

Part 2: Big Moves

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Barrie's Big Moves for Climate Action

Our Plan outlines four **'Big Moves'** - **buildings, transportation, circular economy, natural environment and land use**. Each Big Move includes a goal and supporting strategies, as outlined below. The purpose of the Big Moves is to highlight the areas we – as a community – need to focus our collective efforts for significant energy and emissions reduction. Efforts will be required in each of the areas to achieve our goals. Our first two Big Moves – transportation and buildings – represent the largest sources of emissions in our community, demonstrating the immediate need to act in these areas. Our third Big Move looks at emissions from waste and highlights the City's Circular Economy Framework. The Circular Economy Framework has implications for energy and emissions and how we use, share and recycle goods and resources. Our final Big Move looks at the natural environment and land use, recognizing how land-use patterns influence behaviours and our abilities to reduce emissions.

Wherever possible, our community will need to leverage new technologies, partnerships, and funding to accelerate action within each of the Big Moves. Our focus should be to reduce emissions in the buildings and transportation sectors. While natural assets will play into sequestration efforts, this is only one part of the solution and should not be relied on to compensate for inaction.

In future iterations of the Plan - the programs, plans, and policies identified - should adapt to meet the depth and breadth required to achieve the community's emission reduction targets. At the same time, strategies should be implemented to the fullest extent possible now, as this will be vitally important to prevent emission lock-in across all sectors. Front-loading action and spending will be less costly both for the economy and the environment.

We acknowledge that our community's ability to reduce emissions is impacted by external forces, including higher levels of government. Where appropriate, the City of Barrie will advocate to the provincial and federal governments to implement policies that support climate action efforts of lower-tier governments.

How to Read this Section of the Plan

This section of the Plan (Part 2) focuses on the "what" of local climate action. It outlines the strategies we need to reduce our energy use and emissions collectively. The following information is provided for each of the Big Moves:

- A description of the "Big Move" and a rationale for why it is included in the Plan
- A callout box, which highlights the percentage of emissions from the Big Move in 2018, and our goals for future reductions
- A list of the strategies to achieve each Big Move
- A table outlining the co-benefits of taking action and associated equity considerations

Further information is provided for each strategy, including:

- A description of the strategy
- An outline of the scope of the strategy (where applicable)
 - What is included and how far we need to go
- A selection of case studies from other municipalities, as applicable

Part 3 focuses on implementation – the "how" - and provides actionable next steps for moving this plan forward. The strategies outlined here are a starting point – there will be much work to do in the coming years to design business cases, undertake feasibility studies, identify resources, and align efforts to implement the items identified below.

Big Move #1: Buildings

The Buildings Big Move sets an ambitious goal of reaching near-zero emissions in new and existing buildings across the community – this includes our homes, schools, businesses, and workplaces. Increasing building efficiency is one of the most cost-effective and quickest ways to reduce a community's energy and emissions¹. How we operate and power our buildings will need to become more energy-efficient and rely more heavily on low-carbon technologies to meet the targets of this Plan.

Big Move #1: Buildings

2018: Over 40% of emissions

Goal: Near-zero emissions in new and existing buildings

As buildings account for more than 40% of our community-wide emissions - of which 63% comes from residential buildings - significantly reducing emissions from existing buildings and new developments is a priority. The Building Big Move includes **six key strategies** that consider energy conservation, energy-efficient technologies, renewable energy, and energy distribution and storage.

Strategies:

1. Deep Energy Efficiency Retrofit Program
2. Green Development Standard
3. Energy Management and Benchmarking
4. Solar Generation
5. District Energy (Pre-feasibility)
6. Larger Renewables (Pre-feasibility)

Co-Benefits	Designing for Equity
<p>Creating more energy-efficient buildings has positive co-benefits, from increasing occupants' health and comfort to reducing operating costs. There is evidence that energy-efficient buildings result in lower health-related absenteeism and increased productivity². Renewable energy and energy storage systems can help offset the cost of using electricity during peak hours during the day and increase the resiliency of the community energy supply.</p>	<ul style="list-style-type: none"> • Ensure that retrofits, renewable energy, and green homes are accessible to all residents. • Provide targeted support for low-income residents and small businesses to access retrofit programs. • Work with landlords to provide energy-efficient upgrades in rental units. • Ensure green building principles are used in affordable housing. • Incorporate an equity lens in pre-feasibility studies.

¹ Project Drawdown. (n.d). *Solutions: Sector Summary Buildings*. Retrieved from <https://www.drawdown.org/sectors/buildings>

² Ibid.

Strategy 1: Deep Energy Efficiency Retrofit Program

Description: Development and implementation of a deep energy efficiency retrofit (DEER) program for residential, institutional, and commercial buildings within the community.

A DEER would target older, less efficient buildings first. Such a program would consider the overall performance from the building envelope to technologies used to heat, cool, and ventilate indoor spaces to reduce energy use and emissions. The DEER program will be a critical strategy to meet our reduction targets. The program's scope will be both comprehensive, including residential, institutional, and commercial buildings and all building types, and extensive, covering many buildings each year from the inception of the program to 2050. The DEER program aims to retrofit 16 percent of our 105,000 residential buildings and 25 percent of ICI buildings by 2030, and 82 percent of all structures by 2050.

Additional considerations include:

- Providing inexpensive energy efficiency improvements, such as sealing air leaks for building airtightness.
- Prioritizing the adoption of heat pumps.
- Adding rooftop solar, heat pumps, and other technologies as appropriate, such as solar thermal for hot water.
- Supporting renters by encouraging energy efficiency improvements at multi-unit residential buildings and single-family rental properties.
- Encouraging the adoption of hybrid equipment to transition to zero-carbon technologies.
- Partnering with retailers to cross-promote to residents currently conducting home retrofits and renovations on the benefits of the DEER program.
- Using local case studies to demonstrate successfully retrofit projects and payback period.
- Reducing potential barriers to accessing the program so that its benefits are equitable.

The City has partnered with Clean Air Partnership and Lightspark Software to conduct a residential energy and GHG savings characterization study that will support this strategy.

Case Study: Retrofit Halton Hills³

In 2020, the Town of Halton Hills began planning for its Retrofit Halton Hills pilot project, which aims to retrofit residential buildings in the community. The pilot program will see the deployment of a financing mechanism known as a Local Improvement Charge (LIC) to help homeowners access the upfront capital needed for home retrofits. The program offers low-interest loans that

Target Participation

RETROFIT 16% OF
RESIDENTIAL BUILDINGS
BY 2030

RETROFIT 25% ICI
BUILDINGS BY 2030

³Town of Halton Hills. (2020). *Retrofit Halton Hills*. Retrieved from <https://www.haltonhills.ca/en/residents/retrofit-halton-hills.aspx>

are repayable through property tax bills and stay with the property rather than with the owner. LIC financing has been used in Ontario for decades. An amendment to the legislation governing LICs came into effect in 2012, allowing municipalities to provide financing for home energy efficiency projects. As 22 percent of Halton Hill's emissions come from residential buildings, the program is expected to be an important part of meeting the Town's net-zero target by 2030.

Case Study: Parkdale Landing⁴

Completed in 2018, Parkdale Landing is a mixed-used supportive housing community in East Hamilton. The development was created through one of the largest Passive House retrofit projects in Canada. Originally built in the 1880s, the building had been left neglected in recent decades. The site was purchased by Indwell, a Christian charity that provides supportive housing. It was transformed through the retrofit project to create 57 affordable studio apartments, non-residential space for community programs and retail storefronts. The retrofit included adding exterior insulation, enlarging window openings to allow greater solar heat gain, and installing triple-pane windows to maintain heat. As a result, the building's energy footprint was reduced by more than 50%, and the total heating load of the building is anticipated to be 20 kWh/m² per year or \$40/year for each apartment. By implementing passive house standards to its projects, Indwell has been able to significantly curtail greenhouse gas emissions, while drastically reducing utility costs – helping to ensure long-term affordability for tenants.

A Deep Energy Efficiency Retrofit Program has the potential to avoid over 100,000 tonnes of carbon from being emitted to the atmosphere each year by 2050. This is the equivalent of removing nearly 25,000 cars from our roads annually.

Strategy 2: Green Development Standard

Description: Develop and adopt a green development standard (GDS) for all new buildings, approaching zero emissions by 2035.

The GDS will apply to all building sectors throughout the community. While a GDS will be voluntary, incentives and resources will be implemented to encourage its adoption. Enabling components, such as reduced permitting fees and application barriers, and energy performance labelling, will be used to meet an ambitious adoption rate. By 2035, all new construction to meet the standards' higher tier requirements.

The GDS will include absolute performance metrics, which consider energy and emission per square foot per year of a building and will be based on a tiered system with increasing energy performance standards. This might include thermal energy demand intensity (TEDI), energy use intensity (EUI), and emission intensity.

The GDS will also consider buildings' entire emission life cycle to reduce embodied carbon associated with new construction. The development standard will include electric vehicle charging infrastructure and renewable energy-ready design (rooftop solar and district energy connection readiness).

Target Participation

ALL NEW BUILDINGS
APPROACH ZERO
EMISSIONS BY 2035

ALL NEW BUILDINGS ARE
NET-ZERO BY 2050

⁴ Invisij Architects Inc. (2018). *Parkdale Landing*. Retrieved from <https://invizij.ca/project/1152/>

Additional considerations include:

- Energy performance labelling to encourage increased voluntary adoption of higher energy efficiency standards
- Reviewing parking requirements in zoning bylaws to investigate a maximum parking standard – encouraging transit and active transportation.
- Encouraging green and cool roofs to reduce urban heat islands, reduce GHG emissions and contribute to energy savings.
- Partnering with developers, skilled trade professionals, and retailers to encourage the use of low-carbon materials in new construction.
- Providing site coverage allowances that accommodate space for additional building insulation.
- Advocating for a GDS approach within the Ontario Building Code.

Green Development Standards in Barrie's Official Plan

Barrie's new Official Plan commits to developing Green Development Standards in consultation with the building and construction industry. In the interim, all applications for an Official Plan Amendment, Zoning By-law Amendment, Plan of Subdivision, and/or Site Plan Approval are required to submit a Sustainable Development Report, outlining plans to:

- Provide a high level of efficiency in energy consumption to reduce greenhouse gas emissions.
- Maximize solar gains and be constructed in a manner that facilitates future solar energy installations.
- Include or facilitate future on-site renewable energy systems.
- Provide a high-level of efficiency in water consumption, including rainwater harvesting and grey water recirculation for irrigation purposes/
- Enhance indoor air quality.
- Contain or facilitate the future installation of plug-ins for electric vehicles.
- Use environmentally preferable building materials, high-renewable and recycled content building products, and certified sustainably harvested lumber.
- Prioritize local sourcing to reduce carbon footprint.
- Provide water efficient and drought resistant landscaping, which should include the use of native plants.
- Incorporate *Low Impact Development* and maximize permeable surfaces, including the provision of permeable driveways.
- Incorporate green roofs into building design.
- Reduce construction waste and divert construction waste from landfill.
- Design to connect amenity areas, open spaces and parks.
- Promote Energy Star qualified and LEED-certified development.

City of Barrie. (2021). *Draft Official Plan 2051 Version December 15, 2021*. Retrieved from:
<https://www.buildingbarrie.ca/22277/widgets/90160/documents/71957>

Case Study: Toronto Green Standard⁵

The Toronto Green Standard (TGS) sets sustainable design requirements for new private and City-owned developments. The TGS outlines air quality, energy efficiency, water efficiency, ecology, and solid waste sustainability requirements. The corresponding performance measures are tiered, with incentives for buildings that achieve higher tiers. Tier 1 sets a performance floor – its measures are a mandatory minimum for planning approvals. Developments that achieve the Tiers 2-4 performance measures are eligible for development charge refunds. The TGS is updated every four years. The requirements progressively increase over time to achieve net-zero emissions in new developments by 2030. Version 4 of the Standard was approved by Toronto City Council in July 2021, advancing sustainability requirements further. In addition to greater energy and GHG efficiency, this includes improving resiliency. Resilience can be improved by reducing stormwater runoff and heat island impacts and promoting biodiversity with measures like green roofs, rain gardens, and the planting of native pollinator species. As homes and buildings account for 55 percent of GHG emissions in Toronto, the TGS is a key driver of the City's net-zero targets. The program has already resulted in 169,000 tonnes of avoided carbon dioxide emissions annually.

A Green Development Standard has the potential to avoid over 220,000 tonnes of carbon each year by 2050. This is the equivalent of removing nearly 50,000 cars from our roads annually.

Strategy 3: Energy Management and Benchmarking

Description: Advance energy management and benchmarking in industrial buildings by promoting and supporting existing programs.

Energy management and benchmarking are well-established practices that use engineering and economic principles to manage how buildings use energy in their heating and cooling, ventilation, power systems, lighting, building envelopes, as well as their industrial processes. Completion of a current conditions assessment of the industrial sector in Barrie will help to establish a baseline of present energy management practices being undertaken by the industrial sector and inform how the strategy should evolve. A key component will be to promote existing energy management programs throughout the ICI sectors.

Existing programs include:

- ENERGY STAR Portfolio Manager program offered through Natural Resources Canada, a benchmarking tool that allows users to monitor and optimize how energy is used in a facility.
- ISO 50001 Energy Management Standard, a voluntary standard that provides a structured approach to integrated energy efficiency principles into energy management and provides a framework for continuous energy performance improvements.

⁵ City of Toronto. (2021). *City Council approves bold strategy to reduce emissions from existing buildings to net zero by 2050, updates Toronto Green Standard*. Retrieved from <https://www.toronto.ca/news/city-council-approves-bold-strategy-to-reduce-emissions-from-existing-buildings-to-net-zero-by-2050-updates-toronto-green-standard/>

Promoting building commissioning and recommissioning initiatives, that assess and optimize the performance of operational systems and mechanical equipment of buildings in the industrial sector, will also be included in the strategy. Enabling factors to consider include:

- Requiring buildings to be recommissioned at the time of sale.
- Requiring a commissioning and recommissioning plan submitted with the building permit applications.

A building recommissioning program alone has the potential to avoid over 9,000 tonnes of carbon from being emitted to the atmosphere each year by 2050 in the industrial sector. This is the equivalent of removing nearly 2,000 cars from our roads annually.

Strategy 4: Solar Generation

Description: Develop and implement a rooftop and ground-mounted solar program across all sectors.

The solar photovoltaic (PV) program will be implemented across the community and will include both rooftop and ground-mounted installations. The business case and program design for the Deep Energy Efficiency Retrofit Program will include a solar generation strategy for rooftop PV, though the deployment of the two programs will be separate. The Green Development Standard will include consideration for building rooftop design that can accommodate solar generation.

The cost of solar PV continues to fall significantly each year, with costs falling 85% over the last decade and 7% in 2020⁶. As costs continue to fall, solar PV installations will become increasingly attractive. Based on a preliminary analysis of the available rooftop space in the residential sector, a 5 percent target participation rate has been identified for 2030 and 15 percent in 2050. For commercial buildings, the target participation rate is 15 percent for 2030 and 40 percent by 2050.

For ground-mounted solar in the ICI sectors, 0.5 percent uptake by 2030 and 1.5 percent uptake by 2050 has been identified for the potential available space. Before moving to ground-mounted systems, solar generation will focus on rooftops (all building types). Ground-mounted systems will be considered over paved areas (i.e., parking lots) rather than greenspaces and include electric vehicle charging infrastructure where appropriate.

Target Participation

ELIGIBLE RESIDENTIAL
ROOFTOPS HAVE 5%
COVERAGE OF SOLAR
PANELS BY 2030 AND 15%
BY 2050.

⁶ IRENA. (2021). *Renewable Power Generation Costs in 2020*. Retrieved from <https://www.irena.org/publications/2021/Jun/Renewable-Power-Costs-in-2020>

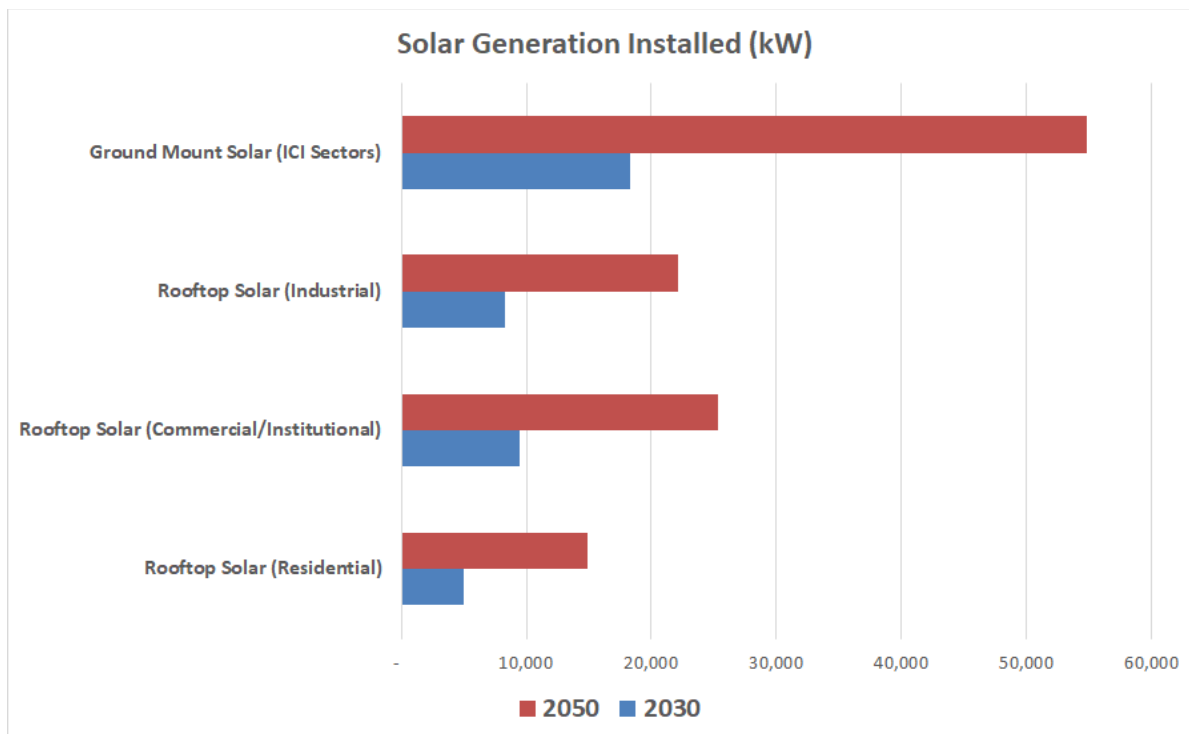


Figure 1: Rooftop and ground mount solar generation potential based on a preliminary analysis of available space in Barrie

Case Study: Halifax Solar City⁷

In 2016, Halifax launched the Solar City Program to make it easier for property owners to explore, install, and finance a solar energy system. With free guidance from the city's Solar City Administrator, property owners can select an eligible technology and a contractor of their choice. The Administrator helps provide a level of review and due diligence to ensure the proposed system meets industry standards and will provide energy and cost savings over its lifetime. Solar City then provides financing as a charge to the property instead of the individual (similar to a Local Improvement Charge) on flexible terms at a fixed interest rate over ten years. This further reduces barriers as no personal credit checks are needed. If a participant sells their property, the charge is automatically passed on to the next property owner. This streamlined process has contributed to the growth of a competitive local solar industry by reducing the cost for contractors, leading to a steady decline in installed unit costs. Over 550 agreements have been executed to date, reducing the community's annual GHG emissions by approximately 4,120 tonnes.

A Solar Generation Program has the potential to prevent over 3,500 tonnes of carbon from being emitted to the atmosphere each year by 2050. This is the equivalent of removing nearly 800 cars from our roads annually.

⁷ Halifax Regional Council. (2021). *Halifax Solar City Program Update and Future Program Recommendation*. Retrieved from <https://www.halifax.ca/sites/default/files/documents/city-hall/regional-council/210720rc1121.pdf>

Strategy 5: District Energy (Pre-feasibility Study)

Description: Undertake a pre-feasibility study and business case for a district energy system within Barrie.

District energy systems (DES) have a central plant(s) that use pipes to supply heating, cooling, and/or power to multiple connected buildings. Heating and cooling are centralized, but the thermostats remain independent within each building. District energy systems can use various fuel types, such as natural gas, oil, biomass, geothermal, large-scale solar thermal, and waste-to-energy. They can also capture and distribute excess heat from industrial processes and power generation. Buildings that produce excess energy (“anchor tenants”) can redistribute energy to nearby buildings. Anchor tenants could include hospitals, hotels, large housing complexes, swimming pools, libraries, universities, or college campuses with significant demand for power.

District energy systems are beneficial from an energy perspective because they replace individual small boilers and chillers with a centralized plant that is more efficient.

The community of Barrie should explore the pre-feasibility of implementing a low-carbon fuel DES. Areas within the existing built environment (public, ICI sector, and multi-residential properties) around potential anchor tenants should be considered. New neighbourhoods and developments where the density of thermal energy is sufficient to support the costs of DES infrastructure should also be considered. In general, a DES is more favourable in areas where:

- High development and heating density support the business case for a cost-effective DES solution.
- The central plant and the buildings it serves are close to one another.
 - The shorter the distance the energy must travel, the lower the costs.
- High demand for heating or cooling already exists within the development area.

District heating systems have several preconditions, including:

- A stable and reliable energy baseload demand. District heating systems need to be located in high-density development areas (i.e., technology parks, new neighbourhoods, multi-unit residential, or near hospitals).
- A mix of building types, including anchor client(s), which provides a consistent energy baseload.

The viability of DES implementation is improved by:

- A favourable financial return on investment to the project owner and a favourable cost-saving opportunity to end clients.
- Policy support to actively encourage DES development and uptake.
 - For example, the Green Development Standard can stipulate expected energy performance for new developments.
 - Policies can also require developers to incorporate features that facilitate DES connection in the future for all new buildings or retrofits.

The pre-feasibility study would explore the most appropriate locations for a DES, potential buildings for connection, and various building owners’ motivations to be part of the project. This step would also include a review of the technical options, including fuel types and generation

options, configuration of the system and network, and a high-level assessment of the financial viability of the initiative.

A District Energy System has the potential to prevent 2,500 tonnes of carbon from being emitted into the atmosphere each year. This is the equivalent of removing nearly 550 cars from our roads annually.

Case Study: District Energy in Ottawa^{8,9}

A 34-acre waterfront community in Ottawa that is set to become the National Capital Region's first carbon-neutral community. Situated along the Ottawa River, Zibi is developing its own District Energy System (DES) that will provide all the heating and cooling needs of residents on a net-zero carbon basis. This will be achieved by recovering industrial waste heat from the local Kruger Products plant for heating and leveraging the Ottawa River for cooling. All buildings will be interconnected through a heating and cooling loop. The federal government and the Federation of Canadian Municipalities (FCM) are supporting the development of the DES system with an investment of \$23 million through FCM's Green Municipal Fund. In addition to being carbon-neutral, the planned DES system will provide residents with increased energy reliability, comfort, and convenience through temperature control using a mobile application and reduced overall costs, including those associated with ongoing operation and infrastructure maintenance.

Case Study: Markham District Energy¹⁰

In 2000, the City of Markham started Markham District Energy (MDE), its own thermal energy utility, to improve local energy resiliency. MDE's thermal grid systems distribute hot/chilled water to connected buildings to provide heating and cooling services, independent of the energy grid. Currently, two Markham districts are served by MDE: the city's downtown core known as "Markham Centre" and "Cornell Centre," which contains Markham Stouffville Hospital. To date, this represents over 8 million square feet of buildings that use MDE service. Connecting to MDE allows buildings to avoid having their own boilers and chillers on-site, which reduces maintenance costs, provides greater flexibility in architectural design, and increases energy efficiency. MDE has the flexibility to use cleaner fuels such as biomass, which individual buildings could not pursue. These efficiencies have enabled MDE to reduce GHG emissions in the districts it serves by 35% and to attract investments from companies like IBM and Bell that decided to locate job-creating facilities in Markham. In the event of a future emergency that disables the electricity grid, Markham now has the capability to maintain power and heating to over 4 million square feet of selected buildings, including its regional hospital, two high schools, and a community centre.

⁸ DCN-JOC News Services, Daily Commercial News. (2021). *Funding helps create district energy system for Ottawa Gatineau net-zero development*. Retrieved from <https://canada.constructconnect.com/dcn/news/government/2021/04/funding-helps-create-district-energy-system-for-ottawa-gatineau-net-zero-development>

⁹ Zibi. (n.d). *District Energy System*. Retrieved from <https://zibi.ca/zcu/>

¹⁰ Markham District Energy Inc. (2021). *Who we are*. Retrieved from <https://www.markhamdistrictenergy.com/who-we-are/>

Case Study: Toronto Deep Lake Water Cooling^{11,12}

In 2004, the City of Toronto and Enwave Energy launched the world's largest deep lake water cooling (DLWC) system. The system draws cold water from the bottom of Lake Ontario and pumps this water through a closed-loop network of pipes to provide cooling to downtown buildings. Toronto's DLWC originally only had a handful of customers, but now over 100 buildings, ranging from City Hall, Toronto General Hospital, Scotiabank Arena, and several other commercial and residential buildings, have opted to connect to the DLWC because of the efficiencies and cost savings that it provides. DLWC can connect multiple buildings on the same network of infrastructure, rather than each building conducting and managing their own retrofits and reduces electricity use by 80%. This has resulted in Toronto's DLWC displacing 55 megawatts of energy a year from Toronto's electricity grid – which is enough to power eight hospitals. The system is now at capacity, and in 2019 Enwave announced a \$100 million system expansion with \$10 million in federal funding to increase capacity by 60%. This investment will make the City of Toronto more resilient.

Strategy 6: Larger Renewables (Pre-feasibility Study)

Description: Explore the opportunity for larger renewable energy and energy storage infrastructure projects through a pre-feasibility study and business case.

A large-scale renewable energy project was identified as an opportunity to reduce emissions and create greater energy security in the community. As the city moves to electrify the building and transportation sector, the demand on the electricity grid will increase. It is expected that in Ontario, due to the decommissioning of the Pickering nuclear power plant slated for 2024 and an increasing demand for electricity, emissions from the electricity grid will intensify. This is because power generation will rely more heavily on natural gas in the future. The pre-feasibility of a large-scale renewable energy plant should be considered to ensure that electrification leads to emission reduction in our community. This would be in

Energy Storage

Renewable energy solutions, like wind and solar, are intermittent and vary depending on the time of day and season. Distributed energy storage solutions (batteries) can store small or large amounts of energy to be used later when needed, reducing some of this variability. Energy storage can also help to avoid purchasing energy from the grid at peak times - which also corresponds to periods when emissions are greater due to the reliance on natural gas. Batteries are becoming more affordable and allow buildings to achieve energy independence as part of a modernized energy system, reducing the pressure on the grid. Energy storage can also help with resiliency – providing a reliable source of power during outages.

Source: Project Drawdown. (n.d).
Solutions: Distributed Energy Storage.
Retrieved from
<https://www.drawdown.org/solutions/distributed-energy-storage>

¹¹ Enwave. (2021). *Enwave and Toronto Water tap into innovative energy source*. Retrieved from <https://www.enwave.com/case-studies/enwave-and-toronto-water-tap-into-innovative-energy-source/>

¹² Washington Post. (2021). *Toronto is home to the world's largest lake-powered cooling system. Here's how it works*. Retrieved from <https://www.washingtonpost.com/climate-solutions/interactive/2021/toronto-deep-lake-water-cooling-raptors/>

addition to the district energy system and the solar generation on private property (both included above).

A more extensive pre-feasibility analysis of potential renewable energy projects and consultation is required to identify what would work best in Barrie. Large-scale renewable energy projects may include wind turbines, deep lake cooling, geothermal, bioenergy, and solar energy. A large-scale solar plant is likely the most feasible for the community. Potential limiting factors for a project of this kind include the availability of land and assessing impacts on the environment. Ensuring that a large-scale project is not placed on current greenfield areas, or competes with natural assets and infrastructure, was identified as a priority for the community. Therefore, opportunities for larger renewable projects should be monitored over time as technology continues to evolve.

Other considerations include:

- Communicating to the public and partners about the pre-feasibility study process, rationale, potential benefits, and results.
- Exploring opportunities to partner with neighbouring municipalities.

Case Study: Sault Ste Marie, Alternative Energy Capital of North America¹³

In 2008, in recognition of its growing renewable energy assets, Sault Ste Marie declared its intention to be the Alternative Energy Capital of North America. Sault Ste Marie has strategically pursued leadership in renewables to counteract the decline of jobs in steelmaking – the city's traditional industry. The city now produces more than 1.5x its energy needs completely from renewable sources, making it a substantial net exporter of clean energy. Its local energy economy includes hydro (70% of power), wind (24% of power), and solar (4% of power), as well as industrial cogeneration at the local steel plant and alternative energy manufacturing. The Prince Wind Farm alone – one of the largest wind farms in Canada, consisting of 126 turbines – can generate enough electricity to power 60,000 homes.

Case Study: Newmarket Energy Storage¹⁴

In 2019, a new battery energy storage facility was completed and went online in Newmarket, Ontario. The system draws power from the local grid when demand and costs for energy are lowest (e.g., overnight) and can store this power until needed. Typically, when demand is exceptionally high (e.g., heat waves), peaking plants – which are power plants that only run during peak times – would have to be used. Running peaking plants can be very costly. With the battery energy storage facility, the low-cost electricity stored can be fed into the grid during peak times. This energy savings not only leads to a significant decrease in energy rates for residents over time but also provides greater power reliability. The current system has a capacity of four megawatts or 16 megawatt-hours, which can serve 22,000 households during peak periods. In

¹³ Wilson Centre, Person, Place, and Policy. (2017). *Sault Ste. Marie's Alternative Energy Transformation: A Canadian City Thinking Outside the "Grid"*. Retrieved from https://www.wilsoncenter.org/sites/default/files/media/documents/misc/person_place_policy_-_sault_ste_marie.pdf

¹⁴ York Region. (2019). *Tesla battery technology helping to power Newmarket*. Retrieved from <https://www.yorkregion.com/news-story/9639749-tesla-battery-technology-helping-to-power-newmarket/>

the future, the storage system can connect directly to local neighbourhoods and hospitals to further strengthen local resiliency.

Big Move #2: Transportation

Our Plan has set an ambitious goal of reaching near-zero emissions from the transportation sector by 2050. Achieving this goal will significantly reduce the community’s overall emissions and help meet our emission reduction target. The Transportation Big Move includes **five key strategies** that prioritize a shift away from single-occupancy, fossil-fuel-powered vehicles to other modes of travel. Strategies align with the City’s planning framework, which prioritizes non-auto modes and ambitious goals to significantly shift travel within the community away from personal vehicles and increase active transportation and transit uptake.

Big Move 2: Transportation

In 2018, the transportation sector accounted for 56% of Barrie’s overall emissions. Of which 98% was personal vehicles.

Goal: Near-zero emissions from transportation

Our strategies are listed in priority order according to the “Transport Hierarchy,” which first aims to reduce the overall need to travel, followed by shifting to low or no-emission forms of transportation¹⁵.

Strategies:

7. Active Travel & Complete Streets
8. Local Transit Options
9. GO Transit Use
10. Electric Vehicle Adoption
11. Car-Sharing

Co-Benefits	Designing for Equity
Transitioning away from combustion engine vehicles has the added benefit of making the air we breathe in our community cleaner and healthier for everyone. Walking and cycling are beneficial for health and wellness in general. This strategy also provides the co-benefit of enhancing community cohesion.	<ul style="list-style-type: none"> • Ensure equitable connections, such that everyone has access to connected transportation, including under-served neighbourhoods. • Conduct a community audit of accessibility, affordability, and safety related to active transportation, walkability, bikeability, and transit to identify priority projects to improve active transportation. This would be especially important in lower socioeconomic status neighbourhoods. • Ensure all residents are able to access EV charging stations.

¹⁵ Institution of Mechanical Engineers. (2021). *The Transport Hierarchy: A Cross-Modal Strategy to Deliver a Sustainable Transport System*. Retrieved from <https://imeche.org/policy-and-press/reports/detail/the-transport-hierarchy-a-cross-modal-strategy-to-deliver-a-sustainable-transport-system>

Strategy 7: Active Travel & Complete Streets

Description: Increase active travel by planning for complete streets and providing a network of safe infrastructure to promote walking, cycling and rolling.

One way to support active travel is through designing and implementing complete streets. Complete streets are designed to be accessible and safe for all road users, including pedestrians, cyclists, and persons living with disabilities. Mixed land use that enables complete communities, in combination with complete streets, reduces reliance on vehicles and increases the feasibility of active travel for more people. Barrie's new Official Plan indicates that all streets shall be designed to be complete streets, with an emphasis on supporting active transportation comfort and safety.

Active travel can also be supported by:

- Incorporating complete streets principles in existing neighbourhoods and during road reconstruction projects.
- Designing an urban form that incorporates mixed land uses and promotes active transportation.
- Updating City standards to ensure active transportation routes are safe, secure, and comfortable for all ages and abilities.
- Updating zoning bylaws to ensure routes are direct, continuous, and well-connected across the city.
- Ensuring bike racks and other end-of-trip amenities are available at key destinations.
- Promoting bike and scooter sharing programs and repair programs.
- Requiring developers to support or implement enhancements to the active transportation network, bicycle parking requirements, and transit subsidies as part of their approval process.
- Encouraging the adoption of the City's transportation demand management (TDM) guidelines for new development.
- Working with major employers in Barrie to encourage active transportation to commuters.
- Better linking the City's active transportation network to public and regional transit hubs.
- Promoting active school travel programs.
- Communicating and increasing awareness of the health benefits of active transportation.
- Ensuring winter maintenance of active transportation infrastructure.
- Ensuring development charges adequately account for costs to support the implementation of complete streets and related active transportation infrastructure.
- Developing a branded signage and wayfinding strategy for on and off-road active transportation.

Case Study: Complete Streets Kitchener¹⁶

In 2019, the City of Kitchener approved Complete Streets Kitchener: Streets for All, to create guidelines for approaching every roadway (re)construction as an opportunity to improve the design and functionality of a street. The guidelines include design goals to prioritize (design for safety, improve transportation choices, advance sustainability) and visually demonstrate how Complete Streets can be applied to each of its four street types (local streets, minor collector streets, major collector streets, and arterial streets). The guidelines also provide an overview of various design elements that can be applied to better support different street uses and functions, including pedestrian travel, cycling, transit, motor vehicle use, climate action, and urban forestry. Lastly, the guidelines provide an implementation plan and a scorecard that can be used by City Staff, elected officials, and residents to evaluate how well the guidelines are being incorporated into Kitchener's construction projects. By implementing Complete Streets Kitchener, Kitchener envisions that every street can be made safe, comfortable, and convenient for all users.

Strategy 8: Local Transit Options

Description: Advance local transit options for all users as a viable alternative to personal automobile use.

Single occupancy vehicles account for a significant amount of GHG emissions in Barrie. Increasing the uptake of transit can lead to multiple benefits, including emissions reduction, reduced traffic congestion, fewer accidents, and reduced air pollution. Public transit services also enhance equity by providing transportation options to non-drivers. Pre-pandemic, daily ridership on Barrie Transit was 13,000. A ridership of 76,900 per day is expected by 2041¹⁷.

Youth in Barrie have expressed that reducing the cost of transit would remove barriers to using transit and that improving service frequency, availability, and accessibility will enable more youth to use transit. Barrie could successfully implement several transit initiatives to increase transit ridership, such as increasing bus frequencies, reduced transit fares, and special and express services. Additional transit initiatives could include:

- Designated transit priority measures.
- Ensuring connectivity between transit systems (public transit, active transit, vehicles) and neighbouring regions for all users.
- Designing an urban form that incorporates mixed land uses and promotes transit use (transit-oriented development).
- Integrating active transportation and ride-sharing with transit to help support first and last-mile connections.
- Educating first-time transit users (e.g., youth, newcomers) on system use and navigation.

¹⁶ City of Kitchener. (2019). Complete Streets Kitchener: Streets for All Community Edition. Retrieved from https://www.kitchener.ca/en/resourcesGeneral/Documents/DSD_Transport_Complete_Streets_Kitchener_Community_Edition.pdf

¹⁷ WSP. (2019). *Transportation Master Plan: Transit Technical Memorandum*. Retrieved from https://www.barrie.ca/City%20Hall/Planning-and-Development/Engineering-Resources/Documents/Transportation-Master-Plan/Appendices/BarrieTMPAppA_Transit_20190418.pdf

- Providing free transit or reduced fares for priority users such as youth, seniors, and persons living with disabilities.
- Increasing parking fees to be higher than transit fares.
- Marketing and coordination with large employers and employment zones.
- Expanding transit routes and increasing the frequency of service, as outlined in Barrie's Transportation Master Plan.
- Providing express services to significant landmarks and prioritizing transit growth in the secondary plan areas.
- Developing and implementing a program to provide seating and weather protection at all transit stops.
- Communicating and increasing awareness of the health benefits of public transportation.

Case Study: Kingston Free Transit for Youth^{18,19}

In 2018, the Federation of Canadian Municipalities (FCM's) Sustainable Communities Awards recognized Kingston's Transit High School Bus Pass Project. The program provided free bus passes to grade nine students directly at their schools. The key pillar of the program was taking grade nine students on a bus to familiarize them with how the transit system works and teach them about the environmental and cost benefits of public transit. The program taught students how using transit can increase their freedom to travel to other activities. The program resulted in a 20-fold increase in high school ridership after six years. By initiating students in grade nine, students would take the bus more often outside of school and would be more inclined to take transit as paying customers after graduation. This has benefited the community by giving students a life skill, reducing emissions associated with parents driving students, and increasing transit riders during off-peak hours. Due to the success of this high-school program, in 2017, Kingston Transit also eliminated fares for all children aged 0-14.

Strategy 9: GO Transit Use

Description: Work with Metrolinx to increase GO Train use and provide seamless connections for users in Barrie.

Under the Regional Express Rail (RER) program, Metrolinx will be upgrading rail service along the Barrie line to two-way, all-day rail service during peak and non-peak periods. This service will operate along the entire length of the Barrie line from Toronto's Union Station to the Allandale Waterfront GO Station, providing options for commuters coming into and leaving Barrie. The City's Transportation Master Plan recommends coordinating the Barrie Transit and GO Transit schedules to encourage transit use to and from the GO stations. The City is currently in the process of moving its Transit Hub (terminal) to share space with an existing GO Train location, making it more convenient for riders.

¹⁸ Federation of Canadian Municipalities. (2018). *Case study: Kingston gets more youth riding public transit*. Retrieved from <https://fcm.ca/en/resources/gmf/case-study-kingston-gets-more-youth-riding-public-transit>

¹⁹ Clean 50. (2021). *The "Kingston Model" for Youth Transit Programming - the benefit public transit can have on our youth, schools and the community*. Retrieved from <https://clean50.com/the-kingston-model-for-youth-transit-programming-the-benefits-public-transit-can-have-on-our-youth-schools-and-the-community/>

Other initiatives to improve GO Transit use may include:

- Implementing additional measures to support ‘first/last mile’ travel, such as connected active transportation routes, ride-share or on-demand services, and electric, micro-mobility.
 - Consider building on the successful Transit ON Demand pilot, launched in 2020.
- Working with the province to support more frequent service and expanded hours of availability outside of usual business hours (consider commuters coming into Barrie and leaving Barrie).

Strategy 10: Electric Vehicle Adoption

Description: Advance the adoption of electric vehicles by creating an EV-ready city.

The adoption of electric and low emission vehicles (EVs) will play a critical role in driving emissions down in the transportation sector and reaching our goal of near-zero emissions.

In 2021, momentum towards EV adoption accelerated significantly, with EV sales now comprising roughly 7% of new car sales globally²⁰. As an outcome of COP26, automobile manufacturers, as well as governments around the world, committed to 100% of new car sales being EVs by 2040, and by 2035 in major markets²¹.

While a future with 100% EVs is becoming more definitive, encouraging residents and businesses in the community to transition to low-carbon emission vehicles as soon as possible is critical. The vehicles purchased today will still be on the roads in 2030 and some in 2040. It will be vitally important to front-load our efforts immediately to meet the goals outlined in our Plan.

Encouraging the adoption of electric vehicles requires action in four key areas – charging infrastructure, education and awareness, price parity, and the availability of vehicles. While price parity and the supply of EVs are beyond the community’s control, there is work to be done locally around charging infrastructure and consumer education.

There are three levels of **EV charging stations** available on the market today. Level 1 – a regular wall socket – is the slowest form of charging and will provide 8km of range per hour of charging. For most drivers, this will be sufficient for their daily commute or errands. Level 2 – known as “destination” or “opportunity” charging – provides 30km of range with one hour of charging. The highest level – known as “DC fast chargers” – provide 250km of range per hour of charging and are known as the “gas station replacements”.

All three levels of charging stations are beneficial in creating a local network, while supporting the use of EVs beyond the city limits.

Source: Plug'n Drive - Electric Cars. (n.d). *Charge My Car, A Plug'n Drive Initiative: Home Charging*. Retrieved from <https://www.plugndrive.ca/guide-ev-charging/>

²⁰ Utility Dive (2021). *Global EV sales rise 80% in 2021 as automakers including Ford, GM commit to zero emissions: BNEF*. Retrieved from <https://www.utilitydive.com/news/global-ev-sales-rise-80-in-2021-as-automakers-including-ford-gm-commit-t/609949/>

²¹ GOV.UK. (2021). *COP26 declaration on accelerating the transition to 100% zero emission cars and vans*. Retrieved from <https://www.gov.uk/government/publications/cop26-declaration-zero-emission-cars-and-vans/cop26-declaration-on-accelerating-the-transition-to-100-zero-emission-cars-and-vans>

Actions to make Barrie an EV-ready city include:

- Enabling residents to charge EVs at home (where the majority of charging takes place today)
 - Including EV charging in the Green Development Standard and Deep Energy Efficiency Retrofit program.
 - Note that current GDS guidelines within the OP require new developments to contain or facilitate the future installation of plug-ins for electric vehicles.
 - Encourage multi-unit residential buildings to provide charging stations for owners and renters. Consider power management systems that share charging capacity amongst multiple parking spaces and allow for future growth.
 - Encourage landlords that rent-out single-family homes to provide charging stations for renters.
 - Provide alternatives (i.e., public level 2 and DC fast chargers) for those unable to charge at home.
- Enabling residents to charge EVs around the city
 - Installing EV charging stations on all City-owned properties.
 - Creating preferred parking spots and reducing fees for low emission vehicles in municipal parking lots.
 - Encouraging employers, institutional and commercial buildings to install charging infrastructure for staff and patrons.
- Leading by example
 - Accelerating the electrification of the City's vehicle fleet.
 - Advocating for EV-ready housing within the Ontario Building Code.
 - Encouraging commercial and institutional fleets to adopt EVs.
 - Advocating to other levels of government to increase rebate programs to make EVs as affordable as combustion engine vehicles.
 - Advocating for ending the sale of new conventional gasoline/diesel cars.
- Educating the public EV
 - Dispelling myths around EVs.
 - Increasing awareness of and support to access financial supports for EVs.

Switching to electric vehicles has the potential to prevent nearly 150,000 tonnes of carbon from being emitted to the atmosphere by 2030 and 800,000 tonnes by 2050²². This is the equivalent of removing over 30,000 cars from our roads each year by 2030 and 170,000 each year by 2050.

²² Note, the total emission reduction potential decreases as the share of electric vehicles increases over time.

Case Study: City of Edmonton's Electric Vehicle Strategy^{23,24}

In 2018, the City of Edmonton approved a five-year Electric Vehicle Strategy with the goal of becoming an EV-ready city and accelerating the adoption of EVs in Edmonton. In developing the strategy, the City conducted stakeholder research to understand the public's barriers to owning and driving electric vehicles. As a result, Edmonton's Electric Vehicle Strategy focuses on addressing the most cited barriers, such as purchase price, concerns about driving range, charging station availability, and a generally low level of public familiarity with EVs. The strategy includes public education and marketing activities, financial incentives, and City leadership through electrifying the municipal fleet and operating public charging stations at municipal facilities. Since approving the strategy, the number of EVs in Edmonton has more than doubled, from 379 in 2017 to 782 in 2019, and in 2020 the City renewed its popular rebate for homes and businesses that install EV charging stations, adding \$300,000 in funding. Through this strategy, the City of Edmonton projects it will avoid at least 600,000 tonnes of GHG emissions by 2040, while improving its air quality and energy resiliency, and reducing respiratory issues and urban noise.

Strategy 11: Car-Sharing

Description: Promote and support car-sharing programs and networks to reduce the reliance on single occupancy gasoline vehicles.

Barrie's new Official Plan calls for supporting carpooling and ride-sharing programs by establishing standards to be incorporated into new development; identifying opportunities for carpool parking and coordination areas; and, supporting parking for carpool, car-share, and zero-emission vehicles through preferential designated parking spots and/or reduced parking fees, as appropriate. Car-sharing can also be encouraged through:

- Advocating that the provincial government create high-occupancy vehicle lanes on Highway 400, prioritizing high-occupancy and single-occupancy, low carbon emission vehicles.
- Investing in co-working spaces locally to reduce commuting.
- Encouraging major employers to join existing car-sharing networks.
- Supporting the expansion of car-sharing networks.
- Developing guides for partners/businesses to support the implementation and uptake of car-sharing programs.
- Considering access and a tiered fee model to support use amongst low socioeconomic neighbourhoods.

Switching to alternative modes of transportation has the potential to avoid nearly 80,000 tonnes of carbon from being emitted to the atmosphere by 2030 and 24,000 tonnes by 2050²⁵. This is

²³ Solar Alberta, (2020). *Charging Up! Edmonton's Electric Vehicle Strategy*. Retrieved from [https://solaralberta.ca/wp-content/uploads/2020/10/City-of-Edmonton-E V-Strategy.pdf](https://solaralberta.ca/wp-content/uploads/2020/10/City-of-Edmonton-E-V-Strategy.pdf)

²⁴ City of Edmonton. (2018). *Edmonton's Electric Vehicle Strategy*. Retrieved from https://www.edmonton.ca/city_government/city_vision_and_strategic_plan/electric-vehicle-strategy

²⁵ Note, the total emission reduction potential decreases as the share of electric vehicles increases over time.

equivalent to nearly 18,000 cars from our roads annually by 2030 and over 5,000 each year by 2050.

Case Study: City of London Parking Fees based on emissions^{26,27}

In 2018, the City of London, UK, introduced emissions-based parking fees for on-street parking, which charges fees based on the vehicle's emissions, fuel type, and age. Environmentally-friendly vehicles, such as electric and hybrid vehicles, pay a lesser fee, while newer fossil-fuel vehicles pay a standard price. The most polluting vehicles are charged a higher fee. The emission-based parking fees are paid for using a mobile app, automatically calculating the appropriate charge based on the vehicle registration. This was not an issue as 98% of municipal parking was already paid for through mobile phones. The app informed motorists each time they parked about the impact of their vehicle and prompted them to consider alternative transport where possible. The program saw an immediate drop in parking sessions from the most polluting vehicles (pre-2015 diesel vehicles and pre-2005 gasoline vehicles). In contrast, electric and hybrid vehicles have increased over time.

²⁶ Fleet News. (2018). *City of London introduces emissions-based parking charges*. Retrieved from <https://www.fleetnews.co.uk/news/car-industry-news/2018/08/15/city-of-london-introduces-emissions-based-parking-charges>

²⁷ ParkNow Group (n.d). *PARK NOW Group can help Councils make a positive impact in maintaining air quality*. Retrieved from https://fr.park-now.com/wp-content/uploads/sites/4/2020/08/PN-LONDON-CASE_STUDY-BROCHURE-INTERACTIVE-compressed.pdf

Big Move #3: Circular Economy

Our Plan recommends reducing waste-related emissions through a circular economy approach. Within a circular economy, "waste" is viewed as a resource and is reintegrated into the economy. Such an economy eliminates waste and pollution, circulates products and materials, and helps to regenerate nature.

By encouraging a circular economy in Barrie, the waste sent to landfills will be reduced. The target participation rate for waste diversion from landfills is a 60 percent reduction by 2030 and an 80 percent reduction by 2050.

Strategies:

12. Community sharing economy
13. Phase-out of single-use plastics
14. Recovering energy
15. Circular construction

Big Move #3: Circular Economy





In 2018, emissions from Barrie's landfill site made up 2% of the community's emissions.

Goal: Waste reduction through a circular economy.

Co-Benefits	Designing for Equity
<p>Moving towards a circular economy makes better use of our planet's finite resources, protects our natural environment, and preserves landfill space. Reducing pollution supports human health and biodiversity. A circular economy also supports small businesses and local jobs and generates cost savings through more efficient resource use.</p>	<ul style="list-style-type: none"> • There is an opportunity to include those most vulnerable to climate change in the transition to a new economy. Involving vulnerable groups and small businesses in training can help support their involvement in reuse and repair. • Achieving waste reduction in marginalized communities allows cost-savings to be applied to more community-benefiting uses.

Barrie’s Circular Economy Framework

Barrie is currently developing a Circular Economy Framework. The framework will encourage reuse, recycling, responsible consumption, and recovery actions to minimize waste generation and associated emissions. The strategy identifies four pillars as a framework for influencing a circular economy approach in Barrie – reuse, recycle, consume and recover.

The Four Pillars	 REUSE	 RECYCLE	 CONSUME	 RECOVER
Objective:	Create and foster a culture of reuse	Ensure residents and businesses know about and are confident using recycling systems.	Rethink the role that food can play in supporting a circular economy.	Recover energy and materials after other efforts have been exhausted
Goal:	Extend the lifecycle of goods, products, and resources through local repair, upgrade and reuse initiatives.	Maximize the recycling captured for processing.	Minimize food wastage from all sources.	Identify the economic value of waste and maximize local energy benefit from waste streams.
Priority Areas:	<ul style="list-style-type: none"> • Repair • Share • Behaviour 	<ul style="list-style-type: none"> • Blue Box • Producer Responsibility • Behaviour 	<ul style="list-style-type: none"> • Food Production & Consumption • Food Diversion • Behaviour 	<ul style="list-style-type: none"> • Residual Waste • Water • Behaviour

Inspiring Climate Action in Barrie is meant to align with the goals of the circular economy framework, while emphasizing the actions most likely to lead to emissions reductions. Both the plan and the framework should be read and implemented in tandem with one another.

Strategy 12: Community Sharing Economy

Description: Strengthening the community sharing economy includes identifying events and online platforms for swap, share and repair events, promoting innovation and experimentation with circular initiatives, and supporting the reduction and phase-out of single-use plastics.

A community sharing economy might include, for example, the development of a community bike share program or a community hub with tools and expertise to fix items and workshops to share knowledge. Promoting experimentation in the reuse of resources, for example, through upcycling textiles collected in the community, or supporting restaurants in diverting organic waste and redistributing surplus food, are additional ways to build a circular economy.

Producing, using, and disposing of new products costs energy and emits GHG emissions. Some estimates indicate that, together, these processes account for up to two-thirds of global emissions²⁸. The sharing economy can help to use goods more efficiently and reduce emissions.

Barrie's Circular Economy Framework will:

- Support initiatives that actively promote the circular economy through share, repair, and reuse events and programs.
- Incorporate circular economy strategies to inspire innovation and experimentation with circular initiatives.
- Promote activities that support a sharing economy and establish partnerships with internal and external stakeholders.

Strategy 13: Phase-Out of Single-Use Plastics

Description: Supporting the reduction and phase-out of single-use plastics through promotion and education strategies and voluntary bans at City facilities and permitted events.

In addition to being a source of pollution – ending up in our environment, waters, and landfills – plastics produce emissions throughout their lifecycle. More than 99% of plastics are made from fossil fuels, and emissions are produced during extraction, transport, refining, manufacturing, and disposal²⁹. The majority of these emissions occur outside of Barrie; however, the importance of reducing single-use plastics cannot be understated from a broader environmental protection lens.

Barrie's Circular Economy Framework will support the reduction and phasing out of single-use plastic items. This might also include a public awareness and education campaign on the waste management system and the importance of a circular economy. Other supporting actions include:

- Expanding existing municipal recycling programs.
- Minimizing waste generation and maximizing waste diversion opportunities at all City-owned facilities and permitted events.

Strategy 14: Recovering Energy

Description: Recovering energy and realizing the value of resources by minimizing GHG emissions and maximizing energy recovery opportunities from waste management activities. Waste-to-energy (WTE) is a process of converting either solid landfilled waste or wastewater to energy. It can be achieved in several ways, including combustion, anaerobic digestion, and the capture of landfill gas (LFG). Converting waste into energy is a common practice; at Barrie's Wastewater Treatment Facility, anaerobic digesters deliver methane

²⁸ European Environment Agency. (2020). *Cutting greenhouse gas emissions through circular economy actions in the buildings sector*. Retrieved from <https://www.eea.europa.eu/themes/climate/cutting-greenhouse-gas-emissions-through/cutting-greenhouse-gas-emissions-through>

²⁹ Columbia Climate School. (2020). *More Plastic Is On the Way: What It Means for Climate Change*. Retrieved from <https://news.climate.columbia.edu/2020/02/20/plastic-production-climate-change/>

resulting from the decomposition of organic materials in wastewater to what is known as a co-generation system, providing both electricity and heat to power the wastewater treatment process itself. Current plans to upgrade the size of the co-generation engines at the treatment facility are in place and will increase capacity to capture all of the biogas produced on-site. Future upgrades to accommodate population growth are also being considered.

Barrie's Circular Economy Framework will:

- Recover energy generated from waste disposal and waste processing.
- Minimize greenhouse gas emissions from waste management activities.

Strategy 15: Circular Construction

Description: Circular construction through the investigation and development of tools supporting low carbon development. The Green Development Standard should include considerations for circular construction. Currently, about 88% of construction and demolition waste (C&D) in Ontario is being sent to landfills. With home building and renovations on the rise, this is a concerning trend, especially because the City of Barrie's landfill is expected to run out of space by 2035^{30,31}. C&D waste also contains chemicals that may pose risks to human health and the environment if not properly managed. To address this, many Canadian municipalities are developing legislation and programs to encourage the reuse and recycling of C&D waste³².

Barrie's Circular Economy Framework will:

- Encourage reuse and recycling of construction and demolition (C&D) waste.
- Advocate for updating regulations related to construction and demolition waste through municipal waste management organizations and investigating the pre-feasibility of including innovations for the reduction of GHG emissions as a deliverable in procurement documents for waste collection programs.

Case Study: Vancouver Green Demolition By-law³³

In 2014, the City of Vancouver enacted the Green Demolition By-law, which established that at least 75% (by weight) of demolition waste from pre-1940 homes must be recycled or reused. This was in response to the finding that construction and demolition (C&D) waste represented more than 40% of total materials disposed of in Vancouver. Contractors must submit green demolition compliance reports that show where materials are sent; recycling, for example, must be sent to Metro Vancouver licensed facilities. Between 2014 and 2018, the bylaw resulted in 86% of waste from pre-1940 home demolitions being recycled or reused, almost double the typical rate. Due to this success, Vancouver City Council has committed to expanding the bylaw

³⁰ National Post. (2021). *Let's talk about waste – Canadian construction industry can do its part to help the environment*. Retrieved from <https://nationalpost.com/life/homes/lets-talk-about-waste>

³¹ City of Barrie. (2021). *Barrie Landfill Site*. Retrieved from: <https://www.barrie.ca/Living/GarbageAndRecycling/Pages/Landfill.aspx>

³² Government of Canada. (2021). *Reducing municipal solid waste*. Retrieved from: <https://www.canada.ca/en/environment-climate-change/services/managing-reducing-waste/municipal-solid/reducing.html>

³³ City of Vancouver. (2018). *Green Demolition By-law Update*. Retrieved from <https://council.vancouver.ca/20180516/documents/pspc2c.pdf>

requirements to newer homes incrementally over time. Since 2019, the bylaw has expanded to include pre-1950 homes, capturing 70% of residential homes and diverting about 18,000 tonnes of materials annually. A deconstruction requirement has also been added to the bylaw, mandating that at least three metric tonnes of materials must be salvaged from pre-1910 and heritage-listed homes. As a result, 20-30% of the deconstructed homes are reused in local construction and furniture making, which has helped grow the local downstream market and salvage industry.

Diverting waste from landfills has the potential to prevent nearly 25,000 tonnes of carbon from being emitted into the atmosphere each year. This is the equivalent of removing nearly 5,500 cars from our roads each year.

Big Move #4: Natural Environment & Land Use

How communities are designed and operate can play a significant role in reducing emissions while also improving the quality of life for residents. High-density and mixed-used development can reduce the energy required to power our buildings and lessen the commuting time required to move around our city.

Big Move #4: Natural Environment & Land Use

Goal: Livable neighbourhoods that support energy efficiency, mixed-use, complete communities & protection of the natural environment.

Promoting local food options supports our businesses and shortens supply chains needed to transport goods from other places. Creating a zero-emission neighbourhood has been identified as an opportunity for a demonstration project to show how our community and its neighbourhoods can look and function in the future.

Achieving net-zero emissions by 2050 will require reducing the emissions we generate to the fullest extent possible. Recognizing that, as our emissions come closer to zero, there will be areas of our community where reductions are more challenging or not possible to bring to zero. Once we reach this point, we will need to offset emissions and drawdown carbon from the atmosphere. Our Plan considers the protection and expansion of natural assets that sequester carbon from the atmosphere and considers how to support further advancement of nature-based solutions into our future.

Strategies:

16. Higher density, mixed-use developments
17. Zero-emissions neighbourhood
18. Local food
19. Nature-based solutions

Co-Benefits	Designing for Equity
Complete communities offer residents many benefits. Active transportation options and local food help to promote physical and mental health. Access to greenspace provides climate resilience, ecosystem services, and overall human health and wellbeing.	<ul style="list-style-type: none"> • Individuals from all levels of socioeconomic status should have access to the benefits of complete communities – including access to active transportation, transit, greenspace, and healthy food. • There is a need to promote equitable access to natural environments and the benefits they provide. • A future zero-emissions neighbourhood should include affordable housing options for people of all ages and socioeconomic statuses.

Strategy 16: Higher Density, Mixed-Use Development

Description: Create higher density, mixed-use developments, fostering complete communities.

High-density, mix-use development enables residents to live, work, shop, and play without travelling long distances. The Official Plan defines Complete Communities as "places such as mixed-use neighbourhoods or other areas within cities, towns, and settlement areas that offer and support opportunities for people of all ages and abilities to conveniently access most of the necessities for daily living, including an appropriate mix of jobs, local stores, and services, a full range of housing, transportation options, and public service facilities." Complete communities are age-friendly. They may take different shapes and forms appropriate to their contexts" (p. 199)³⁴. Complete communities are integral to improving public transit and active transportation to become more safe and convenient, and to reducing emissions from transportation.

Barrie's new Official Plan includes several provisions to promote the development of complete communities with healthy community design principles – both at the neighbourhood and city-wide level, such as:

- Concentrating density and the widest mix of uses in areas that can support additional growth, with criteria for affordable housing options.
- Ensuring high-density areas have a sufficient population to attract fresh food retailers.
- Planning for transit-oriented development, which is supportive of active transportation that is safe and accessible.
- Ensuring a mix of housing and employment options are available.
- Centring residential developments around parks and schools to support access to greenspace and community gardens.

Strategy 17: Zero-Emissions Neighbourhood

Description: Develop a zero-emissions neighbourhood (ZEN). This could be a new or existing neighbourhood within the city. High thermal and energy efficiency, low-carbon materials, and renewable energy sources can help to achieve neighbourhood-wide emissions reductions.

³⁴ City of Barrie. (2021). *Official Plan 2051 Final Version – December 15, 2021*. Retrieved from <https://www.buildingbarrie.ca/22277/widgets/90160/documents/71957>

A ZEN is a community designed to reduce its emissions to zero over time. ZENs typically have the following characteristics³⁵:

- Buildings and other infrastructure are built and operated in a manner that reduces lifecycle emissions.
- Highly efficient homes and buildings, powered by primarily renewable energy.
- Buildings share energy in a flexible way to minimize waste.
- Neighbourhood design promotes active, safe and sustainable modes of transportation.
- Innovation and economic sustainability are embedded in design, development, and operations.

The development of a ZEN in Barrie would require a detailed, neighbourhood-specific energy plan. This would include specific modelling and analysis of the energy and emissions generated within a neighbourhood and recommendations to approach zero emissions. These recommendations would feed into an update at the secondary plan level, establishing the policy guidance for ZEN development. Consideration should also be given to affordable housing within the ZEN so that its benefits are equitable. While both greenfield and brownfield ZEN is possible, a review of best practice suggests beginning with brownfields as they are often located close to amenities in urban centres³⁶.

Case Study: Markham's Net Zero Community^{37,38}

In 2018, the City of Markham announced the development of a pilot neighbourhood that will use community-scale geothermal energy for heating, cooling, and domestic hot water. The planned development of approximately 300 homes will be Canada's largest residential community to use net-zero emission geothermal heating and cooling. The community will access geothermal energy through wells that are up to 250 metres deep. Each well will be connected to a common pipe (called an ambient loop) buried underneath the community and connects to each home to provide heating and cooling. This community-scale model reduces the number of needed wells, allows for centralized maintenance, reduces energy costs, and improves energy efficiency. As a result, each of the 300 homes in the community is projected to use 61% less energy and generate 86% fewer GHG emissions than homes with conventional heating and cooling. The City of Markham is championing this pilot to innovate community design to meet its 2050 net-zero emissions target.

³⁵ FME ZEN. (n.d). *What is a Zero Emission Neighbourhood?* Retrieved from <https://fmezen.no/what-is-a-zen/>

³⁶ Community Energy Knowledge - Action Partnership. (2017). *On the path to net-zero communities*. Retrieved from https://www.cekap.ca/resources/research-report-OCC_Full%20Report.pdf

³⁷ Enwave Energy Corporation. (2018). *Smart, energy-efficient homes of the future coming to Markham*. Retrieved from <https://www.enwave.com/resources/smartenergy-efficienthomesofthefuturecomingtomarkham/>

³⁸ City of Markham. (n.d). *Media Backgrounder: Markham Geothermal Community Pilot Project*. Retrieved from <https://www.enwave.com/resources/smartenergy-efficienthomesofthefuturecomingtomarkham/>

Strategy 18: Local Food

Description: Promote a culture of growing and buying locally grown food.

Local food production supports the local economy, reduces the distance food travels (and resulting transportation emissions), sequesters carbon, and contributes to local food security and resiliency. Local foods are also known to be fresher, taste better, and contain more nutrients³⁹. Healthy food should be accessible for all community members, whether by transit or active transportation networks. Suggested actions include:

- Promoting urban agriculture (community gardens, indoor vertical gardens, edible landscaping, rooftop gardens in residential, commercial and institutional areas) through policy, operational plans, and zoning bylaws.
- Maintaining and expanding the community garden program within the city.
- Protecting and conserving land and water for use in the production of food as part of a sustainable local food system.
- Expanding organics diversion opportunities and developing a food waste reduction strategy.
- Partnering with food producers, restaurants, and charities to redistribute edible surplus food in the community.
- Promoting local food production and sales, such as through the Barrie Farmer's Market.
- Supporting foraging opportunities of safe and edible plants, medicines and food, local community gardens.
- Educating the community on planting vegetable gardens at home (i.e., indoor vertical gardens), food waste reduction, composting, and related topics.

Case Study: MealCare Guelph⁴⁰

MealCare Guelph is a student group at the University of Guelph addressing local food insecurity by reducing campus food waste. Two students founded the group when they noticed that edible surplus food from campus kitchens was being sent to compost or landfill daily. To prevent this waste, they organized a process where volunteers collect campus-prepared surplus food, package, label, and refrigerate the food according to public health guidelines, and coordinate redistribution through local charities. MealCare Guelph has partnered with local charities such as the campus food bank, Royal City Mission, and the city's youth shelter, Wyndham House, to redistribute the collected food. In 2021, after three years of operations, MealCare Guelph had grown to become an accredited student association club with over 20 volunteers and has donated over 17,000 pounds of rescued food to date.

Strategy 19: Nature-Based Solutions

Description: Protect and expand carbon sequestration through trees, wetlands, and other nature-based solutions.

Though not quantified at this time, protecting our natural assets has several benefits and should be prioritized. In addition to sequestering carbon, natural assets provide climate resilience,

³⁹ Michigan State University. (2013). *Seven benefits of eating local foods*. Retrieved from https://www.canr.msu.edu/news/7_benefits_of_eating_local_foods

⁴⁰ University of Guelph. (2021). *MealCare Guelph Helping to Alleviate Local Food Insecurity*. Retrieved from <https://guides.uoguelph.ca/2021/07/mealcare-guelph-helping-to-alleviate-local-food-insecurity/>

ecosystem services and contribute to overall human health and wellbeing. Protecting and expanding nature-based solutions might include:

- Completing a natural asset inventory for Barrie, which includes carbon quantification and cost valuation to develop a baseline of the sequestration potential of the current urban canopy.
- Setting a target for Barrie's urban canopy cover.
- Developing a private tree conservation bylaw.
- Developing a greenspace policy to promote equitable access to natural environments and the benefits they provide.
- Supporting the equitable distribution of nature-based solutions.
- Promoting and enhancing awareness of the environmental, social, health, and economic benefits of thriving natural environments.
- Ensuring native and fruit-bearing trees are expanded on public lands.
- Increasing the recognition that natural systems are important infrastructure supporting mitigation and providing many adaptation and health co-benefits.

Case Study: 10,000 Trees for Barrie⁴¹

In 2019, Living Green Barrie (LGB), with support from the City of Barrie, Lake Simcoe Region Conservation Authority (LSRCA), and various community sponsors, launched a campaign to plant 10,000 trees in Barrie by 2024. LGB is a registered charity that has spearheaded various environmental innovations in the community for over 30 years. The 10,000 Trees for Barrie campaign focuses on planting native trees and shrubs and guides community volunteers in before-planting and after-planting care to give them the best chance to grow. Increasing Barrie's tree canopy through this initiative will reduce Barrie's GHG emissions through carbon sequestration, contribute to cleaner air and waterways, mitigate the urban heat-island effect, and provide habitat for birds and pollinators and other wildlife. By engaging community members through various events and activities, LGB has already mobilized volunteers to plant over 2200 trees since the campaign started.

Case Study: Montreal's Urban Forest Action Plan⁴²

The City of Montreal has one of Canada's boldest municipal tree planting plans, given its ambitious timelines and challenges posed by its high population, industry, and commercial density. In 2010, the City set a target of growing its tree canopy coverage and has since further committed to planting 500,000 trees by 2030. Montreal has pursued these targets vigorously by investing in public trees, purchasing land to add to public parks, providing funding to treat and protect trees from insect infestations, and funding a coalition of local NGOs that support increasing tree cover on private land. The partnership with local NGOs has allowed for more focused outreach to inspire community and corporate participation, resulting in close to 55,000 trees planted on privately owned land since 2015. Despite setbacks from Emerald Ash Borer infestations, Montreal has increased its canopy cover to 23%.

⁴¹ Living Green Barrie. (n.d). *Tree Planting*. Retrieved from <http://www.livinggreenbarrie.com/tree-planting/>

⁴² Smart Prosperity Institute. (2021). Growing forests in a city. Retrieved from https://institute.smartprosperity.ca/sites/default/files/Urban%20Trees%20study_EN.pdf