CLIMATE ACTION PLAN

DECEMBER 2021

wolfville

The preparation of this plan was carried out with assistance from the Government of Canada and the Federation of Canadian Municipalities. Notwithstanding this support, the views expressed are the personal views of the authors, and the Federation of Canadian Municipalities and the Government of Canada accept no responsibility for them.

LAND ACKNOWLEDGEMENT

The Town of Wolfville respectfully acknowledges that we are in Mi'kma'ki, the ancestral and unceded territory of the Mi'kmaq People. This territory is covered by the "Treaties of Peace and Friendship" which Mi'kmaq and Wolastoqiyik (Maliseet) People first signed with the British Crown in 1725. The treaties did not deal with surrender of lands and resources but in fact recognized Mi'kmaq and Wolastoqiyik (Maliseet) title and established the rules for what was to be an ongoing relationship between nations.

Foreword and Acknowledgements from the Mayor

Climate change is the defining issue of our time. In Wolfville, climate change poses risks to our safety, our health, wellbeing, and our economic prosperity. Climate change threatens the vitality of our ecosystem. The impacts we are experiencing today are largely influenced by human behaviours that emit greenhouse gases. While this may be a dark realization, it also means that it is within our ability as humans to reverse this change and reduce our emissions.

The Climate Action Plan explains the sources of Wolfville's greenhouse gas emissions and guides us on the path toward a low carbon future. When we choose this path, we can all contribute to an economically prosperous, healthy, just, and safe future for generations to come.

Town of Wolfville Council declared a Climate Emergency in May 2019, underscoring the Town's dedication to responding to the climate crisis. Prior to the declaration, the Town's Environmental Sustainability Committee advised Staff on key areas of concern and made the case for the need to hire a Staff member to complete this Climate Action Plan. Through funding obtained from the Federation of Canadian Municipalities (FCM), a Staff member was hired as the Town's Climate Change Mitigation Coordinator and work to complete the Partners for Climate Protection (PCP) Five Milestone climate action plan framework began.

This Climate Action Plan reflects work that started in 2018, including efforts made by our Planning Advisory Committee. Funding and support also came from Nova Scotia's Low Carbon Communities grant, multiple Councils and all Town Staff. Sustainability Solutions Group helped us understand our emissions and community attitudes and community behaviours were examined by Thinkwell Shift. Hundreds of community members dedicated time to complete online surveys, submit letters or emails, and engage with Staff during in-person events, with a significant portion of this engagement supported by Wolfville's summer students.

This is Wolfville's first Climate Action Plan. It addresses both mitigation and adaptation as we tackle this local and global crisis. We thank all members of the community for their valuable contributions to this Plan and we thank all stakeholders for their committment to ensuring a low carbon future.

The success of this Climate Plan depends on collective action and it must involve all community members. May we continue to inspire each other in our community climate action.

Mayor Wendy Donovan

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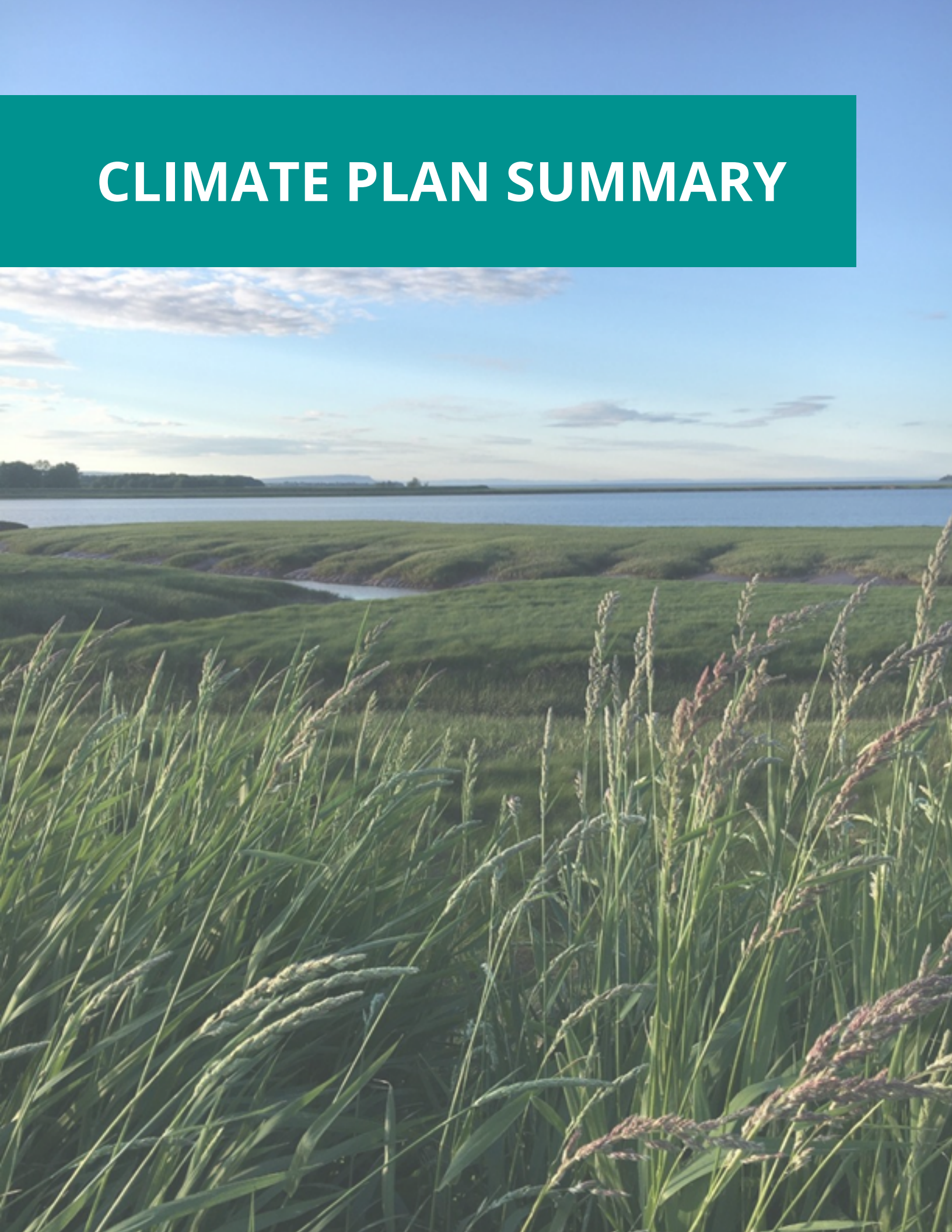
Appendices

Appendices are available on www.wolfvilleblooms.ca/climateplan

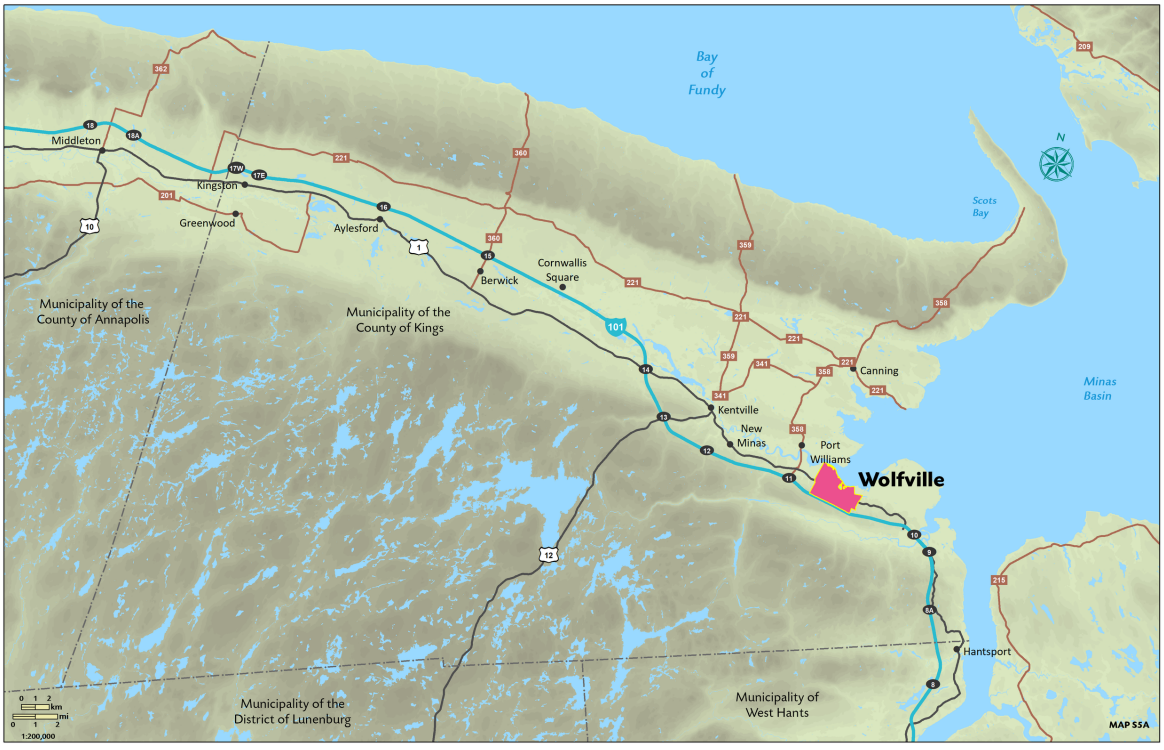
CLIMATE PLAN SUMMARY



PLAN SUMMARY

BACKGROUND

The Town of Wolfville Climate Action Plan has been developed in order to plan how the Town will strive for a low carbon future by the year 2050. It follows two and a half years of engagement with the community, Staff and Council to ensure this Plan accurately reflects our collective values. This plan acknowledges that immediate and robust action is required to meet our greenhouse gas emissions reduction targets and to protect against impending climate change impacts. Wolfville acknowledges that climate action is a community and regional effort, that all community members must act together for meaningful change. The Town of Wolfville aims to inspire drastic changes to our area's greenhouse gas emissions through actions that inspire community and region-wide behaviour and energy-use change. Climate Action is part of implementing the Town's Municipal Planning Strategy adopted in September 2020.

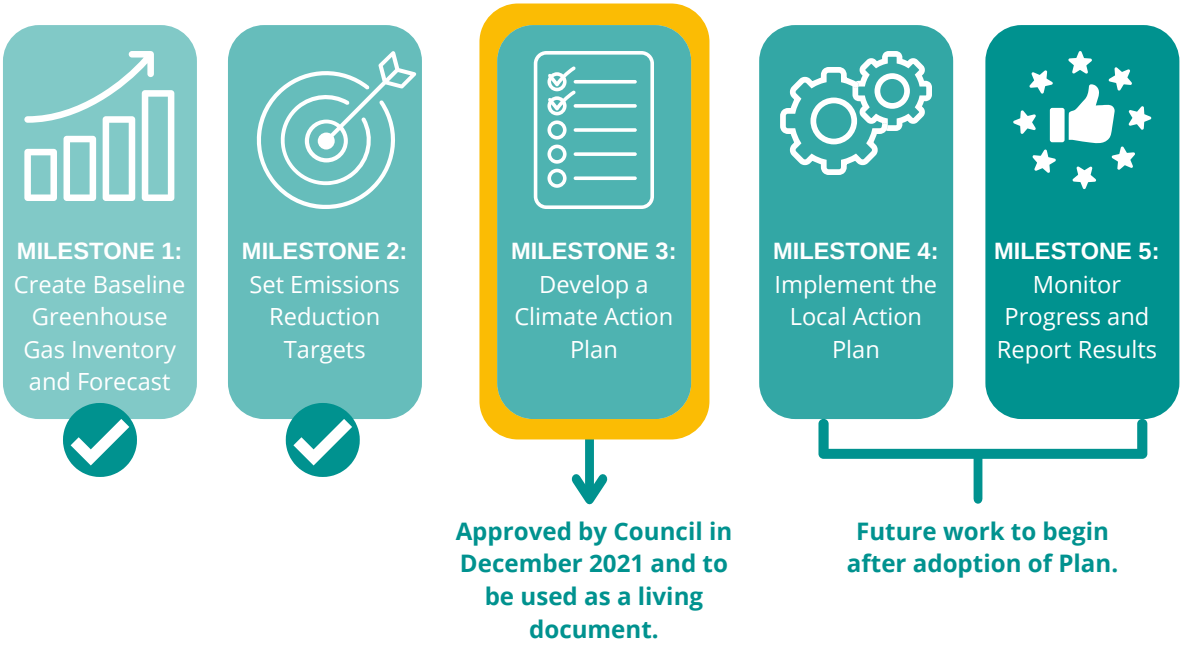


Wolfville is situated within the Municipality of the County of Kings, pictured above, which also includes the Towns of Kentville and Berwick. The Towns and Municipality in the region are working together to produce greenhouse gas emission inventories for all municipalities and a regional climate plan.

PLAN SUMMARY

HOW WE GOT HERE

In May 2019, Wolfville Town Council declared a **Climate Emergency** following pleas from concerned community members that greater action to reduce greenhouse gases was required in order to limit the effects of climate change. Following this declaration, a staff person was hired using funding from the Federation of Canadian Municipalities (FCM) to develop this Climate Action Plan, and work to complete the 5 Milestone program through the FCM's Partners for Climate Protection program began.



Climate change is also one of the Community Priorities of the Wolfville Municipal Planning Strategy (MPS). The community priorities are specific statements of what the Town intends to achieve through the MPS and provide further guidelines for how climate action will be taken through land use design. The Core Concepts of this priority are listed below:

Adaptation
Strategies and Actions that manage the impacts of climate change, including climate variability and extremes.

Mitigation
Strategies and Actions that reduce the emissions that cause climate change.

Ecological Footprint
The impact of human activities measured in terms of the area of biologically productive land and water required to produce the goods consumed and to assimilate the waste generated.

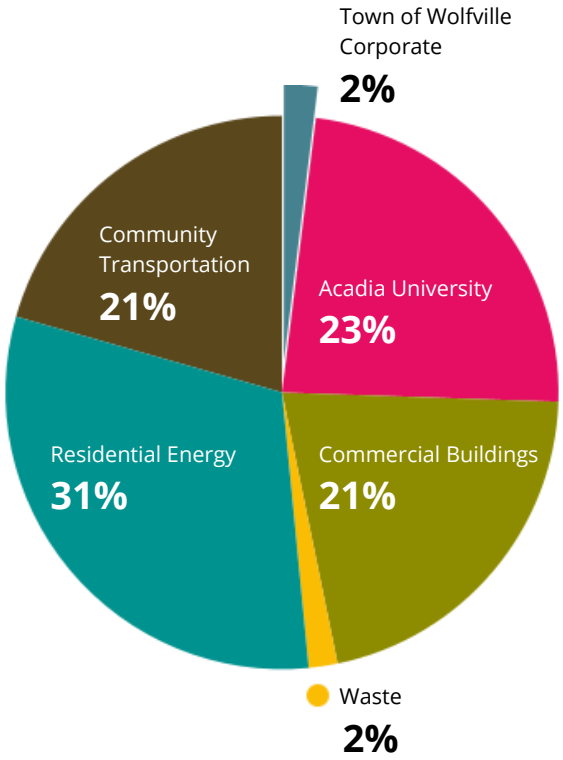
Energy Poverty
Individuals who are unable to afford the energy/fuel needed to maintain their life (a household that spends more than 10% of their income on home energy).

Clean Energy
Energy sources including solar, wind, water, geothermal, and bioenergy.

Active Transportation
Any form of human-powered transportation through many modes such as walking and cycling that encourage less vehicle transportation.

PLAN SUMMARY

The first milestone, completing a greenhouse gas inventory based off of the year 2016 was completed in April 2020 by consultants at Sustainability Solutions Group.



MILESTONE 1: Create Baseline Greenhouse Gas Inventory and Forecast

The second milestone, setting greenhouse gas emissions reductions targets was achieved in February 2021 when Wolfville Town Council resolved to set targets to reduce emissions by 45% by 2030 from 2016 levels, and to reach net-zero by 2050.

45% by 2030

NET-ZERO by 2050

MILESTONE 2: Set Emissions Reduction Targets

The creation and adoption of this Plan achieves the third milestone and the fourth and fifth will be achieved through the implementation of this Plan as a living document and through monitoring and reviewing actions for success over time.

PLAN SUMMARY

WOLFVILLE'S GREENHOUSE GAS EMISSIONS

The first step towards reducing Wolfville's greenhouse gas emissions is understanding where our emissions are coming from. The table below shows that most emissions (31%) in the Town come from residential energy use. This includes actions like using fossil fuels (oil and coal) for home heating, water heating, air conditioning and running electronics. The second greatest source of emissions is Acadia University (23% of all emissions), followed by commercial buildings and community transportation (21% each), with waste and corporate emissions from the Town contributing 2% each. Understanding the sources of greenhouse gas emissions in the Town allows us to create a Plan to reduce them.

31%	Residential Energy	20,172
23%	Acadia University	15,363
21%	Commercial Buildings	13,840
21%	Community Transportation	13,636
2%	Waste	1,099
2%	Town of Wolfville Corporate	1,238
100%	Total	65,348

What are greenhouse gases?

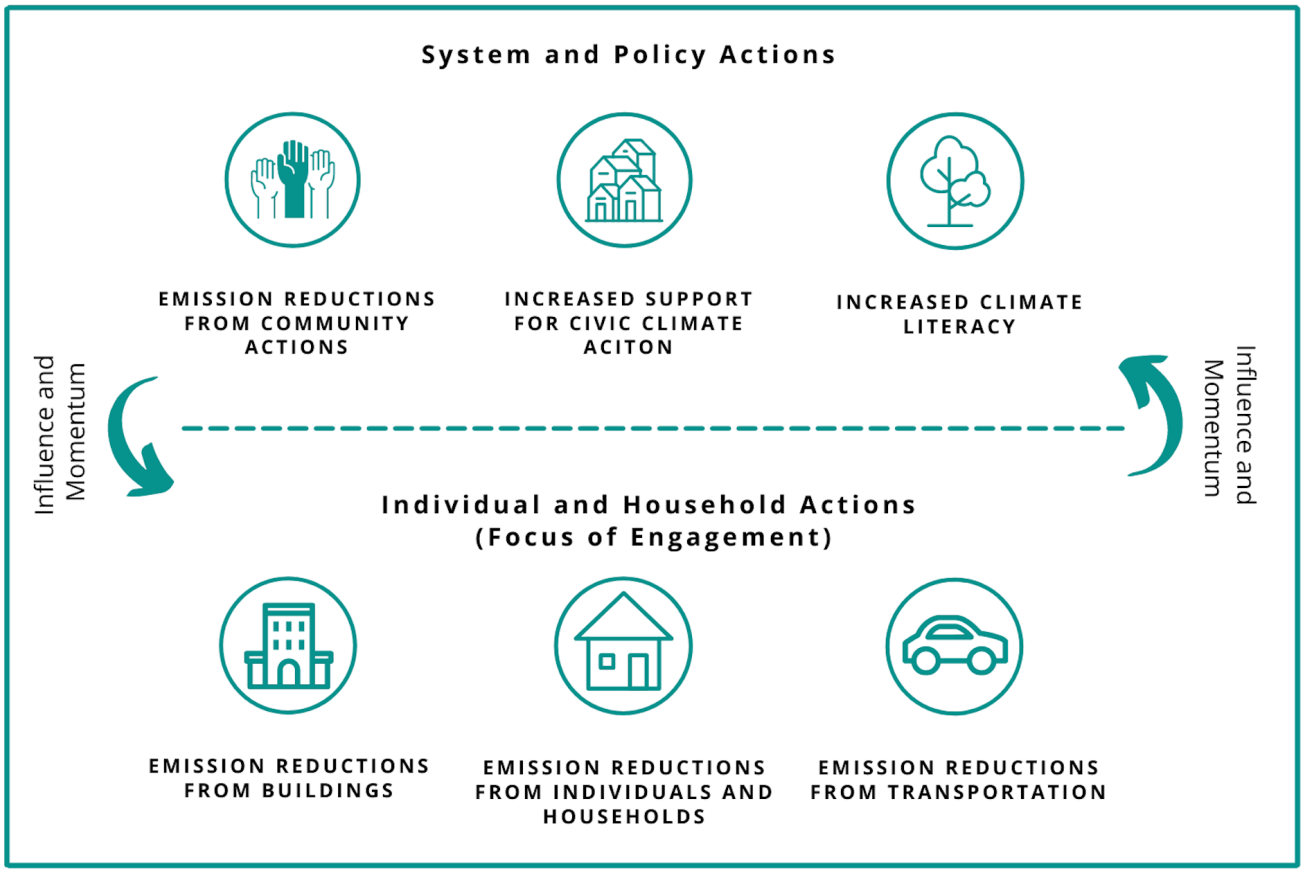
"greenhouse gases trap heat in the atmosphere and warm the planet. The main gases responsible for the greenhouse effect include carbon dioxide, methane, nitrous oxide, and water vapor (which all occur naturally), and fluorinated gases (which are synthetic)" (www.NRDC.org).

While the Town's corporate emissions are low, representing only 2% of the emissions, there are many actions the Town can take to help reduce community-wide emissions because the Town can influence where in the Town people live, how they travel, and how waste is managed among other actions.

PLAN SUMMARY

WE NEED A PLAN

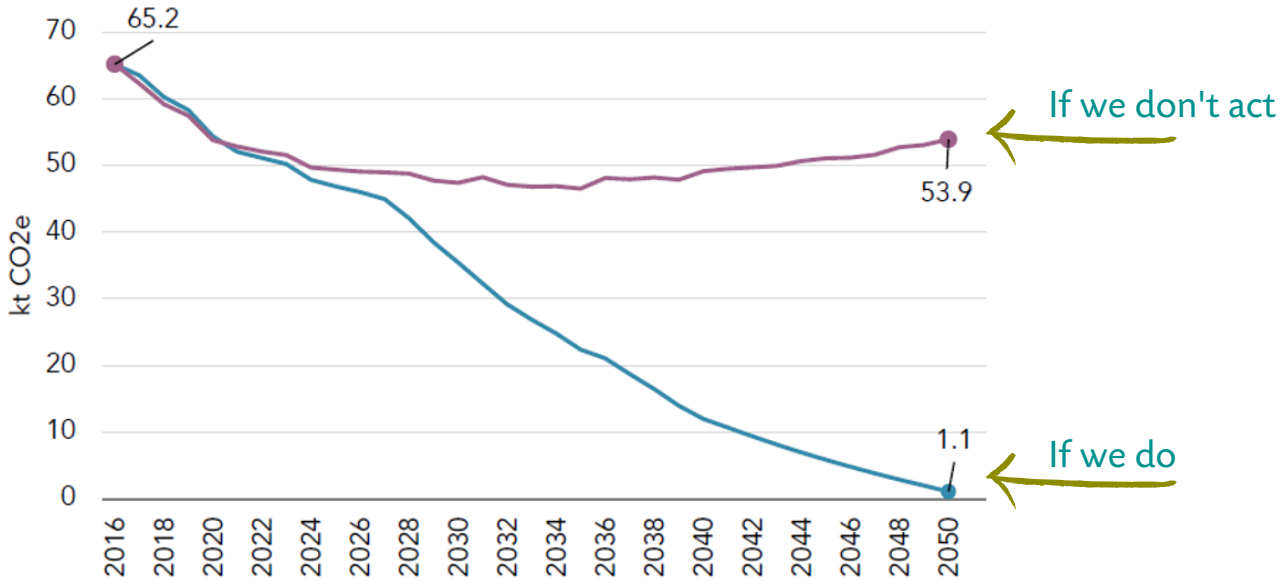
This Plan is prefaced on everyone doing their part to take climate action. That includes both individual actions as well as broader, systems change as illustrated in the graphic below. Reducing corporate emissions and community emissions allows Wolfville to meet our target of net-zero by 2050. Reaching these targets, however, will take considerable effort from all sectors in the community.



If we fail to act, our emissions will only be reduced by 17% by 2050, as outlined in this plan in the Business as Usual Scenario. In the Business as Usual Scenario, no effort is made to reduce greenhouse gas emissions. While there is a slight reduction in greenhouse gas emissions in this scenario due to an increase in uptake of electric vehicles and more renewable energy in grid electricity, we would fall significantly short of the net-zero target by 2050 needed to limit global warming to 1.5°C.

PLAN SUMMARY

This Plan is created as a living document, meaning that items will change or be updated as Council, Staff, and Stakeholders make commitments to reduce greenhouse gases and monitor the implementation of the Plan.



Wolfville's projected greenhouse gas emissions under a business as usual (purple) scenario, and a low carbon scenario (blue).

MILESTONE 4: Implement the Local Action Plan

MILESTONE 5: Monitor Progress and Report Results

PLAN SUMMARY

HOW WILL WE REACH OUR TARGETS?

This Plan outlines key actions that the Town will take in the short term (1-3 years) and identifies longer term actions that will allow us to reach a Low Carbon Future by 2050 through five core action areas and three supporting action areas. These action areas along with ongoing or planned actions to be taken over the next 3 years are:

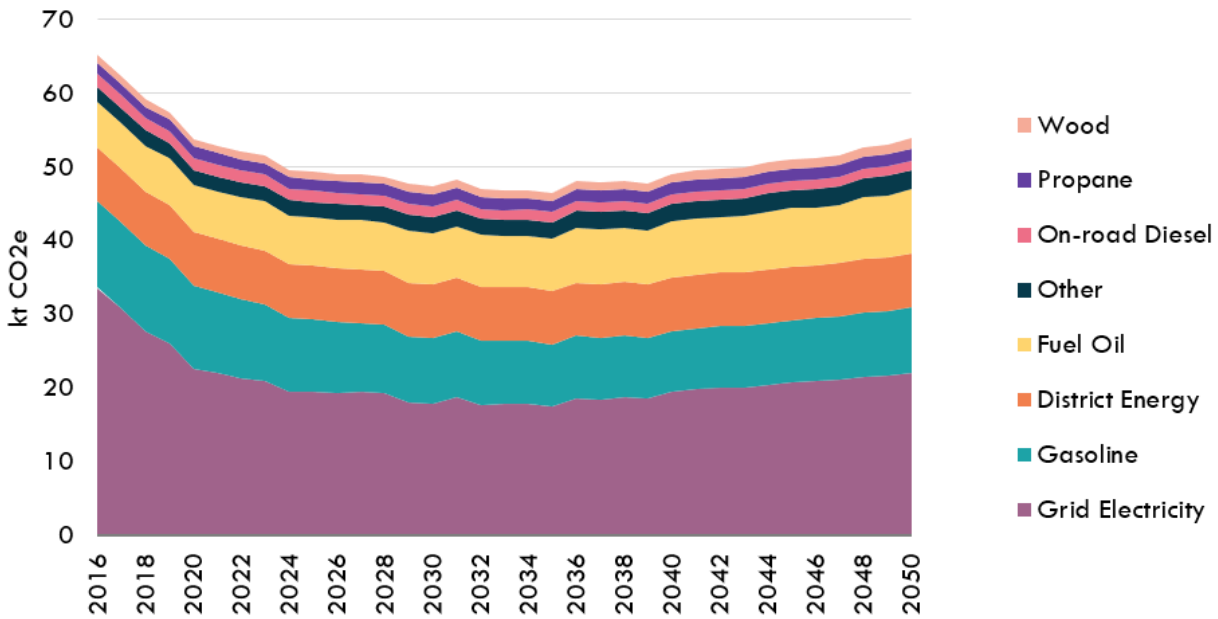
	ACTION AREA	SAMPLE ACTIONS
core actions	**ADAPTATION**	Implement Flood Risk Study, increase height of dyke walls to prevent flooding, upgrade infrastructure when repairing or replacing to better handle extreme weather events.
core actions	**NEW & EXISTING BUILDINGS**	Complete an energy use assessment of Town buildings, continue to incentivize residential energy efficiency through property assessed clean energy (PACE) or similar programming.
core actions	**COMPLETE COMMUNITIES & TRANSPORTATION**	Invest in all ages and abilities active transportation network to reduce reliance on personal vehicle use, explore public transportation options to increase ridership.
core actions	**WASTE, WATER & WASTEWATER**	Set a community-wide water conservation target, perform energy efficiency upgrade at water treatment plant.
core actions	**LOCAL RENEWABLE ENERGY GENERATION**	Install solar panels on all Town buildings, continue to incentivize residential solar uptake through PACE programming, explore opportunities for regional renewable energy generation.
supporting actions	**TOWN PARTNERS & COLLECTIVE MINDSET**	Encourage sustainable behaviours among all community members including Acadia University and award local businesses demonstrating sustainable actions, continue offering Earth Leadership camps.
supporting actions	**GOVERNANCE**	Assess capacity for local or regional Climate Action Coordinator position, support ongoing leadership of corporate climate culture, implement a remote work policy to reduce vehicular travel.
supporting actions	**REGIONAL COOPERATION**	Advocate as a region for system change and capacity and/or resources to other levels of government, Study potential impacts of a regional renewable energy utility.

PLAN SUMMARY

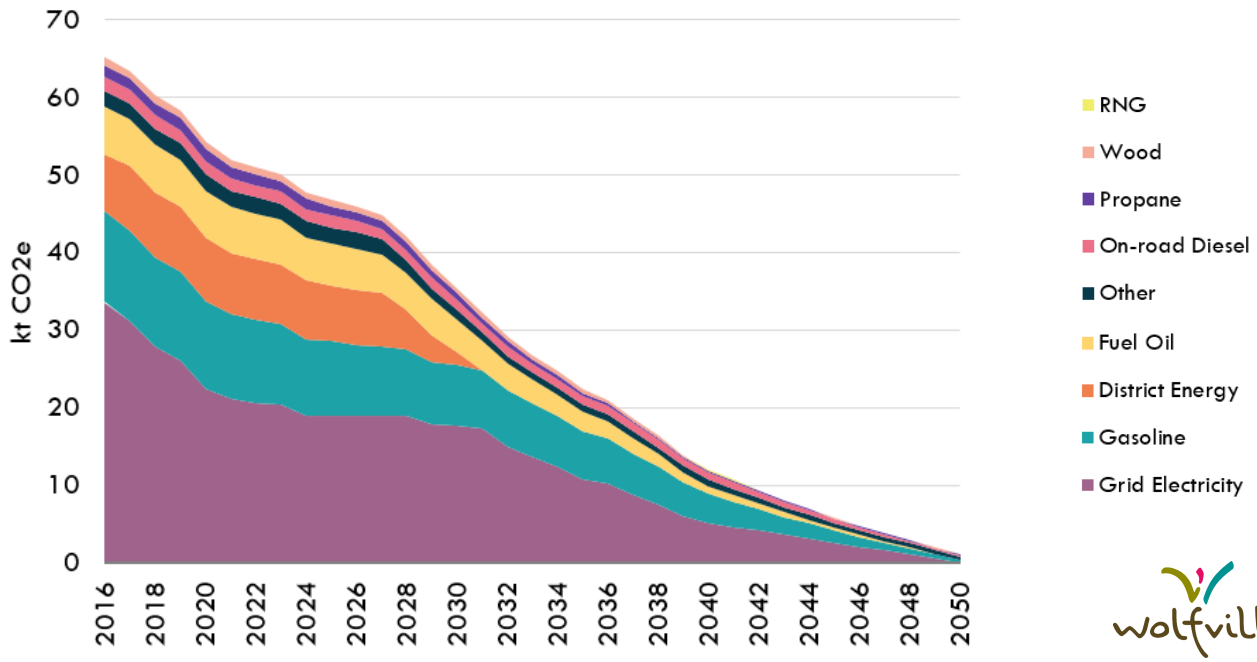
WHERE WILL OUR ENERGY COME FROM IN THE FUTURE?

This plan describes where energy will come from in order for Wolfville to continue to grow in terms of population while also reducing greenhouse gas emissions. This reduction, shown below, is a result of a switch away from fossil fuels, which emit greenhouse gases, to renewable energy sources like solar and wind, which do not emit greenhouse gases.

How do we get from here...

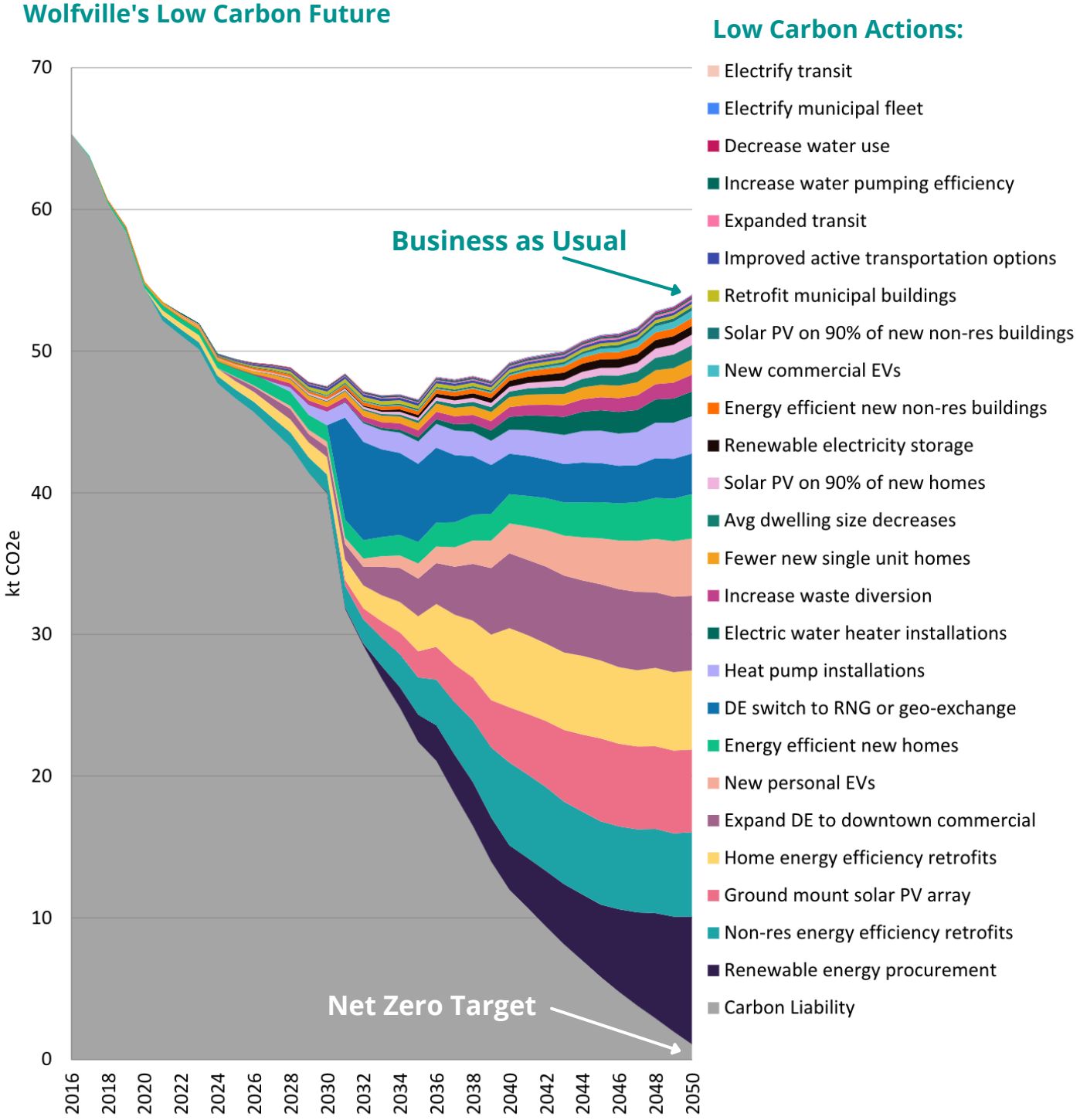


To here...



PLAN SUMMARY

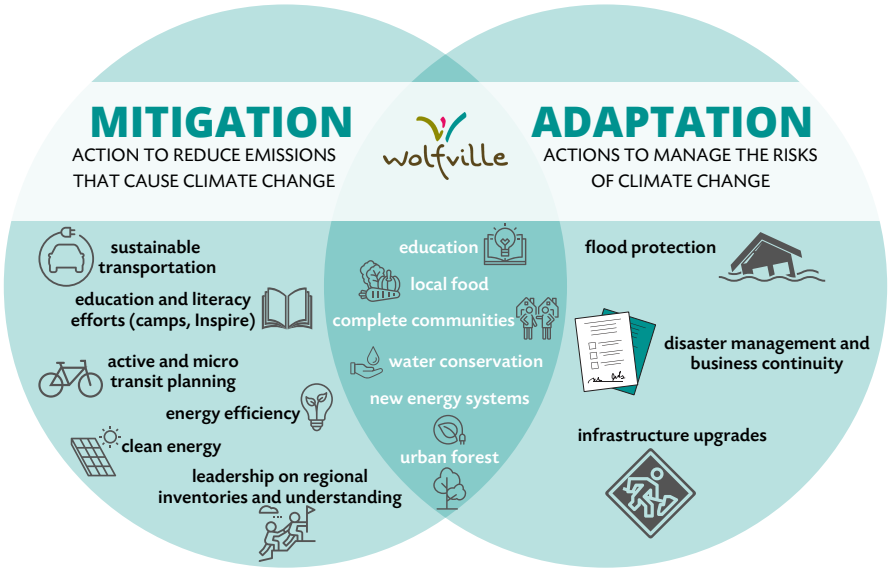
Wolfville's Low Carbon Future



Wedge diagram showing the relative emissions reductions of each action explored in the low-carbon scenario, 2016-2050. The top line of the graph represents total business-as-usual scenario emissions.

PLAN SUMMARY

This Plan focuses on actions that can be taken in three years. These include mitigation (preventative) and adaptation (reactive) actions as shown in the graphic below. Together, these actions help to reduce climate change causing greenhouse gas emissions and protect the Town from existing climate change impacts such as sea level rise and flooding.



The greatest impact the Town can have on climate action is through investments and influence as shown below. Investments in adaptation actions such as raising the dykes can help protect the community against climate change impacts such as sea level rise and flooding. Investments in infrastructure such as active transportation networks and public transportation can allow a greater number of community members to make sustainable choices such as using active transportation, reducing greenhouse gas emissions from travel. The Town can also influence energy use reductions through municipal planning strategy policies that encourage complete communities, allowing for greenhouse gas emissions reductions from the building energy sector. These actions that allow broad community reductions provide the greatest amount of reductions and are therefore central to this Plan.

Local government as...	Authority	Sample actions	Community energy & emissions planning techniques	Potential impact on GHG emissions reductions
Energy Consumers	Direct control	Municipal building retrofits, construction of high performance municipal buildings, purchase of zero emissions vehicles, development of renewable natural gas from organic materials	Corporate GHG inventory and plan	Low
Investors	Indirect control	Renewable natural gas from a landfill, zero emissions transit system, cycling infrastructure, electric vehicle charging stations, recycling programs, public/private partnerships	Situational analysis [review of capital budgets]	Medium-high
Influencers	Indirect control	Municipal Planning Strategy, Property Assessed Clean Energy (PACE) programs	Modelling and scenario-planning	High

CHAPTER 1. IMPLEMENTATION

IMPLEMENTATION

Three-year Implementation Plan

This Climate Action Plan begins with a three-year Implementation Plan. The purpose of this three year Implementation Plan is to outline the steps we can take now to get on track towards a low carbon future for Wolfville. This Implementation Plan outlines the actions that the Town of Wolfville can take over the next three years (2022-2025) to reduce greenhouse gas emissions and protect the Town against climate change impacts.

The actions that can be taken in the short-term are those that Council and Staff are ready and prepared to take on in terms of budgetary and staffing constraints. Some of these actions are those that will pave the way for further actions after 2025 when a new Council will review this plan and identify a new set of actions to adopt from the long-term implementation plan in Appendix A.

This Implementation Plan identifies actions that can be carried out by Council and staff for the Town to reach the reduction targets set by Council; to reduce greenhouse gas emissions from 2016 levels by 45% by 2030, and reach net zero by 2050. While the tables briefly outline the actions, internal Staff have been working through detailed plans stating the Staff person or department responsible for each action, the estimated cost, timeframe for completion as well as readiness for the Town to take each activity on, what next steps are required and how success of each activity will be measured. This Climate Action Plan is a key input to the Town's annual Operating and Capital Budget process.

IMPLEMENTATION

While ideally all actions would be taken immediately, barriers to implementation must be considered and include funding to take on certain actions, as well as capacity and readiness of Council, Staff and the region, Province and key partners (Acadia University) to implement projects. All managers and Councilors at the Town have engaged with the implementation plan effectively to identify which actions can reasonably be taken based on these constraints and the estimated impact of each action.
Annually, Staff will revisit the actions taken in order to monitor the progress of the implementation plan. Greenhouse gas emissions reductions will be monitored through emissions inventories as needed to understand the impacts of the actions taken. Actions to be taken each year are subject to budget and priorities identified each year and each Council cycle.

Implementation actions have been broken down into 8 action areas where the Town can have the greatest impact on adaptation and greenhouse gas emissions reductions (mitigation):

Core Actions	1. **Adaptation**
	2. **New and Existing Buildings**
	3. **Complete Communities and Transportation**
	4. **Solid Waste, Water and Wastewater**
	5. **Local Renewable Energy Generation**
Supporting Actions	6. **Town Partners and Adopting a Collective Mindset**
	7. **Governance**
	8. **Regional Cooperation**

ACTION AREA 1: ADAPTATION

	Ongoing or Planned Actions
1.	Implement flood risk study to improve storm water (drainage) and sea water (dykes) infrastructure required to manage flood risk, continue to disseminate findings and educate community members.
3.	Work on consultation, design of Waterfront Park and Flood Mitigation/Dyke Raising.
4.	When reaching end of life cycle, update existing infrastructure to handle extreme weather.
5.	Work collaboratively with Regional Emergency Management Organization to apply a climate lens to emergency management.

ACTION AREA 2: NEW AND EXISTING BUILDINGS

	Ongoing or Planned Actions
1.	Develop a minimum energy standard for all new buildings.
2.	Conduct a comprehensive review of municipal building energy use.
3.	Convert all heat sources to energy efficient heat pumps or other low carbon sources.
4.	Continue to participate in FCM pilot program, evaluate afterwards to understand what PACE program will look like moving forward.
5.	Dedicate a webpage or link to tracking participation in the various programs offered to the community such as Switch Wolfville.
6.	Continue to incentivize oil tank replacements in the well-head buffer zones.
7.	Provide local businesses and institutions with information on energy retrofits, rebates and other resources to reduce GHG emissions.

ACTION AREA 3: COMPLETE COMMUNITIES AND TRANSPORTATION

	Ongoing or Planned Actions
1.	Invest in quality, all ages and abilities active transportation network connecting key origins and destination.
2.	Investigate microtransit or other public transportation to increase public transit ridership.
3.	Support implementation of Electric vehicles through EV charging infrastructure in the community.
4.	Convert Municipal Fleet to Electric over time.
5.	Expand existing e-bike or e-scooter program with the Wolfville Library to include Acadia University, and integrate into potential park and ride facilities.
6.	Work with Kings Transit to ensure transit options offered in Town are suitable in terms of service, vehicle size, frequency, encourage all transit buses to be electric by 2030.
7.	Partner with Acadia University to identify appealing options to reduce vehicular traffic and vehicle possession.
8.	Review R-1 zoning and building height to increase density and efficiency of services.
9.	Focus on live-work development and promote small lot subdivision in downtown.
10.	Investigate feasibility of solar powered lights at public parks and pedestrian areas
11.	Further promote Wolfville as an idle free community.
12.	Better encourage Town employees to use AT or Transit or work from home.
13.	Investigate appropriate approach to urban forest management.

ACTION AREA 4: SOLID WASTE, WATER AND WASTEWATER

	Ongoing or Planned Actions
1.	Continue applying climate lens and projections to life cycle costing.
2.	Install variable frequency drive (VFD) at the sewage treatment plant and at Cherry Lane to reduce pumps operating at full speed.
3.	Replace blowers at sewage treatment facility with energy efficient blowers when needing replacement.
4.	Set a community water conservation target.
5.	Create a water conservation bylaw to restrict or limit lawn watering.
6.	Install a water meter at the splash pad to identify amount of water used.
7.	Implement a comprehensive recycling program at all municipal buildings.
8.	Encourage behavioral change to reduce waste entering municipal buildings, ie. waste-free lunches, no plastic water bottles, etc.
9.	Promote or advertise waste reduction events, such as Waste Reduction Week, or Zero Waste Days.
10.	Work with Valley Waste to identify waste reduction opportunities and energy savings in the waste sector.

ACTION AREA 5: LOCAL RENEWABLE ENERGY GENERATION

	Ongoing or Planned Actions
1.	Investigate feasibility of solar or renewable energy production within the Town.
2.	Investigate feasibility of regional solar or renewable energy production outside of the Town boundaries.
3.	Continue to offer PACE programs to incentivize residential solar installations.
4.	Encourage Acadia to implement strategies to achieve carbon neutrality as outlined in the Acadia 2025 Strategic Plan.
5.	Encourage local energy co-ops or other alternative/collective governance models.

ACTION AREA 6: TOWN PARTNERS AND ADOPTING A COLLECTIVE MINDSET

	Ongoing or Planned Actions
1.	Adopt a climate action plan and work with it as a living document (updating and monitoring).
2.	Work with our Town Partners (WBDC, Residents, Acadia) on Communicating climate action wins.
3.	Conduct climate education and programming for staff and Town partners.
4.	Continue Earth Leadership camps and expand to take home kits to allow family-based learning and at home learning.
5.	Log climate action achievements to demonstrate leadership.
6.	Continue educational programming with Staff, Council, local businesses, Acadia University and community members to encourage sustainable behaviours over the long-term.

ACTION AREA 7: GOVERNANCE

	Ongoing or Planned Actions
1.	Assess capacity to take on climate action roles and expectations/priorities.
2.	Assess regional versus individual capacity for a regional climate action coordinator to carry out implementation and inventories for the region.
3.	Support ongoing leadership of corporate climate culture.
4.	Apply climate lens to a flex-work policy to allow staff to work from home on certain days and/or arrive and depart from the office at various times in order to reduce congestion and unnecessary vehicular travel.

ACTION AREA 8: REGIONAL COOPERATION

	Ongoing or Planned Actions
1.	Conduct regional greenhouse gas emissions inventories.
2.	Complete regional greenhouse gas emissions reduction catalogue to identify options to reduce ghg emissions.

CHAPTER 2.
A COMMUNITY PLAN

A COMMUNITY PLAN

Municipal Planning Strategy

Climate action has long been a priority of Town Staff, Council and Town Committees. From 2015 to 2020, Staff extensively reviewed the Municipal Planning Strategy and related planning documents to ensure they are aligned with climate action following recommendations from the Environmental Sustainability Committee. Part of this process involved including climate action as a community priority in the Municipal Planning Strategy. The community priorities are specific statements of what the Town intends to achieve through the MPS and provide further guidance for how climate action will be taken through the implementation of our planning documents. The Core Concepts of the Climate Action priority from the MPS are listed below:

OBJECTIVE To control land use in a way that preserves, enhances and protects the natural environment to ensure open space opportunities for all residents. **ANTICIPATED RESULTS** Enhance environmental constraints. Preservation of ecosystem services, including Agricultural land. Ensure source water protection and reduce water consumption.	**OBJECTIVE** To promote clean energy and reduce greenhouse gases (mitigation) by maximizing energy efficiency through conservation, local renewable energy opportunities, partnerships, and the use of sustainable infrastructure and green building design. **ANTICIPATED RESULTS** Work toward advancing our position in the Partners for Climate Protection Program through GHG emissions reduction and energy planning work.	**OBJECTIVE** To undertake climate adaptation and mitigation measures to create a community resilient to disruptors. **ANTICIPATED RESULTS** Work with partners to preserve and enhance resilience to sea level rise. New requirements for buildings in flood prone areas. Educate the community about climate change implications and initiatives.	**OBJECTIVE** To create a leading sustainable transportation network that supports non-vehicular transportation modes and improves connectivity **ANTICIPATED RESULTS** Better leverage our partnership with Regional Transit Authorities Prioritize the creation of walkable and bikeable infrastructure. Explore community/micro transit options.

Further outcomes of this plan review include the hiring of a staff member to carry out the climate plan through the Federation of Canadian Municipalities funding. Climate action work at the Town relies heavily on public engagement and participation, therefore the Town dedicated five years to understand community concerns, listen to ideas, learn from community members and provide education. The following pages of this section highlight some of the key moments from these years, with more information available in Appendix C.

IT SHALL BE THE POLICY OF COUNCIL:
To institutionalize and promote the "Nested Circle" Sustainability Framework in both municipal operations and the overall community.

A COMMUNITY PLAN

Climate Emergency Declaration

While it was officially made by Wolfville's Council, the Town's climate emergency declaration was initiated and precipitated by its residents. At its meeting on April 2, 2019, two Town residents made a presentation to Wolfville's Committee of the Whole about the looming climate crisis. The presenters expressed concern about the dangers posed by climate change to the Town of Wolfville and communities around the world. They referenced findings from the Intergovernmental Panel on Climate Change (IPCC)'s Special Report on the Impacts of Global Warming of 1.5 °C Above Pre-Industrial Levels (SR15) that the world had only 10 years to drastically reduce Greenhouse Gas emissions in order to mitigate the worst consequences of climate change. The presenters called on Wolfville's Council to follow the example of other Nova Scotia coastal communities and declare a state of climate emergency, to prepare a plan for dealing with the coming climate crisis, and to publicize the plan to the Town's residents so that they could contribute to it. The residents provided a written submission, appended to this document as Appendix B, that included suggestions on what could be included in the plan.
At its next meeting, on May 7 2019, the Committee of the Whole adopted a motion to forward the following motion to council for decision: **that Council declare a climate emergency. The motion was made at the Wolfville Town Council meeting on May 21, 2019; after a brief discussion, it was carried unanimously and adopted.**

Community members in Wolfville have also demonstrated climate leadership and concern through involvement with Extinction Rebellion, for which meetings were held at the Wolfville Memorial Library, weekly climate action circles held at the Wolfville Farmer's Market, through Fridays for Future climate strikes and by organizing an event focused on the Green New Deal. These community-led events demonstrate a foundational knowledge and concern regarding climate change in the community, and underscore the need for this Plan.

Community Engagement

Climate action engagement efforts began in 2018 during the MPS review and continued following the declaration in April 2019.
Engagement was pursued in order to understand the base levels of understanding and literacy in the Town in regards to climate change and action, to understand what aspects are most concerning and to whom, where gaps in knowledge exist and to generate discussion on new aspects of climate action not previously considered.

A COMMUNITY PLAN

Several modes of engagement were used to generate the most feedback. Prior to the COVID-19 pandemic and subsequent social distancing and public health measures, these modes included door-to-door engagement, discussion-based climate circles, pop-up events and community workshops. During the pandemic, due to public health protocols limiting in person events and large gatherings, engagement was conducted through the Inspire Wolfville programming, which began with an online survey created by Thinkwell Shift, a Halifax-Based behaviour change company in winter of 2021, and continued through the summer. A summary of findings from this survey is included in Appendix C. The Inspire Wolfville programming included pop-up events at public parks, farmers markets, a cafe and the Wolfville Library. Guided climate action walking tours and online engagement at www.wolfvilleblooms.ca where residents were asked to review the Draft 2050 Low Carbon Roadmap or summary version and provide input to the document were also used for engagement. A brief summary of results from these modes of engagement is discussed in the What We Heard section.

Municipal staff and Council were engaged through Staff reports through the Planning Advisory Committee, Environmental Sustainability Committee and Committee of the Whole meeting presentations, as well as through participation in engagement efforts such as guided climate action walking tours, and engaging with materials on www.wolfvilleblooms.ca. This engagement provided an opportunity to establish a base level of knowledge regarding climate change and action among all Town staff, to obtain feedback on action areas, and identify which actions could be packaged with existing projects. Town Management and Council were included throughout the process, with an emphasis on the implementation section, as these actions often relate directly to budget and staffing. This was arguably the most important step in creating this Plan as it helps to identify solid actions that can be taken immediately, and actions that can be taken at later dates.

Town Staff and Councill joined the Climate Action Walk to learn about climate change during summer 2021

INSPIRE wolfville

wolfville Blooms
Our Community Thought Garden

Visit www.wolfvilleblooms.ca to engage with Town initiatives.

A COMMUNITY PLAN

What we Heard

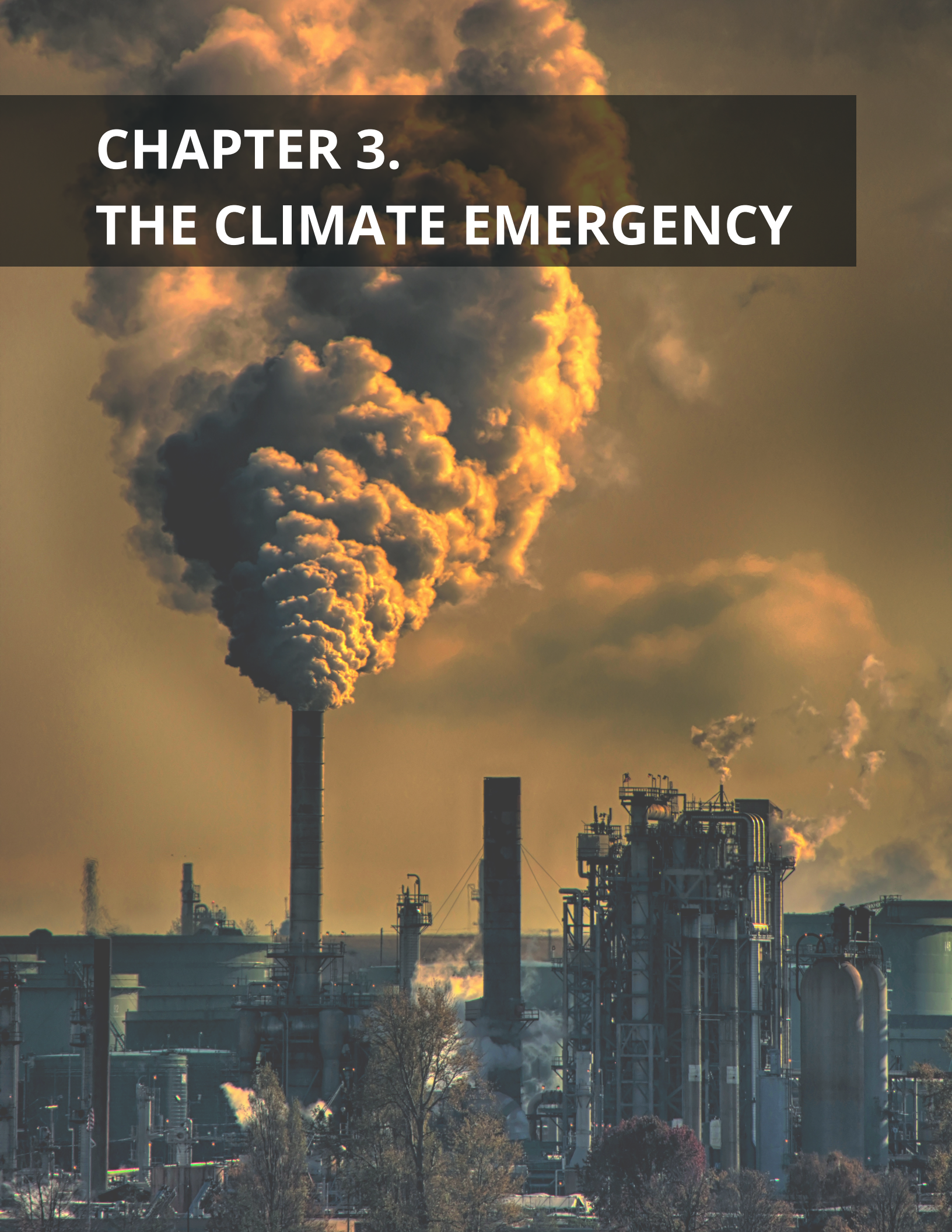
The key areas that these sessions identified as concerns for residents include the need for the Climate Action Plan to adopt more ambitious greenhouse gas reduction targets, and conducting greenhouse gas inventories every two to five years in order to thoroughly monitor any changes in greenhouse gas emissions. The need for shorter-term greenhouse gas emissions reduction targets were also vocalized, with individuals suggesting the need for a year 2025 target in addition to the 2030 and 2050 target years. Furthermore, the Inspire Wolfville team collected feedback on the need for the Climate Action Plan to include issues such as green job creation, decolonization and social justice.

One of the most consistently brought up topics during the Inspire Wolfville engagement sessions was the need for fewer motor vehicles on the road, as well as better public and active transportation options within the Town and region. Residents expressed that concerns regarding safety when using active transport may be resolved if all ages and abilities active transportation networks, or separate active transportation lanes were available within the Town. The topic of microtransit was also raised during these discussions, with residents vocalizing the desire for reliable, electric, and fully-subsidized transit service.

Energy efficiency was another key topic raised during the engagement sessions. While many residents praised the existing PACE program, Switch Wolfville, being offered during this time, many individuals engaged lived beyond the Town boundary and were therefore exempt from the financing incentives available for home energy retrofits or were ineligible because they lived in an apartment or condominium. This program sparked interest in neighboring residents and the need for a regional PACE program to allow greater uptake of this program. Furthermore, residents expressed interest in a community energy co-operative or shared renewable energy program that could be led by the Town or community organization, and allow residents to purchase locally renewable energy rather than relying on the provincial power utility to move to 100% renewable energy.

Finally, concerns regarding the amount of lawn mowing by the Town, Acadia University and residents were recorded, with suggestions to plant pollinator or food gardens, the need for Town staff and Council to collaborate with municipal, regional and Indigenous partners was vocalized, as well as desires to expand the Wolfville Farmer's Market to allow more local food and goods to be grown, made and sold within the Town. Residents also provided ideas for reducing waste and creating circular economies through banning of single-use plastic and implementing a "repair cafe" where residents can repair items that would otherwise end up in the landfill, and tool libraries where residents can loan out tools and household items to cut down on unnecessary purchases of items they may need only on occasion.





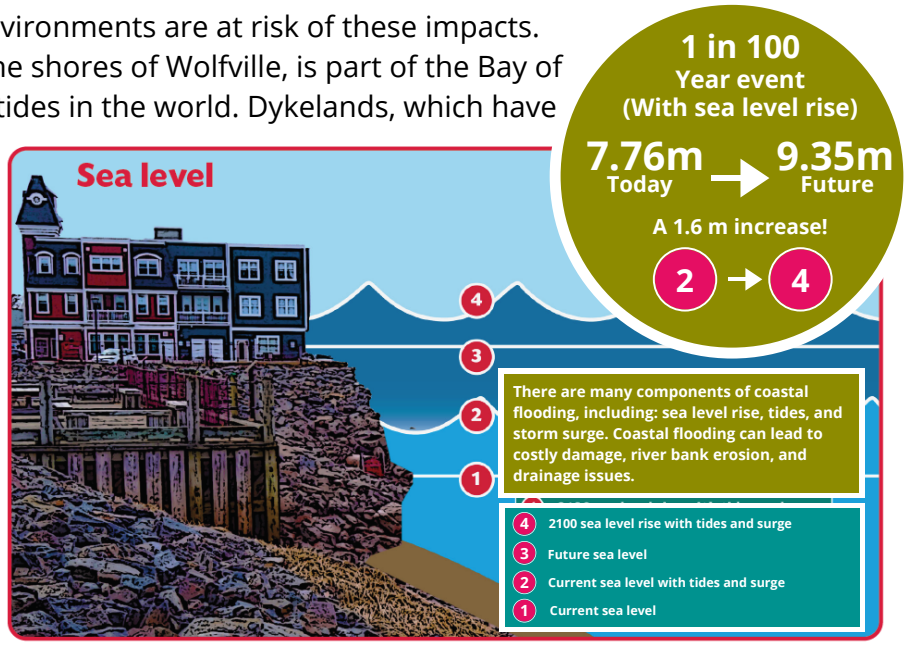
CHAPTER 3.
THE CLIMATE EMERGENCY

THE CLIMATE EMERGENCY

INTRODUCTION

Climate change is the change in global or regional climate patterns. While scientific evidence over several years strongly suggested that the climate change occurring today is caused by human activity, this fact is no longer disputed, and it is recognized that climate change impacts are widespread, rapid, and intensifying (IPCC 2021). The impacts currently affecting and predicted to intensify locally include warmer overall temperatures, more extreme weather events such as hurricanes and rainfall events, and sea level rise, among many other impacts.

The Town, region, and natural environments are at risk of these impacts. The Minas Basin, located along the shores of Wolfville, is part of the Bay of Fundy, which boasts the highest tides in the world. Dykelands, which have protected the inhabited lands of Wolfville for centuries are at risk of erosion and overtopping from sea level rise and storm surge events, which may result in flooding and salination of some of the richest agricultural soils in the province. Given the unprecedented risks of climate change, the Town must make every attempt to mitigate further climate change impacts and adapt to all potential risks.



Graphic from the Flood Risk Study illustrating projected sea level rise for Wolfville.

While taking action to mitigate and adapt to climate change poses a major challenge for all sectors of the Town and region, there is no guarantee of what impacts will occur and to what intensity. Failing to take action will result in higher costs than adaptation and mitigation over the long term. If we choose to be reactive to climate change rather than proactive, we risk being unable to respond effectively to disasters, and miss opportunities to capitalize on some positive co-benefits that will arise.

RATIONALE FOR THE CLIMATE ACTION PLAN AND THE ROLE OF THE TOWN

Municipalities play an important role in climate change mitigation and adaptation. The Federation of Canadian Municipalities (2009) suggests there are 5 key areas where municipalities can have the greatest impact on climate change: municipal operations, solid waste, buildings, transportation and land-use, and energy systems.

While the Town has the greatest control over reducing corporate emissions, these emissions account for only 2% of emissions in Wolfville. Understanding how the Town can take actions to have the greatest greenhouse gas reduction potential helps to target specific action areas. The Ontario Community Emissions Reduction Planning: Guide for Municipalities indicates various roles of local governments, sample actions and the potential impact on greenhouse gas emissions reductions as seen in Table 1. This table states that the role with the greatest impact on greenhouse gas reductions is local government as influencers.

Through actions such as implementing an all ages and abilities active transportation network and a microtransit system, the Town has the ability to assist in community greenhouse gas emissions reductions by creating more and better opportunities for residents and visitors to make less greenhouse gas intensive choices for transportation. These actions allow the Town to influence low and no carbon activities in the wider community. Other actions the Town can take that may influence the wider community include reducing the amount of grass mowing in the Town and opting for pollinator or food gardens, revitalizing living shorelines, conducting energy efficiency upgrades and retrofits on municipal buildings, instituting paid parking, investing in electric vehicle infrastructure, producing or acquiring renewable energy, adopting a flexible work policy and banning single use plastics. Furthermore, taking actions regionally allows the Town and region to reduce GHG emissions in a wider geographic range, resulting in a higher percentage of GHG reductions.

Local government as...	Authority	Sample actions	Community energy & emissions planning techniques	Potential impact on GHG emissions reductions
Energy Consumers	Direct control	Municipal building retrofits, construction of high performance municipal buildings, purchase of zero emissions vehicles, development of renewable natural gas from organic materials	Corporate GHG inventory and plan	Low
Investors	Indirect control	Renewable natural gas from a landfill, zero emissions transit system, cycling infrastructure, electric vehicle charging stations, recycling programs, public/private partnerships	Situational analysis [review of capital budgets]	Medium-high
Influencers	Indirect control	Municipal Planning Strategy, Property Assessed Clean Energy (PACE) programs	Modelling and scenario-planning	High

Table 1. Adapted from the Ontario Community Emissions Reduction Planning: A Guide for Municipalities

MITIGATION AND ADAPTATION

What is Climate Change Mitigation and Adaptation?

Mitigation and adaptation are the two approaches to climate change management. Climate change mitigation refers to actions that minimize or prevent climate change from occurring, while adaptation refers to actions taken to protect against climate change impacts like flooding. Mitigation is achieved through preventing climate change causing greenhouse gases from being emitted into the atmosphere. Reducing greenhouse gas emissions is accomplished through switching to clean, renewable energy sources such as wind and solar from fossil fuel sources such as oil, coal, and natural gas or opting for zero emission choices such as using active transportation instead of motorized vehicles. Mitigation also occurs through a natural process called carbon sequestration, the absorption of greenhouse gases into wetlands, forests, and soil. Because of the environments' ability to sequester, or capture greenhouse gases, protecting and maintaining wetlands and forests is a key component of climate change mitigation, though should not be relied upon without significant reductions in the greenhouse gases emitted. Adaptation refers to actions taken to adapt to or prepare for climate change impacts that are happening at present or are expected in the near future. Examples of climate change adaptation in Wolfville include increasing the height of the dykes and protecting and maintaining the seawalls along the dykelands to prevent sea water overflow and erosion in the event of extreme high tides and storm surge; protecting homes from flooding and improving emergency response procedures, such as opening cooling centres during heatwaves.

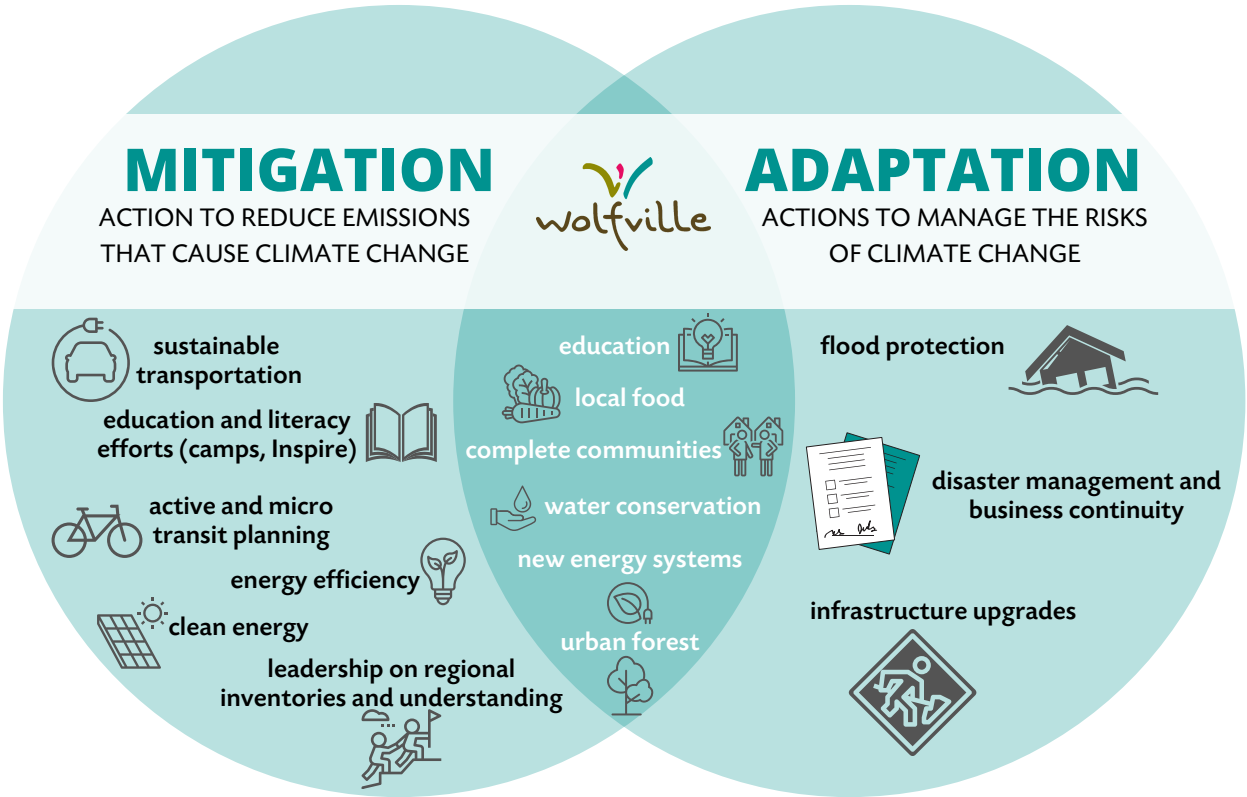


Figure 1. Mitigation and Adaptation

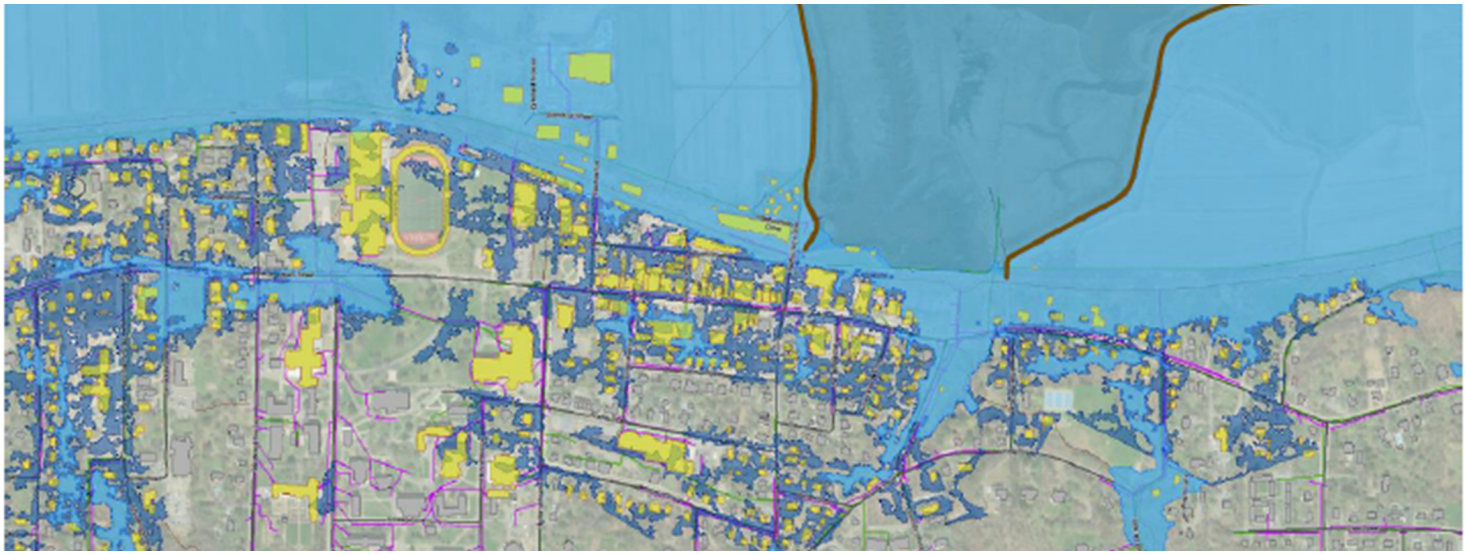
LOCAL IMPACTS

Sea Level Rise

Sea level rise is a widespread climate change impact caused predominantly by atmosphere-warming greenhouse gases that melt polar ice caps, though warmer sea water temperatures (thermal expansion) and changes in salinity (salt levels) also impact sea levels. High tides and storm surge compounded with sea level rise increase the risk and intensity of flooding. To better understand the risk of sea level rise locally, the Town hired consultants at CBCL Limited to complete a Flood Risk Mitigation Plan in 2021. This Plan outlines projected sea level rise and states that sea levels in the Minas Basin, on which Wolfville is located, will rise 1.6 metres by 2100.

As outlined in the Flood Risk Mitigation Plan, flooding incurs the greatest amount of financial damages and losses, with national insured losses of $1.8 billion between 2009 and 2017. The Plan also demonstrates the increasing frequency of flooding: “flooding related costs have quadrupled in 40 years and account for 40% of all the Disaster Financial Assistance Arrangements (DFAA) expenses” (CBCL Limited, 2021 p.2).

Areas at risk of saltwater flooding in 1 in 100 year event from the Flood Risk Mitigation Plan:



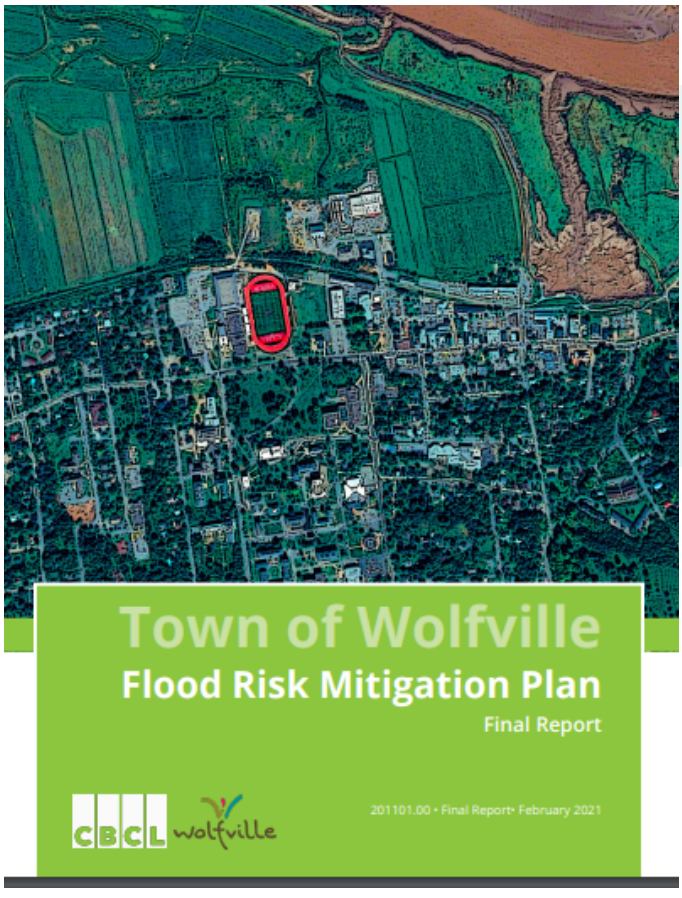
LOCAL IMPACTS

Extreme Rainfall

Extreme rainfall events will become more common as temperatures increase, as warmer temperatures can hold more vapor. The Town of Wolfville Flood Risk Mitigation Plan also describes projections for extreme rainfall events and subsequent in-land flooding that may occur as a result. The Plan states that an extreme 1 in 100 year rainfall event today would result in 174 mm of rain per hour, rising to 280 mm per hour by 2100.

Recommended actions from the Flood Risk Mitigation Plan include the following:

- Communication and Education
- Connecting the 2 dyke systems and living shorelines
- Protect Sewer Lift Stations and Treatment Plant
- Flood forecast and warning system
- Monitoring and future actions (infiltration, conveyance, storage, development measures)



More information about flood risk can be found in the Flood Risk Mitigation Plan available at https://wolfville.ca/adaptation.html

LOCAL IMPACTS

Coastal Erosion

Coastal erosion has amplified around Nova Scotia and will continue to worsen with storm surge and sea level rise. Coastal erosion creates safety concerns for coastal development. In Wolfville, however, most coastal areas are buffered by the dykelands which act as a barrier to flooding though some sites including Waterfront Park are not protected by dykelands and are actively eroding due to freshwater flows from stormwater outlets, rather than sea water. These stormwater outlets erode the mudflats, creating channels that fresh water runs through. Freshwater erosion can be expected to increase with extreme rainfall events.

The Town's Flood Risk Study recommends exploring living shorelines (such as salt marshes) to provide added protection to infrastructure such as the dykes while also providing ecosystem and cultural benefits. Living shorelines can protect infrastructure from effects of storms and sea level rise by stabilizing soils, storing water, maintaining/increasing elevation by trapping sediment, and dampening wave energy.

Image from page 53 of Flood Risk Mitigation Plan shows coastal erosion along the shore of Wolfville.

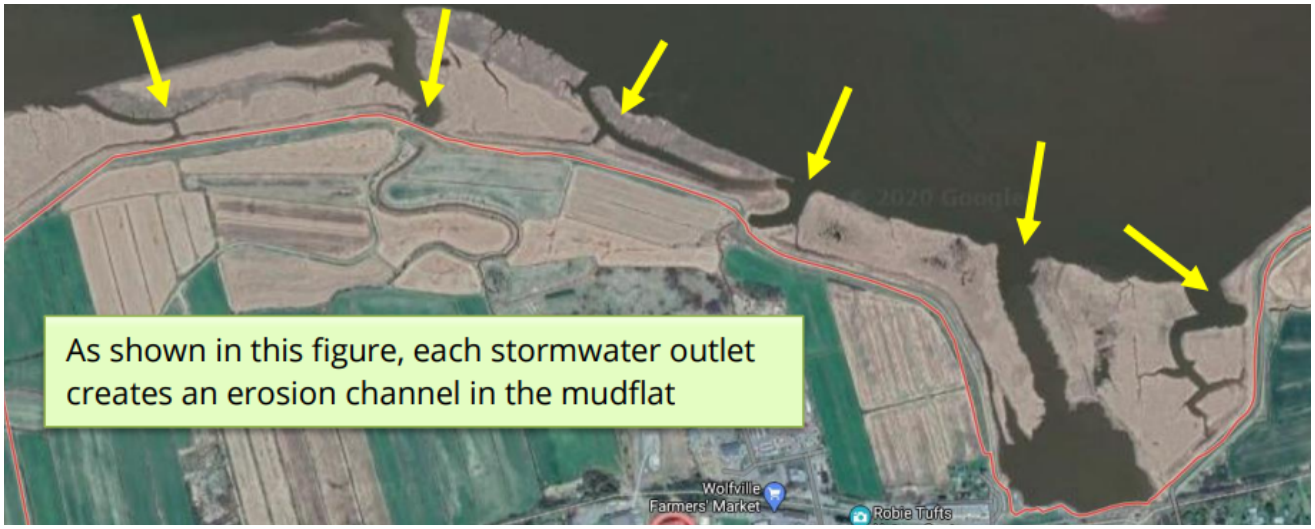


Image from page 54 of the Flood Risk Mitigation Plan shows erosion patterns in the mudflats resulting from fresh water flowing into the Minas Basin.

LOCAL IMPACTS

Agriculture

Agriculture faces both risks and benefits resulting from climate change. Nova Scotia will continue to see warmer, wetter weather allowing for longer growing seasons, and may see better opportunities for growing certain high heat crops and diverse plant species. Vineyards within the region may experience longer, more productive growing seasons as temperatures rise.

This warmth and moisture, however, brings with it a more diverse pest population, which could create a significant challenge for the agricultural industry. Other risks to agriculture include coastal flooding which risks the salination of crops, particularly those in the dykelands; extreme weather events such as hurricanes that may destroy crops through high winds; and drought.

Farmers harvest apples in advance of hurricane Dorian as high winds risk damage to crops and loss of harvest. (CBC News Atlantic, 2019)

Extreme Weather Events

Hurricanes and severe storms will increase in intensity and frequency with climate change. These events can cause damage to ecosystems such as shorelines and coastal environments, in land flooding, crop destruction and high winds can cause damage to property through flooding, tree fall, power outages, and can disrupt access to and from communities affecting individuals and emergency responders.

Moving forward, the Town must continue efforts to reduce greenhouse gas emissions at the corporate and community levels by adhering to the implementation strategy within this plan. This climate action plan functions as a roadmap to our low carbon future and a guide for preparing for and responding to climate change impacts that Wolfville is and will continue to experience.

RATE AND SEVERITY OF CLIMATE CHANGE

While climate change occurs naturally over time due to natural events such as volcanic eruptions, the sun's intensity, and changes in naturally occurring greenhouse gas concentrations (NRDC, 2021), the rate at which it is occurring today is unprecedented and due to human activities that emit or release greenhouse gases. The amount of greenhouse gases currently in our atmosphere is unprecedented compared to the past 800,000 years (NRDC, 2021). This major increase in greenhouse gas emissions is largely attributed to the industrial revolution, which saw a widespread reliance on burning of fossil fuels such as coal, oil, and gas for electricity and transportation, still heavily relied upon today. Deforestation also contributes to the rise in greenhouse gases emitted into the atmosphere as when disturbed, forests are no longer able to sequester carbon, and thus emit greenhouse gases into the atmosphere. Additionally, the use of fertilizer and livestock production emit greenhouse gases, while agriculture and road construction change the reflectivity of the earth's surface, leading to local warming or cooling (Denchak & Turrentine, 2021). These activities have led to the current circumstances we now must work in earnest to reverse.

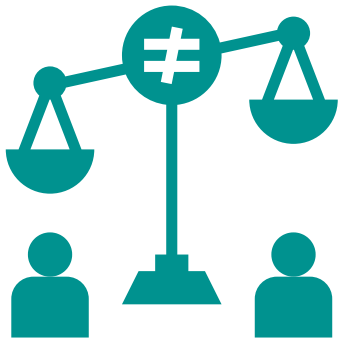
The year 2021 saw **record breaking temperatures** across the globe and in Canada, with temperatures reaching 49.6 degrees Celsius in Lytton, British Columbia. These high temperatures arrived along with a **heatwave** that saw nearly 500 heat related deaths (Royal Meteorological Society, 2021). Likewise, the US saw record heats for the month of June, 2021 (NOAA National Centres for Environmental Information, 2021) These heat events resulted in devastating **wildfires** in Canada and the US, while extreme rainfall events caused severe **flooding** in Western and Atlantic Canada, Europe, India and China. Furthermore, **Arctic sea ice** hit record low levels during July 2021, and the Arctic is predicted to have ice-free summers as early as 2035 (Hausfather, 2021).

Code Red for Humanity

The Intergovernmental Panel on Climate Change's (IPCC) 2021 AR6 report outlines in detail the current state of global climate change and has been referred to as "code red for humanity" by the UN's Secretary-General António Guterre. The IPCC report indicates that warming of 1.2 degrees Celsius has already occurred, that the internationally agreed upon threshold of 1.5 degrees Celsius is approaching at an alarming rate, and that **we are at imminent risk of hitting this mark if urgent and ambitious mitigation efforts are not taken.**

SOCIAL IMPACTS OF CLIMATE CHANGE

While all individuals within the Town will experience or witness climate change impacts, not all individuals or groups will experience these impacts the same. Certain individuals or groups may be more vulnerable or resilient to specific climate change impacts depending on several factors such as race, immigrant and refugee status, poverty, education, food security, and access to clean air, water, and soil. It is therefore important to consider how individuals identifying with one or more of these factors may experience greater climate impacts and what resources are needed to preserve ways of life and protect livelihoods. Understanding the interplay and outcomes of the structural determinants of health, climate impacts and environmental racism is key to creating adequate climate policy.



Additionally, seniors face barriers to climate change impacts due to factors such as health outcomes, reduced mobility and isolation. During heatwaves, for example, seniors are considered an at-risk population as they tend to live alone, and do not always have someone to check in on them. They may also lack mobility to access cooler areas such as cooling centres without assistance. The Canadian Centre for Disease Control and Prevention (2021) states that individuals ages 65 and older do not adjust to sudden changes in temperature as well as younger people, are more likely to be living with an existing chronic illness, and may be taking medication that further prohibits their body's ability to control temperature.

Climate change also disproportionately impacts people living with low incomes, as climate impacts may result in illness or indirectly cause gaps or loss of employment, creating financial hardships.

Climate change has and could continue to contribute to inequitable health and wellness impacts experienced by certain groups. Groups already experiencing health inequities due to structural factors such as colonization, racism and inequitable income distribution are more vulnerable to the negative impacts of climate change. As such, **it is essential to employ an equity lens when addressing climate change and climate action to ensure everyone receives relief from the climate emergency and that groups are provided with the appropriate care to manage and minimize climate change impacts.**

CO-BENEFITS OF CLIMATE ACTION

In addition to mitigating further climate change impacts and protecting against existing impacts, many climate actions can have other non-climate policy related objectives related to economic development, public health, sustainability and equity. An example co-benefit of investing in active transportation networks to reduce vehicular greenhouse gas emissions would be improved cardiovascular health through more regular exercise, as well as cleaner air through fewer pollutants from motorized vehicles. Both of these co-benefits result in costs savings from healthcare and personal fuel expense reductions, and can improve quality of life (Warren & Lulham, 2021).

In the Wolfville context, Council's Strategic Plan as well as the Municipal Planning Strategy identify co-benefits that should be considered as we move forward with climate action investments in order to select those actions with the greatest number of co-benefits.

An analysis of co-benefits created by CDP Worldwide demonstrates how carefully planned climate action can result in multiple positive non-climate benefits (as shown on the left) in addition to climate change mitigation and adaptation. This analysis also found the co-benefits from climate action from a survey of 154 North American cities listed below.

Percent of climate actions resulting in each co-benefit.

Disaster preparedness - increased preparedness of a city to respond to hazards

Disaster risk reduction - reduced risk of hazards in a city

Economic growth - increasing the value of goods and services produced in the city

Ecosystem preservation & biodiversity improvement -i.e. increased connectedness between green spaces

Enhanced climate change adaptation - making the Town more able to withstand changes in climate

Improved access to and quality of mobility services and infrastructure - i.e. access to public transport

Security of tenure – i.e. increased housing security for low-income urban populations who are more likely to live in informal, poor quality, and hazard-prone settlements

Improved resource quality (e.g. air, water) – for example, improved air or water quality

Improved resource security (e.g. food, water, energy) – i.e. improved food, water or energy security

Job creation – new jobs created

Social inclusion, social justice – engaging groups that are traditionally excluded and addressing inequalities

Promote circular economy – for example, supporting greater reuse and recycling of resources

Improved resource efficiency (e.g. food, water, energy) – meeting the needs of the Town with a lower level of resource input

Shift to more sustainable behaviours – supporting lifestyle change that not only reduces emissions but is also more sustainable in broader terms, for example, the health benefits of more active travel and changes in diet, reduced material consumption

Poverty reduction/eradication – for example, reduced fuel poverty

Enhanced resilience - making the city more able to quickly recover from shocks such as floods

Greening the economy - making economic activity in the city more environmentally sustainable

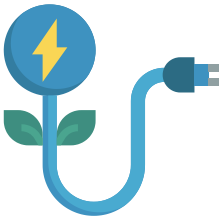
Improved public health – for example, reduced chronic and acute respiratory diseases due to improved air quality

Improved access to data for informed decision making – collection and sharing of data that supports city officials and wider stakeholders' decision-making

Social community and labour improvements – i.e. a stronger sense of 'community' for citizens, and jobs with more security and benefits

ECONOMIC RISKS AND BENEFITS OF CLIMATE CHANGE AND ACTION

The economic impacts from climate change are significant. It is estimated that Canada will spend $35 to $62 billion (2019 CAD dollars) every year by 2050 on physical effects of climate change (Warren and Lulham, 2021). Arguably, the biggest economic advantage of climate change is taking action to mitigate these costs though rapid and widespread climate adaptation and mitigation efforts.



While the costs associated with climate change impacts are significant, climate action brings along with it opportunities for investment and other economic advantages. One major economic benefit for all sectors is costs savings on energy bills attainable through renewable energy retrofits or energy efficiency upgrades. Reducing energy costs means more money remains within the Town, boosting the local economy and wealth of residents, and freeing up cash that can be spent locally. Given the levels of investment coming in the years ahead from other levels of government, the Town's Climate Action Plan creates a more investment-ready environment.

Ongoing Action

One such way the Town of Wolfville has incentivized energy savings is through the Switch Wolfville program, a property assessed clean energy (PACE) program funded by the Federation of Canadian Municipalities. Not only does the Switch Wolfville program incentivize energy efficient residential retrofits, it also increases the demand for employees in the green energy sector as the demand for home energy assessors, contractors and manufacturers intensifies. By being a leader in climate action, the Town of Wolfville has the opportunity to support the creation of new jobs and attract or retain more residents.

Switch | wolfville

ECONOMIC RISKS AND BENEFITS OF CLIMATE CHANGE AND ACTION

Direct and Indirect Costs

There are two types of costs associated with climate change to consider: direct and indirect costs. Direct costs refer to damages and losses of items and services that can be traded in a market and have associated prices, such as the cost of repairing or replacing damaged homes, medical treatments for heat stress, revenue loss from crop failures, as well as costs associated with items that are not traded in a market such as loss or damage to ecosystem services, stress, and quality of life.

Indirect costs refer to damage or destruction of infrastructure such as roads and parks, that can interrupt normal use or service flows. For example, roads may be temporarily closed, blocking traffic and delivery of goods and services, or preventing employees from reaching their place of work, which may interrupt business operations not directly affected by the climate change impact.

Climate Change Impacts on Jobs

As stated in the Town's Municipal Planning Strategy, the greatest employment sector in Wolfville is Education. As the home of Acadia University, Landmark East School and Wolfville Elementary School, educational services make up 21% of total employment of the Town (2016). The second greatest employment sector is Health Services, making up 15% of employment, with 12% of employment from Accommodation and Food Services, reflecting Wolfville's position as a popular tourist destination in Nova Scotia. While those employed in the education sector may be at the forefront of climate science and education, healthcare services as well as tourism are expected to face impacts from climate change.

21%	Educational Services
15%	Healthcare Services
12%	Retail and Food Services

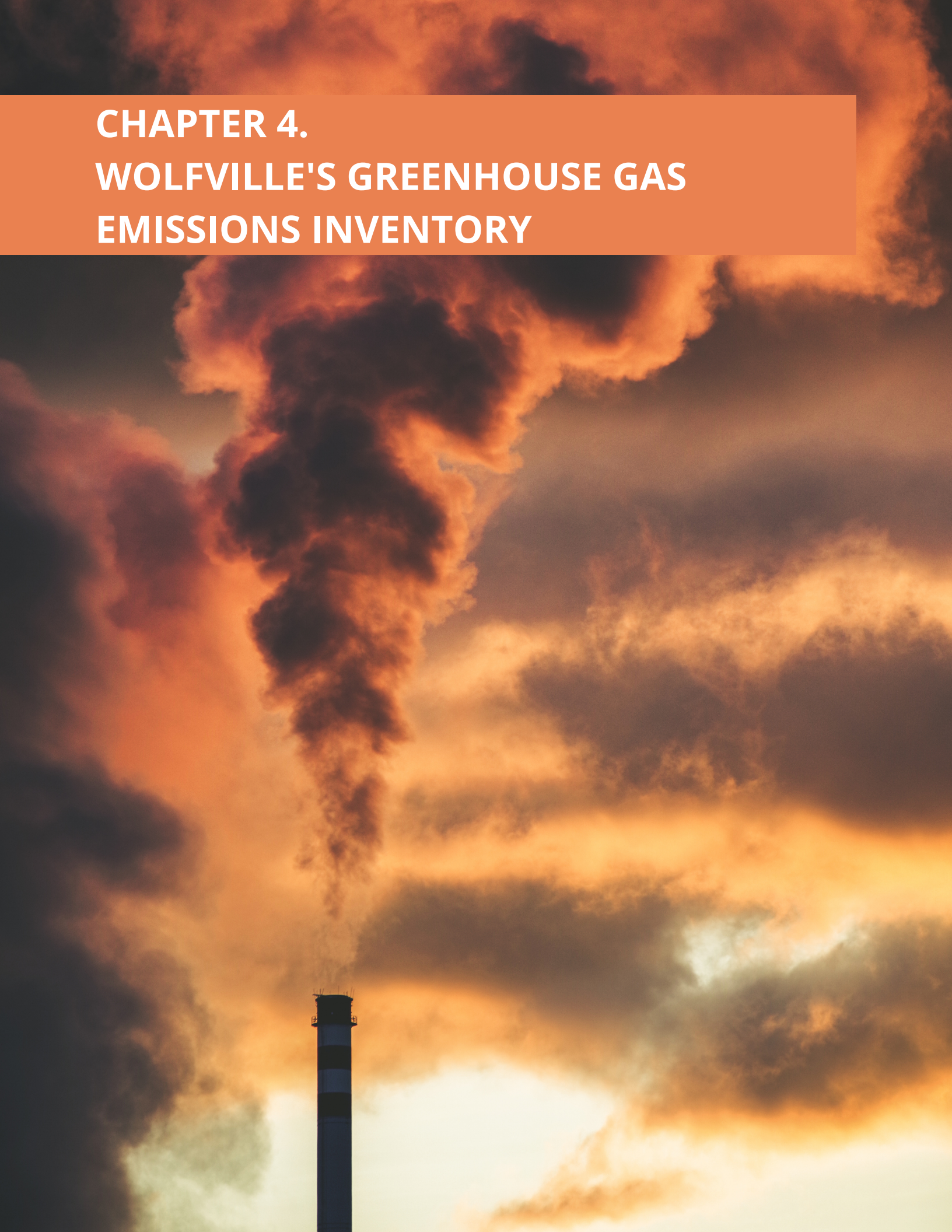
ECONOMIC RISKS AND BENEFITS OF CLIMATE CHANGE AND ACTION

According to the World Health Organization, extreme heat contributes directly to deaths from cardiovascular and respiratory disease, particularly among elderly individuals. As seniors aged 65 years and older make up 27.4% of the Town's population as of 2016, climate change impacts such as heat waves may result in health outcomes that put strain on the existing healthcare system. Waterborne diseases and diseases transmitted through insect bites are also strongly affected by changes in the climate and may lengthen transmission seasons of vector-borne diseases such as lyme disease through tick bites and can alter the geographic range that insects and disease can survive in (World Health Organization, 2021). From an adaptation perspective, it is critical that healthcare services are robust and plentiful enough to manage an increase in heat-related and vector-borne illness that may arise from climate change with an aging population. Mitigation of greenhouse gas emissions plays a significant role in easing the impacts of climate change on healthcare services. Investing in climate action today will reduce the costs and resources needed in the future to combat climate related illnesses, including those difficult to measure, such as mental health outcomes and negative impacts from loss of culture and ways of life.

Wolfville is recognized for its culinary, wine and cider tourism, as well as environmental tourism due to the Town's proximity to the Minas Basin and the world-famous Fundy Tides. Many tourist destinations in the Town thrive by offering locally grown and produced food and beverage or coastal views of the Minas Basin and are vulnerable to the impacts of climate change, particularly drought, crop failure, pest issues, frosts and extreme heat. Mitigating climate change will allow these industries to continue to flourish and better enable expansion in the future. Failure to mitigate climate change will have detrimental effects on the very agriculture these industries rely on.

A 2021 report by the Canadian Institute for Climate Choices states that as dangerously hot days in Canada are expected to increase from 75 to 100 days per year by later this century, hospitalizations will increase dramatically and 128 million hours of work, or the equivalent of 62,000 full-time jobs annually are projected to be lost by the end of the century due to heat impacts on productivity (Canadian Institute for Climate Choices, 2021).

CHAPTER 4.
WOLFVILLE'S GREENHOUSE GAS EMISSIONS INVENTORY



GREENHOUSE GAS EMISSIONS

Baseline Greenhouse Gas Emissions Inventory

The first step in developing an action plan is establishing a baseline: an understanding of present conditions before action is taken. A baseline allows for the impact of actions to be determined by comparing the conditions before and after they are undertaken, which is key to evaluating their effectiveness in achieving the goal of the plan.

MILESTONE 1: Create Baseline Greenhouse Gas Inventory and Forecast

The primary baseline for a Climate Action Plan is a greenhouse gas emissions inventory, which quantifies the volume of greenhouse gases – carbon dioxide, nitrous oxide, and methane – emitted by a community in a given year in terms of carbon dioxide equivalent (CO_2e). As Figure 2 below illustrates, a community inventory documents and measures all of the emissions released by sources within its municipal boundaries (Scope 1), along with some released outside of boundaries as a result of activities inside of them (Scope 2 and 3).

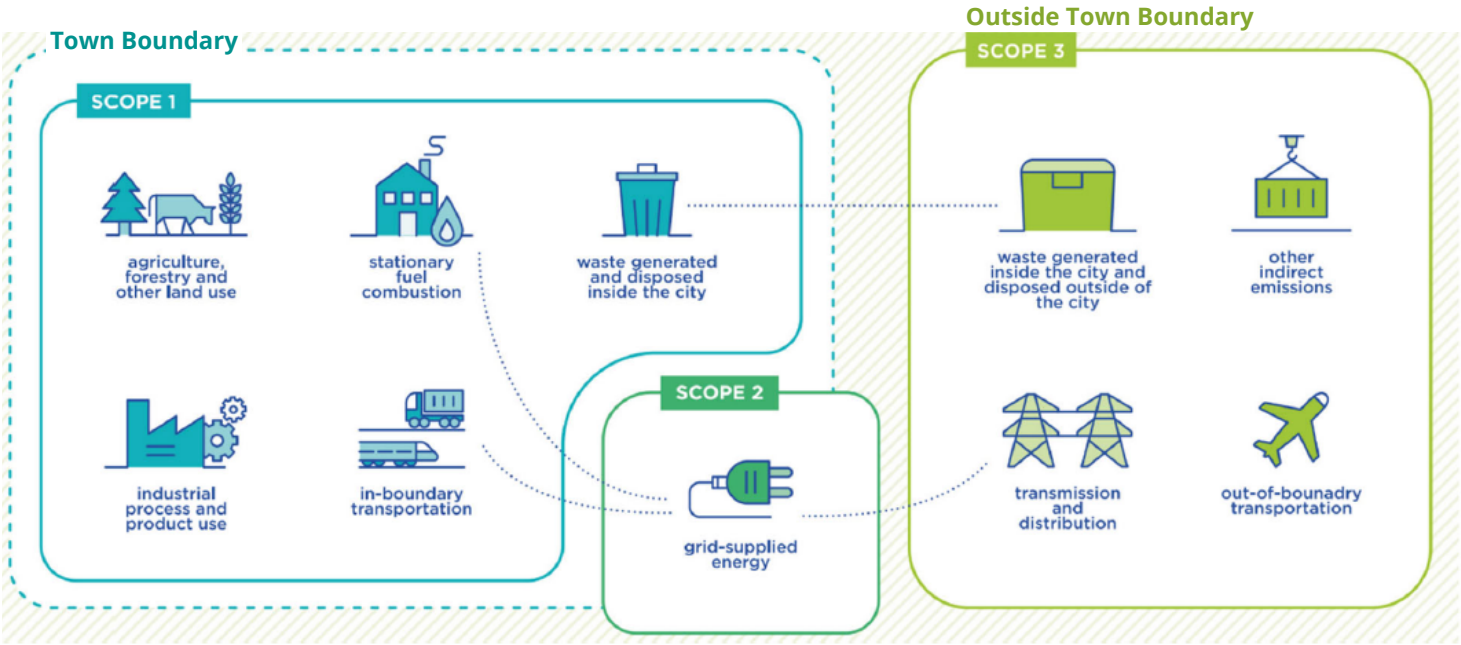


Figure 2. The scope of the greenhouse gas emissions inventory for Wolfville.

Baseline Greenhouse Gas Emissions Inventory: Comparison

To date, three greenhouse gas emissions inventories have been developed for Wolfville: the first by the Centre for Rural Sustainability in 2004, for the year 2003; the second by the then GIS Technician for the Town of Wolfville in 2011, for the year 2006; and the third and current inventory, completed by the Sustainability Solutions Group (SSG) in April 2020, for the year 2016.

GREENHOUSE GAS EMISSIONS

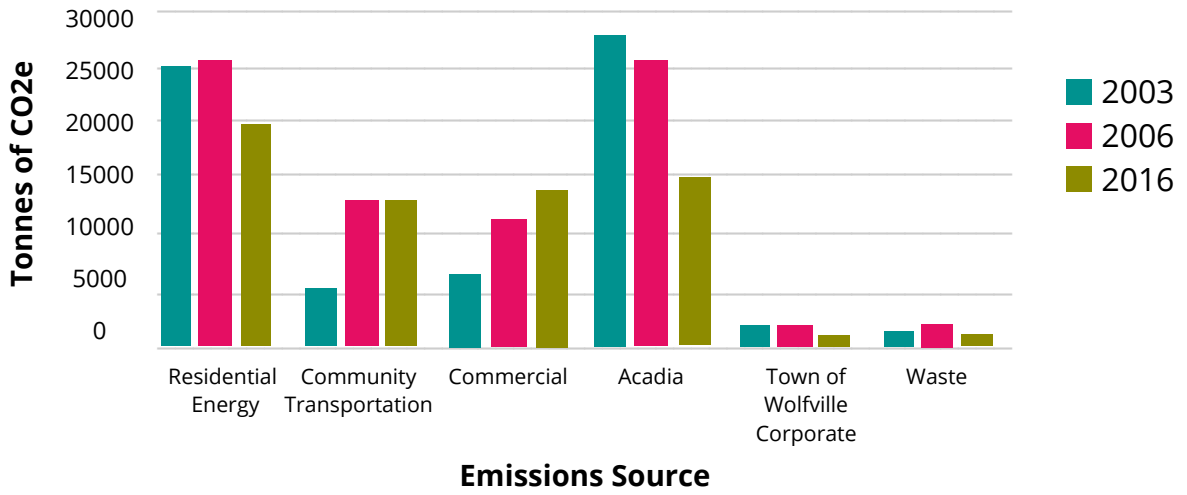


Figure 3. Greenhouse gas inventory comparisons.

In theory, comparing the three greenhouse gas emission inventories developed over 16 years should make it possible to determine the amount of progress (or lack thereof) Wolfville has made in reducing its greenhouse gas emissions since the first inventory was developed in 2004. Unfortunately, until recently, there was no agreed upon protocol for greenhouse gas emissions inventories. Based on research conducted by Town of Wolfville staff during the development of this plan, and in the opinion of the consulting firm contracted to develop the most recent (2016) greenhouse gas emissions inventory, Wolfville's 2003 and 2006 inventories were both rudimentary and incomplete. This assessment is in no way meant to devalue the effort or intention of the parties that developed the inventories; rather, it reflects the state of greenhouse gas emissions inventory development in the early 2000's.

Wolfville's 2016 greenhouse gas emissions inventory was developed by Sustainability Solutions Group, a leading climate-and sustainability-planning firm that has undertaken similar projects for communities such as Bridgewater, Halifax, and Toronto; and is based on the Global Protocol for Community-Scale Greenhouse Gas Emission Inventories (GPC), the standardized global framework for measuring and managing community greenhouse gas emissions which has been adopted by hundreds of cities across the world.

GREENHOUSE GAS EMISSIONS

Baseline Inventory Summary and Highlights

According to the 2016 greenhouse gas emissions inventory, Wolfville produced 65,354 tonnes of CO2e in 2016. The majority of those emissions (76%) come from the building sector, with the second most significant source being transportation (21%). Waste related (2%) and fugitive (leaks) (1%) emissions accounted for a small but significant proportion of Wolfville's emissions, while agricultural emissions were minimal. A complete baseline greenhouse gas emissions report can be found in Appendix E to this plan, and is summarized in the table and graph below. Note that the numbers from the Town of Wolfville's corporate emissions differ between the two charts: the table includes only the Town's corporate building emissions, while the graph includes both its buildings and transportation emissions.

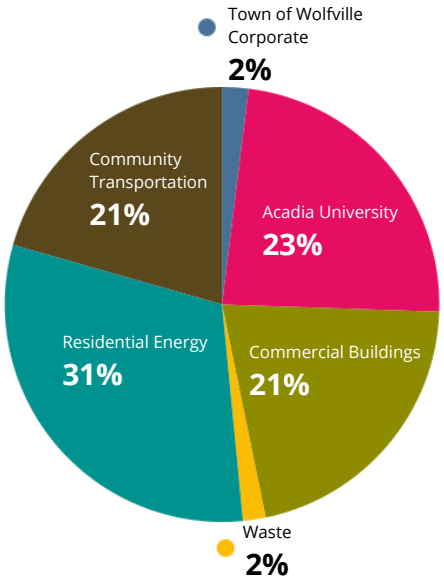


Figure 4. 2016 emissions by source.

Greenhouse Gas Emissions by Source

Source	Tonnes of CO2e	% of total
Total Building Emissions	49,726	76%
Residential Buildings	20,172	31%
Commercial Buildings	13,840	21%
Institutional Buildings (Acadia)	14,475	22%
Corporate Buildings and Utilities	1,238	2%
Total Transportation Emissions	13,636	21%
Transportation within Wolfville	8,137	12%
Transportation outside of Wolfville	5,499	8%
Total Waste Emissions	1,099	2%
Solid Waste Disposal	901	1%
Wastewater Treatment	198	0%
Fugitive (Natural Gas at Acadia)	888	1%
Agriculture	5	0%
Total Greenhouse Gas Emissions	65,354	100%

Figure 5. 2016 emissions by source.

GREENHOUSE GAS EMISSIONS

Baseline Inventory: Buildings

Energy used to heat and power Wolfville's buildings accounts for over three-quarters (76%) of the community's greenhouse gas emissions. This includes heat energy generated by burning wood, heating oil, propane, and, in the case of Acadia University, natural gas; and electricity from the provincial grid used to power buildings and their heating systems.
Energy use by residential buildings represents the single largest source of greenhouse gas emissions in Wolfville, accounting for 31% of the community's emissions.

	Tonnes of CO2e					
Source	Natural Gas	Fuel Oil	Grid Electricity	Propane	Wood	Total
Acadia	8,156	0	7,144	63	0	15,363
Commercial	0	1,294	11,146	1,400	0	13,840
Corporate	0	86	1,153	0	0	1,238
Residential	0	4,905	14,201	95	972	20,172

Figure 6. 2016 building emissions.

The Global Protocol for Community-scale Greenhouse Gas Emission Inventories (GPC) protocol breaks out building energy and emissions by end-uses (Figure 7). Space heating of buildings represented the largest source (44%) of greenhouse gas emissions of any building end-use, followed by plug load (26%), the energy used by products that are powered by means of an ordinary alternating current (AC) plug.

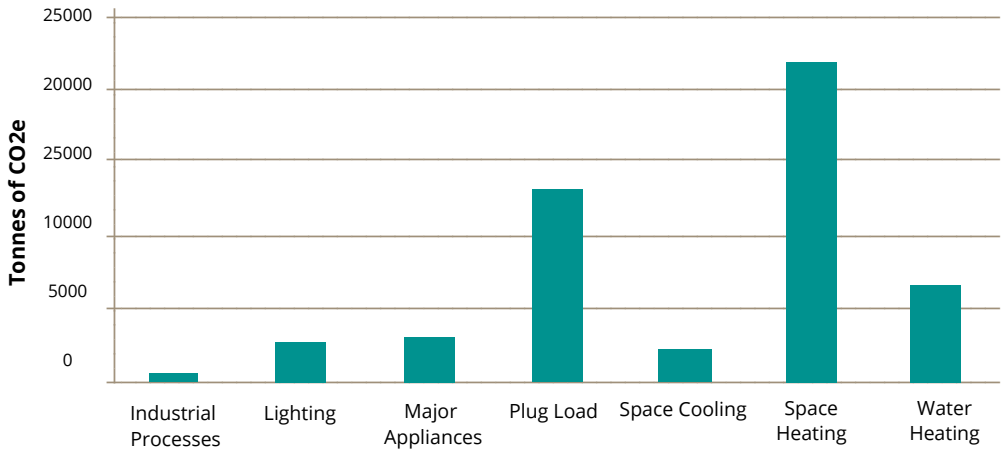


Figure 7. 2016 building emissions by source.

GREENHOUSE GAS EMISSIONS

Baseline Greenhouse Gas Emissions Inventory: Transportation

On-road transportation is the second largest source of Wolfville's greenhouse gas emissions. Wolfville is 3.5km in length from east to west, and while it is over 2km in length from north to south at its widest point, the northernmost 500m of that area is unpaved farmland. With a total land area of 6.46 km², trips in town – that is to say, trips that both originate and end in Wolfville without leaving its municipal boundaries – average 2km in length, and rarely if ever extend over 5km in length.

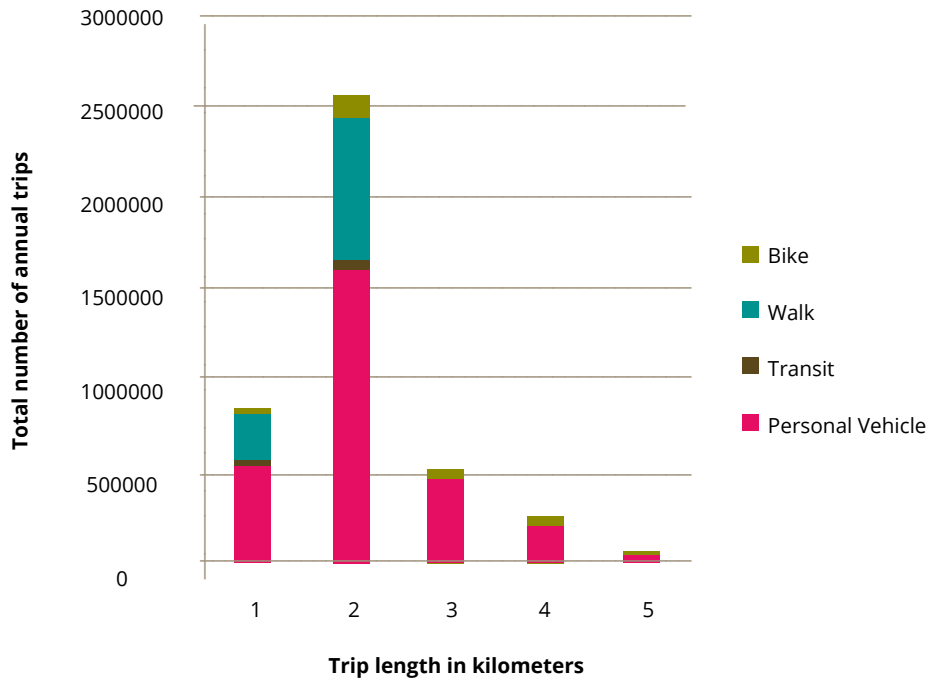
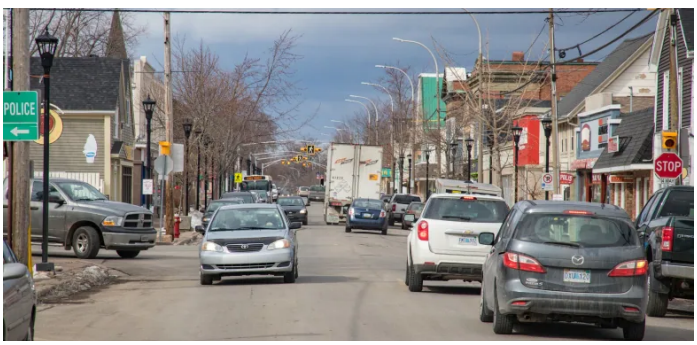


Figure 8. Number of annual trips per trip length.

Trips in Town, however account for only 6% of transportation-related greenhouse gas emissions from Wolfville. Attributing transportation emissions is complicated, because motor vehicles are inherently *mobile*: a trip that begins in Wolfville might emit most of its emissions travelling *outside* Town boundaries. The GPC Protocol addresses this complication by using an induced-activity calculation method, which calculates transportation emissions induced by, rather than occurring in, the community – including trips that begin, end, or are fully contained within the Town. Detailed information about this method can be found in section 7.3 of the Global Protocol for Community-Scale Greenhouse Gas Emission Inventories.



GREENHOUSE GAS EMISSIONS

Based on the induced-activity calculation method, 52% of Wolfville's transportation-related greenhouse gas emissions are generated by external inbound trips – that is to say, trips that originate outside of Wolfville and travel to destinations in the Town. An additional 42% of Wolfville's transportation-related greenhouse gas emissions come from external outbound trips, which start in Wolfville and travel to destinations outside of the Town's boundaries.

Baseline Inventory: Waste

Wolfville's waste-related greenhouse gas emissions come from the solid waste and wastewater generated by the community. Waste disposal and treatment produces greenhouse gas emissions directly through aerobic or anaerobic decomposition, and incineration; and indirectly from energy consumed by wastewater treatment and recycling processes.

Baseline Inventory: Fugitive Emissions

In 2015, Acadia University converted its campus heating system, which had previously used fuel oil, to run on natural gas. This change – along with a number of energy efficiency initiatives and the declining emissions-intensity of Nova Scotia's electricity grid – reduced the University's buildings-related greenhouse gas emissions by 46% between 2003 and 2016. It also introduced a new source of emissions to the community: leaks and other irregular releases of gases or vapours from pressurized containment of natural gas at Acadia University's central heating plant, which account for approximately 1% of the community's total emissions. These leaks are referred to as "fugitive emissions."

Baseline Inventory: Agriculture

While Wolfville is situated in Nova Scotia's agricultural heartland, and approximately one quarter of its land is zoned agricultural, there is little agricultural activity in Wolfville, and emissions associated with agricultural activities reflect this.

GREENHOUSE GAS EMISSIONS

Business-As-Usual Scenario

In the process of developing Wolfville's Climate Action Plan, Town staff worked with consultants from Sustainability Solutions Group to develop a GHG emissions "model" of the town that incorporates and accounts for all of the components that drive greenhouse gas emissions in Town and the relationships between them. The emissions model is projectable and can be used to explore and evaluate the impacts of actions, or inaction, on the Town's greenhouse gas emissions.

Sustainability Solutions Group ran the model based on current trends and forecasts, existing conditions, and population and employment growth projections for Wolfville, to generate a Business as Usual (BAU) Scenario of what Wolfville's emissions would look like over the next ~30 years. As illustrated in Figure 9, the Business as Usual Scenario projects a downward trend in emissions until approximately 2030 followed by a gradual rise, resulting in an overall reduction in emissions of 17.4% by 2050.

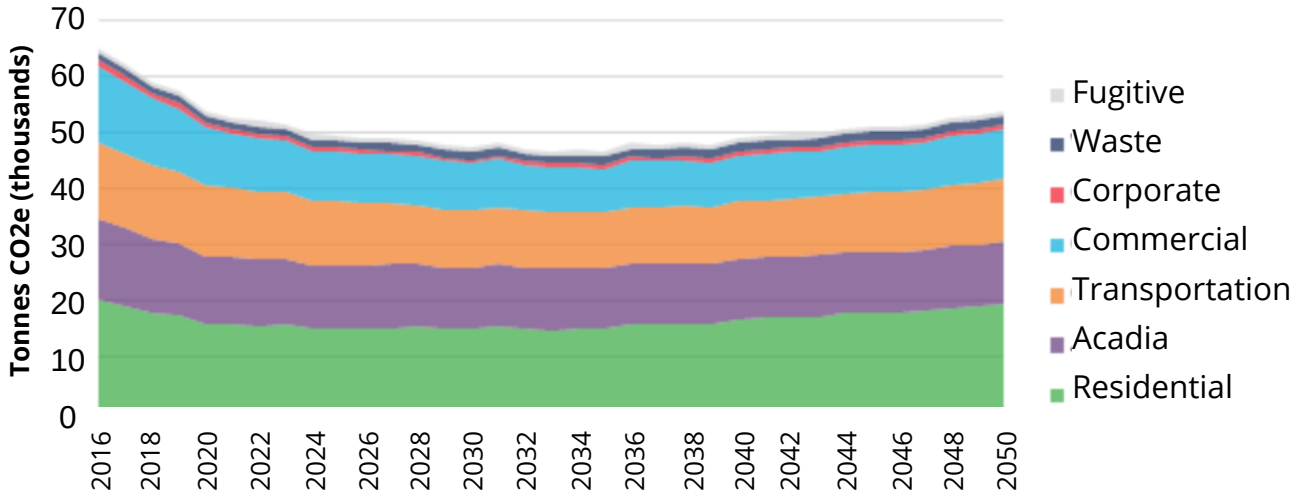
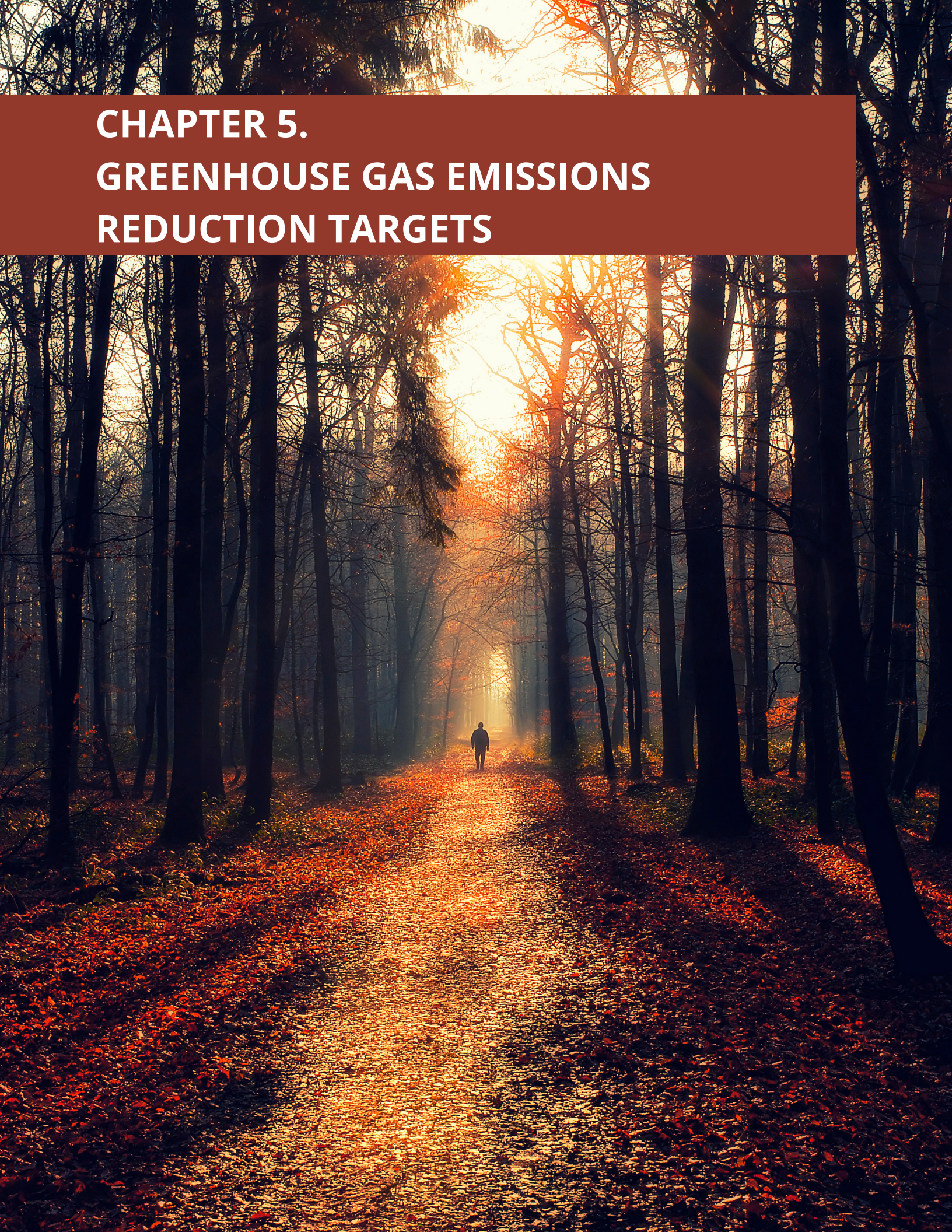


Figure 9. Business as Usual Scenario emissions projection to year 2050.

This projected decline is attributable to provincial and federal policy measures currently in place, including projected home energy efficiency standards in future versions of the National Building Code, increasing federal motor vehicle fuel efficiency standards and adoption rates of electric vehicles, and legislated targets for reduced carbon intensity of electricity available through the provincial grid; along with warmer winters as a result of global warming, requiring fewer heating days.



CHAPTER 5.
GREENHOUSE GAS EMISSIONS REDUCTION TARGETS

GREENHOUSE GAS EMISSIONS REDUCTION TARGETS

Following the development of the greenhouse gas emissions inventory, Town Council set the following emissions reduction targets in February 2021: reduce 2016 greenhouse gas emissions 45% by 2030, and reach net-zero emissions by 2050.

45% by 2030

NET-ZERO by 2050

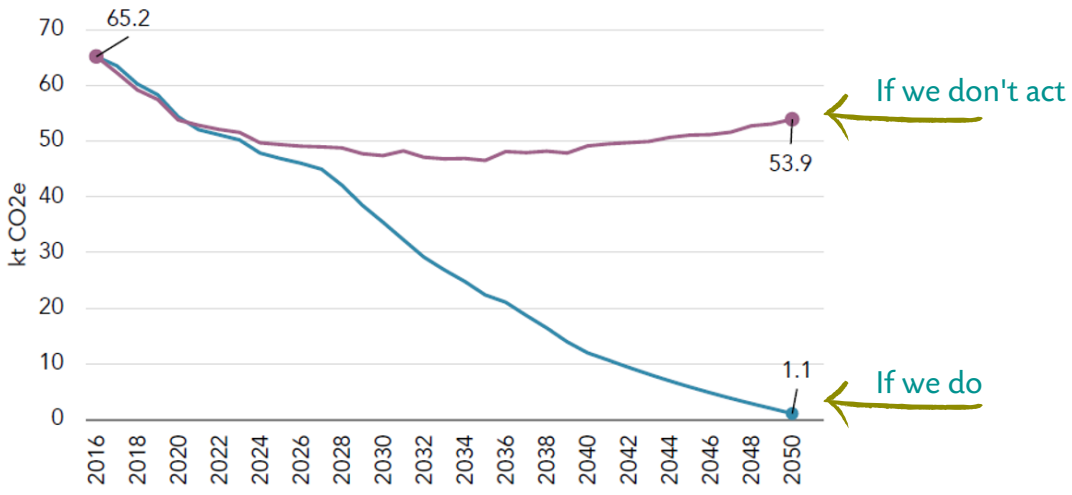
Net-zero occurs when greenhouse gas emissions are reduced, and remaining gases are captured or absorbed, rather than released.

Council's adoption of these targets allowed Wolfville to achieve Milestone 2 of the Partners for Climate Protection program.

By adopting an emission reduction target, a community sets itself a goal of decreasing overall greenhouse gas emissions by a certain amount by a specified point in time.

A report detailing the Town's greenhouse gas emission reduction targets is located in Appendix H. This plan has been created so that the following reductions can be achieved:

MILESTONE 2: Set Emissions Reduction Targets



Wolfville's projected greenhouse gas emissions under a business as usual (purple) scenario, and a low carbon scenario (blue).

GREENHOUSE GAS EMISSIONS REDUCTION TARGETS

The Climate Equity Approach to Emissions Reductions Planning

The low-carbon scenario shows what emissions reduction trajectory is required to achieve net-zero emissions by 2050, in line with the IPCC's call to action in avoiding average global heating above 1.5oC by 2050. This is one way to plan for emissions reductions; another is the climate equity method which determines a pathway to net-zero emissions that addresses global emissions inequities, namely that industrialized nations have emitted more than other nations.

National carbon equity calculations have been made by the Stockholm Environmental Institute in its Climate Equity Reference Calculator. The remaining global carbon budget associated with limiting global heating to 1.5oC by2050 (i.e. maximum allowable emissions ever) is allocated to each country by 'fairs hare' in the calculator. The allocation is based on historical contributions to GHG emissions, development projections, levels of poverty, and other variables. The calculator also determines by what year the allocated emissions need to be reduced to zero based on factors such as the country's capacity to act, average income of residents, and historical responsibility period.

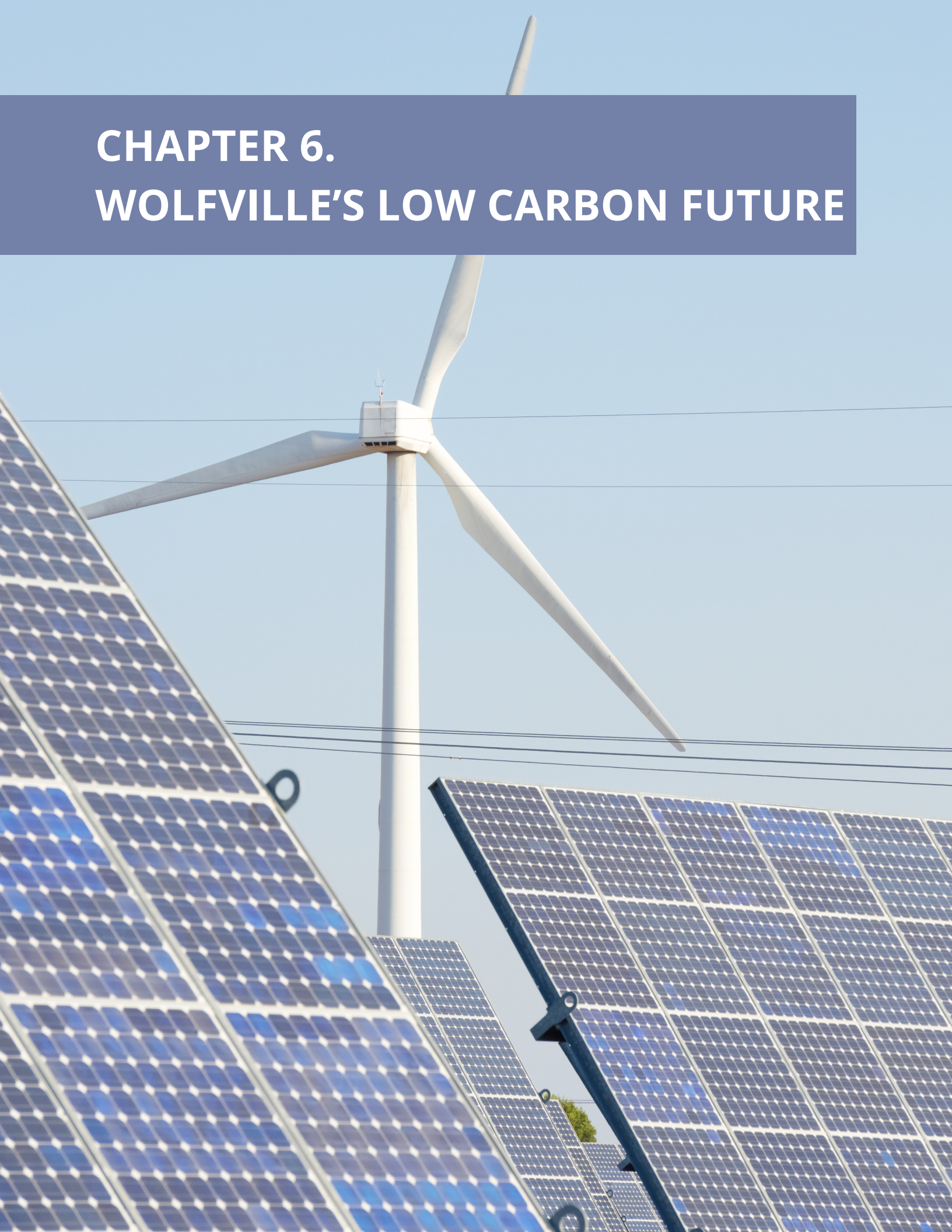
The country allocation can be sub-allocated to municipalities by taking the ratio of a municipality's emissions to that of Canada's in a given year. Determined this way, Wolfville's annual emissions represent an average of 0.012% of Canada's total annual emissions. If Wolfville were to follow Canada's fair share required emissions reduction trajectory - being responsible for 0.012% of Canada's required annual emissions reductions - the town (and the rest of Canada) would have to reach net-zero emissions by 2027 – 23 years ahead of what is targeted under the low-carbon scenario, see figure below.

GREENHOUSE GAS EMISSIONS REDUCTION TARGETS

Comparison of climate equity emissions reduction trajectory versus business as usual (purple) and low carbon scenario (blue) trajectories, 2016-2050.

This is Wolfville's globally equitable emissions reduction trajectory. It is quite drastic compared to the net-zero by 2050 low-carbon scenario trajectory, demonstrating that although climate action to reduce all emissions by 2050 seems ambitious, it is not nearly as ambitious as it should be under a globally equitable scenario. Achieving the emissions reductions in the climate equity scenario would entail rapid energy efficiency transformation of Wolfville's existing building stock, installations of renewable energy generation infrastructure, switching Acadia's district energy plant to net-zero emissions operations, and decarbonization of transportation in less than a decade.

CHAPTER 6.
WOLFVILLE'S LOW CARBON FUTURE



WOLFVILLE'S LOW CARBON FUTURE

This section details the opportunities for greenhouse gas emission reductions that will allow Wolfville to meet the reduction targets of 45% below 2016 levels by 2030, and net zero by 2050. The Town understands and acknowledges that some impacts of climate change are now inevitable, but the degree and intensity of which we experience them can still be lessened by rapid decarbonization.

While the Town is dedicated to taking action, decarbonization requires action from residents, businesses and institutions as well. This Plan identifies actions to be taken across the whole community and presents recommendations that will achieve the reduction targets by the target dates. These actions will help achieve long-term goals and supplement the short-term (3 year) actions from the Implementation Plan.

The energy efficiency and emissions reduction direction may be obvious - just eliminate fossil fuels! - but achieving a low-carbon future requires a conscious and persistent effort, including investment and socio-economic paradigm shifts. Wolfville's path to a low-carbon future includes several big moves and many small ones. How emissions are reduced also requires consideration - see the Reduce-Improve-Switch Paradigm (figure 10) to view a logical and thoughtful approach to reducing emissions.

The Reduce-Improve-Switch Paradigm

Low-carbon community planning considers a wide variety of actions in the transportation, buildings, industrial activity, energy use and generation, waste, and land-use sectors. The actions can be classified under one or more categories of Reduce, Improve, and Switch: reducing energy consumption, improving the efficiency of the energy system (supply and demand), and fuel switching to low-carbon renewable energy sources.

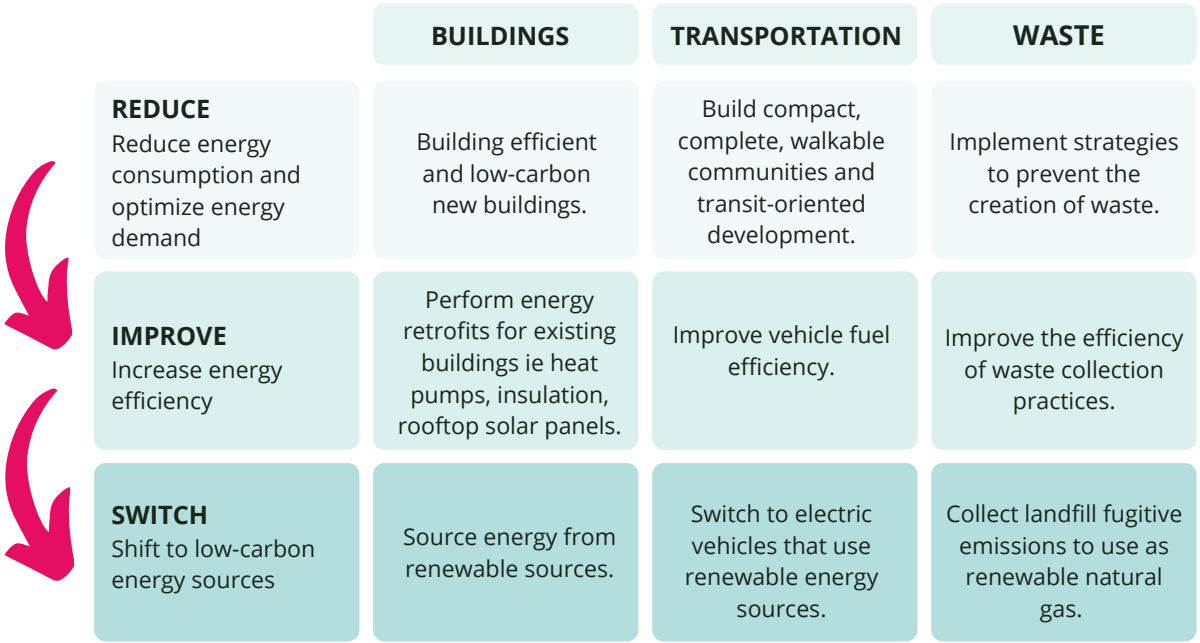


Figure 10. Reduce-Improve-Switch paradigm.

WOLFVILLE'S LOW CARBON FUTURE

The most effective approach in transitioning to a low-carbon community is to first reduce the amount of energy needed as much as possible through energy efficiency and conservation, and then to switch to low-carbon fuel sources to supply the remaining demand. The sequence of the approach is important: by avoiding energy consumption (Reduce), retrofit requirements (Improve), and the need to generate renewable energy (Switch) are both reduced. One benefit of following this sequence is that by reducing energy demand from the grid through building energy efficiency measures, electricity is made available for fossil fuel systems transitioning to electricity (e.g. home heating from fuel oil furnaces to heat pumps, gas vehicles to EVs). This prevents overburdening the electricity grid.

Community Energy Planning Prioritization

The actions described in this Plan can also be categorized broadly as applying to new infrastructure or existing infrastructure. Infrastructure is the first priority in community energy planning as it locks communities into its use for decades. The second planning priority is to address major industry energy use, transportation energy use (personal and commercial vehicles), and building energy design (for new and existing buildings). The final priority is making energy-using equipment efficient (e.g. appliances, heating systems). This prioritization hierarchy concentrates actions where the options to intervene in the future will be fewest.

Infrastructure, Mechanical, and Energy Systems Turnover

There are cyclical opportunities to address existing infrastructure, such as the natural transition at the end of serviceable life, between now and 2050. Different types of infrastructure have different degrees of longevity, for example building HVAC systems (moderate longevity) versus their envelopes (high longevity). Increased energy efficiency can be realized by investing in appropriate upgrades during cycles of infrastructure maintenance and renewal.

Wolfville's Low-carbon Roadmap

Actions that would achieve net-zero emissions by 2050 were explored using energy and emissions modelling by consultants at Sustainability Solutions Group. Assumptions were developed for each action and they were modelled as a low-carbon scenario to demonstrate their emissions reductions potentials compared to current emissions and those projected under the Business as Usual scenario. The collection of actions that will reach the target are summarized here; full descriptions are in Appendix F.

To illustrate the scale of change required, Staff worked with Sustainability Solutions Group to lay out a roadmap of potential actions to meet net zero by 2050.

WOLFVILLE'S LOW CARBON FUTURE

Core Action Areas:

1. Adaptation

Adaptation refers to actions taken to reduce the impacts of climate change. This action differs from the other actions in the Low Carbon Roadmap because it does not provide greenhouse gas emission reductions. Adaptation actions are those that protect human life and the built environment from climate change impacts such as heat waves, inland flooding, sea level rise, storm surge, intense winds and many other impacts currently being felt and anticipated in the Town. Because Wolfville is a coastal community and is located along the Minas Basin, it witnesses twice daily the world's highest tides from the Bay of Fundy, making the Town particularly vulnerable to rising sea levels and subsequent flooding and storm surge events. It is therefore important that the following actions are taken:

- The dyke walls are connected at Waterfront Park to reduce risk of flooding from the Minas Basin and all other recommendations in the Flood Risk Plan are implemented.
- The findings from the Wolfville Food Risk Study are disseminated to all community members.
- Infrastructure is replaced with consideration of climate change impacts when requiring replacement and upgrades.
- Work closely with Regional Emergency Management Organization (REMO) to ensure a cooling station is established and communicated to all community members in advance of heatwaves, and;
- Key emergency routes into and out of the Town are identified and climate risks to these routes are identified and remedied if possible.

WOLFVILLE'S LOW CARBON FUTURE

2. New and Existing Buildings

Buildings consume a lot of energy, and as a result, emit a lot of greenhouse gas emissions. By improving the efficiency of new buildings, deep reductions in both the energy required to heat and operate a building, as well as the emissions associated with energy consumption in a building can be achieved. Energy efficiency improvements in new buildings can include decreasing the size of the average dwelling, opting for multi-unit building types over single unit homes, adopting a net-zero building standard, and switching from emissions-heavy fuels to clean energy sources.

Existing buildings represent a far larger number of buildings than the projected new building stock over the next 30 years. Deep energy retrofits to all types of buildings can reduce the energy demand for space heating and cooling. By switching from fossil fuels to electricity, and also by switching to heat pumps for space heating and cooling, the emissions associated with energy consumption in buildings can be dramatically reduced. The following factors and long-term actions will reduce emissions from buildings:

- 100% of homes have replaced fossil fuel heating with heat pumps by 2040;
- 100% of water heaters are replaced with electric models or heat pump models by 2040;
- Residential building energy efficiency retrofits reduce 50% of thermal energy demand and 50% of electrical demand in homes using electric resistance heating in 100% of homes by 2040;
- Industrial, commercial, and institutional building energy efficiency retrofits reduce 50% of thermal energy demand and 50% of electrical demand in 100% of homes by 2040;
- Industrial processes and motors increase efficiency by 50% by 2050.
- All municipal buildings are retrofit to net-zero emissions by 2030.
- New homes and Industrial, Commercial, Institutional buildings are net-zero emissions and use no fossil fuels by 2030; and
- New buildings increasingly have solar PV installed, supplying at least 10% of the buildings' electrical load. By 2050, 90% of new homes in that year have solar PV systems installed.

WOLFVILLE'S LOW CARBON FUTURE

3. Complete Communities and Transportation

Transportation makes up a third of the total energy consumption in 2016, and 21% of total greenhouse gas emissions. Internal combustion engines have shown little improvement over the last century, resulting in lost efficiency as well as the emissions associated with gasoline and diesel. The switch to electric vehicles allows for dramatic reductions in vehicular emissions.

Quality active transportation infrastructure will result in fewer short trips made by car and will encourage the use of zero-carbon methods of transportation such as walking or cycling.

Reducing community greenhouse gas emissions will be accomplished through enforcing new and existing land use bylaws that help to create complete communities. Complete communities encourage a greater population density through smaller lot sizes, encouraging multifamily dwelling units such as duplexes, townhouses and apartment buildings rather than large, single family homes, and encouraging residential development in areas already provided with municipal services such as sewer, water, and public and active transportation routes. The following factors and actions will result in emissions reductions in community and transportation emissions:

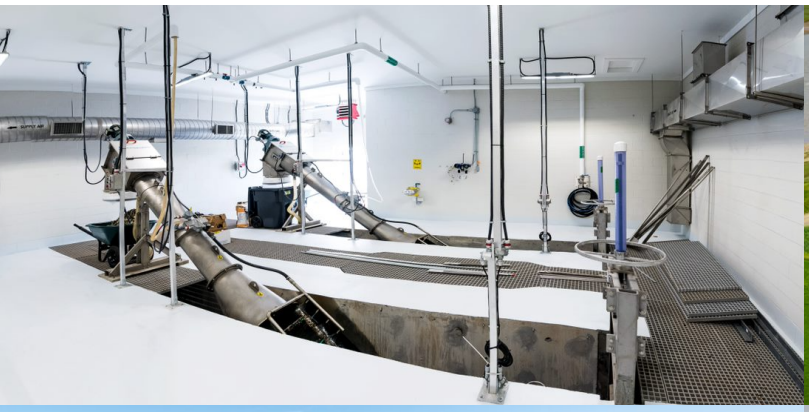
- Due to more multi-unit home development, new home sizes are slightly smaller (and thus typically more energy efficient).
- New developments are denser and preferred in infill areas with existing services to promote travel efficiency and non-vehicular travel;
- 30% of new personal vehicles are electric by 2030, 60% by 2035, and 100% by 2040;
- 30% of new commercial vehicles are electric by 2030, 50% by 2035, and 80% by 2040;
- Transit fleet is 100% electric and right sized by 2035;
- Increase transit frequency;
- Transit use increases to 25% by 2030; and
- 40% of shorter trips are made by walking or biking by 2030, 50% by 2050.

WOLFVILLE'S LOW CARBON FUTURE

4. Solid Waste, Water and Wastewater

A holistic waste management strategy focuses on a waste hierarchy that prioritizes waste reduction, then its reuse and recycling/composting and energy recovery, followed by final disposal as a last option. Numerous cities are striving for zero waste goals (i.e. 100% diversion rates). Opportunities include outreach programs, strict separation policies, incentives/disincentives to promote recycling/organic composting, and bans on certain waste streams. To have a meaningful impact on our waste and water use and treatment, we must achieve the following results:

- Waste generation is decreased by 30% by 2050;
- 100% of solid waste is diverted from landfill by 2050;
- 100% of organics go to anaerobic digestion by 2050;
- Anaerobic digestion facilities are installed for wastewater treatment, and biogas capture for use in the district energy system;
- High-efficiency water pumps are installed by 2035, reducing energy use by 50%; and
- Residential and commercial water use is reduced.



WOLFVILLE'S LOW CARBON FUTURE

5. Local Renewable Energy Generation

Electrification is at the core of a low-carbon energy and emissions strategy, and with that comes the requirement to reduce the greenhouse gas emissions associated with the generation of electricity. The provincial electrical grid, while improving, is still projected to continue the use of high-emissions fossil fuels at its generation facilities. By producing clean electricity locally, through wind and solar installations, municipalities can encourage the switch to electricity while also reducing the emissions associated with electricity production.

Renewable energy can be stored and deployed when needed, bridging the temporal gap between when energy is produced and when it is needed, for example at night and during peak demand periods. Releasing stored energy decreases reliance on fossil fuel-based peaking plants that operate during peak demand hours (e.g. mornings and evenings). The current cost of battery electric storage is high, but prices are decreasing quickly as battery technologies become increasingly inexpensive to produce.

The district energy system at Acadia University currently uses trucked-in compressed natural gas to provide space heating for buildings on the campus. By expanding this system to include buildings in the downtown area, as well as converting it to use renewable energy, the efficiencies of a centralized heating system could be increased, while the greenhouse gas emissions associated with the system are decreased. Changes to the local renewables sector could result in:

- 10 MW of ground mount solar PV capacity installed from 2030-2045;
- Electricity storage is added with new renewable energy installations, able to store 20% of new generation capacity for release during peak electricity demand times;
- 100% of the natural gas required by the Acadia district energy system after efficiency measures is replaced with renewable natural gas or a ground or air source heat pump system, or other emissions reductions systems by 2035; and
- Renewable energy is procured from outside of the municipal boundary to replace remaining grid-supplied electricity by 2050.

WOLFVILLE'S LOW CARBON FUTURE

Supporting Action Areas:

1. Town Partners and Adopting a Collective Mindset

The Town recognizes that all partners in the Town need to take adequate action in order to have a meaningful impact. Town Partners include the Wolfville Business Development Corporation, Acadia University as well as residents. Through recognizing efforts of Town Partners and offering continual education, both corporate and community greenhouse gas emissions can be reduced.

2. Governance

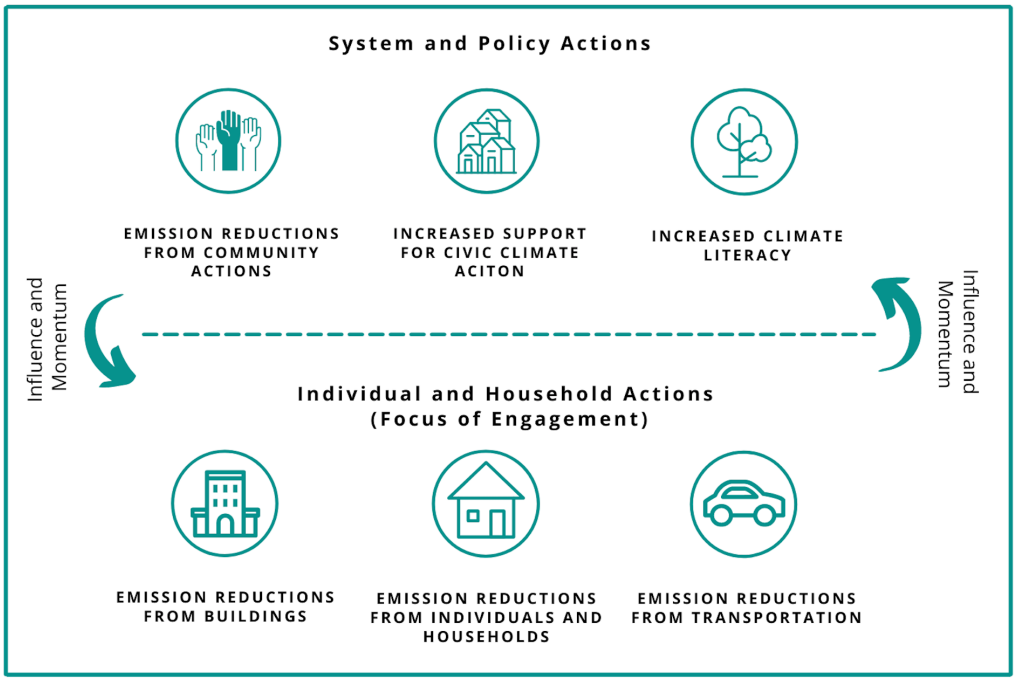
Governance refers to the readiness and capacity of the Province, Region, Council and Town staff to take on each of the actions in the Implementation Plan. This refers to budgetary and resource constraints. Acknowledging the constraints the Town faces is essential to creating a practical and attainable plan. As such, Town management have been directly involved in the creation of the Implementation Plan.

3. Regional Cooperation

In January 2020, Wolfville joined the Towns of Kentville and Berwick as well as the Municipality of the County of Kings to pursue climate action as a regional issue. This work includes a regional greenhouse gas inventory for each municipality based off of 2016 data, and a catalogue highlighting key opportunities for greenhouse gas emissions reductions regionally. The Regional Working Group formed due to a mutual understanding of the widespread impacts and action needed to have a meaningful outcome in terms of climate action. The partner communities must work together to reduce emissions as a region.

Implementing these actions over the next 3 decades will steadily decrease total energy use and emissions across the community. To achieve the 2030, 2035, 2040, and 2050 targets of the low-carbon actions, implementation must begin in the near term. How the Town intends to implement these actions is outlined Appendix A. The low-carbon community energy use and emissions reductions that will result are described in the following pages.

WOLFVILLE'S LOW CARBON FUTURE



Low-carbon Pathway Energy

This section describes how much Wolfville's energy demand must decrease and what sources energy will come from by 2050 in order to reach net zero emissions. Wolfville's total energy demand decreases from 623,000 GJ in 2016 to 249,000 GJ in 2050 in the low-carbon scenario, representing a 60% reduction. This is substantial, especially considering that population, employment, and housing are all expected to grow over the next 30 years.

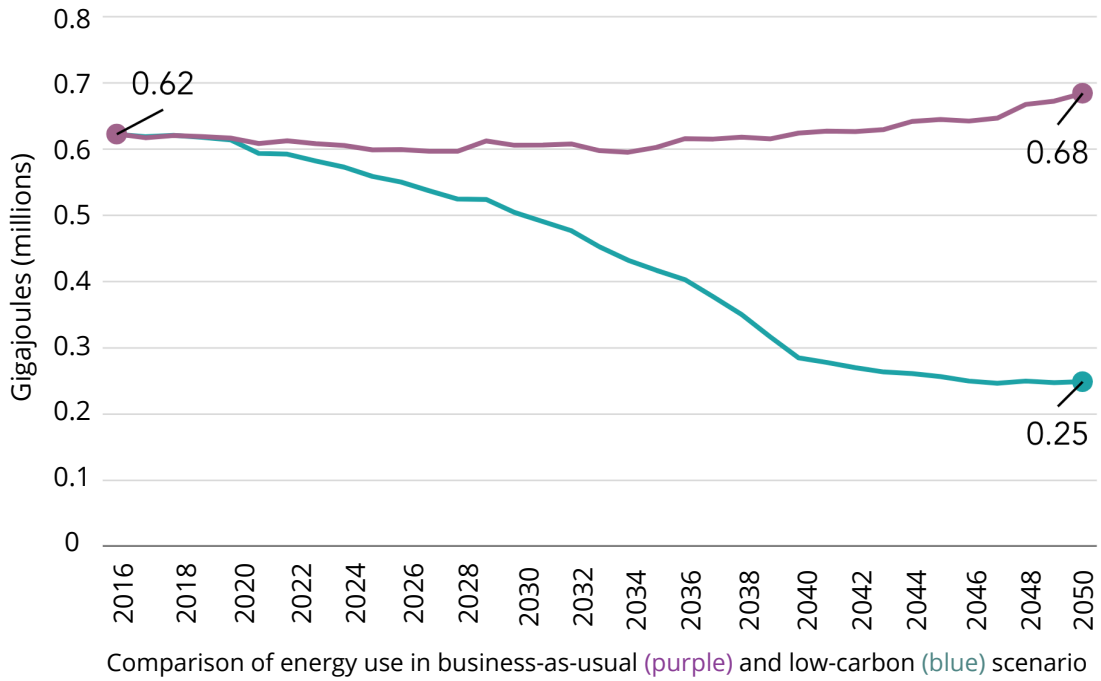


Figure 11. Business-as-usual vs. Low-carbon scenarios

WOLFVILLE'S LOW CARBON FUTURE

Energy flow in the 2050 low carbon scenario is shown in Figure 12 below. When compared with the 2016 Sankey diagram, as well as the 2050 Business as Usual diagram (see Inventory report in Appendix D), it is clear that the move toward electrification of vehicles and space heating dramatically decreases the conversion losses associated with the energy system of Wolfville.

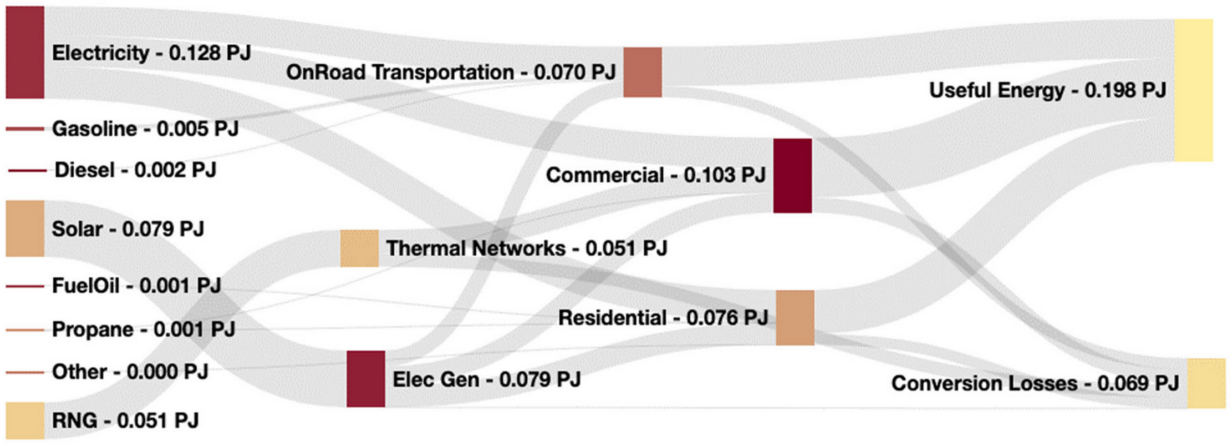


Figure 12. Sankey diagram showing energy flow in 2050 under the low-carbon scenario.

Where Energy Will Come From

The decrease in total energy consumed is paired with a shift away from fossil fuels and carbon-intensive fuels, replacing them with local renewable electricity, renewable natural gas/heat pumps, and renewable electricity generated outside of the municipal boundary ("procured"). In the low-carbon scenario, grid electricity is replaced entirely with renewable electricity. The use of gasoline, diesel, fuel oil, and propane are greatly reduced - replaced with green electricity. Some green electricity is procured from outside the municipality starting in 2030, increasing to 2050 to replace grid electricity still reliant on fossil fuels.

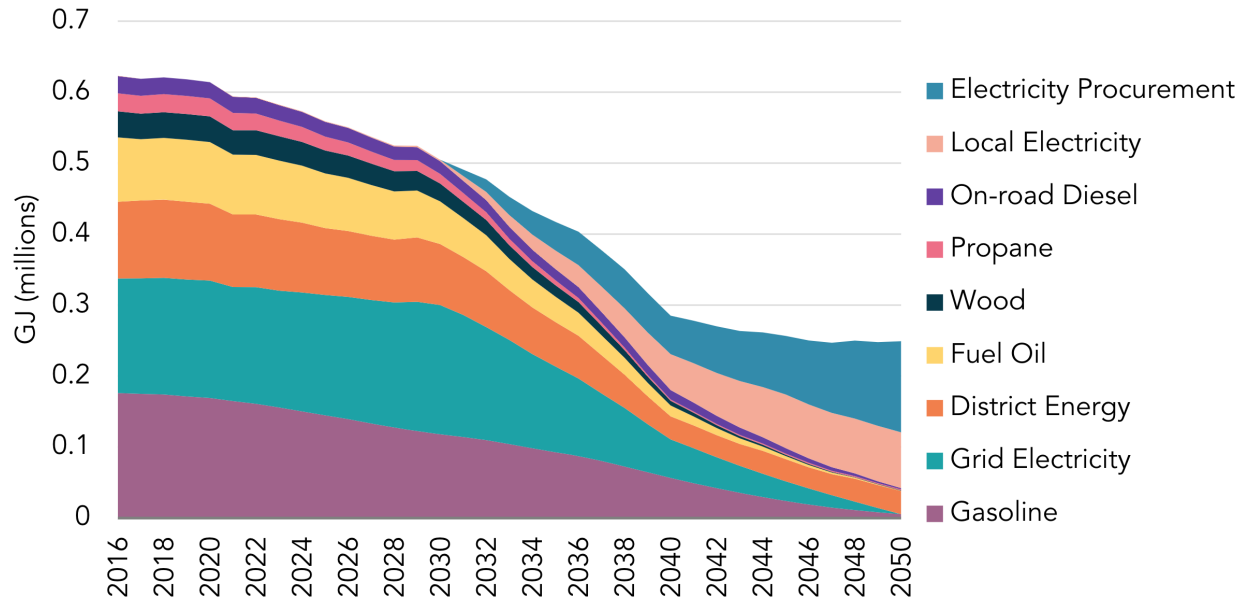


Figure 13. Low-carbon scenario energy use by energy source.

WOLFVILLE'S LOW CARBON FUTURE

Where Energy Will be Used

Energy use in the transportation sector decreases 28% by 2050, driven by a switch from internal combustion engine vehicles to electric vehicles, as well as increased use of transit, and active transportation encouraged by improved transit service and walking and biking infrastructure. Residential energy use decreases by 30% because of wide-spread building retrofits and the switch to heat pumps for space heating and cooling. Building retrofits at Acadia achieve a 23% reduction in energy consumption, and commercial energy demand decreases 17% from switching to more efficient heating and cooling systems, as well as retrofits for energy efficiency.

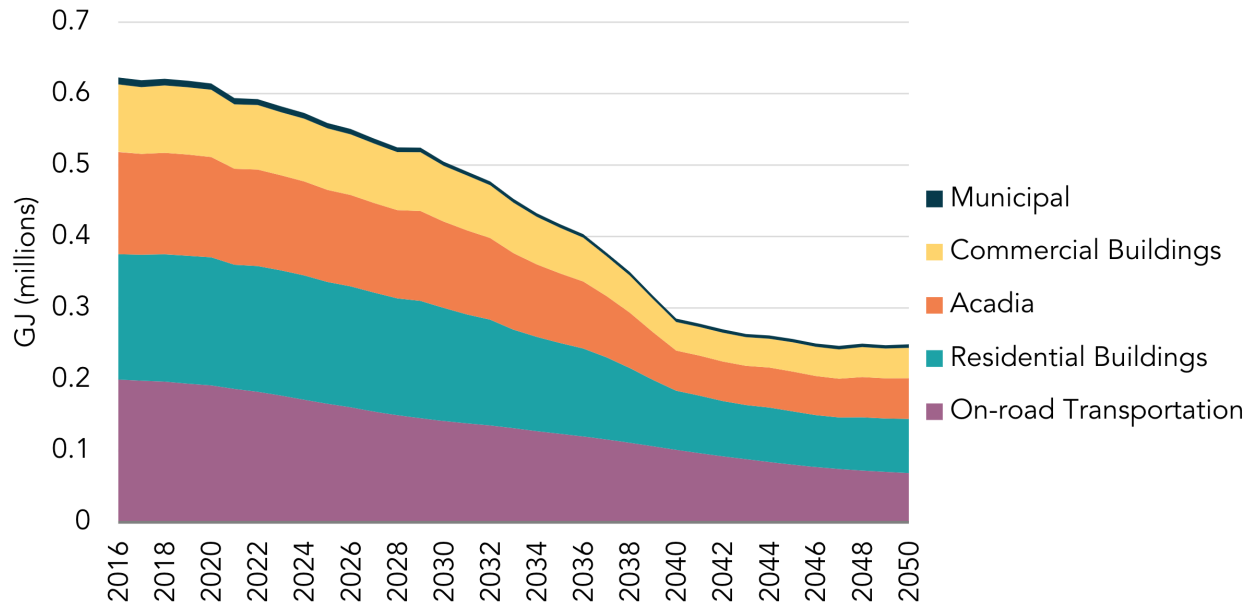


Figure 14. Low-carbon scenario energy by sector.

WOLFVILLE'S LOW CARBON FUTURE

Low-carbon Pathway Emissions

The low-carbon actions achieve a 98% decrease in community emissions by 2050. Total emissions decline from 65.2 ktCO2e in 2016 to 1.2 kt CO2e in 2050. Emissions under the low-carbon scenario in 2050 represent a 97% reduction from those in the Business as Usual scenario (53.9 ktCO2e).

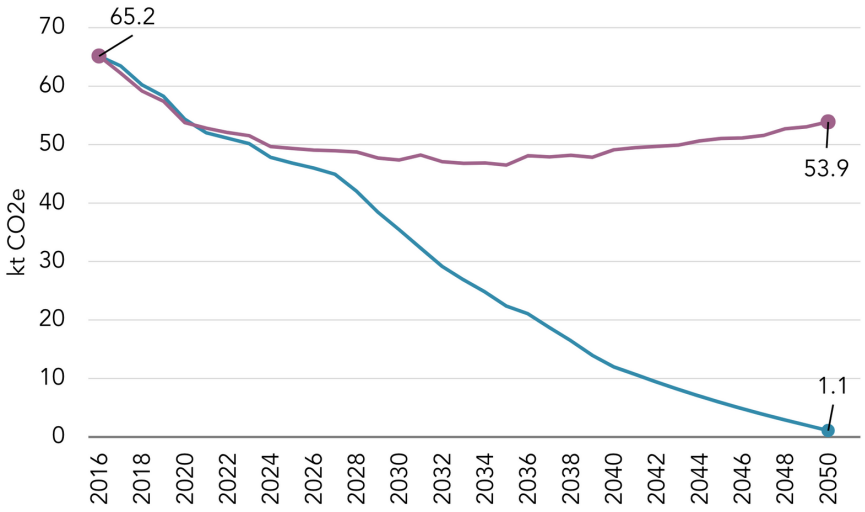


Figure 15. Total community emissions, business-as-usual (purple) and low-carbon scenarios (blue), 2016-2050

Emissions from Energy Sources

Emissions from all fuel sources decrease between 2016 and 2050 in the low-carbon scenario. Emissions from grid electricity and district energy are entirely removed by 2050, and fuel oil, gasoline, diesel, propane, and wood burning emissions are all but removed. The remaining emissions from gasoline and diesel are from older personal gas vehicles remaining on the road nearing replacement, and from a small number of remaining internal combustion commercial vehicles.

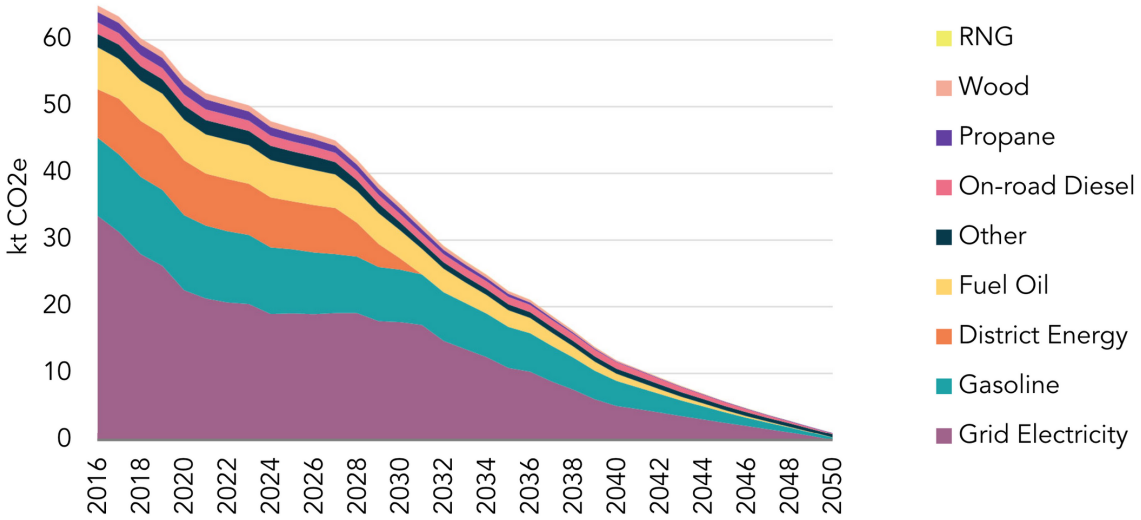


Figure 16. Low-carbon scenario emissions by energy source, 2016-2050.

WOLFVILLE'S LOW CARBON FUTURE

Where Emissions are Produced

Emissions in the commercial sector decrease by 98% from 2016 to 2050 as a result of switching from fossil fuels for space heating, moving to renewable natural gas or heat pumps for district energy, and switching from grid electricity to clean renewable electricity produced both locally and outside of the municipality. Transportation emissions show a 96% decrease, with most personal use and commercial vehicles being replaced by electric vehicles by 2050, and slight efficiency improvements to internal combustion engines. Residential emissions are completely eliminated through electrification of thermal systems and switching to local and imported renewable electricity for most uses within homes. Emissions from Acadia University are removed almost entirely by converting to renewable natural gas or heat pumps, and through the use of renewable electricity.

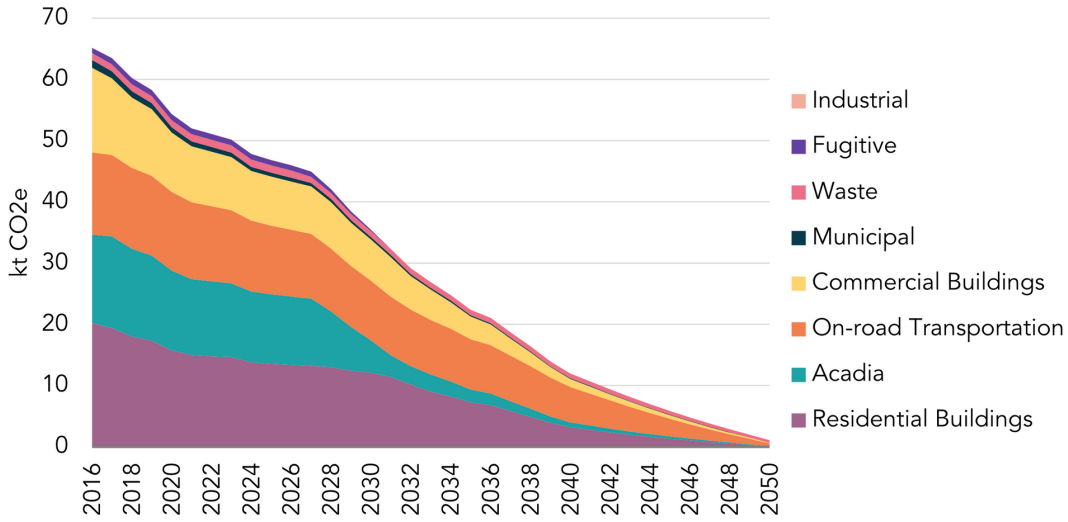


Figure 17. Low-carbon scenario emissions by sector, 2016-2050.

WOLFVILLE'S LOW CARBON FUTURE

How Emissions are Reduced

The breakdown of how specific actions shape the future of Wolfville's emissions is shown in Figure 18. Electrification and zero-emissions electricity are the critical actions – producing it locally through added ground-mount solar and roof-top solar PV installations, and procuring it from outside current grid sources.

Expansion of Acadia's district energy system, and conversion of that system to renewable natural gas or heat pumps also provides important emissions reductions. The emissions reductions from this action are large when the switch first occurs and lessens as the energy demand from the system is gradually reduced due to Acadia campus and downtown commercial building energy efficiency retrofits. This trajectory is reflective of the rate of retrofits – if retrofits of these commercial buildings are prioritized in the next 10 years instead of gradually implemented over the next 3 decades, the energy requirement of the district energy system will be diminished sooner. This would result in requiring a smaller capacity district energy system sooner.

Energy efficiency retrofits, heat pumps for air and water heating installations in homes and commercial buildings constitute more big moves. Encouraging accelerated electric vehicle uptake rounds out the 10 actions with the greatest emissions reductions.

Fifteen other actions – including energy efficient new homes and industrial, commercial, institutional buildings, waste reduction, and increased transit use and active transportation - achieve the remaining emissions reductions. Although they collectively account for less emissions reductions than the residential retrofits action (for example), they still constitute important components of the community's low-carbon transition and will allow the achievement of the net-zero emissions by 2050 target while achieving a host of other community benefits like increased mobility and accessibility, increased equity, decreased energy costs, and improved health.

WOLFVILLE'S LOW CARBON FUTURE

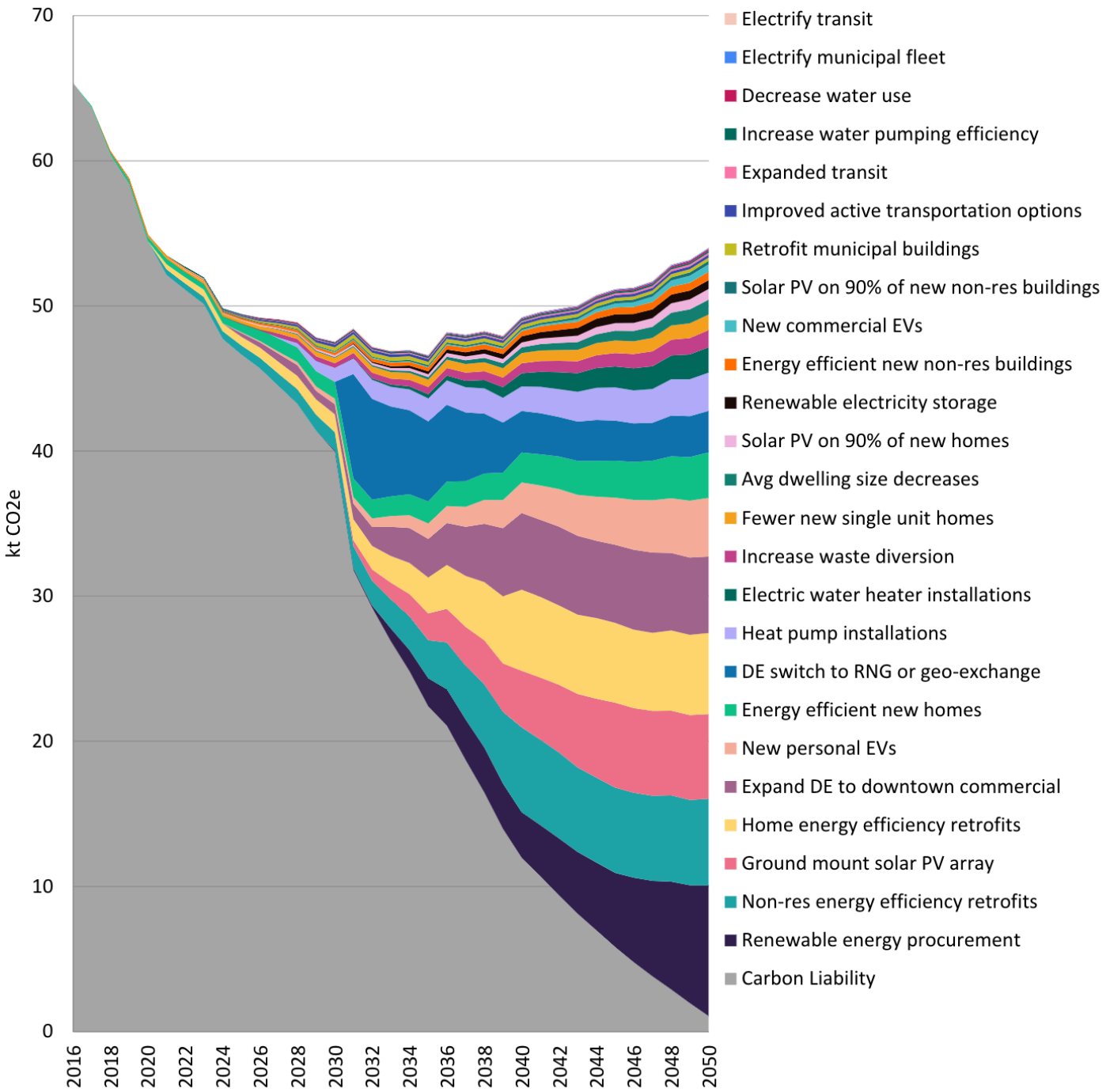


Figure 18. Wedge diagram showing the relative emissions reductions of each action explored in the low-carbon scenario, 2016-2050. The top line of the graph represents total Business-as-usual scenario emissions.

CHAPTER 7. MONITORING

MONITORING

Tracking Progress

It is recommended that performance be tracked against the Town's 2016 baseline rather than direct comparisons to other municipalities, unless a regional approach is formalized in the future. By benchmarking against Wolfville's own baseline, the community will have a clear picture of how it's using energy now, how strategies are performing, and what opportunities exist for improvements.

MILESTONE 5: Monitor Progress and Report Results

Each year, total energy consumption and greenhouse gas emissions for the Wolfville community will change as the Climate Action Plan is implemented and as the population grows. The Town will need to establish a methodology for monitoring and reporting on energy use and greenhouse gas emissions and the implementation of other actions in this plan (e.g. adaptation) and determine a reasonable schedule for reporting on progress. The annual operations plan may be the best tool for this.

Given this plan's focus on the next 3 years (2022-2025) – the next Council should revisit this plan and create another 3 year action plan while also measuring progress against the following potential indicators:

Community Performance Indicator	Measurement
Total energy use	GJ
Total energy use per capita	GJ/capita
Percentage change in total energy use per capita from baseline	%
Total energy use by sector	GJ
Energy use by sector as percentage of total	%
Total energy use by source	GJ
Energy use by source as percentage of total	%
Residential energy intensity	GJ/m²
Non-residential energy intensity	GJ/m²
Total GHG emissions	tCO2e
GHG emissions by sector	tCO2e
GHG emissions by sector as percentage of total	%
GHG emissions by source	tCO2e
GHG emissions by source as percentage of total	%
GHG emissions per captia	tCO2e/capita
Percentage change in GHG emission per capita from baseline (2016)	%

MONITORING

As we transition to a low carbon future – economic indicators should also be explored (potentially in partnership with the Valley Regional Enterprise Network and/or our Wolfville Business Development Corporation and Acadia University). Given the ongoing Regional Emissions Inventory Work, taking a regional approach to monitoring certain macro trends could be beneficial if cooperation and capacity can be realized. Potential metrics on the economic side could include an indication of total annual energy cost ($), avoided annual energy costs (compared to the business-as-usual scenario), per-capita annual energy expenditures ($ per person) and percentage change in per-person energy expenditures from a baseline year.

A Living Document

The Climate Action Plan will need to be flexible in order to adapt to the changing regional, provincial and federal legislative or governance context and other inevitable changes in this complex area of change management for municipalities. As such, the Climate Action Plan should be considered a “living document” that can be updated as new information becomes available. Renewal of the Climate Action Plan should occur at a minimum in 3 years with the new Council term but may require more frequent revisions to recognize provincial and federal legislative changes as well as technological innovations.

Next Steps

Following the adoption of this plan, the next recommend steps from Federation of Canadian Municipalities are for council to adopt policies regarding the revision of actions, checking in with actions and staying accountable. Furthermore, it is recommended that in 2025 a new 5 year plan should be made, identifying actions that build on each other, and identifies new actions Council can take and allocate funds to. When the next Council is elected, the Federation of Canadian Municipalities recommends that their first action is to update the Plan with a new set of actions.

This is Wolfville's Climate Action Plan.

Let's all work together to create meaningful change.

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