Town of Mahone Bay
GHG Reduction Action Plan
March, 2021

TOWN OF Mahone Bay

EXECUTIVE SUMMARY

The Town of Mahone Bay recognizes its vulnerability in the face of climate change and on February 12th, 2019, the Town recognized the Climate Change Emergency by resolution of Council. As a result, the Town amended its Strategic Plan to include priorities for climate change mitigation and to implement initiatives to reduce corporate and community greenhouse gas (GHG) emissions.

To further build upon previous policies and plans this comprehensive emissions inventory and GHG Reduction Action Plan defines overarching goals for emissions reduction that align with the Intergovernmental Panel on Climate Change (IPCC) for a 45% reduction in emissions below 2010 levels by 2030, with a further vision to be a carbon neutral community by 2050.

The actions described in this Plan help achieve these goals and also help to realize a more sustainable and healthier future for the community. In this future, Mahone Bay is a community that sources 100% renewable electricity and electrification of municipal operations and community uses including home heating and vehicles. In addition, each home, business and municipal operation will be able to use energy efficiently and at optimal times for the utility.

Supplementing this central strategy, this Plan aims to foster additional tree coverage and green spaces, highlighting our beautiful scenery and healthy, clean air. To create a community that walks, and bikes, because active transportation is safe and convenient and a place where residents can source their products locally, reducing transportation emissions by supporting local businesses to grow and become sustainable throughout the year.

To achieve IPCC goals and a carbon neutral future, Town Staff, with assistance from Clean Nova Scotia and Sustainability Solutions Group (SSG) Consultants determined a 2010 baseline emissions inventory of 19,108 tonnes of CO_2e (18.4 tonnes/capita). Emissions by sector identified electricity and transportation as the highest emissions sources followed by buildings, solid waste and wastewater.

With this baseline, it was determined that a total emissions profile of 10,509 tonnes of CO_2e (10.14 tonnes/capita), requiring a further reduction of 5,001 tonnes of CO_2e (4.8 tonnes/capita) by 2030 is necessary to be on track for a 100% reduction by 2050.

Mahone Bay's GHG inventory and community engagement activities better informed the actions items listed in this Plan to effectively reduce emissions from municipal operations and community use. The action items listed in Section 7 and 8 aim to achieve grid decarbonization, heating and vehicle electrification, landfill waste diversion, reduction in energy for wastewater treatment and water supply, and continued community effort to implement sustainable behaviours.

Town staff provided SSG consultants with a list of these proposed actions and targets which were modelled against the baseline inventory to determine what the Town's Low Carbon Scenario looks like, should these targets be achieved. This model demonstrates that the Town of Mahone Bay will successfully reduce emissions by 91% below 2010 levels by 2050 and confirms the ability of the Town to, not only exceed IPCC targets, but also to become a carbon neutral community by 2050.

However, though the Town is well on its way to achieving carbon neutrality, additional steps will need to be taken. To complement the actions in this Plan the Town will also be seeking opportunities for carbon offsetting to neutralize the remaining 9% of residual emissions, which come from commercial transportation trucks, industrial, commercial, or institutional buildings, and existing landfill emissions from previously disposed waste.

The successful implementation of this Plan will require cooperation across municipal staff, council, and community members. This Plan is an exciting step to demonstrate the Town's leadership and commitment to mitigate the harmful impacts of climate change.

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1.0 INTRODUCTION

The Intergovernmental Panel on Climate Change (IPCC) has issued a special report on the impacts of global warming and the importance of keeping global temperatures within 1.5 °C above pre- industrial levels. The IPCC report sets out foreseeable and preventable climate-change related outcomes of grave importance to coastal communities. The Town of Mahone Bay aims to take effective action to mitigate and take into consideration climate change at each part of the decision-making process.

The Town of Mahone Bay is a small coastal community located on the South Shore of Nova Scotia and home to a population of approximately 1100. The Town recognizes its vulnerability in the face of climate change and on February 12th, 2019, the Town recognized the Climate Change Emergency by resolution of Council. As a result, the Town amended its Strategic Plan to include priorities for climate change mitigation and to implement initiatives to reduce the Town's corporate and community greenhouse gas (GHG) emissions.

To further build upon previous policies and plans developed such as the Municipal Climate Change Action Plan, the Flood Prevention and Shoreline Enhancement Report and the Integrated Community Sustainability Plan, this GHG Reduction Action Plan defines overarching goals for emissions reduction through a strategy of electrification and decarbonization of town operations and community uses, and lays out the path to achieving those goals.

The Town is in a unique situation, along with three other Nova Scotia municipalities, of owning and operating a municipal electric utility which can offer greater flexibility and control over the source of electricity provided to customers. By targeting 100% of electricity supplied by own source and imported renewable energy, the Town can effectively decarbonize the local electrical grid. Further actions to electrify home heating and vehicle use will

realize substantial GHG emission reductions by reducing the use of fossil fuels and increasing use of the grid's renewably produced electricity. This strategy can also benefit the utility and ratepayers.

The Town of Mahone Bay has partnered with the non-profit organization Clean Nova Scotia to participate in the Federation of Canadian Municipalities (FCM) Transition 2050 Program. This program offers training and support to municipalities to foster emissions reduction through peer learning, strategic planning, and operational implementation. Municipalities involved have been working together to develop long-term GHG reduction plans to transition to low carbon by 2050 aligning with global, federal and provincial targets:

- The Paris Agreement – Limit global temperatures below 1.5 °C by reducing GHGs by 45% below 2010 levels by 2030.
- The Pan-Canadian Framework (PCF) – reduce GHGs to 30% below 2005 levels by 2030.
- Nova Scotia's Sustainable Development Goals Act – reduce GHGs 53% below 2005 levels by 2030 and achieve net-zero emissions by 2050.

The FCM states that Canadian municipalities have influence over roughly 50% of our nation's GHG emissions and by implementing actions aimed to reduce emissions, together, we can improve the quality of life in our communities, save operational and energy costs and work towards healing our environment.

The Town of Mahone Bay is also a participating member of The Partners for Climate Protection (PCP) Program offered by FCM and ICLEI – Local Governments for Sustainability Canada. As a member of this program and the Transition 2050 Program the Town of Mahone Bay aims to meet the following milestones over the next 10-years to successfully transition to low carbon by 2050:

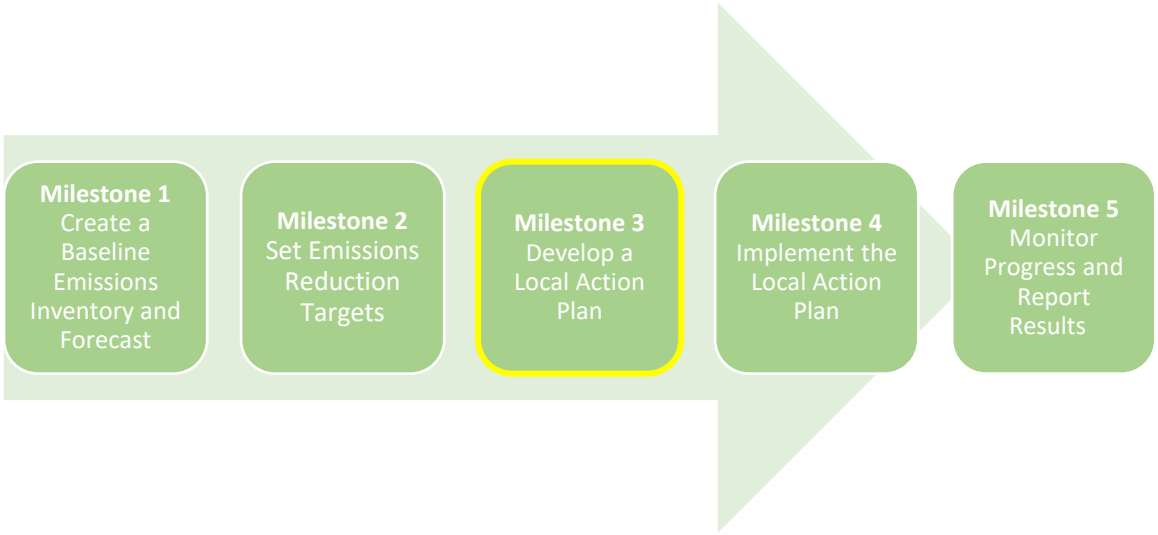


Figure 1: *Milestones for Partners for Climate Protection. Yellow indicates Mahone Bay's progress.*

Milestone #1 of the PCP Program has been achieved and the results are described in Sections 5: 2016 Baseline Inventory; Section 6: Business as Usual Scenario; and Section 9: Low Carbon Scenario.

The baseline emissions inventory highlighted the sectors with the highest emissions and therefore, identified the sectors in need of action to reduce overall emissions. Once the areas of focus were identified, action items that could facilitate emissions reductions were compiled and targets were set for each action that would lead the Town to meet the IPCC targets of reducing 45% of emissions below 2010 levels by 2030 and to be net-zero emitting by 2050. These targets are highlighted throughout this Plan and meets Milestone #2 of the PCP Program.

This GHG Reduction Action Plan (Milestone #3) sets out a clear path to further attain Milestones #4 and #5. The Transition 2050 Program timelines currently anticipate that participating units will finalize local action plans in Q1 2021.

2.0 STATEMENT FROM TOWN COUNCIL

" The Town of Mahone Bay is known as a particularly beautiful coastal community, with a thriving commercial district that is a haven for locals and visitors alike. In February 2019 Mahone Bay Town Council recognized a Climate Change Emergency by resolution of Council and amended its Strategic Plan to recognize the need for change.

Mahone Bay has long been a leader in green energy, as one of three municipal partners in the ownership of a windfarm which feeds power to clients of our municipal electric utility including our own operations. We have now made reducing corporate and community greenhouse gas (GHG) emissions in Mahone Bay a priority as we recognize the role the GHGs play in climate change. As a coastal community the negative effects of Climate Change are clear and we have to take a leadership role in making a positive change.

The Town started this project with a plan to knock on every door and even when the COVID-19 pandemic hit and we found other ways to have that direct engagement with the residents and businesses of Mahone Bay. We are grateful for the unprecedented community participation in this project, and we are encouraged to know that GHG reduction is also a priority to the members of our community.

The 17 actions laid out in the Town of Mahone Bay Greenhouse Gas Reduction Action Plan provide a clear path forward for our community to overcome barriers for all sectors in Mahone Bay to become carbon neutral by 2050. We look forward to leaving a legacy of positive change."

- *Mayor David Devenne*

Mayor David Devenne

Deputy Mayor Francis Kangata

Councillor Alice Burdick

Councillor Penny Carver

Councillor Joseph Feeney

Councillor Richard Nowe

Councillor Kelly Wilson

3.0 PLAN OVERVIEW

This GHG Reduction Action Plan aims to describe how the Town of Mahone Bay will continue to work towards, and meet, the five referenced PCP milestones, setting and achieving reduction targets to effectively reduce GHGs and transition to a low carbon community by 2050.

As a participating municipality of the Transition 2050 Initiative, Clean Nova Scotia and Sustainability Solutions Group (SSG) Consultants have provided the Town with a baseline emissions inventory from 2016. This inventory is important moving forward so actions can be quantified and allows the Town to clearly observe if target reductions are being met.

The baseline emissions inventory captures community, municipal and land use GHGs from every sector to determine a detailed tonnage of CO_2 equivalent (CO_2e) emitted in 2016. CO_2e is used as a standard unit to express the warming capabilities of all GHGs including methane, nitrous oxide, ozone, halocarbons and other less prominent gases.

The Town of Mahone Bay has targeted the IPCC recommended reduction of 45% below 2010 GHG levels by 2030. Up until the baseline data was received, the Town was following what the PCP Program refers to as a top-down approach, working backwards from the IPCC recommendations. With the completion of the emissions baseline, we can now complement this with a bottom-up approach, quantifying each action and its contribution to community GHG reduction.

Town staff also conducted online, telephone, and door-door data collection to gather GHG emitting parameters of homes and businesses. This data further compliments the baseline inventory to help accurately quantify actions and reductions and provides incredible insights into what actions and programs are best suited for the community of Mahone Bay. This data collection is further detailed in the following engagement section.

4.0 COMMUNITY ENGAGEMENT

Town staff in collaboration with the Alternative Resource Energy Authority (AREA) – in which the Town is a partner - have and will continue to host various engagement events to gather resident comments and concerns in relation to climate and energy projects to reduce GHGs. The following engagement activities have occurred to date.

Focus Groups

Town Staff working with AREA and Thinkwell Shift (a consulting firm engaged by AREA), hosted focus groups within the Town to gather thoughts from two groups of 5-6 residents: environmentally minded individuals, and the representative Mahone Bay resident. Residents were asked their opinions on three different topics including community solar gardens and investments options, electric vehicles and how to facilitate community uptake, and a rental or financing program to facilitate home heating retrofits and upgrades. This feedback has informed actions presented in this plan.

Public Engagement and Data Collection

GHG Emissions data has also been collected by staff directly from Town residents and businesses to further detail the modelled emissions baseline from SSG, the data collected from online, telephone, and door-to-door collection includes valuable information pertaining to home heating, fuel type used, vehicle use, and sustainable living. Residents were also prompted to offer comments and suggestions about projects and initiatives the Town should pursue. This data collection began in February 2020 and to date 298 responses have been received from homeowners, renters, and businesses.

This community data can also be analyzed using Geographical Information Systems (GIS) to map progress throughout the Town and to better target and launch educational campaigns and enrollment in future mitigation projects.

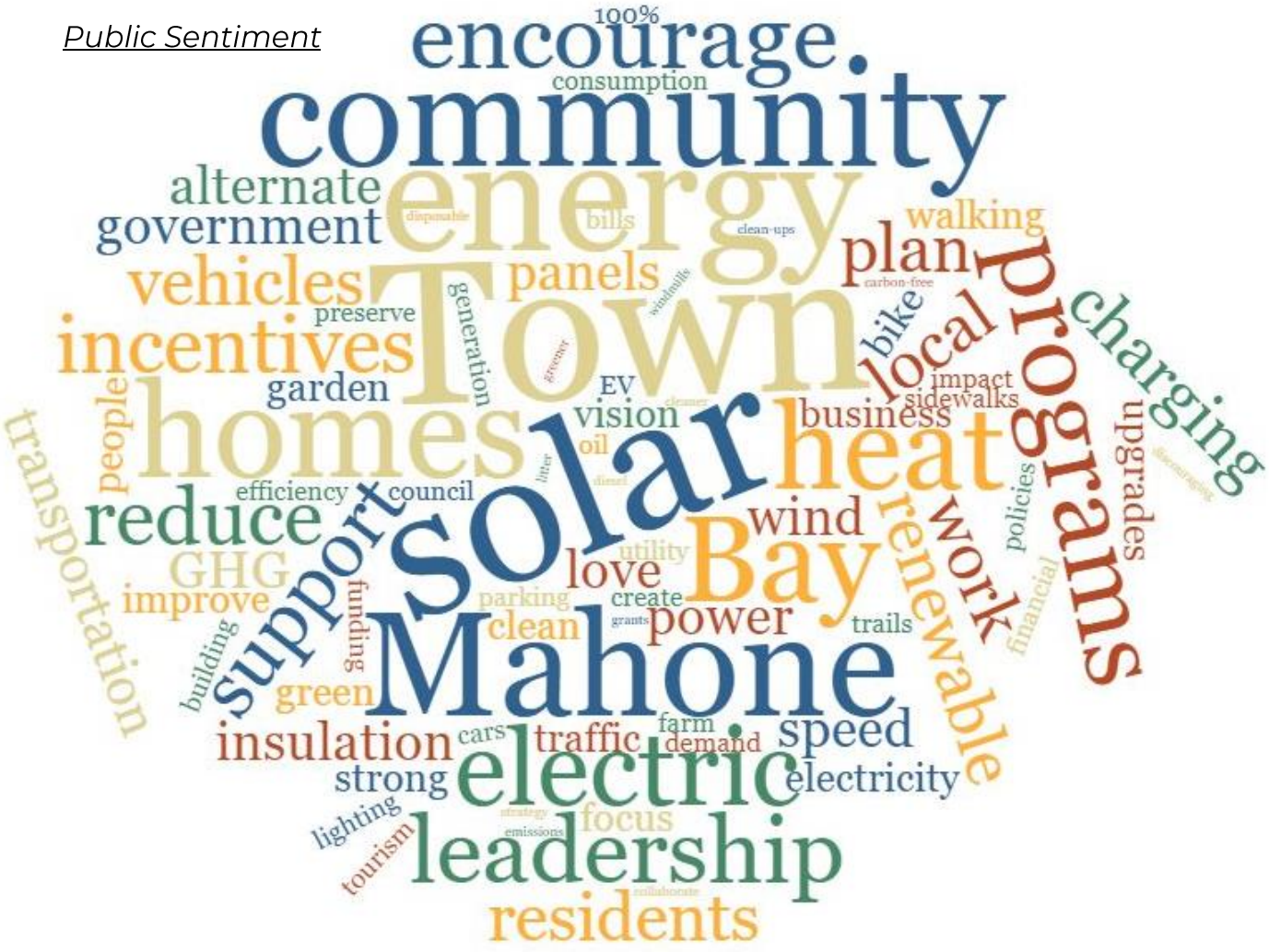
The data collection will be ongoing as staff aims to reach every Town resident and business. This data compliments the baseline inventory and forecasts

completed by Clean NS and SSG consultants giving us further detail and insight into community emissions by individual homes and environmental social behaviours.

The GHG data collection conducted by Town staff is invaluable and has created a detailed database of GHG emission sources from private property homeowners. Staff can further link this data to property and housing data for age of structures and size to determine if certain aging homes would benefit from upgrades, or if homes of a certain size are suited for different home heating solutions. The data can further be linked to meter data and electrical use so we can compare from year-year. Continued data collection and updating will further improve the accuracy and usefulness of this database.

This is a very unique, detailed dataset with a variety of applications to the Town and electrical utility. For example, the Town now has a database of which homes heat with electricity and oil and might benefit most from the HOME Program for heat pump installations. Staff will be able to target specific homes that meet criteria for green initiatives, electrification, and efficiency programs. This data will inform program development, support external funding applications, and aid with overall customer management efforts allowing considerable evolution in best practices for the utility.

Public Sentiment



When asked how respondents would rate the Town of Mahone Bay's leadership in reducing local GHG emissions, an average rating of 7.4/10 was given.

Through the engagement activities undertaken to develop this plan the residents and businesses of Mahone Bay have shared their thoughts on the Town's efforts to mitigate climate change and it is very clear – as reflected in the above word cloud and associated ratings - that Mahone Bay residents support additional action on reducing GHG emissions. Many of the comments and suggestions provided align with the actions listed within this Plan, and Staff will continue to work with residents to identify community needs.

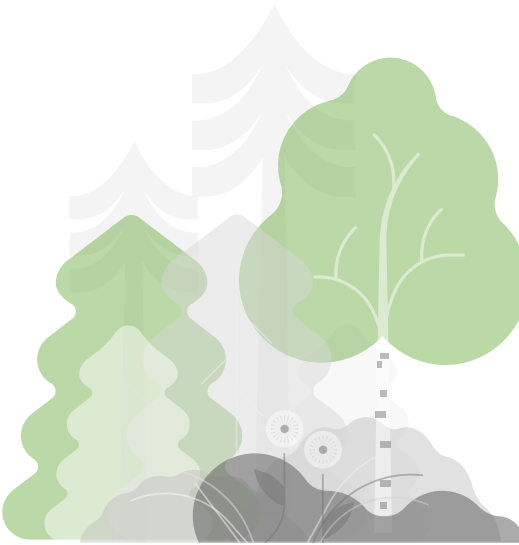
5.0 2016 EMISSIONS INVENTORY

An emissions baseline inventory for 2016 was completed to meet the Town's first Milestone in efforts to reduce GHG emissions. The 2016 data was then used to extrapolate an overall baseline for 2010 to compare the Town's progress against the IPCC target of reducing emissions 45% below 2010 levels.

The Town of Mahone Bay's 2016 baseline emissions inventory was calculated to be 15,510 tonnes of CO_2e. To extrapolate the data, the Town's 2016 data was compared to Nova Scotia's 2010 and 2016 baseline emissions inventories. In 2010, the Province of Nova Scotia produced 20.7 megatonnes of CO_2e and in 2016 emissions were reduced by 23.2% for total emissions produced at 15.9 megatonnes. To determine Mahone Bay's emissions inventory in 2010, the 2016 baseline was increased by 23.2% for a 2010 baseline of 19,108 tonnes of CO_2e.

Staff believe that emissions were actually higher than this baseline because of the significant development of the Ellershouse Wind Farm that reduced emissions associated with the electrical grid to a greater extent than the provincial average. However, extrapolating this data in comparison with Nova Scotia allows a conservative estimate and may make the Town's goals more aggressive than IPCC.

In 2016, the population of Mahone Bay was 1036 which equates to per capita emission of 15 tonnes of CO_2e. To achieve IPCC targets of a 45% reduction in emissions from 2010 levels by 2030, the Town of Mahone Bay must have a total emissions profile of 10,509 tonnes of CO_2e (10.14 tonnes per capita). Though 2016 observed reductions in emissions, a further reduction of 5,001 tonnes of CO_2e (4.8 tonnes per capita) is required by 2030.



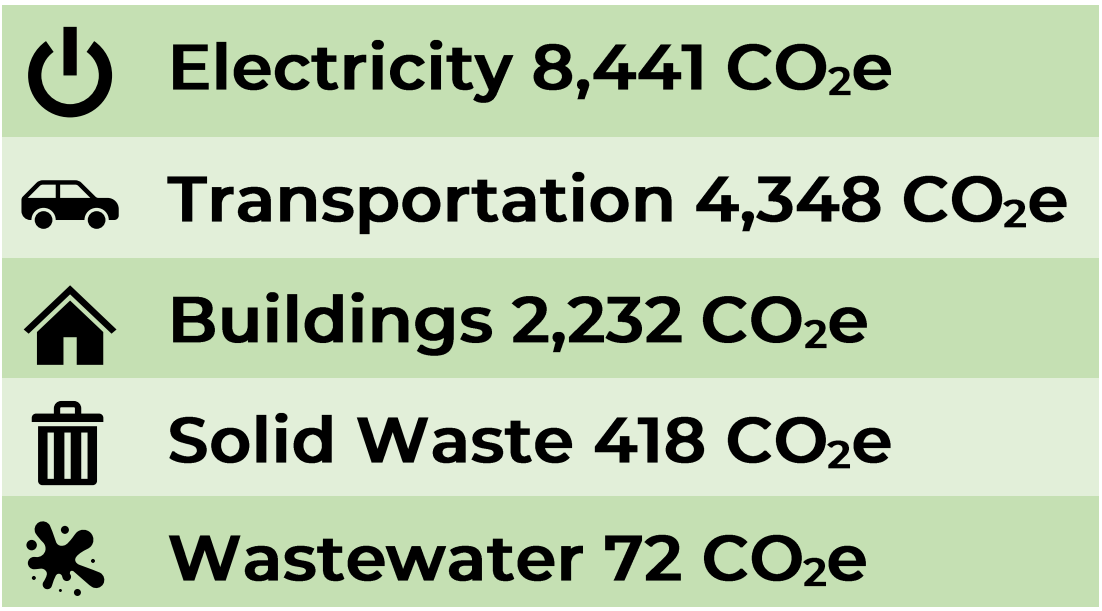


Figure 2: *Mahone Bay's 2016 emissions by sector.*

Electricity is the largest contributor to GHG emissions which has contributed to the Town's focus on this sector in recent years, to procure own-source renewable energy and to source the cleanest electricity while searching for further opportunities to green the grid. The Town also has several large commercial and industrial facilities including a manufacturing plant, school, and grocery store with more energy intensive operations.

The transportation sector presents the second highest source of GHG emissions. Mahone Bay observes a significant influx of vehicle traffic during tourist season and has large transport trucks arriving regularly for deliveries. Additionally, as observed from the Town data collection, residents average 1.41 cars per household and most drive approximately 50-200km a week.

The building sector presents the third highest emissions source resulting from fossil fuel use for purposes such as heating. There is opportunity in the building sector to transition heating sources to electric to reduce fossil fuel use by increasing the use of renewable electricity from the local grid.

Solid waste and wastewater management make up a smaller portion (1.9%) of the Towns GHG emissions. In 2016, waste going to landfill produced approximately 418 tonnes of CO_2e per capita. Additionally, due to ageing water

utility infrastructure, a decrease in emissions related to supply and treatment of water can be realized as old leaky pipes are replaced.

6.0 BUSINESS AS USUAL FORECAST

SSG Consultants have calculated a Business as Usual (BAU) Forecast that demonstrates emissions if the Town were to do nothing outlined in this Plan and carried on with our usual processes and activities. Fortunately, the Town of Mahone Bay and it's residents and businesses already seem to be doing quite a bit to reduce emissions as seen in Figure 3. Mahone Bay residents and businesses already have an eco-conscious mindset as demonstrated in the data collected from community members.

When asked about 10 different lifestyle choices the following percent of respondents were already implementing positive changes:

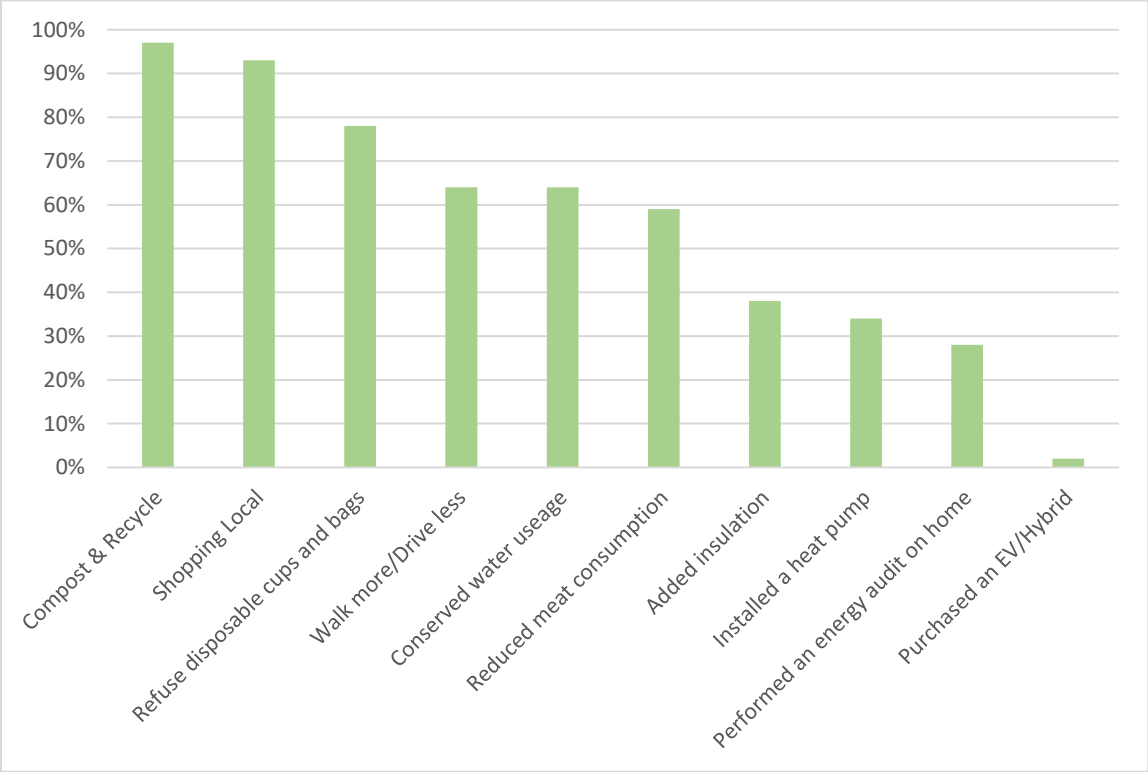


Figure 3: *Percentage of data collection respondents that are implementing these 10 lifestyle changes.*

Some of the other changes Mahone Bay residents are making to reduce their footprint which staff heard through engagement activities include:

- Growing vegetable gardens
- Switching to LED lights

- Using electric mowers
- Air drying laundry
- Programming heating systems
- Replaced vehicle with an electric bike
- Using a rain barrel to conserve water
- Purchasing second hand and repairing items
- Energy saving appliances
- Replacing old windows with energy efficient ones

The Town of Mahone Bay has already taken steps to expand renewable energy generation and make processes more efficient. Similarly, community members have also begun to implement sustainable behaviours and make their homes more efficient. It is presumed that this will continue to occur without any intervention or action from this plan and is therefore considered in the BAU scenario.

Should the Town carry on the same path, assuming a natural population increase, increase in electrical demand, continued changes in social behaviour, and natural home upgrades, the Town's 2050 emissions profile would be 10,081 tonnes of CO_2e. This is significant reduction, and puts the Town on track to meet IPCC targets in 2030, however, it is still some distance from carbon neutral/net zero for 2050, as shown in Figure 4.

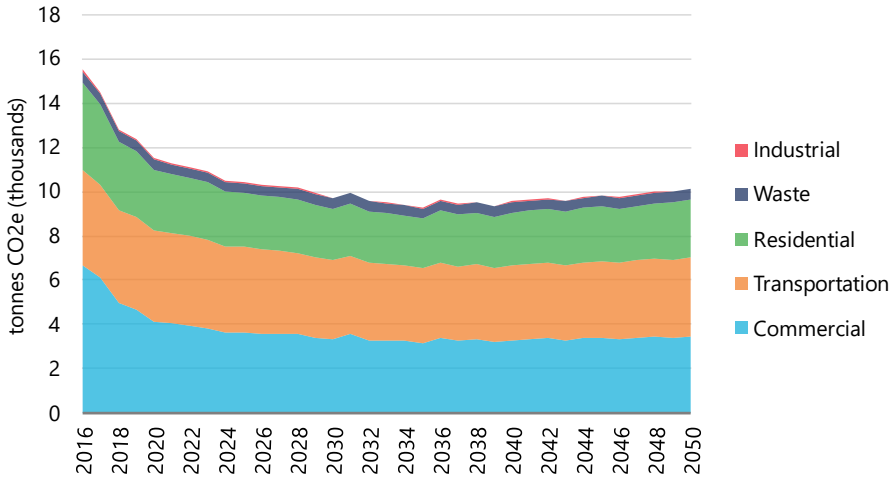


Figure 4: *Town of Mahone Bay Business as Usual emissions from 2016-2050.*

Though Mahone Bay is on track to meet this target by 2030, it is the minimum target. By following actions laid out in this Plan, the Town can exceed these targets and be a recognized leader in emissions reductions and make a significant contribution to Provincial efforts if this Plan is implemented and the Low Carbon Scenario is achieved, further detailed in Section 9.

Fuel Type Emissions

Figure 5 highlights the distribution of fuel type that contributes to the Town's GHG emissions from electricity, home heating, transportation, and waste management.

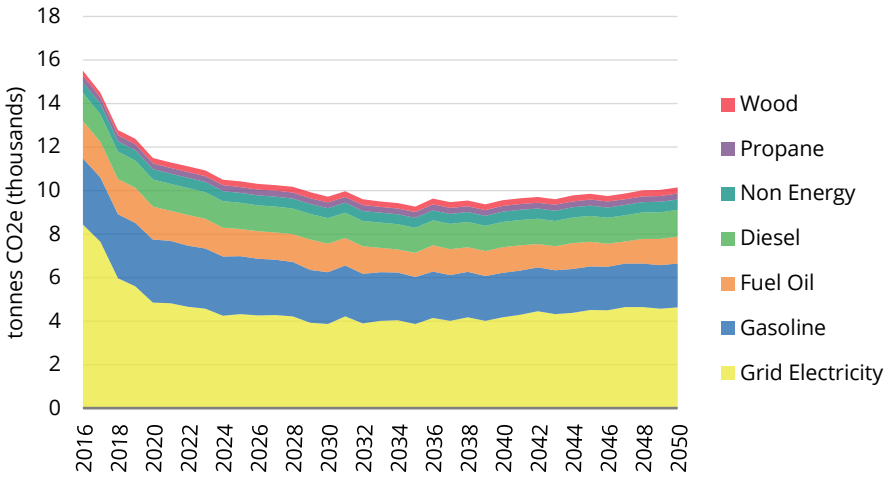


Figure 5: *Town of Mahone Bay total emissions by fuel type.*

The community prides itself on owning its own utility and providing over 60% of it's electrical needs from renewable energy (including imports). However, as Figure 5 demonstrates, further action towards providing more renewable energy to reduce emissions will offer significant emissions savings.

Following grid electricity, we observe fuel oil, gasoline, and diesel as the next largest emissions sources relating to home heating and transportation. Emissions reduction in these sectors can be realized with more efficient home upgrades, a reduction in driving and/or a transition to electrical home heating and electric vehicles. The grid electricity currently produces less emissions per

unit of energy compared to oil and gas and as the grid becomes greener with goals of producing 100% renewable energy, emissions from these sectors could be zero by 2050.

With 100% of electricity produced by renewable energy the most effective way of reducing greenhouse gas emissions associated with fossil fuel use is to transition those systems to electric. Having 100% clean electricity Mahone Bay is also appealing to business and industry with new cap-and-trade/carbon pricing. Transitioning these systems and attracting new businesses would grow the load of the electrical utility and benefit the utility and customers. Customers can be proud they use clean, locally produced renewable energy.

Building Emissions

Figure 6 & 7 demonstrate emissions associated with different uses in buildings such as plug load, heating, lighting, appliances etc. The main source of emissions from buildings include plug load and both space and water heating. Most of the energy to power these uses come from grid electricity and fuel oil with a small portion of propane and wood likely used for home heating and cooking.

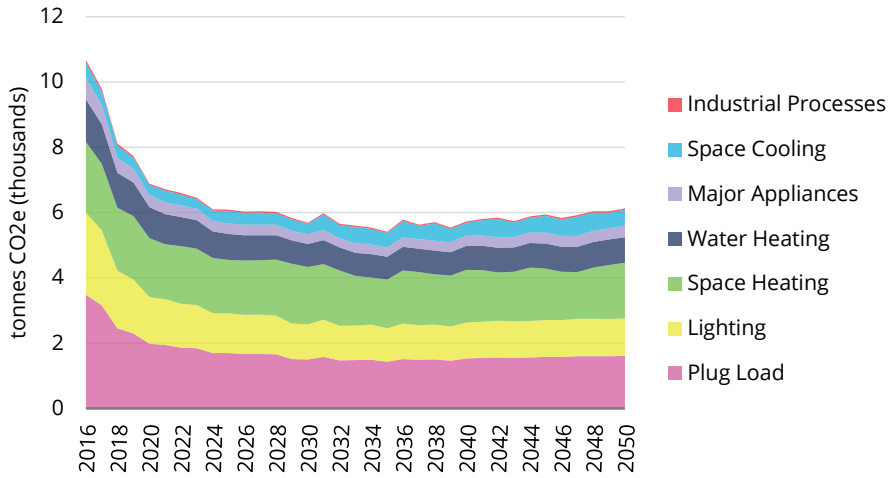


Figure 6: *Building emissions by usage.*

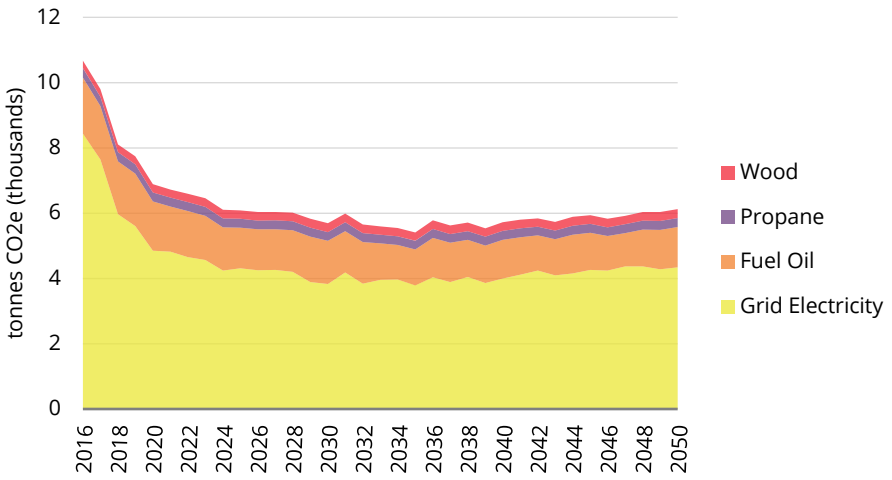


Figure 7: *Building emissions by fuel type.*

This baseline data modelled is similar to the detailed findings gathered through the Town's GHG emissions data collection. Of the 298 responses, the dominant heating source is electric (71%), followed by oil (47%), wood (25%), and propane (10%). These percentages are above 100% because many homes and businesses heat with multiple fuel types (e.g. electric & oil; electric & wood).

A similar distribution was observed in water heating with 77% of respondents heating their water with electricity followed by 15% with oil, 2% with propane, 1.0% with solar thermal and 5% that were not certain of how their water was heated.

Transportation Emissions

Transportation makes up a considerable portion of Town GHG emissions from personal and commercial use of gas and diesel vehicles. In Figure 8, the BAU scenario shows an uptake in grid electricity use for transportation demonstrating a natural transition to more electric vehicles without any additional action taken from this Plan. We have already witnessed this in recent years as electric vehicles become more accessible to Nova Scotians, electric charging infrastructure is installed throughout the province and their range capabilities increase.

During GHG data collection, the Town of Mahone Bay's households and businesses have an average of 1.41 vehicles with the majority being cars (37%) followed by SUV's (16%), trucks (9%), vans (3%), and 4% of Mahone Bay residents have already chosen to purchase a hybrid, or electric vehicle, or have decided to get rid of their personal vehicle altogether (31% of respondents chose not to answer this question). The majority of drivers in Mahone Bay are driving 3-4 times per week and ranging 50-200km per week.

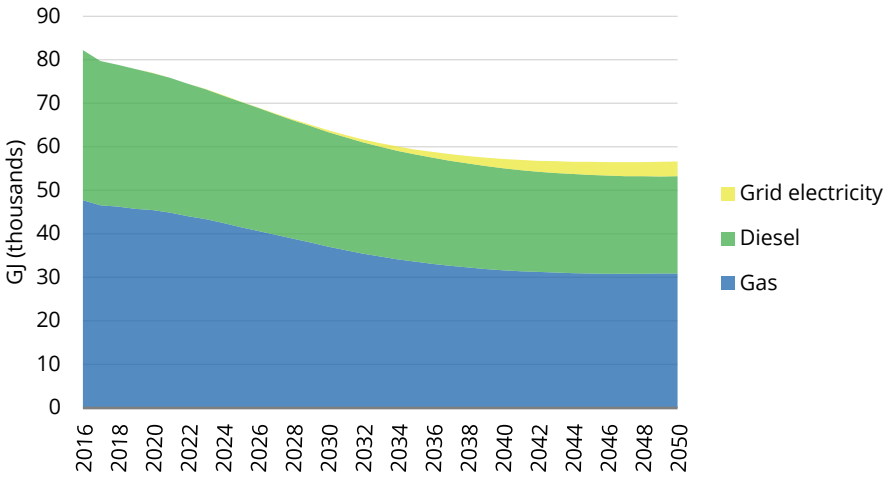


Figure 8: *Transportation emissions by fuel type.*

Waste Emissions

Figure 9 demonstrates the Towns emitting waste streams with the largest contribution attributed to landfill waste. However, when looking out to 2050, it appears that wastewater and biological waste have the largest increase in emissions likely due to an anticipated increase in population and continued landfill diversion initiatives. Continuing to encourage sustainable behaviours can realize emissions savings in this sector. Additionally, the Town will need to collaborate with Region 6 and the Municipal Joint Service Board.

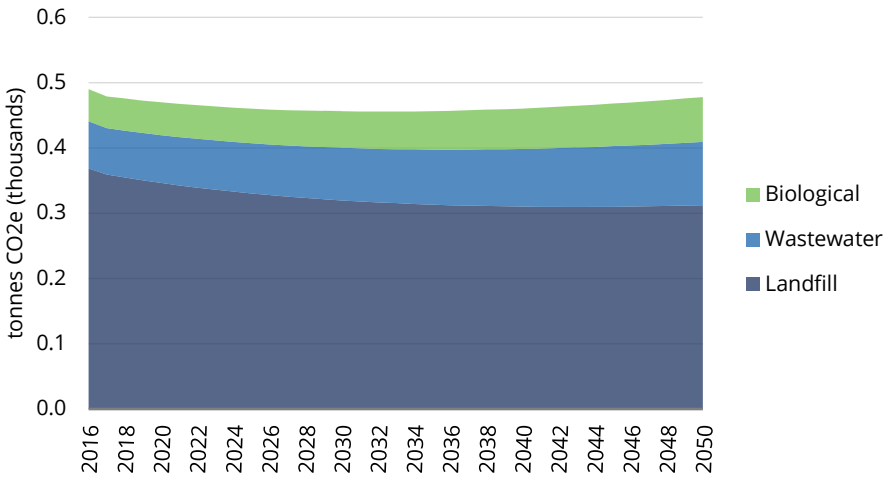


Figure 9: *GHG emission contributions by waste stream.*

7.0 ACTIONS TO REDUCE EMISSIONS

Mahone Bay's GHG inventory along with community engagement helps to better inform the Town on actions items to effectively reduce overall emissions from corporate operations and community use.

These actions align with an overall strategy for the Town and the utility, one that results in 100% of it's electricity sourced from renewable (and increasingly local) sources and electrifying all municipal operations and community uses including electric home heat and electric vehicles. In addition, each home, business and municipal operation will use energy efficiently and at optimal times for the utility.

Supplementing this central strategy, this Plan aims to foster additional tree coverage and green spaces, highlighting our beautiful scenery and healthy, clean air. To create a community that walks, and bikes, because active transportation is safe and convenient and residents can source their products locally, reducing emissions by supporting local businesses to grow and become sustainable throughout the entire year.

Table 1 outlines recommended actions that will help the Town to exceed a 45% or 5,001 tonne reduction in CO_2e emissions by 2030 and put the community on tract for net zero emissions by 2050.

Table 1: *Recommended Actions by Sector*

7.1 Heat & Building Efficiency – **2,232 tonnes CO2e**		Emissions Reduction	Est. Town Cost
Home heating and an inefficient building envelop are a considerable source of GHG emissions. This GHG Reduction Action Plan aims to electrify municipal operations, homes, and business to use cleaner renewable energy and reduce the GHGs associated with fossil fuel based heating and operational systems. Mahone Bay has a considerable amount of older homes and updates to the building envelop (windows, doors, insulation etc.) create a significant opportunity to reduce overall energy use to heat homes.			
1	New buildings standards	Medium	Staff Time
2	Energy efficient retrofits for municipal buildings	Medium	Staff Time
3	Electrification and energy efficient retrofits for the private sector	Major	Staff Time

4	Electrification of home heating systems and residential retrofits	Major	$100,000 / 2 Fiscal Years
7.2 Electricity Supply – **8,441 tonnes CO2e**			
The electricity strategy ensures energy supply is 100% renewable through own-source and imported sources effectively decarbonizing the grid. Until additional own-source renewables are developed this Plan recommends importing to reach a 100% renewable supply as soon as possible (current supply is over 60% renewable).			
5	Develop Community Solar gardens	Major	$1,567,535 / 2 Fiscal Years
6	Assess Opportunities for Other Renewables	Major	Staff Time
7.3 Transportation – **4,348 tonnes Co2e**			
The transportation strategy involves actions to eliminate vehicle congestion via the development of the Town's Transportation Plan, incentivizing a reduction in the number of personal vehicles through an EV CarShare program, and to support the electrification of personal and municipal fleets via the installation of electric vehicle charging stations and potential support for home charging. Reducing congestion effectively reduces GHG emissions from idled vehicles and using electric vehicles offers a clean alternative with the high mix of renewable energy on Mahone Bay's grid.			
7	Implement Transportation Plan (TP) recommendations and encourage active transportation	Major	See TP; plus Staff Time
8	Assess community transit and shuttle options	Minor	Staff Time
9	Install electric vehicle chargers within Town	Medium	$30,000
10	Implement an Electric Vehicle CarShare and encourage vehicle electrification	Major	$60,000 / 2 Fiscal Years
11	Implement shop & eat local campaign	Minor	Staff Time
7.5 Waste – **418 tonnes CO2e**			
Reducing the amount of waste our community produces has positive impacts throughout a lifecycle analysis. By using less and wasting less, demand for that manufacturing is decreased reducing GHG emissions in the manufacturing process for waste collection and end of life processing.			
12	Implement a waste reduction campaign	Minor	Staff Time
7.6	Wastewater - **72 tonnes CO2e**		
13	Water system updates	Medium	Capitol costs through long-term infrastructure budget
7.7 Land Use			

In this context, Green Land Use is considered a carbon sink that is beneficial for removing GHG's, specifically CO_2, from our environment. Developing more green spaces within Town can offset some GHGs. Though green spaces are not a permanent fix, they can temporarily help to meet goals and facilitate cleaner air and wildlife habitat.			
14	Foster trees, gardens and greenspaces on municipal and private properties, target net zero tree loss	Minor	Staff Time
7.8 Policy & Governance – **Decision-making**			
Successful implementation of the GHG Reduction Action Plan will require integration of climate mitigation considerations into Town decision-making. Appointment of a Climate Action Advisory Committee and development / amendment of policies to reference climate mitigation will help to ensure the Town stays on track to meet GHG reduction targets.			
15	Establish Climate Action Advisory Committee	Minor	Staff Time
16	Policies and Policy Amendments	Medium	Staff Time

8.0 ACTION IMPLEMENTATION PATHWAY

The following sections outline each of the actions listed in Table 1 while also associating specific targets for each action. Each action is detailed in how the Town of Mahone Bay plans to implement that action to achieve stated targets and what resources will be needed to be successful at implementing actions.

These Actions are fluid and can be modified as the Council and Climate Action Advisory Committee (Action 15) review and analyze current situations and the actions needed throughout the next 10-30 years.

7.1 HEATING & BUILDING EFFICIENCY

ACTION #1

New buildings standards.

TARGET:

100% of newly constructed residential, commercial, and institutional buildings net zero ready by 2030 and no longer use fossil fuels.

Encourage a decrease in average dwelling size by 10% by 2050.

Encourage a decrease in share of new buildings that are single family homes to 10% by 2030 – Duplexes become more common.

MAHONE BAY'S APPROACH:

The new 2020 National Energy Code for Buildings supports municipalities by introducing a tiered approach encouraging new construction to be Net Zero Energy Ready (NZER) through building and HVAC efficiencies. Municipalities looking to implement energy efficiency and carbon reduction strategies can

prescribe or encourage tiers for new construction that align with the knowledge and capacity of their community.

Tier 1: 2020 Building Code
Tier 2: 10% improved energy performance
Tier 3: 20 % improved energy performance from 2020
Tier 4: 40% improved energy performance from 2020
Tier 5: 70% improved energy performance from 2020

The 2020 Building Code has an ~ 15% better energy ratings than what was enforced in 2015 which was already 10% better than what was enforced in 2015. 2020 Building Code standards can be enhanced via development regulations, which could potentially also impose heat source requirements on new construction (as is being done in some other Canadian jurisdictions).

RESOURCES:

The Town of Mahone is responsible for development services which are provided by the Municipality of the District of Chester under contract. This action will require additional staff time to explore and coordinate proposed regulatory changes and support related public processes / consultations.

ACTION #2

Energy efficient retrofits for municipal buildings.

TARGET:

100% of existing municipal buildings are retrofit to net zero emissions by 2030.

MAHONE BAY'S APPROACH:

As the Town completes upgrades to, and constructs new municipal buildings, electrification and energy efficiency options will be considered in the decision-making process. Prior to major renovations or retrofits, an energy audit may be completed to better inform upgrades to maximize efficiency. Further retrofits to electrify heating systems will reduce GHGs associated with fossil fuels to make use of a cleaner electrical grid.

RESOURCES:

To ensure electrification and energy efficiency is considered in retrofits and new construction, staff time will be needed to coordinate with energy auditors and project contractors. Costs associated with electrification and efficiency options for municipal buildings will be factored into capital project costs.

ACTION #3

Electrification and energy efficient retrofits for the private sector.

TARGET:

Eliminate fossil fuel use for thermal energy supply in 60% of ICI buildings by 2040, 80% by 2050.

Increase efficiency by 50% by 2050.

Convert 100% of fossil fuel use to electricity.

MAHONE BAY'S APPROACH:

Work with Efficiency Nova Scotia, Nova Scotia Business Inc, and other organizations to provide coordinating and external financial assistance to the owners of commercial and industrial buildings for engineering and feasibility studies for larger case-by-case energy retrofits. Smaller businesses may be able to access residential programs.

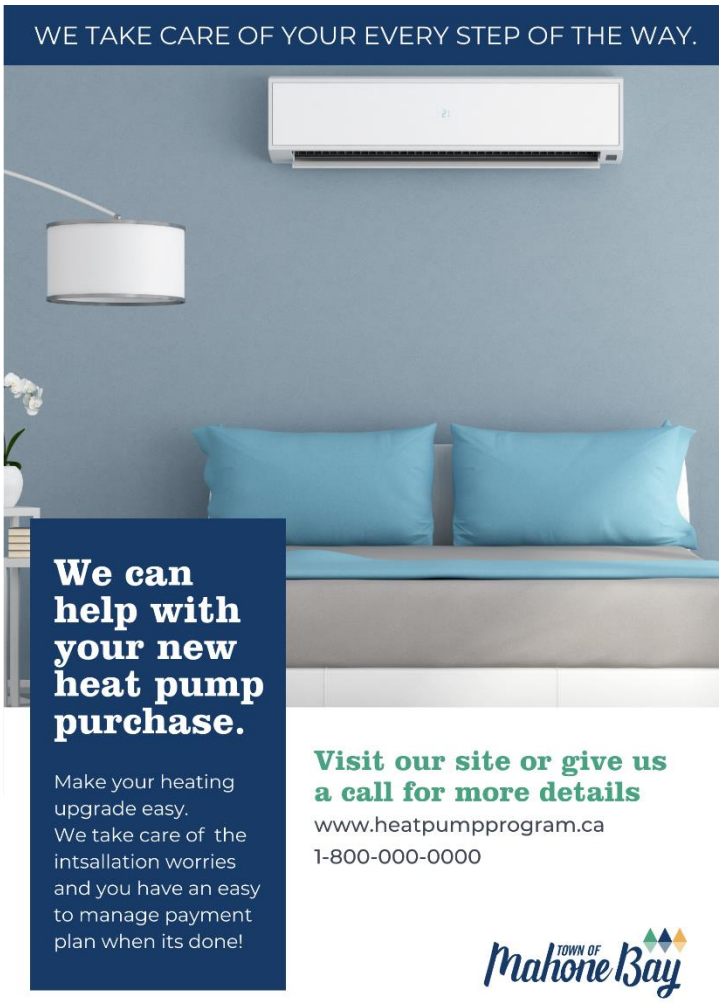
Efficiency Nova Scotia offers a $15,000 rebate to eligible customers to conduct a feasibility study by a third-party consultant. The feasibility study will highlight recommendations to retrofit equipment and building envelopes to increase efficiency.

RESOURCES:

Town Staff can work with interested local businesses to access these programs and provide resources to help work through applications and secure reputable consultants.

ACTION #4

Electrification of home heating systems and residential retrofits.



TARGET:

Achieve 50% thermal savings and 10% electrical savings in 80% of all existing dwellings by 2040 and 100% by 2050.

Eliminate fossil fuel use for thermal energy supply in 80% of homes by 2040, 100% by 2050.

100% of buildings' space heating and cooling needs are met by electric systems by 2050.

10% more renewable energy storage capacity in the form of batteries, or electric thermal storage units.

MAHONE BAY'S APPROACH:

With the ability to ensure a 100% renewable supply, the electrification of home heating systems contributes significantly to community GHG reductions.

Approximately 50% of Mahone Bay homes and buildings were built prior to 1980 and supporting the retrofits of these homes to improve efficiencies will realize GHG reductions, more specifically from fossil fuel heated homes.

Heat Pump and Energy Thermal Storage Financing Program

In collaboration with AREA, the Town of Mahone Bay and electric utility has and will continue to implement a financing program for home heating equipment such as heat pumps. This program is referred to as the HOME Program and launched in October 2020 while drafting this action plan. This

program supports residents through the process of purchasing and maintaining a heat pump and also offers a financing option. This allows customers of the program to heat their homes more efficiently, with a cleaner source of electricity compared to oil, propane, or wood heat and reduce the upfront costs to homeowners, making the equipment more accessible.

Data collected from residents and business also shows that many homes are already equipped with electric heating and 37% of respondents reported having efficient heat pumps installed and 3 respondents (1%) reported having electric thermal storage units. This number is expected to grow as interest in the HOME Program increases.

There were 78 respondents (26%) that reported having both a fossil fuel source (oil/propane) and electric source of heat. These respondents are ideal candidates for the home electrification programs as they likely require minimal electrical upgrades, if any, facilitating uptake and installation processes. Similarly, 27% of respondents also stated that they had no electric heating source and use only oil, propane, wood, or a combination of these sources. These homes would likely be more costly to begin integrating electric heat but may also present the biggest emissions savings as any electrical heating upgrades would directly offset fossil fuel emissions.

Neothermal Pilot Project

Neothermal Energy Solutions presented to Council on January 14th, 2020 about conducting a pilot project with ~10 Mahone Bay residents. While currently only in the pilot stage, Neothermal's energy storage solutions allow homeowners to use 50-80% less oil fuel to heat their homes and switch a portion of their heating needs to electric using the time of day rates and charging the units throughout the night. If 10 residents pursue this heating upgrade about 16,600 litres of oil per year will be avoided equaling a reduction of 28 tonnes of CO_2e per year. Additional GHG savings can also be realized if the ETS units are

charged with excess renewable energy through the night when energy demand is normally low.

These units can be included in a financing program such as referenced above and staff are investigating other options to support this pilot project. This option will be particularly useful for homeowners who have sunk costs in fossil fuel burning systems to use the remaining life of the systems more efficiently.

Efficiency Nova Scotia

Efficiency Nova Scotia (ENS) offers a Home Energy Assessment (HEA) Program which has an auditor assess homes to provide an energy efficiency roadmap. The Assessment cost is $99 + HST and includes a follow-up audit. This fee can also be waived for income-qualifying homeowners through ENS's HomeWarming Program. If homeowners choose to make the efficiency upgrade, the follow-up will determine which rebates they are eligible for.

RESOURCES:

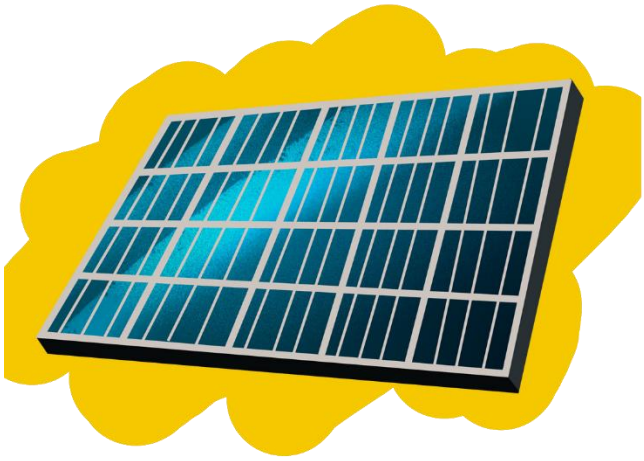
Staff time will be required to develop and implement financing options and programs as well as to coordinate with and maximize homeowner access to external resources such as ENS.

Capital funding of $100,000 over two fiscal years beginning in 2020-21 (originally 2020-21) is recommended to be leveraged against FCM Community Efficiency Financing for an additional $100,000 in external funding, though private financing to homeowners will continue to be explored wherever possible. Funding for installations on private property would be repayable by residents, secured against their properties.

8.1 ELECTRICITY SUPPLY

ACTION #5

Develop Community Solar gardens



TARGET:

Replace 100% of the remaining grid electricity with green electricity by 2030.

18.8% of load supplied by solar

MAHONE BAY'S APPROACH:

The Town of Mahone Bay, in collaboration with AREA, are seeking new opportunities to expand renewable energy generation to the Mahone Bay Electric Utility (with resident investment), including a community solar garden project and the expansion of the Ellershouse Windfarm.

AREA has been working to secure contractors and materials to begin construction of the solar garden which is proposed to begin in the end of 2021/ early 2022. The community solar garden will include a community subscription opportunity that will be structured to best fit Mahone Bay and its residents and encourage community participation.

The solar garden project is predicated on external funding support through the Investing in Canada Infrastructure Program (ICIP) which is anticipated to provide 73% funding to the project with the remaining $1,567,535, coming from the Town, further defrayed by resident subscription. This level of funding would support a solar garden producing up to 18.8% of the electricity currently required by the community.

RESOURCES:

Significant staff time will be required to support this project through to full operations, including community outreach.

Capital funding of $1,567,535 over two fiscal years beginning in 2021-22 is recommended to be leveraged under ICIP for an additional $4,238,151 in external funding. Town capital funding to be further defrayed by resident investment.

ACTION #6

Identify Opportunities for Other Renewables.

TARGET

Increase wind supply to 90% by 2035

Replace 100% of the remaining grid electricity with green electricity by 2030.

Offset remaining emissions with overproduction and selling of renewable energy.

MAHONE BAY'S APPROACH:

Staff continue to work with the Alternative Resource Energy Authority to find new opportunities to procure and produce more renewable energy from wind, solar, and hydro.

Currently 40% of the Town's electricity use is produced from the Ellershouse Wind Farm. The Town has had great success with Ellershouse and will continue to seek out wind energy opportunities to achieve 90% wind energy production by 2035.

As outlined in section 9, with all of the actions implemented from this Plan, there are still some remaining emissions in 2050. In attempt to not only reach

the IPCC target of a 45% reduction from 2010 levels by 2030, but also to put Mahone Bay on a path to 100% carbon-free by 2050, opportunities to overproduce renewable electricity and sell the excess to offset remaining emissions – where economically beneficial to the Town and utility- will be identified.

RESOURCES

Town Staff to continue to work with AREA to identify renewable energy procurement opportunities and/or funding sources for development.

8.2 TRANSPORTATION

ACTION #7

Implement Transportation Plan (TP) and encourage active transportation.

Target:

40% of trips are walking and cycling (including ebikes) by 2030,

50% by 2050, targeting trips of less than 2km for walking and less than 5km for cycling.

MAHONE BAY'S APPROACH:

In 2020 the Town of Mahone Bay contracted CBCL Ltd. to produce a Transportation Plan Report to address transportation needs in town including but not limited to, pedestrian safety, active transportation routes, parking, and more efficient intersections. There are numerous occasions throughout the year that parking becomes an issue increasing the amount of congestion, idling and driving around to find parking which adds to GHG emissions.

The Transportation Plan Report outlines recommendations the Town can implement to encourage active transportation choices by residents and to optimize the flow of traffic throughout town to reduce unnecessary emissions during busy periods such as events.

During data collection, when asked about active transportation 32% of respondents mentioned they choose active transportation 50% of the time or more and made the following suggestions to encourage more active transportation:

- Pedestrian safety
- Share the road initiatives
- Wider sidewalks and road shoulders

- Trail improvements and maintenance
- Designated bike paths/lanes
- Slower speed limits
- Increased accessibility
- Electric scooters

RESOURCES:

Significant staff time may be required to support this action, depending on the recommendations implemented. Staff time will also be used to encourage active transportation choices by residents.

Capital funding will be needed to implement recommendations provided in the Transportation Plan Report and Town funding can likely be leveraged for at least 50% external funding support under programs such as the Department of Energy & Mines Connect2 Program. Recommendations are likely to be focused on improvements to roads, sidewalks, crosswalks, and associated signage.

ACTION #8

Assess transit and shuttle options

TARGET:

Support viable transit options

Transit and car share mode share increases to 10% by 2030

100% of any transit vehicles be electric by 2040.

MAHONE BAY'S APPROACH:

Citizens for Public Transportation have presented to Town Council and have undertaken considerable work on a proposed fixed-route transit plan for Mahone Bay and surrounding area. Community engagement has also supported the idea of a shuttle service during tourist seasons. These options will continue to be assessed with further work needed to find a viable option for Mahone Bay. Discussions are ongoing with neighboring municipal units.

RESOURCES:

Staff time required to assess feasible options. If a viable option for the Town is identified in the future, further financial resources may be required to implement such a service.

ACTION #9

Install electric vehicle chargers within Town

TARGET:

Install 8 charging stations

MAHONE BAY'S APPROACH:

Saint John Energy on behalf of all Atlantic Canada municipal electric utilities, submitted an application to the Zero-Emission Vehicle Infrastructure Program offered through NRCan in September 2019. This funding has been awarded and will cover 50% of the costs to install 104 chargers across all municipalities, eight of which will be located in Mahone Bay.

Chargers are anticipated to be installed by the Spring of 2021.

RESOURCES:

Financial resources contributed from the utility to make up the additional 50% of costs; estimated at $30,000. Additional utility staff time will be needed to install and maintain the chargers.

ACTION #10

Implement an Electric Vehicle CarShare and encourage vehicle electrification.

TARGET:

30% of new personal and commercial vehicles are electric by 2030, 60% by 2040, and 100% by 2050

Small vehicle municipal fleet 100% electric by 2030, 100% of heavy municipal fleet electric by 2040.

MAHONE BAY'S APPROACH:

Staff are exploring options for obtaining an Electric Vehicle for municipal operations and to provide educational and awareness opportunities for community members. Additionally, Town and AREA staff have been discussing options to expand electric vehicle usage in Mahone Bay and propose "Electric Avenue" events to showcase different EV models.

Town and AREA staff are further exploring the feasibility of an Electric Vehicle Carshare Pilot Program with Department of Energy and FCM. Such a program could support early EV adoption in Mahone Bay by making EVs more available and accessible for town residents. An expansion of the single-vehicle option above, this program would allow residents to be a member of the CarShare and use the vehicles as needed while simultaneously making EVs more accessible to test drive different models and familiarize residents with the technology which isn't always available at car dealerships across the Province.

These educational events and the opportunity residents have with a CarShare program aim to facilitate greater EV uptake in town effectively increasing the electrical load and switching vehicles requiring fuel to a cleaner electrical source (and benefiting the Town's utility).

The CarShare program also aims to reduce the number of personal vehicles in town and having fewer trips with combustion engines.

As the majority of drivers in Mahone Bay are only driving 3-4 times per week and ranging 50-200km per week, these statistics look promising for facilitating carsharing as well as the uptake of electric vehicles in Mahone Bay. Electric cars are currently the most manufactured electric vehicle and the range of these vehicles are surpassing 300km per charge. With the implementation of charging infrastructure within Town, electric vehicles would be very suitable for Mahone Bay residents and business. The data also demonstrates that community members are also interested in electric vehicles with 64% stating they would like to test drive one.

To facilitate the uptake of electric vehicles, expansions to the existing HOME Program could also consider the potential to support residents with home charger installations. This in turn, could help grow the load of the utility.

RESOURCES:

This action is scalable on confirmation of external funding support, from a single EV, test drives and education campaigns to a multi-vehicle CarShare program providing a true alternative to residents. Depending on scale significant staff time will be required to support this project.

Recommended project funding of $60,000 over two fiscal years beginning in 2020-21 can support a single-vehicle option with educational activities (partially defrayed by corporate savings on mileage reimbursals) or can potentially be leveraged for up to 80% additional external funding ($240,000) through FCM / provincial sources.

ACTION #11

Implement Shop and Eat Local Campaign

TARGET:

Encourage local shopping by residents

MAHONE BAY'S APPROACH

A shop local campaign is an action under transportation as it minimizes the number of residents and business ordering products online that require shipping, it also reduces the amount of vehicle trips to locations of greater distance away. Shopping local not only reduces the demand for transportation of goods but also supports Mahone Bay's local businesses.

Though local businesses may still be receiving shipments from other locations we can considerably reduce emissions associated with the transportation sector if, for example, 20 people shopped at a local store for an item rather than have a delivery truck deliver that item to 20 different residents.

Additionally, small changes in the way we choose our food can have an impact on GHG emissions. Certain foods are grown unsustainably, degrading soils and changing land use. Some food categories are energy and water intensive to raise crops and livestock while outputs from others produce significant GHG emissions, like methane from the beef industry. Processing, transport, retail and packaging are all part of our foods' life cycle that should be considered when choosing what we eat.

Eating for our environment does not mean never consuming these foods if it is something you enjoy, but simply being mindful of foods and where they come from and looking for more sustainable products or reducing consumption.

For example, if families chose one day a week and do not consume meat products, they could notice small GHG impacts which could lead to cumulative emissions reductions across the community.

RESOURCES:

This action would require staff time to create and implement the educational awareness campaign through newsletters, events, and social media content. Staff can also work with residents and businesses to determine items that have demand but no local source and work with businesses to find ways to offer these products or services.

8.3 SOLID WASTE

Action #12

Implement a waste reduction campaign

TARGET:

100% diversion by 2050,

Reduce generation 30% by 2050

100% organics diversion by 2050

MAHONE BAY'S APPROACH:

In recent years the Province of Nova Scotia has noticed an increase in the amount of waste per capita being sent to landfills.

This action aims to reduce the use of single use items and find sustainable solutions for municipal operations and to support education and awareness for community residents and businesses.

The Town aims to provide more education on lifecycle analysis of the products consumers toss. Each item has a manufacturing and transport process with associated GHGs before making its way to a consumer. Further, Once an item reaches the end of its life there are transportation emissions to pick-up and deliver waste and additional emissions associated with the process of filling landfills and recycling products.

Finding sustainable products that we can use over again begins to reduce the lifecycle GHG emissions of single use products.

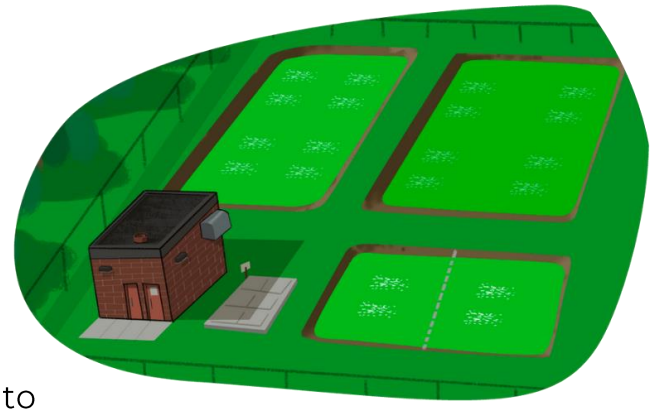
RESOURCES:

Staff time is required to create and implement an educational awareness campaign and to coordinate and host workshops, working with Region 6 Waste Management (in which the Town is a member).

8.4 WASTEWATER

ACTION #13

Upgrade water and wastewater infrastructure



TARGET:

Upgrade to high efficiency pumps by 2035 (-50% energy use)

Decrease water volume use by 1%/year to 2050.

MAHONE BAY'S APPROACH:

As part of Mahone Bay's asset management program, Town infrastructure is being accurately mapped including date of installation and current condition. This allows the Town to better identify and replace aging infrastructure.

Currently, the Town's water utility loses a significant amount of water through leaks in the aging distribution system. As infrastructure is replaced, less energy is required to treat and pump this lost water, and significant water savings and emissions can be realized. Likewise, infrastructure replacement presents opportunities to upgrade to more energy efficient equipment, such as newer lift pumps.

RESOURCES:

Capital funding for infrastructure is informed by the Town's asset management program and reflected in Council's long-term capital planning. Funding for water infrastructure replacement and updating can generally be leveraged for Provincial and Federal support under programs such as ICIP.

8.5 GREEN LAND USE

ACTION #14

Foster trees, gardens and greenspaces on municipal and private properties

TARGET:

Collect and maintain a database of natural assets and condition;

Maintain tree and greenspace, no net tree loss;

Support designation of municipal property as parkland where viable.

MAHONE BAY'S APPROACH:

Designating green areas within Town provides opportunities to grow the Town's natural assets which serve as carbon sinks by sequestering GHGs from our environment. Tree planting and urban gardens, whether vegetable gardens, wildflower gardens, or flower beds, make use of space to offset GHG emissions and create wildlife habitat while being visually pleasing.

This action item draws from inspiration provided by Bayview Community School students who have created bee hotels out of recycled materials. Flower gardens offer bees and other insects a source of nectar. Gardens can include species preferred by our native endangered species such as milkweed for the monarch butterflies.

The Town has many natural assets that act as a carbon sink sequestering CO_2 from our environment. Though they do not offer a permanent solution as carbon is then released as material decays or is burnt, natural assets such as forests, gardens, and other vegetation offer a temporary solution to help mitigate a small percentage of Mahone Bay's emissions.

During Mahone Bay's centennial year celebration, a successful tree planting and donation campaign resulted in over 100 new trees being planted. Including municipal and privately owned lands, approximately 57% of the Town of Mahone Bay's land base is currently forested. The Town aims to maintain and protect these assets and manage them sustainably. Residents can also be educated and encouraged to be stewards of their privately owned land as well.

In order to properly conserve and protect the Town's natural assets a project aimed at data collection for trees, waterways, wetlands and other natural assets must be completed. During this data collection the function and condition of the asset will collected. Many of our natural assets provide essential services to our community free of charge. If these aren't protected, constructing, and maintaining infrastructure to do the same job could become costly. Collecting data on our natural assets will also contribute to the development of an Urban Forest Master Plan as per Council's 2021-2025 Strategic Plan.

RESOURCES:

Town staff time will be required to encourage planting and to assess potential parklands, public planting locations and gardens within the community, coordinating with local schools and non-profit organizations to identify opportunities.

Capital funding for a data collection project and incorporating local community groups and volunteers will be needed to progress natural asset data collection.

8.6 POLICY & GOVERNANCE

ACTION #15

Establish climate action advisory committee.

TARGET:

Committee established in 2021-22.

MAHONE BAY'S APPROACH:

A Climate Action Advisory Committee will be formed with responsibility to oversee the implementation of this Plan and make recommendations to Council. As more information is compiled and circumstances are altered in the face of Climate Change, action items can be fluid. The Committee will advise Council on prioritizing, adjusting, and adding action items as needed and will review staff progress reports. The Committee would be established by amendment of the Town's Committees Policy, after the final draft Plan is approved by Council.

RESOURCES:

Staff time to support committee.

ACTION #16

Policies and Policy Amendments

TARGET:

Policies and policy amendments to support Plan implementation.

MAHONE BAY'S APPROACH:

The Climate Action Advisory Committee will work to develop and recommend a GHG Reduction Policy to Council. Further amendments will be made to current policies such as the Asset Management Policy, to ensure that climate change mitigation is considered in every part of the decision making and procurement process.

The Committee will help also help to inform a "Climate Analysis" to any staff report that may have a positive or negative impact on Climate Change.

RESOURCES:

Staff time to draft policies and policy amendments.

9.0 LOW CARBON SCENARIO

The Town targets having 100% of our community's electrical needs supplied by renewable energy and for all homes, most businesses, and all municipal buildings and operations to be powered by this clean electricity by 2050. Additionally, with upgrades to electric vehicle charging networks, technology and availability, the Town targets 80% electric vehicle usage by 2050.

SSG consultants have modelled Mahone Bay emissions based on these targets along with waste to landfill diversion, a reduction in wastewater treatment, more efficient water supply, and continued community effort to implement sustainable behaviours. With these efforts, by 2050 the Town of Mahone Bay will successfully reduce emissions to 89% below 2016 levels and 91% below 2010 levels. This significantly exceeds the IPCC target of 45% emissions reduction below 2010 levels by 2030 and puts Mahone Bay on track to more than double this recommended reduction by 2050.

***Table 2**: Low Carbon Scenario emissions by sector and fuel type*

By Sector	2016	2016 Share	2050	2050 Share	% change 2016-2050
Commercial	6,642	43%	155	9%	-98%
Industrial	82	1%	0	0%	-100%
Residential	3,948	25%	9	1%	-100%
Transportation	4,348	28%	1,221	71%	-72%
Waste	490	3%	328	19%	-33%
Total	**15,510**	**100%**	**1,713**	**100%**	**-89%**

By Fuel Type	2016	2016 Share	2050	2050 Share	% change 2016-2050
Diesel	1,315	8%	531	31%	-60%
Fuel Oil	1,709	11%	22	1%	-99%
Gasoline	3,033	20%	690	40%	-77%
Grid Electricity	8,443	54%	0	0%	-100%
Non Energy	490	3%	328	19%	-33%
Propane	293	2%	137	8%	-53%
Wood	229	1%	5	0%	-98%
Total	**15,510**	**100%**	**1,713**	**100%**	**-89%**

Table 2 demonstrates a breakdown of 2016 and projected 2050 emissions by sector and fuel type.

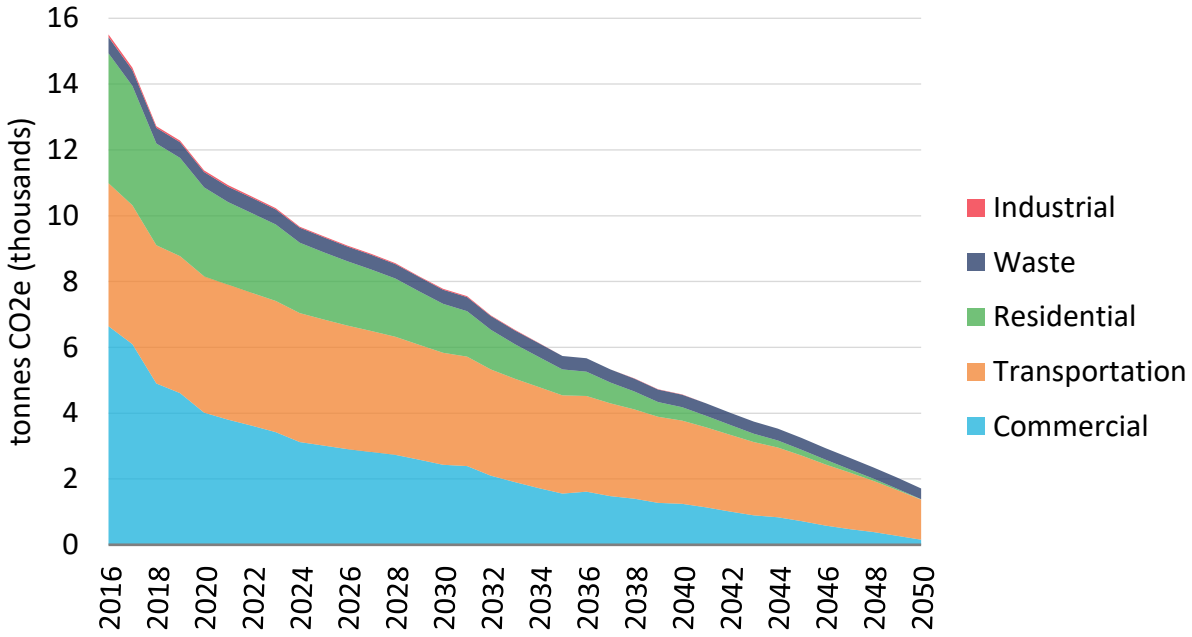


Figure 10: *Low Carbon Scenario emissions reduction to 2050 by sector.*

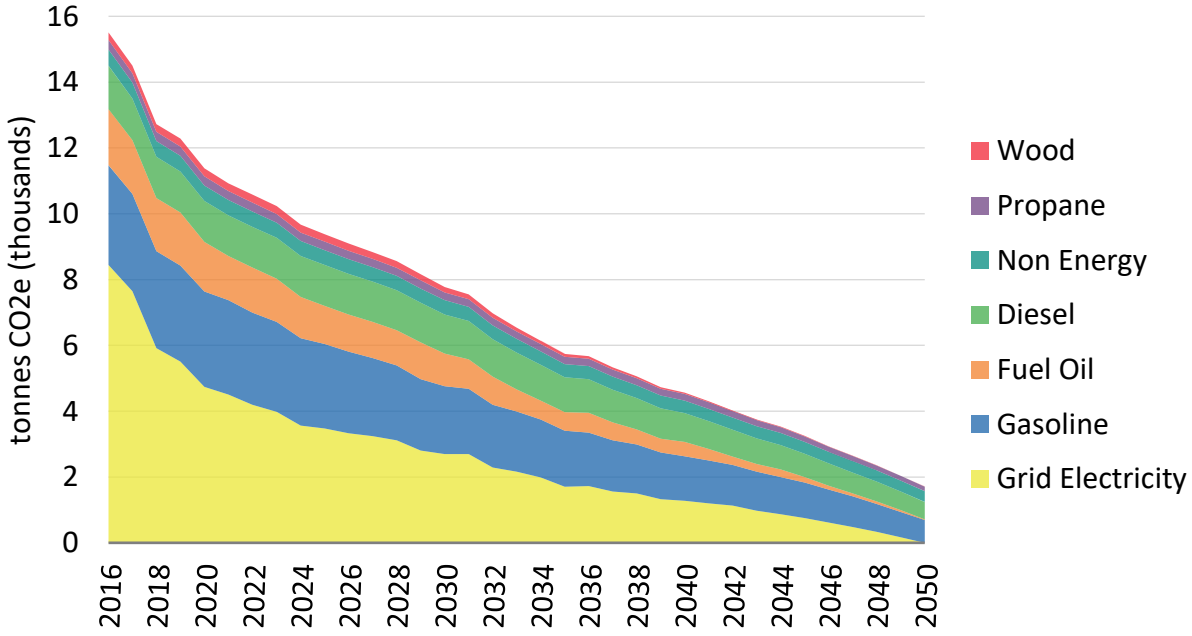


Figure 11: *Low Carbon Scenario emissions reduction to 2050 by fuel type.*

Figure 10 demonstrates the total emissions by sector assuming the Town's Low Carbon Scenario and that all of the targets and actions set out in this Plan are achieved. However, even with the actions laid out in this Plan, there are still emissions related to transportation, commercial buildings and waste.

In the modelling of this Low Carbon Scenario, it was assumed that only 80% of commercial vehicles, and truck transport would be electric by 2050 and that only 80% of industrial, commercial, and institutional buildings would be efficiently retrofitted by 2050 leaving some remaining emissions. There will need to be further work and collaboration in the transportation and building sector to reach a 100% reduction in these sectors, demonstrating Mahone Bay's leading role in climate mitigation.

With regard to waste emissions even if we achieve 100% waste diversion the emissions that remain in the waste sector result from residual greenhouse gas production at existing landfills.

In developing this Plan the Mahone Bay Town Council targeted alignment with IPCC recommendations of achieving a 45% reduction of emissions below 2010 levels by 2030. However, beyond this the Town is in a position to show leadership on GHG reduction by envisioning Mahone Bay becoming a carbon neutral community by 2050. Though the Town is well on its way to achieving and exceeding minimum targets, additional steps will need to be taken to reach net zero. To complement the other actions in this Plan the Town will also be seeking opportunities for carbon offsetting as described in Action #6. Carbon offsetting may be possible by overproduction of renewable energy which can then be sold, however, opportunities such as this will require proper assessment by staff.

10.0 MONITORING & REPORTING

To achieve Milestone #5 the GHG Reduction Action Plan must be monitored for progress. An annual progress report will be provided to Council which will include the following:

- A status update of each action item;
- Any changes made to actions or implementation pathways and reasoning;
- GHG reductions noticed to date;
- Remaining GHG reductions needed to stay on target; and
- Priority actions for the following year

11.0 MAHONE BAY'S PATH FORWARD

Section 1 of this Plan describes how the Town declared a Climate emergency and received funding to hire staff to develop this Action Plan. The Low Carbon Communities (LCC) funding was awarded in February 2020 and comes to and end on March 31 of 2021. Establishment of the Climate & Energy Outreach Coordinator position to oversee the development this plan – supported by LCC funding – has demonstrated the necessity and value to the Town and utility maintaining the staff capacity to implement and monitor this Plan and the actions herein, as well as to support the Town and utility in energy projects and initiatives.

In October 2020, the Town of Mahone Bay worked with AREA and Thinkwell Shift to deploy an Ambassador within the community to make home visits and provide information on the Town's new HOME Program which provides financing options for heat pump installations. It is anticipated that the Ambassador Program will run again in the Spring of 2021.

In addition, during the summer of 2020 the Town received funding for a summer student through Clean Nova Scotia. This position was very successful and aided greatly in GHG community emissions outreach and data collection. It is recommended the Town continue to pursue such summer position funding opportunities.

The in-house development of this Plan by the Town of Mahone Bay is a great achievement. To realize the full benefit of this Plan the Town must continue to invest and make climate mitigation a priority and this Plan must be put into action and overseen to ensure the community remains on track to be carbon neutral by 2050.

It would be beneficial to the Town to maintain a permanent staff position that could not only oversee the implementation of this Plan, but also to supervise the Ambassador and summer positions in the future. This streamlines the climate and energy work and builds the Town's capacity for completing such important work.

Subject to the 2021-22 annual budget process it is recommended that the Town maintain a staff position to focus on climate and energy initiatives and to be tasked with overseeing the implementation and progress of this Plan.

Action	J	F	M	A	M	J	J	A	S	O	N	D
Develop, approve, and implement engagement as seen fit by Council & Approve Plan												
21/22 Climate Budget												
Determine Staff Position												
Form Advisory Committee												
Ambassador and Summer Staff												
Social Behaviour Campaigns & Customer Facing Initiative Outreach												
LCC Funding Application												
Capital Projects Planned for 21/22												
EV charger installation												
Solar Garden Installation												
Municipal EV												

12.0 CONCLUDING STATEMENT

The Town of Mahone Bay has recognized the current Climate Emergency and commits to mitigating climate change and to working toward emissions reductions in line with IPCC recommendations (emissions 45% below 2010 levels by 2030, a reduction of 5,001 tonnes of CO_2e (4.8 tonnes per capita). When assessing the Town's actions and modelled Low Carbon Scenario, the IPCC target is achievable and Mahone Bay staff and Council are encouraged at the feasibility of making Mahone Bay a carbon neutral community by 2050.

This GHG Reduction Action Plan recommends action items to reduce GHGs in the Town of Mahone Bay based on a detailed 2016 emissions baseline from community uses and municipal operations. As actions are implemented the reductions can be quantified to ensure targets are met and continued progress will be assessed and reported as per Section 10.

The successful implementation of this Plan will require cooperation across municipal staff, council, and community members. Only by showing climate leadership and acting now can we protect our community and mitigate further harmful impacts of climate change.

APPENDIX A:

Global Protocol for Community-scale GHG Emissions Inventory

This table provides the 2016 base year emissions data, categorized according to the Global Protocol for Community-scale Greenhouse Gas Emission Inventories.[8] Using this categorization to update the municipal inventory periodically ensures consistency across inventory years and comparability between global municipal jurisdictions.

Reason for exclusion key

N/A Not applicable; Not included in scope
ID Insufficient data
NR No relevant or limited activities identified
Other Reason provided under Comments

GPC Ref No	Scope	GHG Emissions Source	Inclusion	Reason for exclusion	CO2	CH4	N2O	Total CO2e
I		**STATIONARY ENERGY SOURCES**						
I.1		**Residential buildings**						
I.1.1	1	Emissions from fuel combustion within the city boundary	**Yes**		1,113	211	19	1,343
I.1.2	2	Emissions from grid-supplied energy consumed within the city boundary	**Yes**		2,415	4	10	2,428
I.1.3	3	Emissions from transmission and distribution losses from grid-supplied energy consumption	**Yes**		175	0	1	176
I.2		**Commercial and institutional buildings/facilities**						
I.2.1	1	Emissions from fuel combustion within the city boundary	**Yes**		879	0	8	887
I.2.2	2	Emissions from grid-supplied energy consumed within the city boundary	**Yes**		5,411	8	23	5,442
I.2.3	3	Emissions from transmission and distribution losses from grid-supplied energy consumption	**Yes**		393	1	2	395
I.3		**Manufacturing industry and construction**						

[8] The GPC can be found here: https://ghgprotocol.org/sites/default/files/standards/GHGP_GPC_0.pdf

I.3.1	1	Emissions from fuel combustion within the city boundary	**Yes**		0	0	0	0
I.3.2	2	Emissions from grid-supplied energy consumed within the city boundary	**Yes**		0	0	0	0
I.3.3	3	Emissions from transmission and distribution losses from grid-supplied energy consumption	**Yes**		0	0	0	0
I.4		**Energy industries**						
I.4.1	1	Emissions from energy used in power plant auxiliary operations within the city boundary	**No**	NR	0	0	0	0
I.4.2	2	Emissions from grid-supplied energy consumed in power plant auxiliary operations within the city boundary	**No**	NR	0	0	0	0
I.4.3	3	Emissions from transmission and distribution losses from grid-supplied energy consumption in power plant auxiliary operations	**No**	NR	0	0	0	0
I.4.4	1	Emissions from energy generation supplied to the grid	**No**	NR	0	0	0	0
I.5		**Agriculture, forestry and fishing activities**						
I.5.1	1	Emissions from fuel combustion within the city boundary	**No**	NR	0	0	0	0
I.5.2	2	Emissions from grid-supplied energy consumed within the city boundary	**No**	NR	0	0	0	0
I.5.3	3	Emissions from transmission and distribution losses from grid-supplied energy consumption	**No**	NR	0	0	0	0
I.6		**Non-specified sources**						
I.6.1	1	Emissions from fuel combustion within the city boundary	**No**	NR	0	0	0	0
I.6.2	2	Emissions from grid-supplied energy consumed within the city boundary	**No**	NR	0	0	0	0
I.6.3	3	Emissions from transmission and distribution losses from grid-supplied energy consumption	**No**	NR	0	0	0	0
I.7		**Fugitive emissions from mining, processing, storage, and transportation of coal**						

I.7.1	1	Emissions from fugitive emissions within the city boundary	**No**	NR	0	0	0	0
I.8		**Fugitive emissions from oil and natural gas systems**						
I.8.1	1	Emissions from fugitive emissions within the city boundary	**Yes**		0	0	0	0

II		**TRANSPORTATION**						
II.1		**On-road transportation**						
II.1.1	1	Emissions from fuel combustion for on-road transportation occurring within the city boundary	**Yes**		3,905	7	33	3,944
II.1.2	2	Emissions from grid-supplied energy consumed within the city boundary for on-road transportation	**Yes**		0	0	0	0
II.1.3	3	Emissions from portion of transboundary journeys occurring outside the city boundary, and transmission and distribution losses from grid-supplied energy consumption	**Yes**		401	1	1	403
II.2		**Railways**						
II.2.1	1	Emissions from fuel combustion for railway transportation occurring within the city boundary	**No**	NR	0	0	0	0
II.2.2	2	Emissions from grid-supplied energy consumed within the city boundary for railways	**No**	NR	0	0	0	0
II.2.3	3	Emissions from portion of transboundary journeys occurring outside the city boundary, and transmission and distribution losses from grid-supplied energy consumption	**No**	NR	0	0	0	0
II.3		**Water-borne navigation**						
II.3.1	1	Emissions from fuel combustion for waterborne navigation occurring within the city boundary	**No**	N/A	0	0	0	0
II.3.2	2	Emissions from grid-supplied energy consumed within the city boundary for waterborne navigation	**No**	N/A	0	0	0	0

II.3.3	3	Emissions from portion of transboundary journeys occurring outside the city boundary, and transmission and distribution losses from grid-supplied energy consumption	**No**	N/A	0	0	0	0
II.4		**Aviation**						
II.4.1	1	Emissions from fuel combustion for aviation occurring within the city boundary	**No**	N/A	0	0	0	0
II.4.2	2	Emissions from grid-supplied energy consumed within the city boundary for aviation	**No**	N/A	0	0	0	0
II.4.3	3	Emissions from portion of transboundary journeys occurring outside the city boundary, and transmission and distribution losses from grid-supplied energy consumption	**No**	N/A	0	0	0	0
II.5		**Off-road**						
II.5.1	1	Emissions from fuel combustion for off-road transportation occurring within the city boundary	**No**	NR	0	0	0	0
II.5.2	2	Emissions from grid-supplied energy consumed within the city boundary for off-road transportation	**No**	NR	0	0	0	0

III		WASTE						
III.1		**Solid waste disposal**						
III.1.1	1	Emissions from solid waste generated within the city boundary and disposed in landfills or open dumps within the city boundary	**Yes**		0	0	0	0
III.1.2	3	Emissions from solid waste generated within the city boundary but disposed in landfills or open dumps outside the city boundary	**Yes**		0	369	0	369
III.1.3	1	Emissions from waste generated outside the city boundary and disposed in landfills or open dumps within the city boundary	**No**	N/A	0	0	0	0
III.2		**Biological treatment of waste**						

III.2.1	1	Emissions from solid waste generated within the city boundary that is treated biologically within the city boundary	**Yes**		0	0	0	0
III.2.2	3	Emissions from solid waste generated within the city boundary but treated biologically outside of the city boundary	**No**	N/A	0	30	20	49
III.2.3	1	Emissions from waste generated outside the city boundary but treated biologically within the city boundary	**No**	N/A	0	0	0	0
III.3		**Incineration and open burning**						
III.3.1	1	Emissions from solid waste generated and treated within the city boundary	**No**	N/A	0	0	0	0
III.3.2	3	Emissions from solid waste generated within the city boundary but treated outside of the city boundary	**No**	N/A	0	0	0	0
III.3.3	1	Emissions from waste generated outside the city boundary but treated within the city boundary	**No**	N/A	0	0	0	0
III.4		**Wastewater treatment and discharge**						
III.4.1	1	Emissions from wastewater generated and treated within the city boundary	**Yes**		0	72	0	72
III.4.2	3	Emissions from wastewater generated within the city boundary but treated outside of the city boundary	**No**	NR	0	0	0	0
III.4.3	1	Emissions from wastewater generated outside the city boundary	**No**	N/A	0	0	0	0

IV		**INDUSTRIAL PROCESSES AND PRODUCT USE (IPPU)**						
IV.1	1	Emissions from industrial processes occurring within the city boundary	**No**	ID	0	0	0	0
IV.2	1	Emissions from product use occurring within the city boundary	**No**	ID	0	0	0	0

V		**AGRICULTURE, FORESTRY AND LAND USE (AFOLU)**						
V.1	1	Emissions from livestock within the city boundary	**No**	NR	0	0	0	0

V.2	1	Emissions from land within the city boundary	**No**	NR	0	0	0	0
V.3	1	Emissions from aggregate sources and non-CO2 emission sources on land within the city boundary	**No**	NR	0	0	0	0

VI		**OTHER SCOPE 3**						
VI.1	3	Other Scope 3	**No**	N/A	0	0	0	0

APPENDIX B:

Data Summaries

Low-carbon scenario energy use by sector, 2016 and 2050.

Gigajoules	2016	2016 Share	2050	2050 Share	% change 2016-2050
Commercial	50,239	29%	44,093	45%	-12%
Industrial	530	0%	230	0%	-57%
Residential	41,165	24%	19,121	20%	-54%
Transportation	82,159	47%	34,326	35%	-58%
Total	174,092	100%	97,770	100%	-44%

Low-carbon scenario energy use by end use, 2016 and 2050.

Gigajoules	2016	2016 Share	2050	2050 Share	% change 2016-2050
Industrial Processes	530	0%	230	0%	-57%
Lighting	15,995	9%	16,467	17%	3%
Major Appliances	3,711	2%	4,115	4%	11%
Plug Load	22,509	13%	23,116	24%	3%
Space Cooling	2,992	2%	4,392	4%	47%
Space Heating	34,458	20%	5,577	6%	-84%
Transportation	82,159	47%	34,326	35%	-58%
Water Heating	11,737	7%	9,547	10%	-19%
Total	174,092	100%	97,770	100%	-44%

Low-carbon scenario energy use by fuel type, 2016 and 2050.

Gigajoules	2016	2016 Share	2050	2050 Share	% change 2016-2050
Diesel	34,484	20%	9,670	10%	-72%
Electricity Procurement	0	0%	14,002	14%	100%
Fuel Oil	24,033	14%	316	0%	-99%
Gasoline	47,673	27%	10,654	11%	-78%
Grid Electricity	40,248	23%	0	0%	-100%
Local Electricity	14,257	8%	57,972	59%	307%
Other	0	0%	2,733	3%	100%
Propane	4,792	3%	2,234	2%	-53%
Wood	8,603	5%	189	0%	-98%
Total	174,092	100%	97,770	100%	-44%

Low-carbon scenario emissions by sector, 2016 and 2050.

tonnes CO2e	2016	2016 Share	2050	2050 Share	% change 2016-2050
Commercial	6,642	43%	155	9%	-98%
Industrial	82	1%	0	0%	-100%
Residential	3,948	25%	9	1%	-100%
Transportation	4,348	28%	1,221	71%	-72%
Waste	490	3%	328	19%	-33%
Total	15,510	100%	1,713	100%	-89%

Low-carbon scenario emissions by fuel type, 2016 and 2050.

tonnes CO2e	2016	2016 Share	2050	2050 Share	% change 2016-2050
Diesel	1,315	8%	531	31%	-60%
Fuel Oil	1,709	11%	22	1%	-99%
Gasoline	3,033	20%	690	40%	-77%
Grid Electricity	8,443	54%	0	0%	-100%
Non Energy	490	3%	328	19%	-33%
Propane	293	2%	137	8%	-53%
Wood	229	1%	5	0%	-98%
Total	15,510	100%	1,713	100%	-89%