North Shore REGIONAL ENERGY & EMISSIONS PLANNING PROJECT

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Executive Summary

This Regional Energy and Emissions Plan (REEP) for the North Shore is presented at a time (Winter 2020-21) when the world, as we know it, is going through a period of enormous transformational change.

Still reeling from the effects of the 2020 COVID-19 pandemic, our human population is realizing its own vulnerabilities and debating "what is next"?

The question remains: How do we plan and prepare for a future that is more resilient, not only in terms of our response to viruses; but more generally in terms of how we develop communities more sustainably and in a way that *'meets the needs of present generations, without compromising the ability of future generations to meet their own needs'.*[1]

Proponents of sustainability are keen to ensure the rebuilding of our communities will not only lead to satisfactory human health outcomes, but result in a more open, tolerant, and inclusive society - complimented by a vibrant local economy - that effectively balances the risks and effects of climate change.

From a global perspective, the Paris Agreement serves as our current barometer of progress. Negotiated under the United Nations Framework Convention on Climate Change, the agreement came into effect on November 4, 2016, and established the goal of holding an increase in global average temperatures to between 1.5ºC - 2ºC above pre-industrial levels. It also introduced a commitment for signatures to the agreement to engage more constructively in the planning and implementation of climate change mitigation and adaptation measures.

While the purpose of this study is to focus on Regional Energy and Emissions, it is important to recognize how the three primary pillars of sustainability (social, economic, and environmental factors) should be considered as an integrated approach to reducing Greenhouse Gas (GHG) emissions.

Our current capitalist-led model of economic development has, in many ways, contributed to a polarization of people and societies. It has displaced people, communities and ecosystems, and concentrated wealth in favour of a relatively small number of individuals. At the same time, millions of people continue to be affected by poor incomes and entrenched poverty.

The COVID-19 pandemic has demonstrated that our human population and the economic systems we have created are vulnerable from a public health and broader environmental perspective. The greening of our economy has a significant role to play as we restructure our economies and societies in a way that normalizes sustainability in practice.

The impacts of climate change are a concern for individuals, communities, business sectors, and governments. In this regard, the development of this Regional Energy and Emissions Plan for the North Shore aims to bring together various stakeholders to both increase awareness of the threats and develop local solutions to best respond to these challenges.

[1] *Report of the World Commission on Environment and Development: Our Common Future*, 1987. https://sustainabledevelopment.un.org/content/documents/5987our-common-future.pdf

The REEP, therefore, aims to create a “big picture” view, which can serve as an ongoing framework for optimizing sustainability and achieving success together.

This report will contain the following:

1. A review of the purpose of this REEP, and how it can inform the development of actions and policies to address climate change for the North Shore Communities.

2. An acknowledgement that uncertainty is an inherent part of climate change and should be factored into municipal and community-level energy planning and associated modelling, to address potential future climate change scenarios.

3. A calculation of estimated energy use and emissions for municipalities and communities within the defined study area, including qualitative information related to business and industrial sectors.

   Note: There are numerous sources of energy use and emissions that are not accounted for in this report, such as emissions from tourists, seasonal surges of energy use, plus aviation and nautical energy consumptions.

4. Suggestions on actionable items that individuals, communities and municipalities can implement.

   Note: The REEP is intended to serve as a baseline assessment to inform the development of future actions re: opportunities existing for individuals, households, businesses, and communities to both prepare, adapt, and effectively mitigate the effects of climate change.

Note: Smart Green Communities is not responsible for the changes in the website links referenced in this document. Website sources are subject to change without notice.

Table of Contents

Table of Figures

List of Tables

Terms Defined

Definitions with *(IPCC)* at the end means the definition is taken from the Intergovernmental Panel on Climate Change (IPCC)'s Synthesis report 2014.[2]

Business as Usual (BAU) Forecast: Is a projection of future energy use and emissions associated with growth if there are no additional strategies, policies or actions put in place to address energy and emission levels. Estimating this forecast is important because it provides a starting point to develop robust emission-reduction strategies.

Climate Change Atlas of Canada: An interactive tool that combines climate science, mapping, and storytelling to predict climatic changes across Canada to the end of the 21st Century. The 250-layer map is based on data from 12 global climate models. Users are shown a baseline period of warming trends by region that spans from 1950 to 2005 and can navigate between two future projection periods, 2021 to 2050 and 2051 to 2080.

Climate Change: Refers to changes in longer-term weather patterns caused by natural phenomena and human activities that alter the chemical composition of the atmosphere through the build-up of greenhouse gases which trap heat and reflect it back to the earth's surface.

CO2-equivalent (CO_2e) Emissions: The amount of carbon dioxide (CO2) emissions that would cause the same integrated radiative forcing, or global warming potential (GWP) over a given time horizon, as an emitted amount of a greenhouse gas (GHG) or a mixture of GHGs (IPCC), (See 'Global Warming Potential')

Energy efficiency: The ratio of energy inputs within the system compared to useful energy at the point of application.

Global Warming Potential (GWP): The global warming potential (GWP) of a GHG considers both the instantaneous radiative forcing due to an incremental concentration increase and the lifetime of the gas. It is a relative measure of the warming effect that the emission of a radiative gas (i.e., a GHG) might have on the surface atmosphere.

The concept of a GWP has been developed to allow some comparison of the ability of each GHG to trap heat in the atmosphere relative to CO_2e. It also allows characterization of GHG emissions in terms of how much CO_2e would be required to produce a similar warming effect over a given time-period. This is called the carbon dioxide equivalent (CO_2e) value and is calculated by multiplying the amount of the gas by its associated GWP. This normalization to CO2 eq enables the quantification of "total national emissions" expressed as CO2 eq (CO_2e)."

Global warming: refers to the gradual increase, observed or projected, in global surface temperature, as one of the consequences of radiative forcing caused by anthropogenic emissions (IPCC)3

[2] *Climate Change 2014, Synthesis Report,* Intergovernmental Panel on Climate Change, 2014. https://www.ipcc.ch/site/assets/uploads/2018/05/SYR_AR5_FINAL_full_wcover.pdf
[3] *Climate Change 2014, Synthesis Report,* Intergovernmental Panel on Climate Change, 2014. https://www.ipcc.ch/site/assets/uploads/2018/05/SYR_AR5_FINAL_full_wcover.pdf

Greenhouse Gas (GHG) Emissions: Refers to those gaseous constituents of the atmosphere, both natural and anthropogenic, that absorb and emit radiation at specific wavelengths within the spectrum of thermal infrared radiation, emitted by the Earth's surface, the atmosphere itself, and by clouds. Water vapour (H2O), Carbon Dioxide (CO_2e), Methane (CH4), Nitrous Oxide (N2O), Ozone (O3), and Chlorofluorocarbons (CFCs) are the six primary Greenhouse Gases (GHGs) in the Earth's atmosphere in order of abundance.

The Intergovernmental Panel on Climate Change (IPCC): The Intergovernmental Panel on Climate Change (IPCC) is an international body responsible for assessing the science related to climate change. It was set up in 1988 by the World Meteorological Organization (WMO) and the United Nations Environment Programme (UNEP) to provide decision-makers with regular assessments of the scientific basis of climate change, its impacts and future risks, and options for adaptation and mitigation. The assessments are undertaken and presented in a way that is relevant to policy but not prescriptive of any specific policy. The IPCC is both scientific and governmental in nature. Participation in the IPCC is open to all member countries of the WMO and the United Nations. The Panel, made up of representatives of member states, makes major decisions at plenary sessions. The IPCC Bureau, elected by member governments, provides guidance to the Panel on the scientific and technical aspects of the Panel's work and advises the Panel on management and strategic issues. IPCC assessments are written by scientists who volunteer their time and expertise as authors of these reports. IPCC reports undergo multiple rounds of drafting and are reviewed by both scientific experts and governments to ensure they are comprehensive and objective and are produced in an open and transparent way.[4]

Radiative forcing: The strength of drivers is quantified as Radiative Forcing (RF) and measured in watts per square meter (W/m2) as in previous IPCC assessments. RF is the change in energy flux caused by a driver and is calculated at the tropopause or at the top of the atmosphere. (IPCC)

Representative Concentration Pathway (RCP): RCPs are used for making projections based on anthropogenic GHG emission factors driven by population size, economic activity, lifestyle, energy use, land use patterns, technology, and climate policy. There are four different 21st Century pathways of GHG emissions and atmospheric concentrations, air pollutant emissions and land use. The four scenarios are: stringent mitigation scenario (RCP2.6), intermediate scenarios (RCP4.5 and RCP6.0) and one scenario with an extremely high GHG emissions (RCP8.5). (IPCC)

[4] *Canada's Changing Climate Report*, Natural Resources Canada, 2018. https://www.nrcan.gc.ca/sites/www.nrcan.gc.ca/files/energy/Climate-change/pdf/CCCR_FULLREPORT-EN-FINAL.pdf

1.0 Background

(1.0.1) The Regional Energy and Emissions Plan, also known as the REEP, is a project of Smart Green Communities, which is a sustainability-led program managed by reThink Green.

(1.0.2) **reThink Green** is a non-profit organization based in Sudbury, Ontario, which provides consulting and advisory services throughout Northeastern Ontario. The organization was officially founded in 2006 with a focus on regional environmental initiatives. The organization connects people, ideas, and resources to help create more sustainable communities. reThink Green operates programs, offers events, and encourages knowledge-sharing and collaboration among businesses, municipalities, and other stakeholders.

(1.0.3) **Smart Green Communities** is a membership-based program accessible to municipalities, townships, and First Nation groups throughout Northeastern Ontario. The REEPs being produced for both the North Shore communities and Manitoulin Island fall under the Smart Green Communities program and are funded by Independent Energy Systems Operator (IESO) through its Education and Capacity Building (ECB) Program and the Federation of Canadian Municipalities (FCM) Transition 2050 program.

1.1 IESO Education and Capacity Building (ECB) 6.0 Program

(1.1.1) The Education and Capacity Building (ECB) Program provides funding to support awareness, education, skills, and capacity building initiatives[5].

This program includes four areas of focus:

- Community capacity-building initiatives
- Understanding the collection and effective use of community data
- Skill building and project-readiness training; and
- Innovative projects and initiatives related to ECB Program objectives

(1.1.2) This initiative has resulted in the creation of a Regional Energy and Emissions Planning Advisory Group for both Manitoulin Island and the North Shore Communities with the capability to strengthen existing energy planning processes and broaden the scope of renewable, clean and energy efficient solutions for the North Shore. Extensive community and stakeholder engagement has taken place with Islanders since the project's inception in 2017/2018.

1.2 FCM Transition 2050 Program

(1.2.1) The Transition 2050 program, funded by the Federation of Canadian Municipalities, was developed to enable the delivery of training and support-based services via partner organizations including reThink Green, to groups of municipalities, townships, and First Nation Communities so they may achieve deeper GHG emission reductions through peer learning, strategic planning, and operational implementation[6].

(1.2.2) As a grant recipient, reThink Green has been tasked with building a comprehensive network of practitioners with the primary goal being to share information and resources that help

[5]ECB Overview, www.ieso.ca/Get-Involved/Funding-Programs/Education-and-Capacity-Building-Program/Overview

[6]Transition 2050 Partners, https://fcm.ca/en/programs/municipalities-climate-innovation-program/announcing-transition-2050-partner-grant-recipients

identify the issues and challenges, plus develop practical ideas and solutions to overcome existing barriers in terms of meeting GHG reduction targets.

(1.2.3) By participating in this initiative, municipalities, townships, and First Nation communities can learn from case study examples including peers who have faced similar issues and challenges.

(1.2.4) Programs including Smart Green Communities and the Partners for Climate Protection Program (PCP) Initiative are considered highly important within the context of the Pan Canadian Framework on Climate Change, which was enacted following ratification of the 2015 Paris Agreement at the 21st Conference of the Parties (COP21), under the United Nations Framework Convention on Climate Change (UNFCCC).

(1.2.5) The Smart Green Communities program aims to enhance knowledge-sharing among municipalities, townships and First Nation communities on matters related to climate change mitigation and adaptation, including the development of community energy profiles, GHG inventories, and other climate-based policies, tools, and resources to enable more sustainable development throughout the North Shore.

1.3 Partners for Climate Protection Program (PCP):

(1.3.1) A few of the municipalities who engaged with Smart Green Communities are also members of the FCM-ICLEI Canada Partners for Climate Protection (PCP) program. The PCP initiative has established 5 milestones and is assisting municipalities and First Nation Communities across Canada through the development of long-term plans and projects that contribute to a low carbon transition by 2050.

(1.3.2) The PCP Program is managed and delivered by FCM and ICLEI (Local Governments for Sustainability). The PCP program guides municipal staff to act on climate change through the reduction of emissions within their jurisdiction. This program is currently only open to Canadian municipalities and townships, with the hope it will extend to First Nation communities in the future.

(1.3.3) The program consists of five milestones, and participants are encouraged to progressively meet the requirements of each as they close-in on their emissions reduction targets.[7]

- Milestone One: Create a Baseline Emissions Inventory and Forecast
- Milestone Two: Set Emissions Reduction Targets
- Milestone Three: Develop a Local Action Plan
- Milestone Four: Implement the Local Action Plan
- Milestone Five: Monitor Progress and Report Results

(1.3.4) Smart Green Communities' role in the PCP program has been to assist and support participating municipalities as they onboard the program; and to both guide and enable staff to achieve *Milestone One: Creating a Baseline Emission Inventory and Forecast*. Smart Green Communities also facilitates access to necessary information, tools, and resources to support participating members in achieving each subsequent milestone.

[7] *Partners for Climate Protection Program*, Federation for Canadian Municipalities https://fcm.ca/en/programs/partners-climate-protection

2.0 Introduction – What is the REEP?

(2.1) North Shore Regional Energy and Emission Plan is a working document that provides a snapshot of current emissions and enables stakeholders to gain a greater understanding of the issues and identify what policies will be needed to achieve energy and emissions reduction goals. The REEP paves the way for more work to be done in data collection methods and focuses on collaboration between municipalities and communities to reduce energy costs and decrease carbon emissions while addressing climate change risks.

(2.2) REEP Vision:

Through partnership and collaboration, the North Shore Communities will become a leading example of rural energy sustainability, grounded in a commitment to community development and protection of the area's unique environment and quality of life.

(2.3) Goal: The North Shore REEP is a plan that helps the communities and municipalities of the North Shore region prioritize energy and emissions with the aim of:

- Reducing Greenhouse Gas emissions (GHGs)
- Improving energy knowledge between communities, municipalities, and industrial/ commercial sectors to encourage increased efficiencies.
- Reducing future risks, and enhancing community and municipal resilience
- Working collaboratively to engage in actions that benefit the environment and the community.

(2.4) Energy and Environmental Benefits: Work towards creating a region-wide energy and GHG reduction target to help mitigate the effects of climate change.

(2.5) Economic Benefits: Reduce money spent on energy in the North Shore communities per year and convert savings made into economic stimulus which supports the sustainable growth and development of the local economy; while ensuring individual municipalities, townships and First Nation communities are better prepared for climate emergencies.

Other benefits include:

- **Job Creation** - local contractors and building suppliers could benefit from an increase in demand for energy efficient building structures and sustainability-led technologies.
- **Community Development** - Increased collaboration between municipal / township staff, community groups, First Nation communities, and the development sector - to both identify opportunities and implement projects that improve upon existing energy efficiency standards.

(2.6) Social and Resilience Benefits: Achieving region-wide resilience by reducing exposure to risks at the municipal and community-level, for example:

- Improved energy efficiency standards within individual dwellings and municipal buildings, meaning:
- The community could be less vulnerable to future increases in energy prices; and
- Helping the community better prepare for emergencies related to climate change.

(2.7) Targets

Establishing municipal, township and First Nation emission reduction targets will ensure community leaders have greater control over their internal operations and contracted services, at the same time as demonstrating leadership on energy use and GHG emissions. For example, the Partners for Climate Protection program (PCP) specifies that targets should be established for emission reductions in corporate and community energy use under Milestone two.

The following quote is taken from the Minister of Infrastructure and Communities Catherine McKenna in her speech to the Federation of Canadian Municipalities' Sustainable Communities 2020 Conference[8]:

> *"We committed, as a country, as a planet, to stay well below two degrees. We are not going to meet that without the help of municipalities across the country. To put in context how important you are, 40% of emissions are within your control, 40%.*
>
> *40% of emissions are within [municipalities] control, and with this comes a great obligation, not only to your communities to have cleaner air and water, less waste and more jobs and saving money, but also to the kids in your community who are looking to leaders like you, like me, across the country to make a difference.*
>
> *Canada has a target. We have a target, reducing our emissions by 30% by 2030. We have another target, being net zero by 2050. The only way you reduce emissions is by having targets."*

Example targets:

- To reduce emissions by 30% in the North Shore region by 2030 based upon estimated community, municipal, township and First Nation's energy usage identified in the Regional Energy and Emissions Plan and applying 2016 as the baseline year.

Another approach might be to impose stages for emission reduction targets over incremental years by reducing community and municipal energy use, for example:

- Stage One - 30% by 2030
- Stage Two - 40% by 2040; and
- Stage Three - 50% by 2050.

These targets for emission reduction are provided as a suggestion only. Actual targets should be determined through partnership and collaboration between all stakeholders in the North Shore.

Resource for target-setting strategy:

The following guidance produced by the Federation of Canadian Municipalities in conjunction with ICLEI - Local Governments for Sustainability provides further details as to how members of the Partners for Climate Protection program can advance through Milestone Two: https://fcm.ca/sites/default/files/documents/resources/guide/how-to-set-emisison-reduction-targets-pcp.pdf

[8] Minister of Infrastructure and Communities Catherine McKenna's speech to the Federation of Canadian Municipalities' Sustainable Communities Conference, October 22nd, 2020 https://www.canada.ca/en/office-infrastructure/news/2020/10/minister-of-infrastructure-and-communities-catherine-mckennas-speech-to-the-federation-of-canadian-municipalities-sustainable-communities-conference.html

2.8 Guiding Principles:

(2.8.1) The REEP can form the basis of a local framework to assist stakeholders in the process of identifying various actions and measures to collectively minimize the impacts of development, build more resilient communities, and protect the ecosystems that support and sustain us.

(2.8.2) All essential principles of climate literacy are framed by this guiding principle, which is grounded in the notion that social, economic, and environmental challenges require integrated solutions, not least, so the goal of sustainable growth and development can be achieved.[9]

7 Examples of Guiding Principles which the North Shore Communities can adopt:

(2.8.3) The following examples are intended as a guide to assist the future planning and development of communities by policy makers, municipal, township, and First Nation leaders, plus representatives of the development industry, and the public at large. The seven action areas identified form the basis of a structure to guide the next steps in climate action planning for the North Shore communities using the REEP as a benchmark to get started:

1. **Establishing Climate Action Plan(s) to Mitigate GHG Emissions:** Municipalities and First Nation communities have a unique role to play in terms of establishing inventories, developing targets for GHG reductions, implementing strategies, timelines, and more generally introducing a performance-based system to monitor progress made on an annual basis.

   Municipal, township and First Nation communities should establish clear goals and priorities for climate-led action. These objectives should be fully integrated within the organization's strategic and asset management-oriented reports, plus other guiding documentation. Such an approach will not only exert maximum influence re: the risks posed by climate change, but continue to guide a broad range of plans, programs and activities offered at the local level.

2. **Addressing Transportation Emissions**: Emissions related to transportation modes, and personal auto use are some of the largest single contributing sources of GHGs. The automotive Industry has made some gains in recent years, including the development of more energy efficient vehicle designs and associated technologies, powered by hybrid, electric and/or hydrogen clean fuel sources. Addressing the perceived imbalance between local supply (in the form of charging stations and grid-like infrastructure) and the continued increase in demand associated with an increase in the uptake of 'next generation' vehicles should be recognized as a key priority for early implementation in the region.

3. **Reducing Commercial and Residential Sector Emissions:** The commercial and residential sectors are widely understood to be major contributors to overall emissions and important sources of potential GHG reductions.

   Increasing awareness of, and accessibility to, energy efficiency, demand management, and conservation-led programs, supported by an increase in the uptake and use of clean alternative energy/fuel sources will not only build knowledge in this field, but will build capacity leading to new skill development, job creation, and other economic opportunities.

[9] *Teaching the Guiding Principle for informed climate decisions,* Climate.Gov https://www.climate.gov/teaching/essential-principles-climate-literacy/teaching-guiding-principle-informed-climate-decisions

Proactive policies which support and enable our transition to a low carbon economy including new builds, retrofits, equipment upgrades and low-carbon fleet, etc. should be considered a priority for inclusion and adoption within climate action plans spanning the region.

4. **Strong Water and Wastewater Energy Efficiency Standards:** The water and wastewater systems that many of us are fortunate enough to access, do have an inherently high embodied energy associated with them; not least, resulting from the logistical operations involved in the process of controlling the flow, maintaining safe and sanitary storage and filtration systems, and distributing water and wastewater throughout the network.

   Climate action plans should identify measures by which municipalities and First Nations can increase water conservation, reduce wastewater, and promote more innovative and energy-efficient approaches to lifecycle management including the uptake of commercial and household water retention and recycling techniques.

5. **Resilient Communities:** One of the primary benefits of developing a climate action plan in the North Shore will be to introduce measures that support and assist residents as they adapt to a "new normal" which is characterized by increased unpredictability and the effects of climate change.

   From a regional perspective this could lead to more seasonal variations in weather patterns, including but not limited to:

   i. An increase in precipitation, contributing to rising lake levels, erosion, damage to ecosystems, and the "wear and tear" to both land and property.

   ii. The declining availability of potable freshwater supplies

   iii. Increased summer temperatures which not only increase the demand for air conditioning and cooling systems, but exacerbate human, social, and environmental effects (i.e., drought-like conditions, airborne diseases, heat strokes, etc.)

   iv. Inconsistent seasonal temperatures especially during the winter can increase or decrease demand for energy for heating/cooling systems. It is also difficult for people to climatize to changing weather patterns day-by-day.

   v. Food shortages.

   vi. Energy security, service disruption, and communication challenges (i.e., arising from extreme weather / increased peak demand leading to blackouts).

   vii. Other serious challenges predicted to occur within the region.

6. **Lead by example:** Strong leadership that encourages climate action is necessary. There will always be some who do not comprehend, or perhaps do not fully recognize the potentially damaging effects of climate change and how this could affect our own existence as human beings - especially if left unmitigated.

   It is incredibly important that community leaders introduce measurable actions to reduce their own carbon footprint by enacting and implementing policies that reduce GHG emissions arising from their operations.

7. **Inclusion:** Climate action plans should be developed through an open and inclusive process which engages individuals from diverse backgrounds and different age groups to harness their perspectives, insights, and areas of expertise. Participants could include, but should not be limited to, year-round and seasonal residents, business owners, community interest groups, architects, engineers, accountants, environmental, Indigenous, and public health professionals, among others.

The process should be informed by an engaging public outreach strategy which clearly and succinctly identifies the issues at stake and is both relatable and accessible to those who engage with it. The negative effects of climate change will affect everyone, especially marginalized and vulnerable groups, so it is justifiable that all should have a hand in developing mitigation and adaptation plans to address it.

3.0 REEP – Where are we today?

3.1 National

2019 Hydrogen Pathways – Enabling a Clean Growth Future for Canadians[10]

(3.1.1) The federal government is currently working on a strategy which proposes the use of hydrogen fuel cells to decarbonize energy use across the nation. Hydrogen is a versatile fuel that can be produced from numerous different sources and can act as an energy carrier. Hydrogen fuel cells produce electricity by combining hydrogen and oxygen atoms to create a reaction across an electrochemical cell similar to a battery and produces electricity, water, and heat as by products.

(3.1.2) Hydrogen fuel cells can be combined with renewable sources that can be utilized in many different applications. Hydrogen power-to-gas (P2G) allows better use of renewable power by converting surplus renewable energy into hydrogen gas which can then be injected into the natural gas grid. By implementing hydrogen fuel sources nationwide, we can significantly reduce the amount of emissions that industries and the transportation sector emit. Smart Green Communities was able to obtain a copy of the full report from Natural Resources Canada. Please e-mail us if you would like to review a copy at: communities@rethinkgreen.ca

3.2 Provincial

2017 Long-Term Energy Plan: Delivering Fairness and Choice[11]

(3.2.1) As a result of the phasing out of coal-fired electricity in 2014, emissions for Ontario's electricity sector were forecast in 2017 to account for only approximately 2% of the province's total greenhouse gas emissions. The key priority in this plan is to implement strategies to reduce electricity costs.

(3.2.2) The Fair Hydro Act (2017) reduced electricity bills for residential consumers by an average of 25% and holds any increase in the rate of inflation for four years. First Nations Delivery Credits require licensed distributors to reduce the monthly electricity bills of on-reserve First Nation residential customers. In addition, the Ontario government will enhance consumer protection by giving the Ontario Energy Board (OEB) increased regulatory authority over unit sub-meter providers.

(3.2.3) Each chapter within the plan highlights initiatives, via which, we can deliver energy while addressing social, environmental, and economic factors. Examples include making energy more affordable, limiting cost increases, and improving the availability of conservation programs for First Nations and Metis people. Other options include a reduction in emissions and the conservation of energy and enhanced efficiency through local distribution companies, cap and trade programs, market renewal, modernizing the grid, and supporting renewable energy.

[10] 2019 Hydrogen Pathways – Enabling a Clean Growth Future for Canadians, 2019 https://www.nrcan.gc.ca/energy-efficiency/energy-efficiency-transportation/resource-library/2019-hydrogen-pathways-enabling-clean-growth-future-canadians/21961

[11] 2017 Long-Term Energy Plan: Delivering Fairness and Choice, 2017 https://www.ontario.ca/document/2017-long-term-energy-plan/executive-summary

(3.2.4) Ontario Climate Change Action Plan[12]

The Ontario Climate Change Action Plan was a five-year plan adopted on June 8, 2016.

(3.2.5) Actionable items within the plan covered a wide range of areas which are broadly outlined as follows:

1. Establishing a green bank that helps homeowners and businesses access and finance energy-efficient technologies to reduce greenhouse gas pollution from buildings.

2. Creating a cleaner transportation system (by addressing greenhouse gas pollution arising from cars on the road today and increasing the availability of zero-emission vehicles on the road tomorrow), plus deploying cleaner trucks, and making transit more available.

3. Halting the ongoing rise in building-related emissions - giving Ontarians more choices, incentives, and tools to make the right energy choice for their homes and businesses, providing better information about energy use in buildings and homes, and legislating that new buildings become increasingly energy efficient over time.

4. Making Ontario "one of the easiest and most affordable jurisdictions in North America" for homeowners and businesses to install or retrofit clean-energy systems like solar, battery storage, advanced insulation, and heat pumps, while helping to protect and support low-income households, vulnerable communities, and many renters from the costs and impacts of carbon pricing.

5. Supporting a carbon market that drives the lowest cost greenhouse gas emission reductions. Actions in this plan, supported by cap-and-trade proceeds, were to be used to assist business and industry in making investments that reduce greenhouse gas pollution. It was suggested, this would help save energy costs, improve productivity and global competitiveness, plus protect, and create jobs.

6. Working in partnership with First Nations and Métis communities to address climate change, with actions guided by Traditional Ecological Knowledge, and helping to build capacity in these communities to participate in the economic opportunities that may arise from these actions.

7. Building on progress, leading by example, and acting on opportunities to make government operations carbon neutral. The province was seeking to achieve this goal by reducing greenhouse gas pollution across its facilities, operations, and procurement.

8. Ensuring natural, agricultural, and forested lands are used in ways that are efficient, sustainable and enhance the removal and storage of carbon from the atmosphere while working with Ontario's waste sector to leverage different practices and technologies to capture greenhouse gas pollution that would otherwise be released into the air.

The action plan had stated intentions of helping consumers, businesses, and workers in the Province of Ontario smoothly transition to a low-carbon economy.

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[12] Government of Ontario, Climate Change Action Plan, 2015 https://www.ontario.ca/page/climate-change-action-plan

Ontario's Cap and Trade Program

(3.2.6) Ontario's cap-and-trade program were established to generate revenue and was largely seen as a cornerstone in the fight against climate change. The action plan helped define how cap and trade auction proceeds would be spent. By law, those proceeds were to be invested in projects and programs that help reduce greenhouse gas pollution. The provincial government stated its interest in ensuring all cap-and-trade proceeds were managed in transparent and accountable ways.

(3.2.7) In 2018, the newly elected Ontario Government divested itself from the Climate Action Plan and scrapped the Cap-and-Trade program. (The Federal Government is now working on a new plan for carbon pricing, including carbon offsetting).

(3.2.8) Instead, the draft *'Preserving and Protecting our Environment for Future Generations: A Made-in-Ontario Environment Plan' (Made in Ontario)* was created in 2018 with the stated intention of addressing the challenges Ontarians have faced in protecting air, land, and water, reducing litter and waste, and supporting Ontarians to reduce their Greenhouse Gas emissions. The plan also includes some suggestions as to how communities and families can prepare for climate change.

(3.2.9) The Made in Ontario plan states, since 2001, Ontario has achieved a reduction of up to 30 megatonnes of annual GHG emissions when coal-fired electricity generation was phased out. Today, Ontario's electricity is ""virtually emissions-free". Ontario has a GHG reduction target of decreasing its emissions by 30% below 2005 levels by 2030. This target aligns with Canada's 2030 target under the Paris Agreement.

(3.2.10) In this context, the 'Made in Ontario' Plan states the following priorities and objectives:

1. **Protecting the air, lakes, and rivers**

    a. Making it easier for people to report pollution and incidents with photos or videos sent online, via e-mail, phone, or through an app.
    b. Improving the complaint response system where Ontarians can see real-time information and the status of their reported incident, and what to expect from inspectors and investigators when they file a complaint.
    c. Improving air quality in communities, including reduced emissions from heavy-duty vehicles, and the monitoring of pollutants to evaluate long-term trends and gather information needed to act on air pollution.
    d. Protecting water quality and ecosystems in the Great Lakes, while pursuing efforts to ensure coastlines and beaches are clean, native species are protected, and safeguarding against invasive species and reduced algae blooms.
    e. Working with municipalities, conservation authorities, the private sector, and other partners to promote best management practices in terms of reducing road salt in the waterways.
    f. Encouraging sustainable water use and water security, promoting water conservation and associated planning-based activities, and improving municipal wastewater and stormwater management and reporting.

2. Addressing climate change

a. Undertaking a provincial impact assessment to identify where and how climate change is likely to impact Ontario's communities, infrastructure, economics, and the natural environment.
b. Undertaking impact and vulnerability assessments for sectors such as transportation, water, agriculture, and energy distribution.
c. Educating the public on the impacts of climate change, using an online tool to help Ontarians understand the potential impacts of climate change in their communities.
d. Using climate science modelling to identify and create climate change adaptation solutions.
e. Supporting communities on applying climate science in decision-making to improve climate change resilience.
f. Modernizing building codes to better prepare homes and buildings to withstand extreme weather events.
g. Encouraging municipalities to incorporate climate resilience improvements when repairing or replacing damaged infrastructure after a natural disaster.
h. Building resilience in Ontario's critical infrastructure so that vital services and infrastructure can both withstand, and remain operational, during extreme weather events.
i. Supporting improvements on existing road conditions and developing a strategy to enhance all-season road connections in northern communities.
j. Supporting programs and partnerships to make agriculture and food sectors more resilient to current and future climate impacts.

3. Hold polluters accountable

a. Implementing emission performance standards for large emitters and introducing strong enforcements on emissions.
b. Launching an emissions reduction fund - The Ontario Carbon Trust, and an Ontario reverse auction to encourage private investment in clean technology solutions.
c. Enhancing corporate disclosure and information-sharing to promote climate-related disclosures in Ontario.
d. Encouraging private investments in clean technologies and green infrastructure
e. Conserving energy in homes and buildings to cut costs and reduce emissions. (Note: This is done through providing customers with access to their energy data through implementation of the Green Button Data Standard).
f. Increasing access to clean and affordable energy for families.
g. Making climate change a cross-government priority.
h. Empowering local leadership on climate change.
i. Improving public transportation to expand commuter choices and support communities.
j. Supporting green infrastructure projects.

4. Reduce litter and waste in communities.

a. Reducing and diverting food and organic waste from households and businesses
b. Reducing plastic waste.
c. Reducing litter in neighbourhoods and parks.
d. Increasing opportunities for people to participate in waste reduction efforts.
e. Ensuring producers are responsible for the waste generated from their products and packaging.

f. Exploring opportunities to recover the value of resources in waste such as chemical recycling or thermal treatment.
g. Providing clear rules for compostable products and packaging to ensure they are accepted by the green bin programs.
h. Making producers responsible for the end-of-life management of their products and packaging.
i. Supporting competitive and sustainable end-markets for Ontario's waste.

5. Keeping soil clean

a. Increasing the redevelopment and clean-up of contaminated lands in Ontario to put vacant land back to good use.
b. Making it easier and safer to reuse excess soil.
c. Improving the management of hauled sewage to protect human health and the environment from the impacts of nutrients and pathogens.

6. Conserving land and green spaces

a. Improving the resilience of natural ecosystems to conserve and restore natural ecosystems, strengthening and expanding grassland habitats, and protecting against wildfires.
b. Protecting important environmental and ecological areas.
c. Supporting conservation and environmental planning to protect natural areas.
d. Promoting parks and increasing recreational opportunities.
e. Protecting species at risk and responding to invasive species.
f. Managing forests sustainably (The Ontario Forest Sector Strategy).

(3.2.11) The Made in Ontario plan continues to make its way through the legislature with consultation and engagement taking place with stakeholders. Some priority initiatives have already been implemented and other initiatives are currently subject to stakeholder review. The formal public consultation period ended on January 28, 2019; however, a further round of stakeholder engagement did take place between November 19 – 25, 2020. The Smart Green Communities team attended the northern Ontario session on November 25, 2020 and a summary update is provided as follows:

(3.2.12) 79 attendees were in attendance representing, among other sectors, municipalities, the public sector, non-profits, energy associations, and community environmental groups. The following topics were discussed:

- Conservation authorities
- Building codes and emissions associated with buildings, the net-zero building code, and EV-ready forms of new construction in Ontario.
- Waste management including the blue box program.
- Increasing our ambition re: Ontario's targets and reducing GHG emissions
- Stormwater management and alerts which notify the public of sewage spills.
- Forest management and land protection
- Improving incentives for heat pumps for space and water heating, district energy systems
- Transparent, unbiased, science and evidence-based environmental assessments

Ontario Forest Sector Strategy 2020[13]

The Ontario Forest Sector Strategy includes the following information:

(3.2.13) Vision: The Ontario forest sector is a world leader in making and selling forest products from renewable, sustainable, and responsibly managed forests. Ontario is a preferred location for investing in commodity innovative forest products and advanced manufacturing.

Four Pillars of Action:

1. Promoting Stewardship and Sustainability

- Enhance recognition of sustainable forest management.
- Establish and strengthen partnerships with Indigenous communities.
- Respect Indigenous rights and protect values.
- Apply best research and science.
- Respond to a changing climate.
- Improve collaboration in managing our forests.

2. Putting more wood to work

- Invest in advanced remote sensing technologies.
- Remove barriers to accessing wood.
- Increase forest growth.
- Provide wood supply certainty.
- Maintain and attract new investment.

3. Improving Ontario's cost competitiveness

- Increase efficiencies to help reduce costs.
- Reduce the regulatory burden.
- Consider strategic investments in critical infrastructure.
- Encourage use of underutilized species and log qualities.

4. Fostering innovation, markets, and talent

- Expand and find new markets.
- Grow talent in the forest sector.
- Encourage wood use and develop new innovative products.
- Enable technology adoption.
- Increase the use of wood in Ontario's building and bridge infrastructure.

(3.2.14) Sustainable forest management provides for forests that are resilient to the impacts of climate change, while playing a vital role in capturing and storing carbon dioxide. Applying forest management practices to encourage forest growth and productivity may also result in opportunities to increase the amount of carbon sequestered.

Please refer section 6.2 of this report titled 'Sustainable Forestry and Carbon Sequestration Strategy' for more information on carbon sequestering of forests and biological matter.

[13] Sustainable Growth: Ontario's Forest Sector Strategy, Government of Ontario, August 2020 https://www.ontario.ca/page/sustainable-growth-ontarios-forest-sector-strategy

3.3 Northern Ontario

(3.3.1) Growth Plan for Northern Ontario[14]

The Growth Plan for Northern Ontario was prepared under the *Places to Grow Act, 2005* with the aim of stimulating growth by creating a diversified northern economy, stronger communities, a healthy environment, and a skilled, adaptive, and innovative workforce. The plan was intended to guide the development of land, people, and resources over the next 25 years.

Altogether, northern Ontario comprises 144 municipalities, 106 First Nations, Métis communities, and more than 150 unincorporated communities. All these communities will play an important role in implementing the plan and achieving a healthy and prosperous future for the north.

According to the plan, establishing a successful and prosperous future for the north will begin at the local level by establishing a clear vision for each community's future, and mapping out the path to achieve that vision. Official plans and community economic development plans, informed by robust stakeholder and community engagement, are recognized as effective tools, and approaches to ensure citizens' and businesses' views are reflected in their communities' future economy and longer-term sustainability. The plan indicates that municipalities and Aboriginal communities could choose to collaborate to prepare longer-term community strategies.

The primary purposes of the Growth Plan for Northern Ontario were stated as being to:

1. Enable decisions about growth to be made in ways that sustain a robust economy, build strong communities, and promote a healthy environment and a culture of conservation.
2. Promote a rational and balanced approach to decisions about growth which build upon community priorities, strengths and opportunities and makes efficient use of infrastructure.
3. Enables planning for growth in a manner that reflects a broad geographical perspective and is integrated across natural and municipal boundaries.
4. Ensures a long-term vision and goals to guide decision-making about growth and provides for the co-ordination of growth policies among all levels of government.

In the context of the environment, northern Ontario includes two of the Great lakes: Lake Superior and Lake Huron, both of which are not only valued environmental features but provide northern Ontario with innumerable economic advantages. The plan states that the province will work with the federal government, municipalities, and others to promote northern Ontario locations for investments to contribute to the growth of Ontario's green economy including opportunities for research and commercialization of green technologies.

From a climate change perspective, the plan also states the following:

"This plan also recognizes the need for climate change mitigation and adaptation, which is of particular importance in the North. Average temperatures are rising more quickly in the North than the rest of Ontario. This will alter the profile of the boreal forest and the sensitive ecology of waterways, lakes, and wetlands. It threatens the region's biodiversity, increases the risk of storms and forest fires, and shortens the transportation season for remote communities that rely on temporary ice roads to import essential supplies".

[14] Growth Plan for Northern Ontario, Government of Ontario, 2011. https://www.ontario.ca/document/growth-plan-northern-ontario/communities

(3.3.2) Northern Ontario Multi-modal Transportation Strategy[15]

The Northern Ontario Multi-modal Transportation strategy addresses the current and future concerns of the transportation system in Northern Ontario. It identifies methods to address those concerns over a 25-year timeframe in accordance with *The Growth Plan for Northern Ontario (2011)*. The report addresses challenges including the need for more accessible transportation to service demographics including low-income households, an aging population, and younger generations.

The **vision statement** is as follows: *"Northern Ontario's transportation system is responsive to economic, social, and environmental needs and change, and is transformative in supporting new economic activity, healthy communities, and a cleaner environment".* The goal of the strategy is to introduce an integrated and connected multi-modal transportation system which allows for the safe and efficient movement of people, goods, and services.

The 5 stated goals include:

1. **Connected and Prosperous**
   - Increase and modernize transportation options to support everyday living and economic activity in Northern Ontario.
2. **Safe and Reliable**
   - Enhance traveler safety and system reliability and minimize travel delays and complications.
3. **Address Remote and Far North Challenges**
   - Work with remote and Far North communities to address unique transportation needs with more reliable connections between communities and the all-season ground transportation network.
4. **Integrated and Innovative**
   - Anticipate and respond to economic, technological, environmental, and social change to link people, resources, and businesses.
5. **Healthy and Sustainable**
   - Create a cleaner and more sustainable transportation system in northern Ontario by reducing GHGs and other environmental and human health impacts.

The effect of climate change on roadways is that there will be more frequent and severe rainstorms and/or freezing rain, which could result in flooding, road, and rail washouts, plus ice formation on roads and power lines. These conditions create more hazardous travelling conditions. Climate change is causing an accelerated rate of degradation of winter roads, with pavements cracking due to increased frequency of freeze-thaw cycles and the rutting of asphalt road surfaces.

Those components of the *Northern Ontario Multi-modal Transportation Strategy* which address climate change and transportation, and are directly applicable to the REEP include:

[15] Northern Ontario Multimodal Transportation Strategy, 2014. https://northernontariommts.files.wordpress.com/2017/07/draft-northern-ontario-multimodal-transportation-strategy1.pdf

- The gathering of data, and increasing monitoring, knowledge and forecasting to support longer-term transportation planning.

- Reducing GHG emissions from car and truck transportation in northern Ontario by decreasing reliance on diesel and gasoline fuels and shifting to electrically powered systems and lower carbon fuels.

- Increasing the use of renewable energy throughout the northern transportation system, including vehicular travel at airports and among remote communities.

3.4 Region of North Shore

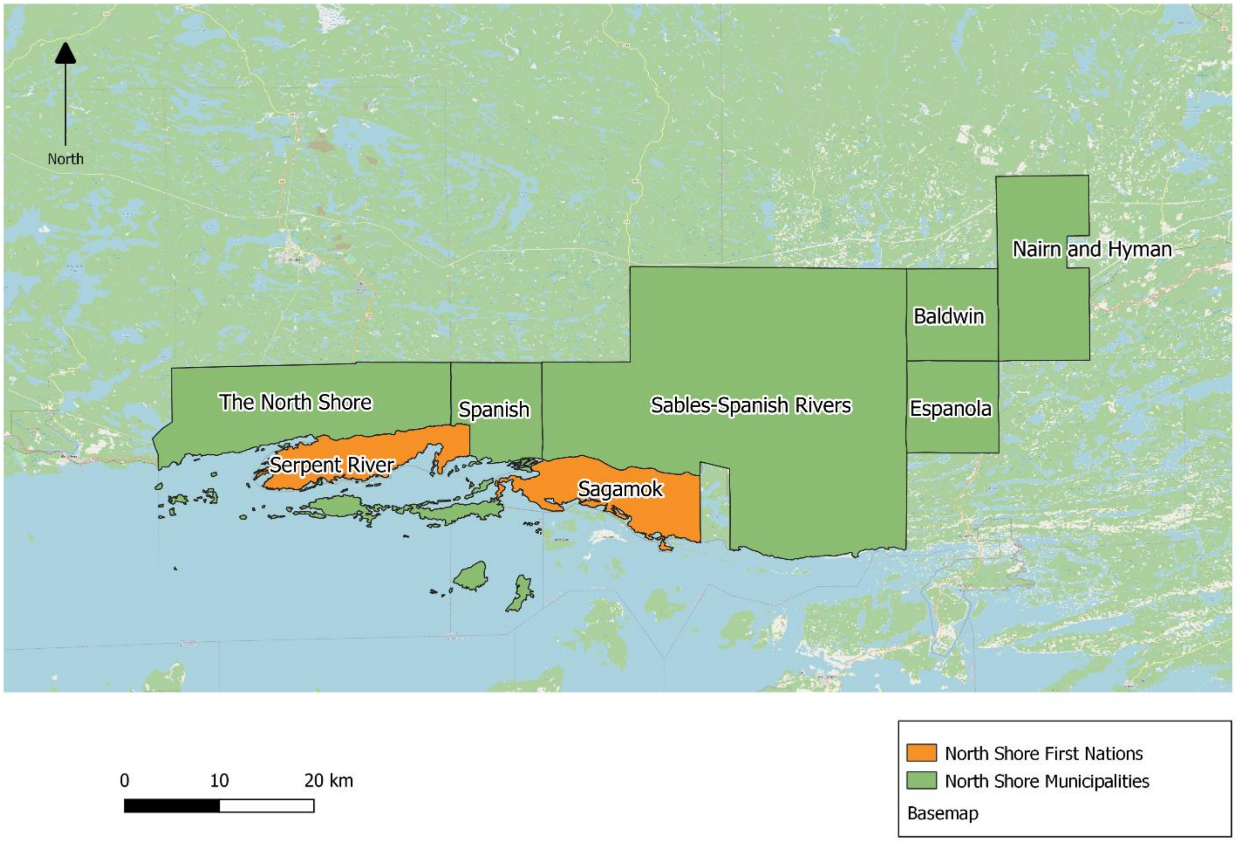


Figure 1: Map of North Shore Region

(3.4.1) Introduction to the North Shore Communities

The North Shore Communities identified within this report comprise a cluster of municipalities, townships and First Nation communities which are primarily located along the northern shores of Lake Huron, in Northeastern Ontario.

A number of these communities directly adjoin the 'north channel', a natural feature within Lake Huron, which separates the North Shore Communities from Manitoulin Island (the largest freshwater lake in the world).

The REEP study area extends from Nairn and Hyman in the East to Serpent River and the Township of North Shore to the West. These communities are located along the Trans Canada Highway, which extends for approximately 95 kilometers along the North Shore.

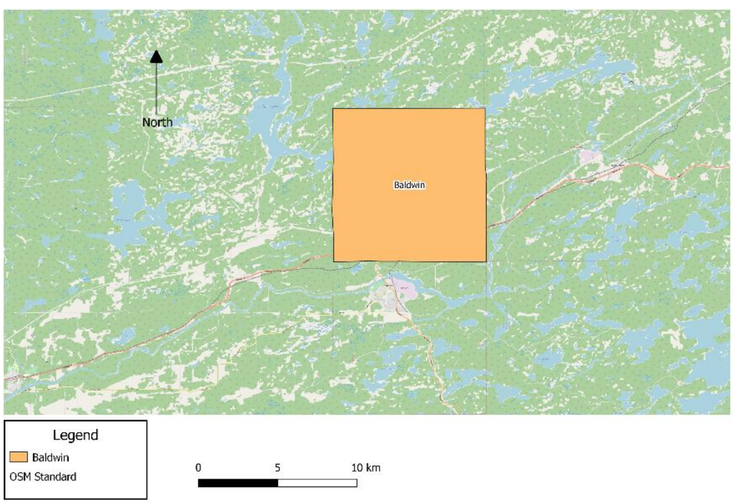
The Trans-Canada Highway and Northern Channel are strategic 'assets' which not only provide a means of transportation, but facilitate a wide range of social, economic, and recreational/ tourism-based activities.

A railway line also runs along this corridor, which provides mainly freight-based services. Some local interest groups, such as the Northeastern Ontario Railway Network (NEORN)[16], have been active in recent years in their efforts to introduce a passenger railway service (forming part of a wider network) to increase mobility and accessibility among a range of communities served.

The Spanish River has traditionally played an important role in the development of local economies (from the fur trade, to logging/forestry, and more recently tourism). It is now widely recognized as a feature of local significance among numerous municipalities affected within the North Shore communities study area.

The Spanish River gained its name from an ancient aboriginal village called Skimington located in Sagamok which is a Spanish River Reserve south of Massey. The Chief of the Ojibway band at Skimington was an individual known as the Spaniard or l'Espagnol. Both the town of Espanola and Spanish River owe their names to this person.

Altogether, the North Shore communities study area comprises 6 municipalities and 2 First Nation communities **with a combined total population of 10,892 residents** according to the 2016 Census. Given the mixed economic profile of these communities, it is challenging to quantify how much the avg. population increases in the North Shore communities vary on an annual basis. The following provides a summary of the profiles for each community within the Study Area:



(3.4.2) Baldwin

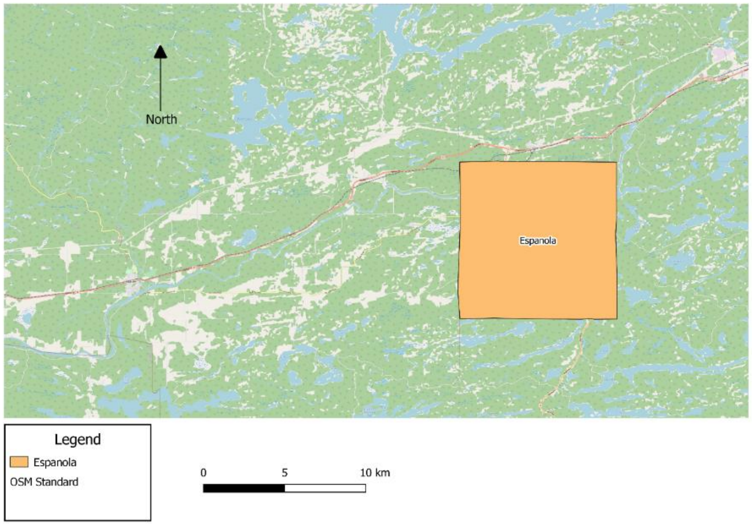
Named after Mr. F.A Baldwin, the Township of Baldwin is a predominantly rural community located on Highway 17, 3km east of Highways 6 and 17. The Township was incorporated in 1927.

Population (2016): 620

Industry: Baldwin township has no heavy industry within its boundaries; however, Domtar Paper Products is a paper mill that is located approximately 2km away within the jurisdiction of the Town of Espanola and serves as an important employment base to the residents of Baldwin.

Future Goals/Objectives: The Township of Baldwin's Conservation Demand Management (CDM) Plan, which extended from 2014 -2019, indicates the municipality recognizes those municipal buildings built prior to 1927 are known to have heat loss and energy conservation issues and that such matters should be addressed as a priority. Funding will need to be secured in order that the township may construct a new / replacement municipal building.

[16] Northern and Eastern Ontario Rail Network http://neorn.ca/wp-content/uploads/2016/03/Carte-Huron-Central-Ottawa-Valley.pdf

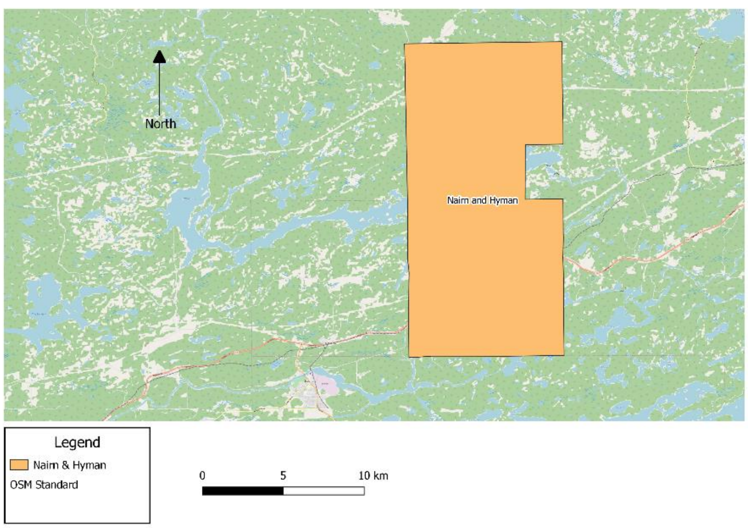


(3.4.3) Espanola

Located on the Spanish River, The Town of Espanola originated as a company-owned town by the Spanish River Pulp and Paper Company and was incorporated in 1958. The Town of Espanola is a service hub for the LaCloche-Manitoulin region.

Population (2016): 4996

Future Goals/Objectives: As stated in its CDM plan (2020-2024), the Town of Espanola strives to reduce municipal energy consumption by an additional 5-10% in municipal operations by 2025 compared to the 2014 baseline. The municipality has established many goals to reach its next energy consumption reduction target, which includes investigating options for renewable energy sources.



(3.4.4) Nairn and Hyman

Named after a railway engineer's hometown of Nairn, Scotland, Nairn and Hyman is a township that was created because of the Canadian Pacific Railway's development. The township was officially chartered as a municipality and was formed from the geographic townships of Nairn, Lorne and Hyman in 1896.

Population (2016): 342

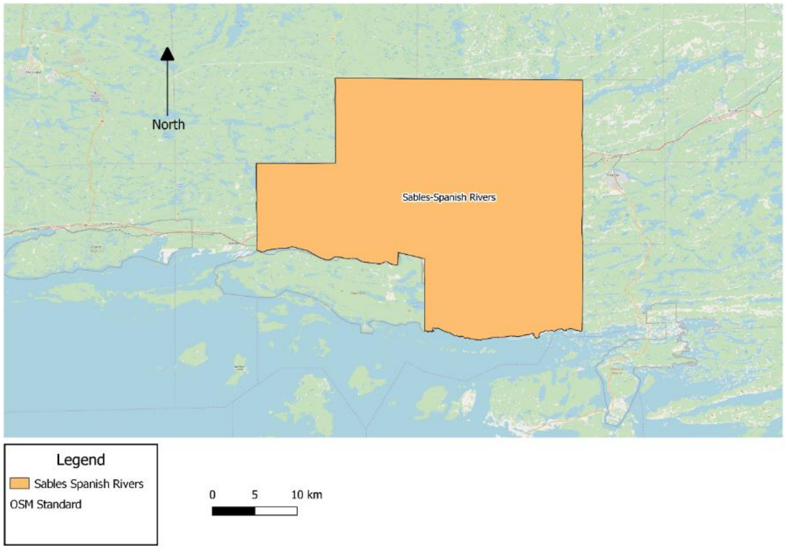
Industry: Historically, established as a logging industry, Nairn Centre was the core residential area. With the decline in logging-based activities, the Spanish River instead now provides opportunities for recreational activities such as fishing, boating, swimming, hunting, camping, and several kilometres of scenic off-road trails. Nairn Centre is relatively close in proximity to the City of Greater Sudbury, which provides additional opportunities for employment in the mining, manufacturing, retail, business, tourism, and forestry sectors, among others.

Future Goals/Objectives:

The Conservation Energy and Demand Management Plan (2019 - 2024) identifies the following as being priority action areas:

- The replacement of the Hyman Fire Station Oil Furnace with a high-efficiency Propane furnace
- The replacement of insulation in Nairn Fire Station

- An LED lighting retrofit in the Water Treatment Plant



(3.4.5) Sables-Spanish Rivers

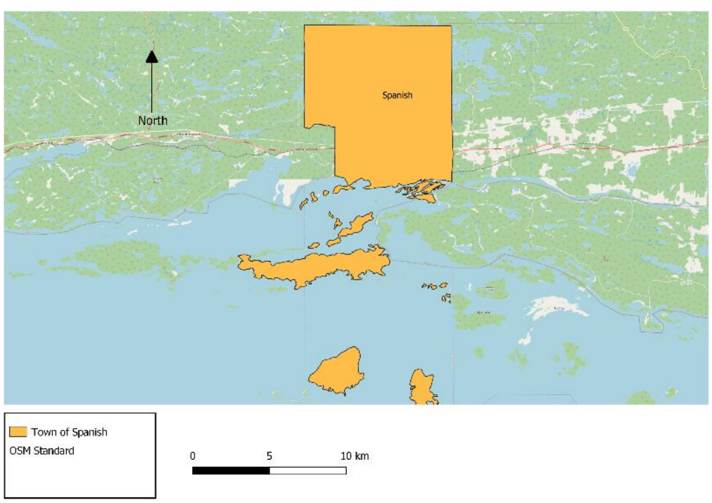
The Township of Sables-Spanish Rivers was created in 1998 by amalgamating the towns of Massey and Webbwood with the township of Spanish Rivers and the unorganized geographic townships of May and Shakespeare. It was named for Massey's location at the junction of the Spanish and Aux Sables rivers. The annual Massey Fair is held here in late August.

Population (2016): 3,214

Future Goals/Objectives: The Township of Sables-Spanish Rivers proposes a 20% total energy use reduction target by 2024 (in reference to a baseline year of 2014). The actions they have proposed to reduce energy use includes, installing LED lights, updating / replacing systems, and appliances, tinting windows to reduce heat transfer and implementing behavioural energy consumption actions.

Other relevant information: The Township of Sables-Spanish Rivers is a member of the PCP Program, and is working on completing Milestone 2: Setting targets

(3.4.6) Town of Spanish



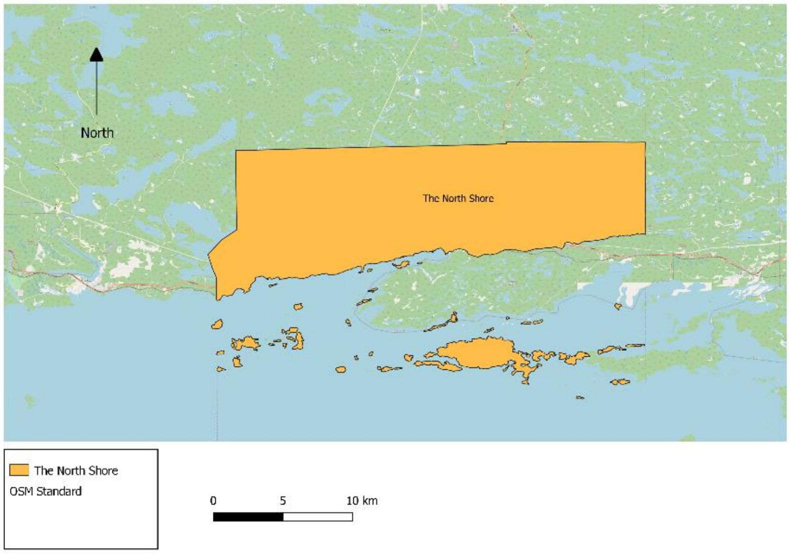
The Town of Spanish is in Algoma District along the Trans-Canada Highway (17) at the mouth of the Spanish River that leads into the North Channel of Lake Huron.

Population (2016): 712

Future Goals/Objectives: The Town of Spanish recognizes that energy efficiency is a continuous effort due to rising fuel costs, energy security, and environmental concerns. Energy saving efforts focus largely on electrical, heating, and cooling systems. Actions include raising awareness to reduce energy consumption, exploring opportunities that are available to reduce energy consumption, and seeking funds to increase efficiencies within municipal facilities.

Other relevant information: The Town of Spanish is a member of the PCP Program.

(3.4.7) Township of North Shore



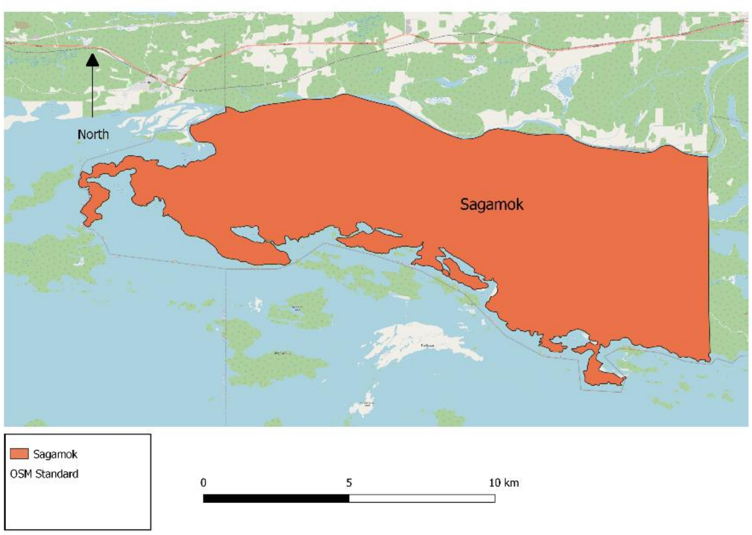
The Township of North Shore is in the district of Algoma which has three primary village areas known as Serpent River, Spragge and Algoma Mills. Spragge was originally known as Cook's Mill - a named which was based on a sawmill operation owned by the Cook Brothers Lumber Company founded in 1882.

Population (2016): 497

Industry: The village of Spragge once had sawmill activity but that was terminated in the 1930s. The town also had a thriving mining industry through the discovery of uranium and copper deposits in the area.

Future Goals/Objectives: To improve energy efficiency and lower costs in the Township of North Shore. The goal is to ensure employees are aware of energy conservation and reduce energy consumption, plus explore opportunities to reduce energy consumption and seek out funding opportunities to increase efficiencies within municipal facilities.

(3.4.8) Sagamok First Nations



The word 'Sagamok' is loosely translated as "two points joining". The Sagamok First Nation community is located on the north shore of Lake Huron. Sagamok's culture and language is Anishinaabek and its population primarily comprises the Ojibwe, Odawa, and Pottawatomi tribes, also known as the Three Fires Peoples.

Population (2016): 1,140

Future Goals/Objectives: Economic development initiatives in Sagamok First Nations include the hydro project at Aux Sable River, monitoring wind sources for potential wind energy projects, and solar energy project(s).

- The hydro project is a prefeasibility study done on the Sables River. This was conducted by Neegan Burnside Limited in 2012.

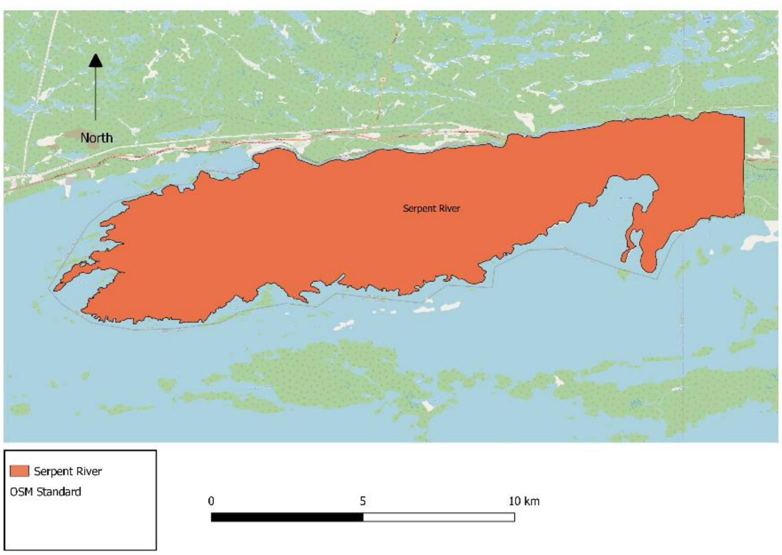
- The wind power project was conducted in September 2005 using a 50m meteorological tower (met tower) erected in the western part of Sagamok Anishinabek with another 60m met tower erected May 2006 (1.5 km south east of the original tower).
- Wind speeds and data from the Ontario Wind Atlas, and data from the met towers indicated strong enough winds for further study of environmental and feasibility.
- Hatch Energy completed a Technical and Environmental Report on this Project which identified the potential for development, but also, challenges with the terrain and connections.
- Rising energy costs associated with the grid could result in the community revisiting this renewable energy project in the future[17].
- Eclipsall Energy Group and Sagamok Anishnabek First Nation signed a joint venture agreement in 2012 where they will work collaboratively to plan the development and implementation of solar energy projects within the First Nation.
- The partnership will seek to develop and implement photovoltaic (PV) projects with a longer-term objective of sustainable, renewable energy deployment[18].

Other Relevant Information:

Sagamok Anishinabek Community Plan 2013

Sagamok Anishinabek is one of seven member communities of the North Shore Tribal Council (NSTC) that has developed community plans. The Community Energy Plan identified future initiatives to conduct energy retrofits, install LED/Solar streetlights, rooftop solar PV, solar water heating, plus the potential to explore other renewable energy projects.

(3.4.9) Serpent River



Serpent River First Nations is located on the North Channel of Lake Huron, including the Serpent River Basin. The town of Elliot Lake is located further north. The Serpent River First Nations community largely comprises the Anishinaabe tribe, a signatory to the Robinson Huron Treaty of 1850.

Population (2016): 371

Future Goals/Objectives: Serpent River Fire Hall and Water Plan are managed by the Township of North Shore as part of their public sector reporting and asset management plans.

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[17] Sagamok Development Corporation, Community Plan. https://sagamok.ca/documents/assets/uploads/files/en/sagamok_community_plan.pdf

[18] Dalton, *Anishnawbek Partner for Solar Energy Projects,* June 22, 2012 https://www.ebmag.com/eclipsall-and-sagamok-anishnawbek-first-nation-partner-for-solar-energy-projects-12506/

4.0 North Shore Energy Use and Emissions

4.1 Community Household Energy Use and Emissions

(4.1.1) Methodology: In developing a methodology to obtain community energy data, the Smart Green Communities team recognized early-on in the process that the collection of precise and accurate firsthand data would require the involvement and participation of many residents living on the North Shore. It was also understood that the collection of data in rural and remote areas can be particularly challenging when participation is voluntary.

(4.1.2) Although interviews involving all North Shore dwellers may sound ideal, this was not considered a plausible option as it would require a mixture of in-person and online surveys to collect this information. In addition, in-person surveys would involve multiple trips to the region to collect data, which is largely contrary to the program mandate, being to reduce emissions and energy usage. As well, with the status of the Covid-19 pandemic in 2020, prioritizing the health and safety of residents and participants is highly important.

(4.1.3) Another approach Smart Green Communities staff considered was to attend all festivals taking place within, and/or surrounding the North Shore communities during the summer months and ask festival goers about their energy use. (See Section 9.1).

(4.1.4) However, to collect an accurate amount of energy usage from residents, a visit to each municipality and township would be required to ensure the data is truly representative of the people that reside in the North Shore communities. If this methodology were to be followed, a representative sample size of 35% of the North Shore population would be required. This would require approximately **3,500** people to respond to Smart Green Communities' surveys. This option was not, therefore, considered likely to yield timely responses or deliver a representative sample size.

(4.1.5) That said, the Smart Green Communities team did attend a few festivals in 2019, including Massey Fair, to gain a qualitative account of how people currently consume energy. A series of questions were asked of attendees to both gauge their opinions and identify any actions that have taken place from an energy conservation perspective.

(4.1.6) However, to collect specific community energy use amounts, participants would need to provide energy bills for preceding months, and many people indicated they were not willing to do this, especially in the context of attending a public and largely social event such as Massey Fair. See 9.1.2 Massey Fair Report (August 2019).

(4.1.7) In lieu of these challenges, a community household energy use and emissions tool were developed to get an estimate of the general energy usage in the region.

4.2 Community Household Energy Use and Emissions Calculations Tool

(4.2.1) The Community Household Energy Use and Emissions Calculations Tool can be used to display an estimation of emissions from household heating and secondary energy sources by each municipal, township and First Nations community.

(4.2.2) Household heating energy use and emissions are broken down by types of energy including fuel oil, electricity, propane, and wood. A video, which explains the methodology and how the calculations were made is available on the Smart Green Communities website **here**.

A written calculation methodology can also be referenced in **'Appendix C: Community Household Energy and Emissions Calculation.**

The next section (4.3) displays charts which highlights community energy usage and the emissions of each fuel source for municipalities, townships, and First Nations in the North Shore:

Next steps:

(4.2.3) To approach better data collection strategies, a self-reporting tool can be developed for municipalities to collect data on energy usage in their communities. Residents of the municipality can enter their energy bills online using this tool. Offering an incentive such as a raffle prize or gift card when residents report their energy usage is helpful to encourage participation.

Please see the following example of a Community Energy Plan prepared by the Corporation of the Municipality of Wawa. An example of a *Resident Survey* is provided under *Appendix 1: Wawa Energy Action Plan Survey.*

http://edcwawa.ca/wp-content/uploads/2018/04/WAWA-ENERGY-PLAN_FINAL.pdf

4.3 Estimated Household Energy and Emissions Intensity by Municipality per person

This section identifies the estimated emissions per person on the North Shore. It uses the population of each municipality, township and First Nation and calculates community household energy usage. The determining factor for energy intensity is based on the ages of private dwelling homes and emission intensities from different energy types.

(4.3.1) The Smart Green Communities team was not able to clarify whether any of these homeowners have implemented their own household improvements measures which could improve the energy efficiency of older homes. As such, a provincial average from Statistics Canada was applied to determine an estimate. Please refer to section **Appendix C: Community Household Energy and Emissions Calculation** for more information on calculation methods.

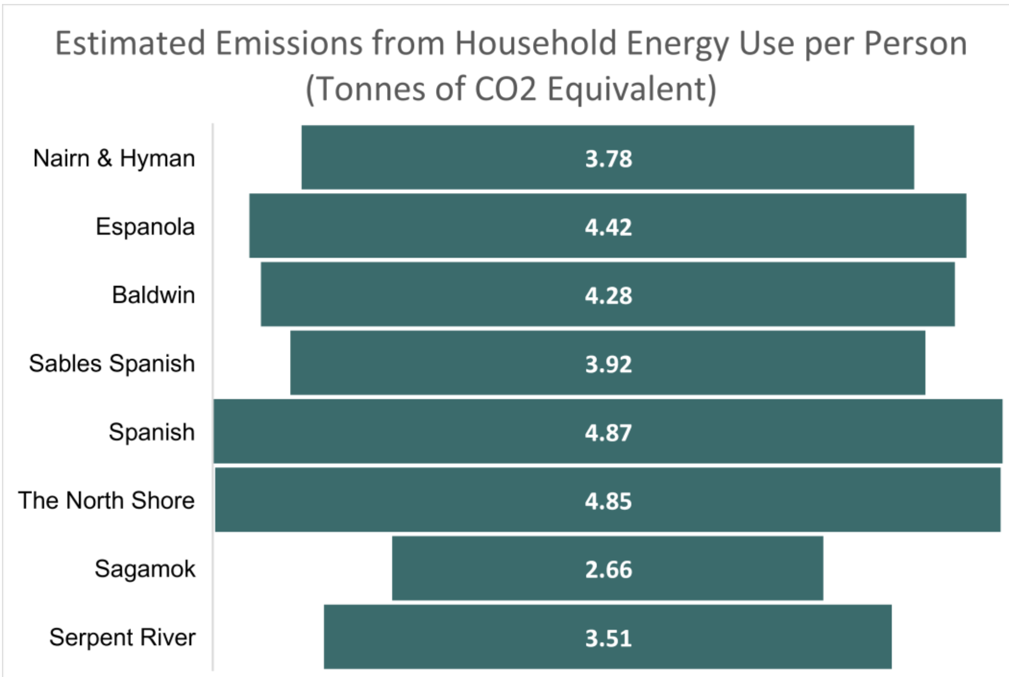

Figure 2: Household Energy Intensity and Emissions per person by each Municipality and First Nations Community (Including heating and secondary energy use and emissions)

4.4 Estimated Community Household Energy Use and Emissions Graphs by Energy Type

The household energy use ratios are broken down under the estimation that 65% of households on the North Shore are heated by electricity, 20% fuel oil, 10% propane, and 5% wood.

As explained in **Appendix C: Community Household Energy and Emissions Calculation**, this 65% / 20% / 10% / 5% energy use breakdown can be changed according to your own municipality, township or First Nation communities' known or predicted energy use breakdown.

Disclaimer: Primary data collection is required to ensure accurate reporting of energy types and usage of each community on the North Shore. Fuel Oil and propane are not used simultaneously for home-heating, but this is to account for potential scenarios of emissions and usage based on estimation factors. Evidence suggests that increased population numbers result in higher emissions levels associated with increased use. Therefore, it is important to refer to energy and emissions per person to develop action items that reduce personal energy use and emissions.

Each energy type is broken down by sub-sections as follows:

- 4.4.1 Fuel Oil
- 4.4.2 Electricity
- 4.4.3 Propane
- 4.4.4 Wood

4.4.1 Fuel Oil

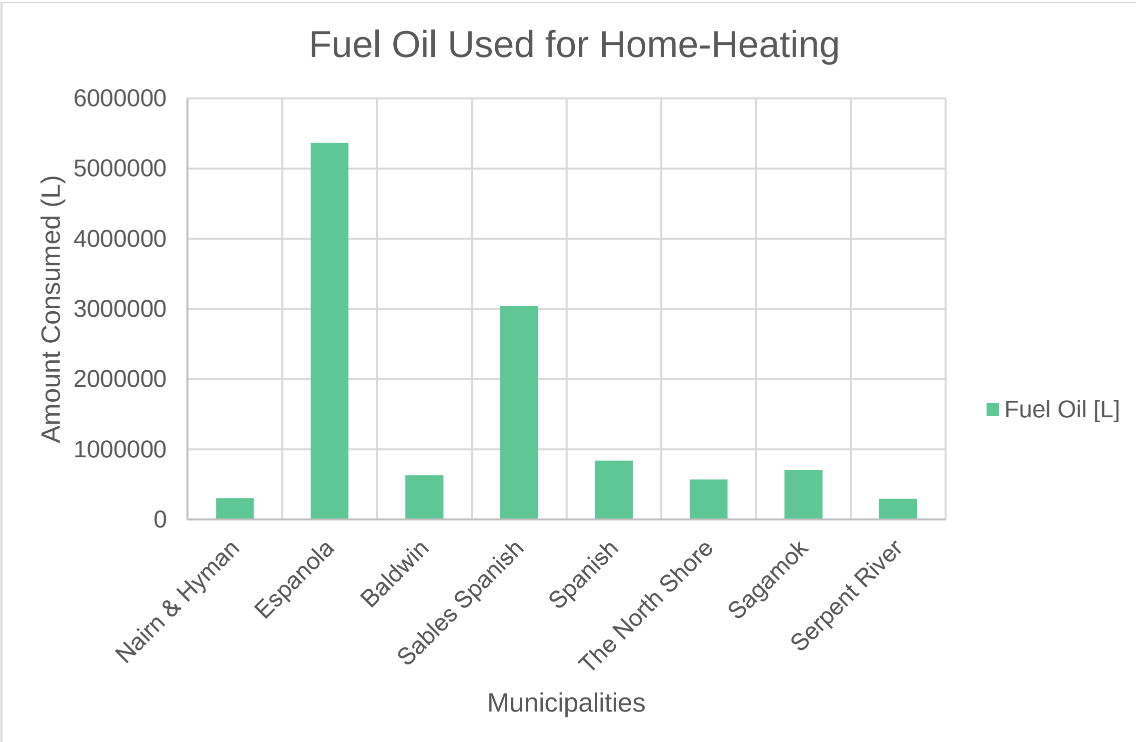

Figure 3: Fuel Oil (L) Usage for Home-Heating for the North Shore Communities

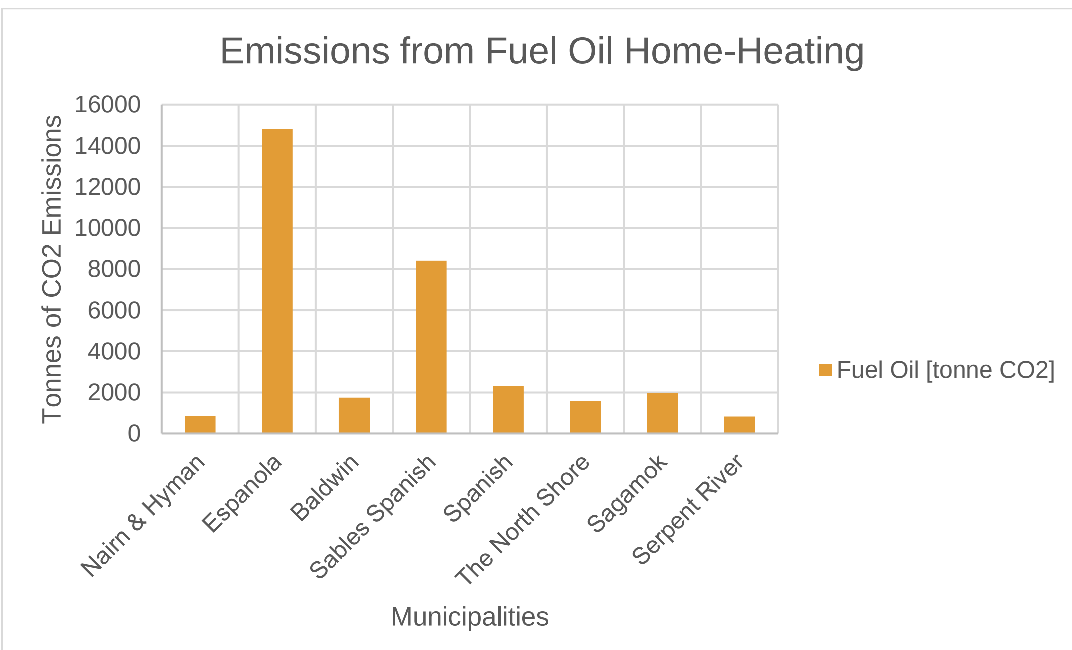

Figure 4: Total Emissions from Fuel Oil (Tonnes CO_2e) used for Home Heating for the North Shore Communities

4.4.2 Electricity

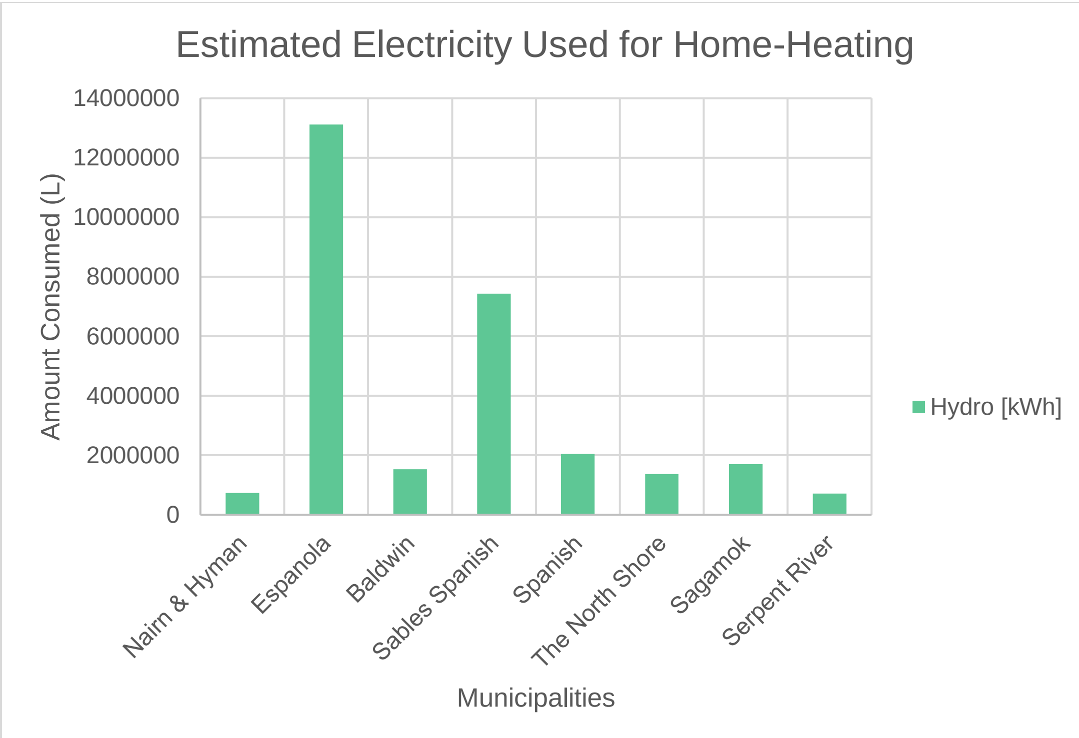

Figure 5: Hydro usage in kWh for home heating for the North Shore Communities

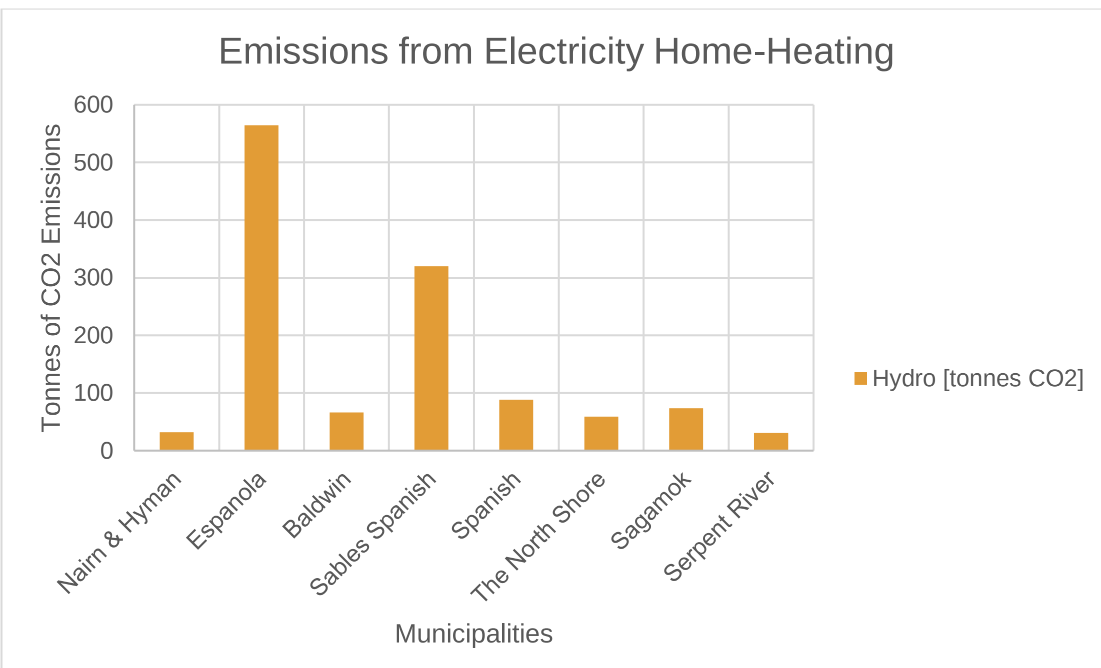

Figure 6: Total Emissions from Electricity (Tonnes CO_2e) used for Home Heating for the North Shore Communities

4.4.3 Propane

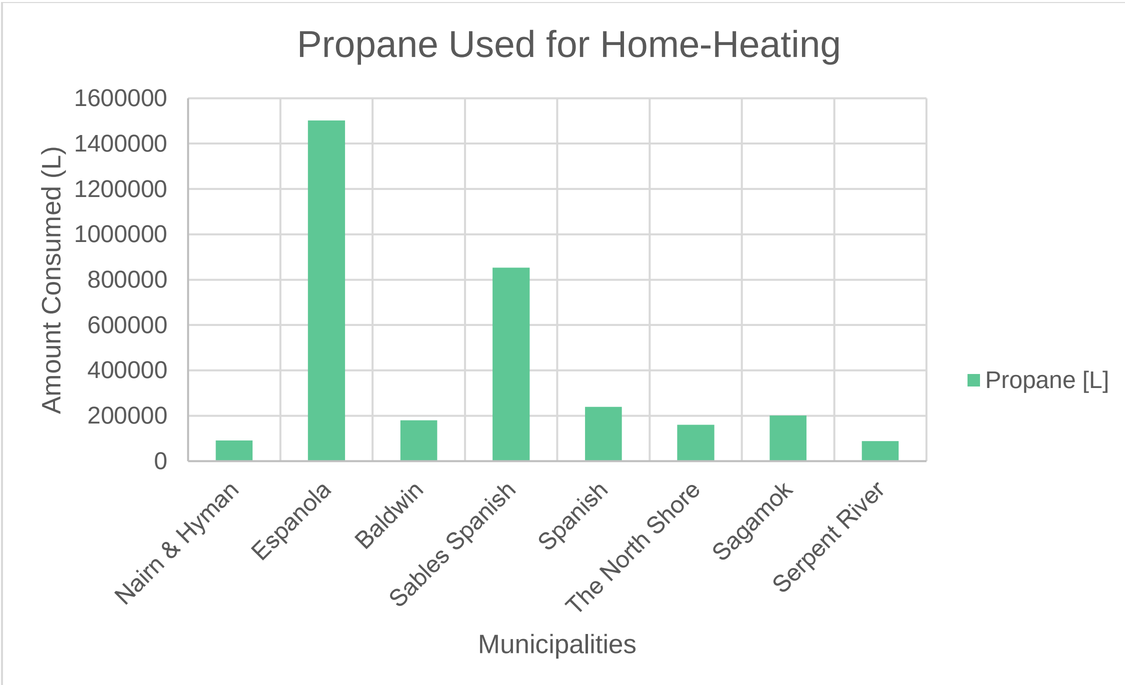

Figure 7: Propane usage in L for home heating for the North Shore Communities

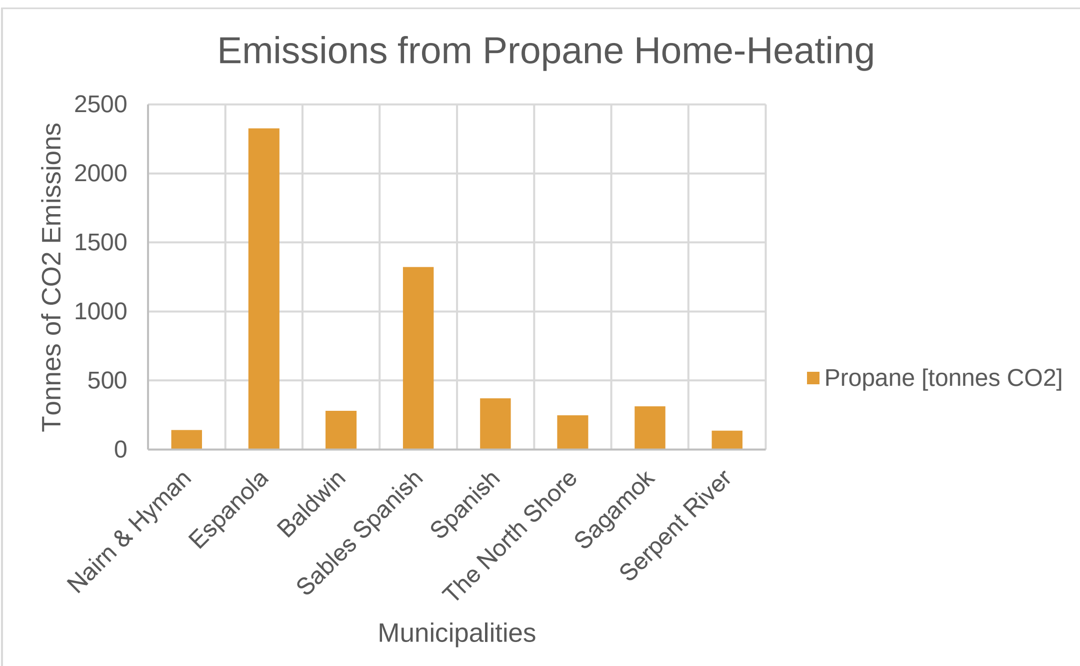

Figure 8: Total Emissions from Propane (Tonnes CO_2e) used for home heating for the North Shore Communities

4.4.4 Wood

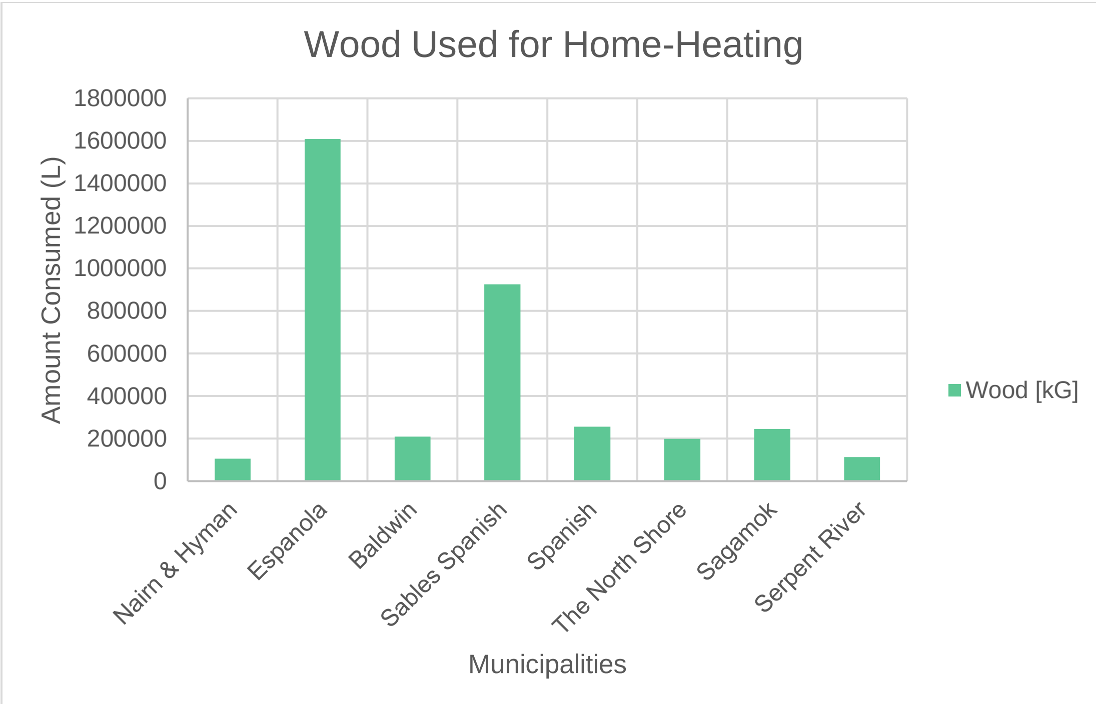

Figure 9: Wood usage in kilograms for home heating for the North Shore Communities

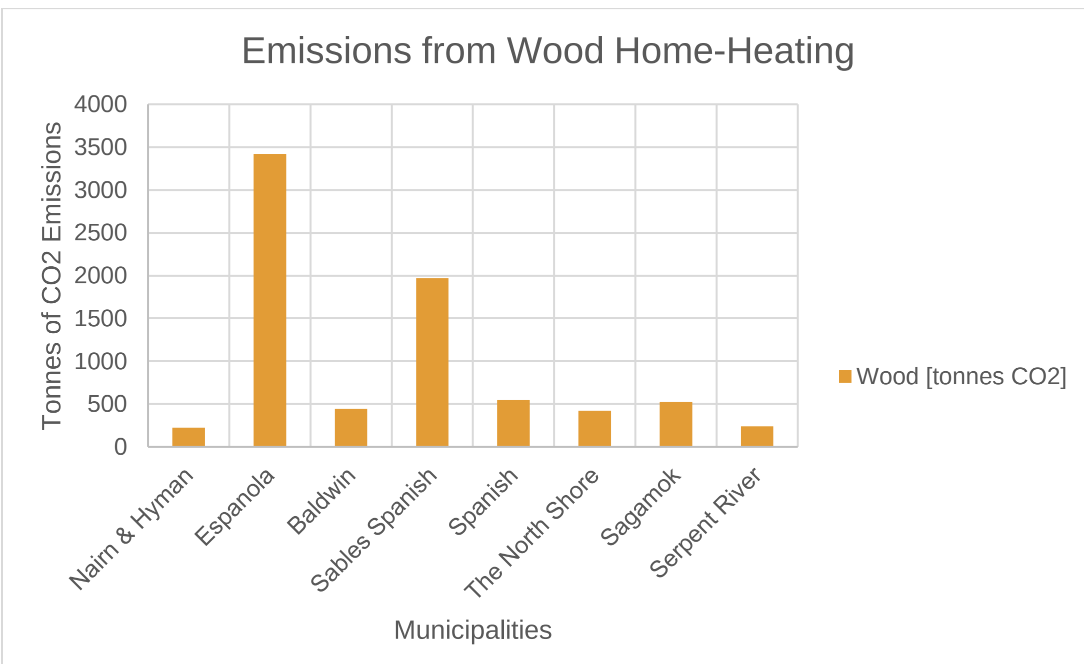

Figure 10: Total emissions from Wood (Tonnes CO_2e) used for home heating for the North Shore Communities

4.5 Estimated Community Household Energy Use and Emissions Graphs from Secondary Electricity Usage

This section breaks down each municipal, township and First Nation communities' energy use and emissions in respect of secondary heating sources by energy type. The Community Household Energy and Emissions Tool was used to create these graphs. This is calculated based upon Natural Resources Canada averages re: secondary household electricity usage. When applying the number of households for each community within the North Shore, the tool calculates the average amount of electricity used for each type of secondary energy sources.

For a more detailed explanation regarding the methodology and calculations, please refer to section '**Appendix C-2 Explanation of Secondary Energy Calculations**'.

Each section is broken down by sub-sections:

- 4.5.1 Lighting
- 4.5.2 Cooling
- 4.5.3 Electric Appliances
- 4.5.4 Natural Gas Appliances

4.5.1 Lighting

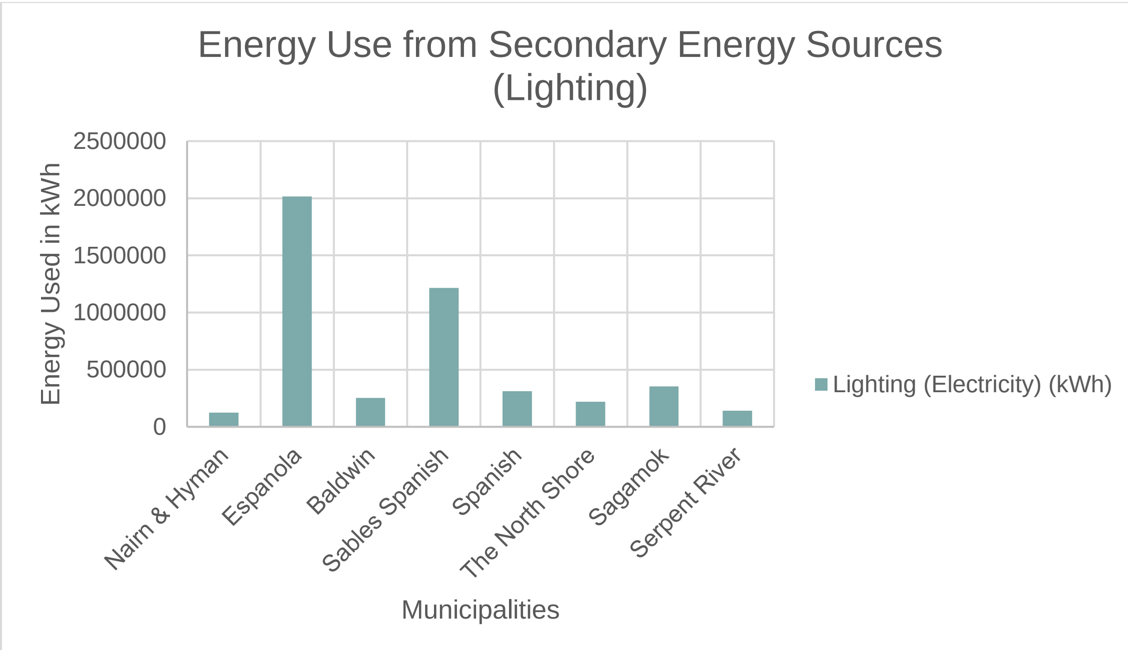

Figure 11: Energy Use from Lighting in kWh for the North Shore Communities

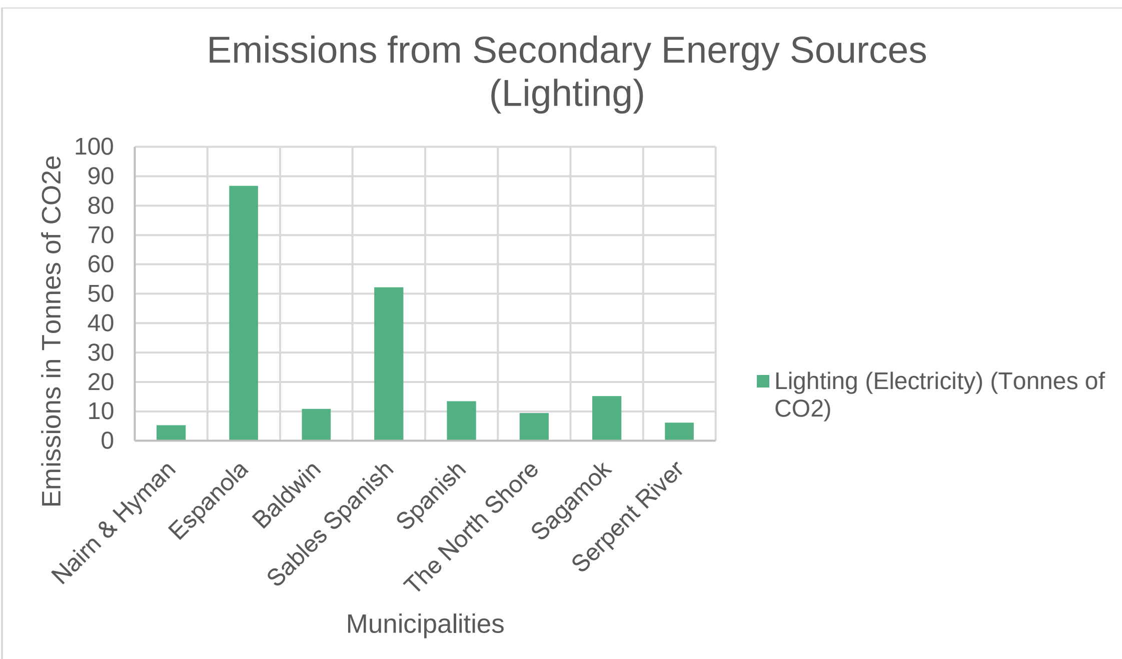

Figure 12: Total emissions from Lighting (Tonnes CO_2e) used for the North Shore Communities

4.5.2 Cooling

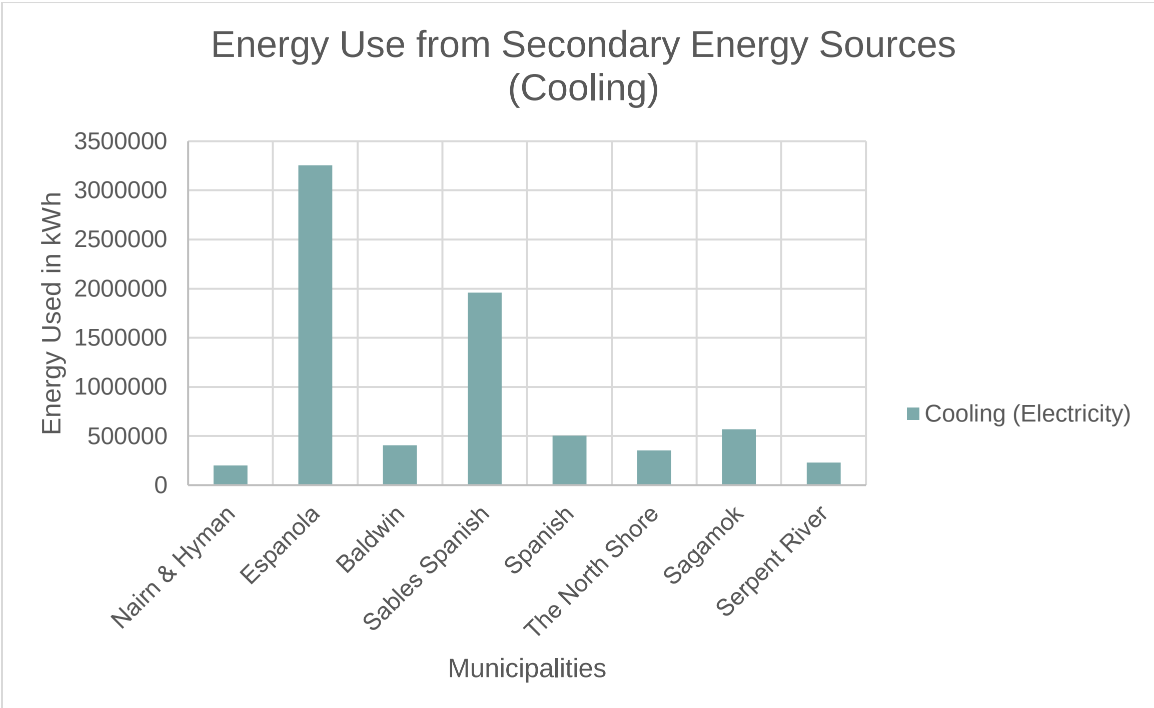

Figure 13: Energy Use from Cooling in kWh for the North Shore Communities

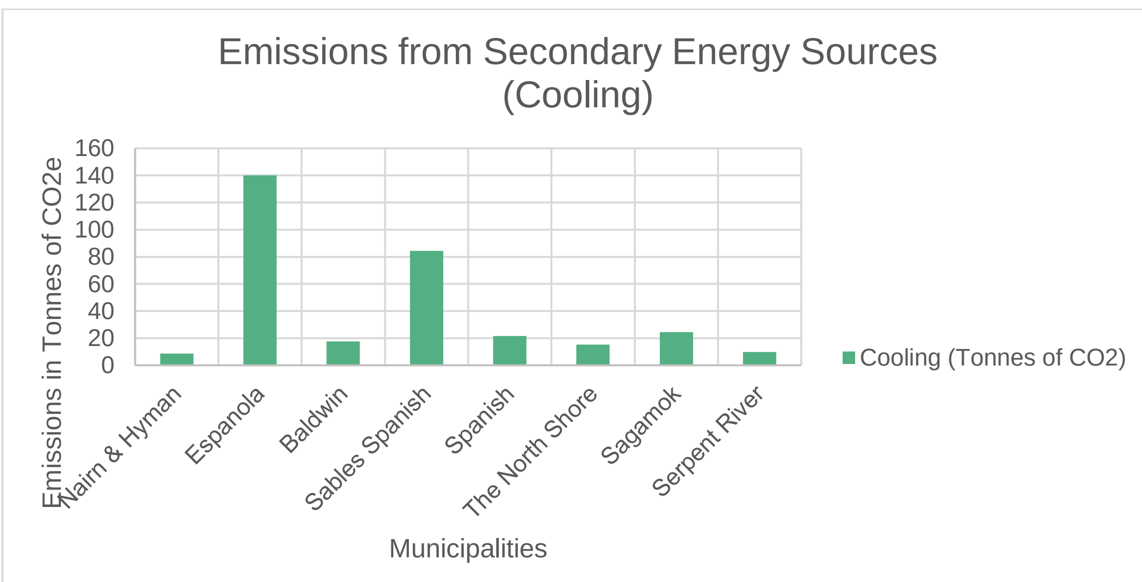

Figure 14: Total Emissions from Cooling in kWh for the North Shore Communities

4.5.3 Electric Appliances

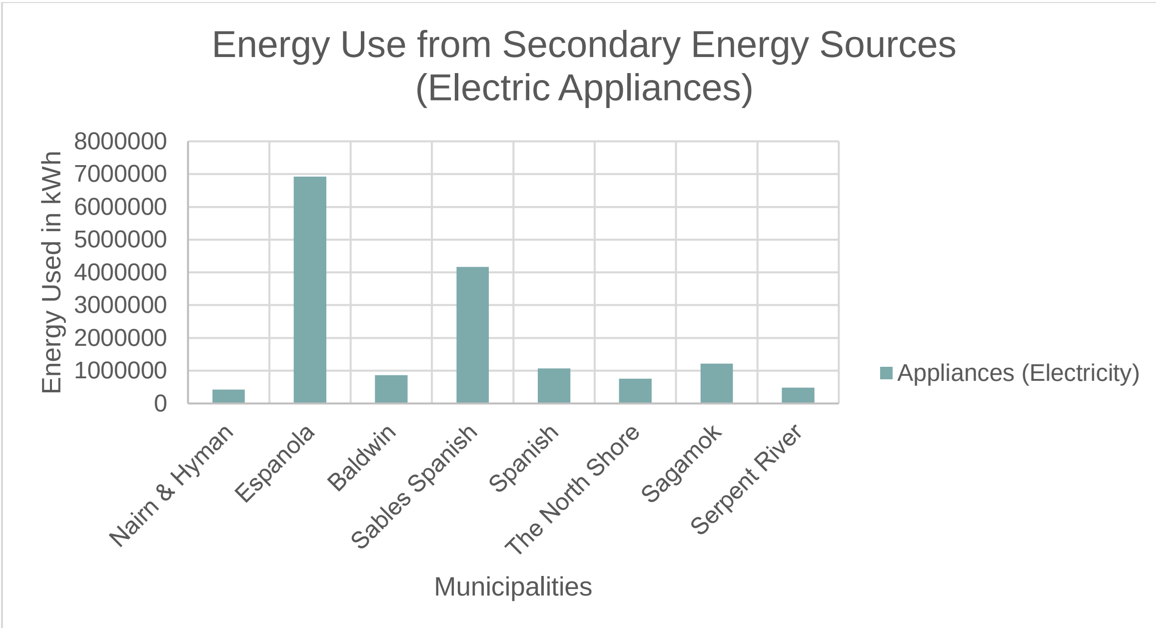

Figure 15: Energy Use from Appliances in kWh for the North Shore Communities

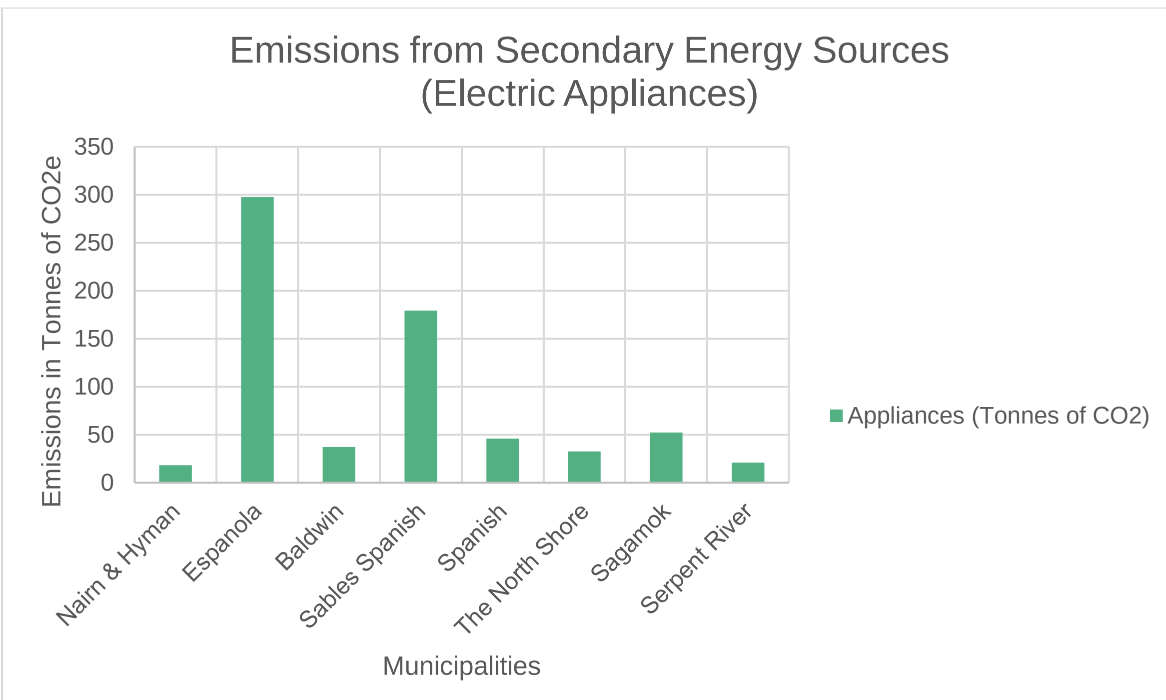

Figure 16: Total Emissions from Appliances in kWh for the North Shore Communities

4.5.4 Natural Gas Appliances

Disclaimer: This calculation is listed as potential energy use and emissions if natural gas appliances are used in the North Shore. However, a detailed and accurate data collection method is required to determine whether natural gas appliances are actively being used in the community or not.

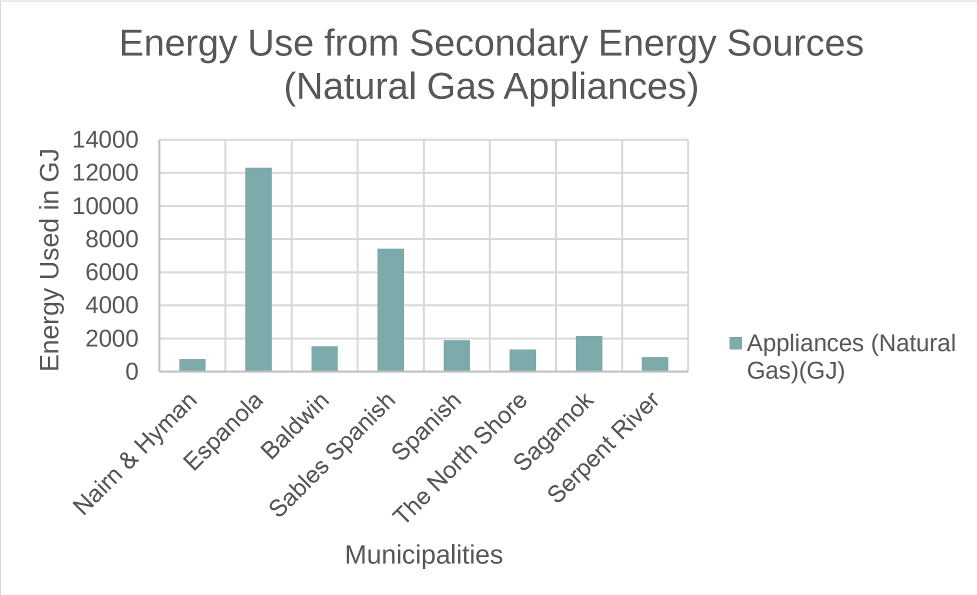

Figure 17: Natural Gas Use from Appliances in Gigajoules for the North Shore Communities.

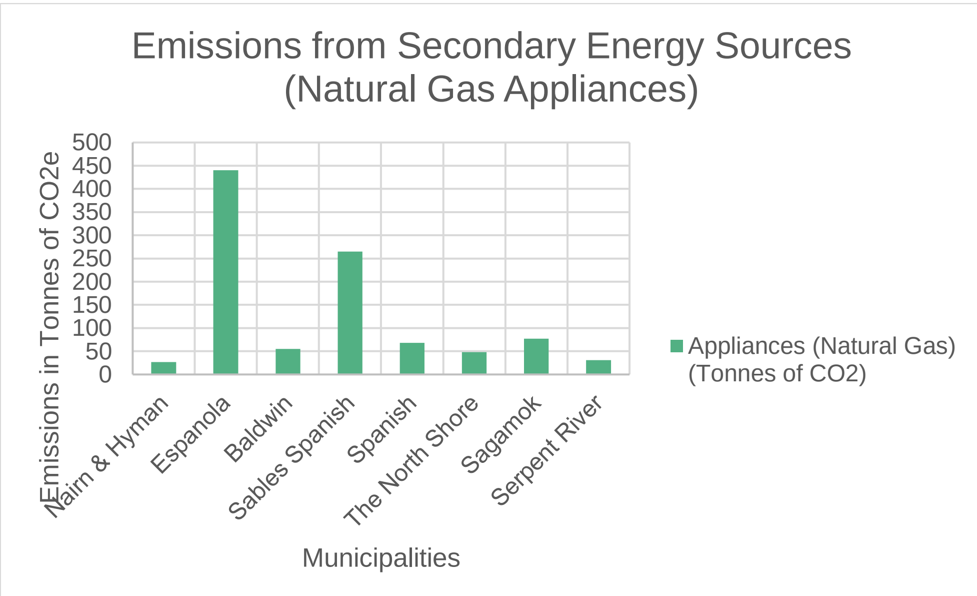

Figure 18: Total Emissions from Appliances using Natural Gas for the North Shore Communities.

4.6 Transportation

Vehicles Kilometres Travelled (VKT)

(4.6.1) The process involved in calculating the total distance travelled by vehicle on all highways within the jurisdiction of the North Shore communities has involved three primary steps:

1. The total number of kilometers of highways within the North Shore communities were obtained from Ministry of Transportation (MTO) sources.
2. The number of cars travelled in 2016 on each highway was determined based upon the Annual Average Daily Traffic (AADT) amounts
3. These totals were applied in the context of known average Canadian car emissions, which amounts to approximately 251 grams of CO2e per kilometer[19]

(4.6.2) As such, we have made the corresponding calculations and determined the following regarding vehicles travelling throughout the North Shore Communities in 2016:

1. There are approximately **237.8** kilometers of highway within the North Shore Communities
2. In 2016, approximately **33,415,750** vehicles travelled on these highways.
3. Multiplied by the average car emission rate of **251 grams** of CO_2e per kilometer, this resulted in approximately **95,616 tonnes** of CO_2e in 2016. For detailed calculations, please refer to *'Appendix A-1: North Shore Provincial Highway Vehicle Kilometer Travelled Strategy'.*

Note: The above calculation only relates to provincial highways which traverse the North Shore Communities and does not account for travel on municipally managed roads. It was not possible to obtain data from recreational modes of travelling such as snowmobiles, ATVs, boats, and other landscaping / construction-based equipment. This calculation does, however, include people travelling to and from these other destinations who may need to access these major highways to commute to their destinations.

[19] *Greenhouse Gas Emissions from a Typical Passenger Vehicle, United States,* Environmental Protection Agency https://www.epa.gov/greenvehicles/greenhouse-gas-emissions-typical-passenger-vehicle

4.7 Total Fuel Purchased in the North Shore Communities

(4.7.1) The process of calculating how much fuel residents used within the North Shore communities in 2016, involved 3 primary steps:

1. The amount of fuel in litres sold in 2016 for road motor vehicles was obtained from Statistics Canada. This is broken down by litres of net gasoline, gross gasoline, net diesel, and net petroleum.

2. Referencing the 2016 census data, the most recent population numbers for each jurisdiction in the region of North Shore were identified.

3. The amount of fuel purchased per person was also determined.

(4.7.2) Finally, when applying the North Shore communities' total population of 40,821 in 2016, the net gasoline, gross gasoline, net diesel, and net petroleum amounts for that year were calculated as follows:

Net gasoline usage on NS	**Gross gasoline usage on NS**	**Net Diesel usage on NS**	**Net Petroleum usage on NS**
50,618.04	51,434	16,737	196

Tonnes of CO2 for Gasoline	**Tonnes of CO2e for Gasoline**	**Tonnes of CO2e for Diesel**	**Tonnes of CO2e for Petroleum**
116.421492	118.2982	45.1899	0.5292

For a more detailed calculation, refer to: 'Appendix A-2: Fuel Consumption on the North Shore Calculation'.

(4.7.3) It is further important to acknowledge the secondary emissions that can arise from residents' lifestyles and actions which this report cannot account for. For example, someone travelling to purchase goods or products, or purchasing something that was produced outside of the study area can also have an impact in terms of overall GHG emissions. In addition, emissions typically arising from existing global resource extraction, manufacturing, distribution, and supply systems, combined with individual actions, behaviours and consumer preferences is contributing significantly to climate change.

4.8 Energy and Emissions Maps

(4.8.1) This section identifies a series of maps for each municipality and its public sector buildings, including total greenhouse gas emissions from 2011 to 2016.

(4.8.2) The maps were created using a software called QGIS, which is a free mapping software that provides necessary components needed to create a detailed map.

Please refer to Appendix B-1: Energy and Emissions Mapping Methodology for detailed explanation on data organization.

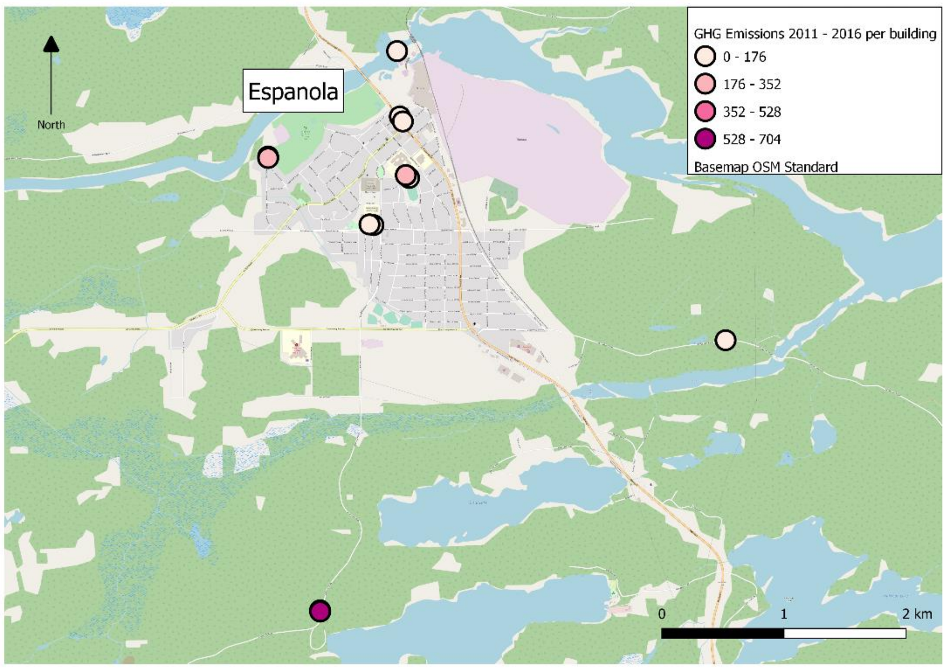

Figure 19: Espanola Municipal Building GHG Emissions (TCO2e) 2011 - 2016

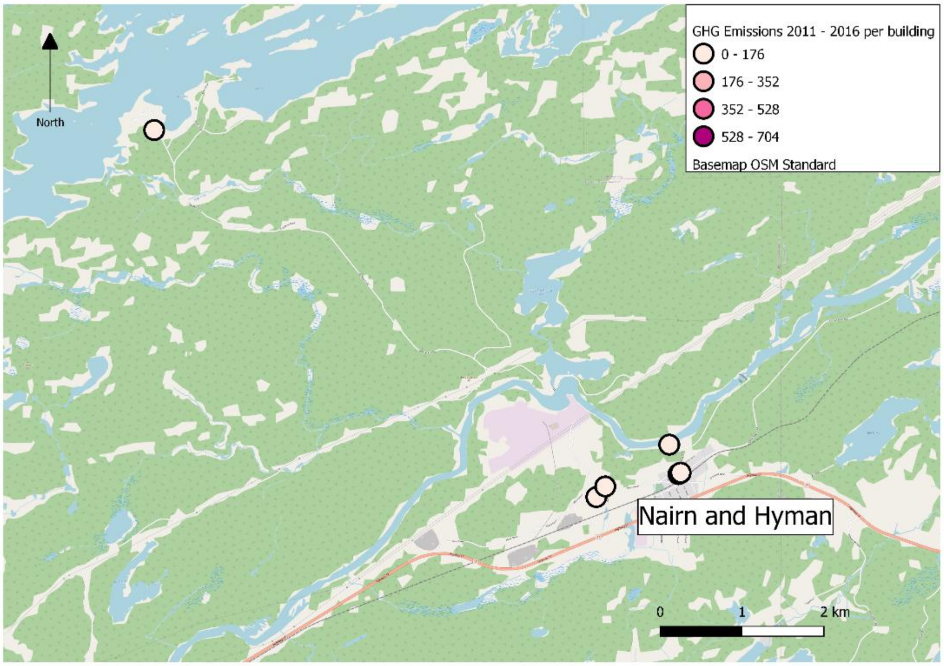

Figure 20: Nairn and Hyman Municipal Building GHG Emissions (TCO2e) 2011 - 2016

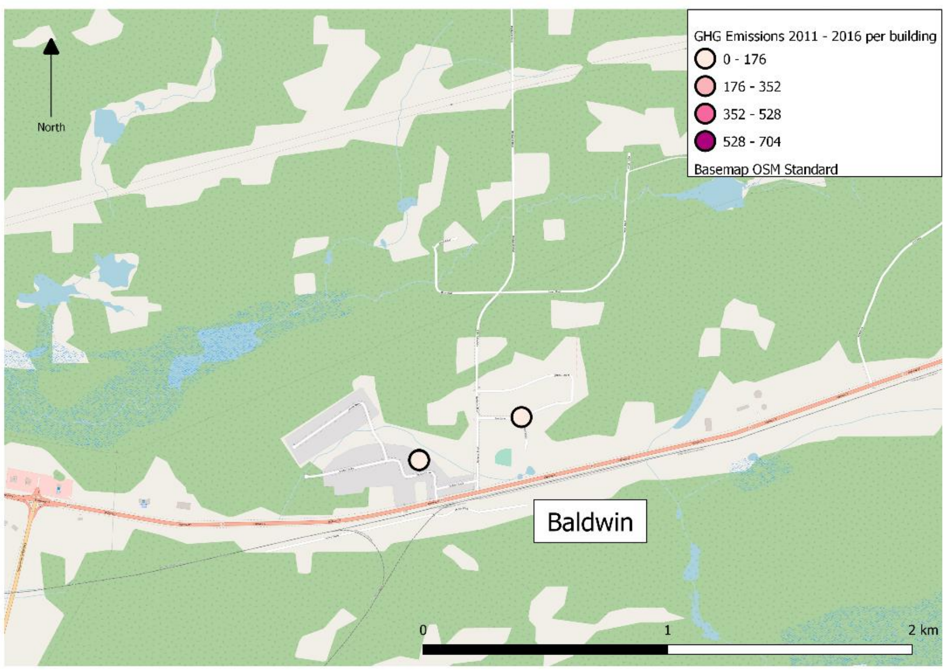

Figure 21: Baldwin Municipal Building GHG Emissions (TCO2e) 2011 - 2016

Figure 22: Town of Spanish Municipal Building GHG Emissions (TCO2e) 2011 - 2016

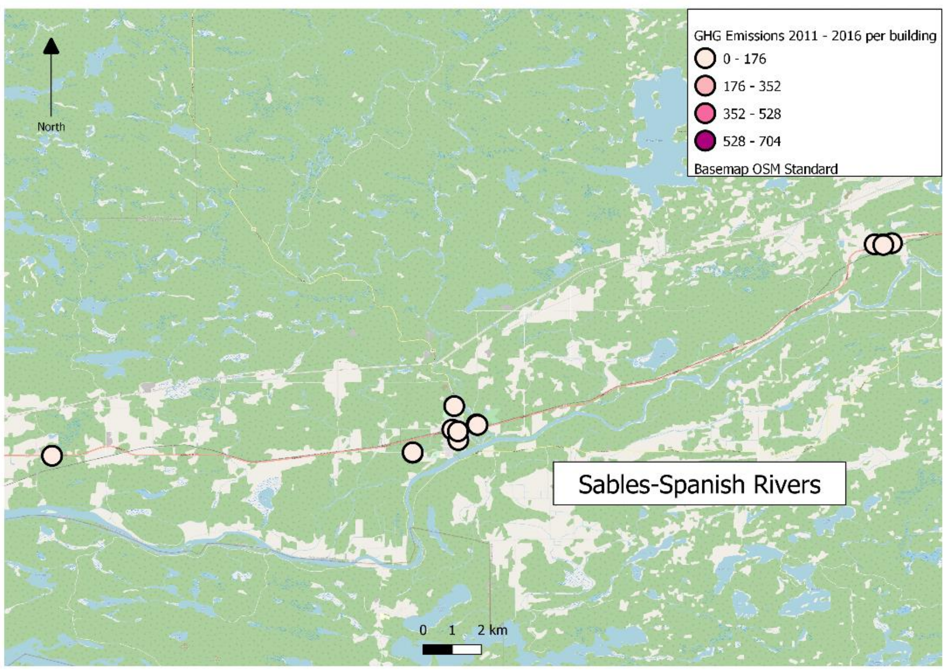

Figure 23: Sables-Spanish Rivers Municipal Building GHG Emissions (TCO2e) 2011 - 2016

4.9 Energy Consumption by Municipality

The following section breaks down the energy consumption by each municipality from 2011 to 2016 for the North Shore communities. Please refer to section '**Appendix B: Municipal Energy Use and Emissions.'**

The following key applies to each of the graphs presented (per community):

First graph: Energy consumption by fuel type (fuel oil, propane, and electricity) in Gigajoules,

Second graph: Annual GHG emissions by scope.

Scope One = Emissions from propane and fuel oil type 1 and 2

Scope Two = Emissions from electricity

Third Graph: Annual GHG emissions by fuel source (fuel oil, propane, and electricity) in tonnes of CO2e equivalent (tCO_2e).

Disclaimer: This data is publicly sourced from the Government of Ontario. Any gaps or large differences in data between each year is due to reporting gaps from the sources which Smart Green Communities is unable to obtain. As such, Smart Green Communities advocates annual reporting on the basis that data should be consistent and provide a true and up-to-date reflection of building and energy performance.

(4.9.1) Baldwin

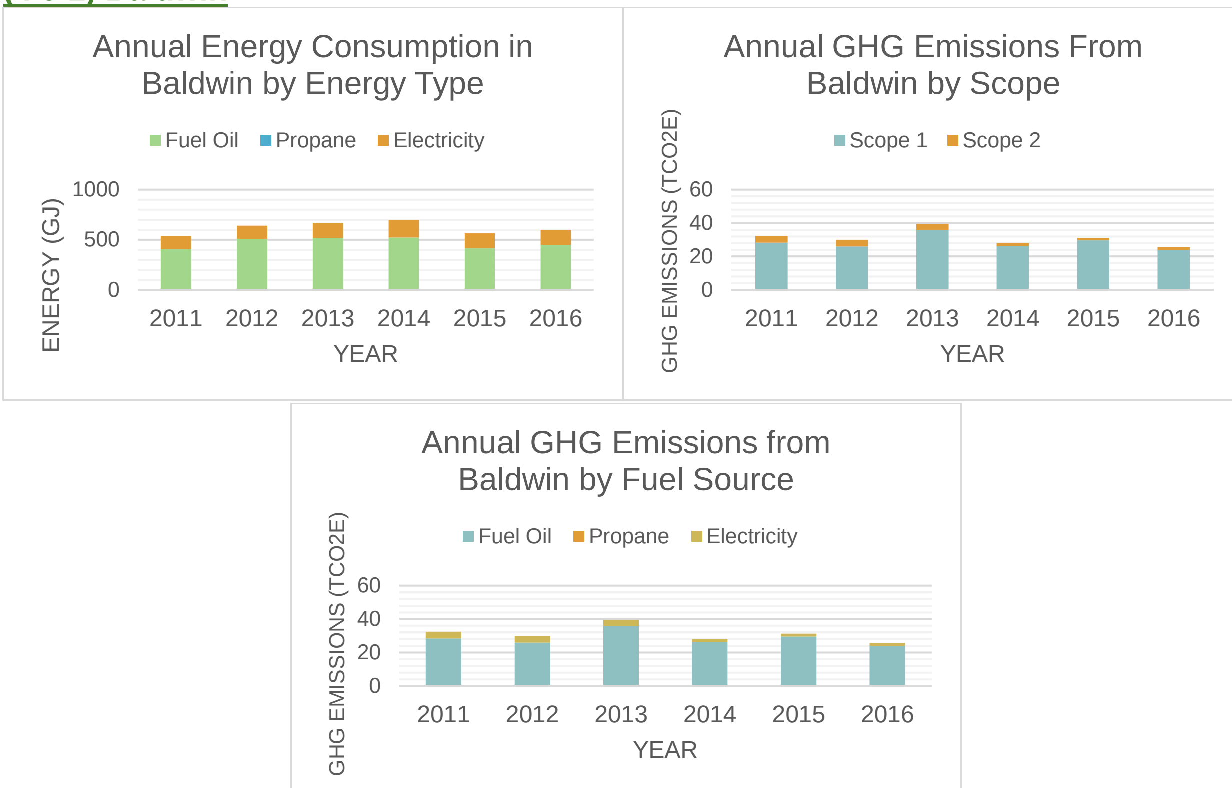

Figure 24: Baldwin Annual Energy Consumption and GHG Emissions

(4.9.2) Espanola

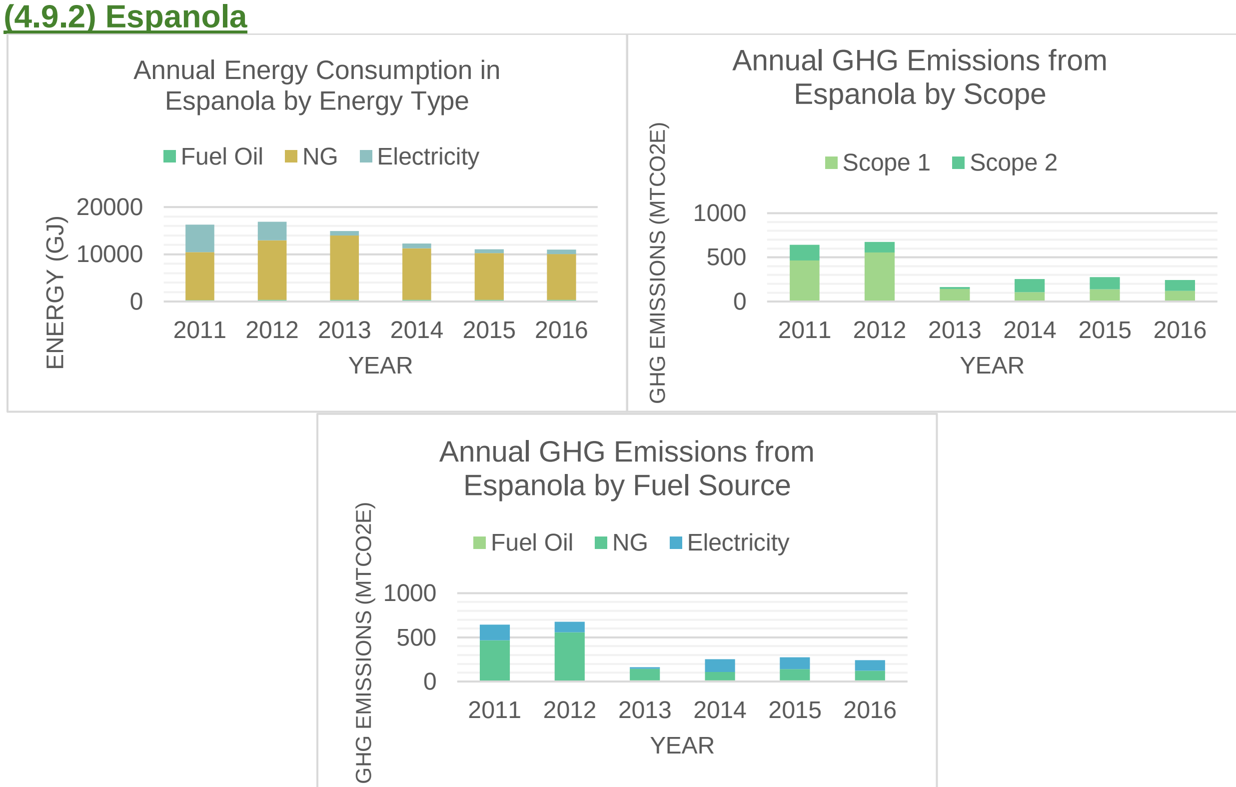

Figure 25: Espanola Annual Energy Consumption and GHG Emissions

(4.9.3) Sables-Spanish Rivers

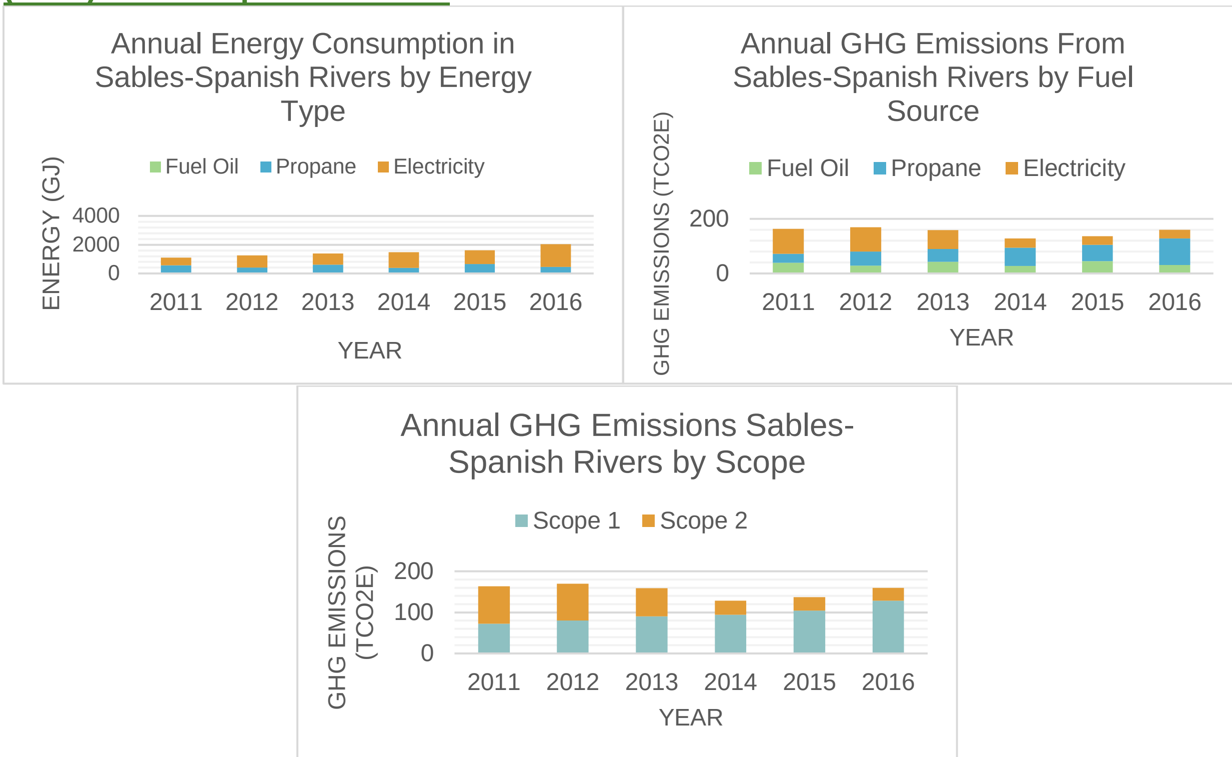

Figure 26: Town of Sables-Spanish Rivers Annual Energy Consumption and GHG Emissions

(4.9.4) Town of Spanish

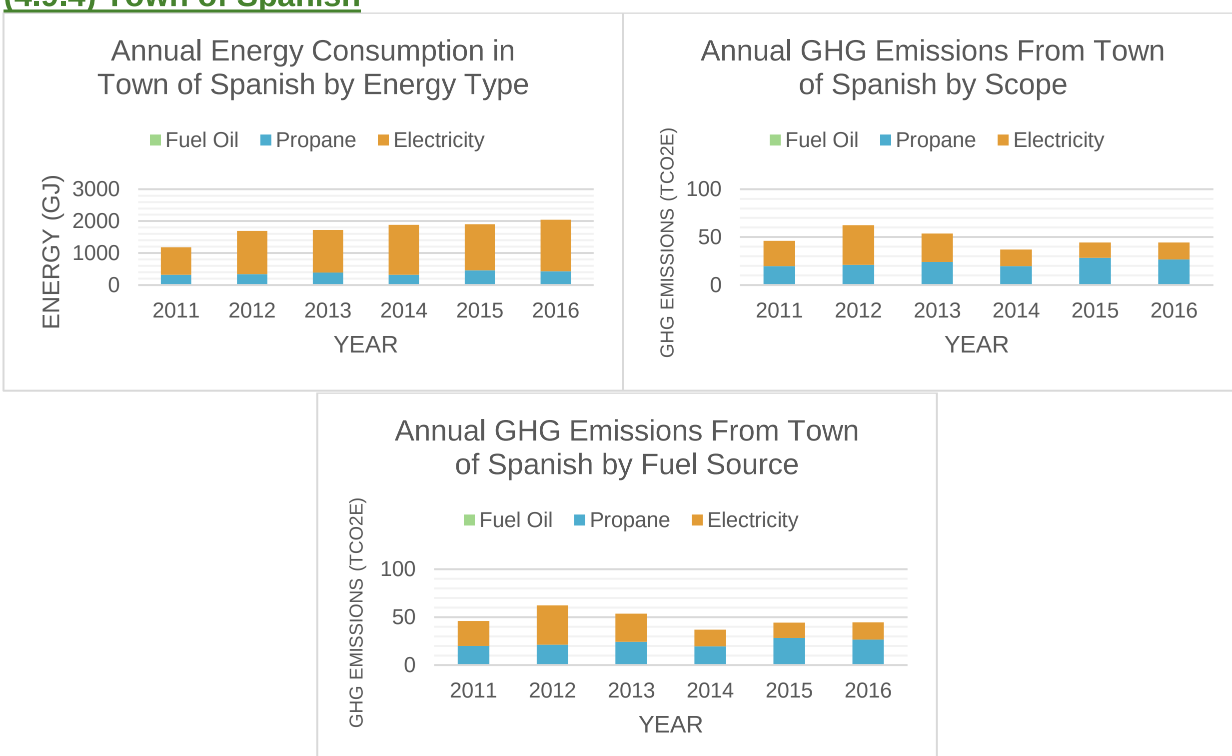

Figure 27: Town of Spanish Annual Energy Consumption and GHG Emissions

(4.9.5) Township of Nairn and Hyman

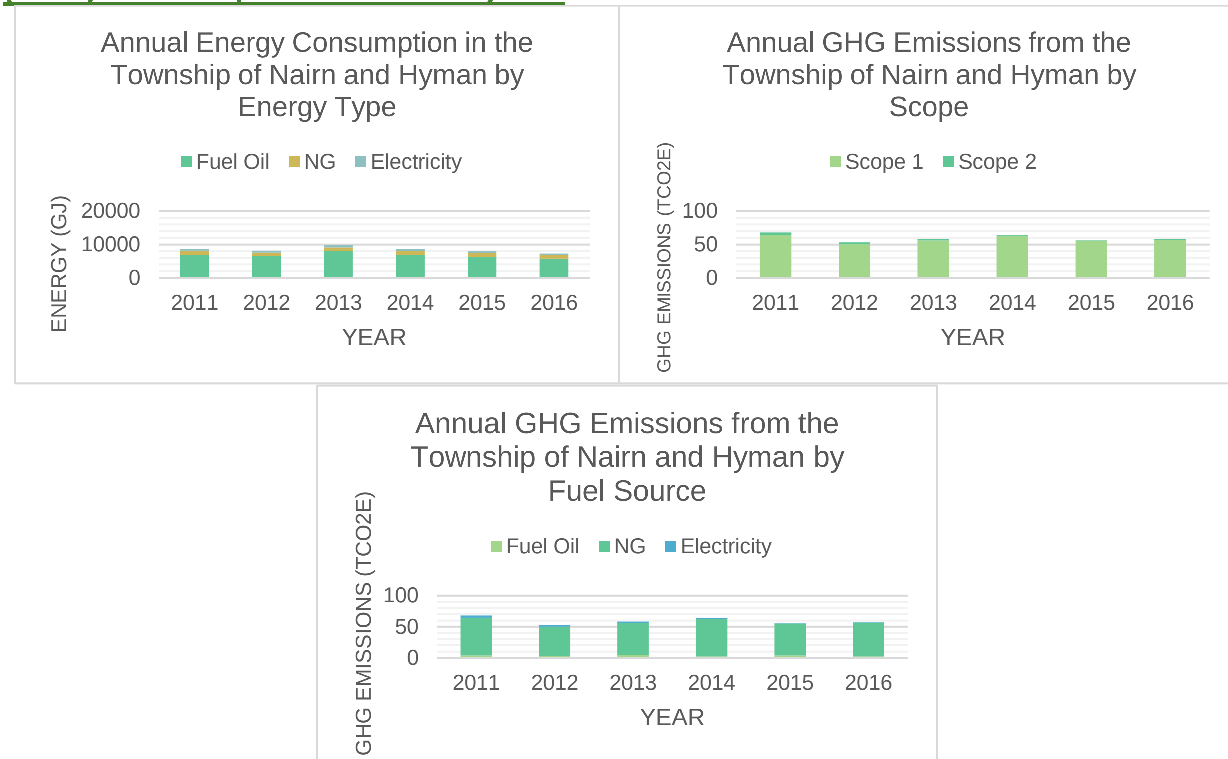

Figure 28: Township of Nairn and Hyman Annual Energy Consumption and GHG Emissions

(4.9.6) Township of North Shore

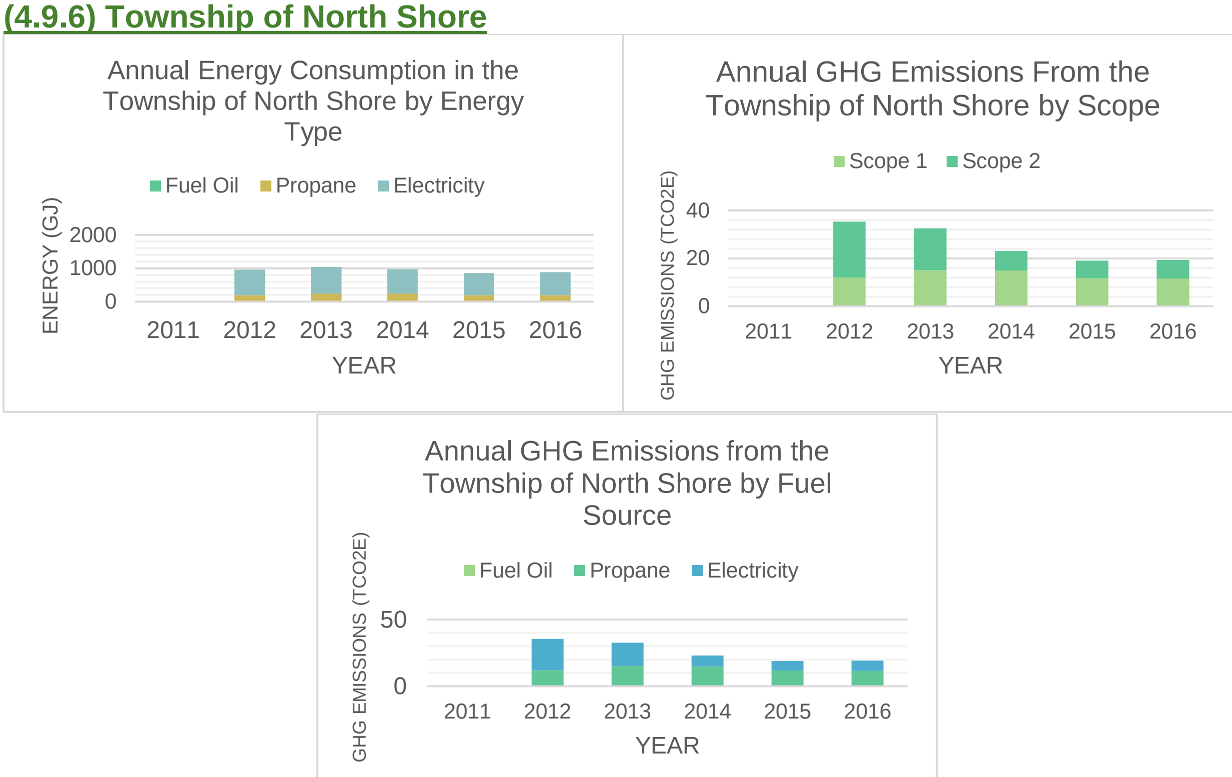

Figure 29: Township of North Shore Annual Energy Consumption and GHG Emissions

4.10 Commercial / Industrial Qualitative Data

(4.10.1) Smart Green Communities faced some challenges collecting data from the commercial and industrial sectors as there are no public sources from which to obtain such data. Hydro One was able to provide some commercial / industrial sector data broken down by postal codes; however, it was determined there was a large margin of error that could not be accounted for.

(4.10.2) Therefore, the Smart Green Communities team decided to obtain additional qualitative data to capture what businesses and industries are doing within the North Shore communities to address their energy usage.

(4.10.3) Going forward, increased collaboration with businesses will be required to account for all components of energy data, including but not limited to:

1. Business name / address
2. Name of owner / manager and contact information (consent required)
3. Date founded / approximate # of employees.
4. Sector of the economy
5. Map showing municipal / township boundaries, and approximate location of case studies.
6. A 2-3 paragraph summary of the business / organization and its operations
7. The baseline year and GHG emissions
8. A summary of action plan items
9. An estimate of high / peak and low energy demands
10. Recent / existing measures put in place.
11. Savings gained, and
12. The proposed next steps

Ontario's Energy and Water Reporting and Benchmarking (EWRB)

https://www.ontario.ca/page/report-energy-water-use-large-buildings#:~:text=Ontario's%20Energy%20and%20Water%20Reporting,water%20usage%20to%20similar%20buildings

Reporting of Energy Consumption and Water Use Regulation **(O. Reg 506/18)**

(4.10.4) Under Ontario Regulation 506/18, large building owners need to report their building's energy and water use once a year to the Ministry of Energy, Northern Development and Mines (ENDM) on:

- July 1, 2019 for buildings 100,000 square feet and larger
- July 1, 2023 for buildings 50,000 square feet and larger
    - Buildings larger than 100,000 square feet need to have a certified professional verify reported information before submitting.

(4.10.5) Building owners need to report the building's water and energy usage, and need to provide the following:

- Building information
- EWRB ID – Unique 6-digit number assigned to your property by Ontario's Energy and Water Reporting and Benchmarking (EWRB) initiative
- Usage data – report the usage data for all forms of energy that your building uses (electricity, natural gas, diesel, fuel oil) and water for the reporting year (Jan 1 to Dec 31).

5.0 REEP – What Does the Future Look Like?

Business as Usual Scenarios, Forecasts, and Impacts

5.1 Why is it important?

(5.1.1) In recent years and months (particularly considering the COVID-19 pandemic) there has been an increased focus on addressing climate change in all sectors of society. In this regard, it has become important to ensure that climate change is taken into consideration when developing future strategies, policies, and plans.

(5.1.2) The North Shore communities have seen an increased occurrence of extreme weather events such as flooding over the past few years. To address potential future challenges caused by climate change such as extreme weather, it is crucial that community leaders take the necessary steps to manage the risks. Therefore, this section is intended to assist municipal, township and First Nation leaders in their understanding of the existing and potential climate impacts within the North Shore communities, and how best to mitigate those risks.

5.2 BAU Forecast

(5.2.1) This section will address Business-As Usual (BAU) forecasts, including both historic and more recent changes in precipitation and temperature levels to predict future patterns.

(5.2.2) A Business-as Usual (BAU) forecast is a projection of future energy use and emissions associated with “growth” if there are no additional policies, actions, or strategies put in place to address energy demands and rising GHG emissions in the atmosphere. The BAU forecast is important for policymakers because it provides a future-viewpoint to help prepare for climate risks and develop robust emission-reduction strategies.

(5.2.3) For the purpose of this report, the initial planning stage in *Figure 30: Simplified GHG Reduction Quantification Management Process* is used to conduct the BAU forecast. For further project planning stages, please refer to Figure 30 and its footnotes for more information.

The beginning stages of a BAU Forecast involve the following steps:

- Defining and characterizing the target population of GHG emitters.
- Developing historical GHG estimates for the target population(s)
- Developing the business-as-usual GHG forecast for the target population(s).[20]

[20] *Ontario Public Service Guidance Document for Quantifying Projected and Actual Greenhouse Gas Emission Reductions, 2017*. Prepared for the Ontario Ministry of the Environment and Climate Change. https://www.ontario.ca/page/guide-greenhouse-gas-emissions-reporting

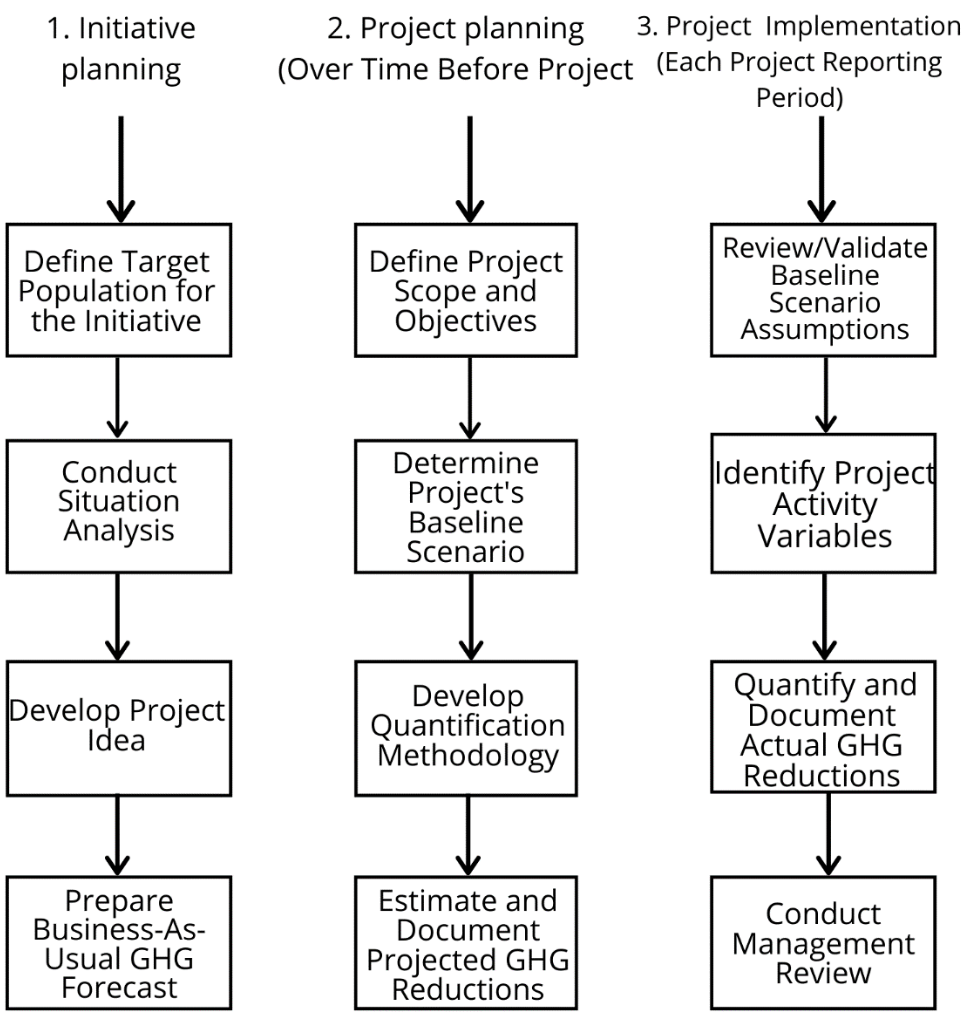

Figure 30: Simplified GHG Reduction Quantification Management Process

i. <u>Defining and Characterizing the Target Population</u>

According to the 2016 Census, the total population of the North Shore Communities has been determined to be 11,892 people throughout the 6 townships and 2 First Nation communities.

Table 1: Population Change between 2006 to 2016

Geographic Area	Population 2006	Population 2011	Population 2016	% population change (2006 - 2011)	% population change (2011 - 2016)
Nairn and Hyman	493	477	342	-3.25%	-28.30%
Espanola	5314	5364	4996	0.94%	-6.86%
Baldwin	554	551	620	-0.54%	12.52%
Sables-Spanish Rivers	3237	3075	3214	-5.00%	4.52%
Town of Spanish	728	696	712	-4.40%	2.30%
Town of North Shore	549	509	497	-7.29%	-2.36%
Serpent River First nations	340	373	371	9.71%	-0.54%
Sagamok First Nations	884	1036	1140	17.19%	10.04%
Total	12099	12081	11892	-0.15%	**-1.56%**

(5.2.4) As seen in Table 1, half of the North Shore communities saw a population growth from 2011 to 2016. However, the total population change of these communities was determined to be **-1.56%.**

(5.2.5) In producing this report, it is important to recognize that population growth generally leads to increased GHG emissions where a 'Business as Usual' approach is applied.

(5.2.6) In this regard, if no further emissions-reducing actions are undertaken, Ontario's future greenhouse gas (GHG) emissions are predicted to hit 160.9 Mt in the year 2030. (**Note:** This projection was re-estimated in August 2019 by the Auditor General of Ontario to be 163.6 Mt in 2030, 2.7 Mt higher than the previous projection in 2019[21] (See *Figure 32 : Projected Global Warming Associated with RCP Scenarios*)). This projection has changed due to a number of factors, including new emissions data and the cancellation of renewable energy initiatives, as part of Ontario's 2017 Long-Term Energy Plan.

[21] *Climate Change: Ontario's Plan to Reduce Greenhouse Gas Emissions*, Office of the Auditor General of Ontario https://www.auditor.on.ca/en/content/annualreports/arreports/en19/v2_300en19.pdf

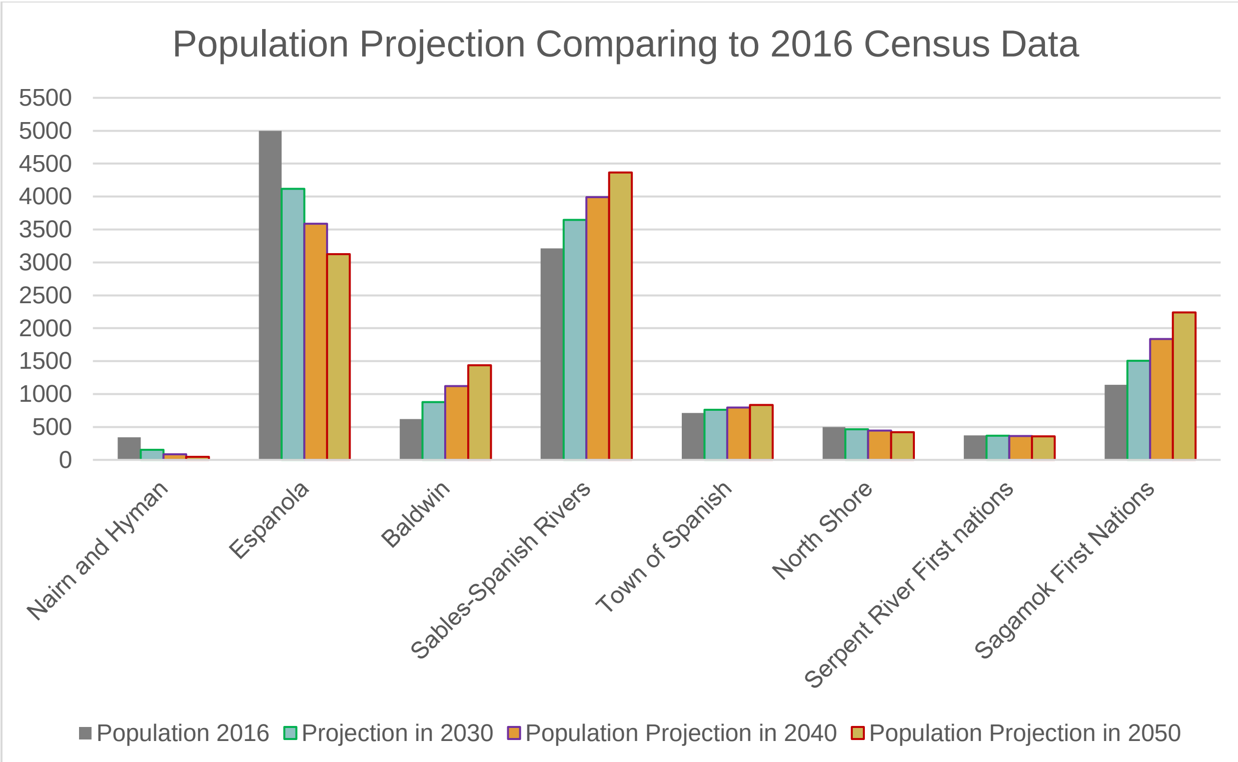

Figure 31: Population Projection for 2030, 2040 and 2050 compared to 2016 Census Data.

Disclaimer: It is important to identify that uncertainty can be part of the study of climate change. Uncertainty should be factored into climate change scenarios to reflect the complex reality of climate change, and the changing relationships between human populations and the environment.

Any predictions made cannot be given with absolute certainty and all predictions should be taken into consideration. It is not possible to anticipate accurate climate change scenarios with certainty, but it can help create a representation of potential future climate conditions.

The factors of uncertainty are based on assumptions of future atmospheric composition and an understanding of the effects of increased atmospheric concentrations of GHGs.

New technology has a role to play in producing increasingly accurate climate change models and associated predictions.

5.3 Climate Change Scenarios

(5.3.1) Representative Concentration Pathways (RCPs) are a set of climate change scenarios that provide the basis for the Fifth Assessment Report from the Intergovernmental Panel on Climate Change (IPCC).

(5.3.2) RCPs are used to make projections based on anthropogenic GHG emissions driven by population size, economic activity, lifestyle, energy use, land use patterns, technology, and climate policy.

(5.3.3) RCPs include various scenarios that range from RCP 2.6, RCP 4.5, RCP 6.0, and RCP 8.5.

(5.3.4) Table 2 below provides a description of each RCP scenario. For this report, RCP 8.5 is used as it represents a '*Business-as-usual'* pathway with emissions continuing to increase – if no measures are put in effect to offset current emissions trends.

Table 2: IPCC Fifth Assessment Report Climate Change Scenario Characteristics

Scenario	Description
RCP 2.6	**Lowest projected GHG concentrations**, resulting from dramatic climate change mitigation measures implemented. Figure 32 represents an increase of 2.6 W/M2 in radiative forcing to the climate system.
RCP 3.5	**Moderate projected GHG concentrations**, resulting from substantial climate change mitigation measures. Figure 32represents an increase of 4.5 W/m2 in radiative forcing to the climate system.
RCP 6.0	**Moderate projected GHG concentrations**, resulting from some climate change mitigation measures. Figure 32represents an increase of 6.0 W/M2 in radiative forcing to the climate system.
RCP 8.5	**Highest projected GHG concentrations**, resulting from business-as-usual emissions. Figure 32 represents an increase of 8.5 W/m2 in radiative forcing to the climate system.

i. Historical GHG estimates for the target population

Please refer to section **4.0 North Shore Energy Use and Emissions** for current Greenhouse Gas estimates for the North Shore communities. Information from that section is used as a baseline to establish a GHG estimate for the target population.

Developing the Business as Usual (BAU) forecast for the target population

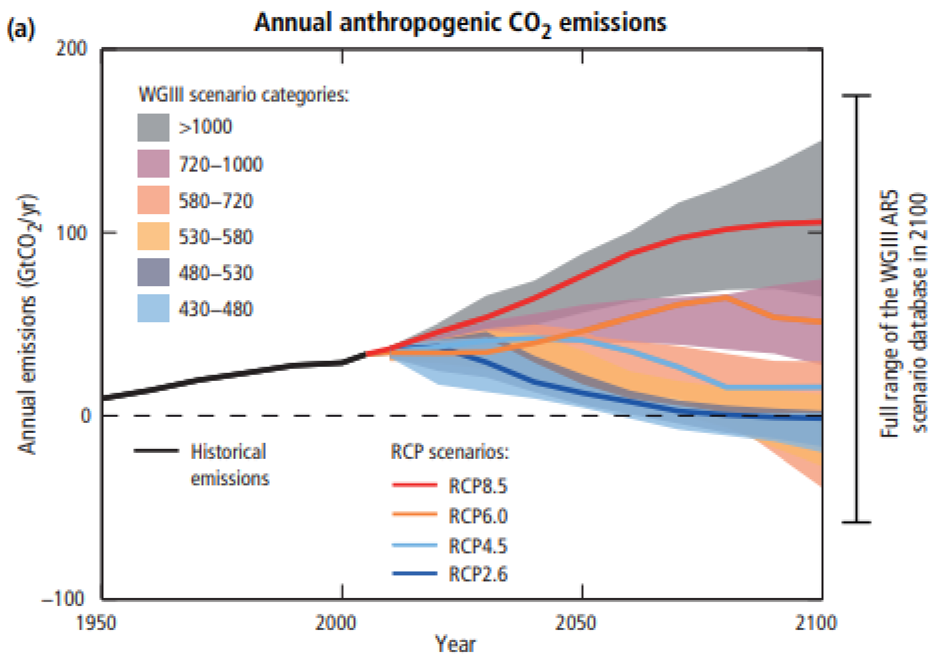

Figure 32 : Projected Global Warming Associated with RCP Scenarios[22]

(5.3.4) Figure 32 displays different Representative Concentration Pathways (RCP) scenarios, with RCP 8.5 (very high GHG Emissions) as 'Business-As-Usual' scenarios. WGIII (Working Groups III of IPCC Report) scenario categories summarize the wide range of emission scenarios and are defined based on CO2-eq concentration levels (in ppm) estimated to 2100.

[22] *Climate Change 2014 Synthesis Report Summary for Policymakers*, Intergovernmental Panel on Climate Change (IPCC), 2018.
https://www.ipcc.ch/site/assets/uploads/2018/05/SYR_AR5_FINAL_full_wcover.pdf

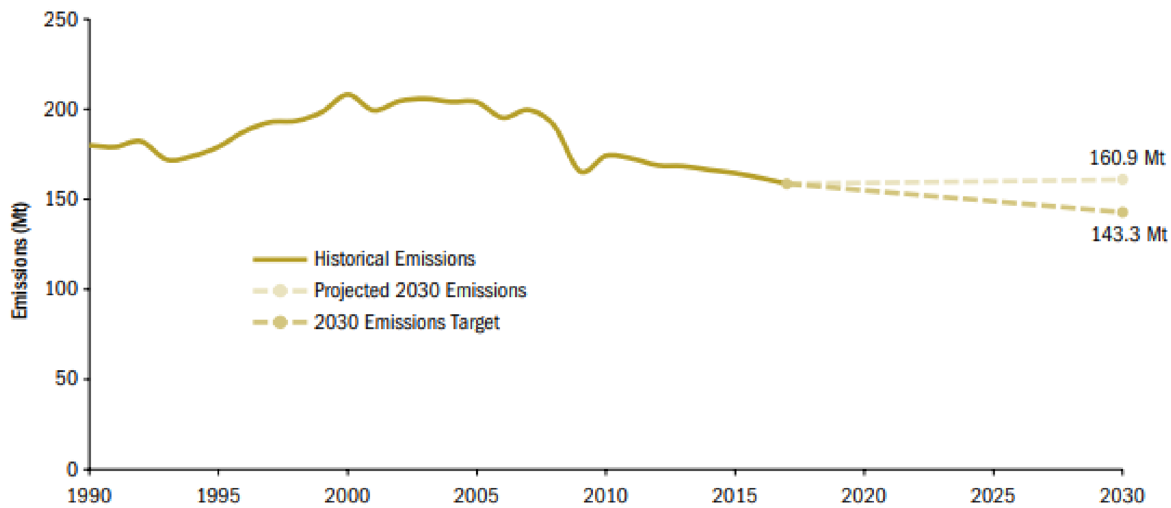

Figure 33: Ontario's Historical GHG Emissions, Projected GHGs and the 2030 Target[23]

(5.3.5) When evaluating trends according to the census data for the North Shore, it is predicted that if population growth increases within the North Shore, emissions will also increase in conjunction with *Figure 32 : Projected Global Warming Associated with RCP Scenarios*.

(5.3.6) While *Figure 32 : Projected Global Warming Associated with RCP Scenarios* displays global emissions, it will still affect the rate of climate change and emissions in the North Shore communities because climate change effects can be experienced all over the world and ultimately affects Ontario and the North Shore as a whole. This is seen in *Figure 33: Ontario's Historical GHG Emissions, Projected GHGs and the 2030 Target*. Section 5.4 explains the two different scenarios if a business-as-usual scenario continues.

5.4 Scenario Analysis, Forecast and Impacts

(5.4.1) Scenarios can give an idea of plausible futures, and provide a deeper understanding of potential environments that people may have to operate in. Scenario analysis helps identify what environmental factors should be monitored overtime so when the environment shifts, a prediction can be made as to where it may be headed[24].

Scenario 1: Temperature

(5.4.2) Rising summer temperatures and warmer winter temperatures due to climate change can have an impact on overall energy usage and emissions, arising from heating/cooling sources.

[23] *Climate Change: Ontario's Plan to Reduce Greenhouse Gas Emissions*, Office of the Auditor General of Ontario https://www.auditor.on.ca/en/content/annualreports/arreports/en19/v2_300en19.pdf
[24] Alternative Scenarios, https://www.mycoted.com/Alternative_Scenarios

Scenario 1 Forecast

(5.4.3) Evidence suggests that Canada's climate has warmed since the last decade and will continue to increase in the future. This is observed through the past and projected increases in the mean temperature in Canada. Such indicators suggest that an increase in Canada is twice the global mean temperature, regardless of the emissions scenario[25]. Northern Canada is susceptible to some of the largest changes in both annual and seasonal mean temperatures.

Figure 34: Map from Climate Atlas of Canada (Region of Blind River is highlighted in red square)

(5.4.4) The Climate Atlas of Canada website was referenced to identify projected future temperature changes for the North Shore region. Table 3 and 4 below provide further details.

Table 3: Baseline Mean Temperatures (1976 - 2005) for the Region of Blind River

Degrees	Annual	Winter	Spring	Summer	Fall
°C	4.2	-9.8	2.9	17	6.5

[25] Environment and Climate Change Canada, Canada's Changing Climate Report – Chapter 4: Changes in Temperature and Precipitation Across Canada, 2019. https://www.nrcan.gc.ca/sites/www.nrcan.gc.ca/files/energy/Climate-change/pdf/CCCR-Chapter4-TemperatureAndPrecipitationAcrossCanada.pdf

Table 4: Projected Seasonal Temperature for the Region of Blind River under RCP 8.5

	2021 – 2050		**2051 - 2080**	
	Mean	**Range**	**Mean**	**Range**
Winter	-7.2	(-10.1) - (-4.2)	-4.3	(-7.3) – (-1.2)
Spring	4.9	2.3 – 7.9	7.1	4.4 - 10.5
Summer	19.1	17.6 – 20.7	21.3	19.6 - 23.1
Fall	8.7	6.9 – 10.4	10.7	8.8 – 12.4
Annual	**6.4**	**5 - 8**	8.8	**7.1 – 10.7**

(5.4.5) The data in Table 3 and 4 was retrieved from an interactive tool provided by the Climate Atlas of Canada which uses climate science, mapping, and data visualization to depict climatic changes across Canada. The map is based on data from 12 global climate models, and users are shown a baseline period of climate trends by region (in a map grid) that includes the timelines of 1950 to 2005, and future projection periods ranging from 2021 to 2050 and 2051 to 2080. This allows a comparison to be drawn which allows for differences in climate modelling. In this regard, the Region of Blind River is identified as covering 90% of the catchment area for the North Shore Communities.

Scenario 1 Impacts

(5.4.6) Across Ontario we have seen an increase in prolonged heat waves, torrential rainstorms, windstorms, and drought. Extreme weather events are becoming more frequent and more intense. The potential for increased temperature averages could pose significant threats to communities on the North Shore. Health risks and increased energy demands are the two factors that could pose a wide range of risks to vulnerable populations such as low-income or elderly residents. North Shore residents will see increased occurrences of heat warnings, which are issued when extremely high temperatures or humidity conditions elevate the risk of heat illnesses, such as heat stroke or heat exhaustion[26]. In addition, there is predicted to be an increased incidence of heat-related illnesses and respiratory and cardiovascular disorders due to rising temperatures and reduced air quality. Furthermore, there will be an increased risk of diseases such as Lyme disease, West Nile Virus transmitted by mosquitos, ticks, and other vectors due to rising summer temperatures, shorter winters, ecological changes, increased human exposure and faster maturation cycles for pathogens.

(5.4.7) There will be increased demand for energy on the grid due to warmer temperatures, which leads to power outages if the grid is not resilient enough to withstand surges in demand at peak times. This could become problematic especially for vulnerable populations if these blackouts occur on the hottest days.

(5.4.8) From a natural environment perspective, hotter temperatures will result in increased chances of wildfires. Sudden heavy rainfalls tend to drain away or evaporate because the ground cannot absorb all the water. This will cause forests to dry out between storms.

(5.4.9) For example, in May 2020, Highway 17 in the Webbwood area was closed due to forest fires. In 2018, the occurrence of forest fires tripled in the French River area, in respect of the annual average, which caused mandatory evacuations and emergency protocols to be

[26] Metzger, *What Climate Change has in Store for Ontario,* Nov 14th, 2017. https://www.tvo.org/article/what-climate-change-has-in-store-for-ontario

implemented in local areas[27]. Related to this, additional strain and risks can be posed to firefighters working closely together, handling the same firefighting equipment, and sharing the same truck[28]. The following website can be used to track any active forest fires and Restricted Fire Zones (RFZ) in place: https://www.ontario.ca/page/forest-fires.

(5.4.10) Forest fires also contribute to diminished air quality and can pose an increasingly severe risk to those with respiratory illnesses. At the time of writing this study, the COVID-19 crisis is having a significant impact on the respiratory health and wellness of populations around the world which could further exacerbate the problem. Therefore, maintaining a reliable air quality index is especially crucial from a public health perspective.

Scenario 2: Precipitation and Water Levels

(5.4.11) Increased precipitation levels within the North Shore Communities could result in increased flooding without corresponding flood risk management measures put into place. Any lack of capacity to store and effectively dispose of excess floodwaters could adversely impact upon municipal infrastructure and lead to increased maintenance costs. This is especially true during wet seasons of spring and fall periods. However, during the summer season, the risk of droughts may increase due to rising temperatures and drier days.

(5.4.12) Sagamok First Nations has identified that water pumping, and treatment is the biggest single factor regarding the consumption of electricity within the community. Water conservation measures have been put into place to help sustainably manage water use and reuse.

Scenario 2 Forecast

(5.4.13) The annual mean precipitation in Canada has increased and this is especially true in northern Canada. Data obtained from the Department for Environment and Climate Change, suggests that recent increases in precipitation are consistent with model simulations of the anthropogenic effects of climate change.[29] According to this data, Northern Canada would expect to see a significant increase in precipitation, and a rise in water levels. *Table 5: Baseline Mean Precipitation (1976 - 2005) for Region of Blind River* below highlights the seasonal precipitation change as a % in Ontario using RCP 8.5 and the period between 1986 and 2005 as a baseline.

(5.4.14) The Climate Atlas of Canada provides information on weather patterns in the region of Blind River. In this context, the North Shore communities are expected to see an increase in precipitation in alignment with provincial changes observed in

Table 6: Projected Seasonal Precipitation for the Region of Blind River for RCP 8.5 below, with some decreases in precipitation also anticipated during the summer months.

[27] Russell, *Forest Fire triples in French River area – Mandatory Evacuations,* July 22nd, 2018. https://www.myalgomamanitoulinnow.com/18523/forest-fire-triples-in-french-river-area-mandatory-evacuations/

[28] Sasvari, *2020 Could be Above-Normal Year for Wildfires in the Northeast,* June 5th, 2020. https://www.manitoulin.ca/2020-could-be-above-normal-year-for-wildfires-in-northeast/

[29] Environment and Climate Change Canada, Canada's Changing Climate Report – Chapter 4: Changes in Temperature and Precipitation Across Canada, 2019. https://www.nrcan.gc.ca/sites/www.nrcan.gc.ca/files/energy/Climate-change/pdf/CCCR-Chapter4-TemperatureAndPrecipitationAcrossCanada.pdf

(5.4.15) The baseline for the following data is 1975 - 2005. It shows future projections and precipitation for the highest emissions scenario of RCP 8.5. Applying the precipitation baseline, the North Shore Communities can expect to experience an average annual precipitation increase of 57mm between 2021 - 2050, and 89mm between 2051 – 2080. (Table 5 and 6).

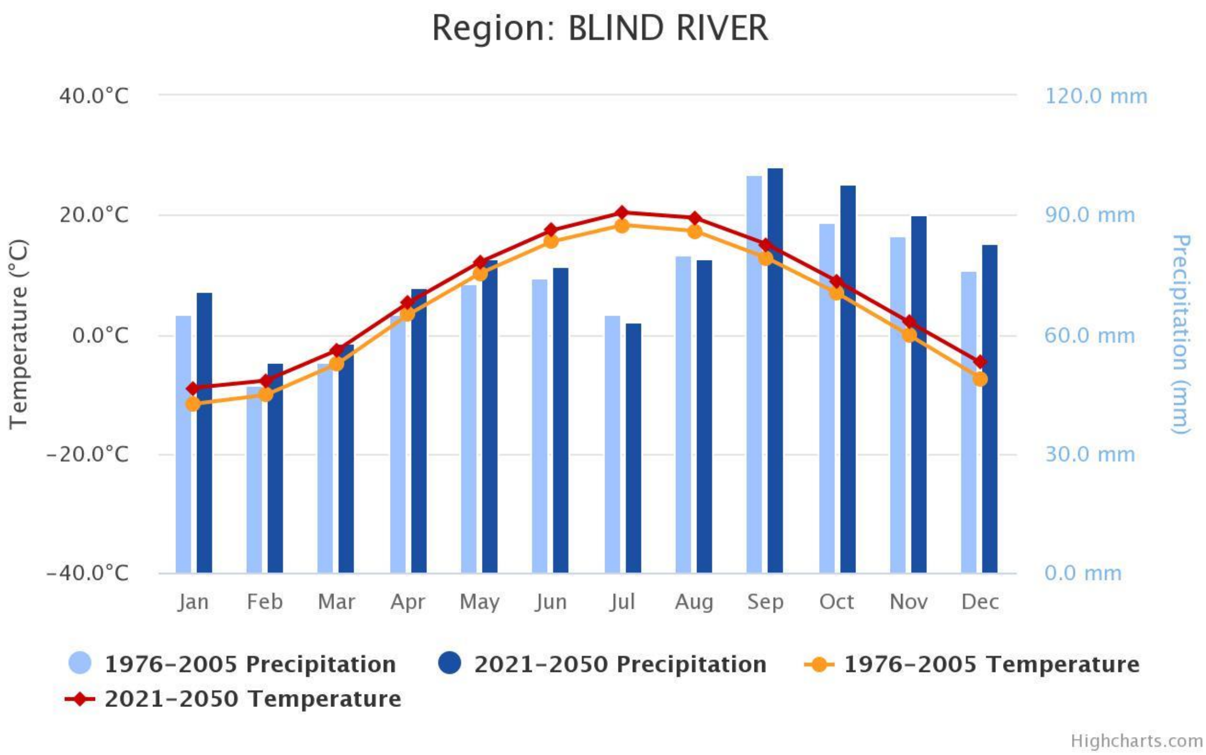

Figure 35: Precipitation Trends for Historical Data and Future Trend Projections (RCP8.5)

Table 5: Baseline Mean Precipitation (1976 - 2005) for Region of Blind River

	Annual	Winter	Spring	Summer	Fall
mm	871	189	193	218	272

Table 6: Projected Seasonal Precipitation for the Region of Blind River for RCP 8.5

	2021 – 2050		2051 - 2080	
	Mean	Range	Mean	Range
Winter	207	148 – 271	224	159 – 292
Spring	212	140 – 298	228	149 – 318
Summer	220	137 – 308	214	138 – 301
Fall	272	197 – 391	294	197 – 400
Annual	**928**	**763 – 1101**	**960**	**795 – 1148**

Scenario 2 Impacts

(5.4.16) The changing frequency of temperature and precipitation extremes are expected to lead to an increase in the occurrence of events such as wildfires, droughts, and floods. Human-caused Greenhouse Gas emissions have increased the risk of extreme events such as the 2013 flood in southern Alberta, the 2016 Fort McMurray wildfire, or the 2018 Parry Sound forest fire.

(5.4.17) Droughts are defined as a prolonged period of abnormally low rainfall, leading to a shortage of water. The region of North Shore Communities can see an increase in the amount of drought days in effect in the summer as temperatures rise and dry periods of no rainfall extend.

(5.4.18) The North Shore communities can expect to see increased flooding resulting from an increase in precipitation levels in future years. Flooding is defined as the covering or submerging of normally dry land with a large amount of water. Residents in the region of North Shore communities are already seeing a surge in water levels on Lake Huron and local water bodies which has resulted in damage to local infrastructure.

(5.4.19) Lake Huron has reached a full 90 centimeters above average, and a typical rise is between 25 to 30 centimeters[30]. This is due to warmer temperatures and higher precipitation amounts which raise water levels. Infrastructure damage is one of the potential outcomes of increased precipitation and water levels in the North Shore communities.

(5.4.20) Lakes, rivers and streams are not limited by municipal borders. As such, it is important that all communities contained within the study area collaborate to address the combined threat of increased precipitation levels, and associated risk to flooding.

[30] McCutcheon, Alicia. *New Annual Record Highs Expected for Lake Huron Water Levels*, April 8, 2020. https://www.manitoulin.ca/new-annual-record-highs-expected-for-lake-huron-water-levels/

(5.4.21) One approach might be to implement policies and plans that reduce and mitigate the risks of flooding. The Township of Sables Spanish Rivers applies the following principles in its Official Plan to address stormwater management requirements[31]:

1. That natural hydrological characteristics are maintained, and where possible, enhanced as a means of protecting the base flow of watercourses.
2. That the natural infiltration of water on lands to be developed are maximized.
3. Proposed development will not result in increased downstream flooding or erosion or cause adverse effects on receiving waters during construction and post construction.
4. To ensure alterations to natural drainage systems are prohibited, or at least minimized, by maximizing the retention of natural vegetation and by leaving stream channels in their natural form.
5. That fish and wildlife habitat are protected, enhanced, or restored including habitat linkages were affected by the discharge or outlet of drainage facilities.
6. That a sustainable environmental approach is utilized in protecting water resources.
7. That water quality will be monitored on an ongoing basis as a means of evaluating the effectiveness of storm water management practices.
8. That a construction mitigation plan is instituted to prevent stream borne sediments, changes in flow or other adverse characteristics from affecting the ecological functions or other impacts on receiving waters during construction; and
9. That the post construction phase shall include rehabilitation, the continued maintenance of infrastructure, and preferably a monitoring program.

(5.4.21) In addition, the Official Plan for Sables Spanish Rivers states that future infrastructure building projects should incorporate flood proofing standards which combine measures within the basic design and / or construction of buildings, structures, or properties to reduce or eliminate flooding hazards, wave uprush, and other water-related hazards along the shorelines of the Great Lakes-St-Lawrence River System, in large inland lakes and flooding along rivers, streams, and small inland lake stream systems[32].

(5.4.22) "Protection Works Standards mean the combination of non-structural or structural works and allowances for slope stability and flooding/erosion to reduce damage caused by flooding hazards / erosion hazards and other water related hazards, and to allow access for their maintenance and repair"[33].

(5.4.23) [Ontario's Flooding Strategy] identifies that local governments have responsibility for identifying and managing flood risks. It advocates that local decision-making should be based on available data and science to help minimize the risks and impact of flooding events. To prevent unnecessary damage and costs associated with flooding, the risks must be reduced to keep people and property away from high-risk areas. The following figure (Figure 36) displays a diagram which identifies the four pillars of emergency management related to flooding:

[31] Official Plan, *Township of Sables-Spanish Rivers,* 2010 http://sables-spanish.ca/wp-content/uploads/2018/02/FinalVersionOPSept2010.pdf
[32] ibid
[33] ibid

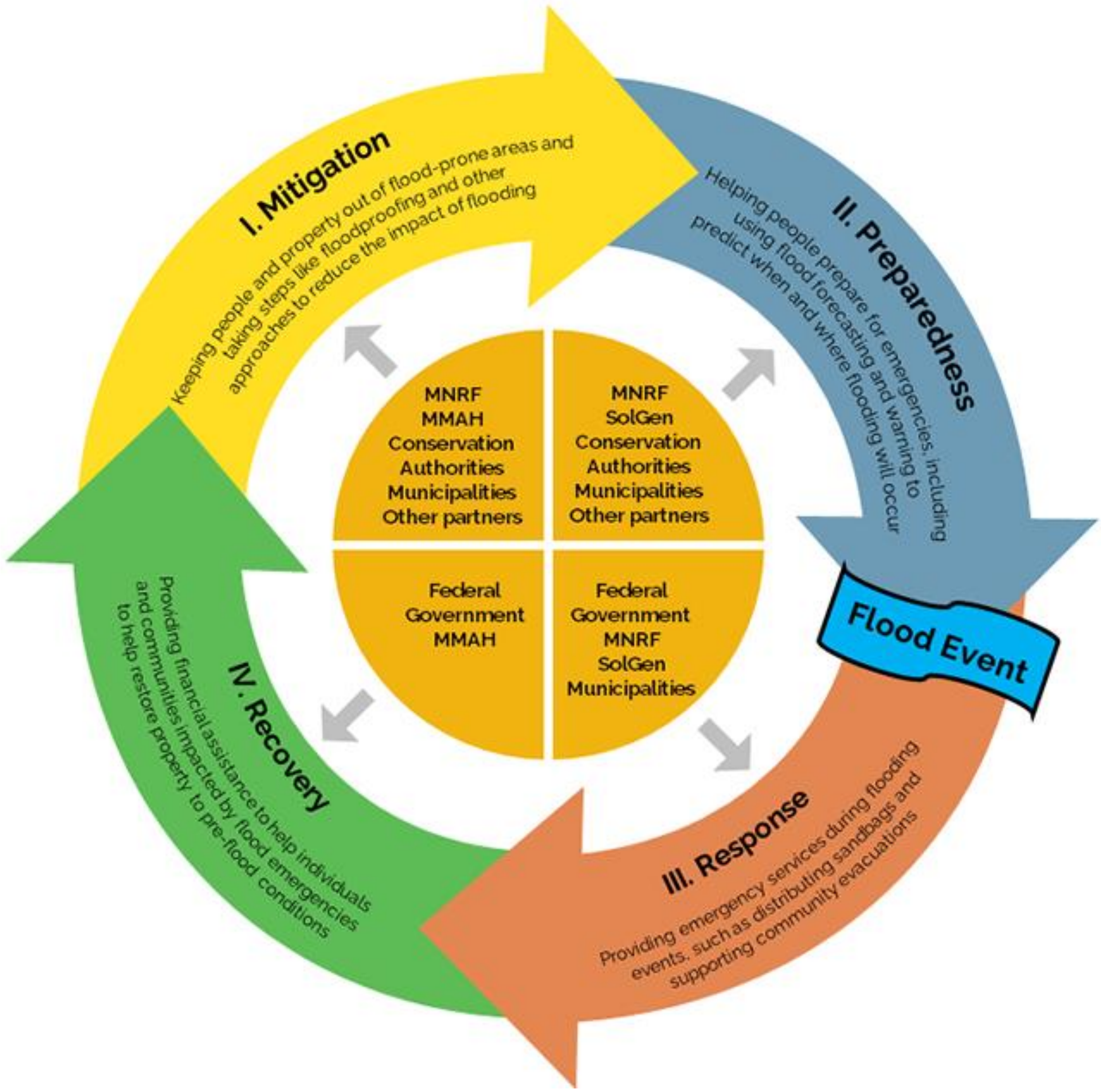

Figure 36: The four pillars of Emergency Management related to Flooding[34]

[34] *Protecting people and property: Ontario's Flooding Strategy*, Ministry of Natural Resources and Forestry, October 28, 2020 https://www.ontario.ca/page/protecting-people-property-ontarios-flooding-strategy#section-1

(5.4.24) The four pillars of emergency management related to flooding identify the key players, agencies and levels of government who are responsible for each pillar. The diagram reads as follows:

1. **Mitigation** - Keeping people and property out of flood-prone areas and taking steps like floodproofing and other approaches to reduce the impact of flooding.

2. **Preparedness** - Helping people prepare for emergencies, including the use of flood forecasting and warning systems to predict when and where flooding will occur.

   [After flood event occurs]

3. **Response** - Providing emergency services during flooding events, such as distributing sandbags and supporting community evacuations.

4. **Recovery** - Providing financial assistance to help individuals and communities impacted by flood emergencies to help restore property to pre-flood conditions.

(5.4.25) To effectively manage the risks and address potential issues associated with flooding, local governments are encouraged to assess the following priorities:

1. **Understand flood risks.**
   - This is a vital first step to improving our ability to reduce the impacts of flooding. It seeks to increase municipal and government understanding of flood risks in your region, to ensure increased awareness, and appropriate decision-making that leads to mitigation.
   - Requires the upgrading and enhancement of <u>flood maps</u> to:
     - Define flood hazard limits, prepare flood maps, and develop appropriate land use planning policies that reflect the identified hazardous areas.
     - This may involve establishing a **multi-agency flood mapping technical team** and **developing a multi-year approach to updating flood mapping**, **maintaining flood-related foundational geospatial data,** and **increasing transparency around water management decisions.**

2. **Strengthen governance of flood risks.**
   - Municipalities and conservation authorities implement policies made by the province on flood management. Ensure that all agencies involved in flood management work together to minimize the risk of flooding. This involves:
     - Clarifying roles and responsibilities in the management of flooding and other natural hazards;
     - Identifying areas that may pose a risk to the public; and
     - Promoting sound land use planning decisions to ensure the land-use planning framework is consistent with best practices.

3. **Enhance flood preparedness.**
   - Flooding will continue to happen in areas of Ontario, regardless of the level of preparedness. However, by being prepared for when and where flooding is most likely to occur, municipalities and agencies can be better equipped when it does happen.
   - This involves having <u>enhanced flood forecasting and early warning systems in place.</u>

  - The Provincial Flood Forecasting and Warning Committee provides a program link between agencies responsible for flood forecasting and warning, flow measurement and data collection.
  - Uses science and research to identify areas at risk of flooding.
  - Maintains Ontario's road weather information system.
    - Ontario 511 serves as a public communication tool which shares messages and information direct with users. This can also be used to share information on flooding, especially, where it pertains to road washouts and highway closures.

4. **Enhanced flood response and recovery**
   - How a municipality responds to flood events is crucial to ensure the safety and recovery of people and property and communities.
   - By ensuring that emergency response and recovery programs are well coordinated and effective in supporting communities in their time of need and receiving the support they need to respond and recover from flood emergencies
   - This involves an enhanced emergency response.
     - Includes actions taken to address and deal with the impacts of a flood emergency such as providing logistical support, sandbags, social and health services and taking emergency actions such as community evacuations during flooding events.
     - Requires training for emergency response staff and meeting with stakeholders prior to a flooding emergency to create and maintain awareness of the threat and risks to ensure an effective response.
       - Ontario's "Build back better" pilot project from the Municipal Disaster Recovery Assistance (MDRA) Pilot Program provides financial assistance to eligible communities requiring an emergency response, including reparation costs following a natural disaster.

5. **Invest in flood risk reduction.**

   - Work with the province, FCM and federal funders to secure the necessary funding required to deliver infrastructure improvements and implement flood mitigation strategies.
   - As noted in Ontario Regulation 588/17: Asset Management Planning for Municipal Infrastructures - municipal planning is needed for stormwater management and to consider opportunities for adaptation and mitigation.

(5.4.26) The strategies suggested by the Ontario government on managing flooding risk could be introduced as part of future discussions on municipal stormwater and asset management-led planning-based activities. Some other resources are provided for reference.

(5.4.27) Tools

A tool produced by the National Institute of Scientific Research (INRS) with support from the Municipalities for Climate Innovation Program, was created to assist communities near the Petite-Nation river while assessing the risk of flooding and developing sustainable management plans, informed by monitoring and the visualization of flood risk levels. The two tools developed by the partnership are:

- The GARI Tool: Flood Risk Management and Analysis

- An interactive map to assist in sustainable stormwater management.

Further details are provided here for reference:
https://fcm.ca/en/case-study/mcip/tool-assess-flood-risk-and-develop-sustainable-management-plans

(5.4.28) Case Studies

The following case studies from the Federation of Canadian Municipalities in partnership with PSD Research Consulting Software, the Canadian Water Network, and Canadian Water and Wastewater Association demonstrate how data was applied to address water infrastructure vulnerabilities. It identifies how five communities are using better data to identify climate change-related infrastructure vulnerabilities, including:

- **Kenora, Ontario:** Asset Risk Assessment
- **Edmonton, Alberta:** Flood Mitigation and Mapping
- **Moncton, New Brunswick:** Flood Mitigation and Neighbourhood Vulnerability Assessment
- **Saskatoon, Saskatchewan:** Grey and Green Infrastructure Adaptation
- **Lake Erie, Ontario (Union Water Supply System):** Drinking Water System Vulnerability Assessment

Further details are provided here for reference:

https://fcm.ca/en/resources/mcip/case-studies-using-data-address-water-infrastructure-vulnerabilities

Another case study relates to reducing flood risks in Saint John, New Brunswick. Specifically, it is noted how the City of Saint John followed a multi-faceted approach to climate change, to reduce the risk of flooding from increases in the sea level, and the frequency and severity of storms.

Further details are provided here for reference:

https://fcm.ca/en/case-study/mcip/reducing-flood-risks-in-saint-john

6.0 REEP Action Plan

(6.0.1) The above data provides a stark warning to us all. Regardless of whether the 'best' or 'worse' case scenarios transpire; evidence suggests there is a need for action not only to help reduce some of the predicted adverse effects of climate change, but to help create a more sustainable environment and economy with reduced risks.

(6.0.2) The following information is provided as a guide to help generate some ideas and practical solutions as to how energy usage and emissions can be reduced while supporting and enabling sustainable forms of development to occur:

6.1 Low hanging fruits

The term 'low-hanging fruits' refers to the tasks, actions or goals that may be easily achieved. It is used to describe an action that takes no to low effort to accomplish. These tasks are categorized as **community, personal, municipal,** and/or **political.**

(6.1.1) Community

"*[A] bottom-up approach matches the wider recognition of the need for active community participation in development projects capable of sustainable environmental management*"[35].

Bottom-up approaches emphasize participation of the local community in development initiatives so they can select their own goals and the means of achieving them. They also ensure community ownership, and commitment and accountability to the development project as it seeks authority from below[36].

Action Items include:

1. Creation of an education and awareness campaign to inform the public of existing and potential opportunities to reduce their energy consumption and use.
    - Integrate climate change information into the school curriculum and involve local community groups / organizations to support teaching on the importance of climate change mitigation.
2. Promote community champions to ensure a more balanced approach to decision-making on issues related to sustainable development through the land use planning process.

[35] Fraser, E., A. Dougill, W. Mabee, M. Reed, and P. Mcalpine. *Bottom Up and Top Down: Analysis of Participatory Processes for Sustainability Indicator Identification as A Pathway To Community Empowerment And Sustainable Environmental Management*, 2006. .https://www.sciencedirect.com/science/article/pii/S0301479705001659

[36] Kaiser, *Bottoms-up vs Top-Down,* 2012. https://www.thedailystar.net/news-detail-252290#:~:text=Bottom%2Dup%20approaches%20emphasise%20the,the%20means%20of%20achieving%20them.andtext=On%20the%20other%20hand%20top,who%20also%20lead%20the%20process.

(6.1.2) Personal

1. Behavioural changes:
    - Reduce electricity consumption at times of peak demand.
    - Reduce individual carbon-footprints by choosing emission-free or lower emission methods for transportation.
    - Choose lower emission products such as locally made or home-grown products.
2. Using technology to reduce commuting amounts, such as video calling instead of in-person meetings.
3. For homeowners, reducing energy use and implementing energy-efficient initiatives can help you reduce emissions and save money!
    - Install a programmable thermostat that can automatically turn down during times when no one is home or at night.
    - Periodically replace air filters in air conditioners and heaters
    - Replace incandescent lights to LED lights.
    - Seal and insulate your home in areas such as:
        - Windows and doors;
        - Mail slots;
        - Baseboards;
        - Worn weather stripping;
        - Wall or window mounted air conditioners; and
        - Baseboards.
    - Wash laundry in cold water.
    - Ensuring full load before starting the cycle can also reduce significant water and energy compared to half-loaded laundry machines.
4. Invest in electric vehicles.
    - There are currently 2 incentives available for Ontario residents for EV:
    - $1000 off the purchase of a used fully electric or plug-in hybrid electric vehicle:

   https://www.newswire.ca/news-releases/plug-n-drive-launches-1-000-used-electric-vehicle-incentive-program-892399915.html

Two types of incentives available through Government of Canada:

- Battery-electric, hydrogen fuel cell, and longer-range plug-in hybrid vehicles are eligible for an incentive of $5,000.
- Shorter range plug-in hybrid electric vehicles are eligible for an incentive of $2,500.

  https://tc.canada.ca/en/road-transportation/innovative-technologies/zero-emission-vehicles

(6.1.3) Municipal / Political

1. Invest in Infrastructure that inherently requires less energy to operate (for example-Sagamok First Nation has identified the need for energy efficient appliances and retrofitting existing infrastructure).
2. Reward and celebrate changes in behaviour, including the recognition of green businesses, community champions, and other stakeholders throughout the region (i.e., The Green Economy North Program).
    - Partner with local environmental organizations to work together on a common cause - addressing and mitigating risks associated with climate change.
    - Provide incentives for actions that encourage sustainable behaviour such as biking or carpooling as a form of commuting.
    - Subsidize or incentivize the United Manitoulin Island Transit busses to encourage more use, expanding to the region of North Shore.
3. Host events that would involve communities and businesses to come out and celebrate the environment. Such as Wawa's Green Days: https://www.myalgoma.ca/tag/wawa-green-days/
4. Sign up to the Partners for Protection Program (PCP) operated by the Federation of Canadian Municipalities (FCM).
    - Track current emissions, and work through milestones to reduce emissions, set targets and achieve your goals.
    - **https://fcm.ca/en/programs/partners-climate-protection**
5. Ensure a comprehensive Conservation and Demand Management Plan (CDM) is in place which accords with the requirements of the Green Energy Act. The plan should provide an outline of stated priorities and goals regarding energy efficiency measures, conservation projects, plus other initiatives in place to reduce your impact.
6. Report yearly under *Ontario Regulation 507/18: Broader Public Sector - Energy Reporting and Conservation and Demand Management Plans,* the energy use and Greenhouse Gas (GHG) emissions arising from the Broader Public Sector: https://www.ontario.ca/laws/regulation/180507
7. Influence positive attitudes towards sustainability by working on initiatives that would involve the community to work together with the municipality.
    - Initiatives might include the greening of a public space or supporting the development of community gardens.

6.2 Long-Term goals

(6.2.1) The following long-term goals are suggested:

1. Transition to clean and decentralized energy sources of electrical energy to both improve the grid's capacity and resilience at the regional scale.
   - Note: In the property management and development sectors, a shift away from fuel oil and propane to alternate energy sources such as electricity could further result in decreased emissions. Although this shift would result in higher electricity consumption in the building sector, overall emissions would decrease as provincial electricity production is relatively clean.
2. Implement more renewable energy sources, which can be sourced, produced, and distributed at the local scale including new renewable energy sources (i.e., solar, wind, geothermal).
3. Change how we travel (including the use of energy efficient electric, biofuel, and/or hydrogen fuel cell-powered vehicles).
4. Increase accessibility to and improve ridership levels on mass transit system (UMIT, Ontario Northland).
5. Lead by example - serve as an ambassador for systemic change, and sustainable growth and development which protects and preserves the environment for future generations.
6. Subsidize and/or reduce the cost of electricity to encourage homeowners to switch to energy efficient electric-powered home-heating sources to reduce emissions.
   - Note: Current costs for electricity prove to be a barrier for homeowners to switch to electricity powered home heating sources. This would ultimately reduce emissions, but the cost analysis to switch to this technology is not feasible as the cost of electricity is very expensive.

Further sector-specific interventions are outlined as follows:

Encourage Sustainable Agricultural Practices

(6.2.2) Sustainable agriculture is *"the efficient production of a safe, high-quality agricultural product in a way that protects and improves the natural environment, the social and economic conditions of the farmers, their employees and local communities, and safeguards the health and welfare of all farmed species."*

(6.2.3) Sustainable agriculture practices necessitate a reduction in financial risks over time. This could comprise a range of bold interventions and associated measures including different approaches to land use management (i.e., storing rainwater for crop irrigation), maintaining soil nutrients through crop-rotation, and renting sustainable farming equipment.

(6.2.4) The following provides a list additional factors that should be considered:

1. **Improving water quality**

   Natural filtration systems, and other manmade rainwater harvesting systems can help conserve freshwater supplies for crop irrigation purposes.

2. **Reducing the need for application of fertilizers and pesticides**

   A wide range of natural and biologically inspired best practices continue to emerge including regenerative agriculture, the application of root and soil-based bacteria, and the planting of native/complimentary species to both support biodiversity and the creation of a more resilient and balanced ecosystem.

3. **Restoring and naturalizing riparian zones**

   The Riparian Zone is a corridor between the upland zone and the shoreline, which allows animals to travel between different biomes. This zone provides rich, moist soils where diverse plant communities can grow. It can also help maintain water levels, temperatures and prevent erosion[37].

4. **Introducing smart watering practices**

   - Flood storage and diversion areas support the capture of excess rainfall, surface water run-off and snow melt. By increasing our reserves, we can ensure the increased availability of water during drought seasons.
   - Some best practice ideas are provided here for reference: https://www.sare.org/wp-content/uploads/Smart-Water-Use-on-Your-Farm-or-Ranch.pdf?inlinedownload=1

5. **Establishing proper cover crops to maintain soil quality and productivity.**

   For example, using rye or barley as a cover crop to protect the soil surface from wind and water erosion. This can be planted over a whole field for erosion protection or selectively planted in the most erosion prone areas.

6. **Maintaining soil health**

   This can ensure adequate organic matter, biological activity, and an optimal balance of nutrients. Managing soil health benefits crops over the longer-term, which can reduce and/or eliminate the need for synthetic fertilizers.

7. **Crop rotation including the use of manure / compost - instead of synthetic fertilizers**

   The process of crop rotation can protect water quality at the same time as establishing year-round soil cover (either residue or cover crop). Integrating crop and animal systems can further maximize efficiencies.

8. **Controlling invasive plants**

   The changing climate is encouraging the spread and growth of invasive species in Northern Ontario. Ensuring best practice mitigation and control measures are in place will reduce their effects.

9. **Lead by example.**

   Farmers are encouraged to promote sustainable farming practices among their peers while protecting and preserving the environment for future generations.

[37] *The Riparian Zone,* Watersheds Canada. https://watersheds.ca/wp-content/uploads/2016/02/The-Riparian-Zone-Final.pdf

Sustainable Transportation

1. Given the proximity of Highway 17 (The Trans Canada Highway), the North Shore Communities have typically been served by Trans-National and/or Inter-regional Bus Services.
2. In this context, there remains potential to further increase the number and frequency of bus services to facilitate a shift in demand and increased ridership levels.

Municipal Fleet

(6.2.5) Municipalities, townships, and First Nations are encouraged to take steps to transition their own fleet to non-gas-powered alternatives.

(6.2.6) There remains potential for region-wide emissions to decrease within the transportation sector as fuel efficiency standards in vehicles continue to improve.

(6.2.7) A reduction in 2.6 Mt in emissions could result from a continued and steady decrease in the use of gasoline, combined with an incremental uptake in the use of electrically powered vehicles[38].

(6.2.8) Currently, there are three (3) EV chargers located in the region of North Shore. One each in the Towns of Spanish, Espanola, and also, the Community of Baldwin. Figure 36 shows that the EV charger in the town of Spanish (Scotiabank) is currently under repair (November 2020). The region could benefit from installing additional EV charging stations in community centers, or shared public places to further increase access and awareness. A **52km** stretch exists between Spanish and Baldwin which does not have an EV charging station in place. Increasing access to EV chargers will also increase tourism and accessibility for those who have electric vehicles.

(6.2.9) Funding streams are made available on a periodic basis which apply to the installation of EV Charging Stations. Some of the biggest gains are where 20 or more stations are being proposed. The North Shore region could benefit from installing additional EV charging stations forming part of an integrated network in locations that include community centers and other public buildings and spaces. By pursuing a coordinated approach to investment in EV charging stations, individual communities will not only increase the level of access to, and use of EV chargers by Islanders, but potentially increase their appeal to tourists.

[38] *Climate Change: Ontario's Plan to Reduce Greenhouse Gas Emissions,* Office of the Auditor General of Ontario, 2019
https://www.auditor.on.ca/en/content/annualreports/arreports/en19/v2_300en19.pdf

Figure 37: Map of EV Chargers in the North Shore (https://www.plugshare.com/)

Using Behavioural Science to Encourage Energy Efficiency

(6.2.10) Climate change is undoubtedly a complicated subject matter, with many components involved. The following video produced by Vox in partnership with the University of California (UCLA) emphasizes that messages which create a sense of "doom and gloom" are not always seen as an effective way of delivering a "call to action". Such an approach may result in individuals feeling less inspired or motivated to act on climate change: https://youtu.be/DkZ7BJQupVA

(6.2.11) Greenhouse gases arise from many sources and are altogether less visible than other forms of pollution (i.e., plastic pollution). Carbon Dioxide and Carbon Monoxide are intrinsically linked to all aspects of our lives, from the exhaust fumes of the vehicles we drive, to the energy required to power our homes, workplaces, and equipment. Energy is used (and emissions are released) at multiple stages of a product's life cycle including: the preparation, storage and distribution of food, drink, clothing, and construction materials, plus the many other products and services we choose to consume daily.

Goal: how to make CO2 visible so people can take actions to reduce their impact?

(6.2.12) UCLA's Engage Building Performance Project introduces behavioural experiments to encourage the conservation of energy[39]. They utilize meters which track real time usage and send the data to residents in the form of weekly update reports.

(6.2.13) The project identifies how much energy individuals and households are using in respect of lighting, heating and cooling systems, appliances, and the multiple other energy dependent devices many of us use daily.

(6.2.14) The example from UCLA also identifies ways we can reduce our collective impact. For example, households were sent personalized emails with their energy bills and how they could save money. Others learned that their energy use impacted the environment and children's health. Fort example, e-mails that linked the amount of pollutants produced to rates of childhood asthma and cancer led to an 8% drop in energy use, and 19% in the households that had children.

(6.2.15) Another method is to use social competition, by publicly showcasing how residents were doing - red for falling behind, green for good, and a 'gold star' for being above and beyond. Sharing information publicly in this way, led to a 20% reduction in energy use. The justification is that

[39] Energy Conservation and Behaviour, UCLA, 2017. https://www.ioes.ucla.edu/project/ucla-engage/

humans naturally like to compare themselves with each other and are willing to both learn and adapt in the process.

(6.2.16) In 2015, Hydro Ottawa implemented behavioural science principles to encourage increased energy efficiency among their residential customers. The Summer Saving Day Pilot Program[40] encouraged customers to save electricity in their homes by sharing end-user energy usage data, which led to a comparative analysis of similar neighbours and personalized tips on the ways residents can lower their usage on designated days. Hydro Ottawa collaborated with Opower and the Ontario Ministry of Energy to deliver this program.

(6.2.17) Opower (now renamed Oracle) works with over 100 utility companies to provide personalized energy reports to tell customers how they compare with their neighbours. Large companies are now tapping into behavioural science to help move the dial. All these actions utilize our natural competitive spirit to drive action and achieve the goal of reduced energy usage and decreased emissions. Further information regarding Oracle is available here for reference:

https://www.oracle.com/ca-en/industries/utilities/products/what-is-opower.html

Sustainable Forestry and Carbon Sequestration Strategy

(6.2.18) As identified in Sustainable Growth: Ontario's Forest Sector Strategy[41], sustainable forest management strategies can help forests become resilient to the impacts of climate change, while playing a vital role in capturing and storing carbon dioxide.

<u>What is Carbon Sequestration?</u>

(6.2.19) One of the major ways we can reduce carbon dioxide concentrations in the atmosphere is to increase the amount of carbon sequestration. Carbon Sequestration is defined as the long-term storage of carbon in plants, soils, geologic formations, and the ocean[42].

(6.2.20). In this regard, carbon is transferred naturally from the atmosphere to terrestrial carbon sinks through the process of photosynthesis - which occurs in biomass and soils. terrestrial (or biologic) sequestration means using plants to capture CO2 from the atmosphere, and then storing it as carbon in the stems and roots of plants and the soil.

(6.2.21) Both new and existing forests can act as "carbon sinks". Forest regrowth is an especially effective way of securing new carbon sequestration. As such, sustainable forest management practices should aim to support new growth and enhanced productivity, while increasing the amount of carbon sequestered.

(6.2.22) Beyond the renewal of existing forests, replacement vegetation can be introduced on previously cleared lands. Afforestation involves the conversion of non-forested land to new forests. Increasing the amount of vegetative cover alongside agricultural lands and integrating sustainable forestry management practices into this process is also an effective way of cultivating

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[40] *Hydro Ottawa Leverages Behavioural Science Principles to Encourage Energy Efficiency in New Program,* 2015 https://www.newswire.ca/news-releases/hydro-ottawa-leverages-behavioural-science-principles-to-encourage-energy-efficiency-in-new-program-518810931.html
[41] Sustainable Growth: Ontario's Forest Sector Strategy, Government of Ontario, August 2020 https://www.ontario.ca/page/sustainable-growth-ontarios-forest-sector-strategy
[42] Carbon sequestration, Britannica, n.d https://www.britannica.com/technology/carbon-sequestration

organic crops as part of a balanced ecosystem. The following diagram explains the carbon cycle in sustainable forest management:

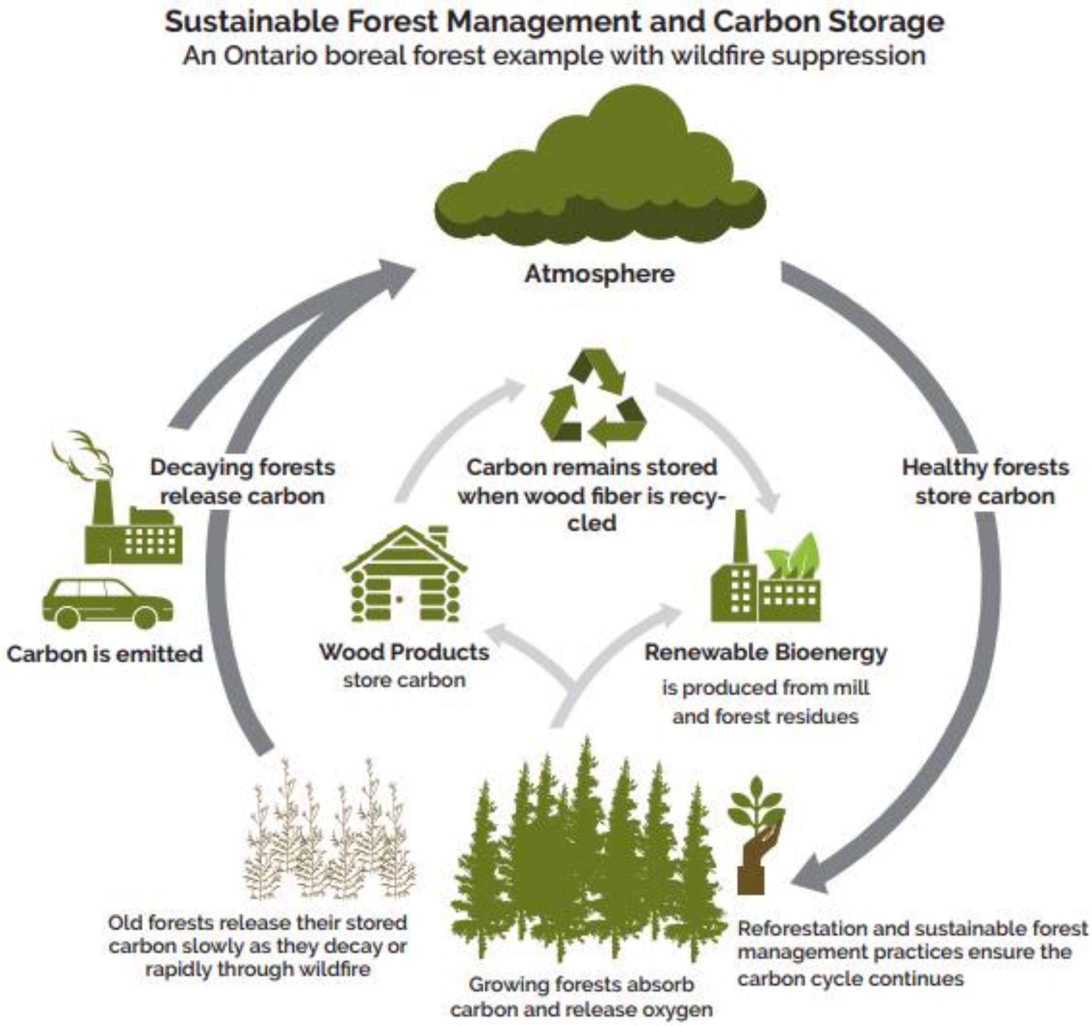

Figure 38: Sustainable Forest Management and Carbon Storage[43]

<u>Future strategies proposed by the Government of Ontario in Ontario's Forest Sector Strategy</u>

(6.2.23) Numerous initiatives were proposed by the Ontario Government on increasing and promoting the use and practice of sustainable forestry products. The most relevant initiative related to the REEP is that Ontario will work with Quebec to develop a tool that can be used by building designers to estimate greenhouse gas emissions from various building designs and help them make the best use of various wood products - acknowledging the inherent ability of wood to store carbon. This tool will be made publicly available so it can provide a way for the private sector, municipalities, and provincial entitles to account for the carbon footprint of their building assets.

[43] Sustainable Growth: Ontario Forest Sector Strategy, Government of Ontario, August 2020 https://www.ontario.ca/page/sustainable-growth-ontarios-forest-sector-strategy

6.3 Provincial Actions

(6.3.1) Ontario's 2017 Long-Term Energy Plan discussed initiatives and projects that would reduce emissions associated with energy generation. Such initiatives, including renewable energy production were cancelled in 2019 by the newly elected provincial government. This action has resulted in projected emissions increasing for the Province of Ontario, which trickles down to emissions for municipalities and communities.[44]

Economic Sector and 2017 Emissions	Most Common Sources of Emissions	Primary Actions to Reduce Emissions	Examples of Means of Implementing these Actions
Transportation 56 Mt (35% of total)	Gasoline cars and trucks, diesel trucks	• Reduce the travel distances required • Switch to low- or zero-carbon modes of transport	• Design walkable communities • Work from home • Walk, bicycle, use public transit, rideshare, or drive an electric vehicle
Industry 47 Mt (30% of total)	Natural gas and coke boilers, industrial processes	• Minimize energy use and material waste • Switch to low- or zero-carbon industrial inputs • Use carbon capture and storage (CCS) technology	• Use renewable energy in industrial processes • Use materials for producing low-carbon cement and steel • Install CCS at facilities that produce highly concentrated carbon dioxide emissions
Buildings 35 Mt (22% of total)	Natural gas furnaces and hot water tanks and refrigerants	• Minimize building heating requirements • Switch to passive or high-efficiency heating and ventilation technologies that use low- or zero-carbon energy sources • Reduce leakage of refrigerants	• Insulate and improve air tightness • Install heat pumps, and energy/heat recovery ventilators • Use air conditioners with refrigerants that have a low global warming potential, and collect waste refrigerants
Agriculture 12 Mt (8% of total)	Fertilizer, livestock, manure, on-farm fuel use	• Build up farm soils to increase carbon storage • Optimize use of fertilizers/manure	• Practise no-till agriculture • Use precision agriculture techniques
Waste 6 Mt (4% of total)	Organic waste decomposition, waste water treatment, incineration	• Reduce waste generation • Divert waste from landfills • Capture landfill gas	• Design products for easy repair, reuse and/or recycling • Compost organic waste • Install landfill gas capture systems
Electricity 2 Mt (1% of total)	Natural gas power plants	• Reduce electricity consumption at times of peak demand • Phase out greenhouse gas-intensive power	• Behaviour change • Use hydro, nuclear, wind, solar, and biomass power while enhancing energy storage
Ontario Total – 159 Mt			

Figure 39: Ontario Greenhouse Gas Emissions Sources and Ways to Reduce Them, by Economic Sector[45]

(6.3.2) Ontario would benefit from refocusing its efforts on reducing emissions on carbon-intense sectors such as transportation, industries, buildings, agriculture, and waste. Figure 39 provides some suggestions on reducing emissions in each sector. From this, we have determined that the electricity sector produces the least amount of emissions; however, that grid capacity remains an issue. Therefore, implementing renewable energy sources to supplement hydro is seen as most beneficial in terms of meeting demand.

[44] *Climate Change: Ontario's Plan to Reduce Greenhouse Gas Emissions,* Office of the Auditor General of Ontario, 2019 https://www.auditor.on.ca/en/content/annualreports/arreports/en19/v2_300en19.pdf
[45] *Climate Change: Ontario's Plan to Reduce Greenhouse Gas Emissions,* Office of the Auditor General of Ontario, 2019 https://www.auditor.on.ca/en/content/annualreports/arreports/en19/v2_300en19.pdf

(6.3.3) The following strategies are provided as suggestions to inform policy makers:[46]:

Several options, each with benefits and challenges, are available to governments to assist people households and businesses in reducing their Greenhouse Gas emissions. These include:

- **Legislation and regulations:** The government sets laws and/or rules that apply to businesses and consumers to limit emissions. This may require reducing emissions to a certain level, switching fuels, or installing technologies. The costs of making such changes may be passed on to consumers.
- **Pollution pricing:** The government applies a price to GHG emissions, which may be passed on to consumers. There are several ways this has been done, including:
- **Using a "cap and trade" approach:** A limit is placed on the amount of Greenhouse Gases that may be emitted, but individual entities covered by the system can buy the right to produce additional emissions from those who have reduced theirs.
    - The cap-and-trade approach is now inactive The Draft Made-In-Ontario Environment Plan suggests a new approach (page 15 - Section 3: Provincial Context)
- **Introducing a "Carbon Levy"**: A price is charged directly in response to the emission of GHGs. The levy is usually applied to fossil-fuel purchases, such as gasoline. The government controls the price and may choose to charge the levy to individuals and/or businesses.
- **Financial investments**: Government funding, subsidies and/or rebates that encourage businesses and/or consumers to reduce their emissions.
- **Information programs:** The government provides information that encourages voluntary actions to reduce emissions.

[46] *Climate Change: Ontario's Plan to Reduce Greenhouse Gas Emissions,* Office of the Auditor General of Ontario, 2019
https://www.auditor.on.ca/en/content/annualreports/arreports/en19/v2_300en19.pdf

6.4 Current Initiatives

This section identifies sustainability-led initiatives which have occurred in the North Shore area in recent years. It highlights actions taken by the various communities and businesses which can be referenced in support of further actions to benefit the North Shore going forward:

(6.4.1) Advocates for the North Shore Water and Environmental Resources (ANSWER)[47]

- The ANSWER community works to protect biodiversity in the North Shore, particularly the Blanding's Turtle sanctuary that was recently discovered.
    - A large population of Blanding's turtles were discovered in the Township of North Shore
- The Great Lakes population of Blanding's turtles were recently listed as endangered in Canada due to threats such as habitat destruction.

(6.4.2) Pellet manufacturing plant in Nairn Centre[48]

- A new Wood Pellet Manufacturing Plan is proposed in Nairn Township.
- Pellets will be used as an alternative heating source.
- The new facility will be built beside an existing sawmill where the by-products will be used to create pellets.
- This will serve as an additional stream of revenue for Wiikwemkoong and provide economic benefits to surrounding municipalities.
- There are many producers that cannot keep up with pellet demand.
- This will create a new market for the sawmill and repurpose logging waste.
- The project is expected to create 35-45 jobs at the plant with 100 additional jobs in the forestry sector, and 50 initial construction jobs.
- Wood pellets are a cleaner technology than fossil fuels.

(6.4.3) Investments to help Domtar Inc. upgrade its pulp and paper mill in Espanola[49]

- Improvements to the mill will reduce the need for single-use plastics (such as medical and food packaging), reduce GHG emissions, and preserve jobs.
    - Projected to reduce waste from production and reduce GHG emissions by 48 000 tons annually, as well as maintain 430 jobs in the community.
    - Will improve air quality and reduce noise pollution; plus.
    - Increase the competitiveness of Canadian pulp and paper production.

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[47] Advocates for the North Shore Water and Environmental Resources (ANSWER), https://answercommunity.ca/

[48] Erskine, *Wiikwemkoong receives $100,000 for pellet plant plan,* October 16, 2019 https://www.manitoulin.ca/wiikwemkoong-receives-100000-for-pellet-plant-plan/
Wiikwemkoong Pellet Plant in Nairn Centre, An Economic Venture by the Wikwemikong Development Commission, 2019. https://wikydevcom.ca/wp-content/uploads/2019/05/WPP-Pellet-Presentation.pdf

[49] *Project will help reduce greenhouse gas emissions, improve competitiveness and maintain 430 jobs,* July 23, 2019, https://www.canada.ca/en/innovation-science-economic-development/news/2019/07/ps-serre-announces-investment-in-innovative-technology-that-could-replace-single-use-plastics.html
Sudbury Star Staff, *Ottawa to spend $28.8 million to Upgrade Domtar's mill in Espanola,* July 23rd, 2019. https://www.thesudburystar.com/news/local-news/ottawa-to-spend-28-8-million-to-upgrade-domtars-mill-in-espanola

(6.4.4) Sables-Spanish Rivers Energy Conservation and Demand Management Plan[50]

- Massey Arena
  - On demand hot water system for domestic water;
  - New overhead doors in the service building;
  - Utilizes nightly timers for heating purposes; and
  - Introduced sensor activated lights in service areas.

- Massey Medical Clinic
  - Retrofitted its heating and lighting systems.

- Township Office
  - Retrofitted a lighting system.

- Fire Station #2
  - Introduced a sensor-activated lighting bay area.

(6.4.5) Sagamok Food Security Plan[51]

- Plans to take control of the local food system to become more self-sufficient and ensure access to healthy and affordable food.
  - Opportunity to make use of agricultural land, address the challenge of rising energy costs, and meet food security needs.
  - Consists of a local grocery store for the community, a farmer's market to encourage locally grown food, plus a community garden, greenhouse, etc.

(6.4.6) Sagamok Current Initiatives[52]

Looking to:

- Retrofit heating and lighting systems in the five buildings with the highest energy usage.
- Introduce Solar and LED streetlights as a retrofit.
- Install a solar water heating system and rooftop solar on south-facing rooftops.
- Pursue renewable energy projects, including:
  - A pre-feasibility study for a hydroelectric power project on the Sables River;
  - A partnership with Centennial College to study solar radiation values on the reserve to provide data for potential solar projects; and
  - A wood-based biomass heat recovery unit .

[50] *Energy Conservation and Demand Management Plan,* Township of Sables-Spanish Rivers, 2014. http://www.sables-spanish.ca/wp-content/uploads/2018/03/Energy-Plan.pdf
[51] Sagamok Anishnawbek, Community Plan, 2013. https://sagamok.ca/documents/assets/uploads/files/en/sagamok_community_plan.pdf
[52] Sagamok Anishnawbek, Community Plan, 2013. https://sagamok.ca/documents/assets/uploads/files/en/sagamok_community_plan.pdf

(6.4.7) Northeastern Ontario Passenger Train[53]

- A regional group of experts known as the Northeastern Ontario Rail Network (NEORN) has long advocated the reinstatement of a Northeastern Ontario-wide Railway Passenger Service which would enhance connectivity between communities as follows:
  - Moosonee - North Bay - Toronto
  - Hearst - Cochrane - North Bay - Toronto; and
  - Hearst - along Lake Superior - North Bay - Toronto

If implemented, the Loop would significantly improve accessibility by providing alternative travel options which connect Northeastern Ontario with the GTA. Specific advantages include support for economic development, increasing wilderness tourism and connecting northern communities.

- The benefit of rail is that it reduces carbon emissions and increases the resiliency of northern communities - helping them transition away from fossil fuels.
- By leveraging existing railway infrastructure, NEORN, Ontario Northland and the Ontario government could bring back the Northlander train to provide passenger services to residents in Northern Ontario.

(6.4.8) Mask-wa Oo-ta-ban, the Bear Train[54]

- Mask-wa Oo-ta-ban, the Bear Train, is an initiative of First Nations communities and socio-economic stakeholders of the Algoma passenger trail rail corridor and is being led by the Missanabie Cree First Nation with the intention of resuming the Algoma passenger train service.
- The Federal Government Ministry of Indigenous and Northern Affairs (INAC) officials have supported the proposed Mask-wa Oo-ta-ban (Bear Train). They see the Algoma passenger train service as the ideal way in which to attract and transport tourists to Indigenous tourism destinations in MCFN's traditional territory, thus both acknowledging and honoring their historical ties to the railway itself.
- The Canadian Group of Seven artists inspired the remote wilderness regions to be part of the Algoma passenger train corridor and many of the sites for hundreds of their paintings are not publicly accessible - except by the train.

53 Northeastern Ontario Passenger Trail, http://neorn.ca/
54 Bear Train http://beartrain.ca/about/

7.0 REEP Implementation Framework and Next Steps

7.1 Governance

In this section, we provide an overview of identified best practices measures put in place from a governance perspective to help reduce GHG and mitigate the effects of climate change.

(7.1.1) The City of Kitchener is well-renowned throughout Ontario and Canada for having initiated and implemented bold reforms to help guide its future growth and development.

(7.1.2) The City of Kitchener received federal funding to support its work implementing 17 of the United Nations established Sustainable Development Goals (SDGs).[55]

(7.1.3) The City of Kitchener successfully applied an SDG grant of $95,000 to help frame its governance structure, starting with a Strategic Plan and connecting this to other key plans, programs and initiatives that align with the SDGs.

(7.1.4) The City of Kitchener is participating in the ISO World Council on City Data Project - which shares data with cities around the world to learn from best practices tackling shared challenges like climate change, affordable housing, equity, diversity and inclusion and economic sustainability.

(7.1.5) Since 2010, the City of Kitchener has reduced its greenhouse gas emissions by 27% and since 2010, nearly 3,100 tonnes of CO2 equivalent emissions have been reduced.

(7.1.6) Initiatives which the City of Kitchener has advanced to date, and are outlined in the City's Sustainability Report of 2019 include:

- Approved an Energy Efficiency Reserve Fund - which is a revolving fund for capital projects, with the savings reinvested for future energy efficiency projects.

- Conducted 53 energy audits at city facilities such as arenas, pools, and community centers, resulting in:
    - Lighting retrofits
    - The installation of variable frequency drives on pumps and fans at City Hall
    - Updating building automation systems at community centers; and
    - Introducing an operational greenhouse

- Upgraded to its municipal fleet.
    - Introduced electrically powered mowers, hand blowers, pole pruners, line trimmers and chainsaws for landscaping activities.
    - Hybrid SUC.
    - Idle reduction technology such as solar photovoltaic power kits.

- Introduced a waste diversion station for city events.
- Expanded the industrial plastic recycling program at the Kitchener Operations Facility.

[55] City of Kitchener, *City of Kitchener Received Federal Funding to Localize Sustainable Development Goals.* https://www.kitchener.ca/Modules/News/index.aspx?newsId=72f4c75d-227d-4337-b085-955069e1a667#

(7.1.7) Plans

- Created an award-winning and industry-leading stormwater master plan and program and secured $49.9 million of funding through the Disaster Mitigation and Adaptation Fund.
- Worked with FCM to embed climate change indicators into its Asset Management Plan and municipal services.
- Produced a Sustainable Urban Forestry Strategy 2019 - 2028 which proposes a tree canopy target be established by 2020.
- Developed a Corporate Climate Action Plan which addresses 9 of the 17 United Nations Sustainable Development Goals (SDGs).
- The City of Kitchener is also collaborating with ClimateActionWR to develop Waterloo region's first Community Action Plan on climate change.

(7.1.8) The City of Kitchener has adopted the following strategic plans and documents with a focus on climate change, sustainable development, and more detailed issues such as energy efficiency gains:

City of Kitchener's 2019 - 2022 Strategic Plan (2019)

City of Kitchener's Corporate Climate Action Plan (2019)

City of Kitchener's Energy Conservation and Demand Management Plan 2019 – 2023 (June 2019)

City of Kitchener's Sustainability Report (February 13. 2020)

City of Kitchener's Integrated Stormwater Master Plan and Implementation Plan (October 27, 2016)

Region of Waterloo's Community Energy Investment Strategy (February 2018)

Climate Action Waterloo Region (ClimateActionWR) Community Climate Action Plan (March 2020)

Region of Waterloo's Community Climate Adaptation Plan (2019)

(7.1.9) The Smart Green Communities team also held a conference call with the City of Kitchener's Corporate Sustainability Officer, Claire Bennett and the following suggested actions and recommendations were made:

- Municipalities need to focus on making the business case for energy and emissions reduction initiatives.
- Action plans need to focus on the holistic side of sustainability which highlights co-benefits that are not just measured in numbers but result in positive experiences including social and environmental equity and justice.
- Municipal leaders need to promote and recognize sustainability as an important factor in decision-making and throughout the process of developing plans and proposals.
- Having a sustainability program or initiative can increase recognition among funding agencies and corporations, which in turn can increase the chances of obtaining funding and/or investment.
- There is a need to ensure plans are made in compliance with regulations and applicable legislation.

- Municipalities need to focus on increased engagement and encouraging participation among the community on broader climate change issues, goals, and priorities.
- When producing community energy data, businesses need to be involved in the consultation process and encouraged to share data in the process.
- Landlords that own properties which businesses lease / operate from - need to be part of the stakeholder group as they often have control over the building's energy performance and how this translates to utility bills.
- Encouraging conversation among business / property owners, including landlords, can encourage sustainability initiatives to be adopted.
- Energy efficiency initiatives on the building itself trickle into business operations, reducing operating costs that can offer greater stability for business owners.

(7.1.10) Here are some additional best-practice projects and examples, as identified from FCMs Sustainable Communities Awards 2020:

1. **Climate Change: City of Campbell River, BC**

   Campbell River Rising Seas

   The City of Campbell River's recently adopted Sea Level Rise Action Plan puts in motion a series of interventions to protect the community and the surrounding ecosystems from the impacts of rising sea levels. The City worked extensively with the community to create a plan that prioritizes protection of the shoreline, community infrastructure and other assets, plus emphasizes building capacity through education.

2. **Energy: Town of Raymond, AB**

   Raymond Electrical Net Zero

   To reduce their GHG emissions and save costs, the Town of Raymond installed a series of solar PV systems on their municipal buildings, including their town hall, aquatic center, fire hall, arena and more. The solar arrays will save nearly 700 tonnes of CO_2 per year and generate over 1300 MWh of renewable electricity annually, meeting 100% of the electricity needs of the Town's operations. The town was able to see an annual energy savings of $130,186.

3. **Transportation: Region of Waterloo, ON and Town of Cochrane, AB**

   Region of Waterloo, ON

   Growing Up: The Story of ION Light Rail in Waterloo Region

   In 2019, the Region of Waterloo's new ION Light Rail Transit system opened its doors to the public, with over 300,000 passengers using the system in its first 11 days. The ION system provides fast, reliable travel between three urban centers and contributes substantially to the region's environmental and community goals, including reducing GHG emissions and urban sprawl.

4. **Town of Cochrane, AB**

   Cochrane On-demand Local Transit

   The Town of Cochrane's on-demand local transit program (COLT) provides a stop-to-stop transit service for community members, while addressing issues such as affordability, inclusion, and accessibility. The new program expands easy access to transit stops to over 90% of the Town's population and has seen significant uptake since its launch in 2019.

5. **Visionary Award: Regional Districts of Central Kootenay, East Kootenay, and Kootenay Boundary, BC**

   Accelerate Kootenays

   The Accelerate Kootenays project creates a network of more than 50 electric vehicle (EV) charging stations in small communities in the Kootenays region of BC. The result of widespread collaboration between community members, three regional governments and their partners, Accelerate Kootenays provides rural access to EV infrastructure, reduces GHG emissions, supports community engagement and education, and benefits local businesses and tourism.

7.2 Resources and Funding

(7.2.1) Natural Resources Canada, Industrial Energy Management Program:

NRCan is offering financial assistance to help fund the industrial facility's energy management project. This provides financial assistance of up to 50% of eligible costs, to a maximum of $40,000 per facility.

The following types of projects are considered for assistance:

- ISO 50001 Energy Management Systems Standard Projects
- Energy Management Information Systems (EMIS) Project
- Process Integration (PI) and Computational Fluid Dynamics (CFD) studies

(7.2.2) Energy Management Information System (EMIS) Project Proposal

The following link includes the application guide with information on eligibility criteria, instructions on how to complete the proposal template and links to additional information from NRCan:

(Link availability is subject to change based on the original author of the files):

https://drive.google.com/drive/folders/16vGwCRbm70Wg_36Ruj7AnzFAUSvxRnky

The application deadline was on the November 20, 2020. Smart Green Communities has contacted NRCan to confirm whether another proposal intake is forthcoming, and a response is pending.

Please sign up to the Smart Green Communities Program to receive further updates on current funds available. E-mail: communities@rethinkgreen.ca

7.3 Community involvement

(7.3.1) The following document entitled "Sustainable and Inclusive Communities in Latin America" is a report that identifies FCM and CISAL's project experience working with 17 local governments in mining regions of Colombia and Peru. The tools, practices and examples outlined in this report can be used in your own municipality to promote effective governance and inclusive development.

https://data.fcm.ca/documents/reports/International/sustainable-and-inclusive-communities-in-latin-america-cisal.pdf

(7.3.2) The following text provides a summary of the key points raised within the document:

The values and principles of good practice are:

- Local government leadership
- Transparency and accountability
- Stakeholder engagement
- Gender equity
- Sustainable development

(7.3.3) 5 strategies for sustainable and inclusive development

1. Creating multi-stakeholder dialogue tables
    - Coordinated efforts between government, organizations and local communities are essential to ensure that all parties work towards the same goal.
    - Multi-stakeholder dialogue tables promote governance, strengthen citizen engagement, strengthen transparency and accountability, build relationships, and trust among different stakeholders plus foster the creation of a long-term vision for development.
2. Promote political and economic empowerment of women.
    - To ensure sustainable development, a project's framework approach needs to be inclusive with social, political, and economic opportunities that allow women to fulfill their full potential as equal members of society.
    - While this is more relevant in the case study of Peru and Latin America, the same emphasis needs to be considered in respect of Northern Ontario's minority BIPOC (black, indigenous and people of colour) population.
    - Creating inclusive environments can involve women and BIPOC in decision-making spaces, consulting them about their needs and priorities and enabling access to political and public participation of all equal members of society.
3. Local Economic Development (LED)
    - LED is a participatory development process that fosters collaboration agreements between public and private actors in a territory, and developing a strategy based on local resources and businesses to create jobs and stimulate economic activity.
    - It involves local government leadership to encourage a culture of LED planning, identifies benefits for all stakeholders in a community, and values the importance of small to medium-sized businesses.

4. Managing Funds [to promote local economic development]

    - Providing a funding framework in the local region differs on what each community may need support on. The general structure and principle of creating a fund is to ensure that there is a local approach, gender equity, capacity building, and demonstrate local leadership plus key funding needs and opportunities.
    - In this report, the CISAL Fund was developed based on best practices of other funds by FCM. The CISAL Fund has a fund management committee that calls for individuals or collective businesses to submit a proposal on projects that would align with sustainable development goals of the plan. The goal of this is to create jobs, bridge gaps on local needs and improve opportunities for local business and entrepreneurs.

5. Strengthening local [community associations]

    - For the context of the REEP, importance should be brought upon the strengthening of local community associations such as Manitoulin Streams, Manitoulin Nature Club and other groups that represent the interest of the residents in the community. This ensures that the voice of local community champions and leaders are heard and to create an approach that offers effective services to meet local needs. As a result, municipalities can provide better resources, capacities and tools for residents and community groups to encourage more partnerships in the community.

7.4 Ongoing Progress Tracking

(7.4.1) Yearly energy use and emissions data tracking in relation to both a corporate and community inventory is essential to monitoring progress and is the first step towards achieving GHG reductions.

(7.4.2) Municipalities can use the Partners for Climate Protection (PCP) Tool to track corporate inventories for yearly energy usage and associated emissions. Using PCP's five milestones, municipalities can progress through each stage in terms of creating a plan to achieve emissions reduction targets and monitor current baseline emissions, plus identify where larger-scale emissions can be reduced.

The five milestones consist of the following:

- Milestone One: Creating a Baseline Emissions Inventory and Forecast
- Milestone Two: Setting Emissions Reduction Targets
- Milestone Three: Developing a Local Action Plan
- Milestone Four: Implementing the Local Action Plan; and
- Milestone Five: Monitoring Progress and Reporting Results

A personal carbon emissions calculator can be found at: https://www.gbbr.ca/carbon-calculator/

(7.4.3) This is a 15-minute survey that allows homeowners, seasonal residents, and businesses to calculate GHG emissions arising from their buildings, vehicles, and waste. Users can calculate their GHG emissions by inputting their building's energy use, the types of vehicles owned, the distance driven, and the amount of monthly garbage produced. It also includes the use of recreational vehicles.

(7.4.4) Once complete, users have the option of having their results emailed to them, showing how they compared to the average Canadian and Ontarian. Businesses can also calculate their GHG emissions by entering similar data.

7.5 Updating the REEP

The current REEP is considered valid for a period of five years and should be revisited in advance of the next specified date to ensure continued progress.

8.0 Appendices

Appendix A: Transportation on the North Shore

Appendix A-1: North Shore Provincial Highway Vehicle Kilometer Travelled Strategy

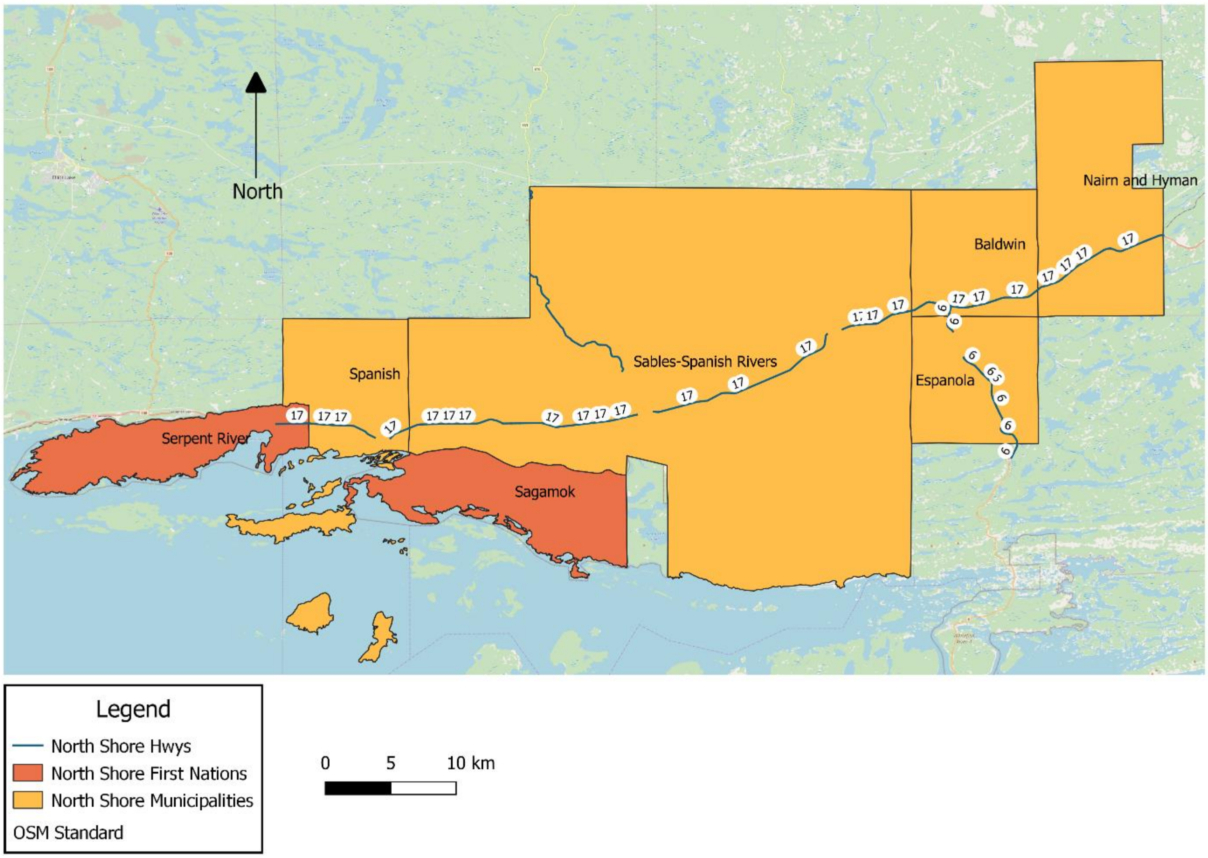

Figure 40: Map of North Shore's Major Highway Roads

Purpose: To calculate the total vehicle kilometers travelled within the North Shore Communities in a year.

Method: Apply Ministry of Transportation data to calculate an estimate as to how many kilometers have been travelled in an average year on highways within the North Shore Communities.

Step 1: Create map and road network on GIS software.

- Apply 2016 census tract shapefiles.
- Road network shapefile 2016 (Statistics Canada)

Step 2: Identify major highway roads on North Shore

- Highway 6
- Highway 17
- Highway 538
- Highway 553

Step 3: Look up each highway Annual Average Daily Traffic (AADT) Count

- Record the distance of each road segment and AADT count from the MTO website*
- Multiply the AADT number by 365 to produce the yearly traffic count data.
- Calculate the total to produce the whole regional provincial highway traffic count.

*The MTO website provides an estimated total. To ensure complete accuracy, counting stations would need to be introduced on every highway and operated daily.

Definitions:

AADT: The Annual Average Daily Traffic defined as the average Twenty-Four Hour, two-way traffic for the period January 1st to December 31st, 2016.[56]

NOTES[1]:

(a) The reported data includes "estimated values". Since traffic volumes are not static, direct field measurements are accurate only for the time of the count. Also, the size of the Provincial Highway network makes it impractical to measure each section annually. Thus, approximately one third of the reported sections are counted each year. The following three methods of measuring traffic volumes are employed:

1. Permanent Counting Stations: At designated locations across the Province counts are taken for each hour of the year.

2. Inventory Counting Stations: Each unique volume section has a set location where traffic volumes are sampled on a cyclical basis by season and year.

3. Request Counting Stations: Traffic volumes are measured at random locations as necessary to address operational and/or planning concerns. Using the available traffic volume information and historical trends, estimates are made for each highway section.

(b) The abbreviation "N/A" (Not Available) refers to a new volume section or where no data is available. Data for these sections should be available in future publications once collected.

(c) There may be some missing or incorrect traffic sections and distances due to highway realignment, highway transfers, renumbering, or sections which have been recently built.

Main Highways:

Below is a list of major highways which traverse the North Shore Communities as obtained from the Ministry of Transportation. The Annual Average Daily Traffic (ADDT) Count is recorded for each section of Highway. In this context, calculations were produced to determine the total

[56] *Provincial Highways, Traffic Volumes 2016*. Ministry of Transportation https://www.library.mto.gov.on.ca/SydneyPLUS/TechPubs/Portal/tp/tvSplash.aspx

amount of emissions arising from traffic. A detailed explanation and calculations are provided below for reference:

Note: Some highway segments do not have data from the Ministry of Transportation, therefore the total number of vehicle journeys made is understood to be greater than the amount calculated here. In addition, many of these segments comprise major routes which enable commuters to access a range of destinations beyond the North Shore Communities. Therefore, the amount of traffic in total may include residents passing through the North Shore to reach another destination (beyond the studied area).

HWY 6

Name (Location From)	Location to:	Road Distance (km):	Annual Average Daily Traffic (ADDT):
LITTLE CURRENT N LTS -	END OF NA MANITOULIN-SUDBURY DIST BDY	23.9	3,200
MANITOULIN-SUDBURY DIST BDY FOSTER DR-	ESPANOLA S LTS - START OF NA	20.6	3,900
FOSTER DR-ESPANOLA S LTS - START OF NA	TUDHOPE ST(E) SHEPPARD ST(W) - END OF NA	3.8	
TUDHOPE ST(E) SHEPPARD ST(W) -	END OF NA HWY 17 - HWY END	2.6	8,500

HWY 17

Name (Location From)	Location to:	Road Distance (km):	Annual Average Daily Traffic (ADDT):
FAIRBANKS LAKE RD (N) DEN/LOU RD (S)	SMITH ST(S)HWY 7082(N)	18.1	8,400
SMITH ST(S)HWY 7082(N)	HWY 6(TO ESPANOLA)	16.1	9,850
HWY 6(TO ESPANOLA)	WEBBWOOD E LTS	7.9	6,650
WEBBWOOD E LTS	AUX SABLE R BR	17.2	6,000
AUX SABLE R BR	SEC HWY 553-IMPERIAL ST-MASSEY	0.5	6,950
SEC HWY 553-IMPERIAL ST-MASSEY	MASSEY W LTS	11.4	5,700
MASSEY W LTS	JOHN ST- SPANISH TRUNK RD (S)	9.9	4,900
JOHN ST- SPANISH TRUNK RD (S)	IMPERIAL RD-CUTLER	11.2	4,750
IMPERIAL RD-CUTLER	HWY 108-ELLIOT LAKE RD	7.2	5,050

HWY 108-ELLIOT LAKE RD	E JCT SEC HWY 538	14.5	4,100
E JCT SEC HWY 538	W JCT SEC HWY 538 (S)	4.8	4,650
W JCT SEC HWY 538 (S)	BLIND RIVER E LTS - START OF NA	8.6	4,650
BLIND RIVER E LTS -	START OF NA BLIND RIVER W LTS - END OF NA	4	
BLIND RIVER W LTS - END OF NA	DEAN LAKE RD	16.9	4,050

HWY 538

Name (Location From)	Location to:	Road Distance (km):	Annual Average Daily Traffic (ADDT):
538 E JCT HWY 17	MIRANDA BLVD (N)	4.6	60
MIRANDA BLVD (N)	W JCT HWY 17 - HWY END	0.8	150

HWY 553

Name (Location From)	Location to:	Road Distance (km):	Annual Average Daily Traffic (ADDT):
HWY 17-MASSEY - START OF NA	1.5 KM N OF HWY 17 - END OF NA	1.5	0
1.5 KM N OF HWY 17 -	END OF NA TERTIARY RD 810 - HWY END	31.7	40

Table 7: Total North Shore HWY Annual Traffic Count

Total North Shore Hwy Annual Average Daily Traffic (ADDT)	91,550 vehicles
Annual Average Traffic Count (AATC)	33,415,750 vehicles
Total Distance Travelled (km) Annually on NS Hwys	380,941,010 kilometers
Grams of Emissions from Total km Travelled on NS Hwys	95,616,193,510 g CO2e
Converted Grams of emissions to Tonnes	95,616 tonnes CO2e

Calculation:

<u>Annual Average Traffic Count (AATC)</u> = Annual Average Daily Traffic (ADDT) * 365

- Take the Annual Average Daily Traffic Count (AADT) and multiply it by 365 (days in one year) to get the Annual Average Traffic Count (AATC)

- In one year, the total Annual Average Traffic Count (AATC) is 33,415,750 on North Shore major highway roads.

$$Total\ vehicles\ per\ km\ on\ MI\ Hwy\ =\ AATC\ /\ Road\ Distance\ (km)$$

- To calculate the total number of vehicles in a year per km of road on the North Shore Communities' highways, take the Annual Average Traffic Count (AATC) and divide by the Road Distance (km)

- For each kilometer of major highway in the North Shore Communities there is an average of 939,000 vehicles in a year

$$Total\ distance\ travelled\ annually\ on\ MI\ Hwy\ =\ Road\ Distance\ (km)\ *\ AADT$$

- In order to calculate the total distance travelled annually in the North Shore Communities major highways, it is important to take the road distance of each highway section and multiply it by the annual average traffic count.

- In approximately one year, the total distance travelled annually on highways within the North Shore Communities is estimated to be approximately 380,941,010 kilometers.

$$Total\ vehicles\ in\ this\ segment\ of\ road\ annual\ average\ *\ 251\ =\ emissions\ in\ grams$$

- The average passenger vehicle emits about 251gCO2/km (Canada)[57]

- It is therefore important to convert grams to tonnes. Dividing the amount by 1000000 = the equivalent amount of tonnes of CO2e.

Figure 41: The official road map of Ontario - Map #12: Wawa, Timmins, Kirkland Lake, New Liskeard, North Bay, Sudbury, Elliot Lake, Sault Ste. Marie[58]

[57] *Greenhouse Gas Emissions from a Typical Passenger Vehicle, United States Environmental Protection Agency.* https://www.epa.gov/greenvehicles/greenhouse-gas-emissions-typical-passenger-vehicle
[58] *The Official Road Map of Ontario,* Ministry of Transportation. http://www.mto.gov.on.ca/english/publications/official-road-map/pdfs/map-12.pdf

Appendix A-2: Fuel Consumption on the North Shore Calculation

Purpose: To calculate an estimate of how much fuel residents in North Shore Communities are using.

Method: Apply Statistics Canada data and the 2016 Census Data to produce an estimate of how much fuel residents within the North Shore Communities are using.

Data sources:

Statistics Canada: "Sales of fuel used for road motor vehicles, annual" [59]

Census Data: 2016 Census Profile[60]

Definitions[61]:

- "Net sales of gasoline" (road grade),
- "Net sales of diesel oil" (road), and
- "Net sales of liquefied petroleum gas" represent sales on which taxes were remitted at road-use rates minus sales previously reported at road-use tax rates on which taxes were totally or partially refunded.

The above calculations represent sales on which taxes are remitted at road-use rates minus the sales previously reported at road-use tax rates on which taxes were totally or partially refunded.

- The "Gross sales of gasoline" represents the total sales of all road grades of gasoline, including off-road activities such as farming, forestry, construction, and mining.

In order to calculate the Ontario average of fuel purchased per person in 2016, it is necessary to take the Population of Ontario (13,448,494) and divide by the known Sales of Fuel used for Road Motor Vehicles in 2016. Example: Net gasoline amount in Litres (16,622,835) divided by the Population of Ontario (13,448,494) = 1.24L

In order to calculate the fuel purchased within the North Shore Communities in one year, it is necessary to take the 'Fuel purchased per person in Ontario in 2016' and multiply by the total population of the North Shore Communities in 2016.

[59] Table: 23-10-0066-01, *Sales of Fuel used for Motor Vehicles, Annual,* Statistics Canada, 2020 https://www150.statcan.gc.ca/t1/tbl1/en/tv.action?pid=2310006601andpickMembers%5B0%5D=1.7

[60] *Census Profile, 2016 Census, Ontario [Province] and Canada [Country],* Statistics Canada, 2019 https://www12.statcan.gc.ca/census-recensement/2016/dp-pd/prof/details/page.cfm?Lang=EandGeo1=PRandCode1=35andGeo2=PRandCode2=01andData=CountandSearchText=35andSearchType=BeginsandSearchPR=01andB1=AllandCustom=andTABID=3

[61] https://www150.statcan.gc.ca/t1/tbl1/en/tv.action?pid=2310006601andpickMembers%5B0%5D=1.7

Appendix A-2.1: Ontario Average of Fuel Purchased per Person in 2016

Population of Ontario in 2016: 13,448,494

Table 8: Fuel used per person in Ontario

	Net gasoline (Litres)	**Gross Gasoline (Litres)**	**Net Diesel (Litres)**	**Net Petroleum (Litres)**
Sales of Fuel (Litres) Used for Road Motor Vehicles (2016)	16,622,835	16,891,060	5,459,048	64,175
Fuel Purchased per Person in Ontario in Litres (2016)	1.24	1.26	0.41	0.0047

Appendix A-2.2 North Shore's Average Fuel Purchased in 2016

In order to calculate the fuel purchased in the North Shore Communities in one year, it is necessary to take the 'Fuel purchased per person in Ontario in 2016' and multiply by the total population of the North Shore Communities in 2016.

Population of North Shore in 2016: 40,821

$$Net\ gasoline\ for\ \text{North Shore in Litres (50,618)} \\ = \text{Net Gasoline per person in Ontario) } 1.24 * \text{(Population of North Shore) } 40{,}821$$

Table 9: Fuel Used on North Shore based on Population

	Net gasoline (Litres)	**Gross Gasoline (Litres)**	**Net Diesel (Litres)**	**Net Petroleum (Litres)**
Fuel Usage per Person in Ontario in Litres (2016)	1.24	1.26	0.41	0.0048
Sales of Fuel Used on North Shore for Road Motor Vehicles 2016	50,618	51,434	16,737	196

Appendix A-2.3: Calculating Emissions Associated with Fuel Usage:

In reference to data obtained from Natural Resources Canada: *Emissions from your vehicle* fact sheet, it has been calculated that gasoline engines produce 2.3kg of CO2e per Litre of gasoline consumed, and that Diesel engines produce 2.7 kg of CO2e per Litre of diesel fuel consumed[62].

Emission factors for petroleum have also been determined in reference to dates provided by the Environmental Protection Agency (EPA[63]) which indicates approximately 10.29 kg CO2e per gallon.

When converted to KG of CO_2e per Litre, it is identified that Petroleum emits about 2.7 kg of CO_2e per Litre used.

The final step involves taking the sale of fuel used in the North Shore Communities for Road Motor Vehicles, multiplied by the emissions per Litre of fuel, and a conversion of the KG amounts of CO_2e to Tonnes of CO_2e.

In this regard, the final numbers are determined as follows:

Table 10: Emissions from Fuel Usage

Fuel Usage	Amounts (Litres)	Emission Factor (kg/Litre)	kg of CO2e	Converted Tonnes of CO2e
Net Gasoline Usage on NS	50618.04	2.3	116421.49	116.421492
Gross Gasoline Usage on NS	51,434	2.3	118298.20	118.2982
Net Diesel Usage on NS	16737.00	2.7	45189.90	45.1899
Net Petroleum usage on NS	196	2.7	529.20	0.5292

[62] *Auto$mart Learn the Facts: Emissions from your Vehicle,* Natural Resources Canada, 2014. https://www.nrcan.gc.ca/sites/www.nrcan.gc.ca/files/oee/pdf/transportation/fuel-efficient-technologies/autosmart_factsheet_9_e.pdf
[63] *Emission Factors for Greenhouse Gas Inventories,* Environmental Protection Agency, 2014. https://www.epa.gov/sites/production/files/2015-07/documents/emission-factors_2014.pdf

Appendix B: Municipal Energy Use and Emissions

Purpose: To identify municipal energy use and emissions from 2011 to 2016.

Method: Using Ontario Public Sector data to graph out yearly energy and emissions through calculations of emission factors of fuel sources.

Data Required:

- National Inventory Report Parts 1, 2 and 3
- Ontario Public Sector data

Step 1: Introduce public sector data reported by year, and filter by municipality, compiling these for the North Shore.

Step 2: Calculate energy usage by introducing a National Inventory Report for electricity, fuel oil and propane.

Step 3: Calculate emissions by introducing a National Inventory report for emission factors for electricity, fuel oil and propane.

Example of energy consumption calculation in Gigajoules in 2016[64]

Table 11: Reference Approach Energy Conversion and Emissions Factor for Canada

Table A4–2 **Reference Approach Energy Conversion and Emission Factors for Canada**

Fuel Types			Energy Conversion Factor, GCV			Carbon Emission Factor—2017 Value (t C/TJ GCV)	Reference	Oxidation Factors	Comments
			2017 Value	Unit	Reference				
Liquid	**Primary Fuels**	Crude Oil	39.3	TJ/ML	See Comments	18.94	Refer to Comments	1.0	Weighted energy conversion and emission factor are based on country-specific data.
		Ethane	17.22	TJ/ML	4	15.46	2	1.0	Total available ethane is consumed as a feedstock in industrial processes.
		Orimulsion	NA	–	–	NA	–	1.0	
		Natural Gas Liquids	25.31	TJ/ML	–	16.33	–	1.0	Propane and butane from natural gas liquids.
	Secondary Fuels	Bitumen	44.46	TJ/ML	4	21.11	3	1.0	Use of asphalt.
		Gas/Diesel Oil	38.35	TJ/ML	4	19.07	2	1.0	Use of diesel fuel oil.
		Gasoline	33.45	TJ/ML	4	18.81	2	1.0	
		Jet Kerosene	37.4	TJ/ML	4	18.67	2	1.0	Use of aviation turbo fuel.
		Liquefied Petroleum Gases (LPG)	27.13	TJ/ML	4	16.59	2	1.0	Country-specific weighted factors for propane and butane from petroleum refineries.
		Lubricants	39.16	TJ/ML	4	19.66	3	1.0	
		Naphtha	35.17	TJ/ML	4	19.33	3	1.0	
		Other Kerosene	37.68	TJ/ML	4	18.53	2	1.0	
		Other Oil	38.8	TJ/ML	4	19.15	2	1.0	Use of light fuel oil.
		Petroleum Coke	44.41	TJ/ML	4	22.76	4	1.0	Country-specific weighted emission factors based on available emission factors for refining and upgrading (of oil sands to synthetic crude oil).
		Refinery Feedstocks	35.17	TJ/ML	4	19.33	3	1.0	Use of petrochemical feedstock in industrial processes
		Residual Fuel Oil	42.5	TJ/ML	4	20.26	2	1.0	Use of heavy fuel oil.
		Shale Oil	NA	–	–	NA	–	–	
		Still Gas	39.50	TJ/ML	4	14.93	4	1.0	Country-specific weighted emission factor based on factors from refinery and from upgrading (of crude from oil sands to synthetic crude oil) activities.
	Other Liquid Fuels	Aviation Gasoline	33.52	TJ/ML	4	19.25	3	1.0	
		Other Product Feedstocks	39.82	TJ/ML	4	19.84	3	1.0	
Solid	**Primary Fuels**	Anthracite	27.7	TJ/kt	4	23.45	3	0.988	
		Other Bituminous Coal	28.37	TJ/kt	4	20.94	5	0.988	Use of Canadian bituminous coal
		Sub-bituminous Coal	18.37	TJ/kt	4	25.99	5	0.994	
		Lignite	16.29	TJ/kt	4	24.24	5	0.995	
		Oil Shale	NA	–	–	NA	–	–	
		Peat	NA	–	–	NA	–	–	
	Secondary Fuels	Coke	28.83	TJ/kt	4	30.02	2	1.0	Previously reported as Coking Coal.
		BKB & Patent Fuel	NA	–	–	NA	–	–	
		Coke Oven Gas	19.14	TJ/GL	4	12.52	2	–	
	Other Solid Fuels	Foreign Bituminous Coal	29.82	TJ/kt	4	23.47	5	1.0	
Gaseous	**Primary Fuels**	Natural Gas	40.14	TJ/GL	4	13.48	2	1.0	Country-specific weighted emission factor based on proportion of marketable and non-marketable natural gas.
Biomass		Municipal Solid Waste	–	–	1	24.36	1	1.0	1) Consists of biomass combustion, for energy purposes, at landfills.
		Solid Biomass	18	TJ/kt	4	18.44	3	1.0	1) Consists of industrial and residential biomass consumption.
		Liquid Biomass	16.31	TJ/kt	4	18.82	3	1.0	1) Consists of spent pulping liquor, ethanol and biodiesel.
		Gas Biomass	36.35	TJ/Gl	1	13.54	1	1.0	1) Consists of methane from landfill gas.

Notes:

References: (1) IPCC (2006); (2) McCann (2000); (3) Jaques (1992); (4) Statistics Canada, #57-003 (2015 data); (5) Environment Canada, 2016.

NA = Not applicable; BKB = Charcoal briquettes; NGL = natural gas liquids; LPG = liquified petroleum gas.

64 Page 204, Table A4-2 Reference Approach Energy Conversion and Emission Factors for Canada, National Inventory Report 1990-2017, Part 2.

Fuel Oil

Applying the energy conversion factor for crude oil in 'Primary Fuels' section, use 39.3TJ/ML = 39MJ/L to calculate total energy used for fuel oil. Finally, convert to gigajoules by dividing 1000.

Fuel Oil (L)	Multiplying Factor	Total Energy (MJ)	Total Energy (GJ)
2016	MJ/L	2016	MJ/1000
6007	39.3	234,273	234.25

Propane

Applying the energy conversion factor for natural gas liquids 'Primary Fuels' section, use 25.31TJ/ML = 25.3MJ/L to calculate total energy used for propane. Finally, convert the unit to gigajoules by dividing 1000.

Propane (L)	Multiplying Factor	Total Energy (MJ) = Propane L*Multiplying Factor	Total Energy (GJ)= Total Energy (MJ)/1000
2016	MJ/L	2016	MJ/1000
7,595	25.3	176,963.5	176.96

Electricity

1 kWh = 3.6MJ = 0.0036GJ

1/0.0036GJ = a factor of 227.778

1GJ = 227.778 kWh

Applying the electricity consumption amount and divide by the electricity factor to get the total amount of energy used in gigajoules.

Electricity (kWh)	Electricity Factor	Total Energy (GJ)
2016	kWh	kWh / factor
28,956	277.78	104.24

Example of calculating GHG emissions in 2016:

National Inventory Report Part 1: IPCC Global Warming Potentials (GWPs)

> *"The global warming potential (GWP) of a GHG considers both the instantaneous radiative forcing due to an incremental concentration increase and the lifetime of the gas. It is a relative measure of the warming effect that the emission of a radiative gas (i.e., a GHG) might have on the surface atmosphere.*
>
> *The concept of a GWP has been developed to allow some comparison of the ability of each GHG to trap heat in the atmosphere relative to CO_2e. It also allows characterization of GHG emissions in terms of how much CO_2e would be required to produce a similar warming effect over a given time-period. This is called the carbon dioxide equivalent (CO_2e) value and is calculated by multiplying the amount of the gas by its associated*

GWP. This normalization to CO2 eq enables the quantification of "total national emissions" expressed as CO_2e."

Table 12: IPCC Global Warming Potentials (GWPs) [65]

Table 1–1 **IPCC Global Warming Potentials (GWPs)**

GHG	Formula	100-Year GWP[1]	Atmospheric Lifetime (years)
Carbon Dioxide	CO_2	1	Variable
Methane[2]	CH_4	25	12 ± 1.8
Nitrous Oxide	N_2O	298	114
Sulphur Hexafluoride	SF_6	22 800	3 200
Nitrogen Trifluoride	NF_3	17 200	740
Hydrofluorocarbons (HFCs)			
HFC-23	CHF_3	14 800	270
HFC-32	CH_2F_2	675	4.9
HFC-41	CH_3F	92	2.4
HFC-43-10mee	$CF_3CHFCHFCF_2CF_3$	1 640	15.9
HFC-125	CHF_2CF_3	3 500	29
HFC-134	CHF_2CHF_2	1 100	9.6
HFC-134a	CH_2FCF_3	1 430	14
HFC-143	CH_2FCHF_2	353	3.5
HFC-143a	CH_3CF_3	4 470	52
HFC-152	CH_2FCH_2F	53	0.60
HFC-152a	CH_3CHF_2	124	1.4
HFC-161	CH_3CH_2F	12	0.3
HFC-227ea	CF_3CHFCF_3	3 220	34.2
HFC-236cb	$CH_2FCF_2CF_3$	1 340	13.6
HFC-236ea	CHF_2CHFCF_3	1 370	10.7
HFC-236fa	$CF_3CH_2CF_3$	9 810	240
HFC-245ca	$CH_2FCF_2CHF_2$	693	6.2
HFC-245fa	$CHF_2CH_2CF_3$	1 030	7.6
HFC-365mfc	$CH_3CF_2CH_2CF_3$	794	8.6
Perfluorocarbons (PFCs)			
Perfluoromethane	CF_4	7 390	50 000
Perfluoroethane	C_2F_6	12 200	10 000
Perfluoropropane	C_3F_8	8 830	2 600
Perfluorobutane	C_4F_{10}	8 860	2 600
Perfluorocyclobutane	$c\text{-}C_4F_8$	10 300	3 200
Perfluoropentane	C_5F_{12}	9 160	4 100
Perfluorohexane	C_6F_{14}	9 300	3 200
Perfluorodecalin	$C_{10}F_{18}$	7 500	1 000
Perfluorocyclopropane	$c\text{-}C_3F_6$	17 340	1 000

Notes:
1. Data source: IPCC's *Fourth Assessment Report—Errata* (IPCC 2012).
2. The GWP for methane includes indirect effects from enhancements of ozone and stratospheric water vapour.

"For example, the 100-year GWP for methane (CH4) used in this inventory is 25; as such, an emission of one hundred kilotonnes (100 KT) of methane is equivalent to 25 x 100 KT = 2500 KTCO_2e eq."

[65] Page 17, *Section 1.1.3 Global Warming Potentials*, National Inventory Report 1990-2017, Part 1

Table 13: Emission Factors for Refined Petroleum Products

Table A6–4 **Emission Factors for Refined Petroleum Products**

Source	Emission Factor (g/L)		
	CO_2[1]	CH_4[2]	N_2O[2]
Light Fuel Oil			
Electric Utilities	2 753	0.18	0.031
Industrial	2 753	0.006	0.031
Producer Consumption	2 670	0.006	0.031
Residential	2 753	0.026	0.006
Forestry, Construction, Public Administration and Commercial/Institutional	2 753	0.026	0.031
Heavy Fuel Oil			
Electric Utilities	3 156	0.034	0.064
Industrial	3 156	0.12	0.064
Producer Consumption	3 190	0.12	0.064
Residential, Forestry, Construction, Public Administration and Commercial/Institutional	3 156	0.057	0.064
Kerosene			
Electric Utilities	2 560[3]	0.006	0.031
Industrial	2 560[3]	0.006	0.031
Producer Consumption	2 560[3]	0.006	0.031
Residential	2 560[3]	0.026	0.006
Forestry, Construction, Public Administration and Commercial/Institutional	2 560[3]	0.026	0.031
Diesel—Refineries and Others	**2 681[4]**	**0.133**	**0.4**
Diesel—Upgraders[5]	**2 681**	**0.151**	**1.10**
Petroleum Coke	**(see Table A6-5)**	**0.12**	**(see Table A6-6)**
Still Gas—Refineries and Others	**(see Table A6-5)**	**(see Table A6-7)**	**0.00002**
Still Gas—Upgraders	**(see Table A6-5)**	**0.0389**	**0.00002**
Motor Gasoline[5]	**2 307**	**0.100**	**0.02**

Notes:
1. McCann (2000); except Kerosene, Diesel and Motor Gasoline
2. SGA Energy (2000); except Diesel—Upgraders and Motor Gasoline
3. Assumed McCann (2000) aviation turbo-fuel emission factor
4. ECCC (2017b)
5. CO_2 from ECCC (2017b); CH_4 and N_2O adapted from IPCC (2006)

Fuel Oil

To calculate the total GHG emissions of fuel oil in grams of CO_2e, it is necessary to apply Table 11: Emission Factors for Refined Petroleum Products in the section '*Light Fuel Oil'* – Residential.

Take Fuel Oil amount in Litres, multiply by the multiplying factors, and add each value.

$$6049982\text{g CO2e} = (2191 * 2753) + 25 * (2191 * 0.26) + 298 * (2191 * 0.006)$$

Convert to Tonnes of CO_2e equivalent and divide by 1,000,000.

$$6.05\text{t CO2e} = 6049982/1000000$$

Fuel Oil (L)	GWP for Fuel Oil CO_2e	GWP for Methane = 25	GWP for Nitrous Oxide = 298	Total Emissions (g CO_2e)	Total Emissions (tCO2e)
2016	**CO_2e g/L *1**	**CH4*25**	**N2O*298**	**2016**	**(gCO2e)/1,000,000**
2191	2753	0.026	0.006		6.05

Propane

Table 14: Emission Factors for Natural Gas Liquids[66]

Table A6–3 **Emission Factors for Natural Gas Liquids**

Source	Emission Factor (g/L)		
	CO_2	CH_4	N_2O
Propane			
Residential	1 515[1]	0.027[2]	0.108[2]
All Other Uses	1 515[1]	0.024[2]	0.108[2]
Ethane	986[1]	0.024[2]	0.108[2]
Butane	1 747[1]	0.024[2]	0.108[2]

Notes:
1. McCann (2000)
2. SGA Energy (2000)

To calculate the total emissions in grams of CO_2e, it is necessary to determine the propane amount in Litres, and multiply by the multiplying factors and add each value.

$$2640647.45g\ CO2e\ =\ (1706*1515)+25*(1706*0.027)+298*(1706*0.108)$$

Convert to tonnes of CO_2e, and divide by 1,000,000:

$$2.64t\ CO2e\ =\ 2640647.45/1000000$$

Propane (L)	**GWP for Propane CO_2e**	**GWP for Methane = 25**	**GWP for Nitrous Oxide = 298**	**Total Emissions (gCO2e)**	**Total Emissions (tCO2e)**
2016	**CO_2e *1**	**CH4*25**	**N2O*298**	**2016**	**(gCO2e)/1,000,000**
1706	1515	0.027	0.108	2640647.45	2.64

[66] Page 221, *Table A6-3 Emission Factors for Natural Gas Liquids,* National Inventory Report 1990-2017 Part 2

Electricity

Table 15: Electricity Generation and GHG Emission Details for Ontario[67]

Table A13-7 **Electricity Generation and GHG Emission Details for Ontario**[1]

	1990	2000	2005	2012	2013	2014	2015	2016	2017[2]
	Greenhouse Gas Emissions[3]								
	kt CO_2 equivalent								
Combustion	**25 800**	**44 200**	**35 400**	**14 300**	**10 300**	**6 030**	**6 250**	**5 540**	**2 530**
Coal	24 700	38 800	29 000	4 390	3 150	100	–	–	–
Natural Gas	8	4 930	6 210	9 800	7 040	5 810	6 170	5 420	2 380
Other Fuels[4]	1 160	475	182	68	60	130	80	120	140
Other Emissions[5]	–	**0.77**	**1.4**	–	–	–	–	–	–
Overall Total[6,7]	**25 800**	**44 200**	**35 400**	**14 300**	**10 300**	**6 030**	**6 250**	**5 540**	**2 530**
	Electricity Generation[8,9]								
	GWh								
Combustion[10]	**29 200**	**52 200**	**40 900**	**22 400**	**17 500**	**15 600**	**15 900**	**13 700**	**6 800**
Coal	27 800	40 800	29 400	4 100	2 850	80	–	–	–
Natural Gas	3.18	10 200	10 000	17 600	13 900	14 700	15 300	12 800	5 900
Other Fuels	1 430	1 140	1 440	703	722	778	640	908	867
Nuclear	**59 400**	**59 800**	**78 000**	**84 900**	**93 100**	**96 200**	**91 800**	**90 900**	**90 600**
Hydro	**38 700**	**36 600**	**34 600**	**33 000**	**36 900**	**38 200**	**34 800**	**34 900**	**39 500**
Other Renewables[11]	–	**1.22**	**26.0**	**4 320**	**4 240**	**3 660**	**12 240**	**11 870**	**10 740**
Other Generation[12,13]	–	–	–	–	–	–	–	–	–
Overall Total[7]	**127 000**	**149 000**	**153 000**	**149 000**	**155 000**	**154 000**	**155 000**	**151 000**	**148 000**
	Greenhouse Gas Intensity[14]								
	g GHG / kWh electricity generated								
CO_2 intensity (g CO_2 / kWh)	200	300	230	95	65	39	40	36	17
CH_4 intensity (g CH_4 / kWh)	0.002	0.01	0.01	0.02	0.01	0.01	0.01	0.01	0.0
N_2O intensity (g N_2O / kWh)	0.003	0.005	0.004	0.002	0.002	0.001	0.001	0.001	0.001
Generation Intensity (g CO_2 eq / kWh)[7]	**200**	**300**	**230**	**96**	**66**	**39**	**40**	**37**	**17**
Unallocated Energy (GWh)[15,16]	10 000	12 000	12 000	14 000	20 000	9 000	6 000	13 000	14 000
SF_6 Emissions (kt CO_2 eq)[17]	76	75	50	56	64	43	56	62	56
Consumption Intensity (g CO_2 eq / kWh)[18]	**220**	**320**	**250**	**110**	**80**	**40**	**40**	**40**	**20**

Notes:

1. Data presented include emissions, generation and intensity for facilities classified under NAICS code 22111 – Electric Power Generation.
2. Preliminary data.
3. Emissions based on data taken from the *Report on Energy Supply-Demand in Canada*, Catalogue No. 57-003-XIB, Statistics Canada.
4. Includes GHG emissions from the combustion of refined petroleum products (light fuel oil, heavy fuel oil, and diesel), petroleum coke, still gas and other fuels not easily categorized.
5. GHG emissions from on-site combustion of fuel not directly related to electricity generation.
6. GHG emissions from the flooding of land for hydro dams are not included.
7. Totals may not add up to overall total due to rounding.
8. Taken from StatCan Data Tables 25-10-0019-01 and 25-10-0020-01 (2005–2017).
9. Taken from the *Electric Power Generation, Transmission and Distribution* (EPGTD) publication, Catalogue No. 57-202-XIB, Statistics Canada (for 1990–2004).
10. From 2014 onward, this includes the electricity generated from the by-product steam associated with the fuel combustion. Prior to 2014, it was not possible to break this data into the original fuel source, so it was included in Other Generation.
11. Other Renewables – includes electricity generation by wind, tidal and solar.
12. NAICS category 221119, Other Electric Power Generation.
13. Prior to 2014, this includes electricity generation from steam from waste heat. From 2014 onward, electricity generation from steam from waste heat is reported as part of its original fuel source.
14. Intensity values have been rounded so as to present the estimated level of accuracy.
15. Adapted from StatCan Data Table 25–10-0021-001 (2005–2017) or Cat. No. 57-202-XIB (1990–2004).
16. Includes transmission line losses, metering differences and other losses.
17. The electric utility sector's share of emissions from electrical equipment from CRF Category 2.F.viii (Production and Consumption of Halocarbons and SF_6).
18. Consumption intensity values are impacted by unallocated energy and SF_6 transmission emissions.

– Indicates no emissions or no electricity generation

0 Indicates emissions or electricity generation value less than 0.1

x Indicates data not shown due to statistical limitations

* For years where unallocated energy data was not available, values were interpolated

[67] Page 65, Table A13-7: Electricity Generation and GHG Emission Details for Ontario, National Inventory Report 1990-2017, Part 3

To calculate the total emissions of electricity in grams of CO_2e, it is necessary to identify the amount of electricity in kWh and multiply amount of electricity used by the factor of 40.

$$1158240g\ CO2e\ =\ 28956 * 40$$

To convert grams of CO2e to tonnes of CO2e, divide by 1,000,000.

$$1.16t\ CO2e\ =\ 1158240/1000000$$

Electricity (kWh)	Multiplying Factor	Total Emissions (gCO2e)	Total Emissions (tCO2e)
2016	**Emissions per kWh in 2016**	**2016**	**(gCO2e)/1,000,000**
28,956	40	1,158,240	1.16

Municipal energy use and emissions data are taken from public sector reporting based on 'Energy use and greenhouse gas emissions for the Broader Public Sector'(BPS) page on the Government of Ontario website.[68]

Under O. Reg. 507/18 BPS organizations are required to:

1. Report annually to the Ministry of Energy, Northern Development and Mines on their energy use and greenhouse gas (GHG) emissions and publish the reports on their websites (as of July 1, 2013).
2. Develop a five-year conservation plan and publish the plan on their websites. Plans must be updated every five years (as of July 1, 2014).

"Missing or incorrect data is the sole responsibility of the BPS (Broader Public Sector) organization. The ministry has attempted to remove duplicate data from this data set to improve data integrity."

Since the regulation came into effect in 2013, any data from previous years (2011 and 2012) might not be collected accurately. This could be that during the collection process, the municipality had to go back to previous energy files from the past few years to get this information.

There are data gaps, and the uncertainty of data quality may affect the overall outcome of carbon accounting and baseline calculations. Since this regulation is not strictly enforced by the government, there has been little to no consequences when yearly energy use data is reported, or when this information is updated within the 5-year Conservation and Energy Demand Management (CDM) Plans. As a result, public sources of data only continue up until 2016 and any data from 2017 and 2018 is available through municipal websites or can be requested from the municipal administration.

With any data estimation, it is important to be mindful there are discrepancies and gaps which the Smart Green Communities Team may not be able to fully account for, as the methodology of data collection was not explained. Instead, Smart Green Communities has aimed to utilize the most

[68] *Energy use and Greenhouse Gas Emissions for the Broader Public Sector,* Government of Ontario, 2020. https://www.ontario.ca/data/energy-use-and-greenhouse-gas-emissions-broader-public-sector

up-to-date and credible sources of data to ensure accurate calculations and methods based upon which conclusions were drawn.

Appendix B-1: Energy and Emissions Mapping Methodology

Purpose: To create an energy and emissions map for the North Shore as per the project deliverables.

Method: Using Ontario Public Sector data to graph out emissions for each municipal building within a municipality in the North Shore region.

What's Required:

- Ontario Public Sector data
- Mapping software (QGIS)

Step 1: Using the data that has been processed for *Municipal Energy Use and Emissions* in Appendix B, combine GHG emissions data for each municipal building from 2011 to 2016.

Step 2: Using QGIS software, create a map with each municipal building as points on the map.

Step 3: Display GHG emissions with graduated symbol with gradient colours to show light colours as lower emission buildings and darker colours as higher emission buildings.

The dataset is broken down by 4 classes to show different levels of emissions.

Symbol	GHG Emissions in TCo2
White Dot	0 – 53
Light pink dot	53 – 161
Dark pink dot	161 – 323
Red	323 – 704

This is automatically generated by the QGIS software when choosing the mode of class breaks as 'Natural Breaks (Jenks)'.

Natural Breaks method is a data classification method that arranges a set of values into "natural" classes which is the most optimal range of class range found naturally in a dataset. In the Natural Break method, the classes have equal interval breaks of value between each class. It reduces the differences between data values in the same class but maximizes the difference between classes. Natural breaks include almost equal values between each class. It is a better approach to illustrate the spatial pattern more effectively as they are more equal and evenly spread out.

Appendix C: Community Household Energy and Emissions Calculation

Purpose: To view an estimate of community energy and emissions usage for household heating sources.

Method: The user of the tool inputs household census data to receive an estimate of community energy use and emissions for household heating and secondary energy sources.

The calculation of energy use and emissions includes a series of formulas and conversions that will be explained in further detail below.

Data Used:

- Statistics Canada – Ontario Census Profile 2016, Topic: Housing
- Natural Resources Canada – National Energy Use Database
- Energy conversion tables – Canada Energy Regular
- Units and Conversions Fact Sheet – Massachusetts Institute of Technology
- Heating with Gas – Natural Resources Canada

How to use the tool:

Required data for input: Ontario Census Profile 2016, in the housing section (see below), Total Occupied Private Dwellings by Period of Construction

Census Profile, 2016 Census

Espanola, Town [Census subdivision], Ontario and Ontario [Province]

Topic: Housing Counts Rates Submit Related data

Characteristic	Espanola, T Ontario [Census subdivision] Total	Male	Female	Ontario [Province] Total	Male	Female
	Counts (unless otherwise specified)					
Household characteristics						
Total - Occupied private dwellings by period of construction - 25% sample data 138	2,190	...	...	5,169,175	...	...
1960 or before	905	...	...	1,293,135	...	...
1961 to 1980	960	...	...	1,449,585	...	...
1981 to 1990	175	...	...	709,135	...	...
1991 to 2000	85	...	...	622,565	...	...
2001 to 2005	25	...	...	396,130	...	...
2006 to 2010	40	...	...	368,235	...	...
2011 to 2016 137	10	...	...	330,390	...	...

Total – Occupied Private Dwellings by Period of Construction, Census Profile, 2016 Census – Espanola [Census Subdivision], and Ontario [Province][69]

[69] Census Profile, Espanola, Ontario https://www12.statcan.gc.ca/census-recensement/2016/dp-pd/prof/details/page.cfm?Lang=EandGeo1=CSDandCode1=3552026andGeo2=PRandCode2=35andSearchText=espanolaandSearchType=BeginsandSearchPR=01andB1=HousingandTABID=1andtype=0

For example, using Espanola's 2016 Census Data, the total occupied private dwellings by period of construction can be seen above:

Using the census tract's Total Occupied Private Dwellings by Period of Construction, input the following numbers (905, 960, 175, 85, 25, 40, 10) into this tool. It will conduct a background calculation of the total energy usage and emissions for different types of home-based heating systems.

Year Built	No of Households Built by Year (Census Tract Data)
1960 or before	905
1961 to 1980	960
1981 to 1990	175
1991 to 2000	85
2001 to 2005	25
2006 to 2010	40
2011 to 2016	10
Total	2200

Types of Fuel	Percentage of households that use fuel sources
Electricity	65.00%
Fuel Oil	20.00%
Propane	10.00%
Wood	5.00%
Total	100.00%

Numbers can be changed based on how your community's household heating types are distributed.

Consolidated Outputs | Inputs | Outputs | Energy Calcs | HouseHold Calcs

Inputting the numbers into the tool

Type	Fuel Oil [L]	Hydro [kWh]	Propane [L]	Wood [kG]	Fuel Oil [tonne CO2]	Hydro [tonnes CO2]	Propane [tonnes CO2]	Wood [tonnes CO2]	Lighting (Electricity) (kWh)	Cooling (Electricity)	Appliances (Electricity)	Appliances (Natural Gas)(GJ)	Lighting (Electricity) (Tonnes of CO2)	Cooling (Tonnes of CO2)	Appliances (Tonnes of CO2)	Appliances (Natural Gas) (Tonnes of CO2)	Total Emissions (TCO2e)
Total Output Energy Usage	5366226	13116645	1502584	1608946	14826.00	564.30	2325.90	3421.30	2016668.28	3255529.98	6922672.2	12320	86.716736	139.99	297.6749	440	**22101.88**
Category	Energy Consumption				Emissions				Energy				Emissions				
	Home Heating								Non-Home Heating								

Outputted energy usage and emissions for Espanola's 2016 Census Data, for both Home Heating and secondary energy *sources*

Appendix C-1: Explanation of Household Heating Calculations:

The spreadsheet has multiple tabs, which is how the background calculation is conducted to create the output amounts. The tabs are input, output, energy calculations, household calculations, fuel use calculations and emissions calculations. The following sections provide explanations for each tab within the spreadsheet:

Energy Calculations:

This tab is the basis of how energy use and emissions for community home heating is calculated.

To determine the values in the section '*Thermal Requirements per Household'*, the 2016 data from Natural Resources Canada: *Gross Output Thermal Requirements for Single Detached Home*[70] was used. This will help determine how much energy is used per household vintage, while matching the timeline of census data household built year.

Table 16: Gross Output Thermal Requirements for Single Detached by Building Type and Vintage

	1990		2015	2016	2017
Gross Output Thermal Requirements for Single Detached (GJ/household)					
Before 1946	137.2		160.1	160.1	160.1
1946–1960	86.7		100.0	100.0	100.0
1961–1977	88.3		91.6	91.6	91.6
1978–1983	85.0		90.3	90.3	90.3
1984–1995	72.7		82.1	82.1	82.1
1996–2000	0.0		65.4	65.4	65.4
2001–2005	0.0		67.9	67.9	67.9
2006–2010	0.0		65.4	65.4	65.4
2011–2015	0.0		66.4	66.4	66.4
2016–2017	0.0		0.0	67.5	67.5

70 *Table 32: Gross Output Thermal Requirements for Single Detached homes*, Natural Resources Canada, 2015-2017 http://oee.nrcan.gc.ca/corporate/statistics/neud/dpa/showTable.cfm?type=CPandsector=resandjuris=onandrn=32andpage=0

Census Data Timeline	NRCan Timeline
1960 or before	Before 1946
1961 to 1980	1946 to 1960
1981 to 1990	1961 to 1977
1991 to 2000	1978 to 1983
2001 to 2005	1984 to 1995
2011 to 2016	1996 to 2000
	2001 to 2005
	2006 to 2010
	2011 to 2015
	2016 to 2017

In matching the NRCan Timeline with the Census Data timeline it is necessary to determine the Gross Output Thermal Requirements for Single Detached homes. As such, the following calculations were made:

First, the number of years between each timeline were identified. By, taking the energy required for each household timeline, an average was determined.

For example: assuming the oldest house was constructed in 1926, the average Gigajoule of energy used for houses built between 1926 and 1946 has been calculated to be 160 GJ /Household.

For houses built between1946 and1960 the average Gigajoule of energy used is understood to be 100GJ/Household.

Assuming an equal number of houses were built within each timeframe, the following calculation was produced:

$$\frac{160 * 20 \ + \ 100 * 14}{34} = 135.2941$$

For the 20-year period between 1926 and 1946, the amount of energy required per household was calculated to be 160. For the 14 years between 1946 and 1960 the energy required was calculated as 100 GJ/household.

It was therefore necessary to draw an average between these two timeframes, and this resulted in the estimated GJ/Household for the timeline between 1926 and 1946 as being: 135.29 GJ/Household.

Table 17: *Energy output for single detached homes with timelines that match the Census Tract Data 'Occupied private Dwellings by period of construction.'*

Household Built Year	GJ/Household
1960 or before	135.29
1961 to 1980	90.95
1981 to 1990	86.2
1991 to 2000	73.75
2001 to 2005	67.9
2006 to 2010	65.4
2011 to 2016	66.4

The next section calculates the efficiency factors for each energy source in the tab 'Energy Calculations'. In reference to the publication entitled *Heating with Gas* document[71], as produced by Natural Resources Canada, the following efficiencies are applied:

- 62% efficiency is assumed for a propane fired heating system.
- 78% efficiency is assumed for a heating oil fired heating system.
- Close to 100% efficiency is assumed for electrically powered heating systems.
- 50% efficiency is assumed for wood heating systems.

Energy efficiency is the ratio of input energy to the system in comparison to the useful energy at the end use. In the case of home heating, this represents the ratio of useful energy obtained to heat the home over the input fuels.

A 62% efficiency for propane means that for every 100GJ inputted to the system, 62GJ of useful heating energy will be generated. Hence, if the required energy inside the home is known, the required input of energy can be calculated by using the inverse of the efficiency.

For example: if you know you need 100GJ of heating energy, with a 50% efficiency of the system, you will require 200GJ of input energy.

$$100 * (1/0.5) = 100 * (2) = 200GJ$$

The following calculations and conversions were performed to determine the amount of energy needed in each fuel source per gigajoule of energy, using the energy density values cited by the Canadian Energy Regulator (CER) [72]

[71] *Heating with Gas*, Natural Resources Canada, 2012. https://www.nrcan.gc.ca/sites/www.nrcan.gc.ca/files/energy/pdf/energystar/Heating_With_Gas.pdf

[72] *Energy Conversion Tables, Canada Energy Regulator*, Government of Canada https://apps.cer-rec.gc.ca/Conversion/conversion-tables.aspx?GoCTemplateCulture=en-CA#s1ss2

1 m^3 = 1000 L

1GJ = 1000MJ

Table 18: Conversion factor for energy types

Fuel Source	Energy Density	Conversion
Heating Oil	36.72 GJ/m^3	(Inverse) 0.02723 m^3/GJ or 27.23 L/GJ
Electricity	1 kWh = 3.6 MJ	1 GJ = 277.778kWh
Propane	25.53 GJ/m^3	(Inverse) 0.03916m^3/GJ or 39.16 L/GJ
Wood	15 MJ/Kg	(Inverse) 0.06667 kg/MJ or 66.67 kg/GJ

To calculate energy expenditure based on energy consumption and efficiency factors, we used the amount of energy needed in each fuel source per gigajoule, multiplied by 100 and divided by the efficiency factor.

$$Fuel\ Oil\ 27.23\ L/GJ\ *100/\ efficiency\ factor\ (78\%)\ =\ 34.91L/GJ$$

Introducing the calculated household requirement of energy based on period of construction, one can calculate the required input of energy required to heat the household.

The follwing formula identifies how:

$$Quanity\ of\ Fuel\ required\ per\ household\ \left(\frac{Kg}{household}\ or\ \frac{L}{household}\right)$$
$$= Household\ Energy\ Requirement\left(\frac{GJ}{household}\right)$$
$$*\ Inverse\ Energy\ Density\left(\frac{Kg}{GJ}\ or\ \frac{L}{GJ}\right) * \frac{1}{energy\ efficiency\ of\ system}$$

Fuel Oil (L) /HH	Hydro (kWh) / hh	Propane (L) / hh	Wood (kg) / hh
4474.976923	37583.562	10568.8548	16532.438
3008.346154	25265.91	7105.014	11114.09
2851.230769	23946.36	6733.944	10533.64
2439.423077	20487.75	5761.35	9012.25
2245.923077	18862.62	5304.348	8297.38
2163.230769	18168.12	5109.048	7991.88
2196.307692	18445.92	5187.168	8114.08

From the tab 'Energy Calcs'

Household Calculations

This section breaks down the number of households that use electricity, fuel oil, propane, or wood for heating. It also introduces the energy expenditure per household in gigajoules (NRCan) and matches the timeframes specified within the 2016 Census Tract and other date provided by NRCan.

The calculation produced is the average amount of gigajoules per household between each timeline per period of construction. The calculation assumes the oldest house was constructed in 1926, and that there is an even distribution of houses per year in each of those timelines.

- The next calculation involves taking the number of households from the input sheet and breaking it down by the percentage of homes heated by electric, fuel oil, propane, and wood, which is 65%, 20%, 10% and 5% respectively.
  - This number was based on community observations and an estimation of how home heating is being distributed throughout the North Shore Communities.

Household Built Year	GJ/Household	No. of Households (from Input Sheet)	0.65	0.2	0.1	0.05
1960 or before	135.29	50	33	10	5	3
1961 to 1980	90.95	60	39	12	6	3
1981 to 1990	86.2	30	20	6	3	2
1991 to 2000	73.75	30	20	6	3	2
2001 to 2005	67.9	15	10	3	2	1
2006 to 2010	65.4	25	17	5	3	2
2011 to 2016	66.4	10	7	2	1	1

- For example: there are 60 houses that were built between the timelines of 1961 to 1980. Applying the percentage of houses that use the different type of fuel source (65% electricity, 20% fuel oil, 10% propane and 5% wood) it is estimated that of the 60 houses built between 1961 and 1980, 39 use electric home heating, 12 use fuel oil, 6 use propane heating and 3 using wood.

'Fuel Use' Calculations:

- To get this calculation, it is necessary to apply numbers contained within the 'Energy Calculations' Tab in the section *'Estimated amount of energy used per household'* and multiply it by the estimated number of households in the 'Household Calculations' Tab. This determines the total amount of energy needed per household. In other words, these calculations are tied between each tab within the sheets.
- For example: To calculate the estimated amount of energy used per household in each timeframe, it is necessary to multiply this figure by the number of households that use the different types of fuel from the tab 'Household Calcs' to get the amount of heating source used for the number of houses inputted. This total will be displayed in the output tab for energy consumption based on how many houses were inputted.

House Built Year	Fuel Oil Use (L)	Hydro Use (kWh)	Propane Use(L)	Wood Use(kg)
1960 or before	147674	375836	52844	49597
1961 to 1980	117326	303191	42630	33342
1981 to 1990	57025	143678	20202	21067
1991 to 2000	48788	122927	17284	18025
2001 to 2005	22459	56588	10609	8297
2006 to 2010	36775	90841	15327	15984
2011 to 2016	15374	36892	5187	8114
TOTAL	445421	1129953	164083	154426

'Fuel Use' Tab

Type	Fuel Oil [L]	Hydro [kWh]	Propane [L]	Wood [kG]
Total Output Energy Usage	445421	1129953	164083	154426
Category	Energy Consumption			

What it shows on the 'output tab'

Emissions Calculations:

This section calculates the amount of emissions the community would emit based on home heating. It takes into consideration emission factors arising from fuel oil, hydro, propane, and wood.

- The emission factors are from the **Ontario Public Service Guidance Document for Quantifying Projected and Actual GHG Emission Reductions, 2017**
- To calculate the amount of CO_2e in tonnes that each housing vintage emits, it is necessary to multiply the emission factor by the energy used per household in the 'Fuel Use' tab.

Type of Fuel	CO_2	CH4	N2O	Total Emissions	Converted to Tonnes of CO_2e
Light Fuel Oil(L)	2,753	0.006	0.031	2762.388 g/L	0.002762388
Propane (L)	1,515	0.024	0.108	1547.784 g/L	0.001547784
Wood (Kg)	1,900	7.284	0.148	2126.204 g/kg	0.002126204
Hydro (kWh)	43			43 g/kWh	0.000043

Appendix C-2: Explanation of Secondary Energy Calculations

This section calculates the average household secondary energy use and emissions, separated by sections of lighting, appliances, and cooling.

Lighting

Residential Sector
Ontario[1]
Table 3: Lighting Secondary Energy Use and GHG Emissions

	1990		2015	2016	2017
Total Lighting Energy Use[2] (PJ)	19.8		19.7	17.6	17.7
Activity					
Total Households (thousands)	3,632.5		5,250.0	5,322.0	5,403.0
Energy Intensity (GJ/household)	5.5		3.8	3.3	3.3
Total Lighting GHG Emissions Excluding Electricity[2] (Mt of CO2e)	–		–	–	–
Heat Loss (PJ)	7.7		7.9	6.8	7.1

Table 19: Lighting Secondary Energy Use and GHG Emissions[73]

Using the number ‘Energy Intensity (GJ/Household)’ amount, the average household usage of lighting in amounts and emissions can be calculated by incorporating the numbers inputted by the user.

Average Household Energy Use in Ontario = 3.3GJ/Household

[73] *Table 3: Lighting Secondary Energy Use and GHG Emissions,* Natural Resources Canada. https://oee.nrcan.gc.ca/corporate/statistics/neud/dpa/showTable.cfm?type=CPandsector=resandjuris=onandrn=3andpage=0

Home Cooling

	1990		2015	2016	2017
Total Space Cooling Energy Use[2] (PJ)	**7.8**		**20.0**	**28.4**	**18.7**
Energy Use by Cooling System Type (PJ)					
Room	1.8		1.3	1.7	1.0
Central	6.1		18.7	26.7	17.6
Shares (%)					
Room	22.8		6.5	6.1	5.6
Central	77.2		93.5	93.9	94.4
Activity					
Cooled Floor Space (million m^2)	196.6		600.5	615.5	631.6
Energy Intensity (MJ/m^2)	**39.9**		**33.3**	**46.1**	**29.6**
Total Space Cooling GHG Emissions Excluding Electricity[2] (Mt of CO2e)	–		–	–	–
Cooling Degree-Day Index	**1.05**		**1.36**	**2.09**	**1.36**

Table 20: Space Cooling Secondary Energy Use and GHG Emissions by Cooling System Type[74]

Home cooling is broken down by cooling system type, and floor space. For this calculation, the total number of households in Ontario was determined through the Census Data, which was 5,322,000 households. By taking the 'Cooled Floor Space' in square meters, divided by the number of total households in Ontario, we get the average household area.

Table 20 also provides the energy intensity in Megajoule per square meter. Taking the average household area in square meters and multiplying the energy intensity to get the average household energy use in MJ/Household. Since all the calculations are in gigajoules, the final number was divided by 1000 to convert to GJ. Therefore, the average household energy use is determined to be 5.327 GJ / Household.

[74] *Table 4: Space Cooling Secondary Energy Use and GHG Emissions by Cooling System Type,* Natural Resources Canada. https://oee.nrcan.gc.ca/corporate/statistics/neud/dpa/showTable.cfm?type=CPandsector=resandjuris=onandrn=4andpage=0

Appliances

Residential Sector
Ontario[1]
Table 12: Appliance Secondary Energy Use and GHG Emissions by Energy Source

	1990	2015	2016	2017
Total Appliance Energy Use (PJ)	**66.6**	**69.7**	**64.0**	**65.1**
Energy Use by Energy Source (PJ)				
Electricity	64.7	65.7	60.4	61.6
Natural Gas	1.9	4.0	3.6	3.5
Shares (%)				
Electricity	97.1	94.3	94.4	94.6
Natural Gas	2.9	5.7	5.6	5.4
Activity				
Total Households (thousands)	3,632.5	5,250.0	5,322.0	5,403.0
Energy Intensity (GJ/household)	**18.3**	**13.3**	**12.0**	**12.0**
Total Appliance GHG Emissions Excluding Electricity (Mt of CO2e)	**0.1**	**0.2**	**0.2**	**0.2**
GHG Emissions by Energy Source (Mt of CO2e)				
Electricity	–	–	–	–
Natural Gas	0.1	0.2	0.2	0.2
GHG Intensity (tonne/TJ)	**1.4**	**2.8**	**2.7**	**2.6**

Table 21: Appliance Secondary Energy Use and GHG Emissions by Energy Source[75]

To calculate energy usage and emissions for appliances, Natural Resources Canada has broken down appliances as 94.4% electric and 5.6% natural gas. With this, the energy intensity amount (GJ/Household) is multiplied by the percentage of electricity (94.4%), and the total electricity in GJ used per household is estimated as being approximately 11.328 GJ.

On this basis, it is important to use the energy intensity amount (GJ/Household) and multiply by the percentage of electricity (94.4%). This indicates that the total electricity used in GJ per household is approximately 11.328 GJ. Using the same calculation for natural gas, it appears that approximately 0.67 GJ of natural gas is used per household. When applying the data to calculate

[75] *Table 12: Appliance Secondary Energy Use and GHG Emissions by Energy Source*, Natural Resources Canada.
https://oee.nrcan.gc.ca/corporate/statistics/neud/dpa/showTable.cfm?type=CPandsector=resandjuris=onandrn=12andpage=0

the total electricity and natural gas usage per household, the spreadsheet calculates how much energy household appliances have used through the input of user data.

<u>Calculating Consumption of Fuel Oil / Propane per Person</u>

Using the 'output' tab from the *Community Energy and Emissions Calculation Tool*, the value for <u>Fuel Oil (L)</u> and <u>Propane (L)</u> was used to calculate the consumption of fuel oil / propane per person.

A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R
Type	Fuel Oil [L]	Hydro [kWh]	Propane [L]	Wood [kG]	Fuel Oil [tonne CO2]	Hydro [tonnes CO2]	Propane [tonnes CO2]	Wood [tonnes CO2]	Lighting (Electricity) (kWh)	Cooling (Electricity)	Appliances (Electricity)	Appliances (Natural Gas) (GJ)	Lighting (Electricity) (Tonnes of CO2)	Cooling (Tonnes of CO2)	Appliances (Tonnes of CO2)	Appliances (Natural Gas) (Tonnes of CO2)	Total Emissions (TCO2e)
Total Output Energy Usage	470108	1129953	132663	168506	1303.00	48.90	205.60	358.60	201666.828	325553.00	692267.2205	1232	8.6716736	14.00	29.7674905	44	2012.54
Category	Energy Consumption				Emissions				Energy				Emissions				
	Home Heating								Non-Home Heating								

Using 'Fuel Oil (L)' from home-heating, divide it by the population of each municipality, township or First Nations community, and the fuel oil consumption per person in litres is calculated.

Using 'Propane (L)' from home-heating, divide it by the population of each municipality, township or First Nation community and the propane consumption per person in litres is calculated.

<u>Calculating Emission Intensity per Person</u>

Using the 'output' tab from the tool, the value for <u>Total Emissions</u> was calculated. This number represents the total estimated amount of emissions from home-heating and secondary energy sources.

A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R
Type	Fuel Oil [L]	Hydro [kWh]	Propane [L]	Wood [kG]	Fuel Oil [tonne CO2]	Hydro [tonnes CO2]	Propane [tonnes CO2]	Wood [tonnes CO2]	Lighting (Electricity) (kWh)	Cooling (Electricity)	Appliances (Electricity)	Appliances (Natural Gas) (GJ)	Lighting (Electricity) (Tonnes of CO2)	Cooling (Tonnes of CO2)	Appliances (Tonnes of CO2)	Appliances (Natural Gas) (Tonnes of CO2)	Total Emissions (TCO2e)
Total Output Energy Usage	470108	1129953	132663	168506	1303.00	48.90	205.60	358.60	201666.828	325553.00	692267.2205	1232	8.6716736	14.00	29.7674905	44	2012.54
Category	Energy Consumption				Emissions				Energy				Emissions				
	Home Heating								Non-Home Heating								

To calculate the emissions intensity per person, the population of each municipality, township and First Nations community was identified through the Ontario 2016 Census Tract.

Using the total estimated amount of emissions from home-heating and secondary energy sources, divide it by the population of each municipality, township or First Nation community and the emissions intensity per person is calculated.

Appendix D: Report of Consultation

Please refer to the separate standalone Report of Consultation which provides further details regarding the stakeholder and community engagement which took place throughout the process of producing this REEP.

9.0 Resources

9.1 Public Engagement

This section includes all the tools, techniques, and resources which the Smart Green Communities Team utilized in order effectively engage citizens in affected municipal, township and First Nation communities within the North Shore REEP study area. It summarizes the steps taken, and the thoughts and opinions of individuals interviewed, plus the actions they plan on taking (or would consider taking) to reduce their own emissions.

9.1.1 Survey (May 2019)

Below is a survey that Smart Green Communities conducted to understand individual participant's energy actions and how municipalities can better support citizens in supporting their actions. Survey responses are summarized in the following section for reference:

Smart Green Communities

rethink green Solutions for a Sustainable Sudbury

Community/Business Energy Survey

1. What actions are you or your business already taking? (Check all that apply)

☐ Lighting improvements	☐ Changing Energy Star rated appliances	☐ Adding insulation	☐ Switch to an electric vehicle
☐ Adjusting temperature by a few degrees to use less energy	☐ Replacing hot water system with more efficient one	☐ Install a geothermal heating system	☐ Replacing windows and doors with more efficient one
☐ Programmable thermostat	☐ Install weather stripping	☐ Install solar panels	☐ Other:

2. What actions do you anticipate taking in the future? (Rank 1 for top priority and 3 for least priority)

☐ Upgrade lightbulbs with CFLs or LEDs	☐ Install rooftop solar panels/geothermal heat pump	☐ Replace/seal leaky doors/windows	☐ Switch to an electric vehicle	☐ Upgrade inefficient appliances
☐ Install programmable thermostat	☐ Conduct an energy audit	☐ Install wall insulation	☐ Develop action plan for upgrades	☐ Other:

3. What motivates your actions? (Check all that apply)

☐ GHG Emissions	☐ Adopt renewable energy	☐ Job creation
☐ Effects of the changing climate	☐ Government policies	☐ Reach new markets
☐ Energy Costs	☐ Economic growth	☐ Other:

4. What challenges do you face, or anticipate facing, in taking action? (Choose top 3)

☐ Building owned/operated by others	☐ Lack of human resources to do improvements	☐ Return on investment is small/doubtful
☐ Lack of Time	☐ Lack of support/programs/info	☐ Energy not a priority
☐ Cost	☐ Lack of education/awareness	☐ Other:

5. How can your municipality/band help support your actions?

☐ Lead by example	☐ Share best practices/raise awareness	☐ Facilitate partnerships with businesses/communities
☐ Provide information/training	☐ Updating city by-laws or building codes or developing policies	☐ Other:

9.1.2 Massey Fair Report (August 2019)

Massey Fair is an annual event that is held by Massey Agricultural Society and occurs in August of each year. The fair offers activities such as: cattle show, horse shows, competitions, live entertainment, craft exhibits, a mid-way carnival, vendor booths, food concessions, demolition derbies and more. The fair is one of the largest and longest running fairs in Northern Ontario. On average, the local fair draws between 10,000-12,000 people. The Smart Green Communities Team attended this event in partnership with the Township of Sables-Spanish Rivers on August 23rd - 25th, 2019.

The Smart Green Communities Team attended Massey Fair on the following dates / times:

- **Friday, August 23, 2019** - 12pm – 7:30pm, 9 people engaged
- **Saturday, August 24, 2019** - 11am – 6:30pm, 32 people engaged
- **Sunday, August 25, 2019** - 10am – 4pm, 14 people engaged

In total 45 people were engaged. with 80% of these identified as being from the Township of Sables-Spanish.

Processes involved:

Attraction

First, to help attract people to the booth, a raffle prize which included a solar-powered lantern was offered as an incentive to all participants who provided responses to the survey.

Interaction

Upon accessing the booth, guests were presented with a summary of the Conservation Demand Management Plan and associated data. Generalized conversations were held on this subject; however, none of the participating individuals expressed an interest in receiving follow up information regarding the Energy Demand Management plan and associated data.

Participation

A tabletop activity was produced, as part of which, participants were asked to place stickers in response to two questions: The top 4 responses are also identified per question as follows:

1. **What are you doing to reduce your energy demands and reduce emissions?**
    - Purchasing and re-purposing second-hand items
    - Washing laundry in cold-water instead of hot
    - Upgrading lightbulbs to CFLs / LEDs
    - Turning lights off wherever possible
2. **What should we as a community do?**
    - Increase the protection of green spaces and/or water bodies.
    - Lobby “higher orders” of government to bring about change.
    - Reduce our individual / household energy use.
    - Make it easier to walk and cycle within our communities, and further afield.

<u>Analysis</u>

From the responses given, the Smart Green Communities Team was able to draw the following conclusions:

Most changes identified by individuals and households are behavioural, reflecting a general desire to do “something”; but also, indicating there is a long way to go in terms of identifying and sharing some (of the many) best practice measures we all can introduce to reduce our collective impact on the environment.

The two consistent themes from these events were that people / businesses are motivated to reduce energy with the goal of reducing operating costs. To reduce operating costs, behavioural change is necessary - followed by low-cost improvements (such as switching to LED lights).

Costs are also recognized as a barrier for people to undertake more impactful actions such as purchasing an Electric vehicle, implementing building upgrades, or installing solar panels.

The second factor driving the demand to reduce GHG emissions is to mitigate climate change impacts. Individuals and businesses reported that the best way for municipalities or communities to be involved is to *‘lead by example, share best practices, and support education and training’.*

The survey indicated that educational material and/or information sessions which highlight positive behaviours exhibited by others could be well received. Such an information and awareness campaign should not only be accessible to, but easily understood by people of all ages and income levels.

Despite this, and having reflected on this experience, the Smart Green Communities Team is largely of the impression that attendees, including families, were mainly seeking other forms of entertainment on that weekend, and were not necessarily primed to receive a tutorial on energy efficiency levels, greenhouse gas emissions, and broader climate-science.

The above comments are made in recognition that we, as a society, still have a long way to go in order to improve our awareness of (and access to) the most accurate and up-to-date information sources. Access to such information is key to influencing public opinion and associated behaviors when it comes to environmental sustainability issues.

The consultation exercise also speaks to the need to advertise the availability of public information sessions clearly and consistently, so the public can gain a more solid understanding of the importance of energy demand management and conservation issues in general.

The implementation of such measures is considered necessary to not only change perspectives but encourage the development of strategies and plans which support the development of sustainable communities.

9.1.3 Interactive Activity to Engage Your Stakeholders

An activity for smaller Canadian municipalities and communities to guide and engage conversations with stakeholders and community members for consultation purposes.

This will help municipal staff to understand current priorities in the community to help develop a plan that benefits the community and local businesses.

Municipalities play a crucial and important role in local energy transitions but cannot achieve their energy and sustainability goals alone.

A successful community energy plan and its subsequent implementation relies on active and engaged community stakeholders. One of the first principles of community engagement is getting the public involved early and often.

Many municipalities find it challenging to engage communities on local energy plans. These challenges fall into the follow broad categories:

> A) Municipalities struggle to **inform** communities about the actions they are already taking to reduce energy use, cut down emissions, and save on costs.
>
> B) Municipalities struggle to **consult** with communities to identify community priorities and to get their input on actions which municipalities can take regarding energy sustainability.
>
> C) Municipalities struggle to **collaborate** with communities - working together on a shared purpose to tackle energy sustainability beyond individual efforts.

The difficulty of getting the public to know what the municipality is doing proves to be a barrier in getting people involved, and municipalities often do not know what communities' priorities are.

Public meetings and consultations can sometimes go “off-topic” making it harder to translate that information into doable actions for the community.

In addition, surveys are often seen as old-fashioned and perhaps a mundane task which individuals are not always motivated to participate in.

To help mitigate these challenges, reThink Green’s Smart Green Communities program developed a way to harness useful feedback from community members.

Background: A poster that is 8ft by 6ft, a large-scale interactive activity poster that asks questions related to community energy planning. Attendees can put stickers on each block as they feel applicable to them. The back of each block has Velcro stickers which allow flexible surveys based on different event environments and purposes.

Purpose: Create an interactive activity that surveys community members and garners their actions and opinions. Questions asked can be changed based on survey needs to develop local

Figure 42: Event Photo from Massey Fair

sustainability priorities and targets. The data acquired from this activity can be taken back to the municipality and community and be used as part of the consultation process in community planning.

Usage: To use in public meetings, townhall meetings and community events

Process: Depending on how professional you want it to look, you can create a printed canvas-material poster of this activity that can be taken to different public meetings for multiple uses OR use flip charts to create a basic version of this.

Cost: Basic version (Poster board and printed blocks) designated for one / two uses: ~$5

Professional version (Printed poster board through professional printing places, and printed blocks) Designated for multiple usages. (Prints provided by Hia media)

<u>Steps to coming up with content for activity</u>

1. **Gather resources.**
   - Look at your municipality's energy conservation demand management plan (CDM), strategic plan and asset management plan.
   - Summarize the points that would be useful to present to your attendees (community members)
2. **Identify Blocks**
   - Ask yourself, if you were a citizen in this municipality, what would you identify as potential priority items to address for a municipality?
   - Identify action items from municipal plans and write them out into blocks.
   - Use levers from the 'basket of ideas' (populated from Smart Green Communities of what other communities are doing)

- **Example:** Making it easier to walk and cycle in the community, developing renewable energy sources, reducing energy bill costs, involving citizens in the consultation process, leading by example, sharing best practices, and supporting education and training

3. **Come up with three main questions that encourage conversation:**

- Think in the context of:
  - you (as an individual)
  - we (as a community); and
  - all (as a municipality to support).
- What have you done so far, what would you/your community like to do? What can your municipality do to support this?

Examples of questions to ask:

- What has your municipality done so far? (Provide information on yearly data, action plans and ongoing projects)
- What have you done so far in energy efficiency in your home?

- What can you encourage others to do?
- What should we, as a community do?
- What can the municipality do to help support this?
- What actions do you prioritize that the municipality should focus on?
- How will you engage other community members to be involved?

4. Creating blocks

- Conducting the research:
  - What are other communities that are similar to yours already doing?
  - What is achievable in your current capacity?
  - What is part of your strategic plan / energy plan for the upcoming years that would be applicable to the community level?

5. Implementation of Interactive activity at Stakeholder Meetings

- **Materials needed:** Facilitator, dot stickers, camera, post-it notes, pen and paper.
  - Ask participants to review materials of current plans (such as conservation and demand energy plan, graphs, visual data, etc.)
  - The third method is to have pre-printed blocks and questions and give people dot stickers to put on the blocks as they feel is most relevant to them (see below picture for reference)

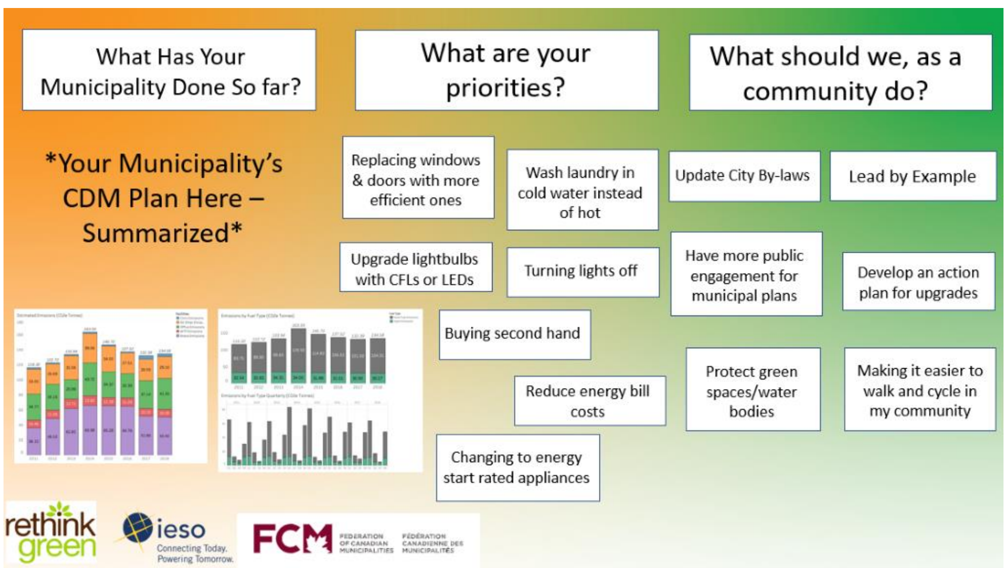

Figure 43: Example of activity layout