SMALL AND RURAL COMMUNITIES CLIMATE ACTION

GUIDEBOOK

ICLEI Local Governments for Sustainability CANADA

FCM FEDERATION OF CANADIAN MUNICIPALITIES | FÉDÉRATION CANADIENNE DES MUNICIPALITÉS

PARTNERS FOR **CLIMATE** PROTECTION

This guidebook was prepared by the Partners for Climate Protection (PCP) program, a partnership between the Federation of Canadian Municipalities and ICLEI—Local Governments for Sustainability. The program receives financial support from the Government of Canada and ICLEI Canada.

The PCP program is a network of over 450 Canadian municipalities committed to taking action on climate change. The program helps local governments reduce greenhouse gas emissions and make a difference in protecting our climate.

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Executive summary

With the growing urgency of climate change planning in Canada, there is a significant opportunity for small communities to act and contribute to national, provincial and territorial GHG emissions reduction targets. Small municipalities, many of which are rural, make up more than 90 percent of communities in Canada and are key players in the Canadian economy, generating 27 percent of the national GDP.[1] This makes them well-positioned to lead local action on climate change mitigation. However, the challenges faced by small communities are often overlooked in policy development, guidelines and research.[2] Furthermore, the conventional approaches to municipal climate mitigation planning, such as high-rise densification and city-wide transit systems, may not be as relevant or impactful in smaller communities or may be cost-prohibitive. Small municipalities have a unique set of strengths and challenges in implementing climate change mitigation strategies. These factors must be addressed in order to take full advantage of climate action opportunities and reap the economic and quality of life co-benefits that they can generate.

This guidebook has been developed for members of the Partners for Climate Protection (PCP) program, to provide guidance for small communities on climate and community energy planning activities. These activities can be tailored to the local context and can allow small communities to play a key role in climate change mitigation.

The introduction provides context for climate action in small and rural communities and speaks to their unique opportunities and challenges. Section 1 discusses important principles and strategies that underpin climate action planning, create community buy-in, and set communities up for successful plan development and implementation. Section 2 outlines the business case for municipal climate action, providing an overview of the economic benefits, the costs of inaction, and a range of co-benefits including its contribution to community revitalization. Drawing on Canadian case studies and success stories, Section 3 discusses climate actions in the following five key municipal sectors (see Figure 1):

- Buildings
- Transportation
- Land use

1 *Federation of Canadian Municipalities,* Rural challenges, national opportunity *(2018). Retrieved from:* https://fcm.ca/sites/default/files/documents/resources/report/rural-challenges-national-opportunities.pdf

2 *Evergreen, "Making Mid-Sized the Right Size: Re-envisioning Success in Ontario's Mid-Sized Cities" (2015).*

- Waste
- Development of agriculture, resources and tourism (DART)*

* *Agriculture, resources and tourism are considered one sector here as they all relate to the development and care of Canada's natural resources and play a central role in the economies and livelihoods of many small and rural communities*

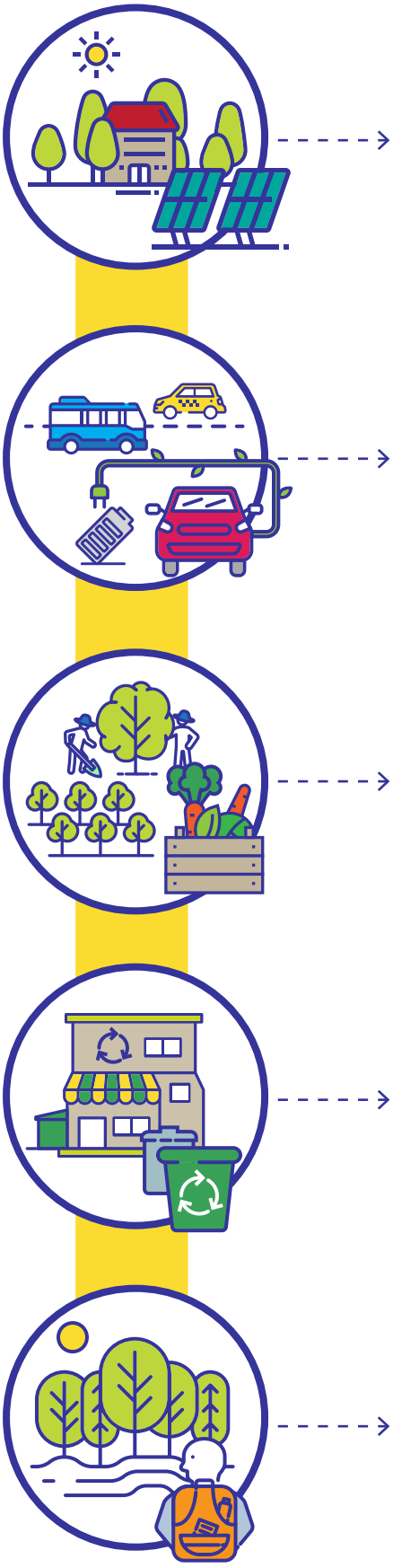
This guidebook focuses primarily on communities with populations of less than 30,000; however, because climate action often occurs as part of rural region, district or county planning, it includes a couple of examples of larger communities with populations of 40,000 to 75,000. Small and rural communities in Canada are a very diverse group. Each community has its own unique set of economic, industry and climate considerations. In recognition of this diversity, this guidebook provides a wide range of climate actions to suit different contexts.

To accompany this guidebook, 11 detailed cases studies from small and rural municipalities that are leading on climate action have been developed and are available on the PCP website. Each case study includes a description of the initiative, its challenges and success factors as well as considerations for successful implementation and adoption by other municipalities. See sidebar for the full list of featured case studies. Other examples of climate action in small and rural communities, as well as guiding resources, are included throughout this guidebook.

Featured case studies

- County of Colchester, Nova Scotia: Solar Colchester
- Town of Canmore, Alberta: Green Building Regulations
- City of Campbell River, British Columbia: Power Down Campbell River energy rebates
- City of Rimouski Quebec: Taxibus demand-responsive public transit model
- City of Plessisville, Quebec: Electric cars, vehicle sharing and the SAUVéR project
- District of Clearwater, British Columbia: Road cross-section bylaw
- Ville de Mont-Saint-Hilaire, Quebec: Transit-oriented development
- District Municipality of Ucluelet, British Columbia: Smart growth principles and density bonusing
- City of Sault Ste. Marie, Ontario: Community revitalization project, Future Sault Ste. Marie
- City of Stratford, Ontario: Pay-as-You-Throw (PAYT) program
- District Municipality of Whistler, British Columbia: Re-Use-It/ Re-Build-It centres

Figure 1: Climate action in five key sectors



Buildings

- Property assessed clean energy (PACE) program
- Energy rebate program
- Non-financial building incentives

Transportation

- Demand-responsive transit
- Electric car vehicle sharing
- Road cross-section bylaw

Land use

- Transit-oriented development
- Smart growth principles
- Community revitalization

Waste

- Pay-as-you-throw
- Curbside compost collection
- Re-use-it/re-build-it centre

DART*

- Biogas
- Sustainable forestry
- Sustainable tourism
- Partnerships

**Development of agriculture, resources and tourism*

Contents

Introduction

In 2016, Canada announced its target to reduce greenhouse gases (GHGs) by 30 percent below 2005 levels by 2030, in conformity with commitments made under the Paris Agreement. In 2020, the Government of Canada announced a new federal target of net-zero emissions by 2050. Municipalities control approximately 44 percent of national GHG emissions and are key in helping achieve Canada's reduction targets.[1] Furthermore, 19 percent of Canada's population is located in rural areas.[2] Small and rural municipalities make up more than 90 percent of communities in Canada, and generate 27 percent of national GDP.[3] With the growing urgency of climate change planning in Canada, small and rural communities are well-positioned to lead on local climate action and have a significant opportunity to contribute to national, provincial and territorial GHG emissions reduction targets. However, small municipalities have unique strengths and challenges that must be addressed—not only to enable local climate action, but also to reap the economic and quality of life co-benefits that accompany such action.

While social and economic factors, such as high real estate prices and the increasing ability to work from home, are contributing to growing rural populations in some areas, shrinking and stagnant populations are still a key challenge for many small municipalities, with the overall national trend showing rural populations declining as a proportion of total Canadian population.[4] Compared to large cities, small municipalities often have fewer financial and staff resources, making it difficult to develop, implement, deliver and monitor climate actions and strategies. Particularly in remote locations, municipalities are unable to draw upon the influence and resources present in larger urban centres—and they may lack specific expertise, making them more dependent on external consultants. Furthermore, dispersed settlement patterns create a high dependency on automobiles, making it more challenging to reduce GHG emissions in the transportation sector.

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

2 *Statistics Canada, Population Centre and Rural Area Classification 2016. Retrieved from:* https://www.statcan.gc.ca/eng/subjects/standard/pcrac/2016/introduction

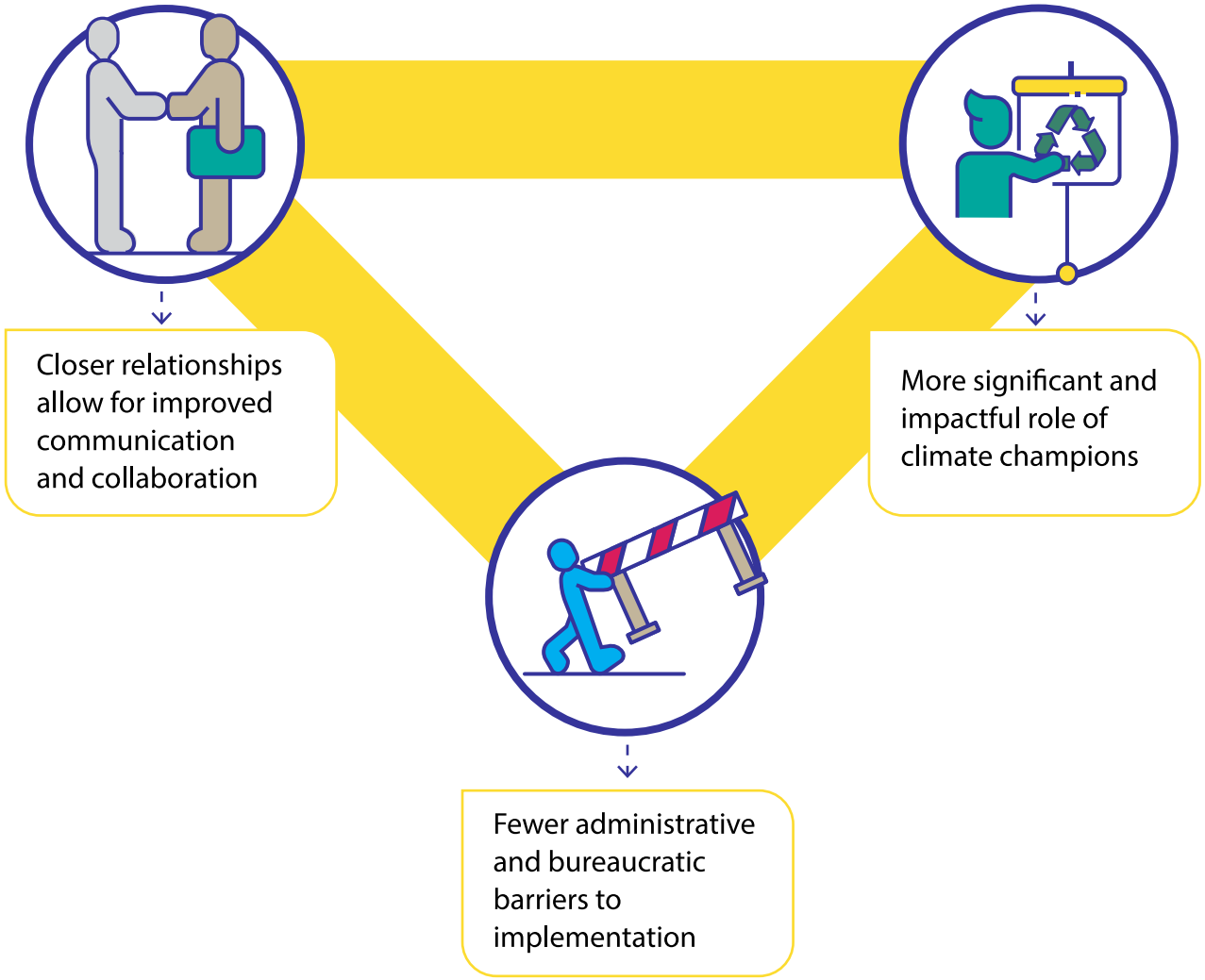
3 *Federation of Canadian Municipalities,* Rural challenges, national opportunity *(2018). Retrieved from:* https://fcm.ca/en/resources/rural-challenges-national-opportunity

4 *Statistics Canada, Population centre (2017). Retrieved from:* https://www12.statcan.gc.ca/census-recensement/2016/ref/dict/geo049a-eng.cfm

In these areas, common mitigation activities such as the development of public transit networks, modal transportation shifts and incentives, and pricing schemes to reduce road travel and congestion are often not feasible or effective.

Small and rural communities face the above challenges but also have a unique set of advantages that allow for the incubation of innovative ideas and solutions. Small communities tend to develop closer relationships among municipal departments and with community stakeholders, allowing for improved communication and collaboration. Unified and well-connected municipal teams also can have more public influence at the local level and having fewer public and municipal stakeholders may remove some of the administrative and bureaucratic barriers to implementation that larger municipalities often struggle with. Furthermore, local climate champions (such as community organizations) can play a more significant and impactful role in increasing public awareness and mobilizing community support in small communities. Strategic climate change planning and community energy planning also generate many co-benefits for the community and can aid in revitalization efforts by establishing new revenue sources, creating economic activity, and reducing operational costs while contributing to a sustainable future.

THE UNIQUE ADVANTAGES OF SMALL AND RURAL COMMUNITIES



1 Guiding principles and strategies for success

Individual mitigation actions are at the core of a climate action plan (CAP). To ensure the development and successful implementation of realistic yet impactful actions as well as build community consensus and buy-in, municipalities should consider a range of principles and strategies—before and throughout the planning process. The following principles and strategies are important building blocks in climate action planning. They can help in creating climate actions that reflect the realities of a community and can enable mitigation activities to persist over political cycles.

What is community energy planning?

A community energy plan (CEP) is a tool that helps municipalities identify, prioritize and manage local energy needs with a view to increasing energy efficiency, reducing GHG emissions and driving economic development. A community energy plan takes an integrated approach by aligning land use planning and infrastructure planning, considering energy use early on in planning processes and identifying opportunities to integrate local energy solutions at a building or neighbourhood scale.

GUIDING PRINCIPLES AND STRATEGIES FOR SUCCESS

Policy development

Municipal land use planning powers are the primary means by which local governments enact climate action. As such, integrating sustainability and climate considerations into official planning and policy documents (e.g. plans, strategies, zoning bylaws, etc.) is a key method for successfully implementing climate actions. This can include setting an overall vision and strategy for sustainability in the community and integrating green development and smart growth principles into land use planning policies. These policies can encourage and incentivize green buildings, increase active transportation, create walkable and beautiful neighbourhoods, and preserve natural areas and farmland.

Public engagement and education

To build consensus on the urgent need for climate action, it is important for local government to establish a strong, trusting relationship with the community, engaging and educating the public on climate science and the range of impacts, benefits and costs of action and inaction. This may be done through direct, municipal-led campaigns, in partnership with trusted community educators or by enabling established organizations within the community to support public education and engagement. A first step is for the municipality to conduct internal education efforts with staff and council before engaging the broader community. This builds a one-unit team approach internally that then enables broader community climate action efforts.

When pursuing projects or initiatives such as renewable energy installations, the installation of electric vehicle (EV) charging stations, or projects targeting energy efficiency, it is important that residents are fully aware of both the immediate and long-term benefits these projects provide. For example, as we are now within only 30 years of the 2050 GHG reduction target deadline, any new buildings constructed using conventional methods will require retrofits to ensure that those climate targets are met. In this context, reducing emissions through investments made today is ultimately cheaper than reducing emissions in the future through retrofits. Even though infrastructure like low-carbon district energy systems or other community energy systems can involve higher upfront capital costs, in the long

run there is a net benefit. Carbon footprint calculation and life cycle analysis can be useful methods to compare the overall costs, benefits and mitigation potential of different options, and this information can aid in building consensus on climate actions. However, these metrics alone can also be difficult to communicate to the public, so they are often paired with metrics that are more easily understood. For example, in describing the benefits of a community-wide energy retrofit program, the metric may be the number of trees that would need to be planted to achieve equivalent results, or the number of cars that would need to be removed from the road.

Many municipal climate actions—such as encouraging green buildings or promoting active transportation—have significant health and well-being co-benefits alongside their GHG mitigation impacts. These benefits are often more tangibly felt among communities and should therefore form a prominent part of public communication and engagement around climate action planning (bike lanes, for example, can have an immediate impact on commute patterns, while improved air quality is a less obvious benefit to the user). See the District of North Vancouver's Community Energy and Emissions Plan, "Appendix II: Improving health and wellbeing through climate action," for an in-depth discussion of these benefits.

Partnerships and collaboration

Often small and rural municipalities can develop close connections with their community members and stakeholders, including community organizations and local business, more easily than in larger metropolitan areas. Building awareness and engaging with these groups early on can help to build momentum for climate action and encourage community participation in municipally led climate mitigation projects. Engagement with local community groups prior to creating or implementing a climate action plan can help to identify existing resources within the community that can be leveraged or bolstered to better achieve municipal climate targets. The residential solar program in **Colchester, Nova Scotia**, is one example of an initiative that was made successful through

partnership and community engagement. By building on existing community supports and interest in solar energy and by partnering with a local solar organization to hold information sessions, Colchester was able to achieve full program uptake before the application closing date.

Engaging with local business and industry is also integral to identifying local options for renewable energy, such as waste biomass from forestry operations, capture of waste heat from local industries, and the use of agricultural and other organic waste for biogas production (see Section 3.5 for more on biogas systems). At a regional level, municipalities can seek to identify synergies and partnership opportunities with nearby municipalities to share costs and infrastructure. For example, on-demand transit, taxibus, or car-share programs can service multiple municipalities in a region, allowing group purchases of electric vehicles to be shared among the participating communities. Partnering with experts is also key to success—particularly when working with innovative (and perhaps expensive) technologies. In the small communities of Warwick, Quebec and **Stratford, Ontario**, biogas projects were made possible by involving technical partners experienced with biomethanization (See Sections 3.4 and 3.5 respectively). The technical partners assisted with the design, building and commissioning of the technology, which reduced risk and helped to build confidence in the project outcomes.

Building a baseline GHG inventory and data assessment

Creating a baseline GHG inventory is an important first step in developing a climate action plan and GHG reduction targets. An inventory tells planners where and how community emissions are produced. It also functions as a starting point to predict future emissions and as a means to measure progress over time or to benchmark against other communities in the same region. Acquiring and managing energy and emissions data is central to this process. This data forms the foundation for determining which actions to prioritize and where to allocate resources.

The data collection process is often the lengthiest phase in the development of a baseline community inventory. Data can come from a multitude of sources, including the municipality's previous plans and studies, local and regional utilities, municipal departments, other orders of government, and academia. Oftentimes, there are roadblocks to acquiring the data: the required level of detail may not be available, utilities may need to respect customer privacy, or there may simply be no organization collecting the data required. To fill in these data gaps, it is not uncommon to rely on assumptions, or use averages from national, provincial and territorial data sets that are then scaled

to a community's population. However, data gaps should be well-documented so that processes can be put in place to begin tracking data with appropriate metrics, and so that future GHG inventories are more accurate. Resources based on international best practice methodologies such as the Partners for Climate Protection (PCP) Protocol, the Global Protocol for Community-Scale Greenhouse Gas Emission Inventories, and the PCP Tool are available to assist communities in understanding the methodologies and data required to calculate emissions at varying levels of detail and accuracy.

Where data gaps exist (e.g. fuel consumption from recreational boating and off-road vehicles) some municipalities are beginning to use surveys or carbon footprint calculators, or both, to inform their inventories as well as to educate and engage residents on climate action planning.[5] Consumption-based inventories are a more comprehensive method of assessment which can also help to educate the community on the full life cycle emissions associated with consumption of goods and services. These life cycle emissions include the embodied emissions in building materials and the emissions from the production and transportation of food outside the boundaries of the municipality.[6] Energy mapping is another tool available to municipalities to aid in the identification, design and prioritization of climate actions. It is the process of mapping the energy consumption, GHG emissions and potential local sources of energy in a community.

Energy mapping allows municipalities to identify and visualize priority areas with high-energy consumption, which is likely to help in the design and deployment of energy retrofit programs. It is also an important tool for facilitating conversations with the community and stakeholders. Looking at an energy map in parallel with land use planning and transportation maps can allow municipalities to adopt integrated approaches to planning and identify gaps or opportunities that may otherwise not have been apparent. Energy maps are also an important tool in a workshop or consultation setting, since they can be used to help participants understand more about where there are opportunities for energy projects and sustainable economic development. Energy maps have also been shown to be useful in discussions with local energy utilities about energy projects and can aid them in their system planning process.

Consult these resources for more information on energy mapping:

- Community Energy Planning in Canada: The Value of Energy Mapping Symposium Report (CanmetENERGY, 2012)
- Integrated Energy Mapping for Ontario Communities: Lessons Learned Report (Canadian Urban Institute, 2011)
- Mapping opportunities for land-based renewable energy generation in Ontario: a guidebook for local planners and analysts (Community Energy Knowledge – Action Partnership, 2019)

5 *See the* Georgian Bay Biosphere Carbon Calculator *which is also used by partner municipalities to fill in common emissions inventory data gaps for activities such as off-road vehicle use and recreational boating use.*

6 *See the* ecocity Footprint Tool *and* Consumption-based GHG emissions of C40 cities *for more information.*

2 The business case for climate and energy planning

Financial constraints are one of the most common barriers to climate action, particularly in municipalities with smaller property tax bases and infrastructure needs that are spread out over large distances. Rural–urban migration, aging populations, and youth out-migration also create challenges for economic development, especially if paired with the loss of industry and employers. However, climate action is an investment in the future of a community, creating new job opportunities, generating cost savings, and improving quality of life.

In addition to helping prevent the catastrophic effects of climate change, climate action and community energy planning generate economic benefits from improved energy efficiency, as well as qualitative benefits from improved public health and better working environments. This section provides a brief overview of the co-benefits (economic and otherwise) of climate action, as well as the future costs of inaction. It will also direct readers to resources with more detailed information on the financial opportunities and co-benefits of municipal climate action.

Generating revenue through climate action

Energy is a significant cost in Canadian communities, in particular as a result of seasonal fluctuations in temperature. Average annual energy spending can be as much as $12 million in communities of less than 10,000 people, and $71 million in communities with populations between 10,000 and 50,000. Many of these dollars leave the local economy, going to regional energy utilities or oil and natural gas suppliers.[7] Implementing a climate action plan can instead help keep this money in the community and can stimulate the economy by reducing energy costs, creating jobs, and reducing operating costs for businesses—helping to attract investors.[8]

7 *Federation of Canadian Municipalities,* GMF Municipal Energy Roadmap *(2020). Retrieved from:* https://fcm.ca/en/resources/gmf/gmfs-municipal-energy-roadmap

8 *Ibid*

> Investing in sustainability measures such as energy efficiency and renewable energy generation also aids in community revitalization by creating more green job opportunities, attracting and retaining young families and sustainability-minded residents, and keeping energy dollars circulating in the local economy that would otherwise leave the community.

A report prepared in 2018 for Clean Energy Canada by Dunsky Energy Consulting, The Economic Impact of Improved Energy Efficiency in Canada, found that undertaking energy efficiency measures across Canada could potentially save $1.4 billion and could create 118,000 full-time-equivalent jobs, or 34 job-years per $1 million spent.[9] Measures explored included increasing energy efficiency in new buildings, retrofitting the existing building stock, installing energy-efficient appliances, supporting energy efficiency in the industrial sector and improving building codes for housing. Most of this economic impact would be realized as a result of energy bill savings for households and businesses, which on average would equal approximately $114 in savings per household per year. Employment gains would be seen across the economy, with half of new job creation being in the construction, trades and manufacturing sectors.

While these numbers show the national potential, a recent New Brunswick research project demonstrates a method for calculating job creation potential on a community scale. A workbook, generated as part of the project, outlines how the implementation of climate action plans can create jobs by:

- retaining energy dollars in the community
- creating direct, indirect and induced jobs from these local dollars
- attracting actors in the energy transition economy and "new dollars" to investment activities that support climate action plans[10]

Sussex, New Brunswick, is an excellent example of this model. The energy-efficiency goals of its Community GHG & Energy Action Plan are estimated to reduce energy spending by 25 percent, resulting in $2.3 million remaining in the community annually. This translates into 56 new direct jobs during the investment phase (i.e. energy auditors, home insulation companies, solar installers etc.) and 19 person-years of employment for 20 years as a result of jobs created throughout the supply chain as well as induced jobs (i.e. jobs created as more money is recirculated within the local economy).[11]

9 *Clean Energy Canada,* The Economic Impact of Improved Energy Efficiency in Canada *(2018). Retrieved from:* https://cleanenergycanada.org/wp-content/uploads/2018/04/TechnicalReport_EnergyEfficiency_20180403_FINAL.pdf

10 *QUEST,* Economic Impact of New Brunswick Community Energy Plans: Primer and Workbook *(2020). Retrieved from:* https://questcanada.org/wp-content/uploads/2020/04/Economic-Impact-of-New-Brunswick-Community-Energy-Plans-Primer-and-Workbook.pdf

11 *QUEST,* Case Study: Economic Impact of New Brunswick Community Energy Plans *(2020).* https://questcanada.org/wp-content/uploads/2020/04/Case-study-Sussex.pdf

Renewable energy is becoming more affordable, and can be an effective economic diversification strategy in rural communities, generating additional job opportunities and economic benefits. Renewables have very low operating costs, help to reduce energy costs over the long term, provide energy cost stability as well as energy security, and can drive down the wholesale price of electricity.[12] Furthermore, larger renewable energy projects generate tax revenue for municipalities, and can be revenue sources for landowners that lease land to project developers. Small scale projects that connect to the local distribution grid, such as onsite or community-scale installations, can also generate revenue by offsetting utility bills or by selling electricity directly to the grid. Depending on ownership and governance models, revenue generating projects can benefit the community through cooperative or share ownership models or be used to fund essential community needs and services as well as community revitalization projects through the establishment of community charities or development trusts.[13]

Communities are also beginning to view climate action and energy planning as an integral part of community revitalization (see case study on **City of Sault Ste. Marie, Ontario: FutureSSM**). This not only creates local economic benefits but can constitute a shift away from reliance on a single "boom and bust" industry and can help to attract new residents to a community. Implementing climate actions and broader sustainability initiatives can also enable profitable ecotourism by offering sustainable options to tourists as well as showcasing sustainability initiatives in forestry, agriculture and renewable energy (See Section 3.5 Development of Agriculture, Resources and Tourism.)

The following resources can help in developing the business case for climate and energy planning:

- *GMF Municipal Energy Roadmap* (Federation of Canadian Municipalities, 2020) https://fcm.ca/en/resources/gmf/gmfs-municipal-energy-roadmap
- *On the money: Financing tools for local climate action* (ICLEI Canada and the Federation of Canadian Municipalities, 2018) https://www.pcp-ppc.ca/resources/financing-tools-for-local-climate-action
- *Community Energy Planning: The Value Proposition. Environmental, Health and Economic Benefits* (Quality Urban Energy Systems of Tomorrow (QUEST), 2016) https://ccednet-rcdec.ca/sites/ccednet-rcdec.ca/files/valueproposition_full-report_feb92016.pdf
- *A Case for Smart Growth* (Deborah Curran, West Coast Environmental Law, 2003) https://www.wcel.org/publication/case-smart-growth

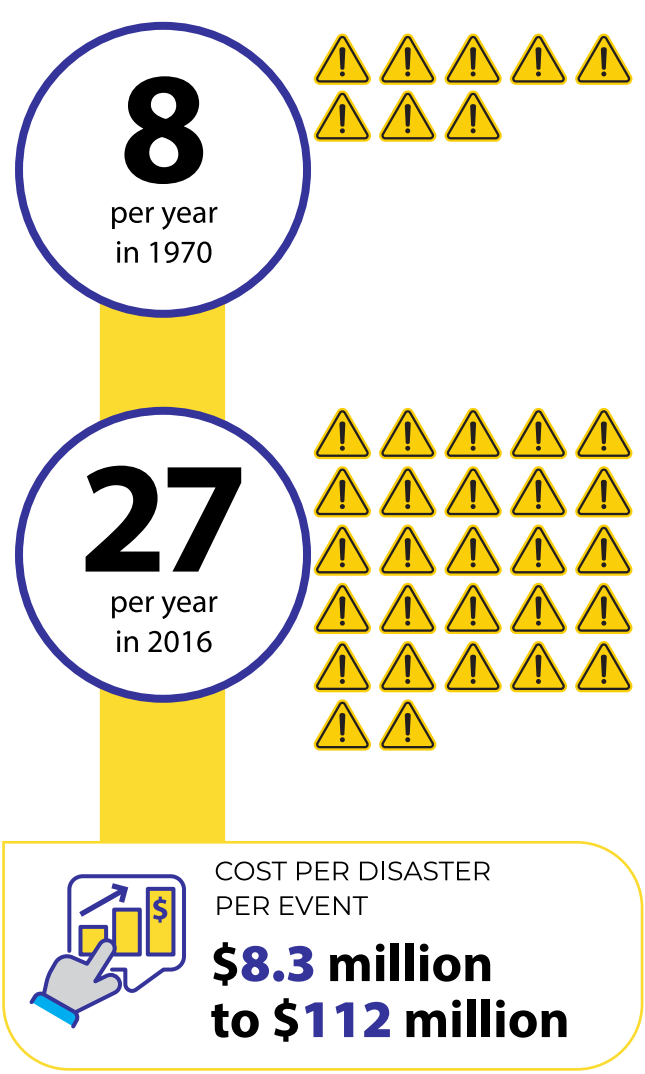
12 *Pembina Institute, "Renewable Energy Opportunities for Businesses and Municipalities in Alberta" (2020). Retrieved from:* https://www.pembina.org/pub/renewable-energy-opportunities

13 *Andrea Miller, Sonak Patel, Carter Gorzitza, and John Russell Parkins,* Community Energy in Western Canada: Insights from case studies on small-scale renewable energy development. *Edmonton, AB: Future Energy Systems, University of Alberta (2019).*

The cost of inaction

Climate change impacts are already being experienced by communities across Canada. Increasingly warm winter temperatures in BC have been linked to the rapid population growth and spread of the Mountain Pine Beetle since its initial outbreak in the 1990's. The pine beetle with its expanded range and numbers has affected 18.1 million hectares of forest, reducing the timber supply and costing the government hundreds of millions of dollars in efforts to mitigate the outbreak, as well as resulting in job loss and mill closures.[14] In 2012, an early heat wave in Ontario caused apple trees to blossom five weeks earlier than expected, leading to the subsequent destruction of approximately 80 percent of the apple blossoms during an April frost. This resulted in losses estimated at $100 million.[15]

The number of disaster events has increased from eight per year in 1970 to 27 per year in 2016, and the cost per disaster has risen from an average of $8.3 million per event to $112 million. Insurance companies are paying out record amounts to cover property damage caused by weather events such as winds, wildfires and flooding.[16] Increased healthcare costs and mortality rates are expected as a result of warmer summers, poorer air quality, extreme



14 *National Round Table on the Environment and the* Economy, Paying the Price: The Economic Impacts of Climate Change for Canada *(2011). Retrieved from:* https://data.fcm.ca/documents/reports/PCP/paying_the_price_EN.pdf

15 *Ibid*

16 *Canadian Institute for Climate Choices,* Tip of the Iceberg: Navigating the Known and Unknown Costs of Climate Change for Canada *(2020). Retrieved from:* https://climatechoices.ca/wp-content/uploads/2020/12/Tip-of-the-Iceberg-_-CoCC_-Institute_-Full.pdf

weather events and greater risk of exposure to infectious diseases transported through food and water.[17] Moreover, forest fires and pest outbreaks can negatively impact agricultural production, cause infrastructure damage, disrupt the forestry and fishing industry, and exacerbate risks related to the planning and management of natural resource industries.[18]

Mitigating the impacts of climate change today can prevent additional and higher costs down the road. The National Round Table on the Environment and the Economy estimated that the costs of climate change could grow from $21 to $43 billion a year by 2050, with a five percent chance that costs could reach $91 billion by 2050.[19] At the municipal level, the worst impacts of climate change are estimated to cost $5.3 billion per year, equivalent to 0.26 per-cent of Canada's GDP.[20] In rural and remote areas, as a result of limited transportation to infrastructure, reliance on natural resources and under-resourced social and physical infrastructure, changing climate conditions will have negative impacts on health and wellbeing[21]. For example, changing access to quality food and water systems from rising temperatures, changing precipitation patterns, and extreme weather events can disrupt the ability to fish, hunt or forage, decreasing consumption of healthy and culturally preferred foods, and increasing reliance on retail food. Where communities rely on fragile water treatment systems rising temperatures and extreme weather events can overwhelm these systems disrupting access to clean drinking water. Food and water insecurities such as these can lead to increased risk of poor nutrition, obesity, diabetes, cardiovascular disease, acute gastrointestinal illness and mental illness. More frequent extreme weather conditions such as heat waves can also lead to negative health outcomes such as heat stroke and respiratory related emergency room visits. More frequent wildfires can create health challenges such as respiratory illnesses, mental health stressors, and damage to critical infrastructure particularly in forest communities. Acting now to mitigate climate change quite literally saves lives and money.

17 *National Round Table on the Environment and the Economy,* Paying the Price: The Economic Impacts of Climate Change for Canada *(2011). Retrieved from:* https://data.fcm.ca/documents/reports/PCP/paying_the_price_EN.pdf

18 *F.J. Warren and D.S. Lemmen, editors,* Canada in a Changing Climate: Sector Perspectives on Impacts and Adaptation *(2014). Retrieved from:* https://www.nrcan.gc.ca/sites/www.nrcan.gc.ca/files/earthsciences/pdf/assess/2014/pdf/Full-Report_Eng.pdf

19 *National Round Table on the Environment and the Economy, Paying the Price: The Economic Impacts of Climate Change for Canada (2011). Retrieved from:* https://data.fcm.ca/documents/reports/PCP/paying_the_price_EN.pdf

20 *Federation of Canadian Municipalities, "Climate adaptation estimated to cost municipalities $5.3 billion annually" (2020). Retrieved from:* https://fcm.ca/en/news-media/news-release/climate-adaptation-estimated-cost-municipalities-5-billion-annually

21 *Amy Kipp, et al. "At-a-glance Climate change impacts on health and wellbeing in rural and remote regions across Canada: a synthesis of the literature,"* Health Promotion and Chronic Disease Prevention in Canada: Research, Policy and Practice*, 39(4), pp. 122–126.*

3 Climate action challenges and solutions by sector

1 Buildings

2 Transportation

3 Land use

3 Waste

4 Development of agriculture, resources and tourism (DART)

Small and rural communities face unique challenges that are very different from the realities of large city centres. This section seeks to identify common challenges and barriers to climate action and highlight communities that have demonstrated leadership in these areas by developing and implementing innovative solutions in five key sectors:

- Buildings
- Transportation
- Land use
- Waste
- Development of agriculture, resources and tourism (DART)

This section demonstrates that with the proper tools, small communities can act on climate change by building sustainable, healthy, energy efficient, and economically prosperous communities.

3.1 Buildings

In 2018, buildings accounted for 13 percent of overall GHG emissions in Canada, primarily due to the use of natural gas, heating oil and biomass for space and domestic hot water (DHW) heating.[22] In this domain, energy availability and high utility distribution costs create unique challenges for rural municipalities. Where natural gas and electricity grid connections are not available, communities must rely on heating oils and biomass for heating, or diesel for electricity generation, which are often more expensive and produce more emissions per unit than natural gas and most provincial and territorial electricity grids.

Key methods of mitigating climate change in this context include retrofit programs to increase energy efficiency in buildings, energy-efficient new development, promoting energy conservation and behavioural changes, and switching to renewable sources of heat and electricity. These measures can also lower the cost of energy and create more energy independence and security.

Electrification of the heating sector

Electrification of heat refers to the replacement of fossil fuel burning furnaces or boilers with electric heat pumps or electric boilers, or both.

Heating sector electrification

Replacing natural gas and other fuels for building heating with electrification can be integral to meeting GHG reduction targets. Electric heat pumps are the primary enabling technology to achieve this and are three to five times more efficient than conventional natural gas heating. As part of energy-efficiency retrofit programs, municipalities should assess the feasibility of including heat pumps in retrofit packages or encourage increased adoption by promoting existing energy-efficiency incentives and resources.

22 *Environment and Climate Change Canada,* National inventory report: Greenhouse gas sources and sinks in Canada *(2020).*

The emissions reductions achieved through electrification will depend on the carbon intensity of the provincial or territorial electricity grid. In areas with low-carbon grids, municipalities can drastically reduce emissions through electrification initiatives, but in areas with carbon-intensive grids, increased renewable energy supply will first be needed before electrification of the heat supply can be used to reduce GHG emissions.[23] The GMF Municipal Energy Roadmap, created by FCM's Green Municipal Fund, can help municipalities identify their grid type and identify appropriate actions for reducing GHGs in the building sector.

Energy-efficiency program development and incentives

Energy-efficiency programs come in three main categories: those that deal with heating and electricity (e.g. retrofit programs); those that encourage or mandate behavioral changes (e.g. to reduce energy consumption); and those that deal with ongoing operations and maintenance in buildings.

Retrofit programs can further be categorized by the degree of energy reduction that they achieve—ranging in implementation from shallow, to moderate, to deep retrofits.[24] Shallow retrofits are "low-hanging fruit" measures that are typically less capital-intensive, are easier to install and have shorter payback periods, but achieve less energy

23 *Federation of Canadian Municipalities,* GMF Municipal Energy Roadmap *(2020).*
24 *Natural Resources Canada, Retrofitting (2019). Retrieved from:* https://www.nrcan.gc.ca/retrofitting/20707

reduction. These include things like LED lighting and weather caulking. Moderate retrofits include measures such as replacing or upgrading insulation and heating and cooling systems, as well as replacing window glazing and doors. Deep retrofits involve a significant overhaul of the building, which can include upgrading the building façade, installing new windows, replacing the roof, or installing a renewable energy heating and cooling system such as a ground-source heat pump. While it may seem attractive to first tackle low-hanging fruit measures with well-known paybacks and success stories, such as installing LED lighting and smart thermostats, this can often lead to deeper energy-efficiency retrofits being abandoned. Municipalities should consider looking at buildings in a holistic manner and bundling shallow energy-efficiency measures with deeper energy retrofits to maximize impact. This strategy can allow shorter-payback measures to help offset the longer payback periods of deeper energy retrofits.

Municipalities can leverage existing incentives and rebates for energy audits, energy-efficient equipment and building upgrades (i.e. appliances, insulation, windows, weather stripping) offered by provincial or territorial governments and local energy utilities to encourage increased adoption by community members. In addition, municipalities can play an important role in educating residents and businesses on the importance and benefits of energy efficiency, explain how to conserve energy through behavioural change, and provide resources to guide them through the retrofit process. For example, in BC, Campbell River's **Power Down Campbell River** program provides a rebate for energy audits, guides and resources to assist residents through the retrofitting process, and awareness-raising community outreach initiatives. Many municipalities across Canada are also beginning to design and finance their own energy-efficiency retrofit programs through the use of property assessed clean energy (PACE) financing models (see the financing section below for more information on PACE financing).

For new buildings, local governments can use land use planning tools to create incentives for developers to build green. They can stipulate building requirements and integrate specific climate-related policies and actions throughout the development process and in official plans—for example, requirements or guidelines for buildings to be district-energy-ready or solar-ready. The voluntary or mandatory green development standards that are being implemented in many communities across Canada can serve as examples of this approach.[25] A variety of incentives can be used to achieve voluntary standards, including expediting development applications, density bonusing or development charge reductions in return for the integration of green building elements into a development (see the use of density bonusing incentives and smart growth principles implemented in **Ucluelet, BC**). Mandatory green building standards are typically enforced, depending on provincial and territorial planning legislation, through measures such as zoning bylaws, official plan policies, and site plan control (see **Town of Canmore, Alberta: Green Building Regulations** and Section 3.3 for more information on land use planning tools).

25 *Clean Air Partnership,* Towards Low Carbon Communities: Creating Municipal Green Development Standards. *Retrieved from:* https://www.cleanairpartnership.org/wp-content/uploads/2020/10/GDS-toolkit.pdf

Financing

Deep retrofit projects and energy installations have variable payback periods depending on the degree of implementation and type of technology chosen. Where paybacks are long, financing is often a significant challenge for municipalities due to budgetary constraints. Small communities have used financing tools and incentive programs to reduce financial risk, allow return on investments and reduce energy costs.[26] To this end, property assessed clean energy (PACE) loans or local improvement charges (LIC) are growing in popularity. These municipal financing tools allow building owners to receive a loan from their municipality for energy-efficiency retrofits or renewable energy installations and pay it back through their property tax bill. This strategy removes the barriers of upfront cost and long payback periods. The building owner can acquire a loan at a favourable interest rate and, because the loan is tied to the property, can still sell the building without worrying about an outstanding loan balance. For the municipality, a PACE program is an investment, as it can earn a higher interest rate from lending than from having that same money sit in a reserve account. See the case study on the **Solar Colchester** PACE program in the County of Colchester, NS, for more information on how this type of program can be implemented successfully. Visit the Nova Scotia Pace website for examples of programs encompassing energy efficiency and clean energy upgrades.

The following are some additional resources on PACE and LIC community efficiency financing:

- Community Efficiency Financing (Federation of Canadian Municipalities) https://fcm.ca/en/programs/green-municipal-fund/community-efficiency-financing
- Collaboration on Home Energy Efficiency Retrofits in Ontario (CHEERIO) (Clean Air Partnership) https://www.cleanairpartnership.org/projects/cheerio/
- PACE Canada https://www.pacecanada.org/
- PACE BC https://www.pacebc.ca/

Energy service performance contracts (ESPCs) are also important financing tools for energy efficiency. ESPCs have primarily been used in public institutional settings such as government buildings, school boards, healthcare facilities and public housing.[27] In an ESPC, an energy service company guarantees a certain level of energy savings over a fixed term as a result of implementing energy-efficiency measures, fuel switching, or renewable energy installations in a building. The energy service company provides the project capital (usually in partnership with a third-party lender) and is repaid from the resulting energy cost savings over the period of the contract, which typically lasts 10 to 15 years depending on the specifics of the project, contract, and type of ESPC model used.

The attractiveness of the ESPC model is that it addresses key barriers faced by building owners and managers: a lack of technical expertise and limited capital budgets.[28] At the end of the contract, after the debt is repaid, the building owner receives all future cost savings as result of the

26 *See the 2018 report by ICLEI Canada and the Federation of Canadian Municipalities,* On the money: Financing tools for local climate action. https://icleicanada.org/project/auto-draft-2/

27 *Energy Services Association of Canada,* Role of guaranteed energy service performance contracts (ESPC's) in achieving Canadian carbon reduction targets *(2016). Retrieved from:* http://energyservicesassociation.ca/documents/ESPCs-and-Reduction-Targets-2016jul.pdf

28 *Natural Resources Canada,* Energy Performance Contracting; Guide for Federal Buildings *(2013). Retrieved from:* https://www.nrcan.gc.ca/sites/www.nrcan.gc.ca/files/oee/files/pdf/communities-government/buildings/federal/pdf/12-0419%20-%20EPC_e.pdf

energy-efficiency upgrades. ESPCs are well-suited to institutional contexts such as municipally owned buildings, because institutions tend to have a larger appetite for the longer payback periods typically associated with ESPCs. Furthermore, in the institutional sector, ESPCs are usually client-driven, in that energy service companies are contracted through an RFP and a competitive tendering process.

In the commercial and residential building sectors, dealing with energy service companies is not a typical core business activity, and building owners may not have the capacity or incentive to engage with these companies.[29] In addition, smaller-scale projects such as those in the private residential and commercial sectors are sometimes seen by energy service companies as higher risk and less likely to be profitable. As a result, ESPCs are less common in the private sector. However, under the right conditions, it is possible to involve the commercial and residential sectors—for example, by aggregating smaller buildings under one larger ESPC through a community partner (such as a local energy co-operative or other community organization).[30]

For more information on ESPCs, consult the following resources:

- Energy Performance Contracting: Guide for Federal Buildings (Natural Resources Canada, 2013)
- Role of Guaranteed Energy Service Performance Contracts (ESPC's) in Achieving Canadian carbon reduction targets (Energy Services Association of Canada, 2016)
- White Paper on the Use of Guaranteed Energy Service Performance Contracts (ESPC's) to Achieve Provincial Carbon Reduction Targets (Energy Services Association of Canada, 2016)

29 *TREC,* Evolving Business Models for Renewable Energy Co-operatives—Spotlight on Energy Efficiency *(2019). Retrieved from:* http://www.trec.on.ca/wp-content/uploads/2019/06/Spotlight_on_Energy_Efficiency.pdf

30 *Ibid*

- Evolving Business Models for Renewable Energy Co-operatives: Spotlight on Energy Efficiency (Toronto Renewable Energy Cooperative, 2019)

Energy efficiency co-benefits

In addition to the environmental and economic benefits of reduced energy consumption, energy-efficient buildings offer various co-benefits such as improved indoor comfort, enhanced market value, and local economic stimulus.[31] Energy-efficiency measures also help to address the issue of energy poverty. Being in energy poverty has been defined as spending more than six percent of one's household after-tax income on energy.[32] This situation can have adverse impacts on low-income families, including weather-related illness and mental strain as they may be forced to face trade-offs between essentials such as food and heat. Recent research shows that 2.8 million households in Canada have experienced energy poverty.[33] Rural households are more likely to experience energy poverty due to the higher cost of energy transmission and the higher average size of rural homes.[34] Implementing a climate action plan in a small community can reduce energy poverty significantly.

Devon, Alberta: Community Centre Solar*
Population: 6,578

In Devon, Alberta, a 100 kW solar PV system was installed on the roof of the local community centre, meeting all the building's electricity needs on an annual basis. The project cost $190,000 in total, $117,000 of which was financed through Alberta's Municipal Sustainability Initiative grant, with the remainder of the costs financed through a 15-year solar leasing program with the utility provider ENMAX. The solar lease payments are roughly equal to what the town would have paid on its utility bill, with the added benefit that the town will take full ownership of the system at the end of the lease term. Having, traditionally been an oil and gas industry community, moving forward on sustainability and energy efficiency was a huge step for the town.

* Edmonton Journal, "Solar Panels Help Devon Become New Kind of Energy Town" (2015).

31 *Tom-Pierre Frappé-Sénéclauze, Dylan Heerema, and Karen Tam Wu,* Deep emissions reduction in the existing building stock: Key elements of a retrofit strategy for B.C. *(Pembina Institute, 2017).*

32 *Canadian Urban Sustainability Practitioners,* Energy Poverty in Canada: A CUSP Backgrounder *(2019). Retrieved from:* https://energypoverty.ca/backgrounder.pdf

33 *Ibid*

34 *Ibid*

Rural energy poverty

Rural households are more likely to experience energy poverty due to the often-larger size of homes in rural settings and the higher costs of transmission on utility bills.

Renewable energy

Onsite or locally sourced renewable energy generation can help to offset emissions from energy use in buildings, particularly in provinces and territories with more carbon-intensive grids or where electric heat pumps are used to replace natural gas furnaces and boilers. While the costs of renewable energy continue to fall year over year, where capital costs are still deemed prohibitive, developing partnerships regionally with third-party organizations or utilities can enable the development of these projects in small communities. For example, utility net-metering allows buildings that supply their own electricity to "sell" their excess power to the grid. Where utility net-metering schemes are in place, renewable energy generation can lower electric utility bills by offsetting the need to draw electricity from the local distribution grid. Solar companies also offer solar leases or power purchase agreements to help overcome upfront capital cost barriers (see example above on **Devon Alberta**). Virtual net-metering and third-party net-metering are other emerging approaches to overcoming these obstacles. While most jurisdictions do not allow for third-party and virtual net-metering, **Nelson's Community Solar Garden** in BC is one of the few examples in Canada where it has been implemented. Many renewable energy organizations in Canada consider virtual and third party net-metering essential to broaden access to renewable energy, but it has yet to be implemented on a broader scale.[35] It is important to be aware of the potential of net-metering in the area and to continue the conversation with local distribution companies and provincial or territorial energy regulators.

35 *Many renewable energy organizations in Canada consider virtual and third-party net-metering essential to broaden access to renewable energy.*

Net-metering

Net-metering is a type of contract with a local distribution company (LDC) that allows a building owner to offset the cost of electricity consumption by sending electricity generated from onsite renewable energy to the grid. The owner only pays for their net-usage—the difference between the amount of electricity generated and the amount consumed.

Third-party net-metering refers to the operation of net-metered renewable energy systems by professional third-party providers, helping to remove technical barriers and enabling the use of different financing schemes such as solar leasing.*

Virtual net-metering allows a centralized net-metered installation to be set up in a suitable area, so that the installation can provide electricity to multiple buildings. In this scheme, individuals own a portion of the renewable energy installation and receive a percentage of the renewable energy produced from it.* This allows access to renewable energy for those that do not have suitable land or buildings and can also improve financial viability through bulk purchasing and the ability to locate the installation at the most optimal site. While this is more widespread in the US, in most jurisdictions of Canada, net-metering is currently restricted to installations within an individual property boundary.

* Aaron Thornell, "Ontario Net Metering Legislation Revoked," Ottawa Renewable Energy Co-operative (November 6, 2018). Retrieved from: https://www.orec.ca/ontario-net-metering-legislation-revoked/

For renewable heating, the use of wood waste or municipal solid waste as fuel for biomass district energy systems has been successfully implemented in a number of small communities. The cities of Revelstoke and Prince George, British Columbia, Oujé-Bougoumou, Quebec, Yellowknife, Northwest Territories, and Charlottetown, Prince Edward Island, have all used this strategy as a means to reduce emissions and fuel costs associated with heating buildings. Further resources include detailed case studies of best-in-class biomass district energy systems from the Biomass Energy Resource Center, as well as the Community Energy Association's Small-Scale Biomass District Heating Handbook.

Nelson, British Columbia: Solar Community Garden
Population: 10,664

Nelson is the first community in Canada to showcase virtual net-metering. In partnership with Bullfrog Power, the City of Nelson launched a 60kW solar garden project that feeds into the city-owned local distribution grid operated by Nelson Hydro. Nelson Hydro is a small municipally owned electric utility that owns its distribution grid, which is what made virtual net-metering there possible*. Community members were offered a chance to purchase solar panels at for an upfront payment of $923 per panel. Subscribers to the project then received solar credits that were deducted from their electricity bill. These credits were calculated annually in proportion to their share of the solar garden's production. Annual electricity cost reductions began at $28 and are projected to grow to $50 commensurate with electricity rates.

Nelson Hydro recognized the benefits of solar power to the community and to the utility. The project improved energy self-sufficiency and led to the development of in-house solar experience for the utility. Nelson Hydro led the project, which had the collective commitment of individual investors and community groups that supported a vision of clean energy in their community and wanted to address the fact that renewable energy generation would not otherwise be possible for many residents. It was funded through the City of Nelson and supported by a pre-feasibility grant from Bullfrog Power as well as additional financial support from Bullfrog Power during the construction phase.**

The project is now fully subscribed, with investors ranging from renters, homeowners and business owners to co-ops, churches and local schools.** The system itself produces 70,000 kWh per year—almost double the initial annual estimate of 36,000 kWh.

* David Suzuki Foundation, "Nelson, B.C. saves money with Canada's first community solar garden" (2017). Retrieved from: https://davidsuzuki.org/story/nelson-bc-canadas-first-community-solar-garden/

** City of Nelson, "Nelson's Community Solar Garden." Retrieved from: https://www.nelson.ca/223/Community-Solar-Garden

District energy

District energy refers to the distribution of heating or cooling, or both, from a centralized energy plant to buildings through a network of underground pipes using steam or water as a medium. District energy is widely regarded as integral to the transition to sustainable energy, because of its ability to take advantage of sustainable sources of heating and cooling that would otherwise not be available to individual buildings or would be wasted (such as local fuel sources and waste heat). Furthermore, as shares of renewable energy increase in electricity grids, district energy will play an important role in balancing the energy system by taking excess electricity produced by renewables and converting it into electric heat using highly efficient large-scale heat pumps.

Demonstrating leadership

Municipalities can demonstrate leadership and show the feasibility of renewable energy, energy efficiency, and district energy to the wider community by implementing these systems first in municipally owned buildings. In doing so, municipalities can also capture the operational savings offered by these technologies. For example, in Perth, Ontario, a municipal investment of $675,000 in LED lighting and mechanical and envelope upgrades in the town's buildings produced an annual savings of $43,000, with a payback period of 15 years.[36] In Raymond, Alberta, net-zero municipal operations were achieved by powering its nine municipal buildings and all of its streetlights from solar panels financed through a $2.8 million solar lease—with $630,000 provided by the Municipal Climate Change Action Centre.[37] The project has a payback period of 16 years, after which the town will see $150,000 in savings annually.[38]

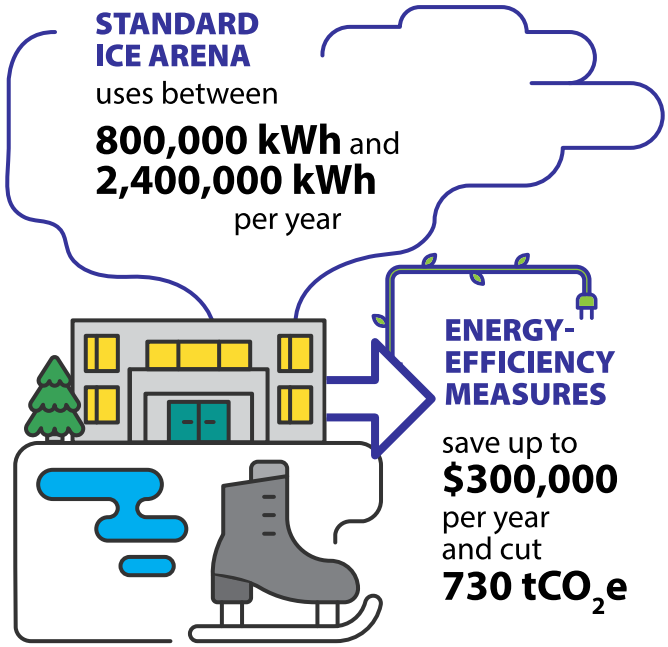
In many small and rural municipalities, community centres and ice rinks are often the largest energy consumers. A standard ice arena can use between 800,000 kWh and 2,400,000 kWh per year, depending on how energy efficient the arena already is.[39] Implementing energy-efficiency measures in poorly performing arenas has been shown to save up to $300,000 per year in reduced

36 *Town of Perth,* Perth's Climate Change Response *(2019). Retrieved from:* https://www.perth.ca/en/live-and-play/resources/Documents/FofT-Presentation-Climate-Change-Action-Plan.pdf

37 *CBC, "Alberta town aims to be first in Canada to rely on solar panels" (2019). Retrieved from:* https://www.cbc.ca/news/canada/calgary/raymond-solar-panels-net-zero-1.5190933

38 *ENMAX Corporation, "Town of Raymond completes net zero installations" (2018). Retrieved from:* https://www.enmax.com/news-events/news/town-of-raymond-completes-net-zero-solar-installations

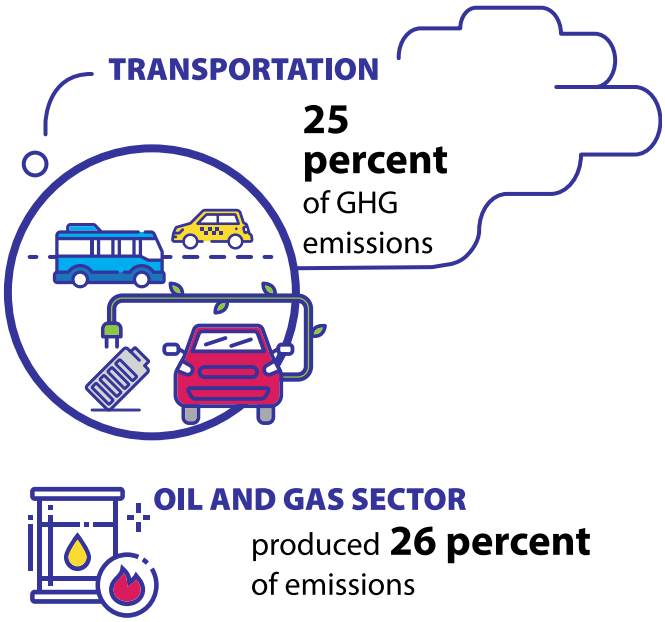
39 *Laurier Nichols, Improving Efficiency In Ice Hockey Arenas (ASHRAE Journal, June 2009). Retrieved from:* https://www.stantec.com/content/dam/stantec/files/PDFAssets/2017/Improving%20Efficiency%20in%20Ice%20Hockey%20Arenas.pdf



energy costs, cutting emissions by 730 tCO_2e. These community hubs are great opportunities for municipalities to reduce operational costs, while also building awareness around climate change, sustainability, energy efficiency and renewable energy installations.[40] In the of Town of Île-des-Chênes, Manitoba, a geothermal district energy system was installed to heat and cool the new community centre, ice arena and fire hall. With funding from the federal and provincial governments as well as FCM's Green Municipal Fund, the $1.3 million project replaced four natural gas boilers with highly efficient ground source electric heat pumps. The upgrades allow the ice season to be prolonged in the arena, reducing energy consumption by 60 percent and creating energy cost savings of 40 percent.[41]

3.2 Transportation

Transportation is the second-largest source of emissions in Canada, accounting for 25 percent of GHG emissions, just behind the 26 percent of emissions produced by the oil and gas sector.[42] The majority of emissions stem from road transportation, with light-duty gasoline trucks and heavy-duty diesel vehicles being the largest contributors. Transportation emissions are a particular issue for rural communities with low population density and undeveloped public transit systems—both between and within regions. Dominated by cul-de-sac street patterns and heavily reliant on private vehicles, small municipalities can find it challenging to develop public transit.



40 *Federation of Canadian Municipalities,* GMF Municipal Energy Roadmap *(2020). Retrieved from:* https://fcm.ca/en/resources/gmf/gmfs-municipal-energy-roadmap

41 *Eco-Ouest, "Île-des-Chênes innovates with district geothermal heating & cooling system" (2021). Retrieved from:* http://eco-ouest.com/en/project/ile-des-chenes/

42 *Environment and Climate Change Canada,* National inventory report: Greenhouse gas sources and sinks in Canada *(2020).*

Financial incentive programs that are often implemented in densely populated cities, such as road tolls, would not be practical and would be met with resistance from vehicle owners.

Strategies for transportation emissions reduction fall into several categories: vehicle efficiency improvements, low-carbon fuels, and vehicle demand reduction. While vehicle efficiency standards fall under federal jurisdiction, municipalities can take action to ensure that their own corporate fleet of vehicles is electric or as efficient as possible.

The following resources provide more information on greening municipal fleets:

- Greening Government Fleets (Natural Resources Canada, 2018) https://www.nrcan.gc.ca/sites/www.nrcan.gc.ca/files/energy/pdf/transportation/NRCan_GreeningGovFleets_e.pdf
- Model Green Fleet Policy (Clean Air Partnership) https://www.cleanairpartnership.org/resources/
- Green Fleets Business Case Series (Clean Air Partnership and Federation of Canadian Municipalities) https://www.cleanairpartnership.org/wp-content/uploads/2020/12/Green-Fleets-Business-Case-Series.pdf

Municipalities can encourage residents and businesses to switch to electric vehicles (EVs) by providing charging station infrastructure as well as reducing the price of EVs through group purchasing.[43] Forming regional partnerships for the development of EV charging stations can help smaller municipalities with low population density overcome barriers to the development of infrastructure projects such as these. Accelerate Kootenays is an example of such an initiative in BC. Multiple regional districts worked together to fund and develop a network of 13 fast charging stations that were strategically placed to benefit each community and provide access to tourist and recreation activities for EV users.

43 *See the 2018 report by ICLEI Canada and the Federation of Canadian Municipalities,* On the money: Financing tools for local climate action. https://www.pcp-ppc.ca/resources/financing-tools-for-local-climate-action

Table 1: Strategies for transportation emissions reduction

Vehicle efficiency	Low-carbon fuels	Vehicle demand reduction
• Fuel standards • Fleet management systems • Driver training to improve fuel economy • Preventative maintenance • Anti-idling policies	• Switching to electric, hydrogen and renewable natural gas vehicles • Increased access to EV infrastructure • Access to free charging stations • Preferred parking for low-carbon vehicles	• Carpooling programs • Car sharing programs • Fixed route rural buses • On-demand transportation services (i.e. taxibus, on-demand minibuses) • Increased trail development and connectivity • Improved bicycle infrastructure: bike parking, paved shoulders, bicycle route maps, dedicated bike lanes, improved trail quality to support increased bicycle usage • Complete Streets policies

While financial constraints can make it more challenging for small and medium municipalities to implement some of the above actions, vehicle demand reduction strategies may be a more feasible approach. Depending on a municipality's location, it may be able to collaborate with other nearby rural communities or metropolitan centres to build inter-regional transportation systems with daily service for commuters, purchase existing public services from regional governments, or create taxibus and car and ride share programs. A municipality might be able to provide public transit with flexible routing and schedules or demand-responsive transit that offers service during hours of high demand or in the form of dial-a-ride taxi-bus. Examples of communities with these types of services include the **City of Rimouski Quebec: Taxibus demand-responsive public transit model**, the Saint-Paul d'Abbotsford, Quebec, Friend-Bus (see the sidebar below) and the Okotokos, Alberta On-Demand Transit service.

Municipalities often collaborate with employers on carpooling and car-sharing programs, and with online ride-matching services, to help area residents find carpool options and matches. Technology will play a large role in enabling access to these services. For example, online car sharing management systems can be accessed through mobile phone apps or personal computers (see **City of Plessisville, Quebec: Electric cars, vehicle sharing and the SAUVÉR project**).

Communities can also encourage active transportation, particularly for shorter trips, in a number of ways: increase bicycle infrastructure such as paved shoulders and dedicated bike lanes; create better signage and publish route maps; provide safe bike lockers or storage areas; and develop and

implement Complete Streets policies that include better safety measures for cyclists and pedestrians (see **District of Clearwater, British Columbia: Road cross-section bylaw**). Trails are also an important means of active transportation, particularly in rural areas with extensive natural spaces. Ensuring connectivity between trails and with other cycling or walking routes can promote their use for commuting or other types of trips. In addition, trails can help create support for the protection of natural areas, particularly if combined with educational signage on the historical and environmental significance of an area.

Municipalities can implement these measures by integrating supporting policies into official planning documents, bylaws, plans and strategies (e.g. transportation plans) and by addressing trail connectivity in parks and recreation master plans or trail master plans. Policies to promote infill, intensification and mixed-use, higher density communities, as described in Section 3.3 below, can also play an important role in reducing vehicle demand and vehicle kilometres travelled.

Saint Paul d'Abbotsford, Quebec: Ami-Bus

Population: 2,870

In partnership with Ami-Bus, Saint-Paul d,'Abbotsford has established the municipality's first public transportation option: Initially a one-year pilot project, the service offers round trip door-to-door transportation within the territory of the municipality and to the nearby larger town of Granby.* Ami-Bus, an adapted transportation service for persons with reduced mobility, delivers round-trip door-to-door service with eight 18-seat minibuses. The service is offered seven days a week, 361 days a year, from 7:00 am to 11:30 pm, and costs $6 per trip. Trips must be reserved the day before.**

The project was funded by a $10,000 grant from the Rural Pact (a provincial policy that established agreements between the government and rural municipalities to strengthen capacity) and has helped to combat rural isolation and give residents more autonomy.**

* La Vox de l'Est, "Public Transport : Ami-Bus now serves Saint-Paul" (2015). Retrieved from: https://www.lavoixdelest.ca/archives/transport-collectif-ami-bus-dessert-maintenant-saint-paul-8bd248db8eb8fa28209f0761227138a6

** Grandby Express, "Saint-Paul-d'Abbotsford s'initie au transport collectif," 2015. Retrieved from: https://www.granbyexpress.com/2015/08/20/saint-paul-dabbotsford-sinitie-au-transport-collectif/

3.3 Land use

Land use planning based on smart growth principles has become increasingly recognized as playing an integral role in reducing transportation-related emissions. Smart growth includes the development of dense, mixed-use, transit-oriented and walkable communities. In addition to encouraging active lifestyles and improving public health, denser communities increase the viability of district energy by providing higher thermal demand over shorter distances (heat density).

Land use planning also plays an important role in protecting a community's natural assets—such as forests and wetlands, which provide carbon sequestration as well as deliver a multitude of ecosystem services including food, fresh water, timber, jobs, trail systems, cooling, reduced air pollution and stormwater management.[44] Further guidance on how municipalities can support climate mitigation through the management and protection of forests and other natural assets can be found in Section 3.5.

Land use planning tools are made available to municipalities through provincial or territorial governments and are an excellent resource for municipalities looking to act on climate change. Many municipalities have begun to integrate smart growth principles into their official planning documents, implementing them in new developments and redevelopment projects (see **Ucluelet, British Columbia: Smart Growth Principles and Density Bonusing**; and **Ville de Mont-Saint-Hilaire, Quebec: Transit-oriented development**). As described in Section 3.1, municipalities are also using smart growth principles to encourage green building development.

Provincial or territorial policies and regulations determine the suite of land use planning tools available to a municipality for climate action. The table on page 30 outlines land use planning tools and strategies that are commonly used by municipalities across Canada.[45]

Ecosystem services

Ecosystem services refer to the multiple benefits people obtain from ecosystems, such as natural purification of water, erosion and flood control, nutrient cycling, and soil formation. The Millennium Ecosystem Assessment divides these services into four broad categories: provisioning services; supporting services; regulating services; and cultural services.

Since its introduction in the 1970s, this concept has evolved to include economic valuation of these services in order to better account for the benefits they provide in our economic systems. **Payments for ecosystem services** are financial incentives given directly to landholders for preserving or increasing the supply of ecosystem services.

44 *ICLEI, "Biodiversity in cities: How natural asset mapping helps cities protect livelihoods and address climate change impacts" (2019). Retrieved from:* https://talkofthecities.iclei.org/biodiversity-in-cities-how-natural-asset-mapping-helps-cities-protect-livelihoods-and-address-climate-change-impacts/

45 *Available land use planning tools and legislative requirements for climate change action and mitigation will vary according to provincial land use planning legislation.*

Community revitalization initiatives are another area where climate action aligns with land use planning. While these initiatives often do not explicitly link to climate change mitigation, many encourage infill, intensification and brownfield redevelopment which reflect smart growth principles and contribute to the reduction of transportation emissions. Research has also shown that new residents, talent and a cultural and creative workforce tend to be drawn to environmentally sustainable and culturally vibrant communities that prioritize health, safety and sustainability through strategies such as downtown core renewal, heritage building preservation, smart growth, and expansion of natural areas including trail and park systems.[46] Investing in sustainability measures such as energy efficiency and renewable energy generation therefore also aids in community revitalization. Sustainability measures create more green job opportunities and help to create attractive, complete communities that draw and retain younger families and sustainability-minded residents. Sustainability measures also keep energy dollars circulating in the local economy that would otherwise leave the community. In recognition of these linkages, the **City of Sault Ste. Marie** has begun implementing a community revitalization program with climate change action and sustainability as key pillars.

Community revitalization is often implemented through financial incentives and grants that seek to attract private sector development and enhance economic activity in downtown cores and employment areas. Depending on the provincial or territorial land use planning framework, the range of tools available to a municipality to promote community revitalization and integrate those projects with climate action will vary. For example, in Ontario, many communities are integrating energy efficiency, infill, and brownfield redevelopment into community improvement plans (CIPs). CIPs are a provincially legislated community revitalization tool that allows municipalities to create financial incentives for private sector revitalization activities.

46 *Richard Florida, Cities and the Creative Class (Oxford: Routledge, 2005).*

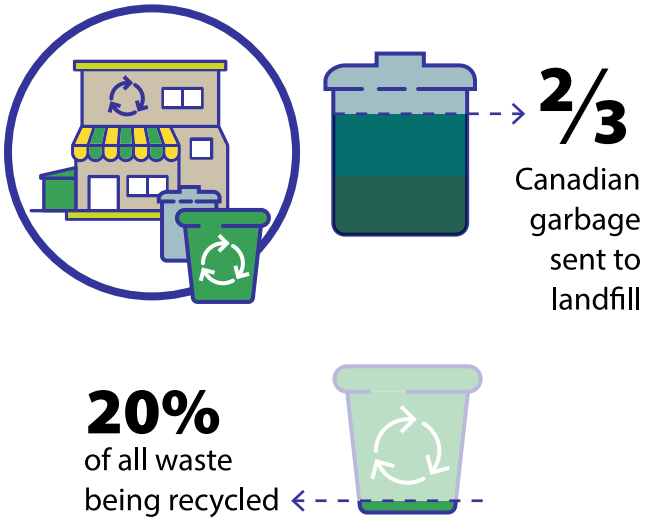
Land use planning tools

Official planning documents	Municipalities can integrate certain principles and goals into official planning documents, such as: GHG targets, climate change mitigation, naturalization, protection of natural asset polices including ecosystem services and biodiversity, complete communities and active transportation, including integration and connectivity of trail systems. Municipalities can also review existing land use planning policies that may present constraints to naturalization and reforestation/afforestation efforts and renewable energy development.
Bylaws and zoning	Bylaws and zoning can be used to create regulations for sustainable, mixed-use, higher density, compact, walkable, and transit-oriented development. Bylaws can also be created that permit naturalization on private property. Depending on the jurisdiction, municipalities may, as part of a planning application, require the developer to provide information, materials or studies. These materials can address activities related to climate action, such as assessing the feasibility of connecting to a district energy system, installing renewable energy technologies, or improving building energy efficiency. In BC and Alberta some municipalities have implemented bylaws requiring connection to a municipally owned district energy system.
Green development standards	Mandatory or voluntary measures can be integrated into the planning process to guide development and encourage environmentally, socially and economically sustainable building design.
Density bonusing, development cost charge adjustments, tax deferrals	Municipalities can offer financial incentives to developers in return for infill and brownfield redevelopment or to encourage the use of green building features or standards. Density bonusing permits developers to build more floorspace than normally allowed under the land use zoning policy for the area.
Expedited development applications	Development applications that meet established objectives for smart growth or green building designs can be prioritized for approval. This incentivizes developers by providing more certainty and reducing the length of the approval process.

Land use planning tools

Sustainability checklists and guidelines	These tools allow municipalities to assess a development's contribution to sustainability goals and serve as educational tools for developers. Completing or committing to the guidelines set out in a checklist can be encouraged through incentives such as density bonusing, development cost charges and fast tracking of development applications. Guidelines can also outline what is needed for a building to be solar-ready, district-energy-ready, or net-zero-ready, to ensure building compatibility with future installation of renewable energy technologies or connection to a district energy system.
Urban boundaries	Municipalities can establish hard urban boundaries and focus development within those boundaries to limit urban sprawl and protect natural and agricultural areas.
External sustainable design elements	Some jurisdictions allow municipalities to require external sustainable design elements such as through site plan control and subdivision planning.
Streamlined development permits	Some jurisdictions offer municipalities the ability to streamline development permits, replacing the site-by-site approach normally taken when issuing permits with more comprehensive planning at the neighbourhood scale. Examples of this streamlined approach include Development Permit Areas in BC and the Development Permit System in Ontario. These tools allow municipalities to set requirements for exterior sustainable design elements in designated areas.

3.4 Waste



Canada's National Inventory Report documents that sources of GHG emissions in the waste sector result from the treatment and disposal of waste including solid waste, composting, biological treatment of waste, incineration and open burning, and wastewater treatment and discharge. While GHG emissions from these sources account for only three percent of total GHG emissions in Canada,[47] decomposition of organic matter in landfills produces methane that is 25 times more potent in terms of its global warming potential. Moreover, this accounting only includes direct GHG emissions from waste at the time of disposal. From a life cycle perspective, food and products that eventually become waste produce GHG emissions through all stages, from production to consumption. Therefore, waste reduction measures can have significant upstream impacts by reducing the need for the extraction of resources and the manufacturing and transportation of goods. For context, in the US, 42 percent of total GHG emissions are emitted during the production, processing, transportation and disposal of products and food.[48] Food waste reduction can be an overlooked climate mitigation measure, yet approximately one-third of Canada's food is never eaten, producing unnecessary emissions throughout the entire food system as well as through the generation of methane when it is disposed in landfill.[49]

Overall, Canada has been performing poorly in waste management, ranking eighth-worst in a recent waste index study, with over two-thirds of Canadian garbage sent to landfill and 20 percent of all waste being recycled—well below the OECD average.[50] Between 2002 and 2014 household waste in landfills has increased by 18%, while over the same period materials in recycling and green

47 *Environment and Climate Change Canada,* National inventory report: Greenhouse gas sources and sinks in Canada *(2020).*

48 *U.S. Environmental Protection Agency,* Opportunities to Reduce Greenhouse Gas Emissions through Materials and Land Management Practices *(2009). Retrieved from:* https://www.epa.gov/sites/production/files/documents/ghg-land-materials-management.pdf

49 *National Zero Waste Council,* Reducing Food Waste and Cutting Canada's Carbon Emissions: Policies for Reaping the Environmental, Economic and Social Benefits *(2016). Retrieved from* http://www.nzwc.ca/Documents/NZWCSubmissionOnPan-CanadianFrameworkForCombattingClimateChange.pdf#search=Reducing%20Food%20Waste%20and%20Cutting%20Canada%E2%80%99s%20Carbon%20Emissions

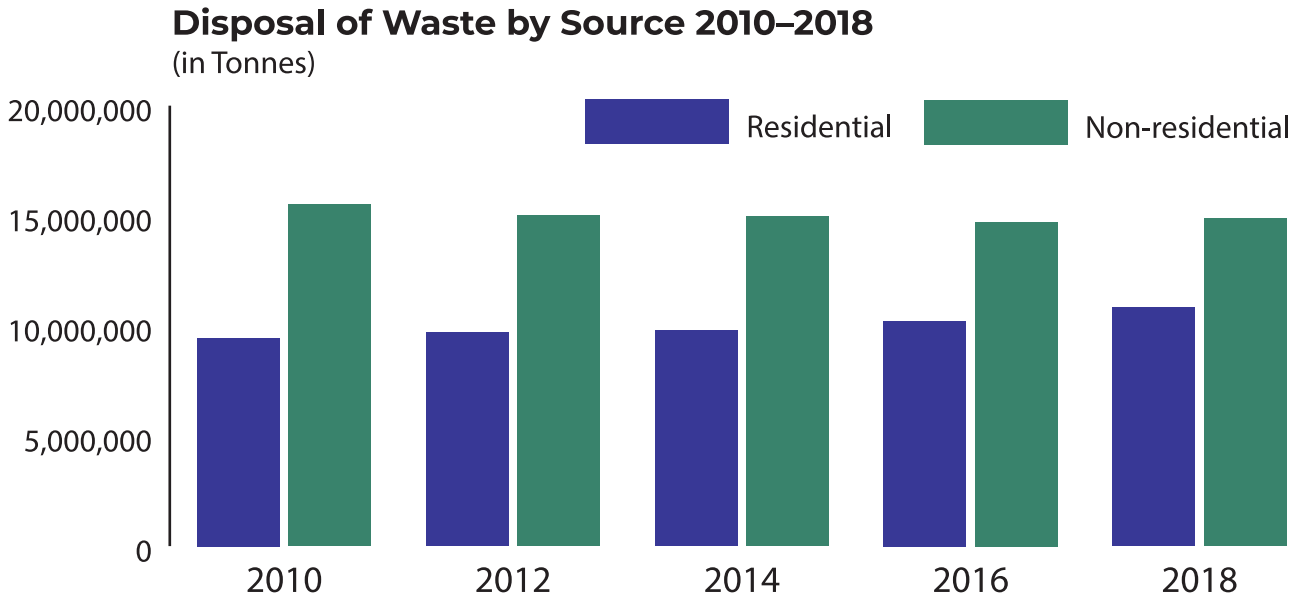
50 *Sensoneo,* Global Waste Index 2019. *Retrieved from:* https://sensoneo.com/sensoneo-global-waste-index-2019/

bins have increased by 36%[51]. This means that while Canadians are recycling and composting, total waste is still growing.

Food waste reduction is an often overlooked climate mitigation measure, yet approximately one-third of Canada's food is never eaten, producing unnecessary emissions throughout the entire food system as well as through the generation of methane when it is disposed in landfill.

As municipalities manage, collect, recycle, compost, and dispose of household waste, they have an important role to play in reversing this trend. Waste reduction measures will not only have environmental benefits but will reduce the need for new landfills and the associated costs, as well as reducing waste processing costs. While household waste is an important part of the picture, municipalities should also be aware that according to Statistics Canada data, over half of municipal solid waste is non-residential. Furthermore, total municipal waste is only a fraction of that generated by industrial sectors such as mining and agriculture.[52]

Figure 2: Disposal of waste by source, 2010–2018 (Statistics Canada, 2020)



51 *Environment and Climate Change Canada,* Canadian Environmental Sustainability Indicators: Solid waste diversion and disposal *(2017). Retrieved from:* https://www.canada.ca/en/environment-climate-change/services/environmental-indicators/solid-waste-diversion-disposal.html

52 *Statistics Canada,* Human Activity and the Environment, *"Section 3: Solid waste" (2012). Retrieved from:* https://www150.statcan.gc.ca/n1/pub/16-201-x/2012000/part-partie3-eng.htm

There are two main types of waste reduction: waste diversion (reuse and recycle) and waste prevention. Of the two, waste prevention has been shown to be more environmentally and economically beneficial.[53] Waste reduction models can range from low-cost initiatives that do not require major investments in infrastructure (like awareness-raising programs and backyard composting programs), to larger material reuse centres and curbside collection programs that deliver to large centralized facilities.

Most Canadian municipalities outside of rural areas have some form of curbside collection program, often imposing few restrictions and usually with a flat fee.[54] However, many Canadian municipalities have already begun to implement variable waste disposal fees, a more effective model which charges based on the quantity of garbage produced by each household. This can be done through Pay-as-You-Throw (PAYT) programs which charge per bag, by volume or by weight. In the US, where PAYT programs have seen more widespread implementation, the Environmental Protection Agency (EPA) reports significant reductions in waste in the over 5,000 communities that have implemented PAYT programs.[55] Studies of PAYT programs in the US report an average waste reduction of 14–27 percent, and a 32–59 percent increase in recycling rates.[56] While 19 percent of communities with PAYT programs reported increases in illegal dumping, the remainder were able to minimize this with communication, education and enforcement.[57] In the **City of Stratford, Ontario**, the PAYT program has resulted in 35 percent less garbage going to the landfill and has increased recycling by 62 percent. PAYT programs also have important co-benefits in that those who use the most pay the most, offsetting the cost for those who use less, as well as generating revenue to help cover the costs of municipal solid waste programs, including recycling and composting programs.[58]

Canada also has one of the lowest average landfill tipping fees in the OECD, as the fees do not typically include the full cost of disposal[59]. Municipalities can charge tipping fees that more accurately reflect the full environmental cost,[60] although, it should be recognized that this may also result in an increase in illegal dumping or travel outside of the municipality to where tipping fees are lower. Another approach that is becoming more common is instituting charges or bans on single-use items such as plastic bags. Canada's federal government now plans to ban single-use plastic items by the end of 2021. While this aids in removing plastic pollution from the environment, an energy-efficient alternative to plastics will be needed to ensure maximum impact. Paper bags require similar amounts of energy to make, and reusable bags take more energy to make and ship than disposable bags.

53 *Smart Prosperity Institute,* Economic tools to reduce household waste and reduce greenhouse gas emissions *(2018). Retrieved from:* https://institute.smartprosperity.ca/sites/default/files/spi-toolsforhouseholdwaste.pdf

54 *Ibid*

55 *U.S. Environmental Protection Agency, "New Studies Document Pay-As-You-Throw Results" (1997). Retrieved from:* https://archive.epa.gov/wastes/conserve/tools/payt/web/html/bullet.html

56 *Ibid*

57 *Ibid. A second study found 27 percent of surveyed communities reported increases in illegal dumping, while only four percent of these communities indicated it was an ongoing issue.*

58 *U.S. Environmental Protection Agency, "Conservation Tools—Pay-As-You-Throw" (2016). Retrieved from:* https://archive.epa.gov/wastes/conserve/tools/payt/web/html/ssintro.html

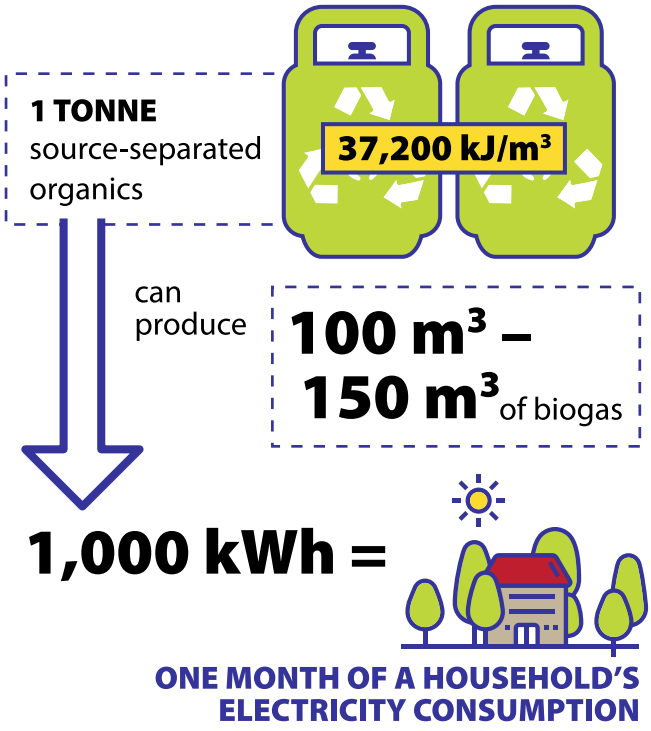
59 *Smart Prosperity Institute,* Economic tools to reduce household waste and reduce greenhouse gas emissions *(2018). Retrieved from:* https://institute.smartprosperity.ca/sites/default/files/spi-toolsforhouseholdwaste.pdf

60 *Canada's Ecofiscal Commission,* Cutting the Waste: How to save money while improving our solid waste systems *(2018). Retrieved from:* https://ecofiscal.ca/wp-content/uploads/2018/10/Ecofiscal-Commission-Solid-Waste-Report-Cutting-the-Waste-October-16-2018.pdf

The establishment of infrastructure for the drop-off or collection of unwanted household items and unused building materials, such as the **Re-Use-It and Re-Build-It centres** in Whistler, BC, has generated revenue for important community programs. It has also provided access to affordable second-hand items for purchase, thus diverting landfill waste. Establishment of depots for hazardous waste such as batteries and electronics will also be important, to avoid significant environmental damage beyond the harm caused by GHG emissions.

Waste composition analyses have found that organic waste accounts for over 50 percent of residential and commercial waste, with food waste making up the largest share (around 80 percent of organic waste).[61] Because organics generate methane, organic waste diversion and prevention programs are an important means of reducing both waste and emissions. The establishment of curbside compost pickup programs—possibly funded through PAYT program revenue—can also be considered. However, in rural areas where curbside pickup may not be viable due to wildlife concerns, organics drop-off depots can be developed that promote organic waste diversion—such as the Food Waste Collection Pilot in Canmore, Alberta. Communities can also seek to partner at a regional level to develop a waste collection system or engage in other lower-cost waste prevention and reduction programs, including:[62]

- media awareness campaigns (e.g. radio and newspaper ads, posters, websites and social media)
- behavioural change strategies (e.g. meal planners, food waste challenges and storage tips, backyard composting, education on environmentally friendly purchasing policies)
- community outreach events (e.g. waste reduction workshops, farmers' markets, local film screenings)



61 *National Zero Waste Council,* Food Waste Management + Climate Action: National GHG Reduction Potential *(2017). Retrieved from:* http://www.nzwc.ca/Documents/FoodWasteClimateChange-Report.pdf#search=Food%20Waste%20Management%20%2B%20Climate%20Action%3A%20National%20GHG%20Reduction%20Potential

62 *British Columbia Ministry of Environment,* Residential Food Waste Prevention: Toolkit for local government and non-government organizations *(2015). Retrieved from:* https://www2.gov.bc.ca/assets/gov/environment/waste-management/organic-waste/food_waste_reduction_toolkit.pdf

If organic waste is processed using anaerobic digestion, the biogas that is produced as a byproduct, consisting primarily of CO_2 and methane, can be used as fuel, providing a renewable energy source. The energy potential of the biogas is determined by the methane content. Biogas can provide approximately 37,200 kJ/m^3; and one tonne of source-separated organics can produce between 100 m^3 and 150 m^3 of biogas.[63] This translates into approximately 1,000 kWh, which is roughly the electricity consumption of a single-family home for a month. Since emissions from the use of biogas are biogenic and would have been emitted to the atmosphere anyway through natural processes it is considered to be climate-neutral and a low-carbon alternative to conventional natural gas. Biogas can also be captured from landfills and municipal wastewater treatment centres, as well as from manure produced in the agricultural sector (which will be discussed further in Section 3.5). Uses for biogas depend on the level of treatment and upgrading required, and include:

- mixing biogas with natural gas, or using it by itself as a natural gas substitute for industrial processes, building space and water heating
- producing electricity and heat in combined heat and power gas generators
- purifying biogas into high-grade fuel (also known as renewable natural gas) that can be sold to natural gas utilities for injection into natural gas distribution systems

Many examples of biogas production, in both the public and private sectors, already exist across Canada. A comprehensive list, as well as further resources regarding the establishment of municipal and agricultural biogas systems, can be found at the Canadian Biogas Association website.

The following resources provide further information on municipal food waste prevention programs and organic waste processing options:

- Residential Food Waste Prevention: Toolkit for local government and non-government organizations (BC Ministry of Environment, 2015)
- Technical Document on Municipal Solid Waste Organics Processing (Environment Canada, 2013)

63 *Environment Canada,* Technical Document on Municipal Solid Waste Organics Processing *(2013). Retrieved from:* https://www.ec.gc.ca/gdd-mw/3E8CF6C7-F214-4BA2-A1A3-163978EE9D6E/13-047-ID-458-PDF_accessible_ANG_R2-reduced%20size.pdf

Stratford, Ontario: Co-digestion project

Population: 31,465

Rather than pay the cost of building a separate new organics facility, in 2017 the City of Stratford entered into a partnership with the Ontario Clean Water Association (OCWA) and Suez Water Technologies to implement a biological hydrolysis technology. This new technology will help optimize and increase the facility's existing digester capacity, allowing for co-processing of source-separated organics. Once the project is complete, the methane from this process will then be upgraded to renewable natural gas and fed into the existing natural gas grid. As a result of waste diversion and natural gas replacement, the project is expected to reduce GHG emissions by 48,951 tC02e/year, while extending the life of the landfill and generating a high-quality fertilizer that replaces synthetic fertilizers on area farms.*

The $22.7 million project has been funded by a $5 million Ontario Centres of Excellence (OCE) grant from the Province of Ontario with initial contributions of $1.5 million each from the City of Stratford and the OCWA. The remaining $15 million will require long-term financing on the part of the city. By siting the project at the existing water pollution control plant, the city is able to utilize existing infrastructure and plant operations, reducing costs. The main sources of revenue from the project will be from tipping fees and the sale of renewable natural gas, which will be subject to a revenue-sharing agreement between the partners. The project is expected to be governed by the establishment of a Municipal Services Corporation, with the municipality and the OCWA as partners.**

Key success factors for the project include a strong technical and financial case, as well as the location of the site, which allows for use of existing infrastructure. The project generated community concerns about increased trucking, safety and smell, but there was strong political commitment and good communication of the benefits of the project as the best waste management option for the city. As well, the city took steps to mitigate community concerns, such as finding alternative trucking routes. All this allowed the project to go forward.

* Canadian Biogas Association, "Empowering Municipal RNG Market Participation: Municipal Profile—City of Stratford, Ontario" (2019). Retrieved from: https://www.biogasassociation.ca/images/uploads/documents/2019/Stratford-Profile.pdf

** City of Stratford, Renewable Natural Gas. Retrieved from: https://www.stratford.ca/en/inside-city-hall/renewable-natural-gas.aspx#Where-would-the-revenue-come-from

3.5 Development of agriculture, resources and tourism (DART)

Agriculture, natural resources and tourism play key roles in the economy and identity of many small and rural communities in Canada. These industries are also often large contributors to GHG emissions. Often, a community is reliant on a single industry for much of its employment and economic output—but these industries can constitute the largest single source of emissions in that community. The agriculture, natural resources and tourism sectors will also be some of the most impacted by climate change; therefore, many opportunities exist to synergize mitigation and adaptation efforts. Municipalities can form partnerships in these sectors to support climate mitigation activities, identify opportunities, and provide access to resources, knowledge and implementation networks. Opportunities also exist to use and promote existing natural assets for tourism and ecotourism, contributing to community and economic revitalization efforts.

Agriculture

Between 1990 and 2018, emissions from Canada's agricultural sector have increased by 27 percent, making up 8 percent of Canada's total annual emissions.[64] These emissions calculations only account for livestock and crop production, which includes

64 *Environment and Climate Change Canada,* National inventory report: Greenhouse gas sources and sinks in Canada *(2020).*

enteric fermentation, manure management, agricultural soils, and field burning of agricultural residues. Other emissions from on-farm fuel combustion are accounted for in the energy sector and are therefore not included in this number.

The largest agricultural sectors in Canada are beef cattle, swine, cereal, and oil seed production, followed closely by the poultry and dairy industries. However, agricultural sectors are highly regionalized in Canada, with the majority of beef cattle, wheat, barley and canola being produced on the prairies, and the majority of dairy cattle, swine, poultry, corn and soybean produced in eastern Canada. Overall, emissions increases in the agricultural sector have primarily been driven by higher usage of inorganic fertilizers linked to increased crop production of canola, corn, soybeans and wheat. Larger populations of beef cattle and swine and changes in feeding (i.e. higher gross energy intake as result of feed, herd characteristics and milk productivity) and manure handling practices (i.e. shifting from solid to liquid systems) in the dairy and swine industries have also contributed to the increase in emissions.

Studies have suggested that most regions of Canada are projected to warm over the next 60 years, which could both positively and negatively impact agriculture. On one hand, this could lead to extended growing seasons, lower feeding requirements for livestock, increased youth livestock survival rates and lower energy costs. It can also result in improved soil quality that can enhance carbon sequestration and allow shifts from annual crop production to perennial crops and grazing lands, which reduces GHG emissions.[65] On the other hand, as the agricultural sector is particularly vulnerable to the impacts of climate change and is highly dependent on the weather and climate, it will be negatively impacted by more frequent extreme weather events such as drought and flooding, and increased prevalence of pests and diseases.

The agricultural sector is also unique in its climate change mitigation potential, in that there are many opportunities for synergies between mitigation and adaptation strategies. For example, several measures can improve both nitrogen use efficiencies and soil carbon storage. These include steps to reduce soil erosion, reduction of nitrogen and phosphorous leaching and conservation of soil moisture, as well as increasing species diversity in crops and implementing frequent crop rotation.[66]

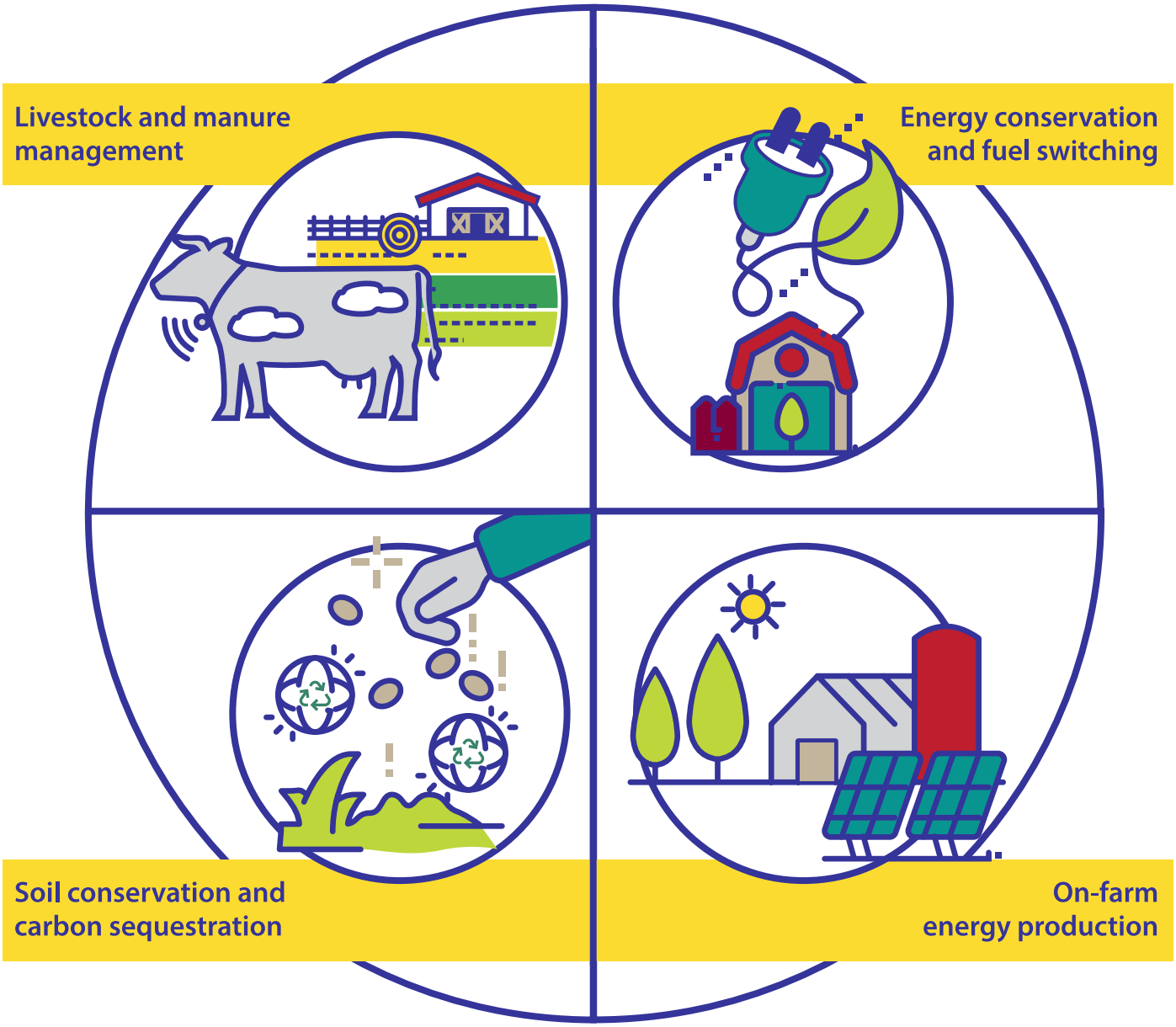
Furthermore, the ongoing farm crisis, characterized by overwhelming farmer debt, shares many of the same causes and solutions as the climate crisis. Canadian farm debt now stands at $106 billion, with 95 percent of farm revenue going to large agri-business corporations that supply fertilizers, pesticides, chemicals, fuel, machinery and other agricultural supplies.[67] Most emission increases in agriculture have been driven by increased use of inorganic fertilizers. There are opportunities to reduce GHG emissions while also increasing farm income, by reducing the use of inorganic fertilizers, shifting toward more holistic management systems and implementing best management practices (as described below).

65 *Agriculture and Agri-Food Canada, "Climate Scenarios for Agriculture" (2020). Retrieved from:* https://www.agr.gc.ca/eng/agriculture-and-the-environment/climate-change-and-agriculture/climate-scenarios-for-agriculture/?id=1329321981630

66 *P. Smith and J. E. Olesen, "Synergies between the Mitigation of, and Adaptation to, Climate Change in Agriculture,"* The Journal of Agricultural Science, *148(5) (2010) pp. 543-552.*

67 *Darrin Qualman and the National Farmers Union,* Tackling the Farm Crisis and the Climate Crisis: A Transformative Strategy for Canadian Farmers and Food Systems *(2019). Retrieved from:* https://www.nfu.ca/nfu-announces-new-report-tackling-the-farm-crisis-and-the-climate-crisis/

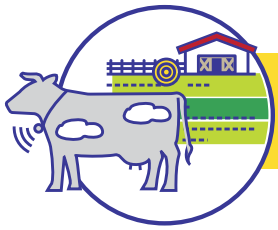
At the farm level, climate action to mitigate GHG emissions can be broken down into four broad categories:[68, 69, 70]



68 *Government of BC, "Reducing agricultural greenhouse gases" (n.d.). Retrieved from:* https://www2.gov.bc.ca/gov/content/industry/agriculture-seafood/agricultural-land-and-environment/climate-action/reducing-agricultural-ghgs

69 *Global Research Alliance on Agricultural Greenhouse Gases and the Sustainable Agriculture Initiative Platform from Livestock Research Group,* Reducing greenhouse gas emissions from livestock: Best practice and emerging options *(2015). Retrieved from:* https://ccacoalition.org/en/resources/reducing-greenhouse-gas-emissions-livestock-best-practice-and-emerging-options

70 *FarmFolk CityFolk Society,* Climate Change Mitigation Opportunities in Canadian Agriculture and Food Systems *(2019). Retrieved from:* https://www.farmfolkcityfolk.ca/wp-content/uploads/2019/12/Climate-Mitigation-Opportunities.pdf



Livestock and manure management:

- Improving grazing management practices (i.e. rotational grazing) can improve the quality of pasture.
- Manure collection and storage can be improved by reducing storage time, avoiding the addition of straw, lowering temperatures, and ensuring that housing systems are optimized for proper aeration and runoff prevention.
- Improving manure deposition and application practices can reduce N_20 emissions. Such practices include: optimizing the amount applied for more efficient and best pasture/crop growth; avoiding application on wet soils; shifting application times toward spring rather than autumn or winter; using urease and nitrification inhibitors to reduce N_20 production and nitrate leaching; and using manure in anaerobic digesters for the production of biogas and high-quality fertilizer.
- The digestibility of feed can be improved by selecting livestock for genetics that favour more efficient food conversion, as well as implementing precision feeding, enhancing quality of diet, and adding ionophores to feed to reduce methane production.

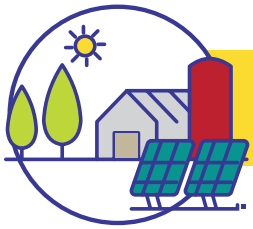
Soil conservation and carbon sequestration

- Many practices that sequester carbon also improve soil quality and health, enhancing soil organic matter. Individual practices include: no/reduced tillage, conservation tillage such as direct seeding, diversified cover cropping, multiple crop rotations, no/reduced use of synthetic fertilizers, reduction/elimination of bare fallow, and management of crop residues. While individual practices such as these can help reduce carbon loss from plants and soil, holistic approaches to farm management that integrate multiple practices are much more impactful. These include regenerative agriculture, conservation agriculture, agroforestry and silvopasture.
- Carbon can also be sequestered by restoring non-production areas of a farm with features such as riparian buffers, hedgerows, and grassland set-asides, as well as by restoring degraded lands and converting marginal farmland to perennial grass or trees, or agroforestry systems.
- Carbon farming is an approach that incorporates many carbon sequestration practices, seeking to maximize carbon sequestration in soil and plants. Quantifying on-farm carbon sequestration also allows for the potential generation of carbon credits and offsets, depending on the

mechanisms in place in the province or territory. Alberta, for example, allows for the generation of carbon offsets from approved agriculture protocols.[71] However, methodologies for quantification of on-farm carbon sequestration are still varied and uncertain. Therefore, municipalities should monitor best practices and ongoing research to identify how quantification of carbon sequestration can best be applied in their community.

Energy conservation and fuel switching

- Farms can switch to production practices that use less energy, such as no tillage, micro-irrigation, and grass-based livestock systems.
- Improvements can be made to tractor and field operation efficiency, machinery maintenance, upgrading equipment and using high-efficiency equipment (e.g. motors, fans, lighting).
- Building energy efficiency can be improved through improved insulation, optimal siting and design of farm buildings, and energy-efficient greenhouses.



On-farm energy production

- On-farm energy sources can include solar, wind, geothermal, biogas production, and combined heat and power systems.

Where a municipality can influence

Municipalities can play an important role in agricultural climate mitigation by providing support, coordination, and access to resources for the agricultural community. The **City of Kawartha Lakes Healthy Environment Plan** is a leading example of the integration of municipal support for agricultural climate change mitigation in a climate action plan. The plan includes measures to support the agricultural community by facilitating forums, training sessions and capacity-building initiatives on manure management best practices and soil carbon sequestration, integrating agritourism into the local economic development strategy, promoting participation in sustainable farm planning programs, and encouraging networking with the agricultural

71 *Government of Alberta, Agricultural carbon offsets—Overview (2020). Retrieved from:* https://www.alberta.ca/agricultural-carbon-offsets-overview.aspx

community to share tools, resources, knowledge and success stories. This approach encourages farmers to pursue profitable, innovative and sustainable agricultural practices.

In terms of on-farm energy production, in addition to wind and solar installations, biogas production from manure offers a significant opportunity for farmers to generate additional income, mitigate methane emissions and produce a high-quality organic fertilizer. Municipalities can play an important role in the establishment of agricultural biogas systems by streamlining the approval process for anaerobic digesters and energy generation installations, as well as providing resources and networks for farmers wishing to engage in these projects. At the individual farm level, biogas production opportunities in Canada are currently limited due to the lack of provincial and territorial enabling policies and regulations (such as Ontario's Feed-in Tariff program which purchased electricity generated from biogas-fueled combined heat and power units). In the absence of such policies, biogas producers are now turning to the production of renewable natural gas. However, upgrading biogas to renewable natural gas that can be injected into the local natural gas distribution grid requires upgrading facilities—which can be costly. The formation of biogas farmer cooperatives is therefore emerging as a solution to these obstacles. These cooperatives allow for higher volumes of biogas to be gathered from multiple farms through shared transportation and upgraded infrastructure.

Warwick, Quebec: Coop Agri-Énergie Warwick
Population: 4,766

Coop Agri-Énergie Warwick is the first agricultural cooperative in Canada dedicated to producing renewable natural gas. Established in Warwick and involving a dozen agricultural producers, the project will deliver manure, liquid manure and organic waste from the farms of these producers (as well as other businesses in the region) to a biomethanation facility that will inject enough renewable natural gas into the natural gas grid to heat 1,000 homes (2.3 million m^3).* The project is fully endorsed by the municipality and is supported through its environmental policies.

The project will take about 25,000 tonnes of farm slurry and manure as well as 25,000 tonnes of agri-food waste and municipal and industrial sludge, allowing the farmers to diversify their income streams while reducing GHG emissions by 6,500 $tC0_2e$ per year. A 20-year contract with the Montreal-based natural gas company Energir has been secured for the purchase of the renewable natural gas.** The project was made possible through a wide range of technical and financial partners, including the Government of Quebec, Desjardins Group, Investissement Québec, Fondaction, the Réseau d'investissement social du Québec, La Coop fédérée (now Sollio Cooperative Group), and the Conseil québécois de la coopération et de la mutualité. The project's design and construction is being led by Génitique, an experienced biomethanization developer.

* Energir, "Coop Agri-Énergie Warwick: a sustainable new business model for the agricultural sector" (2019). Retrieved from: https://www.energir.com/en/about/media/news/premiere-cooperative-agricole-dediee-production-energie-renouvelable/

** Glacier Farm Media, "Quebec ag co-op to power up on dairy cattle manure" (2019). Retrieved from: https://www.agcanada.com/daily/quebec-ag-co-op-to-power-up-on-dairy-cattle-manure

Natural resource development

Many communities rely on Canada's extensive natural resources for their livelihood and well-being. While being responsible for a significant share of GHG emissions (heavy industry and the oil and gas sector account for 37 percent of national emissions[72]) these industries are also some of the most impacted by the effects of climate change. The devastating impacts of a warming climate have been felt throughout the forestry, fishing and mining industries, as detailed in Section 2. The following sections will discuss climate change mitigation opportunities in the mining and industrial sectors, the forestry sector and the tourism sector.

Mining

Canada's land is vast and rich in mineral resources, so it is not surprising that mining makes up a significant portion of its economy (five percent of GDP in 2018[73]) and even plays a role in our infrastructure and food production. Canada is one of the largest producers of minerals and metals in the world with almost 200 mines and 6,500 quarries—with total production valued at $47 billion in 2018.[74]

Mining for substances other than oil and gas accounted for 0.7 percent of Canada's total emissions in 2018, or 4.9 million $tC0_2e$. While this may not seem large in comparison to other sources of emissions in Canada such as the oil and gas sector or transportation, in a small community, a significant portion of emissions within municipal boundaries can come from mining and other industrial activities, such as manufacturing, steel mills, smelters and refineries.

As is the case with many industries, mining not only contributes to climate change but is also threatened by it. The mining industry is already beginning to feel the impacts of climate change, including:

- loss of ice roads and shorter ice road seasons, affecting supply lines to northern mining sites
- increased dust emissions from warmer and dryer conditions
- increased rainfall and snowfall that raises the cost of drying mined materials and sieving rock
- more extreme weather events that may damage mining equipment
- lack of water for processing
- shorter winters which could have a positive impact on the operating season of the mine

Further discussion of the impacts of climate change on the mining sector can be found in the David Suzuki Foundation's report, Climate Change and Canadian Mining: Opportunities for Adaptation.

While much climate adaptation will be required by the mining sector, mining companies also have a large incentive to reduce GHG emissions and energy consumption, as this produces significant operational efficiencies that improve their bottom line. In recognition of the impacts of climate change as well as the benefits of climate action, many mines have begun implementing GHG reduction and energy management plans. For example, Goldcorp's Borden mine is a leading innovator in the sector, with a plan to create the world's first all-electric mine. Other examples of climate change initiatives in the mining sector can be found through the Mining Association of Canada.

72 *Environment and Climate Change Canada,* National inventory report: Greenhouse gas sources and sinks in Canada *(2020).*
73 *The Mining Association of Canada, "Mining Facts." Retrieved from:* https://mining.ca/resources/mining-facts/
74 *Natural Resources Canada, "Minerals and the economy" (2019). Retrieved from:* https://www.nrcan.gc.ca/our-natural-resources/minerals-mining/minerals-and-economy/20529

Sudbury, Ontario: Community Energy and Emissions Plan

Sudbury's Community Energy and Emissions Plan recognized that the industrial and mining sectors are increasingly tracking energy and emissions and are already shifting toward electric vehicles, more efficient motors and processes, and lower-carbon activities. There is also a natural incentive for the industry to implement energy reduction measures in order reduce operational costs. To this end the municipality has set a goal to increase industrial energy efficiency by 35 percent. Sudbury seeks to partner with mining companies to encourage the setting of timelines and targets for process and motor efficiency improvements to help them meet emissions reduction targets. The goals of the plan are to be achieved primarily through the establishment of an industry energy-efficiency working group composed of industry stakeholders that meets quarterly to disseminate knowledge and discuss actions, implementation plans, timelines and lessons learned. To meet the goal of net-zero emissions by 2050, the mining industry will have to have a 100 percent electric vehicle (EV) purchase rate for all new vehicles by 2030 and will need to increase process and motor efficiency by 50 percent. Group purchasing agreements for EVs across the mining sector are to be encouraged. Industry-specific EV campaigns, as well as education and awareness raising campaigns can also provide guidance on costs and benefits and cite industry precedents.

Where a municipality can influence

Regulation of the mining sector falls under federal, provincial and territorial jurisdictions, therefore municipal power to create regulations that require consideration of climate change is limited. However, where a mine falls within municipal boundaries, municipal zoning bylaws must be adhered to, which can allow the municipality to apply conditions to the use of land for mining and extraction. It is important to note that provincial or territorial legislation varies with regard to a municipality's ability to regulate the mining sector within municipal boundaries. In BC, for example, municipal attempts to regulate the mining sector have resulted in legal challenges.[75]

While this section of the guidebook focuses on the mining industry, municipalities can work with other local industries in much the same way—by developing partnerships; encouraging best practices, research and demonstration projects; creating support networks and working groups; and working together to establish energy and emissions reduction targets.

In addition to leveraging local policy or zoning regulations, the municipal role in reducing GHG emissions in the mining sector is largely one of facilitation. Through partnership and engagement with industry, municipalities can encourage the development and implementation of energy management plans, the establishment of goals for reducing emissions and improving energy-efficiency, and the adoption of green technologies (see call-out box above on Sudbury's Community Energy and Emissions Plan). While this section of the guidebook has focused on the mining industry, municipalities can work with other local industries in much the same way—by developing partnerships; encouraging best practices, research and demonstration projects; creating support networks and working groups; and working together to establish industrial energy and emissions reduction targets.

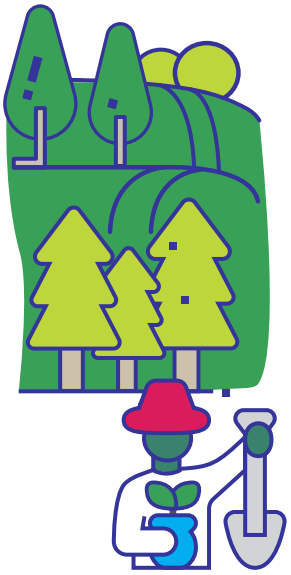
Forestry and natural areas

Forests make up a large part of Canada's natural areas and are important for recreation and employment as well as for the range of ecosystem services they provide. In 2018, forestry employed approximately 210,600 people across the country. It is the main source of employment and revenue for 300 Canadian municipalities.[76] Forests also provide indirect sources of income to communities, as they can attract tourists. In addition, the recreational and

75 *Global Legal Group,* Mining Law 2020 *(Seventh Edition, 2020). Retrieved from:* https://www.lawsonlundell.com/media/news/596_Canada%20Chapter%20The%20International%20Comparative%20Legal%20Guide%20to%20Mining%20Law%202020.pdf

76 *Natural Resources Canada, "How does the forest sector contribute to Canada's economy?" (2020). Retrieved from:* https://www.nrcan.gc.ca/our-natural-resources/forests-forestry/forest-industry-contribute/16517

health benefits to residents of having access to nature are well documented.[77] Forestry is clearly an economic and cultural foundation for many communities, but it is also one of the sectors most affected by climate change and most vulnerable to its impacts. Many visible effects have already been documented, including changes in the frequency and severity of disturbances (i.e. fires, drought, severe storms, pests and disease) as well as less visible changes such as the timing of spring bud burst.[78] Depending on the location, these impacts have both negative and positive implications for forest productivity, the composition, distribution and structure of forest ecosystems, and the available timber supply.



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300

Canadian municipalities.

As a result of natural processes (such as fire, insect infestations and tree growth) and human activities (such as harvesting, afforestation and deforestation) forests can be significant as both carbon sources and sinks.[79] The potential for climate change mitigation depends on how forests are managed. Primary mitigation activities include increasing forest area, increasing stand and landscape-level carbon density through forest management activities, and using harvested wood products that store carbon and displace other emission-intensive materials (such as concrete, steel, plastics and fossil fuels).[80] Mill byproducts and residues such as bark, shavings and sawdust can also be used as a renewable source of fuel to displace carbon-intensive fossil fuels in the production of wood products or in the heating of buildings in the wider community (such as through biomass district energy systems as discussed in Section 3.1).

Where a municipality can influence

Canada has approximately 400 million hectares of forest or other wooded land, 92 percent of which is publicly owned.[81] The federal, provincial and territorial governments are responsible for sustainable forest management laws and regulations. Municipal climate action in the forestry sector has primarily centred around urban forest management strategies, partnership with the forestry industry to encourage more sustainable management

77 *Mathew P. White, et al., "Spending at least 120 minutes a week in nature is associated with good health and wellbeing,"* Sci Rep *9, 7730 (2019).*

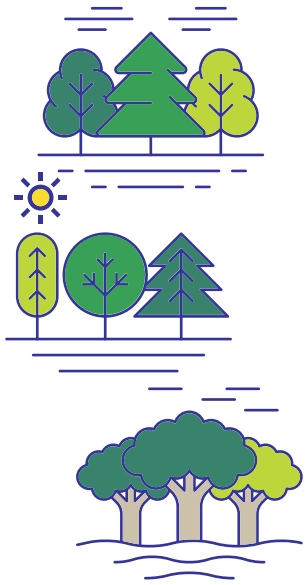
78 *Sustainable Forest Management Network,* Climate change and Canada's forests: from impacts to adaptation *(2009). Retrieved from:* https://cfs.nrcan.gc.ca/publications?id=29616#:~:text=Climate%20change%20is%20already%20affecting,bud%20burst%20are%20also%20underway.

79 *Natural Resources Canada, "Climate change impacts on forests" (2016). Retrieved from:* https://www.nrcan.gc.ca/climate-change/impacts-adaptations/climate-change-impacts-forests/mitigation/13097

80 *C. E. Smyth,* et al., *"Climate change mitigation in Canada's forest sector: a spatially explicit case study for two regions,"* Carbon Balance Manage, *13, 11 (2018).*

81 *Natural Resources ources Canada, "Canada's Forest Laws" (2020). Retrieved from:* https://www.nrcan.gc.ca/our-natural-resources/forests-forestry/sustainable-forest-management/canadas-forest-laws/legality-and-sustainability/13303

techniques, and energy and GHG reduction a ctivities throughout the harvesting and manufacturing process, as well as the establishment of community forests.



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Urban forests are made up of all trees and treed landscapes within a community, on both public and private lands. Even in rural communities, urban forests can play an important role in sequestering carbon, providing shade that reduces the need for energy consumption, and improving quality of life for residents.[82] Urban forests also produce numerous other co-benefits, including increased property values, increased community well-being and pride, and prolonged pavement life. However, there is a lack of awareness around the benefits of urban forests and a lack of funding for urban forest initiatives. Urban forests may face resistance, mainly related to issues like wildfire management, conflicts with overhead utilities, underground root systems, property damage from falling trees, and attraction of bears, raccoons, deer or other wildlife. To help local governments overcome these challenges, various tools are available to assist with inventory and mapping, so that municipalities can make calculated decisions when it comes to planting urban forests. These tools also can help municipalities assess and communicate the range of community benefits urban forests provide. For a full discussion of the challenges, benefits and available tools, please see Planting our Future: A Tree Toolkit for Communities by the Union of British Columbia Municipalities.

Different from urban forests, community forests are forestry operations run at the community level and based on community values. Emerging in Canada in the 1990s, community forests have developed in response to a desire for more local control and community involvement in the forest industry, as well as increased local ownership over the monetary and non-monetary gains generated by them.[83] Community forests have a wide variety of tenure types, property rights regimes, and organizational structures, but they tend to be based on three key fundamental elements: community control, local benefit and sustainable forest management.[84] While each arrangement is unique in its details, there are four broad types of community forest arrangement:

1) local-government-owned land (fee simple land)
2) conservation authority
3) local government on crown land
4) forest organization

82 *Union of British Columbia Municipalities.* Planting our Future: A Tree Toolkit for Communities *(2008). Retrieved from:* http://www.toolkit.bc.ca/sites/default/files/Plantingourfuture.pdf

83 *C. E. Smyth, et al.,* "Climate change mitigation in Canada's forest sector: a spatially explicit case study for two regions," Carbon Balance Manage*, 13, 11 (2018).*

84 *Sara Teitelbaum, Tom Beckley and Solange Nadeau, "A national portrait of community forestry on public land,"* The Forestry Chronicle*, 82, 3 (2006).*

Municipalities can also more broadly support and encourage naturalization initiatives. These initiatives can include the expansion of green spaces, tree planting programs, protection and enhancement of biodiversity, the use of native plant species, and creation of pollinator habitats on public and private lands. Municipalities can encourage such initiatives by integrating new guidelines and policies into official planning documents, processes, bylaws and building development standards or requirements (see Section 3.3). Municipal partnerships with landowners, conservation authorities, and other local conservation organizations will be essential to creating and implementing these policies and guidelines. Clarington's Trees for Rural Roads Program is a good example of a municipal tree-planting program supported by various conservation organizations. The program resulted in the planting of 588 native tree saplings and 50 native shrubs in 2020.

Mapping of natural assets and inclusion of natural assets in overall asset management strategies are also valuable exercises for a community to undertake. These activities establish a baseline that forms a foundation to measure changes in land use over time as well as informing the development of management plans, inventories and evaluations of natural assets, green spaces, wetlands, ecosystems, and ecosystem goods and services.[85]

See the following FCM resources and case studies on natural asset management for more information:

- Primer on Natural Asset Management for FCM's 2018 Sustainable Communities Conference
- Measuring the Value of Natural Assets
- Local governments incorporate ecosystem needs into infrastructure plans

Rural communities with extensive natural assets can especially benefit from payments for ecosystem services. This approach attributes value to natural or semi-natural systems that provide carbon sequestration and other ecosystem services. It also allows for local farms and pastures with wood stands, wind breaks and wetlands to be valued for the services they provide. Funding for payments for ecosystem services has traditionally been provided by governments, however newer programs aggregate funds from a variety of public and private sources. Funding sources will vary depending on the jurisdiction and can include conservation funds, private foundations, provincial or territorial tax incentives, the municipal tax base and conservation offsets. Other methods for funding conservation and increasing carbon sequestration include the sale of carbon offsets from the enhancement and restoration of natural areas. Examples include the Escarpment Biosphere Conservancy in Ontario, and the Cheakamus Community Forest in Whistler, BC, (discussed below on page 50).

For further information on ecosystem services and payment mechanisms in Canada please see the following resources:

- Ecosystem Services Toolkit (Value of Nature to Canadians Study Taskforce, 2017)
- Advancing the Economics of Ecosystems and Biodiversity in Canada (Sustainable Prosperity, 2011)
- ALUS Canada

85 *ICLEI, "Biodiversity in cities: How natural asset mapping helps cities protect livelihoods and address climate change impacts" (2019). Retrieved from:* https://talkofthecities.iclei.org/biodiversity-in-cities-how-natural-asset-mapping-helps-cities-protect-livelihoods-and-address-climate-change-impacts/

Whistler, British Columbia: Cheakamus Community Forest
Population: 11,854

In Whistler, BC, an innovative approach to community forest management is being implemented that quantifies the amount of carbon stored in the forest and compares it to emissions from forest management activities, to generate carbon offset credits. The Cheakamus Community Forest (CCF) was created in 2009 when the tenure rights for the timber harvest volume around Whistler became available. Two neighbouring First Nations and the municipality of Whistler partnered to establish a 25-year community forest tenure agreement with the Province of BC to harvest and manage the forest.* The CCF consists of 33,000 hectares and is managed using an ecosystem-based management approach. Under this approach, more parts of the forest with community and ecosystem value—such as streams, views, recreation and old growth—are protected, with 15,000 hectares completely protected from logging. An average of 40 hectares of forest is allowed to be harvested per year.

CCF partnered with the Brinkman Group and Ecotrust Canada to develop a carbon offset project, quantifying the baseline and calculating the climate benefits of the forest over a 100-year life cycle. This includes the carbon stored in the forest as well as the emissions from forestry management practices and carbon stored in forest products. As a result of this accounting, in 2015 the CCF registered its first tranche of carbon offsets, totalling 44,000 tonnes, with the majority being sold to the BC government and the rest to voluntary buyers. The carbon reductions needed to create the offsets were generated by reducing baseline harvest by 50 percent. The revenue generated by the sale of offsets has been integral to maintaining lower harvest rates and more expensive sustainable forest management methods.**

* Resort Municipality of Whistler, "Cheakamus Community Forest" (n.d.). Retrieved from: https://www.whistler.ca/services/environmental-stewardship/cheakamus-community-forest

** Brinkman Climate, "Cheakamus Community Forest Carbon Offsets" (n.d.). Retrieved from: https://www.brinkmanearthsystems.com/sites/default/files/atoms/files/CCF%20Carbon%20Offset%20Project%20Briefing.pdf

Revelstoke, British Columbia: Integrated Sustainability Plan
Population: 7,547

Revelstoke's Integrated Sustainability Plan takes a comprehensive approach to forestry with the goal of maintaining a strong forest sector by implementing safe and sustainable forest practices and exploring opportunities to add value to products. The municipality itself owns and manages a 120,000 hectare community forest through the Revelstoke Community Forest Corporation and markets the logs at a sorting facility near the town. The community forest is certified for sustainable management through an independent third-party certifier—the Sustainable Forestry Initiative (SFI).

The city also works with the Revelstoke Forest Workers Society to maintain open communication between the forest sector, the community, and the government. In 2011, Revelstoke implemented the City Wood First Policy, which promotes the use of wood in municipal construction projects and other government building, reducing carbon emissions by using local supply first and by replacing other carbon-intensive building materials.

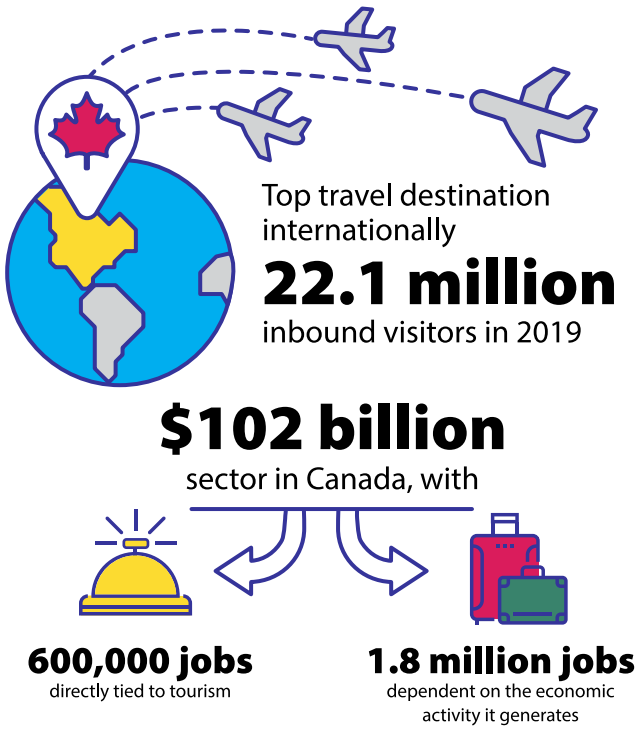
In addition, the town is home to a biomass district energy system that burns wood waste from the local Downie Timber Sawmill. This energy system creates steam for the drying kilns at the mill and hot water for space and water heating in city buildings and downtown businesses. In partnership with Downie Timber, the town is investigating other uses for wood waste, including holding innovation nights to discuss options for creating more locally produced wood products.

* Revelstokes Integrated Sustainability Plan, (2012). Retrieved from: https://revelstoke.ca/437/Key-Reports-Documents

Tourism

Canada continues to be a top travel destination internationally, with Statistics Canada reporting 22.1 million inbound visitors in 2019, the sixth consecutive year of tourism growth in Canada.[86] Tourism is a $102 billion sector in Canada, with 600,000 jobs directly tied to tourism and 1.8 million jobs dependent on the economic activity it generates. Canada's small and rural communities have natural assets that make for great tourism and recreation opportunities. Capitalizing on these has become an important economic diversification and revitalization strategy for many Canadians. However, since tourism relies on travel, sometimes by air, it also generates a significant amount of GHG emissions. While air travel falls outside the scope of municipal climate action, local governments can target other tourism-related areas to reduce GHGs, such as on- and off-road transportation, energy consumption and waste produced from tourist accommodations.

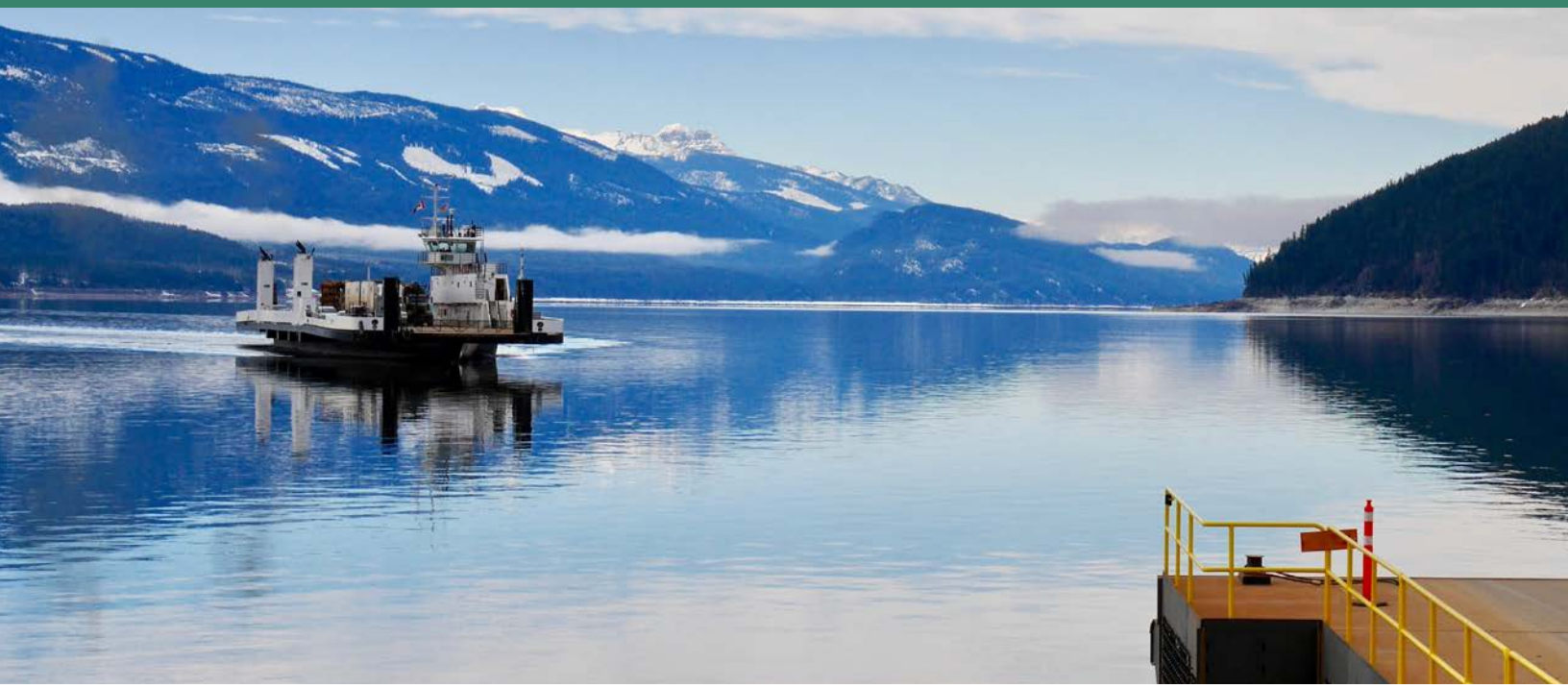
As tourism continues to grow in Canada and municipalities continue to develop and promote tourism opportunities, it is important to consider the climate impacts of these increased activities. Tourism in small and rural communities relies on the abundance and health of the local natural assets such as forests, mountains and water bodies. As a result, it also stands to be one of the sectors most impacted by climate change. In general, cold-weather activities such as those related to winter sports and ski hills are at the most risk, while there may be increased opportunities for warm-weather activities, provided that adequate adaptation measures are in place.[87] While it is clear that the tourism sector must adapt to the increasingly evident impacts of climate change, and sustainable tourism continues to be a growing subsector, there has been little recorded action in Canada to mitigate GHG emissions in this sector.[88]



86 *Tourism Industry Association of Canada, "Canadian tourism reaches new milestone with 22.1 million inbound visitors" (2020). Retrieved from:* https://tiac-aitc.ca/cgi/page.cgi/_zine.html/TopStories/Canadian_tourism_reaches_new_milestone_in_2019_with_22.1_million_inbound_visitors

87 *Micah J. Hewer and William A. Gough, "Thirty years of assessing the impacts of climate change in on outdoor recreation and tourism in Canada,"* Tourism Management Perspectives, *26 (2018) pp. 179-192.*

88 *Rachel Dodds and Sonya Graci, "Canada's Tourism Industry—Mitigating the Effects of Climate Change: A lot of Concern but Little Action," Tourism and Hospitality Planning & Development, 6:1 (2009).*



Where a municipality can influence

Sustainable tourism (and as a subset, ecotourism) represents a growing market.[89] However, to date, sustainability in the tourism sector has mostly been industry-led, whether through the adoption of renewable energy, increased energy efficiency and greater use of local resources (such as in ecolodges), or broader initiatives such as the Hotel Association of Canada's Green Key Program.

Sustainable tourism and ecotourism

While many definitions of sustainable tourism exist, it its root is can be defined as the development of a region's tourism industry in such a way as to not damage or deplete the resources that make the region attractive to tourists.

Ecotourism can be considered a subset of sustainable tourism in that it also seeks to minimize its impact on the environment, but is more specifically defined as "responsible travel to natural areas that conserves the environment, sustains the well-being of the local people, and involves interpretation and education."*

* The International Ecotourism Society, "What is Ecotourism?" https://ecotourism.org/what-is-ecotourism/

89 *Destination British Columbia,* Sustainable Tourism: The essential guide to operating an environmentally sustainable tourism business in BC *(2015). Retrieved from:* https://www.destinationbc.ca/content/uploads/2018/08/Susantainable-Tourrism-TBE-December-2015.pdf

As sustainable tourism relies on reducing the environmental impact of travel, implementing broad sustainability and climate initiatives in the community can support sustainable tourism operations. For example, by implementing energy-efficiency and renewable energy projects, sustainable and active transportation, local food sources, and environmental conservation efforts, the range of sustainable options available to tourists is increased. Furthermore, municipalities can integrate sustainable tourism into their overall goals and objectives for the community—by establishing strategic priorities, economic and tourism action plans and vision statements, and a sustainable tourism advisory committee.

As facilitators, municipalities can work with tourism operators to develop sustainable tourism options. For example, municipalities can publish guides on how to explore without a car and can ensure that alternative transportation options are well-promoted and easily accessible. The feasibility of installing electric vehicle (EV) charging stations in parking lots can also be investigated. This can bring more tourists with EVs into the municipality and would increase the viability of renting EVs for day trips around the region. Temaskaming Shores, Ontario, did this as part of its Municipal Energy Plan. In Banff, Alberta, the climate action plan seeks to enforce anti-idling bylaws (particularly for tour buses), develop "park and ride" facilities, and encourage energy efficiency and sustainable practices in tourist accommodations.

Municipalities can also work with local tourism operators to ensure that they have access to the resources and information they need to understand the business case for greening their operations and to encourage them to achieve sustainable tourism certification. In Canmore, Alberta, the municipal Climate Action Plan encourages and supports all tourism operators and accommodations to conduct energy audits and implement recommended upgrades. Furthermore, sustainability initiatives can themselves generate educational tourism opportunities such as through agritourism, guided tours of innovative renewable energy installations and green buildings, and visits to conservation areas or community forests.

4 Stories and experiences from Canadian municipalities

Small and rural communities from coast to coast to coast have been showing leadership and taking initiative when it comes to climate action. The case studies linked below illustrate this point and are meant to accompany this guidebook. While there are other examples used throughout this guide, each case study below highlights a climate project and includes a municipal profile, project background and description, a description of challenges faced, and success factors and positive outcomes. We encourage you to read about what these Canadian municipalities have achieved.

- County of Colchester, Nova Scotia: Solar Colchester
- Town of Canmore, Alberta: Green Building Regulations
- City of Campbell River, British Columbia: Power Down Campbell River energy rebates
- City of Rimouski Quebec: Taxibus demand-responsive public transit model
- City of Plessisville, Quebec: Electric cars, vehicle sharing and the SAUVÉR project
- District of Clearwater, British Columbia: Road cross-section bylaw
- Ville de Mont-Saint-Hilaire, Quebec: Transit-oriented development
- District Municipality of Ucluelet, British Columbia: Smart growthprinciples and density bonusing
- City of Sault Ste. Marie, Ontario: Community revitalization project, Future Sault Ste. Marie
- City of Stratford, Ontario: Pay-as-You-Throw (PAYT) program
- District Municipality of Whistler, British Columbia: Re-Use-It/Re-Build-It centres

Know of a case study that should be featured on our website? Please submit it to www.pcp-ppc.ca

5 Conclusion

Meeting Canada's climate targets and new net-zero commitments will require national cooperation. There is a need for action by all orders of government, and municipalities will play an integral role in this major transition. No municipality is too small to have an impact. The solutions and case studies discussed in this guidebook show how much can be done with limited resources. There are a wide variety of options, resources and considerations in the small and rural community context. While investment may be needed in infrastructure, transportation and energy systems, these projects can often build on locally available resources, create additional revenue opportunities and have various co-benefits for the community.

Municipalities need not tackle climate action alone; many allies can be found in local community groups, environmental organizations, and local business and industry. Other nearby municipalities may be interested in sharing costs on initiatives that will benefit all communities involved. Establishing partnerships with local industry and creating a shared understanding of the costs and benefits of climate action are key driving factors for success in reducing emissions in small and rural communities, as well as generating operational efficiencies for industry. A common theme across the case studies referenced in this guidebook is the importance of building political commitment, community vision and consensus for sustainability and climate action. Educating the public, real estate developers, industry, politicians and other stakeholders on the importance of climate action, as well as the many co-benefits it can generate, has been a key success factor in the implementation of almost all the initiatives presented here.

Municipalities across Canada are at different stages in their climate planning processes—some are just beginning, while others are setting new targets and developing updated GHG inventories and climate plans. Regardless of where you are in the climate planning process, a wealth of resources are available to help guide you and connect you with other municipalities and experts in the field.

The Partners for Climate Protection (PCP) program offers access to the PCP Hub, a peer-to-peer online network of municipal staff and elected officials. On the Hub, members can ask and answer questions, get advice and network with peers and experts, and learn about available climate action planning resources and funding opportunities. The PCP program also offers ongoing interactive workshops and resources for working through the PCP Milestone framework—including the PCP Milestone Tool, a web-based tool that helps municipalities create GHG inventories, set targets, build action plans and track implementation. We encourage you to build on the ideas, knowledge, resources and examples in this guidebook and explore how they can be used to catalyze action in your own community.

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