provide more economical and equitable living, through focusing on improving transit and active transportation options, providing more affordable and varied types of housing, and creating accessible communities that allow residents to meet most of their needs within walkable distance from home.

This type of community design closely aligns with the Brampton 2040 Vision, which highlights the need for more sustainable and "green"⁵ communities, transit-oriented neighbourhoods, and a move towards compact, decentralized, accessible landscapes revolving around Urban and Town Centres. The 2040 Vision provides the foundation upon which the city can evolve in this global energy transition through the progression towards green communities.

The features and benefits of green communities all tie into optimizing a community's energy demand, increasing system efficiencies and savings, and improving energy resilience. More walkable and transit-oriented communities means less cars on the road and reliance on gasoline. Circular economies can reduce energy waste and streamline production to be more energy efficient. More housing variety can also provide more energy efficient housing choices. For example, typical single detached dwellings are less energy efficient than denser forms of housing, like townhouses, row houses and mid-rise residential buildings. Providing a range of housing choices allow residents to pursue a dwelling suited to their individual needs and energy use and efficiency preferences.

A significant advantage of green communities is the potential for savings on energy from heating and cooling and transportation.

Municipalities and the development industry have a significant role to play within the Green Communities strategic direction. As a municipal government, the City of Brampton is responsible for local land use decisions that drive green communities. As previously mentioned, the 2040 Vision is one foundational document that can guide



Brampton towards becoming a greener community. The City of Brampton can further encourage green communities by ensuring that its Official Plan policies champion transit-oriented, mixed-use, complete communities.

The existing Sustainable Neighbourhood Action Plan (SNAP) program is another avenue for green community implementation at a neighborhood scale. It provides opportunities to tie together home and building retrofits, green community planning, and other on-the-ground actions to achieve community-level retrofits.

The Development Industry role in creating Green Communities involves planning, designing, and constructing mixed-use, compact communities with high efficiency homes and building serviced by alternative energy sources. Brampton's Sustainable Community Program for New Development provides a menu of sustainable options developers can choose from to implement in their development plans. In addition, developers will need to keep themselves informed on how to most effectively incorporate the latest green community design practices and include these energy efficient and sustainable features in their designs. Furthermore, both the municipality and development industry should strive to work together to implement net-zero communities.



5.4.2 Transportation Efficiency

Transportation in Brampton accounts for about 60% of community-wide GHG emissions and 50% of the total dollars spent on energy in the community, reflecting how Brampton is largely an automobile-dependent community. In 2015, active transportation (cycling and walking) accounted for approximately only 3% of trips in the city, while transit accounted for 8%.⁶

Increasing transportation efficiency can lead to cost savings for Bramptonians and healthier and more equitable communities. Providing various options for and investing in safe, reliable, and accessible sustainable transportation options, like transit, cycling infrastructure, and safe and walkable streets, allow residents to meet their daily needs while maintaining a more affordable, connected, and active life. Sustainable transportation provides all residents with affordable access to all the facilities, services, and opportunities the city has to offer.

In order to keep up with the modern energy transition, a significant shift in how we move around our community is needed. By addressing Brampton's unique needs, learning from global best practice, and adapting from local municipalities' mistakes and successes, this city can become a leader in transportation. The Brampton 2040 Vision has already started us on this path. Vision 4 states, "In 2040, Brampton will be a mosaic of safe, integrated transportation choices and new modes, contributing to civic sustainability, and emphasizing walking, cycling, and transit".

How we approach our transportation networks will need to be rethought. Different modes of transportation (e.g. car, transit, cycling, walking) should not be viewed and planned as separate isolated systems, rather as an interconnected system in which people and goods move between one mode to the other to get to their destination. Furthermore, road planning, design, and construction need to take into consideration more than just the car, and move towards a more integrated and holistic approach within Brampton.

Increased investment in sustainable transportation infrastructure is key to keeping pace with the modern energy and transportation shift and meeting the 2040 Vision goals. The growing demand in both personal and commercial electric vehicle use will require significant

expansion and upgrades in electric vehicle infrastructure. The Brampton 2040 Vision's shift towards Urban and Town Centres will require increased transit investment between and within these nodes, and the more widespread incorporation of complete streets and active transportation networks in our communities.

Brampton's strong dependence on automobiles poses one of the city's greatest energy challenges. Automobile-dependence shapes the physical and social fabric of our communities. Higher automobile dependence increases a community's energy use and emissions through increased vehicle trips, requires large amounts of land within our communities, and influences our daily decisions and life choices that in turn effect our carbon footprint and well-being.

The space requirement to accommodate vehicles (e.g. larger roads, major highways, and parking) leads to more sprawl. This increases the resources, infrastructure, and energy requirements needed per person to service this larger, sprawled area. Larger roads and highways also tend to discourage the use of alternative modes of transportation due to the increased safety risks and the general inconvenient and unpleasant experience of a pedestrian-unfriendly environment. The impacts of automobile-dependence also leads to other concerns. Larger roads and more sprawled cities can sever social networks and service support, increase social disparity, reduce community cohesion, decrease local community and economic vibrancy, and impact the health of residents and the environment.

Brampton faces many unique aspects in the transportation efficiency strategy. This will require the City to more deeply explore the relationship between built form and transportation systems - not only how transportation systems and buildings overlap, but also how built form and land use shapes transportation needs and vice versa. For example, moving towards more compact, mixed-use, and walkable neighbourhoods can significantly reduce the number of car trips taken by residents. Creating more local jobs also makes transit and cycling a more feasible commuting option.

Brampton's history and reputation of being a suburban/bedroom community with neighbourhoods built around single family dwellings and residents commuting daily out

to other cities has led to spread out and car centric neighbourhoods with wide roads and large big-box retail. Additionally, as a neighbour of Toronto and member of the GTA, there are several major highways bisecting the city, a large amount of goods and products movement through the city, and significant presence of warehousing and storage facilities within Brampton's borders. These are all factors that need to be considered in this transportation shift.

To address the impacts of transportation on climate change, the City's transportation planning efforts will need to include quantifiable emissions targets and develop ways to measure and forecast these. To that end, the City's transportation modeling and planning efforts will need to use a measure based on the percentage share of each mode of the total number of Passenger Kilometres Travelled (PKT) arising from travel choices in addition to the typical measure based on the percentages of the total number of trips made by each mode. The PKT-based approach more directly links transportation emissions and energy usage and efficiency to the mode of travel chosen. It should be noted that the two approaches are not directly comparable.

The City of Brampton will need to investigate the incorporation of PKT-based measures into transportation plans and transportation forecasting activities, in addition to maintaining the typical measure based on the percentages of the total number of trips made by each mode.

The City of Brampton and the Region of Peel are responsible for the planning, design, and construction of the transportation infrastructure in the City of Brampton, thus will have the most responsibility for achieving the actions under this strategic direction. However, the development industry, businesses, and residents play an important supporting role. The development industry can work towards designing more walkable and pedestrian-friendly communities oriented towards encouraging carpooling, transit, and active transportation. Businesses can encourage employees to work from home, take more sustainable transportation by providing amenities (e.g. EV charging stations, secure bicycle parking, showers, etc.) or by providing incentives to carpool, take transit, bicycle or walk.

Individuals can strive to develop sustainable transportation habits by:

- walking to do daily errands;
- cycling to work and for daily errands;
- taking transit more;
- carpooling to work;
- purchasing fuel efficient vehicles; and
- purchasing low carbon vehicles.

Furthermore, residents can contribute by staying informed on their transportation choices and communicating their sustainable transportation needs to their place of work, schools, and local governments.

Currently, the urban transition described in the Brampton 2040 Vision will support greater transportation efficiency, transit use, and active transportation. Further transportation policy, by-laws and street guidelines updates at both the City of Brampton and Region of Peel will be needed. Updating and aligning Brampton's Transportation Master Plan (TMP) with the CEERP goals and targets will be a significant milestone since the TMP is a driver of transportation decisions and projects within the City. Both the Region and the City of Brampton will need to invest in sustainable transportation infrastructure, taking into consideration the growing demand for electric vehicles, the move towards more complete streets, and need for more accessible transportation alternatives to single occupancy vehicles.

What is Modal Split?

Modal split is the main monitoring and performance measure in the City of Brampton's current Transportation Master Plan. Modal split is the percentage share of travellers using a particular method of transportation (e.g. auto, transit, cycling, walking). The factors that inform what method of transportation a person will choose for a trip include cost (monetary and time), convenience, and comfort. Trips can be comprised of one or more modes of transportation (e.g. cycling to a station, then riding a train and then walking to the final destination). Energy usage and the resulting emissions vary widely for the different methods of transportation; therefore, cumulative energy usage and emissions produced must also be factored into assessments of the impacts of transportation on climate.

What is Vehicle Kilometers Travelled (VKT)?

Vehicle Kilometers Traveled (VKT) is the total kilometers travelled by motor vehicles on the road network during a given period of time. VKT is directly linked to fuel consumption, vehicle emissions, environmental quality, and road network congestion and safety. The current TMP includes VKT in the comparison of alternative scenarios and as an indicator for road network congestion. VKT per capita is emerging as an important transportation performance measure. Reducing per capita VKT can help achieve air quality, climate change, and congestion reduction goals without penalizing for population growth and its addition in the TMP will be considered in the next update.

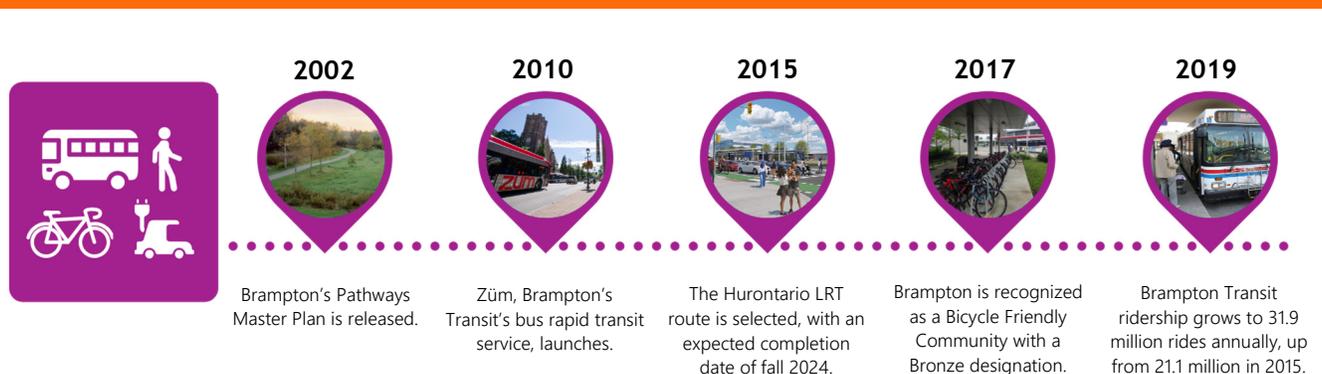
What is Passenger Kilometers Travelled (PKT)?

Passenger Kilometres Travelled (PKT) is the product of multiplying the number of passengers in a vehicle by the distance travelled. Compared to Vehicle Kilometres Travelled (VKT), PKT provides a measure of transportation efficiency. For example, a bus with 20 passengers that travels 10 kilometres results in 200 PKT of service for 10 VKT. If those 20 bus passengers each used their own car, the same 200 PKT would result in 200 VKT, which would require significantly more energy and result in higher emissions. PKT is derived for all modes of transportation. For walking, cycling, and commercial vehicle trips, PKT is assumed to be the same as VKT.

Why Passenger Kilometers Travelled (PKT)?

PKT reflects the basic goal of any mode of transportation: to move a person or goods to a desired destination. The factors that inform what mode of transportation to use for a trip include cost (monetary and time), convenience, and comfort. Trips can be comprised of one or more modes of transportation (e.g. cycling to a station, then riding a train, then walking to the final destination). Energy usage and the resulting emissions vary widely depending for the different modes of transportation. The cumulative energy usage and emissions produced must be factored into assessments of the impacts of transportation on the climate.

As noted previously, the City's transportation planning efforts will need to include quantifiable energy and emissions targets. The CEERP's PKT-based analytical approach supports this.



5.4.3 Home and Building Efficiency

Energy efficiency is the “first fuel” of a sustainable global energy system.⁷ Homes and buildings are the third-largest emitting sector in both Brampton and Canada, and most existing buildings will still be in operation in 30 years’ time. It is less costly to construct energy efficient homes and buildings than to retrofit them to be more energy efficient once they are already built. Buildings account for 44% of Brampton’s energy use and 28% of its GHG emissions.

Building energy efficiency has historically been left to be addressed by the Province through the Ontario Building Code (OBC). However, this plan has shed light on the significant role buildings play in Brampton’s energy use and on the many opportunities available to significantly improve energy efficiency at the community level.

Retrofitting existing homes and buildings and ensuring new construction is delivered to the highest energy standards will be foundational to achieving the targets of the CEERP. On average, buildings in Brampton are approximately half as efficient as global benchmarks, a consequence of historically lower energy costs, less stringent building codes, and less action on climate change. Brampton residential buildings are the source of 21% of GHG emissions and almost three-quarters of Brampton’s water consumption.

As the construction requirements of buildings have been under the jurisdiction of the Provincial government through the Ontario Building Code, addressing building energy efficiency is a new field for municipalities and many aspects are currently beyond the City’s capabilities to address adequately. Therefore, this strategic direction will require significant community leadership and collaboration. Construction, trades, and the development industry will all need to have a strong leadership presence to achieve the targets under this strategic direction.

Residents also need to be educated on and stay informed about their energy efficiency options. A community organization that focuses on large scale community energy projects, such as a home retrofit program, can create a framework in which different community sectors can collaborate and mobilize under to successfully implement the actions under the CEERP that may be outside municipal jurisdiction or capacity.

The City of Brampton can advocate for Ontario Building Code enhancements, ensure buildings are built to code, provide incentives for builders to exceed the Ontario Building Code, and/or be open to new technologies. Furthermore, there is opportunity to expand the City’s SNAPs to include community energy retrofits.



5.4.4 Local Energy Supply and Distribution

Local energy supply and distribution, also referred to as Distributed Energy Systems (DES), is the local operation and generation of energy close or next to its point of use. DES includes power generation (e.g. roof top solar panels), energy storage (e.g. batteries), and distributed energy management (e.g. building energy management systems, micro grids, district energy etc.). This is compared to the traditional centralized energy supply utilized today, where energy is sourced from larger generator facilities outside the community (e.g. in Ontario: Bruce Nuclear Power Plant or Niagara Falls Hydro-electric generation plant) and is sent through large transmission and distribution grids before reaching the end user.

Distributed Energy Systems offer communities the following benefits:

- lowering the carbon impact of meeting the heating, cooling, and hot water needs of buildings through the distribution of heating and cooling;
- reducing system losses associated with the current centralized energy system; and
- increasing the security, resiliency, and flexibility of local energy supply.

The use of natural gas to heat buildings contributes 38% of Brampton's GHG emissions, which underscores the need to identify measures that address the heating, cooling, and hot water needs of buildings. Opportunities are available to incorporate district heating and cooling in major growth and intensification areas, such as the Urban Centres and Town Centres described in the Brampton 2040 Vision. Using waste heat from large facilities (e.g. manufacturing, industrial facilities, waste facilities) is another opportunity to supply heating and cooling to buildings through waste heat power or combined heat and power district systems.

Modern district energy systems facilitate the use of many kinds of low carbon heat sources, including:

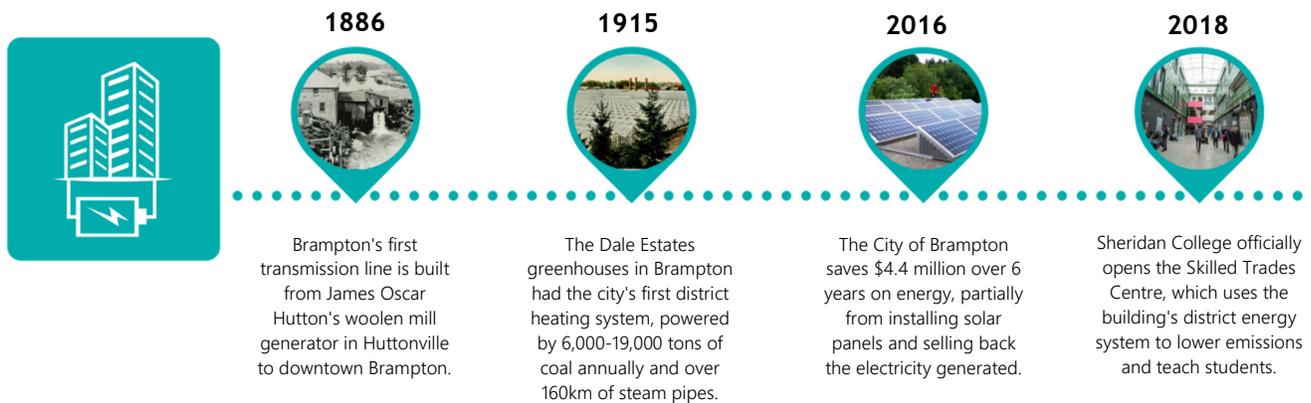
- large solar-thermal arrays;
- biofuel boilers and combined heat and power (CHP);
- sewage waste heat recovery;
- geothermal arrays; and
- boilers using renewable electricity.

Of the five district energy systems noted above, only Combined Heat and Power (CHP) was considered in the CEERP's efficiency simulation, so any opportunities to include the other low carbon heat sources will further reduce the GHG impacts of heating and cooling.



In Brampton, the highest energy system losses were associated with electricity use. Increasing local electricity generation would reduce the economic impact of these losses on the community. In 2016, locally-generated solar power supplied less than 0.5% of Brampton’s electricity needs. Traditionally, municipalities have had a limited role in solar supply. There is opportunity for the City of Brampton, Region of Peel, and local community to play a bigger role in encouraging and building solar infrastructure through advocacy and other direct means. The Community Organization and the retrofit program are vehicles in which solar power can be advanced in Brampton.

Local utilities will play a major role in managing the migration of energy supply to a more decentralized system. Partnerships with and between local industry will also be needed to capitalize on the best opportunities within the city for Distributed Energy Systems. Individual residents and property owners will also play an important role as the option to generate energy off grid becomes more feasible.



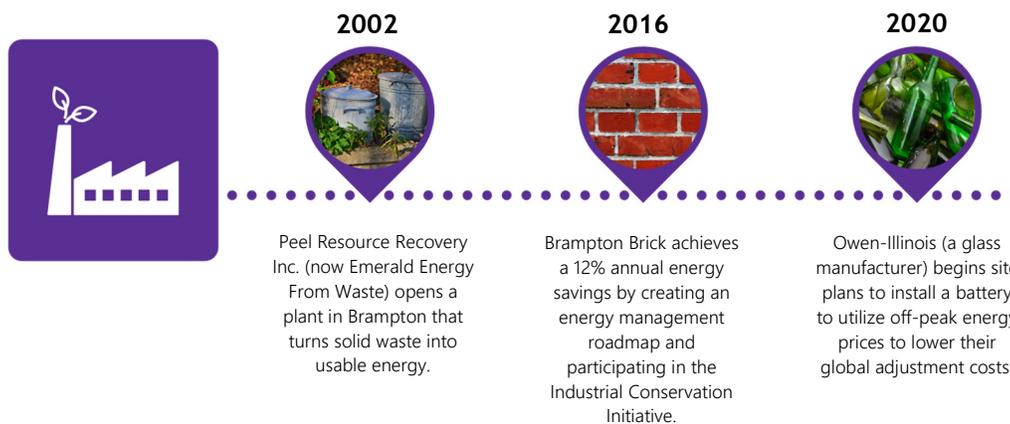
5.4.5 Industrial Efficiency

Industrial activity is most often regulated and guided by broader global best practices and standards because industry is driven to reduce their bottom line with continuous improvement in energy and water management. In addition, many larger multi-national companies have challenging corporate-wide emissions standards that are a direct response to both customer pressure and public opinion in many different countries.

Brampton’s industrial sector consumes 21% of total source energy, although it only contributes 13% of emissions. The city’s industrial sector demonstrates higher energy, emissions, and water performance relative to global best practice than other sectors, such as residential dwellings. As such, there is an opportunity for local industry leaders to share their energy and water management expertise with the community to help achieve world-class energy and water performance.

The Brampton 2040 Vision and Brampton’s Economic Master Plan highlight the critical need to attract and retain local businesses and investment in the city. Retaining and attracting investment in the community through energy advantages is a key tool in which municipalities can utilize as part of the CEERP.

Brampton’s Economic Master Plan highlights innovation through originality as one of its goals. Many industries are currently moving towards innovative ways to reduce energy costs to gain energy savings that will help their bottom line. Local municipalities can play a role in this by assisting industries that are exploring and pursuing opportunities to reduce their energy use and emissions. This could include providing additional assistance in advocating to other levels of government, navigating the planning processes, and promoting and facilitating joint opportunities with other agencies to achieve their energy use and emissions reduction targets.



5.4.6 Green Infrastructure

Green infrastructure can reduce a community’s energy and infrastructure costs, improve residents’ quality of life, promote economic growth, and create construction jobs. Green infrastructure is a strategically planned network of natural and semi-natural features and spaces managed to deliver a wide range of ecosystem services to the community. Examples of green infrastructure include features and spaces such as parks, wetlands, trees, community gardens, green roofs, rain gardens, and bioswales.

Green infrastructure can play a role in reducing community energy demand by mitigating heat island effects, reducing energy requirements for cleaning drinking water and managing stormwater, or reducing heat loss in buildings from cold winds.

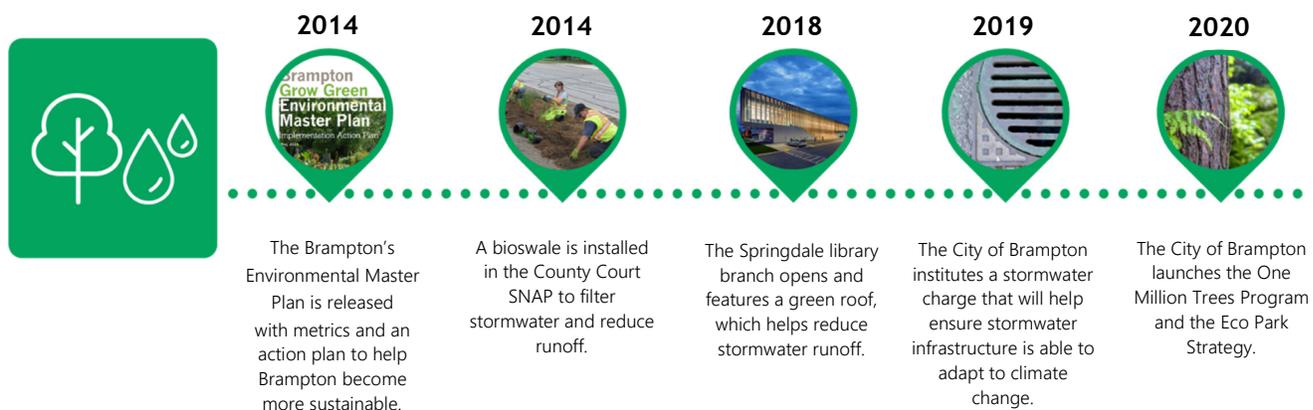
A unique contribution of green infrastructure to the CEERP is its ability to directly remove CO₂ from the atmosphere by sequestering carbon. For example in 2008, Brampton’s urban forest was sequestering approximately 7,700 tonnes of carbon per year as trees grew – equivalent to the amount of carbon that was being emitted at that time in the city in 1.2 days.⁸ Over 175,000 tonnes of carbon was stored in the urban forest – equivalent to 27 days of the city’s carbon emissions. The largest trees store proportionately more carbon – for example, trees greater than 68.6 cm diameter at breast height (dbh) make up less than 1 percent of the total tree population but store more than 30 percent of the total stored carbon. Average sequestration rates are also positively correlated with tree size – larger trees sequester more carbon on an average annual basis than smaller trees.

Carbon sequestration strategies are outside of the scope of the CEERP, however, this additional benefit of green infrastructure can still be a tool within the City’s larger comprehensive climate action strategy and be layered into other City strategies such as the City’s Urban Forest Management Plan.

Through the Brampton 2040 Vision and the Brampton Grow Green Environmental Master Plan, the City of Brampton has already established the groundwork for meeting the Green Infrastructure goals and targets of the CEERP. The first Vision statement of the 2040 Vision is that of the “Environment and Sustainability”. It includes growing our green infrastructure and protecting our natural systems within the city. Meanwhile, the City’s Environmental Master Plan, as well as the One Million Trees Program and the Eco Park Strategy, encourage the integrated use of green infrastructure within Brampton’s green and urban spaces.

The local municipalities (City of Brampton and Region of Peel) and conservation authorities (Toronto and Region Conservation Authority and Credit Valley Conservation) will all have a leading role to play in implementing actions under this strategic direction. Municipal policy, development guidelines, and capital projects should be updated to include green infrastructure where appropriate, and the City of Brampton, often in partnership with the conservation authorities, will continue to implement its green infrastructure programs.

Local community organizations/not-for-profits and local residents can also play a supporting role by partnering with, or participating in, the many green infrastructure and environmental programs provided by the municipality.



5.4.7 Communication, Engagement, and Monitoring

Communicating the CEERP’s priority projects and Action Plan will increase alignment among partners, empower stakeholders and the community to actively implement the priority projects, and help maintain the focus on what’s important. It will be important to clearly communicate to the public and City staff, the importance and benefits of the CEERP, how they can play a role in achieving its goals and targets, and how they can take advantage of this modern energy transition.

The scale of action required to address the climate emergency necessitates a coordinated and collective effort to speed up change. Engaging and working with partners across the community will increase the successful implementation of the CEERP. Indeed, the first two key lenses used to guide the implementation of the Brampton 2040 Vision is that of Engagement (Lens 1) and Collaboration (Lens 2). These two lenses will be vital in the successful implementation of the many of the CEERP Priority Projects. The Community Organization proposed in this Plan and the 2040 Vision (i.e. CCET- see Section 5.7.8), will be a critical component to achieving the objectives of this Strategic Direction.

Finally, ongoing data collection and monitoring, as well as the refinement of the Priority Projects over time, is required to ensure project effectiveness and to gauge the impact of the CEERP. Though some monitoring is currently underway (e.g. EMP indicators, utility data, etc.), data sources are uncoordinated and there are still many large gaps in the type of data needed. Additionally, there will need to be a standardized system to collect, analyze, and report energy and emissions data.





5.5 Objectives and 2041 Targets

Each Strategic Direction has associated objectives (what is hoped to be achieved to support the Strategic Direction) and targets (indicators to determine how successfully each objective is being achieved).

Objectives and targets under Transportation Efficiency, Home & Building Efficiency, Local Energy Supply & Distribution, and Industrial Efficiency reflect the preferred scenario and the measures considered in the Plan's energy efficiency simulations.

Objectives and targets for Green Communities, Green Infrastructure, and Communication, Engagement & Monitoring were not included in the energy simulations. Instead, these Strategic Directions help achieve the objectives, targets and actions under the other Strategic Directions.

Achieving these strategic objectives and targets requires collaboration and the alignment of government, business, the community, and individual activities.

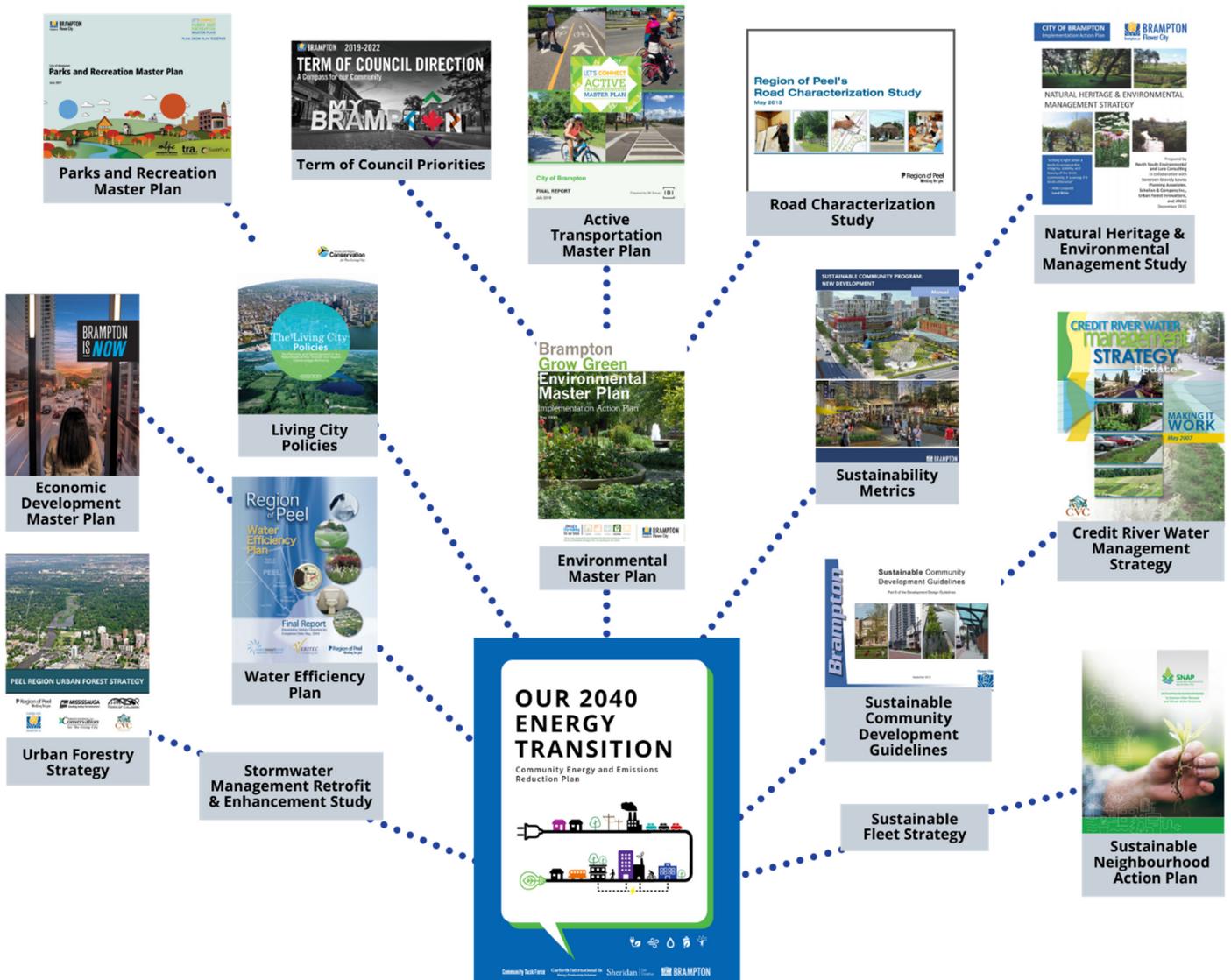
Objectives and Targets by Strategic Direction

Strategic Direction	#	Objective	2041 Target
Green Communities	1A	Achieve near net-zero communities	Attain near net-zero GHG emissions for new communities in Heritage Heights and new buildings in Town Centres and Major Urban Growth Areas
	1B	Policy is aligned	Complete all policy updates as identified in the Action Plan and its subsequent updates
	1C	Establish Major Growth Areas and Town Centres	Meet the Brampton 2040 Major Growth Areas and Town Centres density and job targets (to be revised through the OP Review process)
Transportation Efficiency	2A	Reduce average trip length	Reduce average trip length by 3.75% for light-duty vehicles from 2016 levels
	2B	Increase trips by walking and cycling	Increase the share of passenger kilometres travelled walking and cycling to 7%
	2C	Increase trips by Brampton Transit	Increase the share of passenger kilometres travelled by Brampton Transit to 9.0%
	2D	Increase trips by GO Transit	Increase the share of passenger kilometres travelled by GO Train to 8.5%
	2D	Increase use of electric vehicles	Increase electric share of light-duty vehicles to 22% and heavy-duty vehicles to 7%
	2E	Increase efficiency of vehicles	Increase efficiency of gas/diesel vehicles by 36% and electric vehicles by 20% from 2016 levels
Home and Building Efficiency	3A	Increase efficiency of existing homes	Achieve a 35% residential sector efficiency gain from 2016 levels by retrofitting 80% of existing homes
	3B	Increase efficiency of other existing buildings	Achieve a 22% commercial and institutional sector efficiency gain from 2016 levels by retrofitting 60% of existing buildings
	3C	Increase delivered efficiency of new property	Achieve a 17% Ontario Building Code efficiency gain from 2016 levels
	3D	Increase water efficiency of existing homes and buildings	Achieve a 34% water efficiency gain from 2016 levels

Local Energy Supply and Distribution	4A	Implement district energy in high growth districts with a mix of combined heat and power and other low-carbon heating and cooling sources	Serve 70% of existing high growth Energy Planning Districts and 80% of new high growth Energy Planning Districts with district energy
	4B	Install solar hot water in stable residential areas (low growth districts)	Serve 10% of hot water and heating needs in homes not served by district energy with solar hot water
	4C	Generate significant amounts of solar power installed on suitable rooftops and other locations	Supply 8% of Brampton's electricity needs with locally generated solar power
Industrial Efficiency	5A	Proliferate best practice to all local industry	Achieve a 20% industrial sector efficiency gain from 2016 levels
Green Infrastructure	6A	Expand the Urban forest	Plant 1 million trees by 2040
	6B	Increase restoration of natural heritage system	Increase restoration and enhancement management to 45ha/year
	6C	Integrate natural assets into the City's asset management program	Determine a dollar value for the City's natural assets
Communications, Engagement, and Monitoring	7A	Increase awareness of the importance of energy planning among residents and businesses	Establish a Community Organization (e.g. CCET) to engage in ongoing outreach and education
	7B	Engage with businesses, non-profits, institutions, residents, utilities	At minimum, engage with large energy users, Brampton Board of Trade, Sheridan College, Ryerson University, Algoma University, BILD, Enbridge Gas, and Alectra Utilities
	7C	Partner with other municipalities and levels of government	At minimum, partner with neighbouring municipalities and the Region of Peel
	7D	Integrate with corporate performance metrics (KPI)	Establish a community GHG emissions and energy efficiency target on the Corporate Performance Dashboard and update regularly
	7E	Establishment of self-supporting Community Organization (e.g. CCET) that is focused on delivering community energy planning excellence	Attain recognition as a regional centre for energy excellence

CEERP as a Foundational Document

Guided by the Brampton 2040 Vision, the CEERP is foundational document that will guide and support decision making within the City of Brampton. It provides direction for climate change mitigation and energy considerations for all City plans, policies, and programs. Current and future City documents and decisions will need to consider how they impact and work towards achieving the CEERP goals and its actions. All departments within the City have a role to help the community of Brampton achieve its energy and emissions goals.



5.6 Priority Projects: 2020 - 2025

Priority Projects are identified as critical projects that need to be started within the next five years to put Brampton on the path to achieving its energy and GHG targets and objectives. Priority Projects help prioritize investments and efforts.

Priority Projects were identified through the CEERP planning process and were based on the research of industry best practices and broad municipality experience, expert advice from all City departments and environmental partners, and input from conservation agencies and community stakeholders. The final list of Priority Projects were approved by the Project Working Team and Community Task Force.

The following six projects were identified as a priority for the next five years:

1. ensure the City of Brampton policies and programs are aligned with supporting the CEERP objectives and targets;
2. establish a system to deliver standardized retrofits to Brampton homes;
3. update the Transportation Master Plan (TMP) to reflect complete streets and the integrated nature of mobility and built form;
4. integrate District Energy Systems in appropriate locations within Brampton;
5. develop Integrated Energy Master Plans for public facilities and private development; and
6. establish a Community Organization to lead the development and implementation of select priority projects.

The Priority Projects are primarily focused on transforming the market for:

- energy efficient homes and buildings;
- energy efficiency retrofits;
- near-net-zero neighbourhoods;
- district energy; and
- active transportation and transit.

The rationale for these priority projects is provided below. Actions associated with these Priority Projects are identified in the CEERP Action Plan (see Section 5.7).

Priority Project 1: Municipal Policy and Program Alignment

Regional and local municipal governments approve policies and by-laws that guide the growth and development of the community. Consequently, they have the responsibility of ensuring their policies and by-laws are aligned with the vision and goals of the CEERP. By doing so, they can establish a policy and program framework that enables local stakeholders, businesses, residents, and developers to take action to initiate Brampton energy transition.

Priority Project 2: Home Energy Retrofits

Homes and buildings account for 44% of Brampton's energy use, 17% of energy cost, and 28% of GHG emissions. While energy efficiency gains in new construction has resulted in more energy efficient homes, older homes can be significantly less energy efficient. Considering 52% of Brampton's residential building stock was built prior to 1989, reducing energy use in homes through energy retrofits provides a high return in decreasing the city's overall energy use.

Priority Project 3: Transportation Master Plan Update

The transportation sector makes the largest contribution to source energy use and GHG emissions in Brampton. The City of Brampton and Region of Peel have a critical role and responsibility to align their policies and programs. They should work to reduce the average length of regular trips taken by residents and visitors and increase the number of trips taken via walking, cycling, carpooling, and transit. This includes decisions on urban design, complete streets, and investment in transit and cycling infrastructure.

The City's Transportation Master Plan provides a blueprint for sustainable transportation planning within Brampton. It provides a framework for how the City of Brampton will continue to move forward to serve its growing population through its investments in its transportation networks. The TMP directs future transportation investment decisions, priorities, and projects, making this a critical document for the achievement of the community's energy and emissions targets and actions for transportation. Aligning the TMP with the CEERP's objective and targets will provide significant movement towards achieving Brampton's energy and emissions goals.

As the TMP is updated, it must further explore the role transportation can take in achieving our energy and emission targets. The TMP update will need to provide direction in the city's transition towards the increasing use of sustainable modes of transportation, including transit and active transportation within Brampton, which will reduce energy demands and total emissions as the city continues to grow. Additionally, it will need to address the integration of mobility and built form to create more economical and energy efficient networks and services.

The City's current Transportation Master Plan (TMP), dating from 2015, includes a rudimentary analysis of transportation-related emissions based on forecasts of Vehicle Kilometres Travelled (VKT). The next version of the TMP will need to include quantifiable emissions targets and reflect more refined analysis based on Passenger Kilometres Travelled (PKT) in order to more fully support the CEERP and address the transportation-related targets included in it. As noted previously, a PKT-based approach more directly links transportation emissions and energy usage to the mode of travel chosen than a VKT-based approach does. The updated TMP will also supplement the existing mode share targets based on the percentage of the total number of trips made by each mode with targets based on the percentage of total PKT made by each mode. The TMP, and other transportation planning initiatives, will integrate and support the achievement of the directions of the CEERP.

Priority Project 4: Integration of District Energy Systems

A significant portion of energy use in Brampton goes towards the heating and cooling of homes and buildings. Some of this energy is lost through waste heat. District Energy Systems can provide a more efficient and flexible option for heating and cooling.

A district energy network is typically run as a thermal utility by a company that operates all the energy plants and networks, ensures high service quality, and manages the metering and billing of the heating and cooling services. The network allows for economies of scale, since the generation of heat in a few larger plants is more efficient than having thousands of boilers each heating their individual building. It also enables valuable energy currently

wasted in electricity generation, industrial, and other processes to be cheaply captured and delivered to other consumers. By aligning Energy Planning Districts with Brampton's Urban and Town Centres and growth plans, Energy Planning Districts were identified as candidates for district energy (see Appendix A).

Priority Project 5: Public and Private Sector Integrated Energy Master Plans

Integrated Energy Master Plans are the equivalent of a CEERP, but developed at the site, portfolio, neighbourhood, or community scale. In addition to identifying opportunities to improve the energy efficiency of the built form, they also identify options for integrating local supply and distribution at a neighbourhood or community scale.

Priority Project 6: Development of a Community Organization

It is recognized that to achieve the CERRP key objectives and actions must be completed that are outside the control, influence, or capacity of the municipality. As such, the achievement of these objectives, targets, and priority projects can be accelerated through the establishment of a Community Organization that will engage in and drive the required changes within the community.

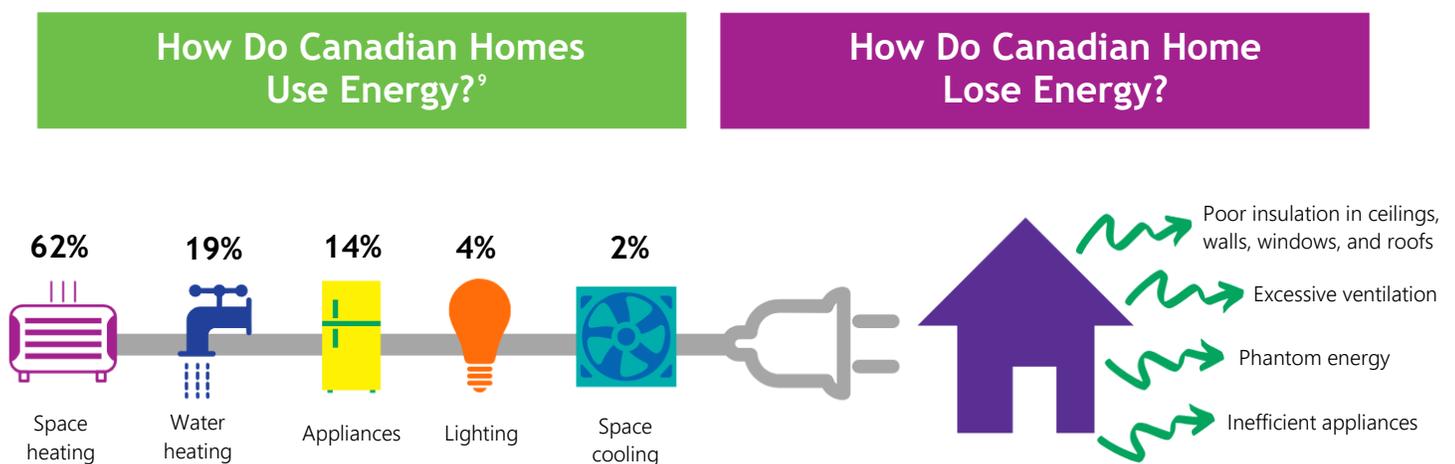
Home Retrofits

The current energy efficiency retrofit market for home and building owners and contractors is not very successful. Historically, market uptake of retrofit programs has been low. From the perspective of the contractor, the effort to prepare customized proposals is high and the closing rate is low. Low volumes and the fact that every project is specific to each household means that material costs are expensive and performance guarantees are risky. From the home and building owners' perspective, obtaining understandable bids from various contractors is time consuming. They are responsible for finding their own sources of funding based on their individual credit rating. Finally, the low volumes result in retrofit costs that typically exceed the value of the energy saving, even over many years.

To address these challenges, the Community Task Force and the Project Working Team recommend that an entity be established to offer standardized energy retrofits to homes, commercial, and institutional buildings at high volumes. Contractors benefit from increased project predictability, improved margins, and vastly higher project volumes. Homeowners benefit from a simplified transaction, guaranteed pricing, lower cost pre-financed retrofits, and a simple billing and payment mechanism.

In addition, property-assessed financing has the distinct advantage of tying the efficiency investment to the property, mitigating the risk to home and building owners that their payback period is longer than the time they remain (or intend to remain) in the home or building.

To address the objective for water efficiency, a water efficiency package should be included in the standard energy retrofit package. While the initial program would focus on delivering retrofits to the residential sector, the program would be well positioned to offer retrofits to the non-residential sector in the future.



5.7 CEERP Actions

The following table contains identified actions for each strategic direction that need to be accomplished in order to help achieve the twenty-four objective and targets. This table will be revised and updated every five years.

Short Term = 1-2 years Medium Term = 3-5 years Long Term = 5-10 years * = Priority Project Action

Accronyms					
City of Brampton	COB	Community Organization	COMM	School Boards	SB
Region of Peel	ROP	The Atmospheric Fund	TAF	Brampton Board of Trade	BBOT
Development Industry	DEV	Clean Air Council	CAC	Official Plan	OP
Sheridan College	SH	Ryerson University	RY	Algoma University	AL
Utilities	UT	Businesses/Industry	BUS	Partners in Project Green	PPG
Conservation Authorities	CA	Non-Profits/NGOs	NP	Community Task Force	CTF

Accelerating the Transition Internally

#	Action	Lead	Partner(s)	Timeline
Municipal Resources				
1.1.1	Assign CEERP implementation to a specific department/division/section that will administer responsibility for each municipal priority project and facilitate interdepartmental collaboration, funding, communication, education, and reporting on the City's performance.	COB	-	Short-Term
1.1.2	Identify staff resourcing gaps and allocate resources (e.g. staff and funding) to ensure that the CEERP municipal priority projects are completed.	COB	-	Short-Term
Build Awareness and Move Projects Forward				
1.2.1	Assign department/division/section to act as an internal resource for CEERP education and outreach.	COB	-	Short-Term
1.2.2	Establish a Community Organization to lead the development and implementation of select priority projects and champion the CEERP to Brampton residents, businesses, and stakeholders.*	COB	COMM, ROP, SH, CTF	Short-Term
1.2.3	Develop a comprehensive communication strategy that highlights the benefits of implementing the CEERP, like economic or community resilience benefits.	COB	-	Short-Term
1.2.4	Host an annual CEERP event in partnership with Brampton's Environment Advisory Committee to share and learn about best practices being implemented.	COB	-	Medium-Term
1.2.5	Develop an annual environmental recognition program for businesses, institutions, and citizens.	COB	-	Short-Term
Establishing Performance Monitoring				
1.3.1	Identify and assign responsibilities for monitoring of Corporate and Community CEERP targets, including data management and reporting.	COB	-	Short-Term

1.3.1.1	Identify corporate resources/expertise to collect data and monitor energy usage/emissions.	COB	-	Short-Term
1.3.1.2	Establish protocols for data collection, analysis, and reporting for each CEERP priority project.	COB	-	Short-Term
1.3.3	Provide a CEERP progress snapshot to Council biennially.	COB	COMM	Medium-term
1.3.4	Provide a comprehensive CEERP Implementation Progress Report to Council every five years.	COB	COMM	Medium-Term
1.3.4.1	Align CEERP reporting with the Environmental Master Plan reporting process.	COB	-	Short-Term
1.3.5	Investigate opportunities to update the Council report templates to incorporate climate change/environmental implications of development applications.	COB	DEV	Short-Term
Budgeting and Decision-making Framework				
1.4.1	Allocate a portion of the City's Environmental Reserve Fund to implement the CEERP's recommended priority projects.	COB	-	Short-Term
1.4.2	Incorporate CEERP framework into decision making process for all program and projects.	COB	-	Short-Term
1.4.3	Ensure annual City budget report addresses how it contributes to achieving CEERP goals and targets.	COB	-	Short-Term
1.4.4	Explore opportunities for disclosing clear, comparable, and consistent information within the City's annual financial reports about the opportunities and risks presented by climate change.	COB	-	Medium-Term
1.4.5	Develop a strategy to secure external funding opportunities and partners to help supplement municipal resources for environmental initiatives.	COB	-	Short-Term
1.4.6	Require all City strategies and master plans to align with the CEERP.*	COB	-	Ongoing
Municipal Operations and Procurement				
1.5.1	Develop a Green Purchasing Strategy and by-law to require climate change considerations for procurement of goods and services.	COB	-	Short-Term
1.5.2	Develop a Sustainable Fleet Strategy to lower emissions of municipal fleet.	COB	-	Short-term
1.5.3	Develop operational procedures to minimize the emissions of City practices (e.g. anti-idling policy for Fleet users).	COB	-	Short-Term
1.5.4	Establish a training program for the responsible use of equipment to minimize energy consumption and GHG emissions.	COB	-	Short-Term

Green Communities

#	Action	Lead	Partner(s)	Timeline
Community Design				
2.1.1	Design new communities to facilitate future distributed energy systems.	COB	DEV	Ongoing
2.1.2	Design new communities to achieve sustainable transportation targets as defined by the Transportation Master Plan.	COB	DEV	Ongoing
2.1.3	Design new communities to expand Brampton's tree canopy cover.	COB	DEV	Ongoing
2.1.4	Design new communities to improve building energy efficiency.	DEV	COB	Ongoing
2.1.5	Promote local employment opportunities in new communities, support retention of local employment in existing communities, and work to increase diversity of employment, especially in green economy sector.	COB	DEV	Ongoing
2.1.6	Design communities for higher density in appropriate locations.	COB	DEV	Ongoing
2.1.7	Partner with landowners and/or developers to create Integrated Energy Master Plans for Urban Centres, Town Centres, Corridors, and large infill opportunities.*	COB	DEV	Ongoing
2.1.8	Design new, infill, and intensification developments to support trips using sustainable modes of transportation.	DEV	COB	Ongoing
2.1.9	Ensure new neighbourhoods establish cycling and pedestrian networks to complement the Active Transportation Master Plan, and includes: <ul style="list-style-type: none"> • strong connectivity; • an appropriate variety of route types; • separated bike paths; and • end-of-trip facilities for key commercial, institutional, and transit destinations. 	COB	DEV	Ongoing
2.1.10	Develop and implement a strategy to require finer grain road and active transportation networks in large redevelopment areas.	COB	DEV	Ongoing
Policy				
2.2.1	Complete the Official Plan update to implement the Brampton 2040 Vision and the CEERP.*	COB	OP Consultant	Short-term
2.2.1.1	Update the Official Plan to include Transportation Demand Management requirements for new development.	COB	DEV	Short-term
2.2.1.2	Update the Official Plan to require the establishment of Integrated Energy Master Plans for greenfield and larger redevelopment sites and other specific types of development (government buildings, other institutional, mid-rise and high rise, large commercial, warehouses, and industry).*	COB	DEV	Short-term
2.2.1.3	Ensure City policies and programs are aligned with supporting district energy and low carbon energy systems.*	COB	DEV	Short-term

2.2.1.4	Build on existing policies and plans to direct residential and commercial growth to high growth areas/hubs to encourage the success of rapid transit infrastructure investment.	COB	DEV	Short-term
2.2.1.5	Update the Official Plan to encourage the planning, design and development of near-net zero buildings and neighbourhoods.	COB	DEV	Short-term
2.2.1.6	Update Official Plan, including Secondary Plan, policies to emphasize mixed use, higher density development in Urban Centres, Town Centres, Mobility Hubs, and along intensification corridors to support future district energy options.*	COB	DEV	Short-term
2.2.1.7	Require all new developments in Urban Centres to achieve a Sustainability Score within at least a Silver Threshold.	COB	DEV	Short-term
2.2.2	Establish an Activity Rate (ratio of jobs to population) target for the city.	COB	-	Short-term
2.2.3	Explore the opportunity to establish an incentive program for development applications that undertake and implement Integrated Energy Master Planning.*	COB	DEV	Short-term
2.2.4	Develop district energy policies, guidelines, and technical requirements for Urban Centres, Town Centres, Mobility Hubs, and along intensification corridors (e.g. ensure home and buildings are district energy ready in high growth areas).*	COB	DEV	Short-term
2.2.5	Plan the Heritage Heights Secondary Plan as a near net zero community.	COB	DEV	Short-term
2.2.6	Update the Sustainable Community Program: New Development (i.e. Development Design Guidelines, Sustainability Metrics) to align with the goals and targets of the CEERP.*	COB	DEV	Short-term
2.2.7	Update the complete submission requirements for development applications to align with the goals and targets of the CEERP.*	COB	DEV	Medium-term
2.2.8	Identify opportunities to introduce new legislative, policy, and/or programs, including by-laws and incentive programs, to require implementation of climate resilience measures (e.g. green roof by-law) in new buildings.	COB	DEV	Medium-term

Transportation Efficiency

#	Action	Lead	Partner(s)	Timeline
Transit				
3.1.1	Advocate to Provincial and Federal governments for service, infrastructure, and policy improvements to interregional transit services that serve Brampton (e.g. schedule improvements, fare integration, etc.).	COB	ROP	Ongoing
3.1.2	Implement network improvements and undertake planning to increase transit service within Brampton (e.g. new routes, increased headways, higher order transit, transit priority measures, advanced technology, etc.).	COB	-	Ongoing
3.1.3	Prioritize transit as the preferred mode of travel in the City's Transportation Master Plan.	COB	-	Medium-term

3.1.4	Develop a Sustainable Fleet Strategy for Brampton Transit's revenue service vehicles (buses) based on the outcomes of 3.1.4.1.	COB	-	Short-term
3.1.4.1	Undertake a Network Electrification Feasibility Analysis for Brampton Transit's fleet (modelling both battery-electric and hydrogen fuel cell electric bus technologies).	COB	-	Short-term
3.1.5	Complete the Pan-Canadian Battery Electric Bus Demonstration & Integration Trial in partnership with Canadian Urban Transit Research & Innovation Consortium (CUTRIC).	COB	CUTRIC, BUS	Medium-term
3.1.6	Construct and electrify the new Third Transit Facility to support a zero tailpipe emission fleet from this new location.	COB	-	Medium-term
3.1.7	Continue to promote car-sharing and facilitate discussions around the uptake of car sharing within the city.	COB	ROP	Ongoing
3.1.8	Embed transportation-related emissions and energy targets in the City's transportation and land use planning documents.	COB	DEV	Medium-term
3.1.9	Launch a pilot project for electric vehicle shuttles between Light Rail Transit and large employment and/or residential areas.	COB	-	Long-term
Sustainable Transportation				
3.2.1	Embed Multimodal Level of Service (LOS) analysis in all transportation studies, including identifying target service levels for each transportation mode in the location and context of specific areas and transportation projects.	COB	DEV	Medium-term
3.2.2	Foster the development of services or platforms that facilitate the seamless use of multiple modes; for example, an app that allows users to seamlessly plan, pay, and manage an entire trip across multi-modes and transportations service providers.	COB	-	Long-term
3.2.3	Elevate the priority of sustainable transportation measures, such as active transportation, in the City's Transportation Master Plan.	COB	-	Medium-term
3.2.4	Explore and/or support micro mobility initiatives (e.g. bike share, etc.).	COB	-	Medium-term
3.2.5	Develop, support, and/or promote Transportation Demand Management initiatives (e.g. car pooling, teleworking) to reduce the number of trips made and/or increase trips made by sustainable modes of transportation.	COB	ROP	Medium-term
3.2.6	Develop and incorporate Sustainable Transportation targets in the Transportation Master Plan.*	COB	-	Medium-term
3.2.7	Investigate work from home program to examine reducing peak traffic time periods.	COB	-	Medium-term
3.2.8	Investigate opportunities to offer staff City fleet vehicles for work related purposes to help reduce the need to drive work and encourage the use of transit and active transportation.	COB	-	Medium-term
3.2.9	Examine free transit as per the Brampton 2040 Vision.	COB	-	Medium-term
3.2.10	Explore and implement efforts to incorporate new technology in the transportation system.	COB	-	Medium-term
3.2.11	Identify and implement strategies to reduce GHG emissions resulting from goods movement.	ROP	COB	Medium-term

Active Transportation				
3.3.1	Implement projects in the Active Transportation Master Plan to enhance/complete the Active Transportation network and support a walking and cycling culture.	COB	ROP	Ongoing
3.3.2	Encourage school-oriented programs to increase active transportation initiatives, such as Peel Safe and Active Routes to School (PSARTS) Committee, and the Peel Public Health (PPH) School Health Team and Active Living Team.	COB	ROP, SB	Medium-term
3.3.3	Improve safe cycling and walking access to schools and end-of-trip facilities for students and school staff, such as Peel Vision Zero initiative.	COB	SB	Medium-term
3.3.4	Advocate to the Province to include active transportation infrastructure as standard practice for infrastructure projects, including an active transportation corridor as part of the Hwy 413/GTA West Corridor and within MTO bridge crossings.	COB	ROP	Medium-term
3.3.5	Improve integration of land use and transportation planning such that new development generates fewer or shorter trips.	COB	-	Short-term
3.3.6	Explore and support micro mobility initiatives (e.g. bike share, etc.).	COB	-	Medium-term
Zero Emissions Fleet				
3.4.1	Explore opportunities through business licensing to promote sustainable/green fleets.	COB	BBOT	Medium-term
3.4.2	Explore opportunities to provide incentives for low and zero emission vehicles (e.g. priority parking spots).	COB	-	Medium-term
3.4.3	Increase the number of EV charging stations at municipal facilities.	COB	-	Ongoing
3.4.4	Update Zoning By-law to set a minimum number of EV charging stations at private facilities.	COB	-	Medium-term
3.4.5	Provide incentives to encourage new construction to be EV-ready.	COB	DEV	Medium-term
3.4.6	Advocate the Federal government for higher vehicle efficiency standards.	COB	ROP	Ongoing
Complete Streets				
3.5.1	Embed the Complete Street Guidelines in transportation planning, infrastructure planning, and urban design plans and processes.	COB	ROP, DEV	Medium-term
3.5.2	Incorporate complete streets design standards for all new and reconstructed arterial and collector roads unless demonstrated that it is not feasible to do so.	COB	ROP	Medium-term
3.5.3	Implement recommendations identified in the Complete Streets Guidelines.	COB	-	Medium-term
Policy and Plans				
3.6.1	Collaborate with Provincial, Regional, and municipal partners on sustainable transportation land use policy and infrastructure implementation initiatives.	COB	ROP	Ongoing

3.6.2	Update the Official Plan to require new development to be transit friendly by requiring applicant so submit Transit Feasibility Studies.	COB	DEV	Short-term
3.6.3	Increase local employment opportunities for residents and reduce outbound commuting.	COB	DEV	Long-term
3.6.4	Ensure City policies and programs support transportation efficiency and CEERP goals and targets.*	COB	ROP	Medium-term
3.6.4.1	Update the Transportation Master Plan to align with the CEERP targets.*	COB	-	Medium-term
3.6.4.2	Update Transportation Master Plan to include Passenger Kilometres Travelled performance indices and targets.*	COB	-	Medium-term
3.6.5	Embed transportation-related direction from the Brampton Vision 2040 into the City's transportation and land use plans, such as priority of modes, providing travel choices, and ensuring safety.	COB	-	Medium-term
3.6.6	Explore the feasibility of implementing a road pricing program alongside Regional and Provincial partners.	COB	ROP	Medium-term
3.6.7	Advocate the Provincial government for high occupancy vehicle (HOV) lanes on all 400 series Highways.	COB	ROP	Medium-term
3.6.8	Undertake a feasibility study for HOV lanes on regional and municipal roads.	COB	ROP	Medium-term
3.6.9	Undertake, with Regional partners, a feasibility study of implementing a parking spot pricing program	COB	ROP	Medium-term
3.6.10	Participate in the Region of Peel's Goods Movement Task Force and Smart Freight Centre program.	COB	ROP	Short-term

Home & Building Efficiency

#	Action	Lead	Partner(s)	Timeline
Home Efficiency				
4.1.1	Develop a Home Retrofit Program (HRP) to achieve deep energy efficiency savings.*	COMM	COB, TAF, CAC, DEV	Short-term
4.1.1.1	Develop a targeted program based on energy mapping, community GHG emissions, age of community.	COMM	COB, TAF, CAC	Short-term
4.1.1.2	Update energy and GHG emissions data on regular cycles (e.g. annually, every five years).	COMM	COB, TAF, CAC	Ongoing
4.1.1.3	Investigate the establishment of a home energy efficient retrofit company to offer standardized energy efficient retrofits and other energy technologies (e.g. solar hot water) to homes and other buildings.	COMM	COB, TAF, CAC, DEV, ROP	Short-term
4.1.1.4	Investigate partnership opportunities (e.g. The Atmospheric Fund and Clean Air Council) to deliver comprehensive home retrofit program, including the use of property assessed financing (i.e. Local Improvement Charges), to assist homeowners with financing standardized energy and water retrofits.	COMM	COB, TAF, CAC, DEV	Medium-term

4.1.1.5	Explore a Home Retrofit Program focused on a Property Assessed Clean Energy (PACE) program approach.	COMM	COB, TAF, CAC, DEV	Short-term
4.1.1.6	Investigate impacts of a Home Retrofit Program on the City's Building Permit review process.	COMM	COB	Medium-term
4.1.1.7	Identify opportunities within SNAPs to implement community retrofit programs and/or related projects.	COB	DEV	Short-term
4.1.2	Investigate multi-municipal collaboration on delivering a regional Home Retrofit Program.	COMM	COB, ROP, TAF, CAC, DEV	Medium-term
4.1.3	Develop an energy efficient retrofit program/strategy for high-density residential buildings.	COMM	COB, ROP, TAF, CAC, DEV	Medium-term
4.1.4	Develop an energy efficient retrofit program/strategy affordable housing buildings.	COMM	COB, ROP, TAF, CAC, DEV	Medium-term
4.1.5	Encourage the Region of Peel to integrate water efficiency programs into the Home Retrofit Program.	COMM	ROP	Medium-term
Building Efficiency				
4.2.1	Develop an energy efficient retrofit strategy/program for the Institution, Commercial, and Industrial (ICI) sector.	COMM	COB, ROP, TAF, CAC, DEV	Medium-term
4.2.2	Develop minimum Energy Performance Targets for all new municipal buildings.	COB	COMM	Short-term
4.2.3	Explore land-use tools and incentives to help property owners and managers undertake deep energy and GHG emissions retrofits of existing buildings.	COB	COMM	Medium-term
4.2.3.1	Investigate the use of business licenses to promote a business retrofit program for more energy intensive sectors (e.g. grocery stores, small industry, food services).	COB	COMM	Short-term
4.2.3.2	Investigate the opportunity to provide density bonusing for energy efficiency in appropriate zones and for specific building types.	COB	COMM	Mid-term
4.2.4	Investigate the opportunity to develop a Community Improvement Plan (CIP) to promote energy efficiency and GHG emissions reduction in buildings.	COB	COMM	Medium-term
4.2.5	Work with the development industry to continually improve energy performance of new construction.	COB	DEV, COMM	Ongoing
4.2.6	Complete a business case for establishing a new or adopting an existing Energy Performance Label program for homes and buildings.	COB	DEV, COMM	Medium-term
4.2.7	Promote skilled training in retrofits in high schools and post-secondary institutions.	COB	SB, SH, RY, AL, COMM	Medium-term
Policy				
4.3.1	Ensure City policies and programs are aligned with supporting the objectives for Home and Building Efficiency.* <ul style="list-style-type: none"> • Update Official Plan Policies • Update Design Guidelines and Sustainability Metrics 	COB	COMM	Short-term

- Update Secondary Plan Policies

Local Energy Supply and Distribution

#	Action	Lead	Partner(s)	Timeline
Corporate				
5.1.1	Complete Integrated Energy Management Plans for priority municipal facilities to align with the targets of the Corporate Energy and Emissions Management Plan 2019-2024: A Zero Carbon Transition and the CEERP.*	COB	COMM, DEV	Medium-term
5.1.2	Investigate distributed energy options for City facilities, including solar, geothermal, and waste heat recovery.	COB	COMM	Medium-term
District Energy				
5.2.1	Develop business cases for District Energy System, including but not limited to, low carbon fuel options (e.g. geothermal, heat recovery, wastewater heat recovery, solar PVT, and hybrid of PV and thermal) in areas identified the CEERP energy district mapping. *	COMM	COB, DEV, ROP, BUS	Short-term
5.2.2	Investigate the requirements for the use of City road right of ways for the purposes of installing district energy infrastructure.*	COB	ROP	Medium-term
5.2.3	Develop a Business Case for establishing a district energy company to distribute thermal energy to homes and buildings.*	COM	COB, ROP, UT	Short-term
5.2.4	Identify and pursue opportunities for combined heat and power (CHP) partnerships for district energy.*	COB	COMM	Medium-term
Low Carbon Energy Sources				
5.3.1	Investigate opportunities to streamline the Building Permit process for zero GHG emissions technologies, such as electric vehicle charging, heat pumps, solar panels, etc.	COB	COMM	Medium-term
5.3.2	Advocate for national and provincial Building Code amendments that require buildings of a certain size, location and use to be built compatible for future low carbon district energy connections and solar PV.*	COMM	COB, ROP	Medium-term
5.3.3	Establish policies and plans to guide the City and private sector to transition to renewables to reduce the carbon intensity of buildings on low carbon district energy systems.*	COB	COMM, ROP	Long-term
5.3.4	Develop a Waste Heat Strategy that identifies reliable sources and has a clear set of planning and design objectives to support district energy.*	COMM	COB, ROP	Medium-term
5.3.5	Investigate municipal tools to facilitate uptake of rooftop solar hot water systems and solar photovoltaic installations.	COB	COMM, ROP	Medium-term

5.3.6	Identify and designate potential large-scale solar photovoltaic installation locations, such as car parking structures, commercial rooftops, etc.	COMM	COB, ROP	Medium-term
Policy				
5.4.1	Ensure City policies and programs are aligned with supporting the objectives for Local Energy Supply and Distribution.*	COB	-	Short-term
5.4.2	Identify policies to support local power generation options, including off-grid and distributed grid options.*	COB	COMM	Medium-term

Industrial Efficiency

#	Action	Lead	Partner(s)	Timeline
Corporate				
6.1.1	Implement an Economic Development marketing campaign highlighting Brampton energy advantages as an incentive to locate business in this city.	COB	COMM	Medium-term
6.1.2	Establish or join an existing community of practice for facility energy managers from public and private sectors to share local industrial energy management expertise.	COMM	BBOT, DEV, PPG	Short-term
6.1.3	Develop a comprehensive inventory of large energy users in Brampton.	COMM	COB	Medium-term
6.1.4	Develop a comprehensive inventory of “green” employers in Brampton.	COMM	COB	Medium-term

Green Infrastructure

#	Action	Lead	Partner(s)	Timeline
Green Infrastructure				
7.1.1	Implement the City’s One Million Trees Program.	COB	ROP, DEV, CA, NP	Ongoing
7.1.2	Develop and implement an Urban Forest Management Plan.	COB	CA	Short-term
7.1.3	Investigate opportunities to encourage the use of green roofs and white roofs on large buildings.	COB	-	Medium-term
7.1.4	Implement the City’s Natural Heritage Restoration Program.	COB	CA	Ongoing
7.1.5	Continue to collaborate on the restoration and expansion of Brampton’s natural heritage system.	COB	CA	Ongoing
7.1.6	Continue to expand the Community Garden Program.	COB	-	Short-term
7.1.7	Develop a mechanism to value green infrastructure assets and the benefits of these assets to the community.	COB	CA	Medium-term

7.1.7.1	Partner with the Credit Valley Conservation on the development of a business case for natural assets.	COB	CA, ROP	Ongoing
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Communication, Engagement, and Monitoring

#	Action	Lead	Partner(s)	Timeline
Communication, Engagement, and Monitoring				
8.1.1	Develop a communication strategy to increase public awareness of energy planning and climate mitigation.	COB	COMM, ROP	Short-term
8.1.2	Develop an engagement strategy to raise the awareness of energy saving opportunities.	COB	COMM	Medium-term
8.1.3	Pursue collaborations with community groups and other organizations to build awareness of the CEERP.	COMM	COB	Ongoing
8.1.4	Expand the mandate of the Grow Green Team to include CEERP implementation.	COB	COMM	Short-term
8.1.5	Create targeted outreach programs based on energy use in residential, commercial, and industrial sectors.	COMM	COB	Medium-term
8.1.6	Develop data collection and monitoring protocol for measuring and reporting on community and corporate GHG emissions.	COB	COMM	Short-term
8.1.7	Coordinate the monitoring protocol with the monitoring and reporting for the Environmental Master Plan.	COB	COMM	Short-term
8.1.8	Commence the update of the CEERP every 5 years.	COB	COMM	Long-term
8.1.9	Explore a rewards based program to encourage individual and business behavioral changes.	COB	COMM	Medium-term

5.8 Roles: Working Together

The success of the CEERP depends on the combined efforts of the municipality, local utilities, industry, businesses, residents, and community stakeholders.

Consequently, a wide variety of local stakeholders were engaged in its development to:

- earn community buy-in for the vision and goals;
- grow the capacity of the community to implement the plan; and
- motivate the public and community stakeholders to act.

Guided by an extensive Engagement Plan (see CEERP Engagement Plan, 2019), various channels were developed to engage the appropriate stakeholders and community-at-large in the development of the CEERP.

The sub-section below provides an overview of the roles of different community sectors and stakeholders. Further discussion and details can be found under each Strategic Direction of the CEERP (see Section 5.4) as well as in the Action Plan Table (see Section 5.7).

5.8.1 What is the City of Brampton's Role?

While implementation is a community-wide effort, the City of Brampton is a key stakeholder and has five essential roles, which include community facilitation, municipal policy alignment, economic development, corporate leadership, and education.

Community facilitator

The City of Brampton is able to organize stakeholders to establish a vision and goals for its community. An important success factor in the implementation of broad, system-wide change is municipal endorsement and support of the vision and goals. The initiation and completion of the CEERP is a demonstration of this role.

Municipal policy alignment

The City of Brampton approves policies and by-laws that guide the growth and development of the community, including housing and transportation systems.

Consequently, the City has an important role in ensuring its policies and by-laws are aligned with the vision and goals of the Plan. By doing so, the City can establish a policy framework that supports and activates local stakeholders and product and service providers in the transitioning energy market.

Economic development

The City of Brampton, through their Economic Development department and partners, can play a key role in retaining and supporting existing businesses and attracting new businesses through the value-added opportunities identified by the Plan. An excellent example was the City of Brampton facilitating two Nordic Urban Labs to identify investment opportunities in Bramalea and Uptown during the development of the CEERP.

Corporate leadership and role model

The City has an important role in demonstrating corporate leadership in the community. The City can update its own internal policies and processes and apply standards in its capital projects and municipal operations (i.e. facilities, fleet, and transit) that reflect the CEERP objectives. The City of Brampton's Corporate Energy and Emissions Management Plan (2019 – 2024): A Zero Carbon Transition is an example of the commitment to the minimizing of energy use and emissions in existing and new facilities.

Education

The City of Brampton has many opportunities to engage with residents and business owners to promote the benefits of community energy planning and raise energy literacy. The City is in a position to be a reliable and trusted source of information and guidance during this energy transition and to communicate expectations and community benefits resulting from the CEERP, particularly its Priority Projects.

5.8.2 What is the Role of the Region of Peel?

The City of Brampton is a lower-tier municipality located in the Regional (upper-tier) Municipality of Peel. The Region of Peel works with residents and partners to create a healthy, safe and connected community for more than 1.5 million people and 175,000 businesses in the Cities of Brampton and Mississauga and the Town of Caledon. The Region provides daily and vital services, including water supply, wastewater and waste management, Regional roads and transportation, affordable housing support, long term care, and public health (chronic and infectious disease prevention), as well as Regional land use planning and growth management.

The Region of Peel provides a wide range of programs and services to those living and working in Peel, on the basis of cooperation with the local municipalities. The Region can lead and support, where appropriate, the identified actions that are in alignment with the Region's established long-term strategic framework and policies, which provides the foundation and basis for the delivery of Regional programs and services.

The Region of Peel, in solidarity with its local municipalities, declared a climate emergency in October 2019. At the same time, Regional Council approved its Climate Change Master Plan (CCMP) that has a corporate GHG reduction target of 45% below 2010 levels by 2030. Similar to Brampton's municipal operations, the Region's corporate emissions are a small percentage of community emissions, making "leading by example" a consistent theme of the two levels of government. To help strengthen the Region's position and support for community energy planning, the CCMP includes actions such as "enable alignment of Regional actions with transition towards diversified and decentralized energy systems".

With the seven strategic directions of the CEERP, there is clear alignment with Regional services and priorities, for example:

- Green Communities align with the Region's Official Plan policy amendments and growth management planning that will look to incorporate district energy planning and climate change considerations as part of achieving complete communities.

- Home and Building Efficiency relates to the state of good repair and building improvements that target energy efficiency and GHG reductions for Regionally-owned affordable housing complexes and other Regional facilities.
- Local Energy Supply and Distribution as an enabling action in the Region's Climate Change Master Plan and emerging direction in Region's Official Plan policy.
- Transportation Efficiency corresponds with the Region's Sustainable Transportation Strategy and opportunities with the Region's Goods Movement Task Force.
- Green Infrastructure relates to the direction in the Climate Change Master Plan to protect and increase green infrastructure throughout Peel, which includes implementing green infrastructure elements contained in the Region's future Stormwater Servicing Master Plan for Regional road infrastructure. It also supports the Region's investment in developing best practice urban forestry guidelines through the Peel Climate Change Partnership.

The Region's Office of Climate Change and Energy Management (OCCEM) builds upon climate change and energy management initiatives happening across Peel and integrates that work towards achieving climate change outcomes.

Working with Regional departments and community partners, OCCEM is:

- developing solutions to reduce GHG emissions;
- setting actions in place that will prepare Peel for changes in our weather and seasons;
- ensuring that the Region of Peel is positioned to respond to climate change; and
- ensuring climate change and energy management measures are effectively integrated and implemented into policy design and decision-making.

The installation of Electric Vehicle charging stations is just one way that the Region has taken action on climate change by reducing GHG emissions and helping build a greener, healthier, low-carbon community. There are

currently 43 EV charging stations across 11 Regional sites with two locations offering public charging during the daytime.

Ongoing consultation with the Region of Peel will continue to further define roles, service outcome alignment, and identify opportunities for collaboration with the City of Brampton as the CEERP moves into implementation phase.

5.8.3 What is the Role of Utilities?

Brampton's utilities play an integral role in the successful implementation of the CEERP and its near and mid-term Priority Projects. In Brampton, there are currently two energy utilities. Enbridge provides natural gas heating and Alectra provides electricity to Brampton homes and businesses.

Utilities provide energy conservation programs to better manage customers' energy consumption, and consequently, their carbon emissions. Their residential, municipal, institutional, commercial, and industrial customers benefit from advice on efficient and cost-effective energy use, incentives to help cover energy project costs, and enabling programs that promote lasting behaviour changes that lead to a culture of conservation and environmental sustainability.

Since 1995, energy efficiency and conservation programs from Enbridge Gas have saved their customers about 20 billion cubic metres of natural gas and reduced CO₂ emissions by about 40 million tonnes, lowering energy costs at the same time.

Collaborative utility and municipal-led energy efficiency programs have made significant contributions towards the advancement of municipal (and higher-level government) policy goals and energy efficiency and GHG reduction targets.

In relation to the Priority Projects, Enbridge's Home Retrofit Program promotes deep energy retrofits through a multitude of channels, such as HVAC contractors, residential energy auditors, and other product and service providers. Leveraging this program as a foundation for Brampton's Home and Building Efficiency Strategy will minimize

program duplication, optimize resources/program networks and process efficiencies, create new funding opportunities for customers, and gain higher participation and engagement from the community. Similarly, experiences with implementing their energy management program for small to very large industrial customers can be valuable in establishing the community of practice as part of the Industrial Efficiency project.

Alectra is also a key player as it distributes locally generated electricity. As an innovation hub for green technology solutions, their Green Energy and Technology Centre identifies, evaluates, develops, and accelerates emerging and clean energy solutions. Through grid innovation, Alectra will leverage grid modernization technologies to enable a more sustainable grid.

In 2015, Alectra launched a residential solar storage pilot, POWER.HOUSE. This is a fully integrated, digitally controlled solution that is providing key insights about the potential to deploy residential solar at scale, as well as determining consumers' readiness to take an active role in managing their homes' energy efficiency. The pilot evaluates the economic and grid benefits of residential solar storage for consumers and Ontario's electricity system.

Alectra's POWER.HOUSE Hybrid pilot shifts energy generation from large centralized GHG emission-intensive sources to decentralized, clean generation using solar panels, in-home EV charging stations, battery storage, dispatchable hybrid heating (dual fuels, gas and electric), and combined heat and power (CHP).

Alectra has demonstrated further energy innovation through its Alectra Drive for the Workplace program. The goal of Alectra Drive for the Workplace is to demonstrate the value of a smart EV charging system that manages the flow of electricity needed to serve the building and EV charging stations. This ensures that electricity costs are minimized while EV drivers have an easy and accessible charging solution. This program aims to encourage the adoption of EV technology while helping businesses to manage their energy costs.

Collaboration between Brampton and its utilities to develop well-designed programs is crucial to achieving CEERP's goals.

5.8.4 What is the Development Industry Role?

Since Brampton's largest users of energy are transportation and residential uses, with the transportation sector representing 35% of source energy use and the residential sector representing 26% of source energy use, the design and construction of our communities and homes is an important aspect of reducing energy use and emissions.

Through responsible planning and management of environmental resources, the development industry can be a key driver in building green communities. They can plan for communities that strive for responsible construction and promote sustainable living, including elements such as green development standards (e.g. LEED, PassiveHouse), energy efficient community design, mixed uses, trails to promote active transportation, natural heritage conservation, urban infill projects, green rooftops, and alternative energy systems.

Building Industry and Land Development Association

The Building Industry and Land Development Association (BILD) is a leading voice of the home building, land development, and professional renovation industry in the Greater Toronto Area. BILD has more than 1,500 member companies from all corners of the industry. In addition to home builders, land developers, and professional RenoMark™ renovators, BILD members include financial and professional service organizations, trade contractors, and manufacturers and suppliers of all types of home-oriented products.

BILD's mission is to enhance the health, vitality and reputation of the home building, residential and non-residential land development, and professional renovation industry. It encourages innovations and excellence in the planning and building of sustainable communities and in the redevelopment and renovation of existing communities.



5.8.5 What is the Role of Business?

For a variety of reasons (consumer interest, high and volatile energy prices, and brand image/public relations) many businesses have taken actions to reduce their energy consumption and GHG emissions. Companies can reduce embedded emissions of their products by working with their suppliers to help reduce GHG emissions in the product's manufacturing, support and adopt circular economy business models, and lower emissions from transportation and logistics. Companies can also offer reusable or low emission products and services to customers and educate consumers through product labelling and tips that customers can take to reduce their carbon footprints.

5.8.6 What is the Role of Industry?

Industry contributes directly and indirectly (through consumption of electricity) to Brampton's GHG emissions. However, industries are continuously improving their energy efficiency through their corporate energy management standards. Companies of all sizes use energy audits to identify opportunities for reducing energy use. Companies can use benchmarking programs developed through trade associations to compare their operations with others, to the industry average, or to best practice, in order to improve energy efficiency. When industries improve energy efficiency, they are saving money as well as emissions.

Industries may consider energy recovery techniques such as heat, power, and fuel recovery. They can re-use the discarded heat in other processes on-site, or it can be used by other nearby industries in their processes. Cogeneration involves using energy losses in power production to generate heat and/or cold for industrial processes and district heating, which provides higher system efficiencies. Co-siting of industries can achieve GHG mitigation by integrating energy systems and allowing the use of byproducts as useful energy. Industries may also consider the use of new technologies which increases competitiveness while reducing GHG emissions and improving energy efficiency.

The City of Brampton can assist industries that are exploring opportunities to reduce their energy use and emissions by providing additional assistance when navigating the

planning process in order to achieve their energy and emissions reduction targets. The City can also advocate to other levels of government and promote joint outreach opportunities with other agencies to advise on the resources available to support them.

5.8.7 What is the Role of Institutions and Non-Profits?

Institutions and non-profit organizations within the GTA offer partnership opportunities and vital information to assist Brampton in achieving its CEERP objectives and targets. Below is just a snapshot of some of the leading institutions and non-profits working in the energy sector.

Sheridan College

Sheridan College is a primary partner in the development of the CEERP by providing funding and staff resources towards the completion of the plan. Sheridan will play an important role in assisting the City and the community in implementing many of the CEERP actions.

Founded in 1967, Sheridan has grown from a local college of 400 students to one of Ontario's leading postsecondary institutions, educating approximately 24,500 full-time and 18,500 continuing and part-time studies students every year on three campuses – Oakville, Brampton, and Mississauga. As an academic institution, employer, investor, and community partner, Sheridan strives to become the institutional model for how a 21st century organization embraces sustainability. It also aims to foster an institutional culture defined by informed and responsible decision making that reflects the crucial balance between economic, social, and environmental priorities, and has built its leadership and reputation by using their campuses as 'living laboratories' for sustainability transition, curricular innovation, and interdisciplinary teaching and learning.

The Davis Campus in Brampton is Sheridan's largest campus, home to more than 12,000 students. This campus is home to the applied health, community services, and engineering and technology programs. In 2017, Davis officially opened its new Skilled Trades Centre. That same year Sheridan completed its Energy Centre that showcases modern systems for the simultaneous production of thermal and electrical energy, and will also be used as an

educational tool for engineering technology programs, as well as a training facility for the numerous trades programs.

In 2016, Sheridan received federal and provincial funding to build on its established district energy expertise and infrastructure by reaching beyond its campus boundaries to collaborate with municipal and public partners in Brampton and Oakville. The goal of the project is to extend Sheridan's networks into community district energy nodes, establish appropriate governance, and validate a replicable and scalable model for academic-municipal collaboration on district energy.

Clean Air Council

The Clean Air Council (CAC) is a network of over 30 municipalities and health units from across Ontario. Since 2000, CAC members have been working collaboratively on the development and implementation of clean air, sustainability, and resilience actions. The Clean Air Council is based on the premise that municipalities benefit from actions that reduce energy use, reduce emissions, make the movement of people and goods more efficient, and make communities more livable, competitive, and resilient.

CAC recently launched a new program called Collaboration on Home Energy Efficiency Retrofits in Ontario. The overall goal of this project is to collaboratively design a high-quality, multi-municipality pilot that will: a) assess the effectiveness of the Local Improvement Charge (LIC) financing powers in accelerating deep residential energy retrofits and b) provide insights and guidance regarding full-scale implementation. The priority focus will be on the residential sector in Ontario, both single-family and multi-unit.

The Atmospheric Fund

The Atmospheric Fund (TAF) is a regional climate agency that invests in low-carbon solutions for the Greater Toronto and Hamilton Area and helps scale them up for broad implementation. TAF is experienced in collaborating with stakeholders in the private, public, and non-profit sectors who have ideas and opportunities for reducing carbon emissions. It advances the most promising concepts by investing, providing grants, influencing policies, and running programs. TAF is primarily focused on programs/projects that offer benefits beyond carbon reduction such as improving people's health, creating new green jobs, boosting urban resiliency, and contributing to a fair society.

Partners in Project Green

The development of Partners in Project Green (PPG) was the culmination of more than a decade of partnership between the Greater Toronto Airports Authority (GTAA) and Toronto and Region Conservation Authority (TRCA). In 2008, after extensive consultation with businesses and various levels of government, Partners in Project Green: A Pearson Eco-Business Zone was officially launched with the goal of creating a Pearson Eco-Business Zone known for its competitive, high-performance, and eco-friendly business climate.

PPG is committed to helping businesses turn sustainable practices into bottom-line success. It brings like-minded organizations together to talk about sustainability issues, share creative ideas and success stories, and collaborate on green business initiatives. PPG's unique peer-to-peer learning and collaboration opportunities help businesses to achieve breakthrough results in energy performance, waste management, water stewardship, and stakeholder engagement.

5.8.8 What is the Role of Citizens?

The CEERP requires buy-in from citizens since many of the changes to achieve energy efficiency and GHG emission reductions will need to be championed and implemented by residents. Through the 2040 Vision engagement process, Bramptonians expressed their support for the environment. Vision 1: Sustainability and the Environment states that in 2040, "Brampton will be a mosaic of sustainable urban places, sitting within an interconnected green park network, with its people as environmental stewards – targeting 'one-planet' living."

Achieving the CEERP targets and the Vision's "one-planet" living will require all Brampton residents to make behavioural changes to their everyday lives, including walking instead of driving to the corner store, carpooling, taking transit to work, or buying "green" products. It will also require larger decisions such as to purchase energy efficient appliances, undertaking home energy retrofits, and investing in an electric vehicle. Finally, it means getting more involved in the community, by planting trees, organizing a green event, and supporting the actions of leaders who strive to address climate change.

5.8.8 What is the Role of the Community Organization?

One of the CEERP's priority projects involves the establishment of a Community Organization to lead the development and implementation of select priority projects. As noted above, a number of CEERP objectives, targets, and priority projects will be achieved through actions taken by the City of Brampton, Region of Peel, utilities, business, developers, and residents. However, there is a gap in the capacity within the city to achieve some objectives, targets and priority projects. This includes the following priority projects:

1. Establish a system to deliver standardized retrofits to Brampton homeowners.
2. Develop Integrated Energy Master Plans for public facilities and private development.
3. Integrate District Energy Systems in appropriate locations within Brampton

The need for this type of Community Organization was first described in the Brampton 2040 Vision as the "Institute for Sustainable Brampton" (i.e. ISB).¹⁰ The Vision described an entity intended to mobilize a massive, community-wide effort to shift the trajectory of the whole city by marshalling financial and social capital to secure the practical capacity for sustainability.

Recognizing the importance of the CEERP and the gaps in implementing some of the priority projects, a framework for a Community Organization based on the initial ISB vision was formed around energy and emissions action. This Community Organization, now renamed by the Community Taskforce as the Centre for Community Energy Transformation (CCET), will be an action oriented arms-length organization focused on creating a sustainable energy future with a mission to lead an inclusive suburban energy transformation.

The Community Organization will make it easier to develop those good ideas and one-off pilots that often get stuck, allowing them to be implemented more broadly and scaled up more quickly. For example, funding might support training for trades development in order to implement building retrofits.

The role of the Community Organization in implementing the CEERP is outlined on the following page.

Additional details and the framework of the Community Organization are provided in the City of Brampton's CCET report: Establishing a Centre for Community Energy Transformation: Report with Recommendations, 2020.



Role of the Community Organization in Implementing the CEERP

- Program Planning and Delivery
 - Plan, coordinate, and deliver select 2020-2025 priority projects with partners
 - Specific projects are included in the Action Plan (attached to the CEERP), and include projects related to:
 - Home efficiency
 - Building efficiency
 - District energy
 - Low carbon energy sources
 - Industrial efficiency
 - Community outreach
 - Ensure program governance, funding, and resources align with the strategic objectives and priority projects
 - Provide strategic oversight and technical advisory services for project delivery
 - Access global knowledge base and subject matter experts
- Community Engagement and Communications
 - Build a network of cross-sector stakeholders and partners
 - Provide direction as well as strategic, promotional, and funding support to delivery partners
 - Secure funding opportunities from the private and public sector
 - Communicate and engage regularly with stakeholders, the public, and funding partners
 - Develop a brand and virtual presence
- Transparency and Accountability
 - Identify key performance metrics related to management and administration of priority projects
 - Validate business cases and verify results
 - Link and coordinate priority projects to identify resource efficiencies and accelerate implementation where possible
 - Report on progress to the public, investors, and funders
- Management
 - Anticipate and plan for future resourcing on an as-needed basis
 - Write and partner to submit grant applications
 - Develop a budget and medium to long-term revenue model

5.9 Getting There

5.9.1 Accelerating the Transition

The City of Brampton has been doing well with its actions as a corporation and now needs to accelerate the urban and energy transition envisioned in the Brampton 2040 Vision and the CEERP. To do so, the City needs to take certain actions (as identified in the above Action Plan) to prepare itself for the acceleration needed to achieve the goals of the CEERP.

These corporate actions will focus on five areas:

1. Municipal resources (define and assign municipal resources)

Successful implementation of the CEERP requires a city champion, resources, and support from staff and leadership.

The CEERP must be embedded in the organizational configuration and composition of City departments and their associated divisions. A City department is typically responsible for specific goals, responsibilities, and tasks relevant to its departmental mandate/function. The way the CEERP is positioned within the City structure will influence collaboration between departments, promote corporate awareness of environmental/energy initiatives and performance, and enhance public messaging about the priority of environmental and energy sustainability within the City.

It is recommended in the CEERP Action Plan that the City take the following actions to help the CEERP succeed in the long term:

- assign CEERP implementation to a specific department/division/section that will administer responsibility for each municipal priority project and facilitate interdepartmental collaboration, funding, communication, education, and reporting on the City's performance.
- identify staff resourcing gaps and allocate resources (e.g. staff and funding) to ensure that the CEERP municipal priority projects are completed.

2. Build Awareness and Move Projects Forward (build awareness and move projects forward within and beyond the Corporation)

Communication of CEERP goals, principles, and priority projects within the Corporation and to the community will be an important element of the CEERP's success.

Internal and external education must focus on engaging stakeholders and building support to undertake the CEERP's priority projects. The public and City staff must understand what they are expected to do, what supports are in place to assist them, and what benefits are expected from their actions.

It is recommended in the CEERP Action Plan that the City take the following actions to expand awareness and initiate action amongst its departments and staff and the community at large about the CEERP:

- assign department/division/section to act as an internal resource for CEERP education and outreach;
- establish a Community Organization to lead the development and implementation of select priority projects and champion the CEERP to Brampton residents, businesses, and stakeholders;
- develop a comprehensive communication strategy that highlights the benefits of implementing the CEERP, like economic or community resilience benefits;
- host an annual CEERP event in partnership with Brampton's Environment Advisory Committee to share and learn about best practices being implemented; and
- develop an annual environmental recognition program for businesses, institutions, and citizens.

3. Performance Monitoring (establish data collection and performance monitoring methods)

Ongoing data collection, monitoring, and refinement of the priority projects over time is required to ensure effectiveness and to gauge the impact of the CEERP. Quantitative tracking of Baseline data will demonstrate whether the city is making progress towards its 2041 targets and provide evidence to support additional initiatives.

It is recommended in the CEERP Action Plan that City take the following actions to establish the basis for successful long-term monitoring of progress:

- identify and assign responsibilities for monitoring of Corporate and Community CEERP targets, including data management and reporting;
- identify if there are corporate resources/ expertise to collect data and monitor energy usage/emissions;
- establish protocols for data collection, analysis, and reporting for each CEERP priority project;
- provide a CEERP progress snapshot to Council biennially;
- provide a comprehensive CEERP implementation progress report to Council every five years;
- align CEERP reporting with the Environmental Master Plan reporting process; and
- investigate opportunities to update the Council report template to incorporate climate change/environmental implications of development applications.

4. Budgeting and Decision-making Framework (detail a budgeting and decision-making framework)

How Brampton budgets for and makes decisions about energy performance and emissions reduction initiatives and programs is fundamental to the implementation of the CEERP. Successful implementation of the CEERP will require a commitment of capital, staff, and institutional resources. The decision-making framework of each City department needs to closely consider the CEERP, as well as the cost of its action and inactions. The CEERP will also open up access to external funding resources such as provincial and federal funding programs, staff internships, and partnerships.

It is recommended in the CEERP Action Plan that the City take the following actions in order to provide support to the CEERP to assist with its long-term success:

- allocate a portion of the City's Environmental Reserve Fund to implement the CEERP's recommended priority projects;
- incorporate CEERP framework into the decision making process for all programs and projects.
- ensure annual City Budget report addresses how it contributes to achieving CEERP goals and targets;
- develop a strategy to secure external funding opportunities and partners to help supplement municipal resources for environmental initiatives; and
- require all City strategies and master plans to align with the CEERP.

5. Municipal Operations and Procurement (manage municipal operations and procurement standards)

The City of Brampton's corporate operations (e.g. facilities, fleet, and transit) contributes a small portion of Brampton's community energy use, approximately 2%. Nevertheless, the City has an important role to demonstrate leadership in the community.

In regards to its facilities, the City of Brampton has a Corporate Energy and Emissions Management Plan (2019 – 2024): A Zero Carbon Transition. This is an example of the City's commitment to reducing its energy use and emissions as it aims to achieve a zero-carbon transition for new and existing corporate facilities. It focuses on minimizing emissions and energy intensity, while maximizing cost recovery within its facilities construction, management, and operations. Through the Corporate Energy and Emissions Management Plan, the City will continue to work to reduce its own emissions and increase its energy efficiency as well as lead by example to help ease the community through the necessary energy transformation.

The City fleet is an important component of the services the City provides to the local community. The majority of vehicles in the fleet and many types of equipment (e.g. lawn mowers, leaf blowers) within the fleet currently rely on gasoline or diesel as its main source of energy. There is opportunity to improve emissions and energy use within the fleet. Internal actions recommended in the CEERP Action Plan include:

- develop a Green Purchasing Strategy and by-law to require climate change considerations;
- update the Fleet Strategy to reflect CEERP targets;
- develop operational procedures to minimize climate change, i.e. anti-idling bylaw for fleet; and
- develop a training program in the best practices and use of equipment that minimizes energy use and GHG emissions.

Transit services currently operates over 400 buses, including 120 diesel-electric hybrid Züm rapid transit buses.

Brampton's transit is still predominately fueled by diesel, however, in 2019 the City of Brampton launched its electric bus pilot project that will include eight electric busses and four high-powered overhead on route charging stations. CEERP's Transportation Efficiency targets emphasizes the importance of transitioning towards an electric transit system, as the combined measures of increasing transit use and the electrification of the transit system can make significant headway towards reducing Brampton Transit emissions and meeting the CEERP goals. It is recommended that the City work towards transitioning to a fully electric transit system, starting with updating the Transportation Master Plan to include a pathway to achieve this.

In addition to increasing the energy efficiency and reducing the GHG emission of facilities, fleet, and transit, the City will need to apply the CEERP goals and objectives to its policies and plans. The CEERP supports and builds on the intent of many other strategic City plans and studies. Other City plans, in their updates or in their implementation, will need to reference the CEERP, particularly recognizing 2041 targets and priority projects. Cross-referencing and supporting the CEERP through the implementation of other plans will ensure that the targets and priority projects of the CEERP are entrenched in the City's decision and policy-making across its departments.

5.10 Monitoring and Evaluating to 2025

Individual and independent action on climate change has been and will continue to be important. However, a primary message of the CEERP is that the scale of action required to address the climate emergency requires coordinated and combined effort by the entire city.

To ensure that the CEERP does not “sit on a shelf” and implementation of the 2020-2025 priority projects are achieved and sustained, it is necessary to dedicate resources to oversee, coordinate, and report on overall progress. These resources range from political, regional, municipal, and community stakeholders to individuals. As well, there is a need for monitoring, measuring processes, providing regular updates, and implementation tools.

5.10.1 Staff Time

The majority of priority projects outlined in this plan will require staff time to implement. This time could be spent implementing the action, overseeing its implementation by another group, or working in partnership with other organizations to complete the project. Each action has been assigned a Lead at the City, the Region or within the community that will be responsible for its implementation. Additional staff resources may be required for items that cannot be integrated into annual work plans.

5.10.2 Monitoring and Measuring Progress

The City is committed to tangible results. It will monitor progress towards its 2041 objectives and targets by integrating the CEERP reporting process with that of the Environmental Master Plan to share the status of performance at regular intervals, including:

- an update of progress towards targets, with direct reference to priority projects;
- sharing success stories;
- sharing areas for improvement or future study; and
- reporting on collaboration/partnerships.

To measure Brampton’s progress over time, the City has developed a set of objectives, targets, and priority projects for each of the strategic directions:

- Green Communities
- Transportation Efficiency
- Home and Building Efficiency
- Local Energy Supply & Distribution
- Industrial Efficiency
- Green Infrastructure
- Communications, Engagement, and Monitoring



5.9.3 Updates

The City will review/update the CEERP every five years to:

- demonstrate achievement/progress towards the objectives and targets and revise as appropriate;
- integrate new climate science and risks;
- include ideas and work from partners and the community; and
- align with other important policy and guidance documents at the City, including:
 - Official Plan,
 - Term of Council Priorities, and
 - Other Master Plans.

5.9.4 Implementation

According to the National Report on Community Energy Plan Implementation¹¹, the majority of communities with a Community Energy Plan are successfully implementing planning and policy measures (e.g. land-use policies such as an infill strategy, complete streets policies, design standards). Communities have less success implementing local financial incentives, renewable energy, district energy, and combined heat and power projects. The CCET (i.e. Community Organization) will play an important role in delivering these projects.

The study found other success factors that support the implementation of plans include:

- a champion or support from staff and leadership;
- close alignment with other planning documents; and
- plans that highlight co-benefits of actions (i.e. economic benefits, community resilience).

In moving forward, the City, the Community Organization, and other partners will ensure each department, utility, industry, business, resident, and community stakeholder clearly understand its responsibility for data collection and how that data should be organized and maintained for monitoring purposes to be used for annual and long-term reporting.

In reporting on energy and emissions reduction performance and progress, the City will ensure that the information provided is easily understood and relates to tangible outcomes. Where appropriate, the data will be stated in absolutes and will be extrapolated to reference information as percentages of the total population to ensure it remains relevant as the city grows.

5.11 Conclusion

In 2014, the Brampton Grow Green Environmental Master Plan set the stage for a more healthy, resilient and environmentally sustainable Brampton.

While much remains to be accomplished, progress has been made in implementing Brampton Grow Green, moving us closer to achieving our ambitious targets. With this CEERP, Brampton is much closer to achieving our Grow Green vision of “a community that will conserve, enhance and balance our natural and built environments to create a healthy, sustainable city. We will carry out our responsibilities to meet the needs of the present community without compromising the ability of future generations to meet their own needs.”

The City of Brampton has a lot to be proud of, including:

- In June 2019, City Council declared a climate emergency and a GHG emission reduction target of 80% by 2050.
- In partnership with Sheridan College, the City developed this Community Energy and Emissions Reduction Plan.
- The City is also working in partnership with Sheridan College and the Region of Peel to define and establish a Community Organization, the Centre for Community Energy Transformation (CCET), based on the Institute for Sustainable Brampton (ISB) recommended by the Brampton 2040 Vision.
- In November 2019, the City signed the declaration to join the Global Covenant of Mayors for Climate and Energy.
- In January 2020, Brampton Eco Park Strategy was approved, which will implement a green framework by better integrating and enhancing natural heritage spaces into our community.
- In February 2020, the Brampton One Million Trees Program was approved, which will enhance the urban forest through a robust tree planting strategy.

As Brampton moves forward with achieving the economic, emissions, and energy saving goals of the CEERP, we also need to look beyond our targets and work towards climate neutrality. By adopting the CEERP, Brampton will be joining the ranks of the global community of cities taking a leadership role in the fight against climate change. We can set an example as to what a successful, growing, suburban city looks like for others to follow.

The CEERP provides a more sustainable, urban, and vibrant future for our city, aligned with nature and “one planet” living. Our diverse community is energized and ready to take action towards energy and emissions reduction. We believe in the power of connections, and our partnerships will allow us to work towards our vision of an energy future that is clean, sustainable, resilient, and supports the Brampton 2040 Vision.

At the time of writing this report, the Covid-19 pandemic was occurring. It has shown us a glimpse of the impacts future climate threats could have on our communities. It has taught us about the urgency of taking swift action collectively and the need to build resilient communities. If we wait to see further impacts of climate change, it will be too late.

Notes

¹ 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*. https://www.ipcc.ch/site/assets/uploads/sites/2/2019/06/SR15_Full_Report_High_Res.pdf

² Source: World Economic Forum. (Dec, 2019). *The Net-Zero Challenge: Global Climate Action at a Crossroads (Part 1)*. Briefing Paper. http://www3.weforum.org/docs/WEF_The_Net_Zero_Challenge_Part1.pdf

³ Source: World Economic Forum, (Dec, 2019).

⁴ Source: Government of Canada. (2016). *Canada's Mid-Century Long-Term Low-Greenhouse Gas Development Strategy*. http://unfccc.int/files/focus/long-term_strategies/application/pdf/canadas_mid-century_long-term_strategy.pdf

⁵ "green" as in more nature, trees and natural systems present.

⁶ Source: City of Brampton. (2015). *Transportation Master Plan*.

⁷ Source: IEA. (n.d). "Energy efficiency: The first fuel of a sustainable global energy system". International Energy Agency. Retrieved from: <https://www.iea.org/topics/energyefficiency/>

⁸ Source: TRCA.(2011).Peel Region Urban Forest Strategy

⁹ Source: Natural Resources Canada. (2020). "Residential Secondary Energy Use (Final Demand) by Energy Source and End Use". Natural Resources Canada website. Retrieved from: <https://oee.nrcan.gc.ca/corporate/statistics/neud/dpa/showTable.cfm?type=HB§or=res&juris=00&rn=1&page=0>

¹⁰ Though described in the Brampton 2040 Vision as the Institute for Sustainable Brampton and referred to as the Community Organization throughout this plan, the final name is subject to change.

¹¹ Source: Quest. (2015). *National Report on Policies Supporting Community Energy Plan Implementation*. https://questcanada.org/wp-content/uploads/2018/08/2015_National-Report-on-Policies-Supporting-Community-Energy-Plan-Implementation_Full_Report.pdf

Appendices

Figure 1: Potential Brampton District Energy Districts Map

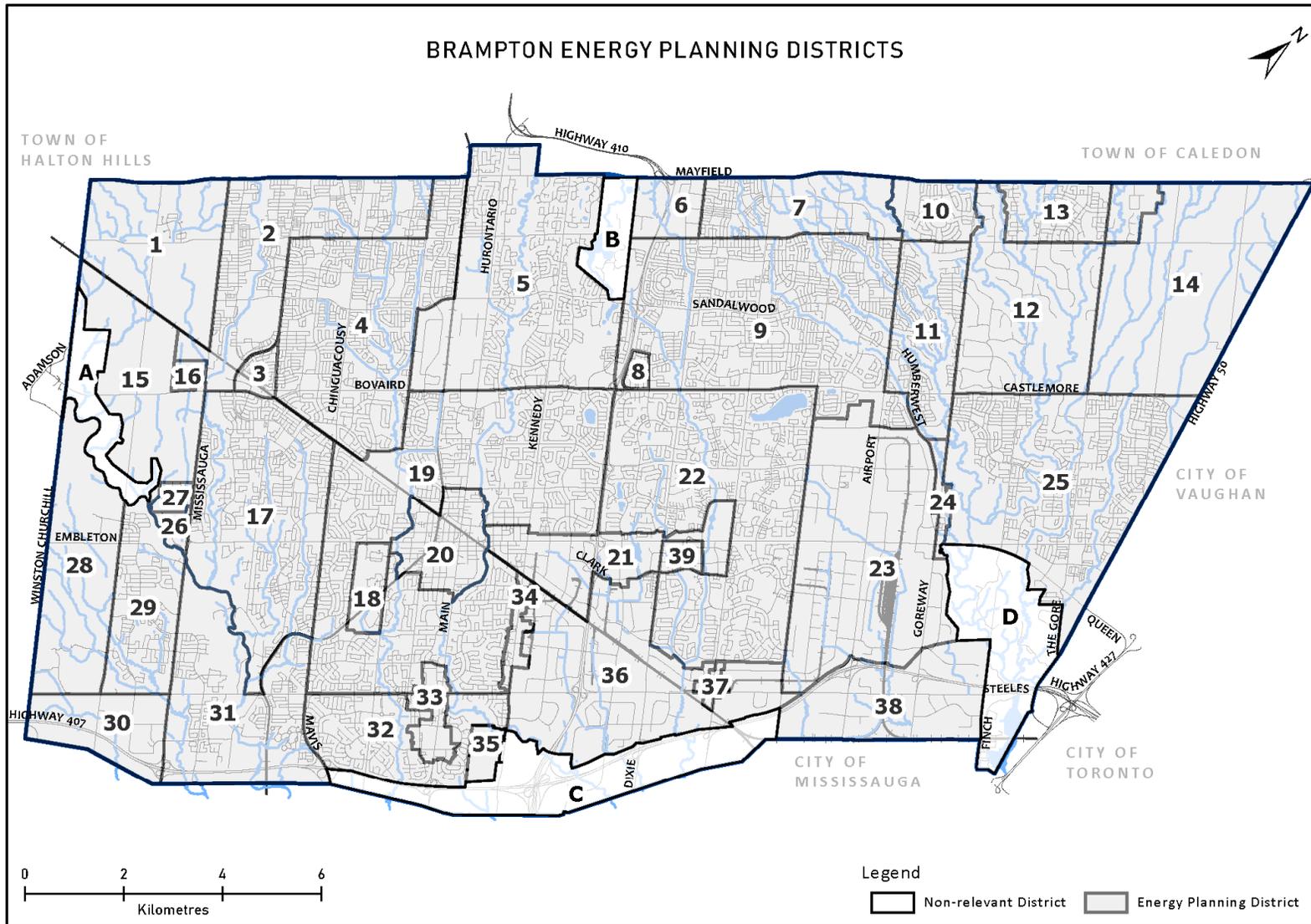


Figure 3: 2016 Base Case Source Energy Consumption

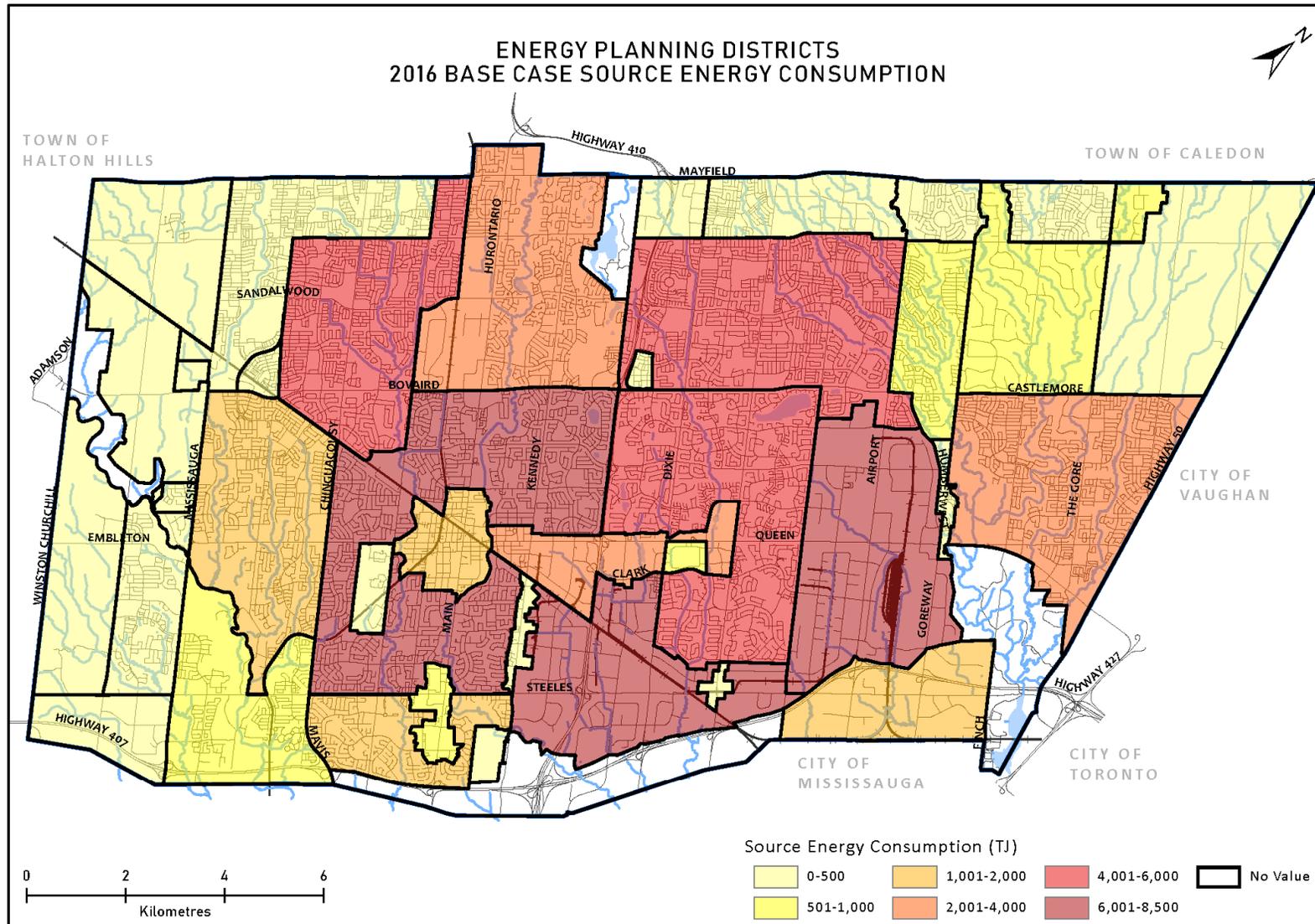


Figure 5: 2016 Base Case Water Use

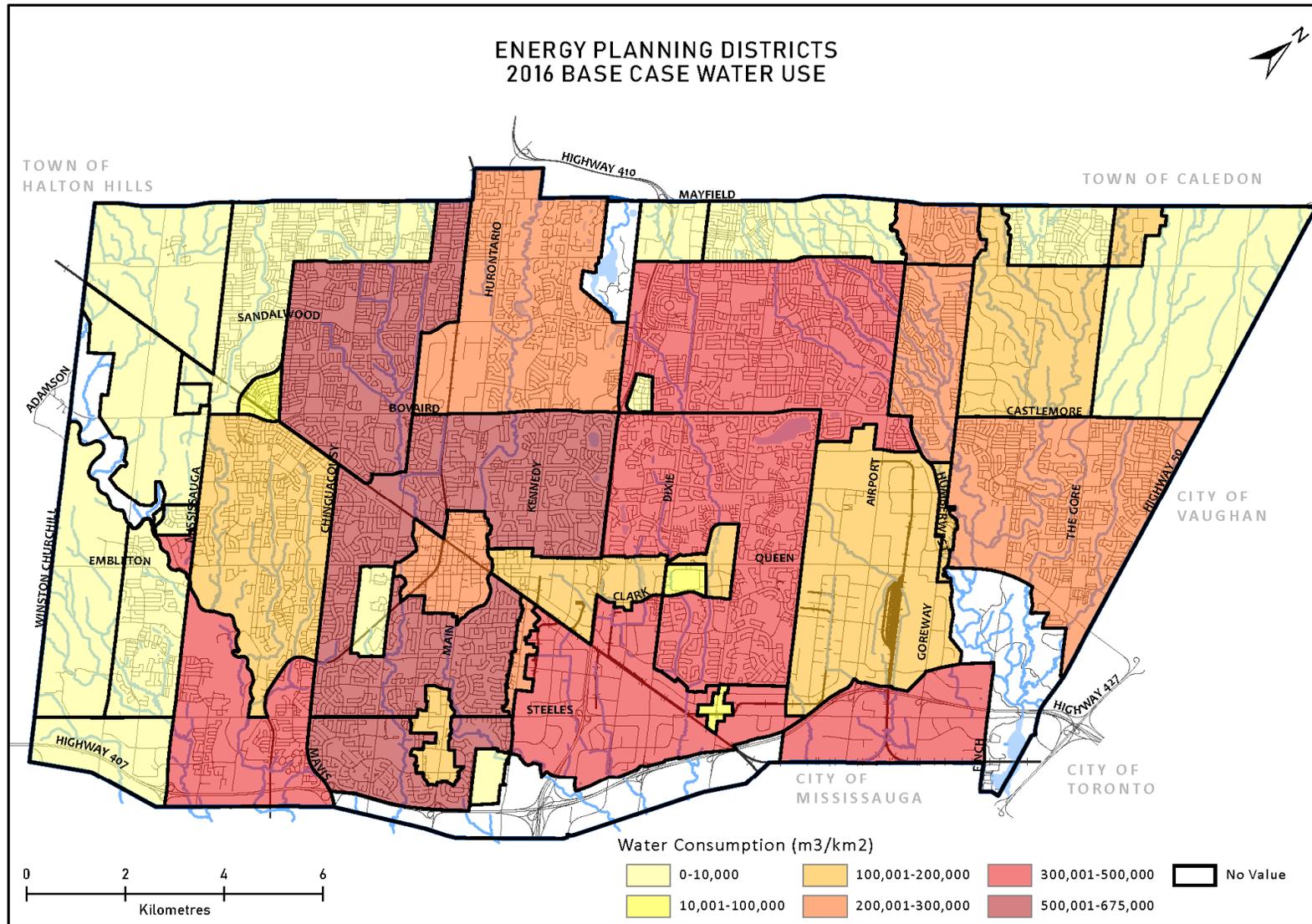


Figure 6: 2050 Base Case GHG Emissions

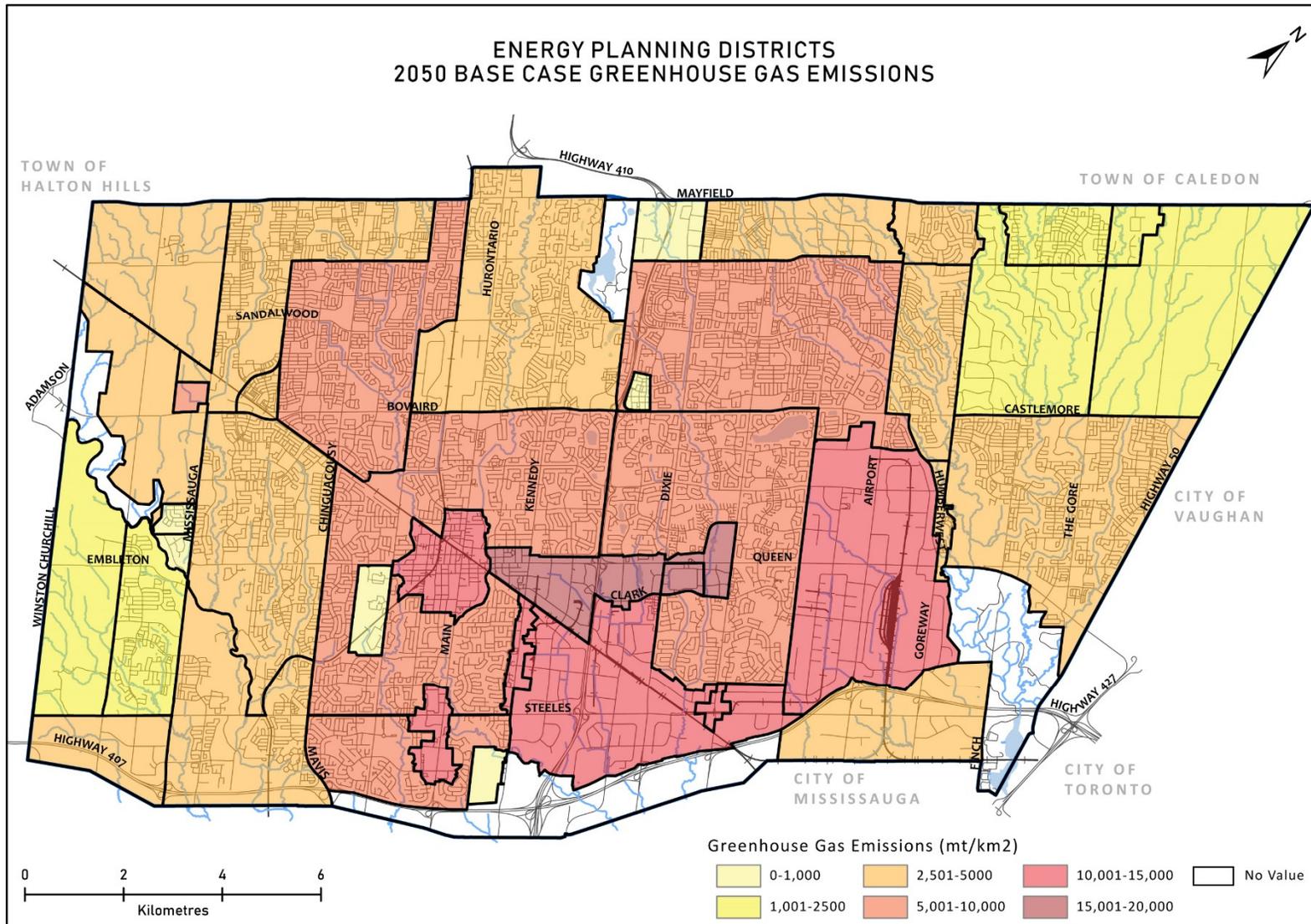


Figure 8: Base Case Source Energy Consumption Increase from 2016-2050

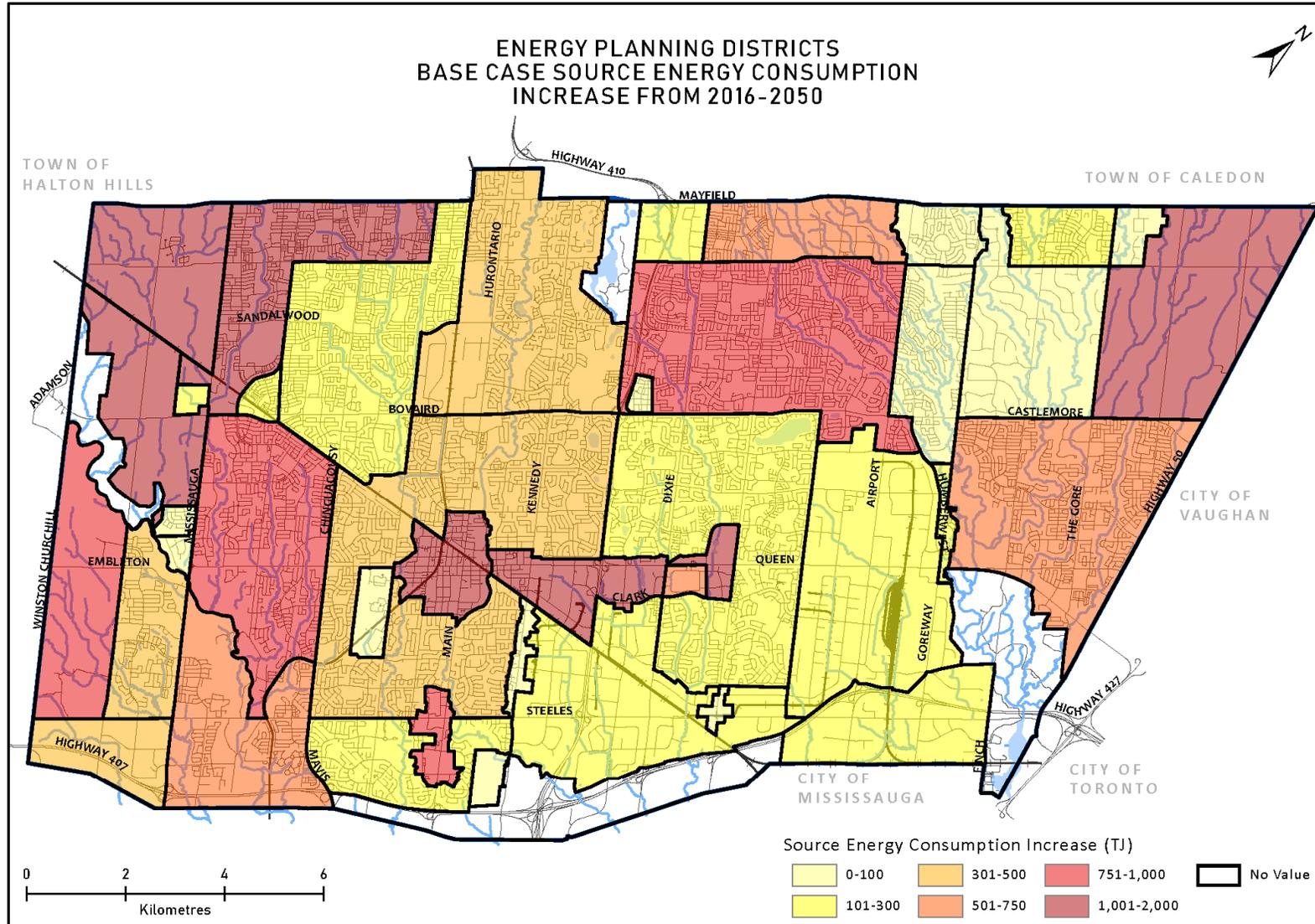


Figure 9: 2050 Base Case Water Use

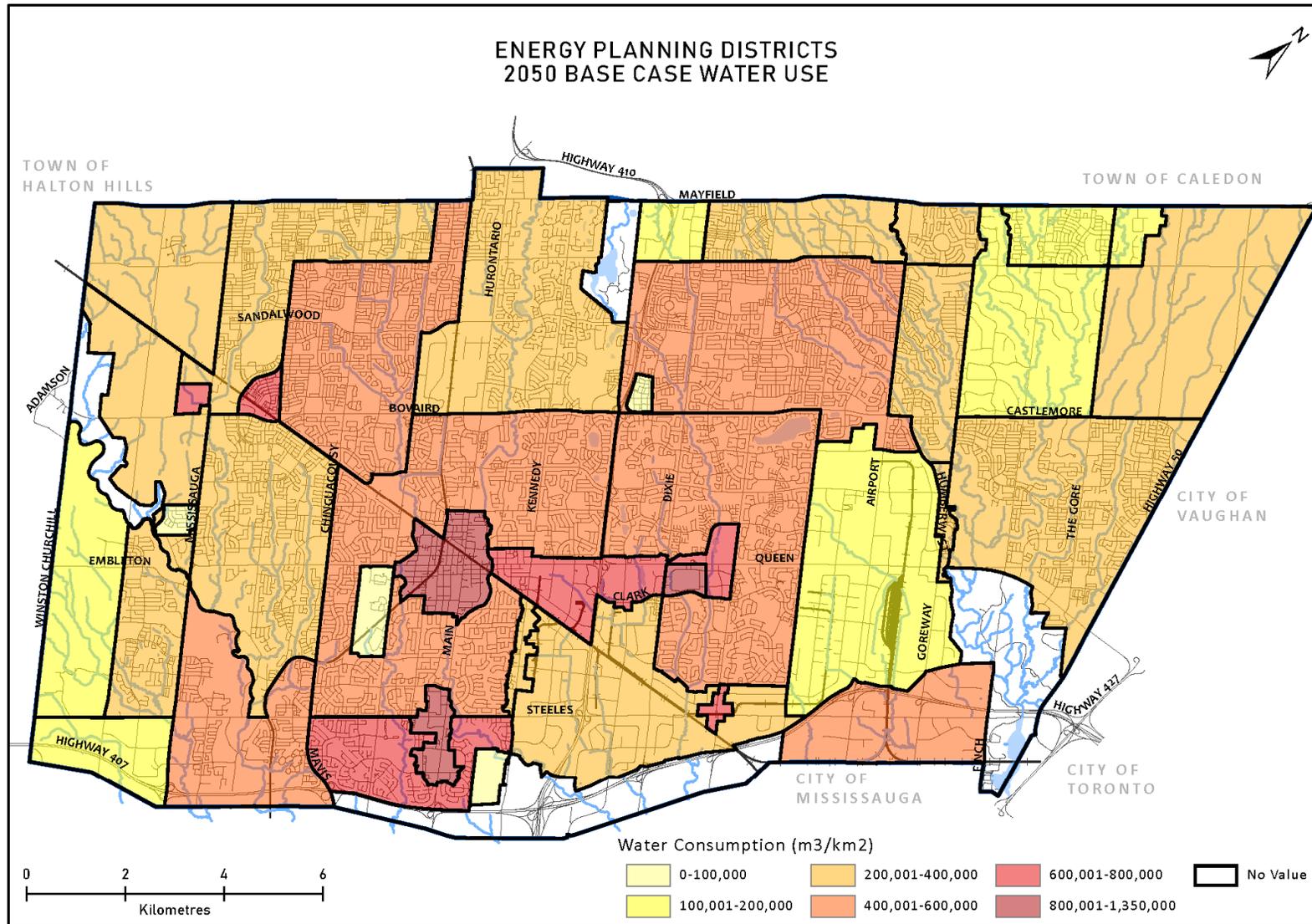
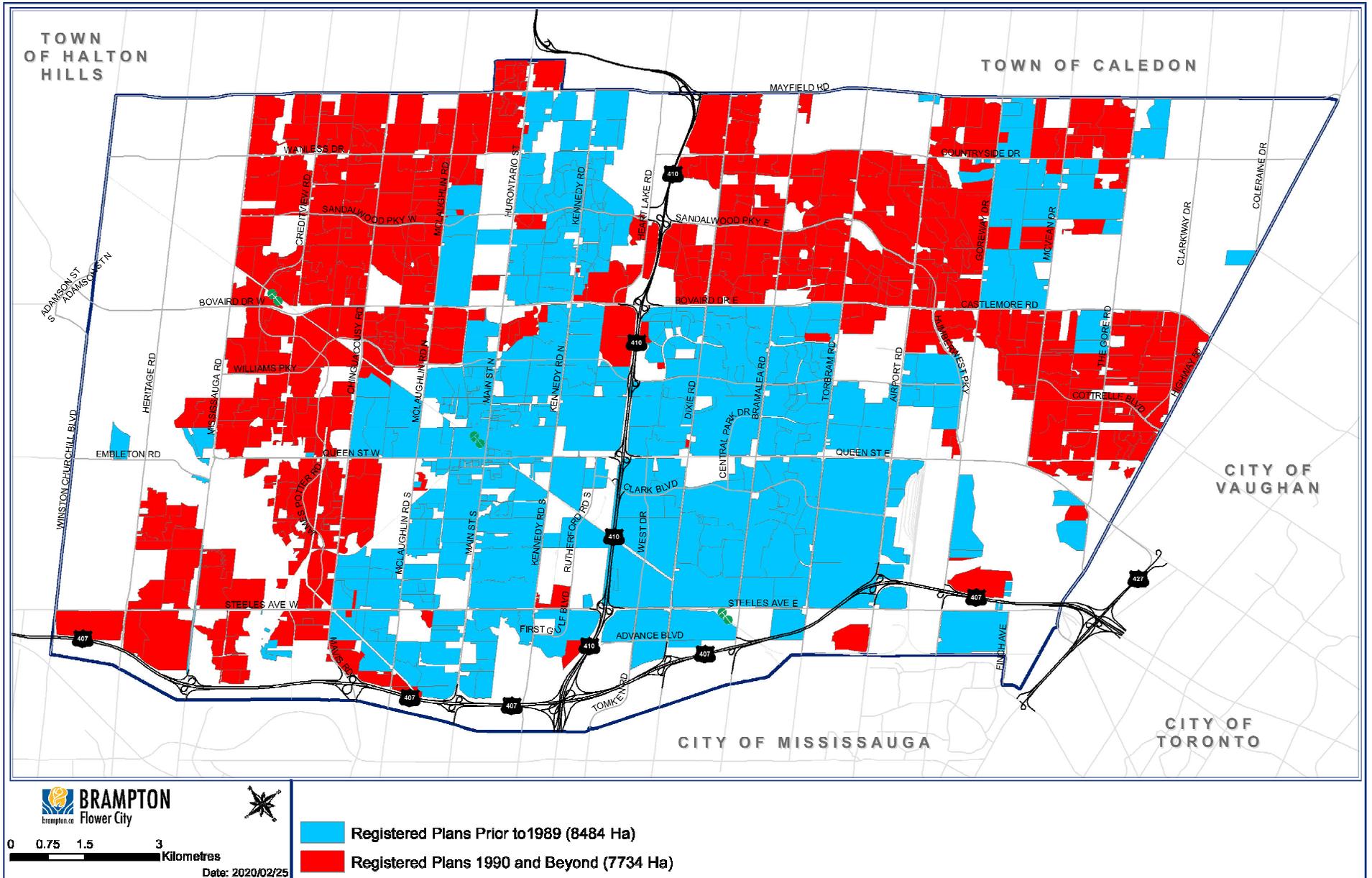


Figure 10: Registered Plans in Brampton





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