CITY OF FREDERICTON

COMMUNITY ENERGY AND EMISSIONS PLAN

Fredericton

ACKNOWLEDGEMENTS

The Project Team would like to gratefully acknowledge everyone who participated in the development of the City of Fredericton's Community Energy and Emissions Plan (CEEP). It is a culmination of efforts from staff, stakeholders and members of the public and reflects a diverse range of knowledge and expertise.

The development of the CEEP was made possible by the generous contribution of the Province of New Brunswick through their Environmental Trust Fund.

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Executive Summary

Since the industrial revolution, human activities such as burning fossil fuels, deforestation, agricultural practices, and other land use changes have resulted in the release of unnaturally large volumes of greenhouse gas (GHG) emissions into the Earth's atmosphere causing global climate systems to change. In 2018, scientists and policy makers globally came to the agreement that to substantially reduce the risks and effects of climate change, and limit global warming to 1.5°C, global society must dramatically reduce greenhouse gas (GHG) emissions 50–60 percent by 2030, 80 percent by 2040, more than 90 percent by 2050 with the remaining emissions being offset or neutralized (e.g. direct air capture, reforestation, etc.) and be net negative in the second half of the century. Across the globe, communities, towns and cities have responded by declaring a climate emergency, acknowledging the need to prioritize climate action and striving to reduce GHG emissions by at least 80 percent by 2050 or earlier.

Recognizing the responsibility to respond to the causes and impacts of climate change, this Community Energy and Emissions Plan (CEEP) is a renewed focus for the City of Fredericton. We have an indispensable role to play in radically reducing our contribution to climate change and adapting our community to the changes that are already locked into the climate system. We also have a role to play in helping Fredericton citizens and businesses make informed climate friendly choices about everyday decisions. This CEEP integrates the work to slow the effects of climate change by setting the City on a path to reduce GHG emissions by at least 50 percent by 2030 and achieve net zero by 2050 while also preparing for the weather related impacts that are likely to occur.

This CEEP is both an action plan and a strategic plan. As an action plan it defines a number of actions that can be initiated by City staff, residents and partners over the next 8 years to achieve the targeted GHG reductions. As a strategic plan, the vision and goals presented will provide overarching direction for future decision making about which initiatives to pursue.

Within this plan, we have identified strategic short-, medium- and long-term strategies and actions and organized them by goal areas. The planned strategies and actions encompass a wide range of approaches, from educational campaigns, to increases in regulations and standards over time, to new and existing sources of potential funding. These actions and strategies will complement existing initiatives and put Fredericton on a path towards the 2030 and 2050 GHG reduction targets. See the next page for a summary of the goal areas and associated actions.

COMMUNITY ENERGY AND EMISSIONS PLAN AT A GLANCE

BUILDINGS

- All newly constructed buildings are highly energy efficient and operate on low/no carbon fuel sources. Developers take advantage of streamlined incentive programs and are building with energy efficiency standards that go beyond the latest National Energy Code of Canada for Buildings and National Building Code.
- Existing buildings in the City are highly energy efficient. By 2030, the City's current annual energy retrofit rate at least doubles and energy and GHG improvements become a central part of every building renewal.

LAND USE

- Future City planning direction and council decisions about land are aligned with the intended direction and commitment for GHG reductions and energy efficiency. The City plans and develops neighborhoods that are accessible, use low/no carbon fuels, and manage energy consumption through design.

TRANSPORTATION

- Through smart land use planning and the adoption of affordable, convenient and safe active transportation methods,
  - All new community plans prioritize pedestrians and cyclists, and existing plans are retrofitted to do so.
  - The City reduces the number of single occupancy trips and there is a significant increase in residents who are choosing to use public transit, walking and cycling (over 2021 levels). The City has established personal vehicle average trip length reduction, active transportation, and transit utilization targets by 2025.
  - The City reduces vehicular travel and associated transportation GHG emissions. The City has a comprehensive network of pedestrian and bicycle routes linking residents to commercial and activity areas.

SOLID WASTE

- The City implements a strategic plan to reduce the amount of solid waste being generated by residents and businesses in the City. The community reduces the generation of waste through the promotion of the 6 r's of waste management (rethink, reduce, reuse, recycle, recover, and residual management).

ALTERNATIVE ENERGY

- The City reduces the carbon intensity of its energy portfolio though the adoption of local renewable energy systems. The City completes an alternative energy assessment to identify neighborhoods or hotspots where solar PV, microgrids, waste heat recovery and district energy (DE) systems could be used.

LOCAL ECONOMY

- The City provides support and engages local businesses, universities, colleges and not for profit organizations in the community to help with the transition towards a low carbon economy. A green economy strategy is included in the new Economic Development Strategy.

COMMUNITY
OUTREACH & FUNDING

- The community has taken ownership of its personal carbon footprints. There is stable funding for initiatives that reduce energy use and greenhouse gas emissions in the community.

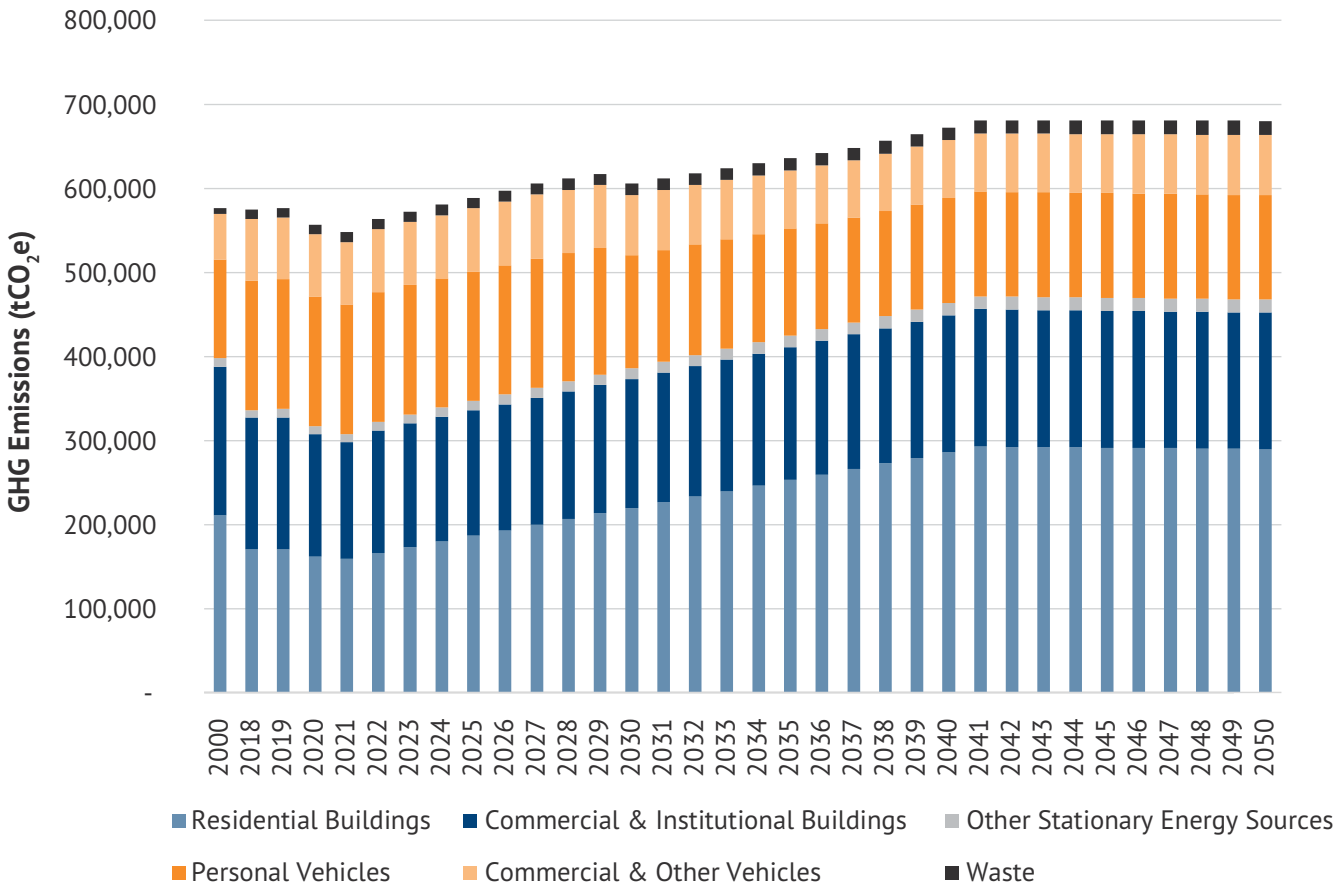
MUNICIPAL LEADERSHIP

- The City is a leader in taking action on climate change.

While many factors will influence the behavior and actions of the Fredericton community over the next 30 years—and ultimately the trajectory of the community's GHG emissions, the achievement of the 2030 and 2050 GHG reduction targets will require more stringent building energy codes, deep energy retrofits to all existing building stock (at least 50 percent by 2030), the continued greening of New Brunswick's energy system, and the rapid adoption of less GHG intense forms of transportation. Carbon removal from the atmosphere through the use of renewable energy credits (RECs) or the purchase of carbon offsets are likely to be part of the CEEP reduction portfolio in years to come with the specifics of those reduction tools to be defined as needed beyond 2030. While 56 actions have been identified to put the City on a path towards our GHG reduction targets, additional actions are going to be required to offset any remaining emissions. While the specifics of these actions will be defined as needed beyond 2030, options to reduce any remaining emissions could include biological sequestration (e.g., planting trees), purchasing carbon offsets, renewable natural gas (RNG) and renewable energy certificates (RECs).

The preparation of the CEEP is Fredericton's first step towards reducing community GHG emissions to achieve the 2030 and 2050 targets. It is a forward-looking vision for GHG emission reductions in Fredericton and will be treated as a living document with the intent to be updated and revised as resources, new science and technologies emerge.

Business As Usual GHG Emissions Forecast



A Call to Action

Since the industrial revolution, human activities such as burning fossil fuels, deforestation, agricultural practices, and other land use changes have resulted in the release of unnaturally large volumes of greenhouse gas (GHG) emissions into the Earth's atmosphere causing global climate systems to change. In 2018, scientists and policy makers globally came to the agreement that to substantially reduce the risks and effects of climate change, and limit global warming to 1.5°C, global society must dramatically reduce greenhouse gas (GHG) emissions 50–60 percent by 2030, 80 percent by 2040, more than 90 percent by 2050 with the remaining emissions being offset or neutralized (e.g., direct air capture, reforestation, etc.) and be net negative in the second half of the century. Across the globe, communities, towns and cities have responded by declaring a climate emergency, acknowledging the need to prioritize climate action and striving to reduce GHG emissions by at least 80 percent by 2050 or earlier.[1]

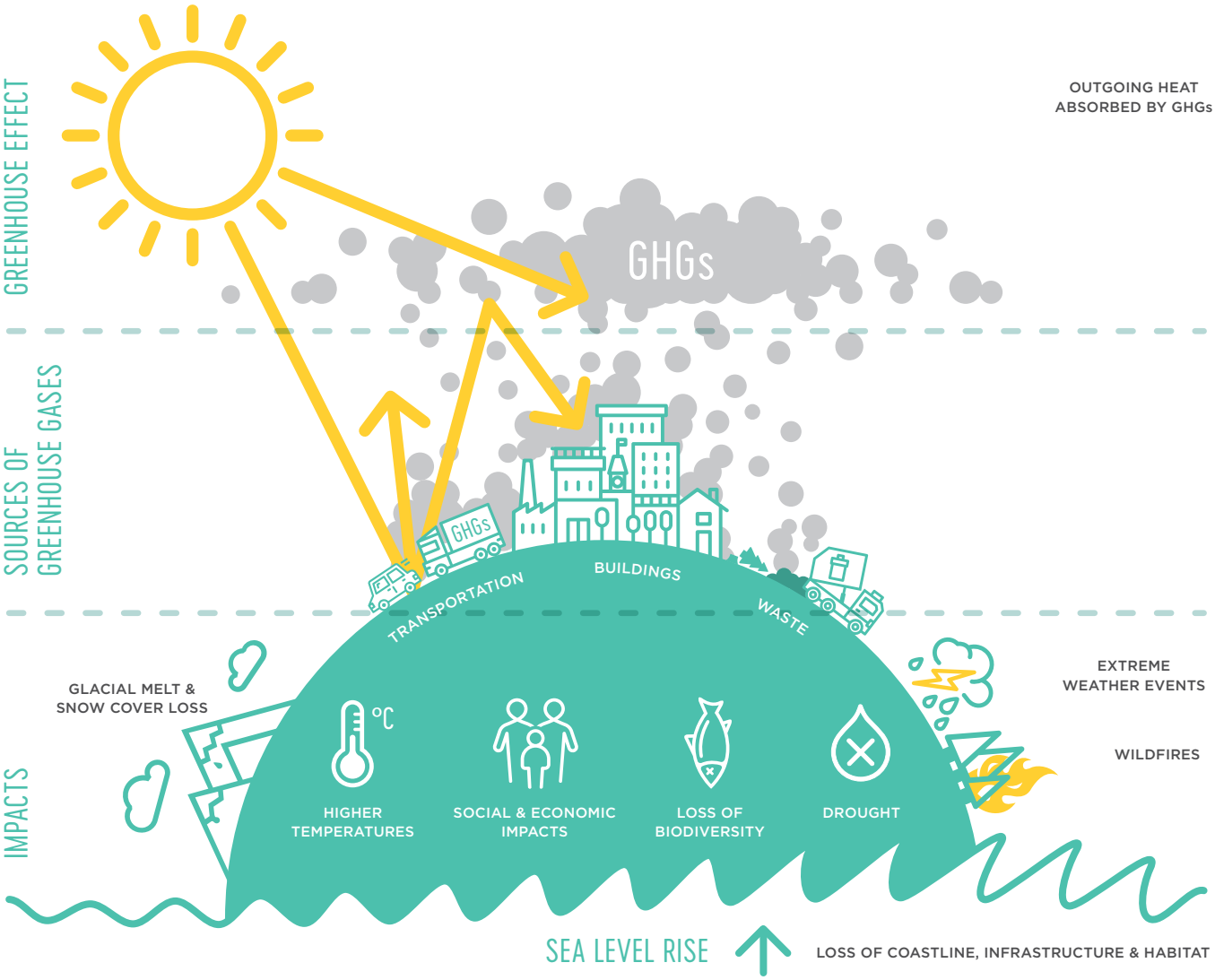
The City of Fredericton has already seen the impacts of climate change—there has been an increase in the number heat waves, extreme weather events and changes in precipitation patterns over the last number of years. Climate projections for the next 50 to 80 years indicate that Fredericton can expect even greater increases in seasonal temperatures, changes in precipitation patterns and an increase in the number and severity of extreme weather events. On the ground, these changes mean a greater likelihood of wildfire, flooding, and wind events which can result in service disruptions, damage to private and public property, and public emergencies and evacuations.

1 Intergovernmental Panel on Climate Change (IPCC) AR6 Synthesis Report, www.ipcc.ch/assessment-report/ar6/

WHAT IS CLIMATE CHANGE?

Since the industrial revolution, human activities such as burning fossil fuels, deforestation, agricultural practices and other land use changes have resulted in the release of large volumes of GHG emissions into the Earth's atmosphere causing global climate systems to change. In 2007, the Intergovernmental Panel on Climate Change (IPCC) concluded that "[the] warming of the climate system is unequivocal, as is now evident from observations of increases in global average air and ocean temperatures, widespread melting of snow and ice, and rising global mean sea level." In 2018, scientists and policy makers globally came to the agreement that to substantially reduce the risks and effects of climate change, and limit global warming to 1.5°C, global society must dramatically reduce greenhouse gas (GHG) emissions 50–60 percent by 2030, 80 percent by 2040, more than 90 percent by 2050 with the remaining emissions being offset or neutralized (e.g. direct air capture, reforestation, etc.) and be net negative in the second half of the century. Across the globe, communities, towns and cities have responded by declaring a climate emergency, acknowledging the need to prioritize climate action and striving to reduce GHG emissions by at least 80 percent by 2050 or earlier.

As a signatory to the Paris agreement, Canada has joined over 120 countries in committing to be net-zero emissions by 2050.



Source: City of Victoria Climate Leadership Plan
https://www.victoria.ca/EN/main/residents/climate-change/climate-leadership.html

MITIGATING AND ADAPTING TO THE EFFECTS OF CLIMATE CHANGE

The phenomenon of climate change and how to address it has been a priority for the past 20 years at the City of Fredericton It was at this point that the City began tracking GHG emissions and creating plans for the reduction of emissions. Through programs like Fredericton's Green Matters campaign, and other supportive policies to reduce energy consumption in the community, the City has been able to realize a 33 percent reduction in per capita emissions while building the local economy and improving the quality of life.

Despite this progress in reducing GHG emissions, the City, like many communities and organizations, is not on track to meet the required GHG reduction targets to keep the planet from warming more than 1.5 degrees by 2050. In recognition of this trend, the City is undertaking additional efforts to reduce GHG emissions. **This Community Energy and Emissions Plan (CEEP) provides a roadmap to slow the effects of climate change by reducing GHG emissions and to achieve the City's goal of reducing community GHG emissions 50 percent by 2030 and achieving net zero by 2050.**

The good news is that there are no substantial technical or economic barriers that would prevent the City from achieving the 2050 GHG reduction targets and required adaptation to climate change. There are multiple pathways to achieving these important climate goals—each involving a different mix of technologies, policy levers, and strategies. These climate action pathways also contribute to the achievement of many of the City's community goals (see 13) and can result in numerous co-benefits including:

- Job creation and highroad careers related to renewable energy, industrial ecology, smart grid development, district energy development, and alternative transportation;
- Shorter commute times through improved access to active transportation methods;
- Improved quality of life through reduced air pollutants;
- Lower energy bills due to energy use and water consumption reductions and more efficient buildings; and
- Fewer disruptions in services due to planned resiliency actions.

Co-benefits can also offset the costs of energy and GHG reduction initiatives, especially for investments in renewable energy sources, and energy efficiency. While the City alone cannot prevent global warming, we can limit our contribution and adapt to the changes and effects that may result.

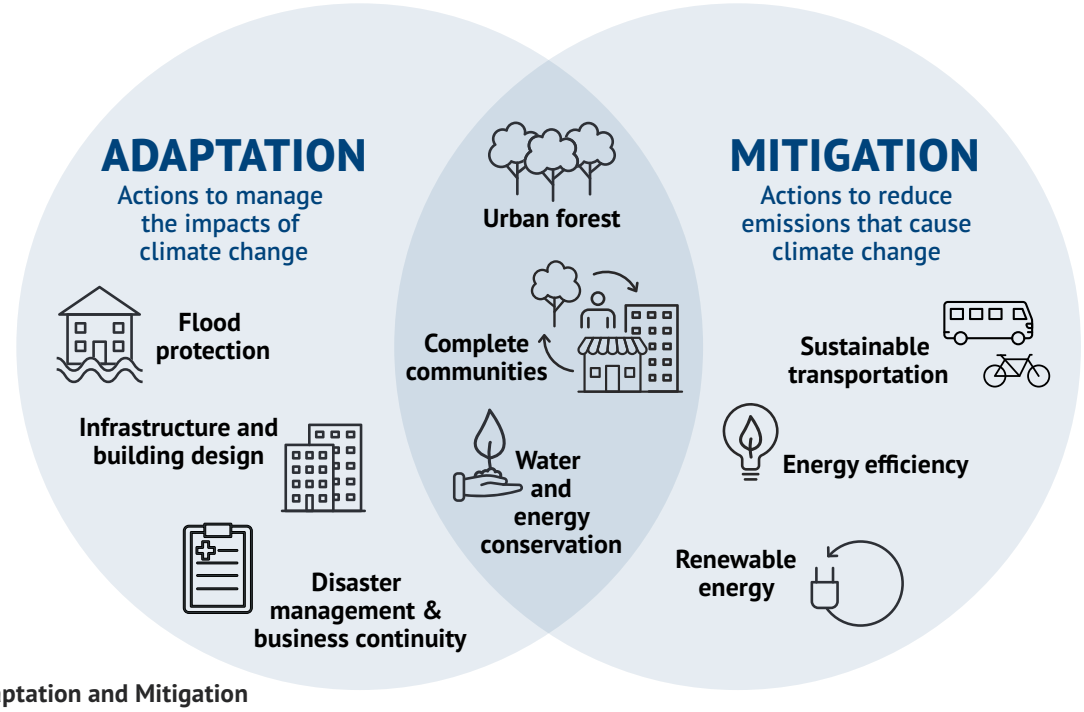


Figure 1. Adaptation and Mitigation

Our Community Energy & Emissions Plan (CEEP)

OBJECTIVE

This CEEP represents a renewed focus on GHG reductions for the City of Fredericton. We have an indispensable role to play in radically reducing our contribution to climate change. We also have a role to play in helping Fredericton citizens and businesses make informed climate friendly choices about everyday decisions. This CEEP identifies strategies and actions to slow the effects of climate change and reduce GHG emissions by 50 percent by 2030 and achieve net zero by 2050. The CEEP complements and supports key City plans including the Municipal Plan, the Climate Change Adaptation Plan (CCAP) and the Corporate Energy and Emissions Plan. Synchronizing the implementation of these plans will allow the City to decrease GHG emissions, while creating a more livable community that is resilient to climate change impacts.

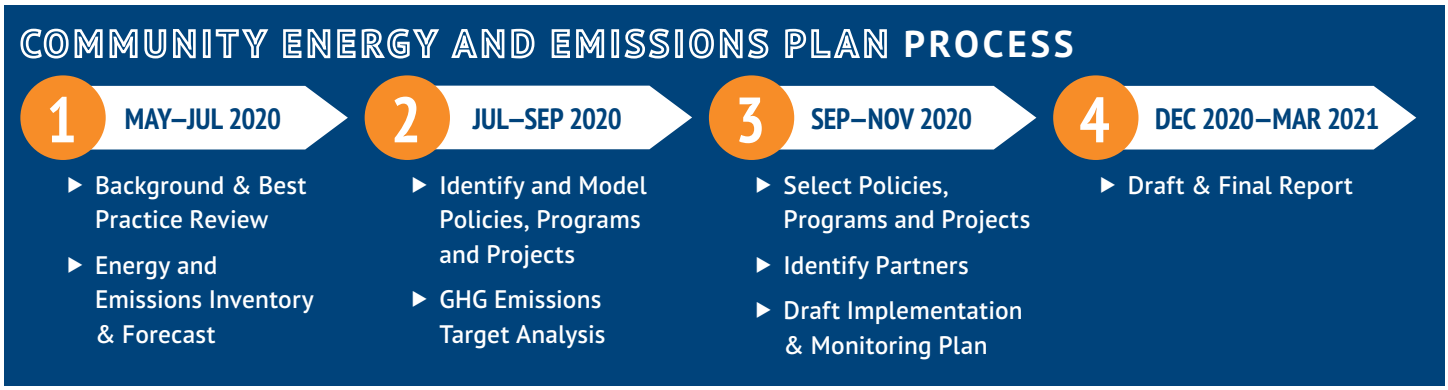
This CEEP is both a strategic plan and an action plan. As an action plan it defines several actions that can be initiated by City staff, residents and partners over the next 10 years to achieve the targeted GHG reductions. As a strategic plan, the vision and goals presented will provide overarching direction for future decision making about which initiatives to pursue. This strategic vision is important when new ideas and proposals are brought forth in the future that have not been conceived or fully developed at the time of this plan.

The CEEP aims to meet the following objectives:

- **Measure**: Define accurate community GHG and energy use (baselines, modelling, and forecasts) to inform all planning and priority decision making.
- **Plan**: Establish effective plans and implement actions to achieve Fredericton's GHG reduction targets of 50 percent below 2000 levels by 2030 and net zero by 2050 to achieve the necessary level of community resilience to reduce climate related risks across human and natural systems.
- **Implement**: Take aggressive and proactive action to tackle the most important GHG mitigation priorities and programs.
- **Monitor and Improve**: Track progress towards the CEEP goals and objectives and inform future plans programs and initiatives.

CEEP DEVELOPMENT PROCESS

The development of the CEEP evolved over the course of the 2020 calendar year and involved a combination of research on policy and best practices, completion of Fredericton's GHG inventory and forecast of GHGs out to 2050, input from staff, stakeholders and the public. Numerous stakeholders were invited to participate in two workshops in the fall of 2020 to provide input into the goals, and help identify key actions and partners, while an online survey hosted in the fall of 2020 was used to assess public support for various high-level strategies in the areas of transportation and land use, buildings and energy, and solid waste. The CEEP was also updated in May 2022 to reflect the City's adoption of more aggressive GHG reduction targets which were approved by City Council in February 2022.



SPOTLIGHT ON ADAPTATION

The City has also focused on adapting to climate change over the past two decades. This means we have been adapting our services and infrastructure based on the climate change impacts that are occurring or are expected, regardless of a decrease in emissions. To address these changes, the City has integrated adaptation measures into operations like oversizing stormwater systems, raising roads, expanding the active transportation network and though communicating with the public including sharing heat alert messages and developing by-laws to mitigate household-level flooding. Most recently, the City has developed a Climate Change Adaptation Plan (CCAP) which identifies and coordinates the key adaptation measures the City can employ to improve the community's resilience to extreme weather events and inevitable changes in climate.

COMMUNITY GOALS AND ENERGY & EMISSIONS PLANNING

The objectives and activities contained within the CEEP are consistent with broader City of Fredericton objectives and activities. The table below highlights some key areas where energy and emissions planning relates to the goals established within City's Growth Strategy, which are included in the City's Municipal Plan.

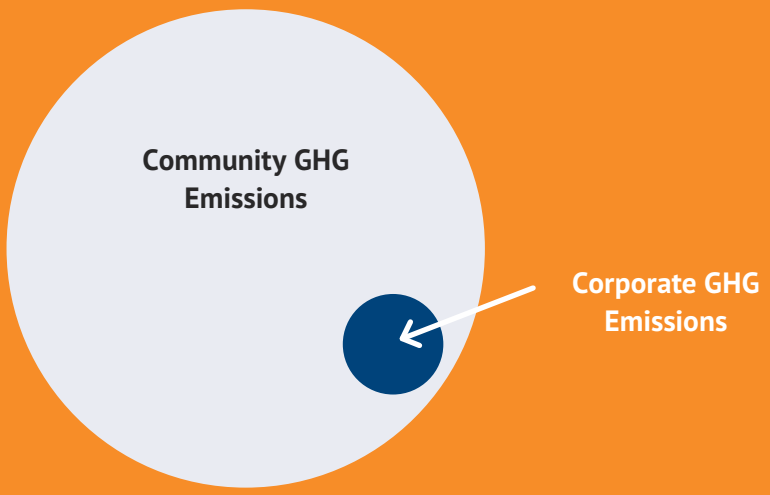
COMMUNITY GOALS	WHAT DOES THIS MEAN FOR ENERGY AND EMISSIONS PLANNING?
S&IPR **Safe and Inviting Public Realm** W&S **Welcoming and Supportive**	Creating a community with good quality of life (healthy, safe) and that will allow future generations to enjoy our current (or better) quality of life means using energy resources in a sustainable manner and creating local energy supply to ensure the long-term resiliency of our community.
CN&DP **Complete Neighbourhoods and Distinctive Places** VD&R **Vibrant Downtown and Riverfront**	Complete communities allow us to live more of our lives closer to home, which reduces the amount of energy we consume for travel (to work/ school, to run errands). Higher densities and more diverse housing options can help to sustain local businesses. In these more dense, mixed use neighbourhoods, alternative and active forms of transportation become more viable.
G&H **Green and Healthy**	Properly managed green spaces remove carbon from the atmosphere and help to reduce the urban heat island and provide other adaptive co-benefits (e.g., reduced erosion, improved floodplain management).
S&E **Sustainable and Efficient** CTS **Complete Transportation System**	Land use planning is a powerful tool for managing energy use and emissions in a community. It can be used to: (i) concentrate growth in certain areas, thereby preserving natural areas and creating viable opportunities for transit and other alternative modes; (ii); guide how development occurs (e.g., energy efficient, low carbon), and; (iii) create vibrant, mixed use neighbourhoods that minimize our need to get around by car.
S&DE **Strong & Diverse Economy**	A transition to a low carbon economy will require new knowledge, skills, goods and services. This introduces business and economic opportunities for the City's business community and land base, as well as the potential for new partnerships to demonstrate energy efficiency, alternative energy and other relevant initiatives to the community.
CR&D **Culturally Rich and Diverse**	Reducing our energy and emissions will require the active involvement of everyone in the community. The development of the CEEP provides an opportunity to engage residents and stakeholders in creating the plan, which can help to ensure buy-in and support through the implementation stage.

CORPORATE VS COMMUNITY GHG EMISSIONS

Actions to monitor and manage energy consumption and GHG emissions are frequently divided into the realm of:

- **Corporate GHG Emissions:** emissions that the City creates through its activities (and which it has control over), such as municipal building operations, vehicle fleets, utility services, procurement; and
- **Community GHG Emissions:** emissions created through the activities of residents and businesses in the community. The City cannot directly control these emissions, but can influence them through planning and program activities.

The GHG inventories, however, are not mutually exclusive in that the corporate GHG inventory is a subsector of the community GHG inventory (see Figure). Cities differentiate between the two GHG inventories to better distinguish which policy levers are required to reduce GHG emissions. For example, at the Corporate GHG level, the City can establish a policy that all existing municipal buildings be upgraded to achieve an energy performance benchmark. At the community GHG level, the City does not have this direct authority, but can influence and encourage energy efficiency upgrades through education and incentive programs. Through specific planning processes, over time, the City can require new buildings meet specific energy performance requirements (e.g., the Step Code).



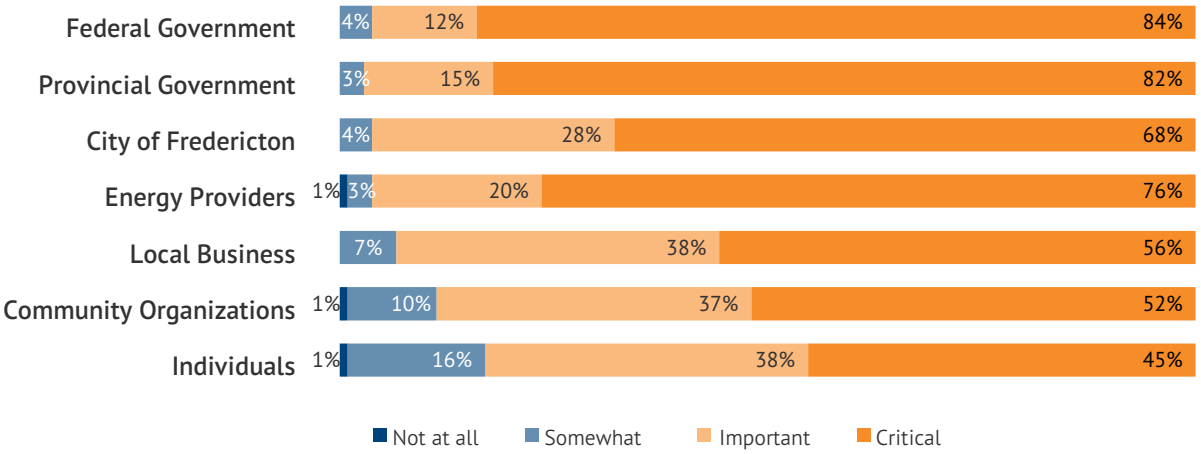
What We Heard

As part of our engagement efforts on the CEEP, we released a survey to the community to help us better understand:

- The importance residents place on taking action to reduce energy consumption and GHG emissions.
- The degree to which residents support the City and its partners in taking action on these issues.
- Residents' willingness to take action to reduce individual energy consumption and GHG emissions.

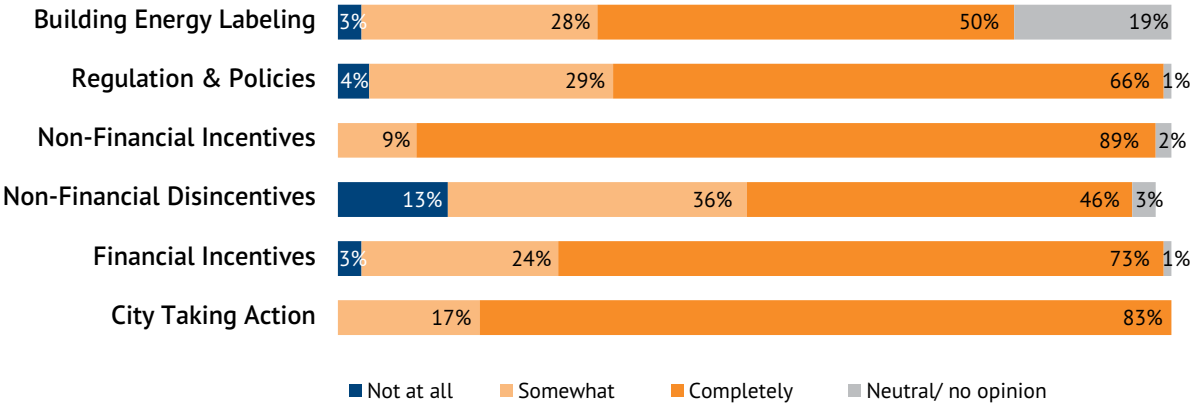
The results, included below, showed overwhelming support for the City to take action on reducing energy and GHG emissions.

How important is it that the following entities take action to reduce energy consumption and GHG emissions?



Like with most communities, there is also a large degree of support for the City taking multiple approaches to reducing community energy and GHG emissions and significant support for financial and non-financial incentives.

To what extent do you support the following approaches to achieving emissions and energy use reductions?



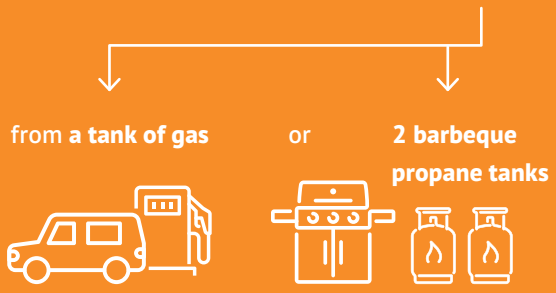
Additional survey results can be found on engagefredericton.ca.

WHAT IS A **GIGAJOULE?**

A **gigajoule (GJ)** is a metric term used for measuring energy use.

1 GJ is equivalent to the amount of energy available,

from **a tank of gas** or **2 barbeque propane tanks**

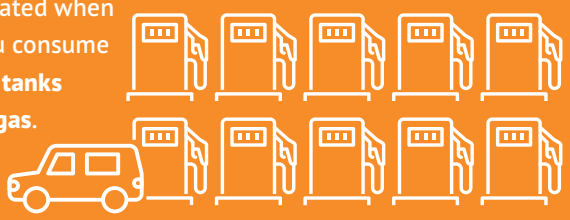


It's also the **amount of electricity a typical home** uses in **10 days**.

WHAT IS A **CARBON DIOXIDE EQUIVALENT?**

Greenhouse gas emissions are measured in **tonnes of carbon dioxide equivalents** or **tonnes CO_2e**. A carbon dioxide equivalent is a way of expressing any given greenhouse gas as a functionally equivalent amount of carbon dioxide (CO_2).

1 tonne CO_2e is created when you consume **10 tanks of gas**.



INITIATIVES UNDERWAY

We have been implementing several initiatives that will provide future year energy and GHG reductions, including adding active transportation infrastructure, developing waste reduction programs for events, and zoning for infill development in the downtown core. The success of these actions are important—they give us a head start on climate action so that we can more efficiently achieve our vision and climate action commitments.

Our Current Situation

Energy and GHG emissions inventories are the primary means by which we can monitor and report progress towards our emission-reduction goals. Using these inventories, we can better grasp where the community uses the most energy, how much energy is used, and how much GHG emissions are being released from these activities. The sections below describe how Fredericton is consuming energy, where emissions are coming from, and how the City is already acting to reduce both energy consumption and the generation of GHG emissions.

GHG EMISSIONS SNAPSHOT

The inventory for 2021 shows that residents and businesses consumed over 7.9 million Gigajoules (GJ) of energy—mostly in the form of natural gas, heating oil, electricity, gasoline and diesel fuel. This led to the release of approximately 548,000 tonnes of carbon emissions (tCO_2e) or about 9 tonnes per person.

The 2021 GHG emissions inventory breaks down as follows:

Waste: A small portion of our GHG emissions (2%) come from the waste that goes to the landfill where it decomposes and generates methane gas, a potent greenhouse gas. Fortunately, most of the CH_4 generated is collected and used for energy at the Fredericton Region Solid Waste landfill. Other sources of waste GHG emissions include wastewater treatment and composting of materials like yard waste.

Transportation: 42% of our GHG emissions come from using fossil fuels in our vehicles. We use a combination of gasoline, diesel and propane to get ourselves around (to work, to school, to shop, to recreation activities) and to move people and goods for our businesses.

Buildings: 54% of our GHG emissions come from heating, cooling and powering our buildings. The majority of these GHG emissions are from electricity consumption with the remaining coming from the consumption of natural gas and fuel oil.

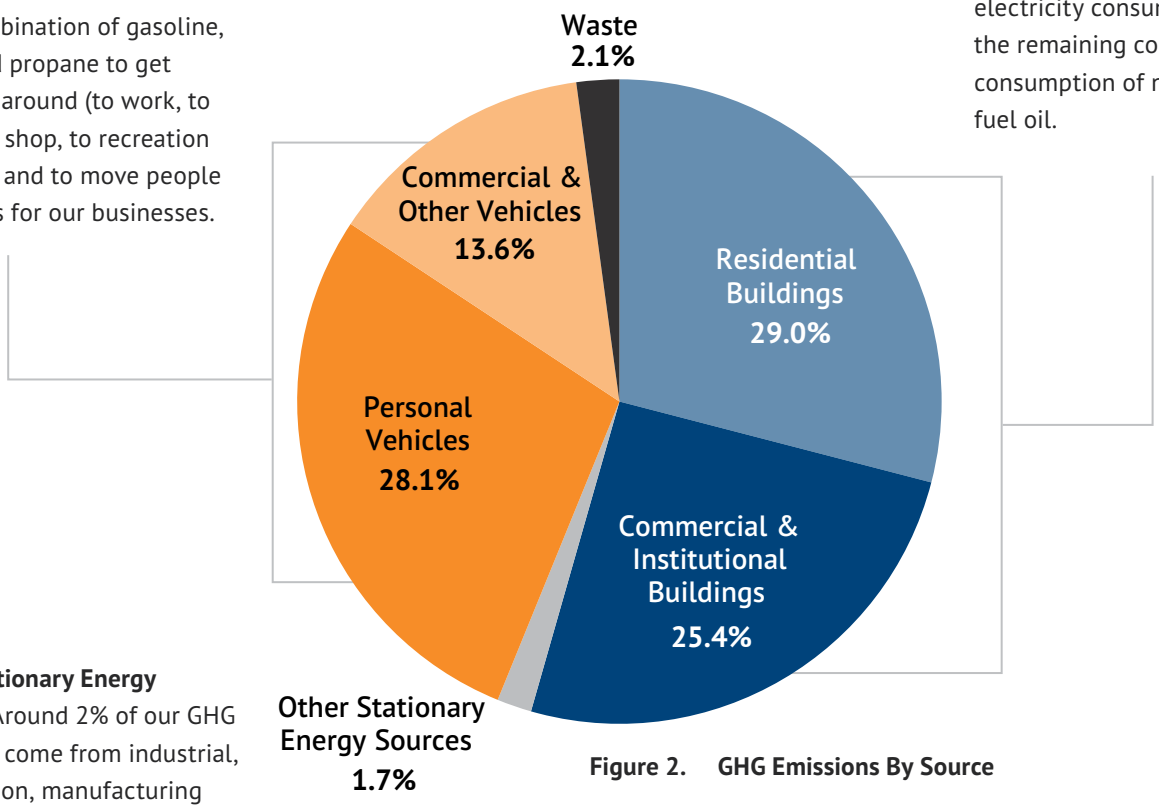


Figure 2. GHG Emissions By Source

Other Stationary Energy Sources: Around 2% of our GHG emissions come from industrial, construction, manufacturing activities that occur in the City. These emission sources include fugitive emissions from natural gas consumption and equipment used to mow our lawns and construct buildings and infrastructure.

We have set the year 2000 as our base reporting year. This is the year to which the City has established its 2030 and 2050 GHG reduction targets against. Since 2000, we have maintained GHG emission levels while the population in the City has grown by 33 percent. On a per capita basis, we have reduced GHG emissions by 33 percent, or 3.5 tonnes per person since 2000.

ENERGY CONSUMPTION IN FREDERICTON

Changes in energy use and emissions are not equal because of the different emissions intensities of our energy sources. Building-related GHG emissions come primarily from consumption of electricity (approximately 81 percent). Other secondary building heating energy sources are much smaller contributors to the community GHG emissions profile and include heating oil, natural gas and wood (Figure 3). The transportation sector produces GHGs mainly by burning gasoline, diesel, and to a much smaller extent propane fuels in passenger vehicles.

This demonstrates a need for businesses and residents to decrease electricity consumption through conservation and efficiency measures, and to consider renewable energy sources. We must also work with higher levels of government and utilities to ensure the greening of electricity sources.

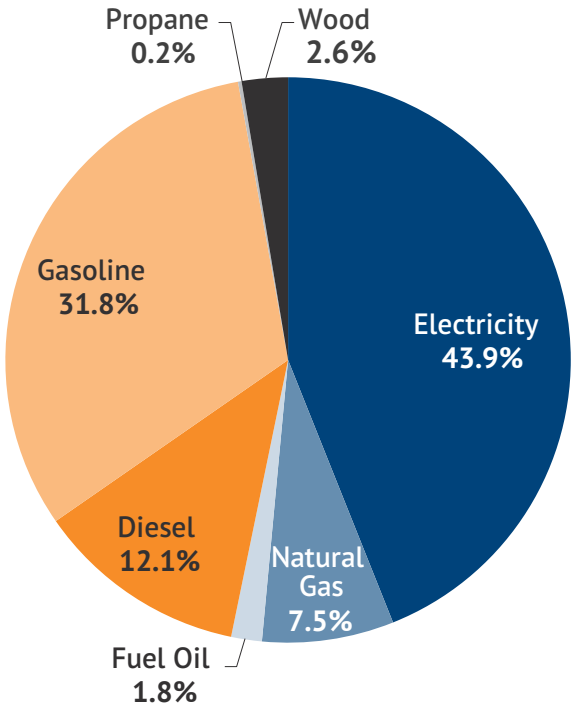


Figure 3. Community GHG Emissions from Different Fuel Sources

BUSINESS AS USUAL GHG EMISSIONS FORECAST

While we have seen a significant downward trend in GHG emissions per person in the community, this trend is not expected to continue. As identified in our Strategic Growth Plan, our population is expected to grow to over 94,000 inhabitants by 2041 and possibly upwards of 103,000 by 2050. As our population grows, so does demand for energy and the release of GHG emissions. Based on this growth, our energy consumption is projected to increase to 9.6 million GJ by 2050. If we do nothing, our GHG emissions are projected to increase to 680,000 tonnes by 2050—an increase of 18 percent over 2000 levels (Figure 4).

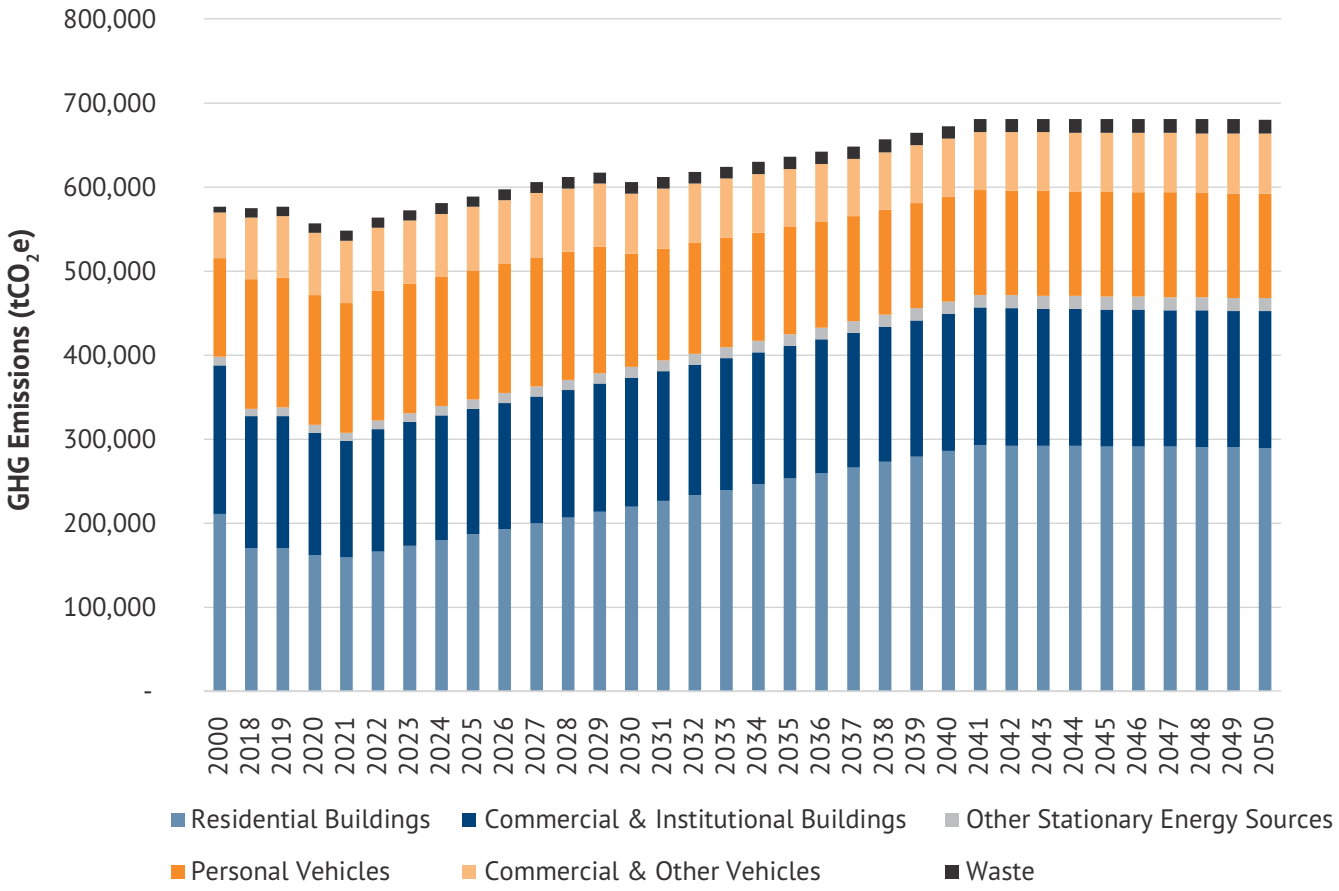


Figure 4. Business As Usual GHG Emissions Forecast

The growth in GHGs will be tempered somewhat by natural and regulated efficiency improvements. Most noticeable, this tempering will occur through building code improvements (Provincial jurisdiction) and vehicle fuel efficiency standards (Federal jurisdiction), which are expected to evolve regardless of action taken by the City. The fact that the population growth is more of less tempered by future improvements in efficiency is coincidental and not related to anything unique about the community. If the population starts to grow faster, then the trends will show an even greater increase.

Defining our Future

We want our City to be a place where we love to live, work and play, and therefore, it is important to define our long-term vision for Fredericton.

CEEP VISION →

Fredericton is a community leading in the transition toward an energy efficient and low carbon future.

CEEP MISSION →

The City's role in realizing this vision is to catalyze community action using local government tools to promote and support action on energy efficiency and conservation, and thereby increase the City's resilience to climate change.

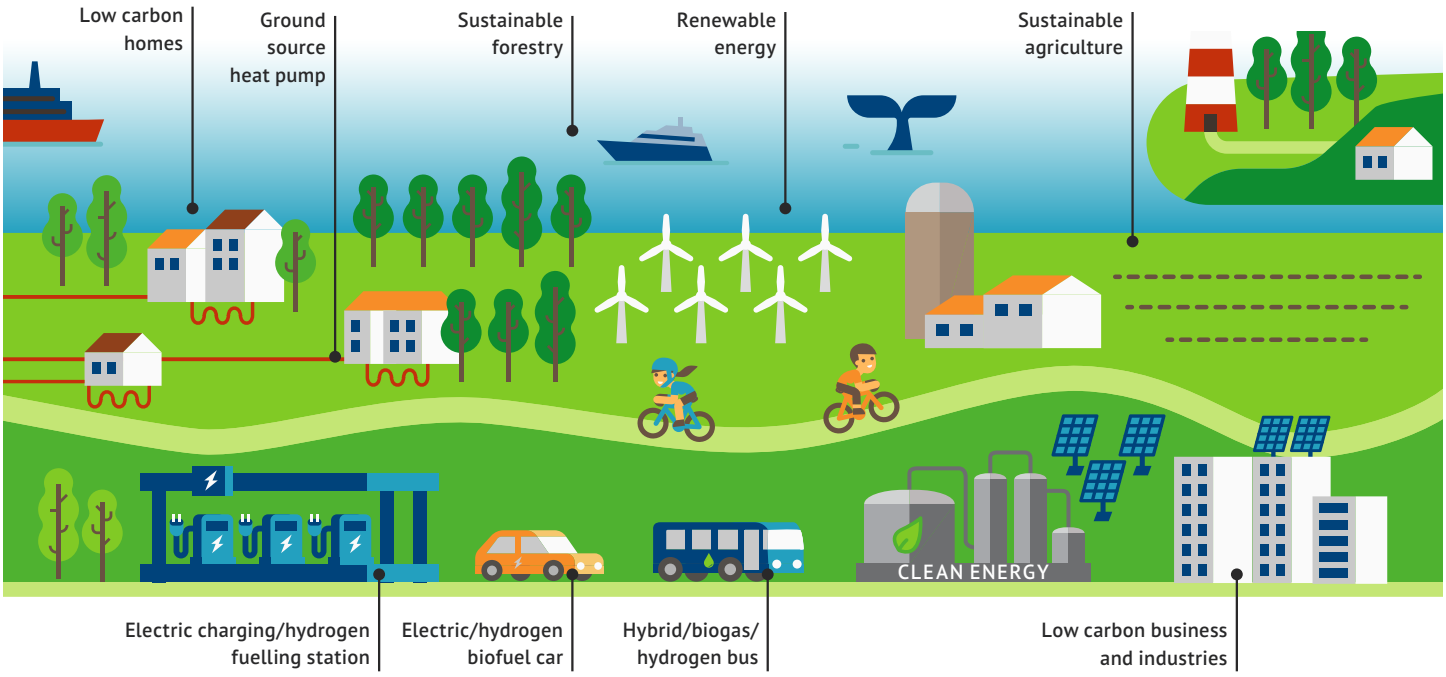
CEEP TARGET

To this end, the City has established GHG emissions reduction targets of 50 percent below 2000 levels by 2030 and net zero by 2050.

A clear understanding of where we want to be helps us make better decisions with respect to planning, developing, and programming for our community so that we not only achieve our 2030 and 2050 GHG reduction targets, but achieve our broader community goals as well.

Strategies and actions included in this CEEP have been derived from best practices demonstrated by cities across the globe working to reduce their GHG emissions. Through meetings with key stakeholders and City staff as well as a community survey, the final suite of strategies and actions includes those with the most support and those that we are most likely able to accomplish. Strategies and actions also reflect current market forces, such as increases in the number of electric vehicles and in the production of electricity from solar power.

Fredericton's role in realizing this vision is to help the community manage its energy consumption and reduce its contributions to climate change. To this end, we are motivators, collaborators, facilitators, partners, planners, instigators, educators, and leaders. The City cannot succeed on its own. Residents, businesses, community organizations and institutions also have key roles in realizing this vision.



CEEP GOAL STATEMENTS

Strategic short-, medium- and long-term strategies and actions are outlined in 8 goal areas, and encompass a wide range of approaches, from educational campaigns, to increases in regulations and standards over time, to leveraging new and existing funding. These strategies will complement existing initiatives and put the City on a path towards its 2030 and 2050 GHG reduction target.

The following goal statements were developed in consultation with staff and stakeholders.

BUILDINGS

- All newly constructed buildings are highly energy efficient and operate on low/no carbon fuel sources. Developers take advantage of streamlined incentive programs and are building with energy efficiency standards that go beyond the latest National Energy Code of Canada for Buildings and National Building Code.
- Existing buildings in the City are highly energy efficient. By 2030, the City's current annual energy retrofit rate at least doubles and energy and GHG improvements become a central part of every building renewal.

LAND USE

- Future City planning direction and council decisions about land are aligned with the intended direction and commitment for GHG reductions and energy efficiency. The City plans and develops neighborhoods that are accessible, use low/no carbon fuels, and manage energy consumption through design.

TRANSPORTATION

- Through smart land use planning and the adoption of affordable, convenient and safe active transportation methods,
  - All new community plans prioritize pedestrians and cyclists, and existing plans are retrofitted to do so.
  - The City reduces the number of single occupancy trips and there is a significant increase in residents who are choosing to use public transit, walking and cycling (over 2021 levels). The City has established personal vehicle average trip length reduction, active transportation, and transit utilization targets by 2025.
  - The City reduces vehicular travel and associated transportation GHG emissions. The City has a comprehensive network of pedestrian and bicycle routes linking residents to commercial and activity areas.

SOLID WASTE

- The City implements a strategic plan to reduce the amount of solid waste being generated by residents and businesses in the City. The community reduces the generation of waste through the promotion of the 6 r's of waste management (rethink, reduce, reuse, recycle, recover, and residual management).

ALTERNATIVE ENERGY

- The City reduces the carbon intensity of its energy portfolio though the adoption of local renewable energy systems. The City completes an alternative energy assessment to identify neighborhoods or hotspots where solar PV, microgrids, waste heat recovery and district energy (DE) systems could be used.

LOCAL ECONOMY

- The City provides support and engages local businesses, universities, colleges and not for profit organizations in the community to help with the transition towards a low carbon economy. A green economy strategy is included in the new Economic Development Strategy.

COMMUNITY OUTREACH & FUNDING

- The community has taken ownership of its personal carbon footprints. There is stable funding for initiatives that reduce energy use and greenhouse gas emissions in the community.

MUNICIPAL LEADERSHIP

- The City is a leader in taking action on climate change.

FREDERICTON'S PATHWAY TO 2050

Exact prediction of the future is not possible. Many factors will influence the behaviour and actions of the Fredericton community over the next 30 years—and ultimately the trajectory of the community's GHG emissions. However, a generalized GHG reduction scenario must be established to define the magnitude of actions that would need to happen in order to establish a pathway to reduce community GHG emissions 50 percent by 2030 and achieve net zero by 2050 (Figure 5).

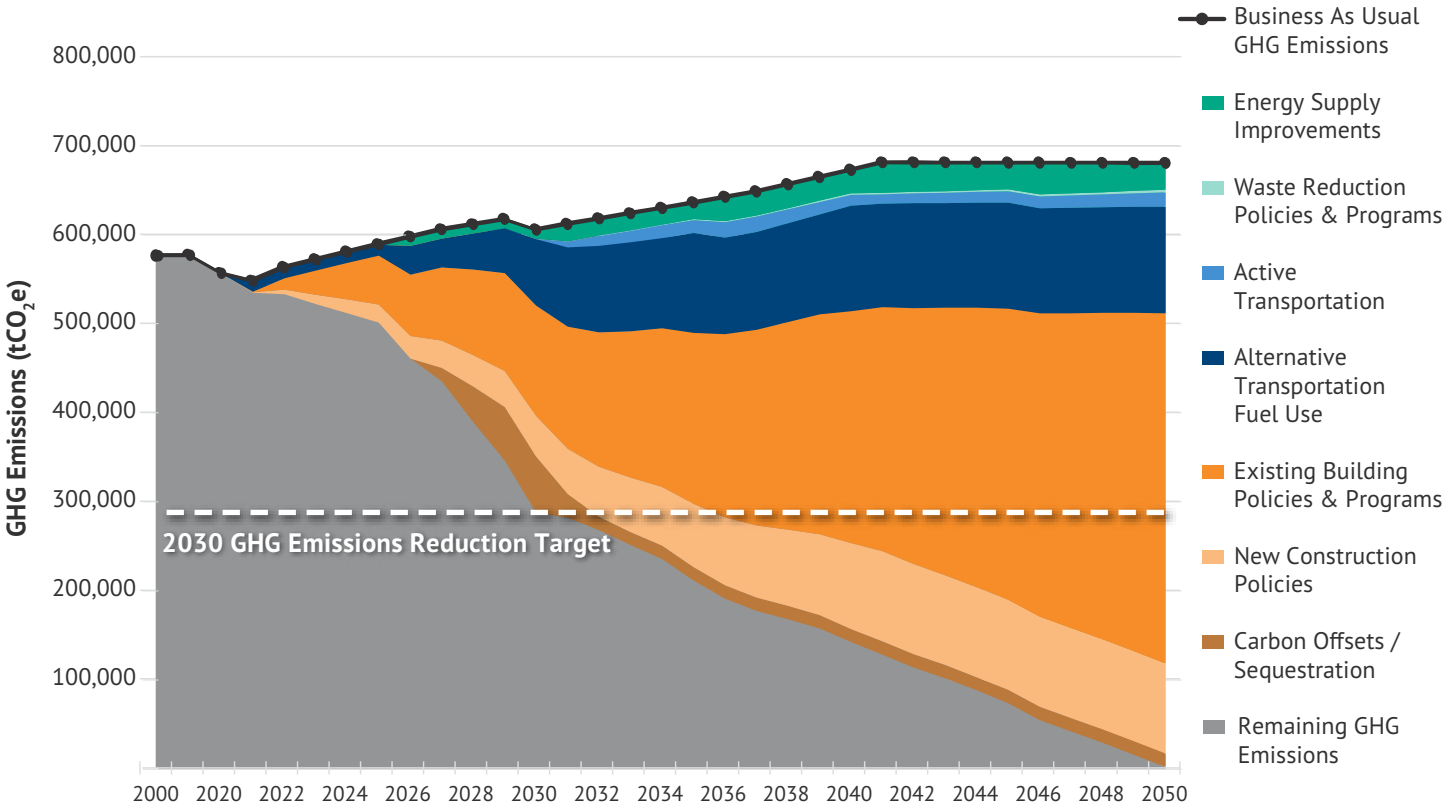


Figure 5. GHG Emissions Forecast

The achievement of the 50 percent for 2030 and net zero by 2050 targets will require more stringent building energy codes, the continued greening of New Brunswick's energy system, and the rapid adoption of less GHG intense forms of transportation. Within this CEEP, 56 actions to be implemented over the next 8 years have been identified. While these actions will put the City on a path towards achieving its 2030 and 2050 GHG reduction targets, additional effort will be required to reduce GHG emissions to zero. While the specifics of these actions will be defined as needed beyond 2030, options to reduce any remaining emissions could include biological sequestration (e.g., preserving park and natural areas, planting trees), purchasing carbon offsets, renewable natural gas (RNG) and renewable energy certificates (RECs). The key message is that realizing deep reductions in GHG emissions will require strong leadership and collaborative action by the City, senior levels of government and local businesses and organizations, as well as lifestyle changes by all residents of Fredericton.

Although specific actions are defined in this CEEP, it is anticipated that they will be prioritized and implemented opportunistically (e.g., certain circumstances may accelerate a particular action, like new funding becoming available) and will be regularly reviewed and updated. Any actions with financial implications will be reviewed and approved by senior staff and Council.

Figure 6 presents Fredericton's 2021 per capita GHG emissions. In 2021, Fredericton's per capita GHG emissions were 8.7 tCO2e per person which is much lower than the national average of 19.7 tCO2e per person, but still 1.4 times higher than Fredericton's' 2030 target.

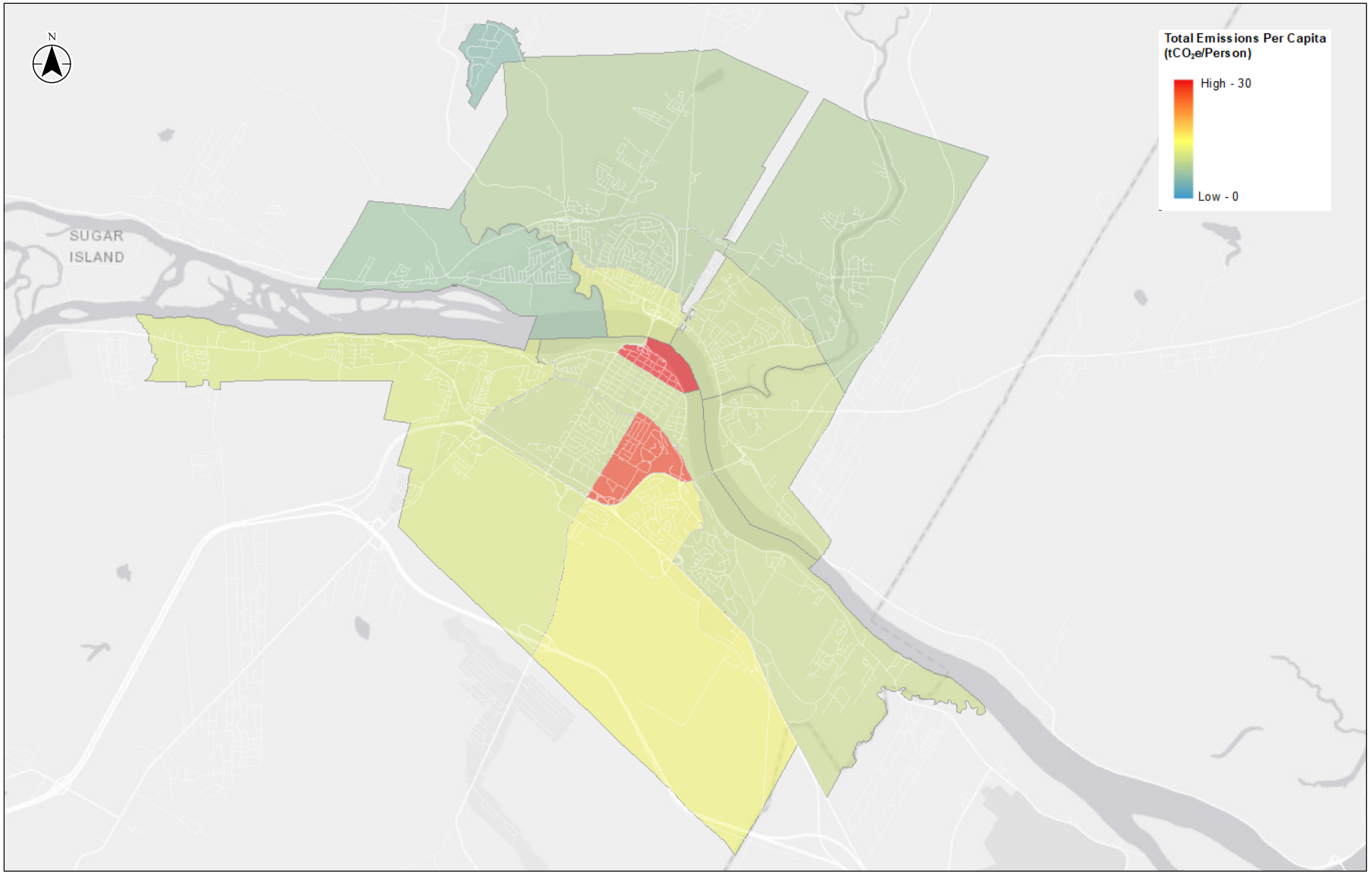


Figure 6. Fredericton's 2021 Per Capita GHG Emissions

Figure 7 and Figure 8 present community maps of emissions per capita under the business-as-usual and the 2050 scenario. These maps are illustrative in that they show that by concentrating new development into focused areas, increasing density, encouraging retrofits and new development to exceed current energy efficiency standards in the building code, and increasing the use of transit and other alternative modes, the City can reduce per capita GHG emissions significantly.

Figure 7. Fredericton's Business As Usual Per Capita GHG Emissions in 2050

Figure 8. Fredericton's CEEP per capita GHG emissions in 2050

Implementation Guide

The following section presents each goal area as well as the associated strategy, goal, implementation considerations, and community partners. This is followed by an action tracking table that includes the following information.

GOAL AREAS & ACTIONS

To put Fredericton on track to reach the 2030 and 2050 GHG reduction targets, the CEEP has detailed 8 goal areas and related actions to reduce energy and GHG emissions. The goals and associated actions are grouped into the following categories:

GHG IMPACT

The GHG reduction potential of actions is indicated by the icons below. These estimates represent the approximate magnitude of GHG reductions if an action is fully implemented. As several actions are based upon other actions, the estimated GHG reduction potential of all actions, denoted using the legend below, should not be treated as cumulative. Rather, these are just indicators of the total possible GHG reductions as it relates to the action described.

C C C C	Reduces total annual GHG emissions by more than 10,000 tonnes CO_2e
C C C	Reduces total annual GHG emissions by 2,500 to 10,000 tonnes CO_2e
C C	Reduces total annual GHG emissions by 0 to 2,500 tonnes CO_2e
C	Lays the foundation for other efforts, though by itself may not reduce GHG emissions measurably

DEPARTMENT LEADS

To assist with implementation and accountability, lead City departments have been assigned to each of the actions identified. The lead department is responsible for initiating the implementation of the action and reporting on progress.

TIMELINES

This CEEP outlines actions to be implemented in five phases. Some of the actions are underway whereas others will require time to plan and implement. The following indicators are used to indicate the timing / phase to which the action should be implemented.

2022—Onwards	2023—2025	2026—2028	2028—2030
Ongoing	**Phase One**	**Phase Two**	**Phase Three**
Continuing with work that is having an impact	*Creating the Conditions for Further Success*	*Exploring Service Changes and Non-financial Incentives*	*Exploring Direct Incentives Through Funding and By-Law Changes*
The City has recently developed and adopted several plans that will contribute to decreasing GHG emissions as they are implemented	The City can have more impact throughout the implementation of the CEEP if it focuses its initial energy on ensuring it has the right partners, and access to resources, data and tools to act	The City can work internally and with external partners to establish or alter services, providing indirect and/or non-financial incentives for residents and businesses to change their behaviour	The City can assist in enabling decreases in community GHG emissions by providing direct funding and/or altering by-laws and fees to change behaviour

COMMUNITY GOALS SUPPORTED

Although the initiatives described in this CEEP are mainly mitigation focused, several actions that reduce GHGs will be driven by the co-benefits to the broader community and environment. For example, increasing the number of bike lanes results in only small GHG reductions, but has numerous co-benefits like reducing air pollution, increasing health and well-being, improving the livability and sustainability of our community, and reducing the indirect impacts to water ways through a reduction in non-point source pollution. This approach ensures that the identified actions do not disproportionately impact vulnerable populations while also addressing other important community needs, including physical, social and mental well-being. The icons below help indicate how each action can help the City achieve its community goals.

S&IPR **Safe and Inviting Public Realm**
Streetscapes improved for pedestrians and safety and to encourage walking / access and safety is imperative.

W&S **Welcoming and Supportive**
Employment and educational opportunities / affordable, good-quality housing / accessibility / affordable, healthy food.

CN&DP **Complete Neighborhoods and Distinctive Places**
Diverse and affordable housing types / access to school, commerce, recreation, etc. / pedestrian oriented mixed use development / new development high standards.

VD&R **Vibrant Downtown and Riverfront**
Public and private investments will reinforce downtown as the economic, civic, and cultural heart of the City and the region / mode people / more density / access to the Saint John River.

G&H **Green and Healthy**
Increase tree canopy / improve air, ground and surface water / protect significant land features and parks / support all season recreation.

S&E **Sustainable and Efficient**
Land, infrastructure, and fiscal resources used efficiently / buildings and infrastructure are energy efficient and resilient / carbon footprint reduced / waste is reduced and managed to the highest and best use / fiscally sustainable.

CTS **Complete Transportation System**
Multi-modal transport system / expansion of cycling systems and north-south connections within the network.

S&DE **Strong & Diverse Economy**
Facilitate and encourage innovation, creativity, and entrepreneurship / government is an economic anchor / technology hub / affordable space.

CR&D **Culturally Rich and Diverse**
Cultural heritage will be protected, interpreted, and celebrated / cultural diversity is celebrated & incorporated / support local arts & crafts.

BUILDINGS

Buildings emissions account for 54 percent of the City's GHG emissions. Currently, over half of dwellings in Fredericton are single detached homes, while the next most prevalent dwelling type is low-rise apartment buildings, comprising nearly 15 percent of where we live. The remaining dwellings are a mix of semi-detached homes, row houses, and mobile homes, though these dwelling types make up very small percentages of the total. The energy mix in the city's buildings is unique and varied, with a blend of electricity, natural gas, heating oil, and wood as energy sources (Figure 9). By current standards, electric, oil, and baseboard heating systems and wood burning stoves are expensive to operate and inefficient consumers of energy. Oil heating systems are also significant emitters of GHG emissions. The electricity that we use in our homes is one of the most significant contributors to emissions and it is one of the hardest emissions sources to address. Making progress on reducing GHG emissions from residential properties will require education and outreach to assist homeowners to individually make choices that will improve the energy efficiency of their homes. Typical measures to take include improving insulation, replacing outdated appliances and heating systems with energy efficient models, upgrading windows and doors, and installing renewable energy sources.

Multiple barriers are currently preventing building owners and residents from adopting energy and GHG improvements. These barriers include planning obstacles like an outdated building code, legislative challenges like barriers to the implementation of PACE-programs and competing costs and priorities. Due to these and other barriers, older and even relatively new buildings continue to exhibit poor energy and GHG performance. If new and existing buildings continue to be inefficient and run on fossil fuels, we will not meet our 2030 and 2050 GHG reduction targets.

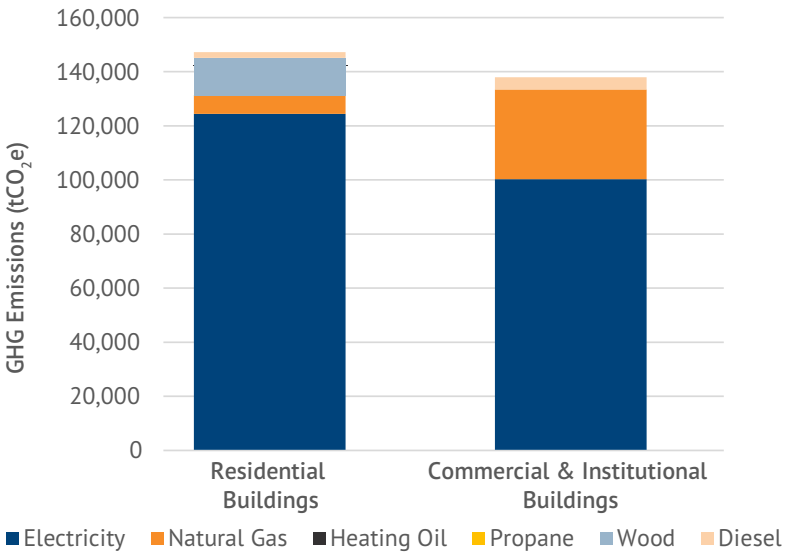


Figure 9. GHG Contribution By Building Type and Heating Source

WHAT IS PACE?

Property-assessed clean energy (PACE) financing allows property owners to take out a loan for energy efficiency upgrades and have the debt be carried with the property. The property owner pays the local government back over time through annual property taxes (increased to cover the loan). The accrued annual savings on the property owner's utility bills help cover the annual payment. A key advantage of PACE is that the loan stays with the property in the event of a sale, as do the benefits of the upgrades. The security of a PACE lien gives the program superior protection against the risk of loan defaults.

CASE STUDIES:

This tool was first tested in Canada by Toronto and Halifax, following legislative amendments by their respective Provincial governments to specifically enable and streamline property-assessed financing. Since then, a number of smaller municipalities in Nova Scotia and Ontario are now offering similar programs. Examples of where this financial instrument have been deployed include:

- The Halifax Solar City PACE program commenced in 2012. The program focused on a single retrofit—the installation of solar hot water systems. In 2015, the program was extended for an additional three years and was expanded to include solar photovoltaic (PV) and solar hot air retrofits. The success of the program is based on its unprecedented uptake in the pilot phase, and the ease in which homeowners could participate.
- The Toronto Home Energy Loan Program (HELP) provides low interest loans to eligible homeowners for up to 100 percent of the retrofit cost and is paid back using the Local Improvement Charge (LIC) mechanism. The loan is transferable as it is tied to the property, not the owner. Toronto also offers a similar program for multi-residential buildings called Hi-RIS.

BUILDINGS

NEW BUILDINGS

With an average lifespan of over 50 years, energy intensive new buildings can 'lock-in' substantial GHG emissions, so new construction is an important consideration in reducing GHG emissions and energy consumption. New building energy consumption can be reduced through passive heating and cooling design strategies, better insulation and air sealing, more efficient building equipment and the use of renewable energy.

With the community expected to grow to over 100,000 people by 2050, it is likely that new construction will focus on multi-unit residential buildings and commercial buildings. As a result, the energy performance of new construction is likely to improve and could be accelerated should the Province adopt the latest National Energy Code of Canada for Buildings and National Building Code. Until a more aggressive energy and building code is adopted, this goal area focuses on developing incentives and policies to encourage and require large new developments to attain higher energy performance standards than what is currently required provincially. Multi-family residential and commercial / institutional buildings are the primary target for the actions within this strategy.

NEW BUILDINGS STRATEGY

Develop and implement requirements and incentives that make new buildings energy efficient and near net zero GHG emissions over their lifespan.

GOAL

All new commercial, institutional and residential buildings are highly energy efficient and operate on low/no carbon fuel sources.

Developers take advantage of streamlined incentive programs and are building with energy efficiency standards that go beyond the latest National Energy Code of Canada for Buildings and National Building Code.

COMMUNITY GOALS ADDRESSED

S&IPR | W&S | CN&DP | VD&R | G&H | S&E | CTS | S&DE | CR&D

IMPLEMENTATION CONSIDERATIONS

It will be important to closely analyze the level of effort to develop and administer actions in comparison with the projected GHG impact overall, in deciding which are the most important actions.

Develop the incentives and programs in consultation and partnership with local developers and builders; consider some focus groups to test incentive programs and analyze case studies. Create incentives and rewards for both large and small developments, as well as individual sites and smaller projects.

These efforts will be supported when the Province adopts the latest National Energy Code of Canada for Buildings and National Building Code to reduce energy demand in buildings.

PARTNERS

Developer Community: The development community and associated groups (e.g., NB Home Builders Association) need to be engaged and on-board as the City has limited influence until provincial regulation is updated (the Building Code, Community Planning Act, and Municipalities Act).

NB Power: Provide financial incentives and support the City to co-deliver programs.

Residents, businesses, stakeholder groups including community agencies and special interest groups of relevance, also need to be part of the process of developing the policies and ensuring that the City's incentives / programs are aligned with their priorities and values. Engaging with the local business and technology community will be key to moving the needle in this area.

NEW BUILDINGS ACTION TRACKING TABLE

BUILDINGS
NEW BUILDINGS

GOAL All new commercial, institutional and residential buildings are highly energy efficient and operate on low/no carbon fuel sources.

	ACTION	TIMING	DEPARTMENT LEAD	COMMUNITY GOALS	IMPACT
1	Advocate for the Province to adopt the National Energy Code of Canada for Buildings.		Corporate Services	S&IPR, W&S, CN&DP, VD&R, G&H, S&E, CTS, S&DE, CR&D	C C C C
2	Ensure that new building policy and code requirements are supported with investment in the development of compliance processes, tools, and training for both staff and applicants prior to the National Energy Code of Canada for Buildings and National Building Code requirements taking effect.		Planning & Development	S&IPR, W&S, CN&DP, VD&R, G&H, S&E, CTS, S&DE, CR&D	C C C C
3	Explore the opportunity to establish a fast-track/rebate program for building permit applications that undertake energy-efficient builds/deep retrofits.		Planning & Development	S&IPR, W&S, CN&DP, VD&R, G&H, S&E, CTS, S&DE, CR&D	C C
4	Explore the opportunity to establish an incentive / fast-track program for development applications that undertake and implement Integrated Energy Master Plans (see Land Use). Incentives could include building permit rebates, reduced DCC rates.		Planning & Development	S&IPR, W&S, CN&DP, VD&R, G&H, S&E, CTS, S&DE, CR&D	C C

COMMUNITY GOALS LEGEND

- S&IPR Safe and Inviting Public Realm
- W&S Welcoming and Supportive
- CN&DP Complete Neighborhoods and Distinctive Places
- VD&R Vibrant Downtown and Riverfront
- G&H Green and Healthy
- S&E Sustainable and Efficient
- CTS Complete Transportation System
- S&DE Strong & Diverse Economy
- CR&D Culturally Rich and Diverse

	ACTION	TIMING	DEPARTMENT LEAD	COMMUNITY GOALS	IMPACT
5	Explore the feasibility of developing Green Development Standards/ Guidelines that encourage the planning, design, and development of near-net zero buildings and neighbourhoods (e.g., establishment of Integrated Energy / Net Zero Master Plans). These would first be voluntary and then mandatory for new builds.		Engineering & Operations	S&IPR W&S CN&DP VD&R G&H S&E CTS S&DE CR&D	C C C C
6	Review current zoning and DCC bylaws to identify low carbon fuel switching, energy conservation and efficiency strategies, and other barriers to densification (e.g., increasing height standards, remove barriers to the use of garden suits/carriage houses, etc.) and adjust the DCCs and bylaws accordingly. Implement the changes incrementally or as a comprehensive review.		Planning & Development	S&IPR W&S CN&DP VD&R G&H S&E CTS S&DE CR&D	C C C C
7	Investigate offering incentives to encourage the use of green roofs and white roofs on large buildings.		Planning & Development	S&IPR W&S CN&DP VD&R G&H S&E CTS S&DE CR&D	C C C C
8	Explore the feasibility of a Revitalization Tax Exemption Bylaw and other tools and incentives to help property owners and managers undertake deep energy and GHG emissions retrofits of existing buildings.		Planning & Development	S&IPR W&S CN&DP VD&R G&H S&E CTS S&DE CR&D	C C C C

COMMUNITY GOALS LEGEND

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FOUR STEPS TO REDUCING ENERGY USAGE IN BUILDINGS

There are many activities that we can deploy to reduce overall energy consumption and GHG emissions at our homes and businesses. Which ones are most effective? Which ones should be higher priority? The "4Rs of Sustainable Community Energy Planning"[2] identify a hierarchy of principles for energy planning.

1. Reduce energy demand

First, look for ways to reduce the amount of energy we need to undertake our daily activities. This step requires us to be smarter about our energy use (e.g., turning the heat down when not in the room) and using more efficient technologies (e.g., better insulation, "passive solar" homes).

2. Reuse waste heat to heat buildings and hot water

The next step is to find places that we are releasing heat into the air that could be recovered or reused. This involves building-scale technologies (e.g., insulation, changes to building envelopes, heat and drain water recovery ventilators) and planning our communities to encourage recovery of waste heat (e.g., trapping heat from sewer pipes, and using it to heat buildings).

3. Develop renewable heat sources to heat buildings and hot water

Once we have looked at all the options for reducing demand and recovering waste heat, we look for renewable sources of heat to supplement or replace our use of fossil fuels. This could entail installing solar panels for hot water, removing heating oil systems, installing heat pumps that extract heat from the ground, water, or air.

4. Develop renewable energy sources to supply electricity needs

The last step is to identify options for supplementing or replacing electricity with renewable sources. This could entail installing photovoltaic solar panels, small wind turbines to generate local electricity. We, the City, are supporting this transition by updating our building policies, frameworks, training staff, and providing incentives to use renewable energy systems in new and existing buildings.

2 Based on BC Hyrdo's 4 R's of sustainable community energy planning

BUILDINGS

EXISTING BUILDINGS

Because buildings last for many decades, more than half of the buildings that will exist in 2050 already exist today. This means that retrofitting existing buildings to improve efficiency and heating systems will be an important action to substantially reduce overall community GHG emissions. However, the replacement or upgrading existing buildings is a gradual process with a consequently gradual impact on energy and GHG emissions and must be accelerated.

Deep energy retrofits can achieve reductions in energy consumption of 50 percent or greater through whole-building analyses and retrofits of multiple building systems at the same time. Common strategies to achieve deep energy retrofits include making improvements to the building exterior (e.g., insulation, air sealing) coupled with upgrades to heating, cooling, lighting, and hot water systems. Studies have demonstrated that many low-cost investments in building energy retrofits have a short payback period and can substantially increase building comfort while reducing operating costs. Actions in this area typically have multiple benefits that include increasing housing affordability, building health, and building comfort.

There are a number of policy tools available to the City to encourage homeowners, landlords, commercial building owners and property managers to retrofit their buildings so that they perform to higher standards of energy performance. Strategies in this area focus on providing information and incentives to encourage energy efficient retrofits to existing buildings.

EXISTING BUILDINGS STRATEGY

Retrofit existing buildings in the City for energy conservation and efficiency. Key components of this strategy will involve:

- Increasing the number of energy efficiency building audits for home owners and businesses through streamlining the process and incentives.
- Increase in the number of equipment replacement and fuel switching retrofits for energy efficient furnaces, light bulbs, smart meters, and thermostats, etc.

GOAL

Existing buildings in the City are highly energy efficient.

By 2030, the City's current annual energy retrofit rate at least doubles and energy and GHG improvements become a central part of every building renewal.

COMMUNITY GOALS ADDRESSED

S&IPR | **W&S** | **CN&DP** | VD&R | G&H | **S&E** | CTS | **S&DE** | CR&D

IMPLEMENTATION CONSIDERATIONS

The City will play a role by raising awareness of these issues and exploring opportunities to provide additional incentives and programming.

A municipal consortium or Regional Not-for-profit could eliminate / reduce the political and resource challenges to implementing actions.

PARTNERS

NB Power / NRCan: Provide financial incentives and support the City to co-deliver/ lead programs (i.e., on-bill financing).

Real Estate Board: Work with the City to support / create a voluntary energy labelling program. Help realtors communicate energy efficiency to potential buyers.

Local Groups / Home Builders Association / Chamber of Commerce Members: May be interested in leading / supporting some actions, supported by the City and local volunteers.

EXISTING BUILDINGS ACTION TRACKING TABLE

BUILDINGS
EXISTING BUILDINGS

GOAL Existing buildings in the City are highly energy efficient.

	ACTION	TIMING	DEPARTMENT LEAD	COMMUNITY GOALS	IMPACT
1	Continue to advocate to the Province to allow municipalities to develop/ run a Property Assessed Clean Energy Programs (PACE) or similar program.		Corporate Services	S&IPR W&S CN&DP VD&R G&H S&E CTS S&DE CR&D	C C C C
2	Seek out funding to support the development of separate residential, high-density residential buildings, and institutional / commercial building deep building energy retrofit strategies.		Corporate Services	S&IPR W&S CN&DP VD&R G&H S&E CTS S&DE CR&D	C C C C
3	Collaborate with the Canadian Home Builders Association and other partners to advance and support the development of a green buildings program. This would include packaging and promoting information through City channels around retrofitting and developing more sustainable and energy efficient buildings.		Corporate Services	S&IPR W&S CN&DP VD&R G&H S&E CTS S&DE CR&D	C C C C
4	Work with NB Power and NRCan to encourage commercial building owners to adopt the use of a Portfolio Manager to track energy consumption and demand charges. Encourage building owners to access benchmarking, auditing and retrofit funding through NB Power.		Corporate Services	S&IPR W&S CN&DP VD&R G&H S&E CTS S&DE CR&D	C C C C

COMMUNITY GOALS LEGEND

- S&IPR Safe and Inviting Public Realm
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- G&H Green and Healthy
- S&E Sustainable and Efficient
- CTS Complete Transportation System
- S&DE Strong & Diverse Economy
- CR&D Culturally Rich and Diverse

	ACTION	TIMING	DEPARTMENT LEAD	COMMUNITY GOALS	IMPACT
5	Work with NB Power, Realtors Association and Canadian Home Builders Association other partners to explore a pilot residential energy labeling program (at the time of sale) for residential homes and explore options for multifamily buildings.		Corporate Services		

COMMUNITY GOALS LEGEND

- S&IPR — Safe and Inviting Public Realm
- W&S — Welcoming and Supportive
- CN&DP — Complete Neighborhoods and Distinctive Places
- VD&R — Vibrant Downtown and Riverfront
- G&H — Green and Healthy
- S&E — Sustainable and Efficient
- CTS — Complete Transportation System
- S&DE — Strong & Diverse Economy
- CR&D — Culturally Rich and Diverse

COMMUNITY IN ACTION CASE STUDY:

With funding from the Federation of Canadian Municipalities' (FCM) Green Municipal Fund (GMF), the City of Fredericton has upgraded Brookside Drive to turn it into a "complete street" that includes:

- A curb-separated cycle track; a first-of-its-kind cycling facility in the city.
- A new sidewalk along both sides of lower Brookside Drive to provide full connectivity to the existing bus stops.
- Trail connections to both the Northside Trail and North Riverfront Trail.
- A realignment of Hawkins Street to improve sight distances.

This section of Brookside Drive functions as a major collector street that primarily served automobile traffic between residential areas and the commercial core of the north side on Main Street. Prior to the upgrade, the street featured a narrow sidewalk and narrow discontinuous bike lanes. The street was serviced by transit, however, the transit stops were not accessible and due to the one-sided sidewalk and a lack of crosswalks near bus stops. The City looks forward to developing more projects enhance active transportation development and connection to our great trail system, transit-oriented streets, and accessibility.

See page 43 for more information on "complete streets".

LAND USE

LAND USE

Land use planning is one of the most powerful tools available to local governments to encourage the use of low/no carbon fuels, conserve and reduce energy use and decrease GHG emissions in the community. Land use patterns are the most enduring and significant determinant of energy consumption for the City in the long-term.

This goal area focuses on land use planning—a foundational activity that supports energy and GHG reductions from other sectors like buildings and transportation. The proposed strategies aim to encourage more compact, mixed-use developments so that residents can travel shorter distances and use more sustainable forms of transportation such as walking, cycling and transit to access employment, educational facilities, and daily amenities. The overall strategy focuses on corridors that are already available or may be part of a frequent transit network in the future. These characteristics will allow the City to make as many gains as possible in energy conservation and efficiency as it continues to grow and evolve. These land use actions will also improve the viability of commercial businesses, allow for mobility choice and support district energy systems.

LAND USE STRATEGY

Proactively include rigorous energy conservation strategies, efficiency targets and infrastructure standards (e.g., Envision ISI) in the City's framework of guiding community related plans and policies. Several of the actions identified could be implemented in individual communities or neighbourhoods, or as opportunities present themselves through current and future policy planning work (e.g., zoning amendments for energy efficiency and inclusionary housing as applications are processed).

GOAL

Future City planning direction and Council decisions about land are aligned with the intended direction and commitment for GHG reductions and energy efficiency.

The City plans and develops neighbourhoods that are accessible, use low/no carbon fuels, and manage energy consumption through design.

COMMUNITY GOALS ADDRESSED

S&IPR W&S CN&DP VD&R G&H S&E CTS S&DE CR&D

IMPLEMENTATION CONSIDERATIONS

Land use policy requires a balance between many strong community and self-motivated interests –including energy efficiency, economic development, and social equity. A key consideration is that the strategies that support fuel switching, energy conservation and efficiency can also advance and benefit complementary objectives for a prosperous, equitable, interconnected, and inclusive community.

PARTNERS

Since the City is responsible for local planning policy, the City is the leader for most of the land use actions. The City would engage and partner with agencies who are involved and have areas of expertise in the planning process (developers, development finance experts, designers, lawyers, etc.). They would play a role in helping the City to build policies that are functional and can be implemented. Partners will need to be informed about the existence of new policies and be supported in how to interpret them.

LAND USE ACTION TRACKING TABLE

LAND USE

GOAL

Future City planning direction and council decisions about land are aligned with the intended direction and commitment for GHG reductions and energy efficiency.

	ACTION	TIMING	DEPARTMENT LEAD	COMMUNITY GOALS	IMPACT
1	Continue to focus on infill development & densification of the downtown, according to the Municipal Plan.		Planning & Development	S&IPR W&S CN&DP VD&R G&H S&E CTS S&DE CR&D	C C C C
2	Explore the feasibility of developing a Bylaw to regulate illuminated signs or keeping buildings lit at night following the principals of "Dark Sky".		Planning & Development	S&IPR W&S CN&DP VD&R G&H S&E CTS S&DE CR&D	C C C C
3	Advocate for the Province to modify the Community Planning Act and Municipalities Act to allow NB cities to address energy and water conservation, efficiency and GHG reduction requirements via by-laws and development guidelines.		Corporate Services	S&IPR W&S CN&DP VD&R G&H S&E CTS S&DE CR&D	C C C C
4	Update the Municipal Plan to align with the corporate and community CEEP and include climate considerations in all new secondary plans.		Planning & Development	S&IPR W&S CN&DP VD&R G&H S&E CTS S&DE CR&D	C C C C
5	Review Development Permit Plans and, where applicable, update them to ensure that neighbourhoods establish cycling and pedestrian networks to complement the Active Transportation Master Plan, and include strong connectivity, an appropriate variety of route types, separated bike paths, and end-of-trip facilities.		Planning & Development	S&IPR W&S CN&DP VD&R G&H S&E CTS S&DE CR&D	C C C C

COMMUNITY GOALS LEGEND

- S&IPR Safe and Inviting Public Realm
- W&S Welcoming and Supportive
- CN&DP Complete Neighborhoods and Distinctive Places
- VD&R Vibrant Downtown and Riverfront
- G&H Green and Healthy
- S&E Sustainable and Efficient
- CTS Complete Transportation System
- S&DE Strong & Diverse Economy
- CR&D Culturally Rich and Diverse

	ACTION	TIMING	DEPARTMENT LEAD	COMMUNITY GOALS	IMPACT
6	Establish a local food policy and supporting programs that supports a local, sustainable food system. This is likely to include: Working with partners to identify land for urban farms and community gardens (and zoning accordingly); Exploring opportunities for residents to grow edible plants on boulevards in front of homes and along bike paths.; Developing an educational / communication program to encourage growing food locally and the benefits that accrue (e.g., reduced emissions, increased food security, etc.); Work with neighboring municipalities, local business, farmers/ producers, chamber of commerce, etc. to implement a "buy local" campaign in the region. Promote the benefits of buying local via websites, in local stores, etc.	>>	Planning & Development	S&IPR W&S CN&DP VD&R G&H S&E CTS S&DE CR&D	C C C C

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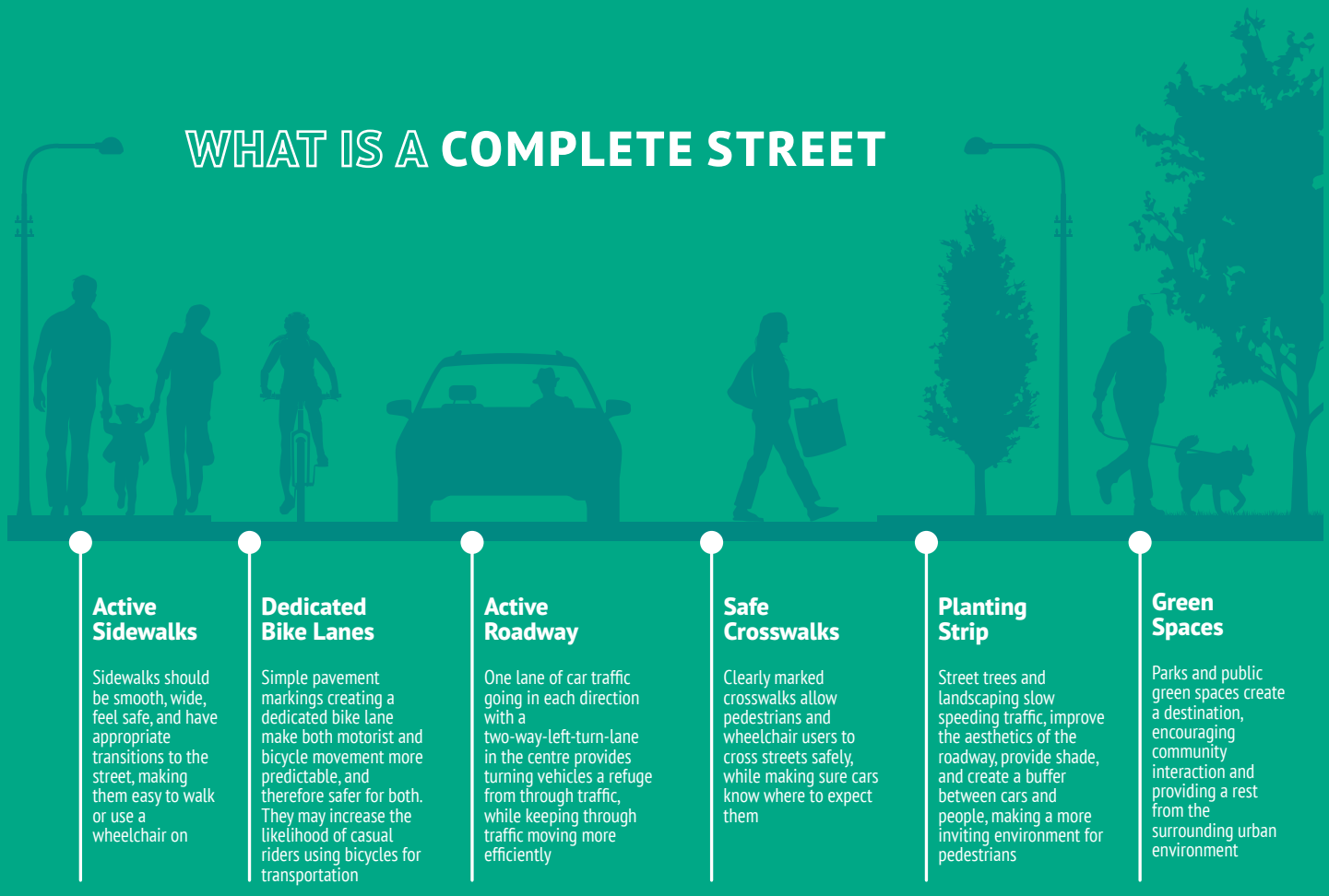
COMMUNITY IN ACTION

In 2020, the City took advantage of planned and much-needed water, sewer and storm sewer upgrades on Brookside Drive to transform the busy corridor into the City's first "complete street" that prioritizes space for pedestrians, cyclists and transit users, along with the high number of motor vehicles that travel the street every day. By making thoughtful room for pedestrians, cyclists and those wanting to take the bus instead of a car, the City is bridging a major gap in its Active Transportation System, which provides space and opportunities for people-powered movement around Fredericton. Indeed, the bike lanes will link residential areas at the northern end of Brookside to the popular Northside Trail, and helps establish better connectivity to the 645-hectare Killarney Lake Park.

"This project is another demonstration of Fredericton's commitment to environmental leadership," said Mayor Mike O'Brien. "When we provide residents with the option to walk and bike safely to their destination, we provide them with an option to commute in a way that is better for their health and the environment."



Adapted from Birmingham City's "What is a complete street?" infographic, https://bhamcitycouncil.medium.com/birmingham-city-council-passes-complete-streets-ordinance-e1699f743163

TRANSPORTATION

The GHG emissions from transportation are strongly linked to land use policy and planning decisions. The structure of the urban environment affects driving habits and the distance that must be traveled to workplaces, recreational facilities, schools, and other landmarks. Transportation emissions are also affected by the availability of viable and attractive public transit and alternative transportation modes (e.g., cycling and walking trails). Supportive policies and infrastructure for carpooling and electric car use will affect how residents of Fredericton choose to travel and will affect the types of fuel used to make those trips.

Managing the city's transportation network to support population growth while seeking significant reductions in GHG emissions is a challenge. There are several transportation trends, global and local, that define how GHG emission reductions can be achieved. Two of the major factors that impact transportation and energy consumption are the types, and densities of land uses within a community. More compact and walkable developments, accompanied by investments in pedestrian and cycling infrastructure (e.g., sidewalks, crosswalks, cycling lanes, and bicycle parking), traffic calming measures, and a mixture of land use types, are typically associated with higher percentages of walking, cycling, and public transit use. Provincially and beyond, low carbon fuels, increasing vehicle efficiency and vehicle electrification are technological trends that also support reductions in GHG emissions. Similarly, car-sharing and ride-sharing are areas of growth that show potential for significant GHG reductions in future. Other trends and emergent technologies are less clear. Autonomous vehicles have potential to reduce emissions and congestion, but conversely could lead to greater traffic congestion and higher GHG emissions under some scenarios.

Fredericton has a great opportunity to benefit from transportation and land use strategies that concentrate jobs and housing in complete communities. Fredericton is projected to gain upwards of 32,000 new residents by 2050. Increased population in the downtown core is an opportunity to encourage density and add to the vibrancy and economy of Fredericton's downtown. As envisaged in the community growth plan, new growth can support Fredericton's efforts to create pedestrian friendly urban centers and neighbourhoods, places with a diversity of housing, employment opportunities, services, recreational opportunities, and convenient transit.

While reducing GHG emissions is the primary purpose of this CEEP, it is important to note that these strategies provide several other community benefits. Residents who can meet many of their daily needs by walking, bicycling, or riding transit also benefit from lower overall household costs and improved health while helping local business districts thrive and increasing opportunities for housing and jobs.

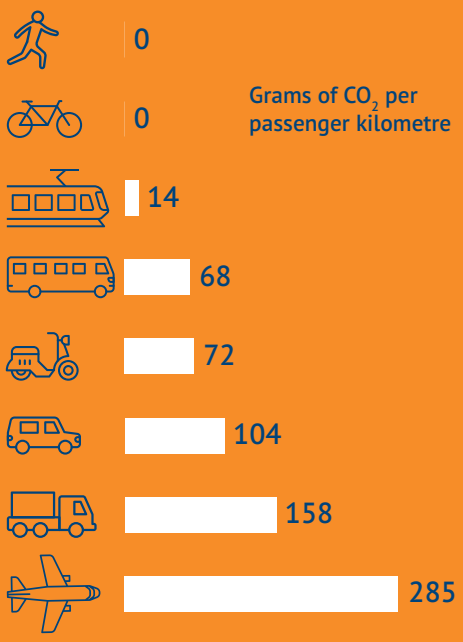
TRANSPORTATION

PERSONAL VEHICLES

Transportation emissions are the second largest portion of the City's emissions, accounting for 42 percent of the total emissions. A suite of strategies and actions is required to reduce transportation GHG emissions to targeted levels. Reducing the number and length of fossil fuelled vehicle trips, increasing the number of people moved per vehicle, and increasing the number of zero emission vehicles on the roads— will significantly reduce the climate impact of Fredericton's transportation system. This can be done by expanding the active transportation network and improving the transit network; changing land use planning so that the development of complete and compact communities is encouraged; and, using tools to incent low or zero carbon transportation behaviours like car share programs, and creating disincentives to single occupancy vehicle trips (e.g., increasing the cost of parking). By providing low carbon infrastructure, like electric vehicle charging stations, the City can also encourage the adoption of fuel switching to less carbon intense forms of transportation.

While the City can have a significant impact on transportation through its land use, transit, and parking policies, some aspects of transportation fall outside of the City's influence. These include fuel prices, vehicle fuel efficiency standards, and technology development. For this reason, the City will promote the use of alternatives to the personal automobile, including trip reduction, transit, and active modes such as walking and cycling. Key components of this strategy will include developing and producing initiatives and educational programs / campaigns to support the use of alternatives to the personal automobile and working with stakeholders, including workplaces and schools to reduce personal vehicle trips and increase the share of alternative forms of transportation.

Carbon Intensity of Travel Modes[1]



1 Adapted from 2018 City of Victoria Climate Leadership Plan (Sourced from: European Environment Agency, European Union. (2016). Carbon Dioxide Emissions From Passenger Transport. https://www.eea.europa.eu)

PERSONAL VEHICLE STRATEGY

The City will promote the use of alternatives to the personal automobile, including trip reduction, transit, and active modes such as walking and cycling. Key components of this strategy will include developing and producing initiatives and educational programs / campaigns, to support the use of alternatives to the personal automobile and working with stakeholders, including workplaces and schools to reduce personal vehicle trips and increase the share of alternative forms of transportation.

GOAL

Through smart land use planning and the adoption of affordable active transportation methods, the City has reduced the number of single occupancy trips and there is a significant increase in residents who are choosing to use public transit, walking and cycling (over 2016 levels).

The City has established personal vehicle average trip length reduction, active transportation, and transit utilization targets by 2025.

COMMUNITY GOALS ADDRESSED

S&IPR | W&S | CN&DP | VD&R | G&H | S&E | CTS | S&DE | CR&D

IMPLEMENTATION CONSIDERATIONS

Most of the infrastructure, programs and initiatives detailed in this strategy reaches beyond the borders of the City and will require extensive collaboration with other municipalities, regional agencies, the province, and other stakeholders. In addition, most of the infrastructure considered is high-cost (EV infrastructure).

Many items include the development of resources (information, technical assistance, content) that demand specialized expertise. By working with stakeholders and other providers who already develop these resources (bicycle safety programs, for instance), the City can deliver these initiatives in the most cost-effective and engaging manner, while building local capacity.

PARTNERS

Business Community: The City will need to engage with the development community, residents, and businesses to assess the possible impacts of parking restrictions and other changes, some of which may have equity considerations that need to be taken into account.

Local Groups / Chamber of Commerce Members: May be interested in leading / supporting some actions, supported by the City and local volunteers. For example, in support of EV charging infrastructure, work with partners to complete a business case to determine the most cost-neutral and legal approach to charging for electricity use (e.g., use of third parties versus in-house operations), and pricing alternatives, including time-based rates, cost per hour, cost per kilowatt-hour, and no-cost charging.

PERSONAL VEHICLES ACTION TRACKING TABLE

TRANSPORTATION
PERSONAL VEHICLES

GOAL Through smart land use planning and the adoption of affordable active transportation methods, the City has reduced the number of single occupancy trips and there is a significant increase in residents who are choosing to use public transit, walking and cycling.

	ACTION	TIMING	DEPARTMENT LEAD	COMMUNITY GOALS	IMPACT
1	Implement network improvements and undertake planning to increase transit service, transit utilization (e.g., new routes, transit priority measures, on-demand technology, etc.) and traffic flow.		Engineering & Operations	S&IPR W&S CN&DP VD&R G&H S&E CTS S&DE CR&D	C C C C
2	Continue to explore the feasibility of installing hydrogen and/or renewable compressed natural gas (R-CNG) infrastructure systems within the City.		Corporate Services	S&IPR W&S CN&DP VD&R G&H S&E CTS S&DE CR&D	C C C C
3	Install electric vehicle infrastructure on City-owned property and develop a strategy to expand the EV infrastructure within the City. Continue to collaborate with partners to promote electric vehicles and alternative fuel vehicles (e.g., incentives, home charging infrastructure, test events, etc.).		Planning & Development	S&IPR W&S CN&DP VD&R G&H S&E CTS S&DE CR&D	C C C C
4	Develop an engagement plan to collect information from City staff to identify and assess the barriers that City employees face (or perceive they face) in their efforts to implement sustainable transport programs and policies.		Corporate Services	S&IPR W&S CN&DP VD&R G&H S&E CTS S&DE CR&D	C C C C

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	ACTION	TIMING	DEPARTMENT LEAD	COMMUNITY GOALS	IMPACT
5	Advocate to the Province to provide City-specific vehicle registration data to improve GHG estimates and inform the development of related policies to encourage fuel switching and driver behaviour.		Engineering & Operations	S&IPR, G&H, S&E, CTS	C
6	Implement transportation upgrades to reduce congestion or travel times (i.e., roundabouts at key intersections).		Engineering & Operations	S&IPR, CN&DP, VD&R, G&H, S&E, CTS	C C
7	Work with the local developer community, and organizations like Google, to improve in-City and transboundary trip distance estimates and to inform the development of personal vehicle average trip length and active transportation targets.		Corporate Services	S&IPR, G&H, S&E, CTS	C C
8	Upgrade traffic signals to smart signals to optimize improve vehicle flow.		Engineering & Operations	S&IPR, CN&DP, VD&R, G&H, S&E, CTS	C C
9	Work with car share providers to explore the piloting of a car share program.		Corporate Services	S&IPR, G&H, S&E, CTS	C C

COMMUNITY GOALS LEGEND

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TRANSPORTATION

ACTIVE TRANSPORTATION

Two of the major factors that impact transportation and energy consumption are the types and densities of land uses within a community. Higher density developments, accompanied by investments in pedestrian and cycling infrastructure (e.g., sidewalks, crosswalks, cycling lanes, and bicycle parking), traffic calming measures, and a mixture of land use types, are typically associated with higher percentages of walking, cycling, and public transit use also known as active transportation. With the expectation that the city's population will grow by more than 40 percent to over 100,000 residents by 2050, it is extremely important that the City require and encourage the development of more compact, mixed-use developments.

Active transportation (AT) includes walking, cycling, and other types of human-powered activity to reach a destination. AT brings many benefits:

- Health and safety, through increased physical activity and design improvements that support pedestrian and cyclist safety.
- Economic—AT infrastructure comes at a relatively low cost (both total and per capita) and can bring economic development benefits to the community as well as cost savings to individuals (e.g., individuals save money by not paying for gas or vehicle insurance).
- Environmental—Human powered transport is a low energy/low carbon form of transportation, particularly where it replaces single occupant vehicles.

The City has extensive control over the development and implementation of an AT network and supporting infrastructure such as bike parking. Within and around major transit station areas, the City is already prioritizing initiatives that promote AT behaviours that follow a travel planning hierarchy (Figure 10). However, there are several real and perceived barriers to shifting from the use of cars to active transportation methods. These range from safety to the cost of equipment to the use of end of destination facilities like showers. Modern, clean and convenient transit, along with first-mile and last-mile solutions for facilities that make active transport more convenient to incorporate into our daily lives will be needed to address these concerns. On this basis, the City will work to facilitate alternative transportation by improving existing infrastructure, adding new signage and amenities, and integrating alternative transportation into community planning. Key components of this goal area include improving pedestrian and cycling infrastructure, improving the flow of downtown traffic and roadways while enhancing efficiently and safely for all users, and planning for rapid transit (or the like) between the City and other major centers (Saint John and Moncton) to reduce single occupant vehicle use.

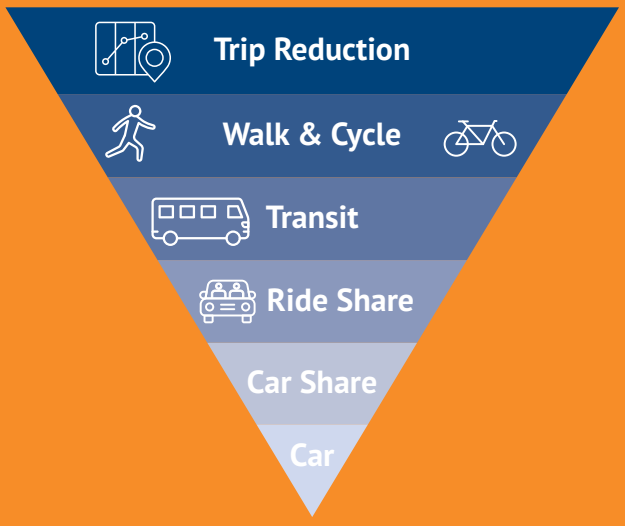

Figure 10. Travel planning hierarchy

ACTIVE TRANSPORTATION STRATEGY

The City will facilitate alternative transportation by improving existing infrastructure, adding new signage and amenities, and integrating alternative transportation into community planning. Key components of this strategy include improving pedestrian and cycling infrastructure, improving the flow of downtown traffic and roadways while enhancing efficiently and safely for all users, and planning for rapid transit (or the like) between the City and other major centers to reduce single occupant vehicle use.

GOAL

Through smart land use planning and the adoption of affordable, convenient and safe active transportation methods, the city reduces vehicular travel and associated transportation GHG emissions.

The City has a comprehensive network of pedestrian and bicycle routes linking residents to commercial and activity areas and all new community plans prioritize pedestrians and cyclists and that existing plans are retrofitted to do so.

COMMUNITY GOALS ADDRESSED

S&IPR W&S CN&DP VD&R G&H S&E CTS S&DE CR&D

IMPLEMENTATION CONSIDERATIONS

Where possible, the City can leverage existing opportunities for compact, complete communities and make provision for these to leverage improved transit as it becomes available. Smaller steps forward in terms of improving pedestrian and bicycle connections to commercial and activity centers and encouraging streetscape improvements in commercial nodes are key actions the City can take in the short- and medium-term.

PARTNERS

Local Groups / Chamber of Commerce Members: May be interested in leading / supporting the AT educational / programming actions, supported by the City and local volunteers.

ACTIVE TRANSPORTATION ACTION TRACKING TABLE

TRANSPORTATION
ACTIVE TRANSPORTATION

GOAL Through smart land use planning and the adoption of affordable, convenient and safe active transportation methods, the city reduces vehicular travel and associated transportation GHG emissions.

	ACTION	TIMING	DEPARTMENT LEAD	COMMUNITY GOALS	IMPACT
1	Continue to implement sidewalk, pedestrian, transit, roadway, and bikeway investment projects that encourage the shift to active transportation modes as identified in the Active Transportation Connection Plan.		Engineering & Operations	S&IPR, W&S, CN&DP, VD&R, G&H, S&E, CTS, S&DE, CR&D	C C C C
2	Continue to embed the City's Street Design Guidelines in transportation planning, infrastructure planning, and urban design plans and processes.		Planning & Development	S&IPR, W&S, CN&DP, VD&R, G&H, S&E, CTS, S&DE, CR&D	C C C C
3	Work with the local business community to develop / adopt intermodal or mixed- modal commuting technology platforms (e.g., apps) that allow users to plan trips that use multiple modes (public transit, car sharing, bike sharing, car- and vanpooling, on-demand ride services, and shuttle services) and promote existing programs (e.g., Trailtowns).		Planning & Development	S&IPR, W&S, CN&DP, VD&R, G&H, S&E, CTS, S&DE, CR&D	C C C C
4	Explore and develop by-laws to support the adoption of micro mobility initiatives (e.g., bike share).		Engineering & Operations	S&IPR, W&S, CN&DP, VD&R, G&H, S&E, CTS, S&DE, CR&D	C C C C

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	ACTION	TIMING	DEPARTMENT LEAD	COMMUNITY GOALS	IMPACT
5	Increase the number of secure and protected bike parking and maintenance facilities available to the public across the City. As applicable, enhance off-street bicycle parking standards and requirements for new developments.		Engineering & Operations	S&IPR W&S CN&DP VD&R G&H S&E CTS S&DE CR&D	C C C C
6	Support partners by promoting bicycle safety education programs that teach drivers and riders the laws, riding protocols, routes, safety tips and emergency maneuvers.		Corporate Services	S&IPR W&S CN&DP VD&R G&H S&E CTS S&DE CR&D	C C C C
7	Support partners by promoting workplace-and school-based initiatives that encourage more sustainable and efficient commuting patterns.		Corporate Services	S&IPR W&S CN&DP VD&R G&H S&E CTS S&DE CR&D	C C C C

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SOLID WASTE

SOLID WASTE

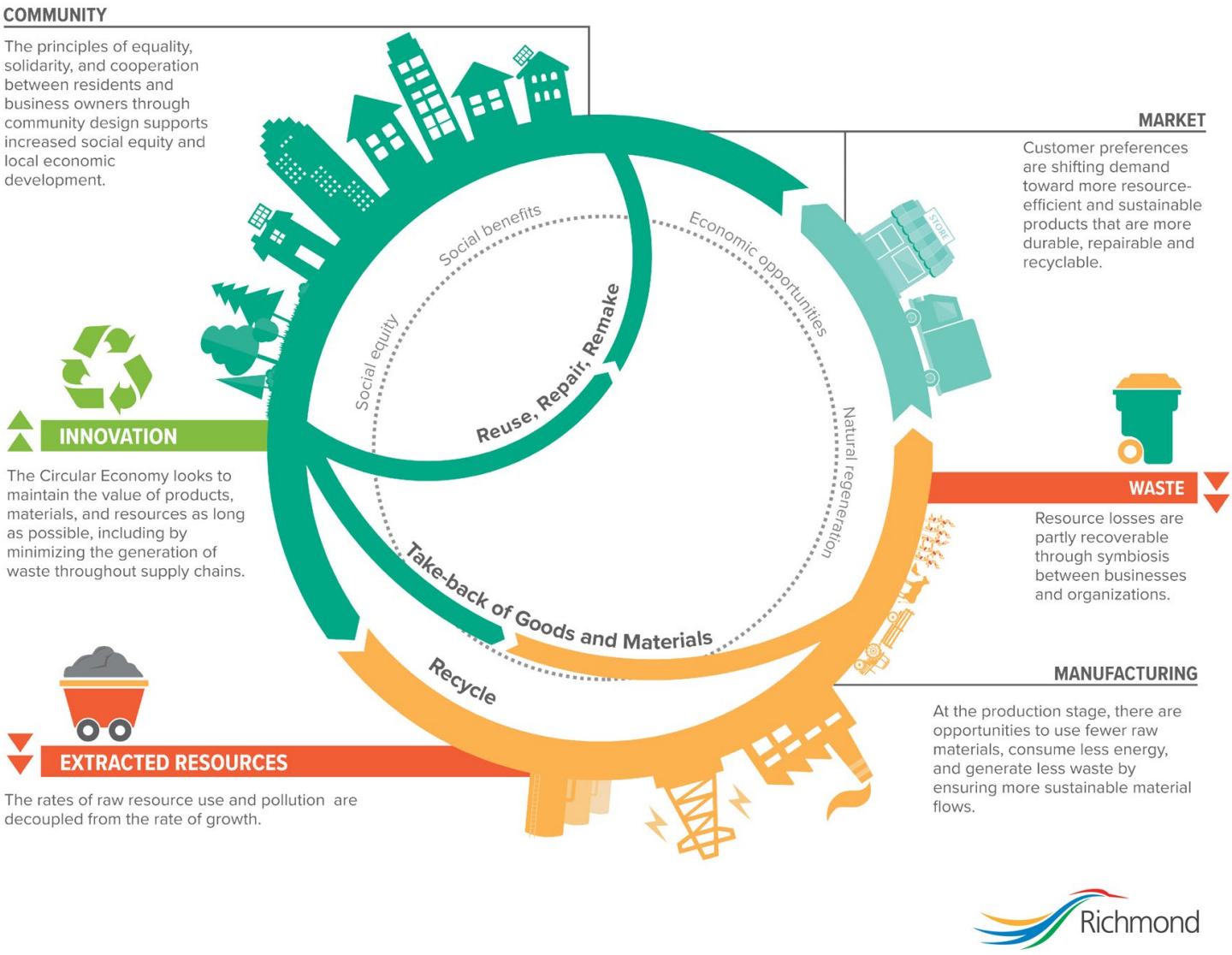
Solid waste accounts for approximately 2 percent of GHG emissions in the City. Reducing the amount of waste created is a critical first step to improving the efficiency of our economy, whilst reducing the burden on the landfill, and reducing GHG emissions throughout a product's lifecycle from extraction of raw materials to manufacturing to disposal. In this Circular Economy, all of our discarded materials, in the form of food waste, electronics, packaging, clothes, tires, and more are designed or used in such a fashion that we can use them as inputs for other processes. For example, many companies are recycling old clothes into new ones, or are shredding them for stuffing in new products. We are already encouraging the reuse and repair of materials and products that would otherwise enter the landfill. For waste items that are unrecoverable, we are providing greater access and convenience to facilities so that they can be recycled.

With an increasing population, we will need to continue to reduce the amount of waste generated by making simple changes in the purchase, use and disposal of products and services. This approach includes supporting the resale, rental and sharing economy, fixing and reusing products, as well as choosing products and services that have lower GHG emissions across the entire lifecycle. Organic waste composting at home and the reduction of food waste are also important ways that residents can reduce GHG emissions, whilst respecting the principles of the circular economy. Other opportunities to reduce waste and GHGs include changing consumer and business behaviours and better product design and planning.

The City will work towards alignment with the principles of a Circular Economy and develop actions to reduce waste. Potential future actions include adopting consumption-based emissions accounting and developing a sustainable consumption strategy that identifies and prioritizes options for lower carbon consumption. The City may also undertake various approaches including adjusting the scope of residential garbage pick-up, launching community based social marketing campaigns, and distributing education materials. The proposed waste related actions are presented in the following table.

WHAT IS THE CIRCULAR ECONOMY?

Instead of the "take, make and dispose" model historically used for producing goods, a circular economy approach reduces waste and avoids pollution by maximizing design and use of materials. It is a model that embodies principles such as "cradle to cradle" and biomimicry to reduce or avoid the creation of waste. Reducing production materials and waste materials is now a financial benefit.



Source: City of Richmond's webpage on Sustainability & Environment Circular Economy
https://www.richmond.ca/sustainability/circulareconomy.htm

SOLID WASTE STRATEGY

In order to reduce the amount of waste being generated, the City will continuously promote waste reduction and identify new programs that support this. The City may undertake various approaches including: adjusting the scope of residential garbage pick-up, launching community based social marketing campaigns, and distributing education materials.

GOAL

The City implements a strategic plan to reduce the amount of solid waste being generated by residents and businesses in the City.

The community reduces the generation of waste through the promotion of the 6 r's of waste management (rethink, reduce, reuse, recycle, recover, and residual management).

COMMUNITY GOALS ADDRESSED

S&IPR W&S CN&DP VD&R **G&H** **S&E** CTS **S&DE** CR&D

IMPLEMENTATION CONSIDERATIONS

The strategic direction of waste management in the City will need to align with regional commitments and Provincial requirements.

PARTNERS

The Province and Regional Solid Waste Commission: The strategic direction of waste management in the City will need to align with regional commitments and Provincial requirements. The Regional Solid Waste Commission may be able to support education programs.

SOLID WASTE ACTION TRACKING TABLE

SOLID WASTE

GOAL The City implements a strategic plan to reduce the amount of solid waste being generated by residents and businesses in the City.

	ACTION	TIMING	DEPARTMENT LEAD	COMMUNITY GOALS	IMPACT
1	Continue to implement community-based social marketing (CBSM) campaigns focused on waste reduction (e.g., no junk mail, smart purchasing, Metro Vancouver's Love Food Hate Waste campaign, reducing contamination in recycling).		Engineering & Operations	S&IPR W&S CN&DP VD&R G&H S&E CTS S&DE CR&D	C C C C
2	Continue promoting home composting programs.		Engineering & Operations	S&IPR W&S CN&DP VD&R G&H S&E CTS S&DE CR&D	C C C C
3	Continue to implement the Green Events Guide to reduce waste at the Garrison Market & other City-run events.		Recreation, Tourism & Community Engagement	S&IPR W&S CN&DP VD&R G&H S&E CTS S&DE CR&D	C C C C
4	Work with community partners to promote product exchange / resale networks.		Communications	S&IPR W&S CN&DP VD&R G&H S&E CTS S&DE CR&D	C C C C
5	Consider incorporating criteria related to the management of wastes from demolition, land clearing and construction activities into its Sustainable Development Checklist. These activities could be further incented by assigning a scoring system to the Checklist and rewarding developers and contractors with Development Cost Charge (DCC) reductions.		Engineering & Operations	S&IPR W&S CN&DP VD&R G&H S&E CTS S&DE CR&D	C C C C

ALTERNATIVE ENERGY

ALTERNATIVE ENERGY

Currently, electricity that is provided to the City by NB Power is primarily generated from a mix of renewable and fossil fuel sources. Most of the energy used in our residential, commercial, and institutional buildings is electricity; however, many of the functions performed could be provided from a variety of energy sources. As well, alternative energy sources could provide alternative methods to generate electricity.

Alternative energy systems that may be used on a building-scale include solar panels for hot water, solar photovoltaic panels for electricity, and heat exchange systems (in the ground, air or water) for heat and hot water. At larger scales (e.g., groups of buildings or neighborhoods), district energy systems may supply heat and hot water using heat recovered from sewers or other available waste heat sources, heat exchange systems, and several other potential sources.

Developing more localized energy systems fed by renewable supply options helps to reduce a community's GHG footprint, and may produce additional co-benefits, such as improved resilience against fluctuating energy supply and prices, and local economic development opportunities as a result of keeping energy spending local and creating new jobs.

The City will promote the development of local renewable energy sources. Key components of this strategy include encouraging solar photovoltaic (PV) systems and exploring opportunities to encourage the adoption of waste heat recovery and district energy systems. District energy systems are infrastructure that provide heating (or cooling) to a group of buildings within a defined geographic area. They typically provide low grade heat (i.e. hot water) to a number of buildings. The proposed alternative energy related actions are presented in the following table.

ALTERNATIVE ENERGY SUPPLY STRATEGY

The City will promote the development of local renewable energy sources. Key components of this strategy include encouraging solar photovoltaic (PV) systems and exploring opportunities to encourage the adoption of waste heat recovery and district energy systems. District energy systems are infrastructure that provide heating (or cooling) to a group of buildings within a defined geographic area. They typically provide low grade heat (i.e. hot water) to a number of buildings.

GOAL

The community reduces the carbon intensity of its energy portfolio through the adoption of local renewable energy systems.

The City completes an alternative energy assessment to identify neighborhoods or hotspots where solar PV, microgrids, waste heat recovery and DE systems could be used.

COMMUNITY GOALS ADDRESSED

S&IPR · W&S · **CN&DP** · **VD&R** · **G&H** · **S&E** · CTS · **S&DE** · CR&D

IMPLEMENTATION CONSIDERATIONS

Alternative energy systems require substantial planning and effort to define the project scope and terms, and multi-million dollar capital funding. A long term perspective is required.

PARTNERS

NB Power: NB Power may be able to provide grant funding to support alternative energy studies.

The University has a large engineering department that could be a key partner in feasibility review.

ALTERNATIVE ENERGY ACTION TRACKING TABLE

ALTERNATIVE ENERGY

GOAL

The community reduces the carbon intensity of its energy portfolio through the adoption of local renewable energy systems.

	ACTION	TIMING	DEPARTMENT LEAD	COMMUNITY GOALS	IMPACT
1	Continue with the City-wide rooftop solar mapping study and make the results publicly available.		Planning & Development	S&IPR W&S CN&DP VD&R G&H S&E CTS S&DE CR&D	C C C C
2	Work with stakeholders to undertake an alternative energy pre-feasibility study in an effort to: understand where potential opportunities exist and identify specific zones / buildings and, investigate partnerships, financing, and governance models to advance potential DE, microgrids, waste heat recovery and solar PV system(s).		Planning & Development	S&IPR W&S CN&DP VD&R G&H S&E CTS S&DE CR&D	C C C C
3	Examine the opportunity around developing financial incentives that can support DE, microgrids, waste heat recovery and solar PV, such as financing to assist in undertaking feasibility studies or low interest loans to help support upfront capital costs. For example, removing property taxes for renewable technology or infrastructure.		Planning & Development	S&IPR W&S CN&DP VD&R G&H S&E CTS S&DE CR&D	C C C C
4	Require the evaluation of waste heat recovery from large refrigeration systems (such as arenas, grocery stores) in new large developments.		Planning & Development	S&IPR W&S CN&DP VD&R G&H S&E CTS S&DE CR&D	C C C C

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LOCAL ECONOMY

LOCAL ECONOMY

The community's economic activities have a strong influence on energy use and GHG emissions. The pursuit of economic growth drives land use and development decisions, transportation planning and road building, and energy demand- all systems that directly affect energy use and GHG emissions. This goal area looks at how energy and climate change related activities can help to support and grow local business opportunities in Fredericton. This goal area aims to support the development of the green economy in Fredericton (e.g., local businesses that offer green energy technologies and services, energy audits, energy efficient new homes and renovations, alternative transportation options, and other green products and services) and support all businesses in implementing practices that benefit the long-term sustainability of the community, as well as the economic bottom line of the business (such as energy efficiency in commercial buildings, more fuel efficient commercial vehicle fleets).

In addition to the following actions, the City should consider updating its Economic Development Strategy to address this interplay, and work to facilitate economic well-being while reducing the energy and GHG impacts of growth. A green economy is low carbon, resource efficient and socially inclusive. In a green economy, growth in employment and income are driven by public and private investment into such economic activities, infrastructure and assets that allow reduced carbon emissions and pollution, enhanced energy and resource efficiency, and prevention of the loss of biodiversity and ecosystem services. Creating a green economy is a smart approach to economic diversification, ensuring local, clean jobs that can stand the test of market fluctuations.[1] The proposed local economy actions are presented in the following table.

1 UN Environment Programme: Green Economy webpage https://www.unenvironment.org/regions/asia-and-pacific/regional-initiatives/supporting-resource-efficiency/green-economy

LOCAL ECONOMY STRATEGY

The purpose of this goal is to:

- Increase the number of local jobs and local hiring in order to reduce the need for City residents to leave the community for work
- Support the local economy by encouraging residents to buy local
- Support the development of the green economy (e.g., local businesses that offer green energy technologies and services, energy audits, energy efficient new homes and renovations, alternative transportation options, and other green products and services)
- Support all businesses in implementing practices that benefit the long-term sustainability of the community, as well as the economic bottom line of the business (e.g., energy efficiency in commercial buildings, more fuel efficient commercial vehicle fleets, etc.).

GOAL

Support and engage local businesses, universities, colleges and not-for-profit organizations in the community in the transition towards a low carbon economy.

A green economy strategy is included in the new Economic Development Strategy.

COMMUNITY GOALS ADDRESSED

S&IPR | W&S | CN&DP | VD&R | G&H | S&E | CTS | S&DE | CR&D

IMPLEMENTATION CONSIDERATIONS

Staff time and resources will need to be sufficiently allocated in order for these education and outreach programs to be implemented.

PARTNERS

Chamber of Commerce, University

LOCAL ECONOMY ACTION TRACKING TABLE

LOCAL ECONOMY

GOAL

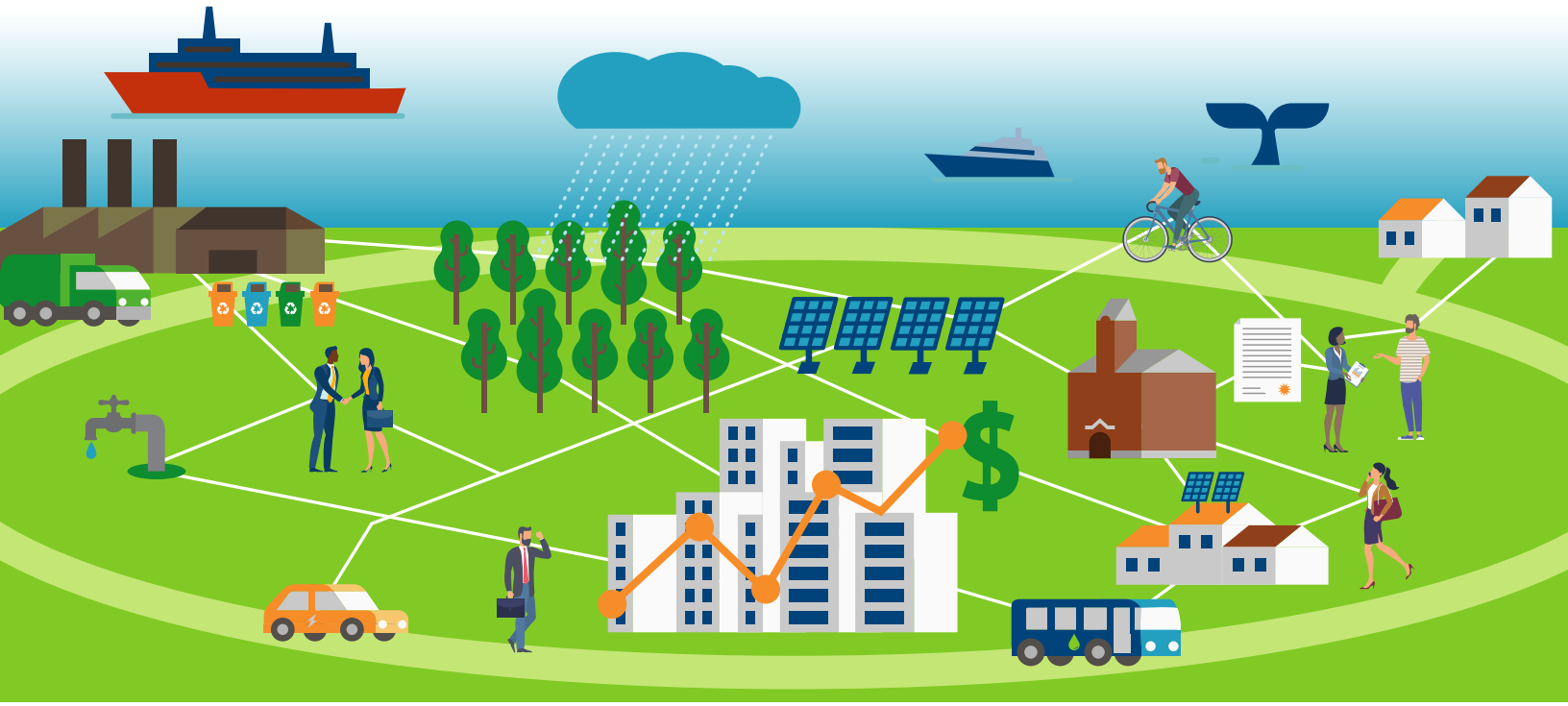
Support and engage local businesses, universities, colleges and not-for-profit organizations in the community in the transition towards a low carbon economy.

	ACTION	TIMING	DEPARTMENT LEAD	COMMUNITY GOALS	IMPACT
1	Package and promote information on existing programs that support energy efficiency improvements in commercial buildings.	Short	Planning & Development	S&IPR, W&S, CN&DP, VD&R, G&H, S&E, CTS, S&DE, CR&D	C C C C
2	Develop a recognition program to recognize developers that are voluntarily incorporating "green" measures into their developments.	Short	Corporate Services	S&IPR, W&S, CN&DP, VD&R, G&H, S&E, CTS, S&DE, CR&D	C C C C
3	Work with the Chamber of Commerce and Green Economy New Brunswick to identify, catalogue and profile local green businesses and businesses undertaking greening activities in the City and develop a recognition program.	Short	Corporate Services	S&IPR, CN&DP, VD&R, G&H, S&E, CTS, S&DE, CR&D	C C C C
4	Work with partners, including the Chamber of Commerce and Green Economy New Brunswick, to develop communications presenting the City's strengths as a location to grow the green economy (e.g., investment-ready land, willingness to find supporting infrastructure district heating or smart grid space), along with the incentives and programs.	Ongoing	Corporate Services	S&IPR, W&S, CN&DP, VD&R, G&H, S&E, CTS, S&DE, CR&D	C C C C

COMMUNITY GOALS LEGEND

- S&IPR — Safe and Inviting Public Realm
- W&S — Welcoming and Supportive
- CN&DP — Complete Neighborhoods and Distinctive Places
- VD&R — Vibrant Downtown and Riverfront
- G&H — Green and Healthy
- S&E — Sustainable and Efficient
- CTS — Complete Transportation System
- S&DE — Strong & Diverse Economy
- CR&D — Culturally Rich and Diverse

	ACTION	TIMING	DEPARTMENT LEAD	COMMUNITY GOALS	IMPACT
5	Work with local businesses / organizations to promote or implement commute trip reduction programs (parking cash out, transit allowances, rideshare, end-of-trip facilities, compressed or flexible work weeks, telecommuting, etc.).	>	Corporate Services	S&IPR W&S CN&DP VD&R G&H S&E CTS S&DE CR&D	C C C C



COMMUNITY GOALS LEGEND

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COMMUNITY OUTREACH & FUNDING

COMMUNITY OUTREACH & FUNDING

To realize tangible reductions in energy consumption and GHG emissions and sustain them over the long-term, the City must take a market transformation approach to increase the share of energy-efficient products and services used and to achieve the goal for people in Fredericton to have ownership of their personal carbon footprints. This will require removing identified barriers to changing people's behaviours to accelerate the adoption of all cost-effective energy efficiency opportunities. It will also require removing the barriers that the municipality faces in terms of using available resources and providing funding.

The process of market transformation can be undertaken using a variety of voluntary and involuntary measures, but in the early stages of the process the focus is on helping individuals, landowners, and businesses to overcome barriers. In many cases these barriers are knowledge-based and may be overcome through outreach and education efforts. In other cases, the barriers are financial and resource constraints at the City level which could be mitigated by establishing a community fund and/or entity.

The City will participate in, promote, and partner with organizers of climate change initiatives. The City will explore establishing a local funding mechanism(s) and/or establishing a community organization to support and encourage the adoption of energy conservation and efficiency actions in the community. The proposed community outreach and funding actions are presented in the following table.

COMMUNITY OUTREACH & FUNDING STRATEGY

The City will participate in, promote, and partner with organizers of climate change initiatives. The City will explore establishing a local funding mechanism(s) and/or establishing a community organization to support and encourage the adoption of energy conservation and efficiency actions in the community.

GOAL

The community has taken ownership of its personal carbon footprints.

There is stable funding for initiatives that reduce energy use and greenhouse gas emissions in the community.

COMMUNITY GOALS ADDRESSED

S&IPR W&S CN&DP VD&R G&H S&E CTS S&DE CR&D

IMPLEMENTATION CONSIDERATIONS

Setting up a fund or community organization will require a coordinated effort between Corporate Administration, and senior management to define how such a mechanism could be set up. Staff time and resources will need to be sufficiently allocated in order for these programs to be implemented.

PARTNERS

Identify **Youth Advisory Committee / University members** to work with the City in promoting youth leadership.

Gaia Project, Quest, Chamber of Commerce, Real Estate Association, APEGNB, Conservation Council of New Brunswick

COMMUNITY OUTREACH & FUNDING
ACTION TRACKING TABLE

COMMUNITY OUTREACH & FUNDING

GOAL The community has taken ownership of its personal carbon footprints.

	ACTION	TIMING	DEPARTMENT LEAD	COMMUNITY GOALS	IMPACT
1	Continue to use the Engage Fredericton Platform and the City's Environmental Dashboard to provide up to date information on the plan's progress and continue to engage residents and allow them to provide input.		Corporate Services	S&IPR W&S CN&DP VD&R G&H S&E CTS S&DE CR&D	C C C C
2	Develop a comprehensive communication & engagement strategy that highlights the benefits of implementing the CEEP, like economic and community resilience benefits & leverages work being done by other community partners.		Corporate Services	S&IPR W&S CN&DP VD&R G&H S&E CTS S&DE CR&D	C C C C
3	Study the costs and benefits of setting up a community fund or not-for-profit entity that could fund energy efficiency retrofits and new building features in the community—e.g., grants for community groups to implement education and outreach campaigns and also secure funds to retrofit and upgrade buildings and facilities.		Corporate Services	S&IPR W&S CN&DP VD&R G&H S&E CTS S&DE CR&D	C C C C
4	Provide sponsorship to local youth to participate in programs that develop leadership in sustainability.		Corporate Services	S&IPR W&S CN&DP VD&R G&H S&E CTS S&DE CR&D	C C C C

COMMUNITY GOALS LEGEND

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MUNICIPAL LEADERSHIP

MUNICIPAL LEADERSHIP

Reducing GHG emissions from our operations presents an opportunity for the City to lead the community by example. Our 'corporate' GHG emissions, account for less than 1 percent of our 'community' GHG emissions which come from the operation and use of buildings and facilities, like recreation centers, streetlights, traffic signals, and water and wastewater systems. Our GHG emissions also include the operation of fleet vehicles and other equipment for the purposes of servicing and maintaining public spaces and infrastructure.

As part of this CEEP, we are identifying which measures we can undertake corporately to reduce GHG emissions. However, like any corporate entity, we have limited capital reserves and must prioritize certain projects or actions over others. One of our key barriers to climate action is that we do not account for the social and environmental costs in our capital and operating frameworks. Integrating these costs into decision-making is an opportunity to reduce energy and GHG emissions, enhance resilience and reduce the long-term costs and impacts of climate change. Mainstreaming climate action into existing and new municipal plans, policies, and regulations—including capital, infrastructure, land use and emergency response plans—may be the most efficient means of reducing the impacts, and vulnerability to, climate change while also contributing to other sustainability objectives, per Natural Resources Canada.[1]

At the municipal operational level, the actions to reduce GHG emissions and the impacts of climate change are consequently diverse, ranging from areas where the City would seek to advocate and educate others, to taking a hands-on approach to improving the City infrastructure's climate resilience. This suite of actions focuses on areas where the City seeks to support residents and businesses in preparing for a changing climate.

1 From Impacts to Adaptation: Canada in a Changing Climate", 2007, and "Adapting to Climate Change: An Introduction for Canadian Municipalities

MUNICIPAL LEADERSHIP STRATEGY

The City's Corporate CEEP includes several energy efficiency initiatives to improve the energy efficiency of the City's operations but the City can do more to improve energy conservation and efficiency in the community.

GOAL

The City is a leader in taking action on climate change.

COMMUNITY GOALS ADDRESSED

S&IPR W&S CN&DP VD&R G&H S&E CTS S&DE CR&D

IMPLEMENTATION CONSIDERATIONS

Staff time and resources will need to be sufficiently allocated in order for these programs to be implemented.

PARTNERS

Establish a partnership with NB Power to advance alternative energy systems, supplement City staff and budget resources, explore ways to reduce community emissions through electricity conservation and help foster a conservation mindset within the community. Other external funding providers, like FCM and Infrastructure Canada are also key.

MUNICIPAL LEADERSHIP ACTION TRACKING TABLE

MUNICIPAL LEADERSHIP

GOAL

The City is a leader in taking action on climate change.

	ACTION	TIMING	DEPARTMENT LEAD	COMMUNITY GOALS	IMPACT
1	Pilot new technologies in City-owned assets to assess suitability for broad community application.		Engineering & Operations	S&IPR W&S CN&DP VD&R G&H S&E CTS S&DE CR&D	C C C C
2	Incorporate climate action performance measures into the City's annual budgeting process.		Corporate Services	S&IPR W&S CN&DP VD&R G&H S&E CTS S&DE CR&D	C C C C
3	Dedicate annual on-going operating funding to enable CEEP implementation.		Corporate Services	S&IPR W&S CN&DP VD&R G&H S&E CTS S&DE CR&D	C C C C
4	Review and update the CEEP every 3–5 years.		Corporate Services	S&IPR W&S CN&DP VD&R G&H S&E CTS S&DE CR&D	C C C C
5	Review CEEP GHG target in 2030.		Corporate Services	S&IPR W&S CN&DP VD&R G&H S&E CTS S&DE CR&D	C C C C

Implementing the CEEP

This CEEP is the City's first step towards reducing community GHG emissions by 50 percent by 2030 and achieving net zero by 2050. It is a forward-looking vision for GHG emissions reductions in Fredericton and must be considered a living document with the intent to be updated continuously, as approaches and technologies change. As new technologies are introduced and improved, new opportunities for GHG emissions reductions may present themselves, while the efficacy of actions outlined in this CEEP may also be affected. Ongoing measurement and review will be beneficial to reframe and refocus our efforts when new insights emerge as a result of ongoing stakeholder collaboration, new research and studies, new technologies, and changes to the political and economic landscape.

OUR PARTNERSHIP WITH THE COMMUNITY

While the CEEP identifies actions that fall within the City's mandate, it also identifies actions that can only succeed with the help of partners and the broader community. In this sense, the CEEP relies on a three-part partnership between the City, its community partners and residents (see the graphic below). These partnerships include universities, school districts, businesses, developers, community groups, and other organizations working in and across the City.

This joint responsibility poses a challenge for implementation in that the City does not control the actions of citizens and community partners. We can try to influence others and rely on their good will to work jointly towards common goals. Whether we are expecting change within the City's policies and practices or appealing to residents to change their behaviours, it will require effective communication to bring the various target audiences on side. To this end, the City pledges to help ensure that the necessary information and decision-making systems are in place to support all community members as they seek to make cost-effective, low carbon energy choices. Our community's willingness and ability to take action will determine the overall pace, scale and success of achieving our climate action goals (see the **Climate Actions for Residents**).

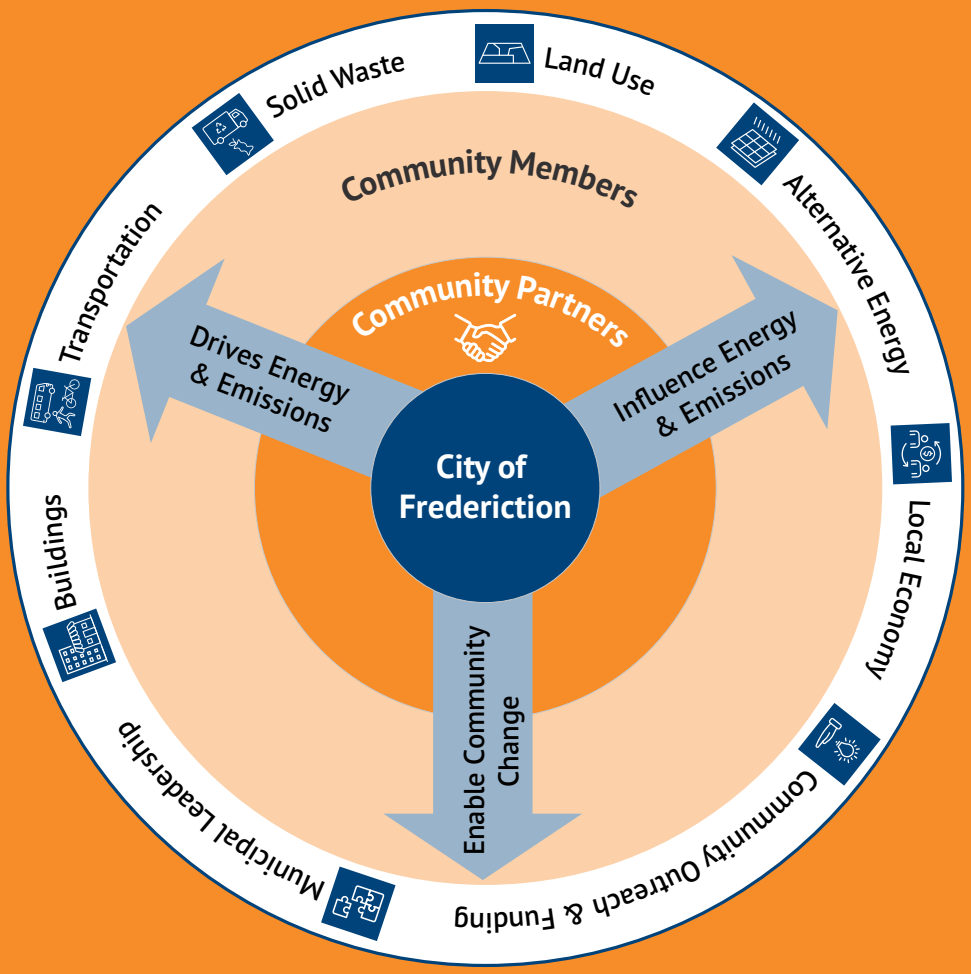
Lastly, there are some key actions that lie beyond the City's jurisdictional powers—like the updating of the current building and energy codes. Our role here will be to support partners and advocate for these changes.

CEEP Partnership

City of Fredericton:
What the City can do.

Community Partners:
What the City can do with the help of partner organizations.

Community Members:
What the City is asking our residents and business owners to commit to do.



MONITORING OUR PROGRESS

The City will need to dedicate staff time and annual funding for the CEEP to be successful in its implementation. However, it will need to collaborate with the community and stakeholders to ensure that the City reaches the identified vision, goals, and 2030 and 2050 GHG reduction targets. It will also be important to regularly monitor, report and review progress on these activities so that they can be adjusted as necessary to improve the outcomes. To this end, the City commits to:

- Review and remain apprised of best practice climate science, trends, technologies, and best practices.
- Foster and develop a tri-disciplinary collaboration between the City and research centers (e.g., the University of New Brunswick), and the private sector to stimulate the creation and piloting of emergent energy and sustainable technologies.
- Deploy an adaptive management approach using best practices that enable the City to implement and re-prioritize, as necessary, the actions described in this plan. This includes re-forecasting GHG emissions every 5 years.
- Re-examine and update the CEEP every 5 years.
- Report through an annual sustainability report on progress toward implementing the initiatives outlined in the CEEP.
- Provide ongoing opportunities for the public to receive information, as well as to provide input as the CEEP implementation process proceeds.

Climate Actions for Residents

BUILDINGS

- Make energy efficiency improvements to your home or office (such as improving insulation; replacing windows; caulking around vents, windows, etc.)
- Turn down the temperature in your home or office by 2°C in the winter (and up by 2°C in the summer)
- Replace your furnace with a high efficiency model, or install a heat pump
- Install low flow water fixtures and faucets in your home or office
- Replace your computer monitor / TV with an LCD / more energy efficient screen
- Take advantage of existing programs to assist with energy efficiency audits and retrofits (such as NB Power Total Home Energy Savings Program, etc.)
- Install a programmable thermostat at home / work
- Set your water heater to 49°C (reduction from factory setting)
- Replace incandescent light bulbs with LED light bulbs
- Wash your clothes in cold water and hang your laundry to dry

LAND USE

- Plant shade trees to the south of your home or office building
- Grow some of your own food in your home garden or community garden plot

TRANSPORTATION

- Walk, cycle or use active modes of transportation to get to work/school at least one day a week
- Purchase or lease an energy efficient vehicle
- Buy an electric bicycle or scooter instead of owning a car
- Turn off your car instead of idling longer than 10 seconds (in temperatures above -10°C)
- Take transit to work / school at least one day a week
- Telecommute to work at least one day week
- Perform regular maintenance checks on your vehicle

SOLID WASTE

- Divert food waste from the landfill by recycling and composting organic materials (kitchen scraps, yard waste, etc.)
- Buy good quality, long lasting products that you will not have to replace in the short term
- Participate in curb-side recycling or drop your own recycling at the local depot
- Reuse products or purchase used wherever possible instead of buying new
- Buy products with minimal or recyclable packaging

ALTERNATIVE ENERGY

- Install a solar hot water system at home

LOCAL ECONOMY

- Buy local food whenever possible

INDICATORS

Because the City will be monitoring and reporting its progress annually, we can learn from our observations and improve the granularity and focus of initiatives going forward. On this basis, some of the more successful actions are likely to be continued and expanded, while unsuccessful ones will be dropped, or reconfigured. Other unforeseen changes, such as technological advancements, energy price changes, grant funding, the use of carbon offsets, etc. will be considered in future updates as well.

To gauge and monitor our progress, we will use a mix of primary and secondary indicators to track and measure the overall impact of our actions. Primary indicators directly track progress towards the desired reduction outcome of energy consumption and GHG emission levels. Secondary indicators provide an additional method of understanding whether progress is being made towards the overall targets and are particularly useful when the overall targets are challenging to measure with much certainty. They also provide clarity on whether identified strategies and actions are resulting in the desired outcomes.

List of Primary Indicators

GOAL / METRIC	INDICATOR	MEASUREMENT UNITS
50 percent reduction in community GHG emissions by 2030 and net zero by 2050	Total GHG emissions from buildings in the community	Tonnes of carbon dioxide equivalent (tCO_2e per year)
	Total GHG emissions from transportation in the community	Tonnes of carbon dioxide equivalent (tCO_2e per year)
	Total GHG emission from waste in the community	Tonnes of carbon dioxide equivalent (tCO_2e per year)
	Total GHG emissions per resident	Tonnes of carbon dioxide equivalent (tCO_2e per year)
	Total renewable energy consumption in the community	Gigajoules (GJ)
Increased community renewable energy	Total renewable energy consumption in the community	Percent (%)
	Total cost of renewable energy / Gigajoule	CAD$/GJ
50 percent reduction in corporate GHG emissions by 2030 and net zero by 2050	Total GHG emissions from Corporate buildings operations	Tonnes of carbon dioxide equivalent (tCO_2e per year)
	Total GHG emissions from Corporate transportation operations	(tCO_2e per year)
	Total GHG emission from Corporate waste operations	Tonnes of carbon dioxide equivalent (tCO_2e per year)
Increased local government renewable energy	Total renewable energy consumption from Corporate operations	Gigajoules (GJ)
	Total renewable energy consumption from Corporate operations	Percent (%)
	Total cost of renewable energy / Gigajoule	USD$/GJ

List of Secondary Indicators

INDICATOR	MEASUREMENT UNITS
GDP per capita is maintained or increases	Change in Gross Domestic Product (GDP)
Tree canopy cover remains stable or increases and ecological diversity remains stable or increases.	Tree cover (percentage)
Total commercial building energy use by square meter	Gigajoules (GJ) / m^2
Total commercial building energy spend per square meter	CAD$ / m^2
Percentage of commercial buildings registered in voluntary building energy benchmarking program.	Percent (%)
Percentage of commercial buildings exceeding an Energy Score of 80.	Percent (%)
Percentage of residential buildings exceeding an Energy Score of 80.	Percent (%)
Average household spend on energy usage per year	CAD$/Household/Annum
Residential per capita natural gas consumption	Gigajoules (GJ) / resident / year
Residential per capita electricity consumption	Gigajoules (GJ) / resident / year
Percentage of buildings operating on renewable energy	Percent (%)
Total GJ of net renewable energy generated per annum	Gigajoules (GJ)
Number of net zero ready buildings	Number of net zero ready buildings
Ratio of renewable energy generated in the community to total energy used in the community	Percent (%)
Number of building scale renewable energy systems installed	Total number of systems installed
Total percentage of construction waste diverted from landfill	Percent (%)
Total material recycled per capita	Tonnes / capita / year
Total material sent to landfill per capita	Tonnes / capita / year
Percent of City facilities that are renewably powered	Percent (%)
Percent of City fleet that is renewably powered	Percent (%)
Number of hours of staff training/education sessions on climate change, energy and GHG management	Number of hours
Percent of City plans and policies that address GHG emission reductions and climate risks	Qualitative response
Percent of registered electric vehicles by type (commercial/residential)	Percent (%)
Ratio of EV-infrastructure capacity to actual use	Percent (%)
Kilometers of sidewalk, designated bicycle facilities / amenities, and multi-use trails	Kilometers (km)
Number of car share vehicles available for use in the City	Number of car share vehicles in the City
Commuting distance	Kilometers (km)

INDICATOR	MEASUREMENT UNITS
Percent of trips by mode of transportation for journey-to-work, or journey-to-school trips	Percent (%)
The average number of vehicles owned per household by type (car, truck, motorcycle, bicycle)	Number of vehicles per household
Ambient Air Quality	Ambient Air Quality Index AQI
Dwelling Unit Density	Units / hectare (ha)
Transit ridership	Average annual number of transit-rider trips per capita

References

Intergovernmental Panel on Climate Change (IPCC) AR4 Climate Change 2007: Synthesis Report, https://www.ipcc.ch/report/ar4/syr/

City of Fredericton Climate Change Adaptation Plan (CCAP)

City of Victoria Climate Leadership Plan, https://www.victoria.ca/EN/main/residents/climate-change/climate-leadership.html

Adapted from Birmingham City's "What is a complete street?" infographic, https://bhamcitycouncil.medium.com/birmingham-city-council-passes-complete-streets-ordinance-e1699f743163

Source: City of Richmond's webpage on Sustainability & Environment Circular Economy https://www.richmond.ca/sustainability/circulareconomy.htm

UN Environment Programme: Green Economy webpage https://www.unenvironment.org/regions/asia-and-pacific/regional-initiatives/supporting-resource-efficiency/green-economy

Impacts to Adaptation: Canada in a Changing Climate", 2007, and "Adapting to Climate Change: An Introduction for Canadian Municipalities

APPENDIX A

Implementation Quick Guide

ACTION	GOAL AREA	TIMING	DEPARTMENT LEAD	COMMUNITY GOALS	IMPACT
ONGOING: 2022—Onwards					
Continue to implement sidewalk, pedestrian, transit, roadway, and bikeway investment projects that encourage the shift to active transportation modes as identified in the Active Transportation Connection Plan.			Engineering & Operations	S&IPR W&S CN&DP VD&R G&H S&E CTS S&DE CR&D	C C C C
Implement network improvements and undertake planning to increase transit service, transit utilization (e.g., new routes, transit priority measures, on-demand technology, etc.) and traffic flow.			Engineering & Operations	S&IPR W&S CN&DP VD&R G&H S&E CTS S&DE CR&D	C C C C
Continue to embed the City's Street Design Guidelines in transportation planning, infrastructure planning, and urban design plans and processes.			Planning & Development	S&IPR W&S CN&DP VD&R G&H S&E CTS S&DE CR&D	C C C C
Continue to explore the feasibility of installing hydrogen and/or renewable compressed natural gas (R-CNG) infrastructure systems within the City.			Corporate Services	S&IPR W&S CN&DP VD&R G&H S&E CTS S&DE CR&D	C C C C
Install electric vehicle infrastructure on City-owned property and develop a strategy to expand the EV infrastructure within the City. Continue to collaborate with partners to promote electric vehicles and alternative fuel vehicles (e.g., incentives, home charging infrastructure, test events, etc.).			Planning & Development	S&IPR W&S CN&DP VD&R G&H S&E CTS S&DE CR&D	C C C C

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- S&DE — Strong & Diverse Economy
- CR&D — Culturally Rich and Diverse

GHG IMPACT LEGEND

- C C C C — Reduces total annual GHG emissions by more than 10,000 tonnes CO_2e
- C C C — Reduces total annual GHG emissions by 2,500 to 10,000 tonnes CO_2e
- C C — Reduces total annual GHG emissions by 0 to 2,500 tonnes CO_2e
- C — Lays the foundation for other efforts, though by itself may not reduce GHG emissions measurably

ACTION	GOAL AREA	TIMING	DEPARTMENT LEAD	COMMUNITY GOALS	IMPACT
Continue to focus on infill development & densification of the downtown, according to the Municipal Plan.			Planning & Development	S&IPR W&S CN&DP VD&R G&H S&E CTS S&DE CR&D	C C C C
Continue to advocate to the Province to allow municipalities to develop/ run a Property Assessed Clean Energy Programs (PACE) or similar program.			Corporate Services	S&IPR W&S CN&DP VD&R G&H S&E CTS S&DE CR&D	C C C C
Advocate for the Province to adopt the National Energy Code of Canada for Buildings.			Corporate Services	S&IPR W&S CN&DP VD&R G&H S&E CTS S&DE CR&D	C C C C
Ensure that new building policy and code requirements are supported with investment in the development of compliance processes, tools, and training for both staff and applicants prior to the National Energy Code of Canada for Buildings and National Building Code requirements taking effect.			Planning & Development	S&IPR W&S CN&DP VD&R G&H S&E CTS S&DE CR&D	C C C C
Continue with the City-wide rooftop solar mapping study and make the results publicly available.			Planning & Development	S&IPR W&S CN&DP VD&R G&H S&E CTS S&DE CR&D	C C C C
Continue to implement community-based social marketing (CBSM) campaigns focused on waste reduction (e.g., no junk mail, smart purchasing, Metro Vancouver's Love Food Hate Waste campaign, reducing contamination in recycling).			Engineering & Operations	S&IPR W&S CN&DP VD&R G&H S&E CTS S&DE CR&D	C C C C
Continue promoting home composting programs.			Engineering & Operations	S&IPR W&S CN&DP VD&R G&H S&E CTS S&DE CR&D	C C C C
Continue to implement the Green Events Guide to reduce waste at the Garrison Market & other City-run events.			Recreation, Tourism & Community Engagement	S&IPR W&S CN&DP VD&R G&H S&E CTS S&DE CR&D	C C C C
Pilot new technologies in City-owned assets to assess suitability for broad community application.			Engineering & Operations	S&IPR W&S CN&DP VD&R G&H S&E CTS S&DE CR&D	C C C C

ACTION	GOAL AREA	TIMING	DEPARTMENT LEAD	COMMUNITY GOALS	IMPACT
Continue to use the Engage Fredericton Platform and the City's Environmental Dashboard to provide up to date information on the plan's progress and continue to engage residents and allow them to provide input.			Corporate Services	S&IPR W&S CN&DP VD&R G&H S&E CTS S&DE CR&D	C C C C
Develop an engagement plan to collect information from City staff to identify and assess the barriers that City employees face (or perceive they face) in their efforts to implement sustainable transport programs and policies.			Corporate Services	S&IPR W&S CN&DP VD&R G&H S&E CTS S&DE CR&D	C C C C
Advocate to the Province to provide City-specific vehicle registration data to improve GHG estimates and inform the development of related policies to encourage fuel switching and driver behaviour.			Engineering & Operations	S&IPR W&S CN&DP VD&R G&H S&E CTS S&DE CR&D	C C C C
Incorporate climate action performance measures into the City's annual budgeting process.			Corporate Services	S&IPR W&S CN&DP VD&R G&H S&E CTS S&DE CR&D	C C C C
Dedicate annual on-going operating funding to enable CEEP implementation.			Corporate Services	S&IPR W&S CN&DP VD&R G&H S&E CTS S&DE CR&D	C C C C
Review and update the CEEP every 3–5 years.			Corporate Services	S&IPR W&S CN&DP VD&R G&H S&E CTS S&DE CR&D	C C C C
Review CEEP GHG target in 2030.			Corporate Services	S&IPR W&S CN&DP VD&R G&H S&E CTS S&DE CR&D	C C C C
Implement transportation upgrades to reduce congestion or travel times (i.e., roundabouts at key intersections).			Engineering & Operations	S&IPR W&S CN&DP VD&R G&H S&E CTS S&DE CR&D	C C C C
PHASE ONE: 2023—2025					
Seek out funding to support the development of separate residential, high-density residential buildings, and institutional / commercial building deep building energy retrofit strategies.			Corporate Services	S&IPR W&S CN&DP VD&R G&H S&E CTS S&DE CR&D	C C C C

ACTION	GOAL AREA	TIMING	DEPARTMENT LEAD	COMMUNITY GOALS	IMPACT
Collaborate with the Canadian Home Builders Association and other partners to advance and support the development of a green buildings program. This would include packaging and promoting information through City channels around retrofitting and developing more sustainable and energy efficient buildings.			Corporate Services	S&IPR W&S CN&DP VD&R G&H S&E CTS S&DE CR&D	C C C C
Explore the opportunity to establish a fast-track/rebate program for building permit applications that undertake energy-efficient builds/deep retrofits.			Planning & Development	S&IPR W&S CN&DP VD&R G&H S&E CTS S&DE CR&D	C C C C
Explore the opportunity to establish an incentive / fast-track program for development applications that undertake and implement Integrated Energy Master Plans (see Land Use). Incentives could include building permit rebates, reduced DCC rates.			Planning & Development	S&IPR W&S CN&DP VD&R G&H S&E CTS S&DE CR&D	C C C C
Work with NB Power and NRCan to encourage commercial building owners to adopt the use of a Portfolio Manager to track energy consumption and demand charges. Encourage building owners to access benchmarking, auditing and retrofit funding through NB Power.			Corporate Services	S&IPR W&S CN&DP VD&R G&H S&E CTS S&DE CR&D	C C C C
Package and promote information on existing programs that support energy efficiency improvements in commercial buildings.			Planning & Development	S&IPR W&S CN&DP VD&R G&H S&E CTS S&DE CR&D	C C C C
Explore the feasibility of developing Green Development Standards/ Guidelines that encourage the planning, design, and development of near-net zero buildings and neighbourhoods (e.g., establishment of Integrated Energy / Net Zero Master Plans). These would first be voluntary and then mandatory for new builds.			Engineering & Operations	S&IPR W&S CN&DP VD&R G&H S&E CTS S&DE CR&D	C C C C

ACTION	GOAL AREA	TIMING	DEPARTMENT LEAD	COMMUNITY GOALS	IMPACT
Develop a recognition program to recognize developers that are voluntarily incorporating "green" measures into their developments.			Corporate Services	S&IPR W&S CN&DP VD&R G&H S&E CTS S&DE CR&D	C C C C
Explore the feasibility of developing a Bylaw to regulate illuminated signs or keeping buildings lit at night following the principals of "Dark Sky".			Planning & Development	S&IPR W&S CN&DP VD&R G&H S&E CTS S&DE CR&D	C C C C
Advocate for the Province to modify the Community Planning Act and Municipalities Act to allow NB cities to address energy and water conservation, efficiency and GHG reduction requirements via by-laws and development guidelines.			Corporate Services	S&IPR W&S CN&DP VD&R G&H S&E CTS S&DE CR&D	C C C C
Work with the Chamber of Commerce and Green Economy New Brunswick to identify, catalogue and profile local green businesses and businesses undertaking greening activities in the City and develop a recognition program.			Corporate Services	S&IPR W&S CN&DP VD&R G&H S&E CTS S&DE CR&D	C C C C
Develop a comprehensive communication & engagement strategy that highlights the benefits of implementing the CEEP, like economic and community resilience benefits & leverages work being done by other community partners.			Corporate Services	S&IPR W&S CN&DP VD&R G&H S&E CTS S&DE CR&D	C C C C
Work with the local developer community, and organizations like Google, to improve in-City and transboundary trip distance estimates and to inform the development of personal vehicle average trip length and active transportation targets.			Corporate Services	S&IPR W&S CN&DP VD&R G&H S&E CTS S&DE CR&D	C C C C
Work with the local business community to develop / adopt intermodal or mixed- modal commuting technology platforms (e.g., apps) that allow users to plan trips that use multiple modes (public transit, car sharing, bike sharing, car- and vanpooling, on-demand ride services, and shuttle services) and promote existing programs (e.g., Trailtowns).			Planning & Development	S&IPR W&S CN&DP VD&R G&H S&E CTS S&DE CR&D	C C C C

ACTION	GOAL AREA	TIMING	DEPARTMENT LEAD	COMMUNITY GOALS	IMPACT
Explore and develop by-laws to support the adoption of micro mobility initiatives (e.g., bike share).			Engineering & Operations	S&IPR W&S CN&DP VD&R G&H S&E CTS S&DE CR&D	C C C C
Increase the number of secure and protected bike parking and maintenance facilities available to the public across the City. As applicable, enhance off-street bicycle parking standards and requirements for new developments.			Engineering & Operations	S&IPR W&S CN&DP VD&R G&H S&E CTS S&DE CR&D	C C C C
Support partners by promoting bicycle safety education programs that teach drivers and riders the laws, riding protocols, routes, safety tips and emergency maneuvers.			Corporate Services	S&IPR W&S CN&DP VD&R G&H S&E CTS S&DE CR&D	C C C C
Support partners by promoting workplace-and school-based initiatives that encourage more sustainable and efficient commuting patterns.			Corporate Services	S&IPR W&S CN&DP VD&R G&H S&E CTS S&DE CR&D	C C C C
Upgrade traffic signals to smart signals to optimize improve vehicle flow.			Engineering & Operations	S&IPR W&S CN&DP VD&R G&H S&E CTS S&DE CR&D	C C C C
PHASE TWO: 2026–2028					
Update the Municipal Plan to align with the corporate and community CEEP and include climate considerations in all new secondary plans.			Planning & Development	S&IPR W&S CN&DP VD&R G&H S&E CTS S&DE CR&D	C C C C
Work with partners, including the Chamber of Commerce and Green Economy New Brunswick, to develop communications presenting the City's strengths as a location to grow the green economy (e.g., investment-ready land, willingness to find supporting infrastructure district heating or smart grid space), along with the incentives and programs.			Corporate Services	S&IPR W&S CN&DP VD&R G&H S&E CTS S&DE CR&D	C C C C

ACTION	GOAL AREA	TIMING	DEPARTMENT LEAD	COMMUNITY GOALS	IMPACT
Work with NB Power, Realtors Association and Canadian Home Builders Association other partners to explore a pilot residential energy labeling program (at the time of sale) for residential homes and explore options for multifamily buildings.		>	Corporate Services	S&IPR W&S CN&DP VD&R G&H S&E CTS S&DE CR&D	C C C C
Review Development Permit Plans and, where applicable, update them to ensure that neighbourhoods establish cycling and pedestrian networks to complement the Active Transportation Master Plan, and include strong connectivity, an appropriate variety of route types, separated bike paths, and end-of-trip facilities.		>	Planning & Development	S&IPR W&S CN&DP VD&R G&H S&E CTS S&DE CR&D	C C C C
Work with car share providers to explore the piloting of a car share program.		>	Corporate Services	S&IPR W&S CN&DP VD&R G&H S&E CTS S&DE CR&D	C C C C
Work with community partners to promote product exchange / resale networks.		>	Communications	S&IPR W&S CN&DP VD&R G&H S&E CTS S&DE CR&D	C C C C
Work with local businesses / organizations to promote or implement commute trip reduction programs (parking cash out, transit allowances, rideshare, end-of-trip facilities, compressed or flexible work weeks, telecommuting, etc.).		>	Corporate Services	S&IPR W&S CN&DP VD&R G&H S&E CTS S&DE CR&D	C C C C
Work with stakeholders to undertake an alternative energy pre-feasibility study in an effort to: understand where potential opportunities exist and identify specific zones / buildings and, investigate partnerships, financing, and governance models to advance potential DE, microgrids, waste heat recovery and solar PV system(s).		>	Planning & Development	S&IPR W&S CN&DP VD&R G&H S&E CTS S&DE CR&D	V

ACTION	GOAL AREA	TIMING	DEPARTMENT LEAD	COMMUNITY GOALS	IMPACT
PHASE THREE: 2028–2030					
Review current zoning and DCC bylaws to identify low carbon fuel switching, energy conservation and efficiency strategies, and other barriers to densification (e.g., increasing height standards, remove barriers to the use of garden suits/carriage houses, etc.) and adjust the DCCs and bylaws accordingly. Implement the changes incrementally or as a comprehensive review.		»	Planning & Development	S&IPR W&S CN&DP VD&R G&H S&E CTS S&DE CR&D	C C C C
Investigate offering incentives to encourage the use of green roofs and white roofs on large buildings.		»	Planning & Development	S&IPR W&S CN&DP VD&R G&H S&E CTS S&DE CR&D	C C C C
Explore the feasibility of a Revitalization Tax Exemption Bylaw and other tools and incentives to help property owners and managers undertake deep energy and GHG emissions retrofits of existing buildings.		»	Planning & Development	S&IPR W&S CN&DP VD&R G&H S&E CTS S&DE CR&D	C C C C
Establish a local food policy and supporting programs that supports a local, sustainable food system. This is likely to include: Working with partners to identify land for urban farms and community gardens (and zoning accordingly); Exploring opportunities for residents to grow edible plants on boulevards in front of homes and along bike paths.; Developing an educational / communication program to encourage growing food locally and the benefits that accrue (e.g., reduced emissions, increased food security, etc.); Work with neighboring municipalities, local business, farmers/ producers, chamber of commerce, etc. to implement a “buy local” campaign in the region. Promote the benefits of buying local via websites, in local stores, etc.		»	Planning & Development	S&IPR W&S CN&DP VD&R G&H S&E CTS S&DE CR&D	C C C C

ACTION	GOAL AREA	TIMING	DEPARTMENT LEAD	COMMUNITY GOALS	IMPACT
Consider incorporating criteria related to the management of wastes from demolition, land clearing and construction activities into its Sustainable Development Checklist. These activities could be further incented by assigning a scoring system to the Checklist and rewarding developers and contractors with Development Cost Charge (DCC) reductions.		»	Engineering & Operations	S&IPR W&S CN&DP VD&R G&H S&E CTS S&DE CR&D	C C C C
Study the costs and benefits of setting up a community fund or not-for-profit entity that could fund energy efficiency retrofits and new building features in the community—e.g., grants for community groups to implement education and outreach campaigns and also secure funds to retrofit and upgrade buildings and facilities.		»	Corporate Services	S&IPR W&S CN&DP VD&R G&H S&E CTS S&DE CR&D	C C C C
Provide sponsorship to local youth to participate in programs that develop leadership in sustainability.		»	Corporate Services	S&IPR W&S CN&DP VD&R G&H S&E CTS S&DE CR&D	C C C C
Examine the opportunity around developing financial incentives that can support DE, microgrids, waste heat recovery and solar PV, such as financing to assist in undertaking feasibility studies or low interest loans to help support upfront capital costs. For example, removing property taxes for renewable technology or infrastructure.		»	Planning & Development	S&IPR W&S CN&DP VD&R G&H S&E CTS S&DE CR&D	C C C C
Require the evaluation of waste heat recovery from large refrigeration systems (such as arenas, grocery stores) in new large developments.		»	Planning & Development	S&IPR W&S CN&DP VD&R G&H S&E CTS S&DE CR&D	C C C C

CITY OF FREDERICTON

COMMUNITY ENERGY AND EMISSIONS PLAN

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