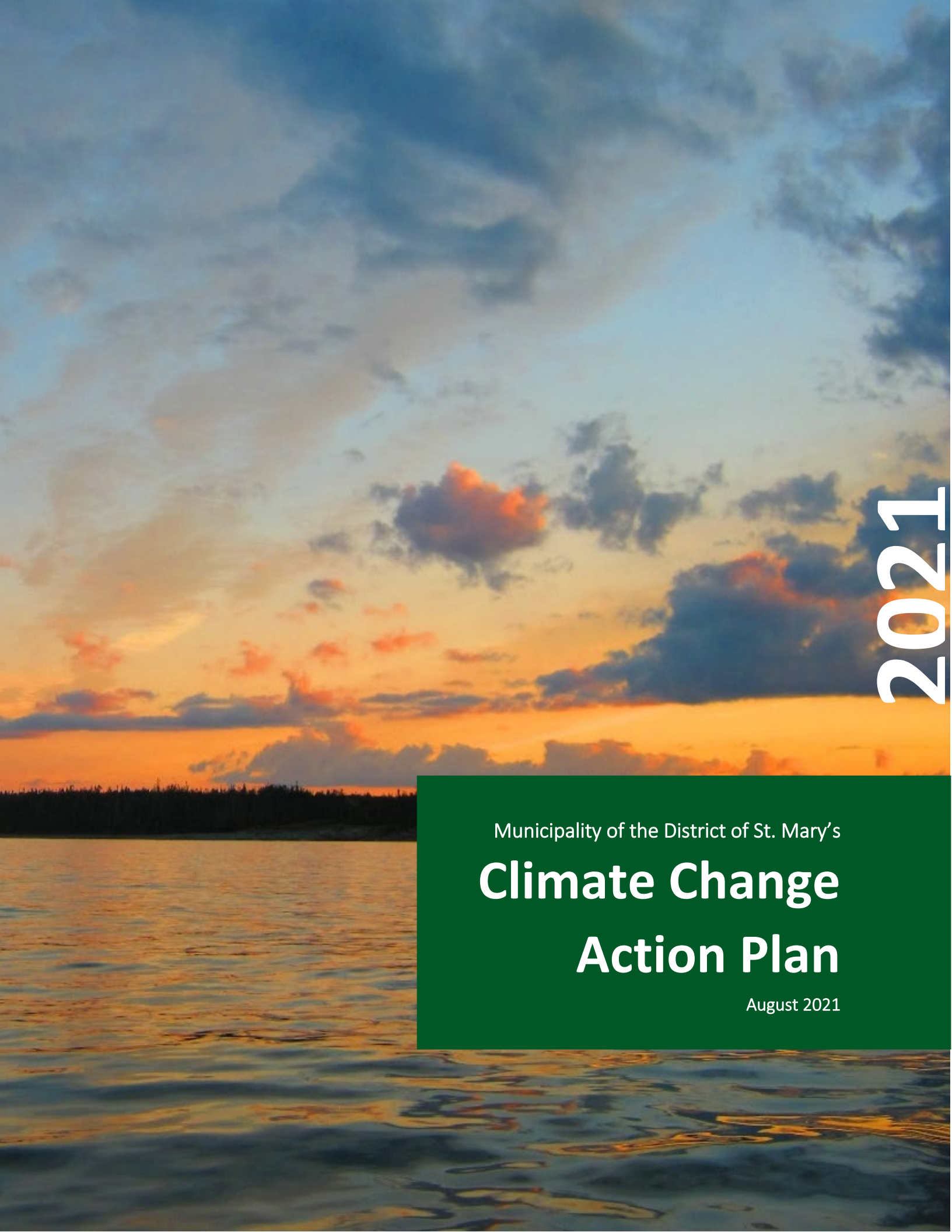

2021

Municipality of the District of St. Mary's

Climate Change Action Plan

August 2021

Acknowledgement

The Municipality of the District of St. Mary's would like to extend their gratitude and appreciation to the committee members who have overseen the creation of this document. Through their volunteer hours, continual engagement, tremendous effort and positive attitudes they have helped to craft a plan that will see the municipality into the next phase of its climate change journey.

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Municipality of the District of St. Mary's

Climate Change Action Plan

Introduction

The effects of climate change impacts residents of the Municipality of the District of St. Mary's from threats such as sea level rise, coastal erosion, forest fire, and various other climate related concerns.[1] The Climate Change Action Plan (CCAP) was developed using a thoughtful effort to address the rising implications of climate change in St. Mary's by identifying climate hazard areas, options for addressing these concerns, and a thorough action-based plan to meet the Municipality's emissions goals.

With a focus on creating positive community action and developing resilience-based policy, the Municipality of the District of St. Mary's is committed to ensuring the long-term viability of the area through engaging in resilient community practices as pertains to climate change.

Vision

To enhance the climate resiliency of the communities by engaging and educating businesses and residents, identifying opportunities for sustainable economic development, and creating partnerships for a climate-forward municipality.

Improved Resilience System

Resilience is often explained as the ability to withstand and "bounce back" or adapt and "bounce forward". Resilience focuses on the ability to cope with and respond to adversity, disturbance, and/or change. A resilient system can withstand abrupt disturbances in a limited time frame and/or the more gradual forces of change that can have an impact over a long period.[2]

Resilience studies highlight that the attributes associated with resiliency in a community are social networks and community connect.[3] Focusing on community unity and cooperation will create a stronger and more climate aware municipality.

Improved Resilience Cycle

Building resilience is not a one-and-done scenario, rather a continual cycle toward improvement. In recognizing that the world is constantly changing, and society is learning more about the environment and climate change impacts. Using the Improved Resilience Cycle, can equip the municipality to meet the needs of today and plan for the future.

The Improved Resilience Cycle was designed by the National Oceanic and Atmospheric Administrators as part of their Coastal Resilience Indicators and Rating Systems[3] and was developed *"as a cycle because once communities implement actions to improve resilience, they need to continually monitor and evaluate progress and ultimately re-assess needs and priorities. Thinking of resilience as a process is the key to promoting short and long-term community sustainability".*

Figure 1. Improved Resilience Cycle[4]

The steps below describe the steps indicated in Figure 1.

Assess risk and vulnerability – Compiling baseline information, recognizing climate change risk areas, inventorying municipally owned infrastructure and property, and identifying climate change hazard areas. The rating system will then be implemented to consider hazard level, cost, and ability for municipal impact.

Plan and prioritize – Using established vulnerabilities and highlighted problem areas, the committee will prioritize issues, develop mitigation and/or adaptation plans, and provide an actionable priority list for Council to consider when planning projects, developing policy, and during budget deliberations.

Implement – The roll out of the CCAP will be initiated through on-the-ground effort within communities, direction from Council, and climate change commitment by local business owners and residents.

Recovery actions – Respond to hazard events and conduct post-disaster assessments. These assessments will then be rolled back into the CCAP's updates.

Monitor, evaluate, and adapt plans – Continuous monitoring and re-assessment of actionable items, arising hazards, and commitment to climate change action. The plan should be reported on annually, updated regularly, and seen as a living document.

Climate Equity

Climate equity refers to the protection from climate change hazards and access to transitional benefits for all regardless of race, gender, income, and other characteristics. Climate change disproportionately negatively effects low-income and disadvantaged populations, women, Indigenous peoples, and the elderly. These groups currently faced with social challenges, structural limitations, and barriers to succeed, will have these challenges compiled by climate change effects and associated inequality.

With recognition of climate inequality and the effect it can have on the most vulnerable citizens, implementation of strong policy that is transparent and gives agency to socially and economically marginalized groups coupled with forward planning for the impacts, climate change inequality may be minimized.

Community planning for climate resilience Climate can revitalize an area and create economic growth, contribute to poverty reduction, create jobs, raise average wages, improve food security and reduce energy costs. With the consideration of climate equity, the CCAP can contribute to supporting the most vulnerable residents and engage the wider community in equity building practices.

Rating System

Concern Rating

Upon identification of risk and hazard areas, each area will be assigned a climate change concern rating. This rating will be used to identify areas of urgency and assign others to long-term strategy planning.

Low	Impacts are likely to occur in the long-term Risk to residents or damage to property/infrastructure is minimal
Medium	Impacts likely to occur in the moderate term Risk to residents or damage to property/infrastructure is moderate
High	Impacts are already occurring Risk to residents or damage to property/infrastructure is high

Following identification of risk and hazard areas for consideration, **Action items** will be developed. Action Items are ideas, programs, and indicatives to mitigate or adapt to the climate change issue. An action item being included it in the CCAP it does not guarantee that it will chosen to be acted upon or what the timeline would be if a particular item was chosen to be acted on.
Identified actionable items will be given four ratings: Action Type, Cost, Leverage, Impact.

Action Type

Depict the best strategy to approach the assigned action.

Direct	Action is under direct control of the Municipality The Municipality has the ability to complete this action on its own without outside jurisdictions approval
Incentivize	Actions to be championed by the Municipality through promotion, incentive-based programs and/or providing of grants
Educate	Actions in which the Municipality may provide training, educational material, internal development, and community engagement activities
Partner	Actions requiring collaboration with organizations, citizens, other levels of government, and/or working groups

Cost

Estimated annual or one-time expense associated with the implementation of the action item.

Low	Less than $2000 per year or $20,000 one-time expense
Medium	Between $2000 and $10,000 per year or $60,000 one-time expense
High	More than $10,000 per year or $100,000+ one-time expense

Leverage

The Municipalities' ability for direct control or ability to effect change of the action item.

Low	Minimal to zero control – e.g., Falls under outside jurisdiction, beyond municipal financial abilities, or requires ministerial approval
Medium	Some control – e.g., Requires additional funding, or partnership needed with outside level of government or group
High	High level of control – e.g., Falls under jurisdiction of the municipality, minimal financial barriers

Impact

The level of impact on achieving municipal climate change vision.

Low	Minimal impact potential
Medium	Some impact potential
High	High impact potential

Greenhouse Gases (GHG)

Greenhouse gases naturally occurs in the atmosphere, and have remained stable through natural processes that would remove as much carbon from the atmosphere as was released.[5] Through human activity we are amplifying the "greenhouse effect"; which is the trapping of long-wave energy transfer causing the Earth's temperature to rise.[6] The greenhouse effect has been exacerbated by human activities, such as burning fossil fuels, which release carbon dioxide, methane, and nitrous oxide into the air creating the block associated with the greenhouse effect.

As the level of GHGs continue to rise, the climate is experiencing a worldwide shift. Climate changes are resulting in the increased severity and frequency of extreme climate events such as heat waves,[7] severe storms and hurricanes,[8] wildfires,[9] and heavy rains.[10] These disruptions have contributed to sea level rise, plant and species risk, and permafrost melting. If levels continue to rise, the effects will only continue to worsen, resulting in loss of critical public infrastructure and increased cost.

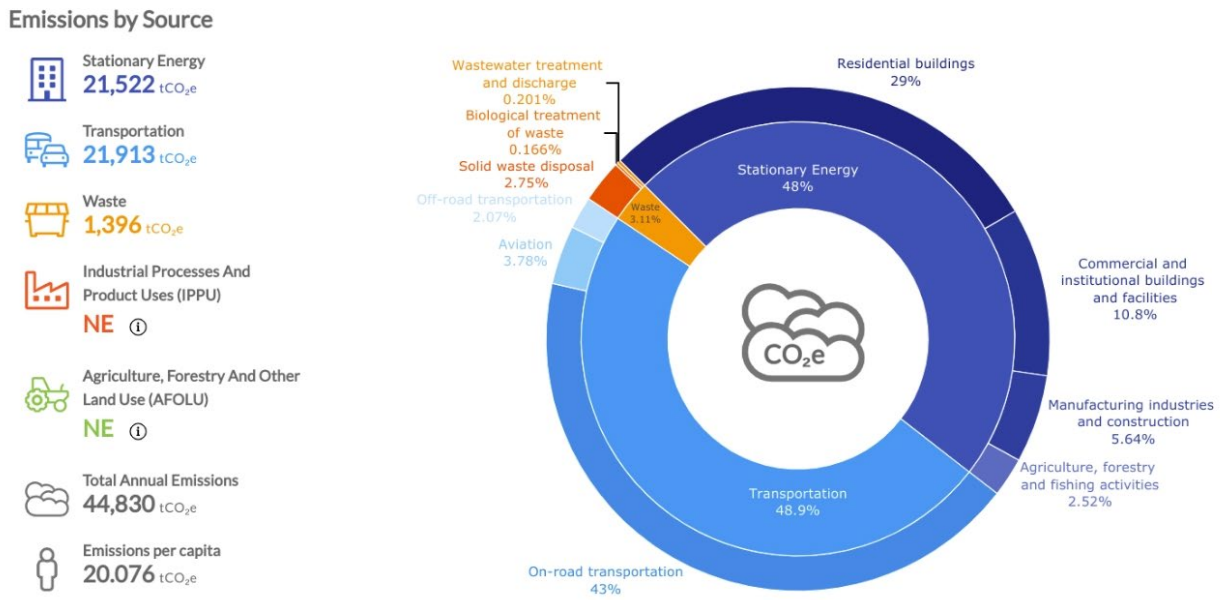


Figure 2. Breakdown of total emissions for St. Mary's[11]

The Municipality of the District of St. Mary's currently sits at 20.076 emissions per capita,[12] which is above the national average of 19.4 tCO^2.[13] Transportation produces 48.9% of the municipalities emissions, with 19,299 tCO_2e the result of on-road transportation. The second

leading emitting factor is stationary energy at 48%, with the largest contributor of residential buildings totaling at 13,018 tCO_2e. Commercial and industrial buildings and facilities are a large contributing factor to the areas GHG totals with 4,846 tCO_2e and growing.[4] In recognizing the largest emitters it enables targeted actions to reduce GHG.

In pledging to become a climate resilient community the Municipality has made the commitment to match the provincial GHG emission targets. The Government of Nova Scotia has made the commitment to reduce GHG emissions in 2020 by at least 10% below the levels that were emitted in 1990, in 2030 by at least 53% below the levels that were emitted in 2005, and in 2050 reach at net zero emissions.[14]

These targets will be met through a combination of action plans laid out in the CCAP, continued monitoring, and annual review of the plan to ensure targets are being met. Based on the anticipated reductions achieved through the proposed mitigation and adaptation prioritized action items the Municipality can conservatively anticipate a reduction of 55% by 2030, 75% by 2040, and net zero emission by 2050.

1.0 On-Road Transportation

Concern Rating	High

On-road transportation results in 19,127 metric tonnes of CO^2 emission each year from the municipality. In order to lower the GHG footprint the Municipality will have to target on-road transportation as a priority area for adaptation and mitigation efforts.

1.1 Electric vehicle charging stations[15] provide an opportunity to encourage residents and visitors to the area with an alternative way to travel. In having access to charging stations, the Municipality shows an outward commitment to being climate forward and climate conscious. Adding these stations to a key tourist destination such as Port Bickerton Lighthouse[16] would fill in the gap currently in the charging station availability along the Eastern Shore,[17] and could be used as part of the Guysborough County[18] or Eastern Shore tourism[19] plan and promotional material.

Action Type	Cost	Leverage	Impact
Direct	High	Medium	Medium

1.2 Charging stations added to the 16 Main Street parking area could allow for continued improvements to the space, additional tourism attraction, and contribute the to park-and-play[ASP] environment being cultivated for Main Street.[SSP]

Action Type	Cost	Leverage	Impact
Direct	High	Medium	Medium

1.3 Charging site(s) located at the Municipal Office would provide the opportunity for a fleet development and sharing program. A pilot project was launched between 2016-2019 in six Quebec Municipalities.[20] The average reduction under the pilot projects in CO^2e was 50.7 tonnes. Funding opportunities are available under Federation of Canadian Municipalities (FCM) Green Municipal fund *reduce fossil fuel use in fleets*[21] pilot project program, grants up to $500,000 to cover up to 50% of eligible projects are available. This program would not only act as a GHG reduction program and provide community transportation to residents without reliable access to transportation and may be a revenue-generating opportunity.

Action Type	Cost	Leverage	Impact
Direct	High	Medium	Medium

1.4 Provide education and grant application assistance to residents surrounding purchasing of electric vehicles and their potential off-sets opportunities; including, the Federal *Zero-Emission Vehicle*[22] program which provides an incentive and tax write-off programs.

Action Type	Cost	Leverage	Impact
Educate	Low	High	Medium

1.5 Research the opportunity to organize an electric vehicle group purchasing program for residents. Purchasing a bulk-number of vehicles residents may be able to receive pricing breaks compared to a single vehicle purchase and create an incentive for residents to make the switch to an electric vehicle.

Action Type	Cost	Leverage	Impact
Direct	Low	High	Low

1.6 Develop and implement an anti-idling policy.[23] This policy may focus on municipally owned vehicles, employees completing municipal business, municipally owned land, by-law implementation,[24] and land-use planning changes.[25]

Action Type	Cost	Leverage	Impact
Direct	Low	High	Low

1.7 Provide education pieces to residents in the form of tips and best practices toward improving car fuel economy.[26] Raise awareness and access to the free online ecoDriving course,[27] to learn how fuel efficiency can help residents save money and reduce GHG. Offer a group training at a variety of local community CAP sites.[28]

Action Type	Cost	Leverage	Impact
Educate	Low	High	Low

1.8 Provide access and remove barriers to public transportation. Currently the only available public transportation option is through Antigonish Community Transit[29] with the cost for a round trip beginning in Sherbrooke estimated at $50. The barrier of cost to access this service needs to be considered. A grant program based off income, tapping into provincial or federal funding[30] to subsidise costs of accessing the service, or a Municipally organized or owned taxi/car ride share service are opportunities to be considered.

Action Type	Cost	Leverage	Impact
Incentivize	Medium	Medium	Low

1.9 Investment and advocacy in bike lanes and alternative transportation infrastructure. Nova Scotia has invested heavily in the extending of road ways to include bike lanes and/or paved shoulders in an effort to develop the Blue Route system across the province.[31] The Blue Route program was developed as a province-wide incentive to increase infrastructure, safety, and way-finding for bicyclists.[ASP] In partnership with the province there is an opportunity to pursue the completed extension of the blue route down the Eastern Shore, connecting the municipality to the greater bicycling community.[ASP]

Action Type	Cost	Leverage	Impact
Partner	Low	Low	Low

1.10 The extension of the Blue Route may be continued in the greater Municipality through way-finding guidelines,[32] the addition of bicycle racks for easy storage, and adding bike route and trail information pamphlets to the visitor information kiosk.[SSP] Installation of free water bottle filling stations[ASP] would be an incentive for a bicyclist to travel through a particular community. Such additions could be extended out from the municipal center to include other community hubs[AL] along route such as Port Bickerton Community Center[33] or Greenfield Oldsters Club.[34]

Action Type	Cost	Leverage	Impact
Direct	Low	High	Low

1.11 Bicycle tourism offers the opportunity for business development including guided tours, repair locations, and lodgings.[SP] Bicyclists take longer to travel through an area, therefor tend to spend a greater sum of money. Capitalising on this, the Municipality may place itself in the position to become a bicycle tourists' hub. Undertakings such as providing support and education for business alignment or start-up associated with the bicycle tourism industry may be beneficial.

Action Type	Cost	Leverage	Impact
Educate	Low	Medium	Medium

1.12 In order to support the bicycle tourism industry businesses could opt to carry supplies or provide services needed by bicycle users, including items such a tire repair kits and clothing. The Municipality may provide them a sign[SSP] to indicate they are bicycle friendly for display in their front window.

Action Type	Cost	Leverage	Impact
Partner	Low	Low	Low

1.13 The extension of the Blue Route would allow residents a way to safely travel between destinations and reduce their emissions.[SL] With the growing popularity of electric bikes, which allows users to travel further and faster than ever before, accessibility between communities may increase greatly. The Municipality may provide education and assistance in applying for the Provincial rebates program for E-bikes through their *Electrify Nova Scotia* program.[35] This may remove barriers of financial cost of purchasing an E-bike and physical limitation associated with enjoying bicycling.[AL]

Action Type	Cost	Leverage	Impact
Educate	Low	Medium	Low

1.14 Education and training may be offered to the wider community to highlight the bicycling opportunities in the area and how residents may take advantage of them.[AL] Including a variety of adult and youth bike courses offered through Bicycle Nova Scotia's CAN-BIKE program.[36] In addition to the CAN-BIKE training and education programs is their Kids CAN-BIKE Festival.[AL]

Action Type	Cost	Leverage	Impact
Educate	Low	Medium	Low

2.0 Stationary Energy

Concern Rating	High

Stationary Energy accounts for 48% of municipal emissions, with 13,018 tCO^2e from residential and 4848 tCO^2e from commercial/industrial buildings. Targeting contributors, the Municipality can actively reduce the Municipal GHG emissions overall. In pursuing education and training will be empowering businesses and residents to make choices on energy efficiency and green building practices.[SP]

2.1 Providing education and training to building inspector(s) surrounding energy efficiency in new builds and green renovations.[37] This will create educated advocates for sustainable and energy efficient building practices in the Municipality's core team.

Action Type	Cost	Leverage	Impact
Educate	Low	Medium	Medium

2.2 The *HomeWarming* program[38] provides home energy assessments and upgrades for qualified residents at no cost to the homeowner. Raising awareness surrounding such programs the Municipality can provide residents the opportunity to take advantage of, for example, reduction of heating and power bills through upgrades to insulation and draft-proofing measures.

Action Type	Cost	Leverage	Impact
Educate	Low	High	High

2.3 *Greener Homes* grant[39] offers up to a $5000 grant to homeowners for energy efficient upgrades including solar panels, heat pumps, and smart thermostats. Providing education and awareness of the various funding programs available for energy efficient upgrades the Municipality can empowering the residents to be proactive in addressing climate change in the home.

Action Type	Cost	Leverage	Impact
Educate	Low	High	High

2.4 An education piece may be developed to provide awareness of home energy programs. Efficiency Nova Scotia, for example, offers their *Home Energy Assessment*[40] program that provides homeowners with an EnerGuide[41] energy performance score and a prioritize list of upgrades. The results may be used for home planning or to apply for various rebate programs under the Efficiency NS umbrella.[42] These rebates range from insulation upgrades, heat pump installations, window and door upgrades, and heat recovery ventilation. Other Efficiency Nova Scotia programs include: Heat pump/wood/pellet/solar/thermal/ETS rebates,[43] Hot water heating rebate,[44] and free Energy Efficiency Product Program.[45]

Action Type	Cost	Leverage	Impact
Educate	Low	High	Medium

2.5 In collaboration with building inspectors, develop a building sustainably check list or guidelines,[46] with associated links, that can be given to inquiring residents or those pursuing a building permit. This will empower the resident to pursue greener building practices, bring awareness to the benefits of building sustainably, and the long-term financial savings associated with a greener build.

Action Type	Cost	Leverage	Impact
Educate	Low	High	Low

2.6 In partnership with outside contributors develop and set a Municipal Green Building Target. Example of a Municipal Green Building Target: Each new build or renovation project would have a prescribed green building target; a deposit would be made to the Municipality on a set amount per $1000 of construction value. If energy target is reached deposit is refunded and other incentives may be included. If the set energy efficiency target is not met the deposit is forfeited to the Municipality where the funds will roll-over into a green energy fund.

Action Type	Cost	Leverage	Impact
Partner	Medium	Medium	Low

2.7 Advocate in favor of the National Energy Code of Canada's[47] implementation of the tiered building code proposal. With a focus on energy efficiency, solar and net-zero ready new builds, and carbon neutral buildings implications.

Action Type	Cost	Leverage	Impact
Direct	Low	Low	Low

2.8 Provide education on PACE[48] – Property Assessment Clean Energy Programs – as an "innovative mechanism for financing energy efficiency and renewable energy improvements" for both commercial and residential properties.

Action Type	Cost	Leverage	Impact
Educate	Low	Medium	Low

2.9 Target community champions[SP] to under-go the LEED[49] training opportunities and provide access to associated services to the residents of the Municipality.

Action Type	Cost	Leverage	Impact
Direct	Low	Medium	Medium

2.10 Work with outside partners to pursue opportunities to invest in sustainable affordable housing.[50] Funding programs such as the *Green Municipal Fund*[51] offers funding and pilot project opportunities that can cover up-to 80% of project costs.[52]

Action Type	Cost	Leverage	Impact
Partner	High	Medium	High

2.11 Conduct research, and where appropriate, policy development to protect against urban sprawl in the Municipality. Options may include land-use by-law changes or tax incentive programs.

Action Type	Cost	Leverage	Impact
Direct	Low	High	Low

2.12 Pursue opportunities for a Municipally owned renewable energy source, which will not only provide an alternative energy source may create the option of a revenue stream. Options for exploration may include solar, wind, or hydro-energy.

Action Type	Cost	Leverage	Impact
Direct	Low	High	High

2.13 Develop an Energy Challenge Pilot Project to engage residents on the impact's household changes may have to their energy efficiency and quality of life.[SP]

a. The pilot project may include 5 families over 30 days and be reported on reality-TV style. Have the families post regularly on social media platforms about ongoing efficiencies and changes they have implemented.
b. Efficiency Nova Scotia may be a targeted partner who could help instruct the participants of their starting efficiency rating and upgrade opportunities and funding. Following completion of the 30-day Energy Challenge a reassessment would take place and the household who made the greatest impact to their rating would be awarded a prize pack.
c. The goal would be to show how simple and low-cost changes, paired with taking advantage of grant/funding opportunities can make an impact on home wellbeing and associated cost savings.
d. Opportunity to connect with the local school or outside community college to develop a set of short videos: introductory video of each family and their starting efficiency levels, overall experience in the Energy Challenge for each family and the concluding energy rating, and a video containing tips and tricks from each family of efficiencies they discovered and could complete themselves for their home.
e. During the Energy Challenge the Municipality may provide updates on how each family is doing, include links to social media posts, and highlight education pieces surround energy efficiency in the home.

Action Type	Cost	Leverage	Impact
Partner	Medium	Medium	Medium

Climate Change Risk Areas

3.0 Temperature Fluctuation

Concern Rating	Medium

Climate change effects on temperatures worldwide[53] are estimated to have risen 1.1°C in the past one hundred years.[54] The effects of this temperature change can be felt here in Nova Scotia where the annual temperature averages are mirroring the global temperature shifts.[55]

Season	Historical 1980s	Projected 2020s	Projected 2050s	Projected 2080s
Winter	-4.1°C	-2.9°C	-1.5°C	-0.2°C
Spring	4.2°C	5.1°C	6.2°C	7.4°C
Summer	16.9°C	17.9°C	19°C	20.1°C
Autumn	8.8°C	9.8°C	11°C	12.2°C
Annual	6.4°C	7.5°C	8.7°C	9.9°C

Figure 3. Historic and projected mean temperatures for St. Mary's[56]

The shifts in temperature have resulted in a myriad of changes for the St. Mary's areas; including, loss of sea ice and permafrost, rise in drought concerns resulting in higher risk of forest fires, the lowering of the water table which may result in drinking water contamination, parasite risk, and saltwater intrusion. Also, this raises concerns for local agricultural initiatives irrigation and water access. While the temperature change threatens winter-based tourism it does extend the mild weather tourism season, which is the more lucrative tourism season for the Municipality.

Through recognizing the risk areas associated with temperature rise and in taking steps to curb the GHG contributions to off-set future temperature rise, may position the Municipality to manage the adverse implications associated with temperature-based climate change impacts.

3.1 Review and catalogue local infrastructure and response measures, and identify investments needed in the area to address a forest fire response. This would require partnership with Department of Natural Resources, volunteer fire departments, and local volunteer groups.

Action Type	Cost	Leverage	Impact
Partner	Medium	Medium	Medium

3.2 Create a space on the municipal website homepage displaying the provincial burn restrictions map[57] during the fire concern months.

Action Type	Cost	Leverage	Impact
Direct	Low	High	Low

3.3 Provide education[58] pieces on safe burning practices,[59] how to protect property from fire,[60] and campfire safety tips.[61]

Action Type	Cost	Leverage	Impact
Educate	Low	Medium	Low

3.4 Partner with Emergency Management Officer (EMO), FAST organization[62] and the Fire Services Committee[63] to determine a list of fire concern areas in the Municipality, develop a response plan, and organize a table-top exercise to practice the plan.[64]

Action Type	Cost	Leverage	Impact
Partner	Low	Medium	Medium

3.5 Develop an in-house protocol to use the municipal Voyent Alert! system[65] for informing residents of potential fire risks and reported fire areas.

Action Type	Cost	Leverage	Impact
Direct	Low	High	Low

3.6 Water conservation may need to be part of resident's warm months plan.[66] Developing an education piece on best practices for water conservation,[67] and awareness of Efficiency Nova Scotia programs,[68] which include free access to items such as low flow shower heads.

Action Type	Cost	Leverage	Impact
Educate	Low	High	Low

3.7 Conduct a study of access to drinking water, including needs and barriers for residents to access clean drinking water.[69] The reliance of drinking water from a secondary source (e.g., hauling water from a local drinking stream) for many rural residents creates a particular challenge that will need to be highlighted in the process of a study.[70]

Action Type	Cost	Leverage	Impact
Direct	Medium	High	Medium

3.8 Following the drinking water access study, a water management and mitigation plan may be created.[71] The unique perspective will need to be undertaken in the area as many of the

residents are rural, and simply upgrading the municipally owned water facilities will not impact most municipal residents. The possibility of establishing a pilot project in conjunction with the provincial[72] or federal government[73] to provide tools to rural residents who do not have access to town drinking water may be developed as part of this plan.

Action Type	Cost	Leverage	Impact
Partner	High	Medium	Medium

3.9 The possibility of expansion of expansion of municipal water should be considered, resulting in designation of watershed areas[SW] that may be targeted for protection. Areas, such as Goshen or Port Bickerton, would then have access to clean water and there would be control and monitored through the local water table.[74] This monitoring ability would be particularly important in seaside communities where the drawing down of the water table may result in saltwater intrusion and contamination of drinking water.[75]

Action Type	Cost	Leverage	Impact
Partner	High	Medium	Medium

4.0 Sea Level Rise (SLR)

Concern Rating	Medium

Sea level rise is in response to the climate change effects associated with melting ice and thermal expansion.[76] It's estimated that by the year 2100 the sea levels will rise between 28-98cm, with the potential for going well over 1 meter.[77] The impacts of a rising sea level will be substantial in St. Mary's boasts roughly 264 km of shoreline. (Figure 4.) Sea level rise raises concerns surrounding coastal erosion, flooding, damage to infrastructure, storm surge, and well-water contamination.

Figure 4. Yellow line=St. Mary's Municipal boundary Blue line=The area measured to determine kilometers of shoreline in the municipality

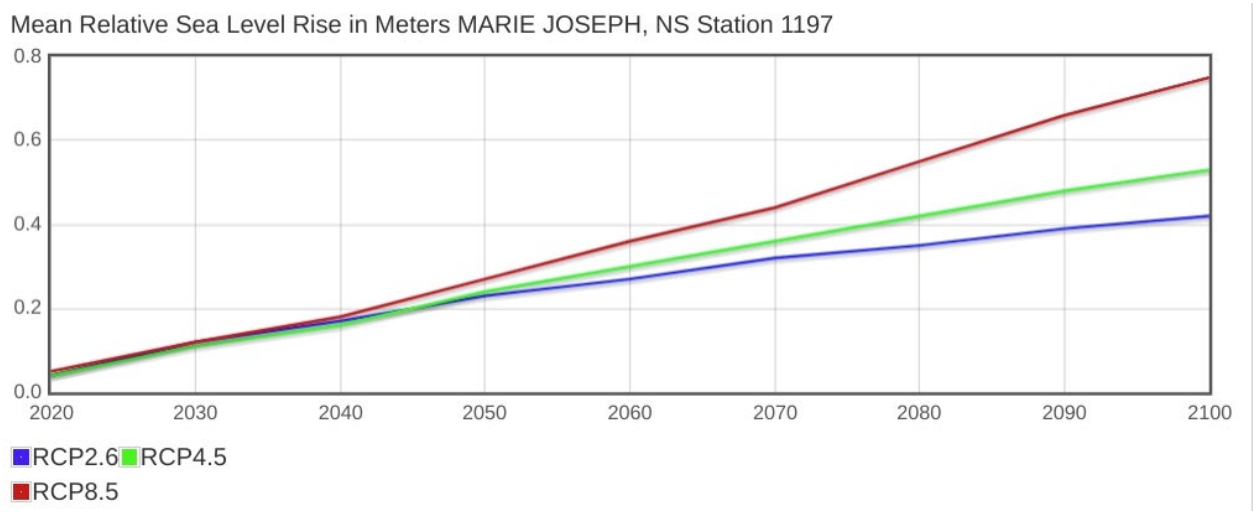


Figure 5. SLS measurements and predicted increases in Marie Joseph[78]

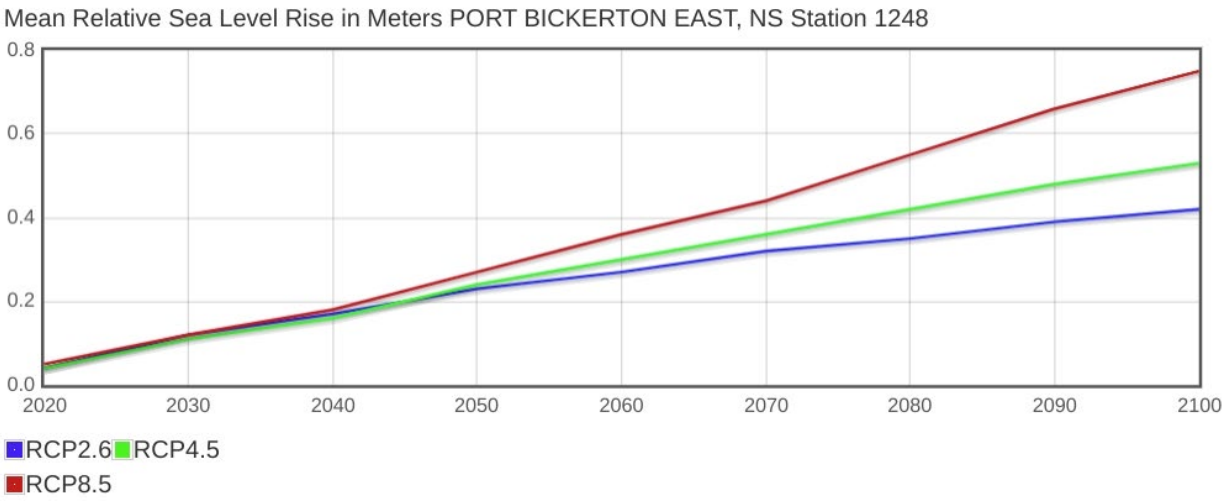


Figure 7. SLS measurements and predicted increases in Port Bickerton[79]

The Eastern Shore tourism[80] experience focuses heavily on historical sight-seeing along with coastal access and beauty, both of which are threatened by climate change and sea level rise.[81] Beyond the obvious destruction of historical sites that could be caused by sea level rise, the narrowing of beaches and threatening of roadways present a specific threat to the coastal tourism industry thriving along the eastern shore.

4.1 Develop an education piece for residents surrounding sea level rise and the implications that could have on the locals, business, and community tourism.[82] Targeted education may be developed for those living or owning property within the projected sea level rise impact area.

Action Type	Cost	Leverage	Impact
Educate	Low	Medium	Low

4.2 Provide training and information for business impacted by sea level rise. Connecting those impacted with supports, such as the Community Business Development Corporation (CBDC)[83] where they can receive assistance and guidance surrounding best practices to climate proof their business or pivot to meet the climate associated challenges.[84]

Action Type	Cost	Leverage	Impact
Educate	Low	Medium	Low

4.3 Planning for sea level rise may include land use changes and building code adjustments to allow for coastal setbacks, adjusted for the projected high-water mark. The Provincial Coastal Protection Act [85] has been developed along with proposed building regulations in consideration of sea level rise and coastal flooding. These new regulations are currently under development and the Municipality should consider taking every opportunity to consult and offer feed-back as the opportunity arises.

Action Type	Cost	Leverage	Impact
Partner	Low	Low	High

4.4 Lobby other levels of government to invest in armouring[86] the coastlines with engineered solutions including, sea walls and breakwaters. The use of dikes and shorelines may act as an additional barrier to protect against the sea level rise and resulting higher storm surge.

Action Type	Cost	Leverage	Impact
Direct	Low	Low	Low

4.5 Saltwater intrusion into drinking water reservoirs will be of great concern for shore dwelling residents. [87] Education on water usage and avoiding large scale community withdrawals may help combat the effects of sea level rise for coastal residents.

Action Type	Cost	Leverage	Impact
Educate	Low	Medium	Low

4.6 Lobby for various sites along the coast to be included in the provincial groundwater monitoring program.[88] To date there is only one monitoring site in Guysborough County and none anywhere along the coast. The data from water monitoring locations could then be used to develop prediction mapping and planning for future water protection measures.			
Action Type	Cost	Leverage	Impact
Direct	Low	Low	High

5.0 Extreme Weather

Concern Rating	Medium

A by-product of climate change is the rise of extreme weather.[89] Intense rainfall events will not only increase in fury but also frequency.[90] This may trigger wide scale and potentially destructive flooding, water contamination from storm run-off, and sediment run-off affecting ecosystems.

Figure 8. Precipitation in St. Mary's -- Historical and Projected[91]

	Historical 1980s	Projected 2020s	Projected 2050s	Projected 2080s
Winter	382.1 mm	398.4 mm	407.7 mm	428.1 mm
Spring	327.4 mm	337.8 mm	343.1 mm	356.3 mm
Summer	277.4 mm	282 mm	280.1 mm	280.4 mm
Autumn	365 mm	368.1 mm	367 mm	374.2 mm
Annual	1351.8 mm	1385.2 mm	1396 mm	1435.3 mm

Predictions for the 2021 storm season are to see tropical storms numbering between 13-20 with a historical average of 14, hurricanes 6-10 with a historical average of 7, and major hurricanes where the historical average has been 3.[92] Large scale weather events like these leave the municipal coastline vulnerable to storm surge, high winds, infrastructure damage, and risk to human life.

The intensity of winter storms raises particular hazards from the flux of the cold warm cycle resulting in large snowfall events melting at a rapid rate leading to flooding. Winter storms bring the risks of ice on trees and power lines, which is only being exacerbated with the changing temperature placing Nova Scotia in a zone more prone to ice events as the temperatures rise and fall. Extreme weather events also threaten tourism and businesses as they tend to be lengthy and destructive, particularly the wind.

5.1 Plans to address given storm scenarios will need to be developed in partnership with EMO, local volunteer fire departments,[93] provincial response,[94] and community organizations.[95] Scenarios to consider planning may include: long-term power outage (winter/summer),[96] and roadway closures due to washout or downed trees.[97]

Action Type	Cost	Leverage	Impact
Partner	Low	Medium	High

5.2 Audit local volunteer fire departments, community centers, and committees will need to highlight gaps in the ability to meet needs of residents in the events of an extreme weather event (e.g., generator capacity, on-site cooking ability, sanitation readiness) and pursue funding[98] to meet needs.

Action Type	Cost	Leverage	Impact
Direct	Low	Medium	Medium

5.3 Provide information to residents of the Municipality surrounding emergency preparedness;[99] such as supplies to have on hand[100] and general property preparations[101] to consider.[102] Highlight emergency preparedness week[103] as a tool to educate residents and utilize programs developed for the awareness week campaign.

Action Type	Cost	Leverage	Impact
Educate	Low	High	Low

5.4 Develop an alert key for the Municipal Voyent Alert[104] system, including threat level indicators.[105] These codes should be clear and sensical; e.g., wildfire may be red, and following the code would be specific information about threat level and exact location(s) impacted. Codes should be circulated through the municipality, perhaps by the municipal newsletter, and posted on the website and municipal property. A webinar, short video, or internet live chat event may be developed to educate residents surrounding the Voyent Alert system and its implications of use for the Municipality.

Action Type	Cost	Leverage	Impact
Direct	Low	High	Medium

5.5 Water and wastewater are under particular risk during extreme weather events. Overflow capacity, containment, and contamination probability are examples of areas of concern. Building off recent upgrades to the infrastructure in place, a long-term plan should be developed to climate proof the facilities.[106]

Action Type	Cost	Leverage	Impact
Direct	Medium	High	Medium

5.6 Developing future infrastructure to contend with extreme weather events can reduce the damage. The rain garden proposal[SSP] offers an excellent example of planning for future rain events, and subsequent drought periods associated with climate change. Ensuring extreme weather events are considered during planning will allow the opportunity to mitigate the effects rather then responding to the implications after they take place.

Action Type	Cost	Leverage	Impact
Partner	Medium	Medium	Medium

5.7 Adjust land-use planning to consider wetlands, floodplains, and source water for protection.[SW] Flood water storage systems could be developed as a capital project to address particular areas of concern in a residential area and protect runoff from contamination associated with extreme weather events.[107]

Action Type	Cost	Leverage	Impact
Direct	Low	High	High

5.8 Lobbying provincial and/or federal government to protect infrastructure from storms and storm surge through beachscape, water-way setback requirements, artificial islands, seawalls, or dykes. And planning for mitigation through sea walls, flood, reforestation in upland areas and buffer zones, and wetland restoration.

Action Type	Cost	Leverage	Impact
Direct	Low	Low	Low

5.9 Developing long-term planning in conjunction with outside entities to mitigate impact of storm events on built infrastructure. These plans could include burying of power lines,[108] or road realignment away from impact zones.[109]

Action Type	Cost	Leverage	Impact
Partner	Medium	Medium	Low

5.10 Lobby for sufficient access to cell coverage and internet capabilities in the event of an extreme storm as a tool in responding.[110] Lobbying for phone or connectivity lines to be buried, above ground infrastructure such as cell towers to be reinforced, and generator systems to run outlying stations to be maintained.

Action Type	Cost	Leverage	Impact
Direct	Low	Low	Low

6.0 Health and Wellness

Concern Rating	Low

The effects of climate change will go beyond the natural environment to have adverse implications on the health and well-being of residents.[111] The rise in average temperatures will increase the risk of heat stress/stroke,[112] while also depleting fresh water resources and leading to water scarcity issues.[113] Lower water tables will lead to an increased opportunity for contamination of drinking water, and the stagnation of the water sources will create a breeding ground for insects that are known carriers of infectious diseases.[114]

An increase in intensity of sunlight will lead to skin damage, skin cancer, and cataract diagnosis increase.[115] Mold and pollen associated with the longer growing season will exacerbate allergies and contribute to a rise in respiratory issues.[116] Air pollution, smog, and soot will cause further damage to airways and results in a merited of breathing and health related issues.[117]

Food safety and food scarcity will rise as a result of the changing climate, and challenge the most vulnerable populations, such as the elderly or homeless, that are at a far greater risk.[118] The mental health implications[119] will be innumerable; varying from, stress to depression and increased anxiety. The mental health sector will need to be bolstered to combat the effects of climate change.

6.1 Partner with health and wellness organizations, such as Community Health Board[120], to develop an education piece around being warm weather safe,[121] both at home and at work.[122] [AL] An example may be a focus on daily water in-take, with a competition or challenge to accompany the information and awareness campaign.

Action Type	Cost	Leverage	Impact
Partner	Low	Medium	Medium

6.2 Provide education and awareness surrounding well water testing[123]; every six months for bacteria and on a biyearly basis for chemicals. Explain how to test, why it's important, and how to interpret the results of testing.[124] [125]

Action Type	Cost	Leverage	Impact
Educate	Low	High	Low

6.3 The Infectious Disease and Climate Change Fund[126] offers the opportunity to build a data bank of current risks and a monitoring plan for future risks. Funding provides for an education and awareness campaign to inform residents and local health professionals on how to monitor for outbreaks.

Action Type	Cost	Leverage	Impact
Partner	Low	Medium	Low

6.4 Prepare codes and best practices through EMO and in conjunction with the Voyent Alert system[127] to inform residents of possible out-breaks, exposures, or at-risk areas. Plan a scaled response for such an event and complete a table-top exercise with appropriate partners, such as fire departments and hospital representatives.

Action Type	Cost	Leverage	Impact
Direct	Low	High	Low

6.5 Partner with the St. Mary's Food Bank[128] and other outside social awareness parties to devise a plan and a congruent program to address food insecurity, which will continue to be exacerbated by climate change. Available funding[129] can be utilized and key stake holders mobilized.

Action Type	Cost	Leverage	Impact
Partner	Medium	Medium	Medium

6.6 Prepare an education campaign for residents surrounding sun safety,[130] specifically targeting children[131] and those who work in the direct sun[132] (e.g., fisher-people). Education may include providing list of approved protection products.[133] Highlight prevention and detection information for skin cancers[134], coupled with the sun safety tips and tricks.[135]

Action Type	Cost	Leverage	Impact
Education	Low	High	Low

6.7 Provide education surrounding the ultraviolet (UV) index[136] and how it can be used as a tool to prepare yourself for sun safety.[137] Highlight the UV index implications during the wintertime[138] when people tend to be less conscious of the sun's adverse effects.

Action Type	Cost	Leverage	Impact
Education	Low	High	Low

6.8 Host a sun safety education webinar in partnership with Canadian Skin Cancer Foundation.[139] This program includes shade mapping, games, and science experiments to explore and understand sun safety.

Action Type	Cost	Leverage	Impact
Partner	Low	Medium	Medium

6.9 Provide awareness of the air quality health index,[140] and tips on how to use and understand the index.[141] Highlight the impacts of air quality in homes[142] and businesses,[143] and impacts on personal health.[144] The changes to improve indoor air quality can often be tied to building energy efficiency upgrades and green new builds.[145]

Action Type	Cost	Leverage	Impact
Partner	Low	Medium	Medium

6.10 Pursue a tree planting initiative[146] to not only offset GHG but to improve air quality. This program could be both a municipal undertaking and a community program that encourages business and homeowners to plant trees. Partner with local groups to provide trees for their conservation projects and community education/trail walks to display for the community the effect trees can have on clean air, as well as positive changes to the natural environment. The 1st St. Mary's Scouts Group[147] may be an appropriate partnership to engage the youth in air quality and climate change initiatives.

Action Type	Cost	Leverage	Impact
Partner	Low	Medium	Medium

6.11 Support research on the effects of climate change on mental health, including pursuing a study[148] to explore the impacts that effect those living in a rural setting with reduced access to supports. This study may be completed in partnership with the community health board,[149] an outside funding partner,[150] or post-secondary educational institution.

Action Type	Cost	Leverage	Impact
Incentivize	Medium	Low	Low

6.12 Provide access[151] to resource[152] and education[153] surrounding mental health and reducing the stigma associated with accessing mental health supports.[154]

Action Type	Cost	Leverage	Impact
Education	Low	High	Low

6.13 Plan programs focused on coping with mental health such as meditation classes,[155] art workshops,[156] and nature based activates.[157]			
Action Type	**Cost**	**Leverage**	**Impact**
Direct	Low	High	Medium

7.0 Ecosystems

Concern Rating	Medium

As a municipality with significant resource and forestry designated land, and whose major employers are resource extraction based,[158] the threat of ecological changes are very real and close to home. Rises in average daily temperatures will lengthen the growing season, shift bloom schedules, and nesting times. These changes will alter vegetation patterns and species migration.[159] This may trigger the loss of rare ecosystems and increase pressure on already threatened flora and fauna.[160] Coupled with the habitat loss due to deforestation and land-use development, the impact on the natural environment could be catastrophic.

As the oceans continue to absorb higher levels of CO^2 in an effort to off-put the rising levels in the atmosphere this will raise the acidity level of the oceans.[161] Ocean acidity will threaten the fishing economy, marine life, coastal and sea vegetation, and any creatures who rely on the ocean as their primary food source.[162] The increase in storm run-off will undoubtedly increase the sediment deposits in the ocean and affect the local marine environments as well.

There is evidence to show that invasive species and pests may move into the area, bringing both a threat to resident's health and the wellbeing of the natural environment[163] (e.g., spruce beetle, large-mouth bass). Engaging in meaningful partnerships, connecting resource-based industries to alternative proactive options, and prioritizing sustainable and green growth the Municipality can work toward protecting the delicate ecosystems.[164]

7.1 Partner with appropriate entity[165] to receive updates on species at-risk and their local habit areas in the Municipality.[166] Having annual access to this information, will empower decision makers to make planning choices with habitat and species protection in mind.			
Action Type	**Cost**	**Leverage**	**Impact**
Partner	Low	Medium	High

7.2 Create an education plan to inform residents of at-risk or endangered species in the area, what to do if they are spotted, and actions they can take to help species thrive.[167] Targeting children through programs, such as Earth Rangers,[168] will direct them to resources where they can learn in an interactive and engaging manner.

Action Type	Cost	Leverage	Impact
Educate	Low	Medium	Medium

7.3 Approach forestry and fishing business owners to work jointly to develop nature-based solutions[169] and sustainable practices to address the concerns raised surrounding the industries and climate change.

Action Type	Cost	Leverage	Impact
Partner	Medium	Medium	Medium

7.4 Partner with CBDC[170] or Atlantic Canada Opportunities Agency (ACOA)[171] to develop innovative plans and locate funding in order to address the agricultural/fishing/forestry changes required to adapt to climate change.[172]

Action Type	Cost	Leverage	Impact
Partner	Medium	Low	Low

7.5 Encourage and provide information on sustainable[173] forestry practices, such as forest certification,[174] in an effort to encourage woodlot owners to shift their practices toward sustainability, including best practice guides.[175] Highlight available funding opportunities associated with programs such as silviculture.[176] Explore the possibility of training associated with assisted migration[177] planting to inform woodlot owners of techniques, climate mitigation implications, and benefits to the health of their woodlots.[178]

Action Type	Cost	Leverage	Impact
Education	Low	Medium	High

7.6 Work with woodlot owners to create a voluntary procedure to identify[179] and report pests.

Action Type	Cost	Leverage	Impact
Partner	Low	Medium	Low

7.7 Develop an education piece to inform the public surrounding pests and amplification of the provincial Don't Move Firewood[180] initiative.

Action Type	Cost	Leverage	Impact
Education	Low	High	Low

7.8 Highlight education[181] for sustainable aquaculture and fishing practices,[182] and highlight funding[183] availability for innovative fishing practices[184] and associated costs.[185]			
Action Type	**Cost**	**Leverage**	**Impact**
Education	Low	Low	Low

7.9 Provide information surrounding agricultural training[186] and best practices[187] for when considering the effects of climate change and to assist in the climate mitigation effort.[188] For example, a longer growing season will require irrigation planning to be altered to not only take in the extension of the season and freshwater availability,[189] or the diversifying of crop choices for future and current businesses owners.[190]			
Action Type	**Cost**	**Leverage**	**Impact**
Education	Low	Medium	Low

7.10 Explore opportunities to partner with educational institutions for research surrounding carbon sequestration and progressive climate change mitigation/adaptation approaches.[191]			
Action Type	**Cost**	**Leverage**	**Impact**
Partner	Low	Medium	Medium

7.11 Work with partners in conservation organizations[192] to protect and advocate for the protections of source water resources, including lakes and streams.[193]			
Action Type	**Cost**	**Leverage**	**Impact**
Partner	Low	Medium	Low

7.12 Work with riparian zone landowners to educate about the importance of buffer zones and vegetation along watercourses.[194]			
Action Type	**Cost**	**Leverage**	**Impact**
Partner	Low	Medium	Medium

7.13 Lobby upper levels of government to develop a system for collecting/sharing data and information about wildlife, ecosystems, and community-based food supply sources.			
Action Type	**Cost**	**Leverage**	**Impact**
Partner	Low	High	Low

Municipally Owned Infrastructure and Property

When reviewing municipal buildings and built infrastructure it was approached from the view point of the climate threat from the outside. To review a full evaluation and recommended approach to interior efficiencies in associated with climate change refer to report *The 2021 Energy Management Plan* published August 2021 by Ainslie Timmons under the Efficiency Nova Scotia On-Site Energy Manager Program.

8.0 Municipal Property

Rating	Low

8.1 Undertake a study to identify, plan, and implement building protection and efficiencies in relation to climate change risks.[195] Having a clear plan with an associated timeline will enable decision makers to plan long and short-term infrastructure projects and improvements.

Action Type	Cost	Leverage	Impact
Partner	Medium	Medium	Medium

8.2 Consider developing and implementing a plan to address outdoor building climate threats to infrastructure with all-natural based protection.[196] This would be the first municipality to approach climate protection measures solely from a natural infrastructure forward framework.[197]

Action Type	Cost	Leverage	Impact
Direct	Low	High	Medium

8.3 In coordination with EMO and appropriate outside entities, develop a response plan and guidelines related to municipal property and infrastructure.[198] These guidelines should include a checklist to be completed on a rotational schedule to identify any arising risk factors and monitor known risks. Items on this checklist may include ensuring drainage is operating properly, or trees are in ideal health with no at-risk limbs.

Action Type	Cost	Leverage	Impact
Partner	Low	Medium	Medium

8.4 Reducing reliance on gas-powered property maintenance tools may be considered.[199] While the devices tend to be smaller than most gas-powered entities, they are highly inefficient. Shifting toward manual or rechargeable equipment present a viable option.[200]

Action Type	Cost	Leverage	Impact
Direct	Low	High	Medium

8.5 When planting shrubbery, trees, plants, etc. some considerations may be made to enhance the infrastructure climate protection.

- Evergreens planted on the north side to protect against winter winds
- Planting of shrubs on east, west, and south side of air conditioning units to provide the unit with natural shade and cooling which will reduce the unit's energy load
- Low trees or shrubbery planted on the north side of a building may act as a wind break
- Shelterbelts along property line may cut winds, which may reduce heating costs and moderate the microclimate

Action Type	Cost	Leverage	Impact
Direct	Low	High	Medium

8.6 Embankment monitoring, evaluation, and response practices may be developed. These practices may begin by developing a baseline of current daily levels and some recent extreme weather event maximums, this will allow for clear indication of rising waters or what to anticipate as capacity in the event of future weather events and make appropriate predictions to which responses may be modeled after.

Action Type	Cost	Leverage	Impact
Partner	Low	Medium	High

8.7 Mitigation of insect and vermin, which are predicted to increase as an effect of climate change,[201] will need to be planned for appropriately. Pest monitoring in and outside of buildings, habitat and mating locations on property, and techniques or guidelines to address the issue in an environmentally friendly manner may need to be developed. An example of measures may be to engage integrated pest management practices.[202]

Action Type	Cost	Leverage	Impact
Direct	Low	High	Low

8.8 During normal maintenance impact resistant windows and doors may need to be installed. These upgrades will protect against damage associated with extreme weather events. Upgrading current window/door protection may ensure the properties ability to withstand a weather event with minimal damage.[203]

Action Type	Cost	Leverage	Impact
Direct	Low	High	Low

8.9 Future landscaping should consider native species and climate tolerance during procurement. Investing in landscaping that is climate tolerant and native to the local ecosystems will be bolstering the natural ecosystems while providing drainage and curb appeal.[204]			
Action Type	**Cost**	**Leverage**	**Impact**
Direct	Low	High	Medium

Municipal Office

8.10 Ensuring landscaping includes firebreak areas. These areas may include items, such as gravel or rock, to protect the building and create a fuel break surrounding the building in the event of a wildfire.[205]			
Action Type	**Cost**	**Leverage**	**Impact**
Direct	Medium	High	Medium

8.11 Rainwater capturing system[206] may be implemented to reduce the amount of water running off into the area in the event of an intense rainfall events, and serve as a storage system to be used on municipal plantings or hanging baskets during dry season as examples.			
Action Type	**Cost**	**Leverage**	**Impact**
Direct	Medium	High	Low

Sherbrooke Library

8.12 Run off from the hill located at the rear of the building represents an area of threat. Monitoring of the hill side and long-term fortification efforts may need to be developed. These plans may include items such as natural reinforcement through targeted planting[207] or an engineered hillside drainage system.			
Action Type	**Cost**	**Leverage**	**Impact**
Direct	Low	High	Medium

8.14 Flooding mitigation planning and preparedness, in the event of a riverbank breach for example, may need to be developed.[208] This plan will need to be completed in consultation with the Eastern Counties Library Board, EMO, and other appropriate partners.			
Action Type	**Cost**	**Leverage**	**Impact**
Partner	Low	Medium	Medium

8.15 Street drainage and slope may need to be altered to reduce risk to the building. In further beautification[SSP] planning, slope of surrounding groundwork and built infrastructure should be considered, maintaining drainage away from the building to reduce the risk of flooding. Installation of street drainage [209] may be an appropriate consideration for the area surrounding the building.

Action Type	Cost	Leverage	Impact
Direct	Medium	High	High

8.16 Use of mulch, climate tolerant plants, and water capturing systems, such as curb gardens,[SSP] may provide capture of water during wet season and slow release in dry season. Such planting techniques may assist in natural cooling of the populated area.

Action Type	Cost	Leverage	Impact
Direct	Low	High	Medium

RecPlex

8.17 Water catchment and divergence from the roof may need to be considered. Currently the flow runs directly off the roof over sides of the building, with only a couple eave troughs diverting runoff resulting in deterioration of outside building material due to moisture damage. Diverting the flow may counteract the moisture damage associated with running water and snowbanks.

Action Type	Cost	Leverage	Impact
Direct	Medium	High	Medium

8.18 Drainage is a concern around the side of the building closest to the road and rear. The area is currently saturated and can become very soft. During winter months a plow is required to clear the full perimeter of the building for safety reasons. This is causing lawn damage, and fear of clearing equipment being stuck. A french drain system or a similar drainage investment may need to be designed in order to counter act the current pooling and redirect the water away from the building.

Action Type	Cost	Leverage	Impact
Direct	Low	High	Medium

8.19 Planning to be fire wise with landscaping may be a beneficial approach.[210] Including fuel breaks in the fire line, may slow down or even stop a wildfire, an example would be a gravel pad. Fire zone clearing may take place yearly to ensure a fire safe buffer zone surrounding the building.

Action Type	Cost	Leverage	Impact
Direct	Low	High	Low

8.20 Green roof installation may be an appropriate option for the building. Green roofs reduce energy costs and slow down runoff from storm events. Exploration of the opportunity to install a green roof may be undertaken as an option to both increase efficiencies and bolster the building against weather events.[211]

Action Type	Cost	Leverage	Impact
Direct	Low	High	Medium

Public Washrooms and Parking Area – 16 Main Street

8.21 The large tree overhanging the facility presents a danger to the building in the form of limbs falling during high winds, ice/snow events, or tree rot. Biannual monitoring of the tree and its health may be an appropriate policy to implement. Ensuring regular monitoring of the trees surrounding the facility the Municipality can engage in preventative measures as the need arises.

Action Type	Cost	Leverage	Impact
Direct	Low	High	Low

8.22 At the rear of the building runs a small stream that connects to the river. The bank between the stream and building is narrow and does not allow for much erosion before major impacts to the building may occur. Exploration of options for fortification of this bank, either through natural measures or engineered solutions, may need to be considered in order to protect the building from the eroding banks implications. Revetment, planting of native shrubs and grasses, or a concrete retaining wall may be options to consider.

Action Type	Cost	Leverage	Impact
Direct	Low	High	Medium

8.23 Flooding threat from both the stream and river is high at this location. Planning for protection of the building during the rainy season or extreme weather events may need to be developed. Plans should include approaches for both mitigation and adaptation. Examples of items that may fall in the plan may include directional drainage plans or removable flood protection barriers.

Action Type	Cost	Leverage	Impact
Direct	Low	High	Medium

8.24 During the next stage of the Streetscapes Plan and paving of the parking lot, directional drainage and sloping may be considered. Embedded drainage in the paving, or planning for the grading and sloping to encourage drainage away from the building, may be able to protect the building from damage due to extreme weather events.

Action Type	Cost	Leverage	Impact
Direct	Low	High	Medium

8.25 Planning for snow removal may be considered. Developing a plan on how best to clear the space surrounding the building, including where snow collection piles will be located, gives a level of control over the melt process and its impact on the building. These plans should be made with a rapid melt scenario in mind or a large scale snow event.

Action Type	Cost	Leverage	Impact
Direct	Low	High	Medium

8.26 High water and flooding may threaten the newly renovated parking area. Plans for drainage solutions, including built-in directional flow infrastructure and natural-based solutions, should be developed. These plans may include immediate implementation items alongside long-term infrastructure planning framework.

Action Type	Cost	Leverage	Impact
Direct	Low	High	Low

8.27 Barriers, permanent or moveable, may be a consideration. This may include large rock along the rivers edge or berms reinforced with vegetation and trees.

Action Type	Cost	Leverage	Impact
Direct	Low	High	Medium

Water Treatment Facility and Storage Garage

8.28 Threat of tree damage surrounding the storage garage may need to be addressed. Falling limbs due to winter storms or wind events may damage the structure and lead to costly repairs. In developing either a monitoring plan or removing the at-risk limbs or trees, the Municipality can address the risk before it creates an issue.

Action Type	Cost	Leverage	Impact
Direct	Low	High	Medium

8.29 The marsh and pond located at the back of the property presents a flood risk. The water treatment facility is elevated and well-sloped offering some protection. The storage shed is in a knoll making it particularly vulnerable to flood damage. A short-term plan to address the threat may include on-site planning to elevate all water-sensitive material or items off the floor onto shelves or hooks. Long-term site planning may include considerations such as raising the building, installing drainage, or building in natural-based defenses such as landscape berm.

Action Type	Cost	Leverage	Impact
Direct	Low	High	Medium

8.30 The lawn space and its proximity to water provides an opportunity to expand the area into a diversity-focused ecosystem. This may involve a focused target group, such as pollinators, or creating an extension of the marshy area currently running along the rear of the property. This would cut down on property maintenance, as many of these systems are self-sustaining once developed and support the continued diversity of the area.

Action Type	Cost	Leverage	Impact
Direct	Low	High	Medium

Wastewater Collection and Treatment Facility

8.31 Large pieces of equipment are located outside of the treatment facility, and future material selection will need to consider the effects of acid rain[212] and other climate change intensified issues.[213] Creation of internal practice or policy to select climate resilient materials that can withstand the adverse effects caused by atmospheric changes, such as acid rain.[214]

Action Type	Cost	Leverage	Impact
Direct	Low	High	Medium

Sherbrooke Village Pump House

8.32 In the event of a power outage the facility will begin to overflow into the river. Research and planning associated with generator procurement, alternative overflow options, or expansion of overflow capacity may be considered. This will reduce the risk of contamination of the site and adverse effects on the surrounding ecosystem.

Action Type	Cost	Leverage	Impact
Direct	Low	High	Medium

8.33 The overhanging tree presents a property damage threat. A maintenance and monitoring plan may be developed in partnership with Sherbrooke Village. This plan may include monitoring responsibilities and removal guidelines.

Action Type	Cost	Leverage	Impact
Partner	Low	Medium	Medium

8.34 Indent or "grooving" around outside of building presents a standing water or pooling issue, another example is the areas on pooling at the front of the building and road. Ensuring proper drainage away from building through ground sloping or other engineered approaches will protect the facility from damage associated with extreme weather events or flooding.

Action Type	Cost	Leverage	Impact
Partner	Low	Medium	Medium

Transfer Station Buildings and Equipment Office

8.35 The office is currently on the bottom part of the hill where the transfer station infrastructure is located. This puts the space at risk of water damage in the event of an extreme weather event. The hill is well-sloped to divert any rainfall down hill toward the ditching system. The only vulnerable area is the office. In raising the building above the current slope, installing a drainage system surrounding the building, or relocating the building away from the drainage route the Municipality may be able to protect the building from water damage.

Action Type	Cost	Leverage	Impact
Direct	Low	High	Medium

8.36 Removal of remaining oil tank located behind the office building may be done in the short term.[215] Leaving an existing tank in place and unused often leads to threat of breakdown or leakage of the tank, which may require remediation of the contaminated area.

Action Type	Cost	Leverage	Impact
Direct	Low	High	Medium

8.37 Supports for the existing wildlife frequenting the area may be considered.[216] This may look like installing bird houses,[217] providing training to staff on work safe practices associated with known animal areas,[218] or ensuring there is safe access to clean water for the creatures.[219]

Action Type	Cost	Leverage	Impact
Direct	Low	High	Low

8.38 Explore opportunities to rethink the concept of waste through waste diversion, upcycling, or new programming initiatives.

Action Type	Cost	Leverage	Impact
Direct	Low	High	High

Port Bickerton Lighthouse

8.39 The hillside supporting the interpretive center and lighthouse is strong and provides protection. Monitoring for erosion and soil weaknesses will need to continue. Addition of targeted planting to enhance the security of the hillside and protect against erosion should be considered. The addition of native plants, such as spirea and bayberry, create a vegetation buffer which stabilizes the area, absorbs water, and slows-down erosion may be considered.

Action Type	Cost	Leverage	Impact
Direct	Low	High	Low

8.40 Long-term planning, including considerations such as armouring of the shoreline, may need to be considered. In being proactive in the planning and protection of the site due to detrition of the area from sea level rise and storm surge the Municipality may provide the opportunity to reduce the risk of damage to the historic lighthouse and its surrounding structures.

Action Type	Cost	Leverage	Impact
Direct	Low	High	Medium

8.41 Drainage along the parking spaces and connecting drives may be addressed through directional rainwater planning. This may include sloping of the surfaces, ditching, or a swale system. Planning for runoff from future weather events provides protection from water damage to the site and protects site users from incidents involving standing water.

Action Type	Cost	Leverage	Impact
Direct	Low	High	Low

8.42 Onsite storm planning may need to be developed. Storm planning may include measures implemented to protect the site, post-event site damage assessment guidelines, and response timetables following an extreme weather event. This planning may be completed in conjunction with EMO and other appropriate entities.

Action Type	Cost	Leverage	Impact
Partner	Low	Medium	Low

9.0 Municipal Roads

Concern Rating	Medium

9.1 When addressing climate change and their effects on roadways, partnership is key. Engaging with local and regional representatives of the Department of Transportation and Active Transit, the Municipality may strike a committee and work as a team to address issues and locate financing for work to be completed.

Action Type	Cost	Leverage	Impact
Partner	Low	Medium	Medium

9.2 Fallen trees from a wind event, heavy snow, or ice may cause a road blockage making access for residents to their homes and emergency response difficult. Work in partnership with the provincial entities to establish setback regulations or vegetation buffers (which currently are not regulated by provincial guidelines) to ensure minimal disruption in the case of a weather event.

Action Type	Cost	Leverage	Impact
Partner	Low	Low	High

9.3 Conclusive planning including immediate, intermediate, and long-term may be developed to ensure the safety and proper financial investment into road infrastructure. These plans may be developed on a singular roadway bases or with a whole approach. Considerations may include age of current infrastructure, current short-falls, climate threats, and traffic density as examples.

Action Type	Cost	Leverage	Impact
Direct	Low	High	Medium

Bennets Loop and Cameron Road

9.4 Proper drainage, ditching, and washouts are issues to consider. The predicted increase in large-scale rainfall events means drainage will be even more important for the future.			
Action Type	**Cost**	**Leverage**	**Impact**
Partner	Low	Medium	Medium

9.5 Bennets Loop offers the opportunity as a location for a roadside wetland[220] on the inside curve of the loop, which is currently woodland and shaded. The wetland area would provide water storage during weather events and will release water during dry seasons aiding in balance for the surrounding environment while reducing dust pollution.			
Action Type	**Cost**	**Leverage**	**Impact**
Partner	Low	Medium	Medium

9.6 Ditching plans accompanied with culverts and rainwater diversion may need to be considered and implemented to allow for rainfall and snow pile-up. Planning for proper water capturing and storage it will reduce the possibility of road washout and damage. Anti-erosion techniques should be employed for the ditching in order to ensure waterway blockages are limited and proficiency of the system may be maintained over time.			
Action Type	**Cost**	**Leverage**	**Impact**
Direct	Low	High	Medium

Hospital Road

9.7 Planning to ensure proper bank supports, both natural and engineered, may need to be developed to ensure long-term safety of the roadway. This may include planting of vegetation and trees to sure-up the bank and slow down erosion, or proper drainage during rain events, winter thaw and ice flow blockages. The addition of retaining wall or riprap may need to be planned for future development and protection of the roadway.			
Action Type	**Cost**	**Leverage**	**Impact**
Direct	Low	High	Medium

9.8 Planning for emergency route access in conjunction with EMO and appropriate entities in case of road washout or impassability may need to be completed. This plan should include scenarios surrounding temporary road closures to full road wash-out. This plan may include an evacuation plan for residents and hospital, power access guarantees for hospital, and contingence planning.			
Action Type	**Cost**	**Leverage**	**Impact**
Partner	Low	Medium	Medium

9.9 Future considerations for roadways may include land procurement or acquisition in order to shift the roadway farther from the waters edge to further guarantee emergency access to the hospital.			
Action Type	**Cost**	**Leverage**	**Impact**
Direct	Low	High	Medium

Restoration Drive

9.10 Proximity to the water treatment facility makes Restoration Drive not only a residential street, but may be an indicator to possible contamination of the water source. Monitoring of water source, water level rise, mineral and chemical levels will enable early detection of issues and allow for mitigation. Installation of a digital monitoring system at the water source ensures early detection and provides staff with a database of information with which to study any changes to the water system.			
Action Type	**Cost**	**Leverage**	**Impact**
Direct	Low	High	High

9.11 Work with local homeowners to engage in shore monitoring and provide resources surrounding shore restoration and maintenance information/funding. By fostering relationships with homeowners, the Municipality will be alerted to water rise issues in a timely manner allowing for adaptation effort.			
Action Type	**Cost**	**Leverage**	**Impact**
Partner	Low	Medium	High

9.12 Explore options for ditching and drainage to address rain events and winter thaw. Consideration should be made for curb appeal and property value reasoning. Conversation with homeowners will ensure a pleasant development of drainage priorities and strengthen the relationship between homeowners and municipal body.			
Action Type	**Cost**	**Leverage**	**Impact**
Direct	Low	High	Medium

Main Street

9.13 Flooding will be the biggest climate concern for Main Street. In order to avoid a flood in the future drainage, water capturing, and diversion plans will need to be developed. The plan should include future upgrades, EMO directives for road closures, and hazard assessment guidelines. Street drainage for rains and flood water may be used as a mitigation method. Instalment of drain grates and channels can reduce the risk of flooding and standing water, and expansion of a closed drainage system may be implemented as part of future infrastructure upgrades.

Action Type	Cost	Leverage	Impact
Direct	Medium	High	High

9.14 Rain gardens present a built infrastructure option for rainwater management. Rainwater may be captured and put into holding tanks to be used for watering municipal flowers and plants, or used in a community garden space.[PP]

Action Type	Cost	Leverage	Impact
Direct	Low	High	Low

Court Street

9.15 Drainage should be considered in anticipation of rainfall and snowmelt events. Consideration made to the fact that Court Street adjoins to Main Street and without proper road slope and drainage, water will pool at the base of Court Street causing washout and road impassability. The far side connects to Sonora Road and High-Crest Nursing Home,[221] which presents a particular vulnerability. Planning to ensure runoff does not pool or flood the nursing home may be considered and flooding mitigation plans developed to protect the residents.

Action Type	Cost	Leverage	Impact
Direct	Low	High	Medium

Port Bickerton Lighthouse Road

9.16 Protection of the wetland and marshes along the roads edge will need to be considered. Placing protective rock or natural barriers between the roadway and delicate areas will guarantee the continued success of the biodiverse areas and provide another buffer for the roadways.

Action Type	Cost	Leverage	Impact
Direct	Low	High	Medium

9.17 Sea level rise and storm surge provide particular areas of concern for the Port Bickerton Lighthouse Road. A long-term plan may need to be developed that includes identifying risks and future climate change eventualities that will threaten the roadway. Eventually large-scale change may need to be considered for the roadway to allow for future climate change advancement. This may include realignment of the roadway away from the precarious ocean edge, rebuilding the entire road to raise it significantly, or moving the roadway inland. Long-term planning will ensure the viability of the lighthouse and beach as a tourism staple. This plan should be completed in consultation with all appropriate entities, including the Port Bickerton & Area Planning Association, to ensure all bodies involved endorse the plan.

Action Type	Cost	Leverage	Impact
Direct	Low	High	Medium

9.18 Safety assessment guidelines may need to be developed following a weather event and/or before the beginning of the tourist season. The guidelines may include offset guidelines, minimum road clearance standards, road condition assessment, and hazard assessment. These guidelines will ensure safety of volunteers, public, and tourists when accessing the site.

Action Type	Cost	Leverage	Impact
Direct	Low	High	Low

9.19 Shoreline and sea-based wave breaks and diversion techniques may be considered. This would slow down the waves and storm surge responsible for the deterioration of the roadway. Such an approach will require multi-level governmental cooperation and support. This work will require consultation and significant planning to ensure the changes would not compromise the local fisher-people or native species.

Action Type	Cost	Leverage	Impact
Partner	Medium	Medium	Medium

4th Street/Sonora Road

9.20 The lower part of the road where it connects to Marine Drive has persistent pooling. Pooling may lead to premature breakdown or deterioration of the roadway and provides a safety risk. In an effort to curb pooling sloping pavement techniques may be considered.

Action Type	Cost	Leverage	Impact
Partner	Low	Medium	Medium

9.21 Ditching and proper drainage may need to be included in long-term infrastructure planning. Ensuring drainage routes remain maintained will allow runoff from rainfall or snow melt events to be directed away from roadways and private property.

Action Type	Cost	Leverage	Impact
Direct	Low	High	Medium

9.22 The brook running under Manson's Bridge is at-risk of flooding during an extreme weather event. The water level remains high even during dry seasons. Monitoring of the water level and mitigation planning may need to take place. Overflow of the brook would not only cause damage to the roadway but also the private residents and businesses surrounding the water way.

Action Type	Cost	Leverage	Impact
Direct	Low	High	Medium

10.0 Municipal Green Spaces and Trail Systems

Concern Rating	Low

Municipally owned green spaces and trails are an excellent resource for community engagement, climate change off-putting measures, and education opportunities.[SP] These spaces are at a risk of threat from climate change implications such as flooding, sea level rise, erosion, storm surge, winds, and temperature fluctuation damage. Considering options to address the climate risks parallel to the opportunities presented in green spaces, the Municipality has the opportunity to make a large impact in a short amount of time to the climate goal, while bolstering the resident's access to areas of wellbeing and retreat.

10.1 Individual plans may be developed[222] in partnership with appropriate entities to address various climate scenarios connected to extreme weather events, which may include: wind, flooding, erosion, storm surge, ecosystem failures, and land degradation. While there will be crossover between the plans,[223] having dedicated outcomes assigned to each location will enable decision makers to address the threat and establish clear objectives for each location.

Action Type	Cost	Leverage	Impact
Partner	Low	Medium	Medium

10.2 Engaging in a planting initiative[224] will act as a way to shore-up banks along the coast that have been affected by erosion,[PBT] create natural protection against future storms and extreme weather events, and purify the air.[SWP/PP]

Action Type	Cost	Leverage	Impact
Partner	Medium	Low	Medium

10.3 Temperature fluctuation will require public spaces to include natural shade mapping to be a part of their future planning. Tree canopies act as natural air conditioning[225] and provide shade for visitors. Further developing the trial systems[226] and connectivity will be providing cool space for outdoor activity[AL] and contributing to the areas outdoor tourism draw.[SP]

Action Type	Cost	Leverage	Impact
Partner	Low	Medium	Medium

10.4 In planting and promoting native plant species the Municipality not only ensures the health of the green spaces, it also creates an environment that will enable native wildlife to thrive.

Action Type	Cost	Leverage	Impact
Direct	Low	High	Medium

10.5 The opportunity to include edible plants and trees[227] in the planting initiative will provide an avenue for local food source.[PP] Partnering with the local St. Mary's Food Bank will ensure the year's harvest goes to those in the community who have the greatest need while beautifying and creating shade zones for community use.[SSP]

Action Type	Cost	Leverage	Impact
Direct	Low	High	Medium

10.6 Habitat restoration[228] work may be completed in conjunction with local groups, such as St. Mary's River Association,[229] to spotlight a particular species[230] at-risk[231] and create a hub[SP] where residents and tourists could be educated on the risks associated, as well as the techniques being employed locally that address them.[PP/SWP]

Action Type	Cost	Leverage	Impact
Partner	Low	Medium	Medium

10.7 A study of the wetlands and coastal area[232] running along the Port Bickerton Trail systems may be conducted to identify at-risk species and develop a plan to support endangered species in the area.[233] In utilizing these wet land and bog areas the Municipality will be able to diversify the current plant population and create an atmosphere where at-risk species can thrive.[234] This also offers the opportunity to extend the education program currently provided at the lighthouses interpretive centre.[235]

Action Type	Cost	Leverage	Impact
Partner	Low	Low	Low

10.8 Pursuing the planning [236] of greenspaces to fall under the natural play space [237] framework will enable residents and children to interact with the natural environment in an educational sphere while being physically active.[AL] Developing signage identifying local plant species, providing summaries of native wildlife that may be witnessed in the area, and encouraging development of community clubs, such as a bird watching group, all lead to greater engagement and education surrounding the natural environment, as well as the benefits to mental[AL] and physical health.[SP]

Action Type	Cost	Leverage	Impact
Direct	Low	High	Low

10.9 Engaging youth is recognized[238] as a key to addressing climate change.[239] Integrating environmental and climate change education [240] into the pre-existing programs the Municipality is arming the next generations with the information they need to be climate stewards for the area.[SP]

Action Type	Cost	Leverage	Impact
Educate	Low	High	Medium

10.10 Development of pollinator habitats will encourage a natural[241] growth in the pollinators populations and benefit local agriculture.[242] [SWP/PP] Pairing the pollinator habitats with community gardens [243] in municipal greenspaces or supporting them in community-run greenspaces will encourage community involvement, hands-on education, and municipal-wide pollinator support. The community gardens may be used as an additional resource for local food sources. There are various communities who have taken on beekeeping[244] and its educational[245] properties may be planned for future expansion of greenspaces.

Action Type	Cost	Leverage	Impact
Direct	Low	High	Low

10.11 Development of berms or vegetation barriers creates an unobtrusive view to the natural area while acting as an assistant to drainage, providing a buffer from events, such as high wind and storm surge, which would have otherwise damaged the surrounding environment.[PBT]

Action Type	Cost	Leverage	Impact
Direct	Medium	Medium	Medium

10.12 Protection of wetlands will act as a barrier for flooding and storage system surrounding drought periods. [246] Wetlands naturally hold water and slowly release them to the surrounding areas in a sustainable manner reducing the risk of flooding following extreme weather events.[247] This process of releasing water benefits during drought or dry seasons where the slow release of water allows the surrounding lands to remain moist, reducing the risk of forest fire and ecosystem degradation. Protecting existing wetlands[PBT] [248] and supporting the developing new ones[SWP] [249] creates a natural water catchment and release system for storm events, vast rainfall, and drought periods.[250] Wetlands are some of the most diverse ecosystems in the world, and often provide habitat for at risk or threatened species.[251]

Action Type	Cost	Leverage	Impact
Partner	Medium	Medium	High

10.13 Planning[252] and collaboration with appropriate parties to reinforce shore lines[PBT/PP] with rock or engineered solutions, such as a retaining wall, may be considered for the future.[253] Having substantial reinforcement work along water edges will protect the area against damage from rough waters, winds, storm surge and erosion.

Action Type	Cost	Leverage	Impact
Direct	High	High	High

10.14 With the rise in extreme weather events, particularly along coastal areas, clean up and damage assessment plans may need to be developed. This can be done by working in conjunction with Public Works Department, Community Development, and other appropriate entities to develop a checklist for municipally owned space assessment and cleanup. This may include hazard markers and timeframes for assessments post-event. Having a predetermined plan creates clear accountability and responsibility for all departments involved.

Action Type	Cost	Leverage	Impact
Direct	Low	High	Low

10.15 Demonstrate forestry and land management related to climate change through sustainable and ecologically based forestry management. This may look like a partnership with upper levels of government or development of a community forest co-op.

Action Type	Cost	Leverage	Impact
Partner	Medium	Medium	Medium

10.16 In anticipation of worsening climate change effects, planning of future infrastructure to be removable in the case of an oncoming event may be prudent. For example, removable board walk pieces that can be transported out of the storm surge zone during an event and put back following its conclusion.[PBT] Congruently, planning for in-place securement of items, picnic tables as an example, as to prevent them from becoming air-born and being a hazard.[PP/SWP] Planning infrastructure to either withstand the effects of climate change or be removed during times of threat, the Municipality is enabling a long-term approach to the climate issue and infrastructure protection.

Action Type	Cost	Leverage	Impact
Direct	High	High	High

11.0 Hazard Areas

Concern Rating	Medium

A hazard area is a space where climate change is threatening the local space. This could be a threat from temperature fluctuations, sea level rise, or extreme weather. The threat could be to property, ecosystems, or health and wellness. Recognizing hazard areas at the local level, will empower decision makers to request funding, create plans, invest in preventative infrastructure, or work with other levels of government to address the issue.

11.1 EMO planning in the event of a partial or complete washout of the roadway during a storm event or flooding event may be undertaken. This plan may include various storm scenarios, natural erosion scenarios, or infrastructure failure scenarios. The plan may be completed in partnership with the local volunteer fire department(s) and other levels of government where appropriate.

Action Type	Cost	Leverage	Impact
Partner	Low	Medium	High

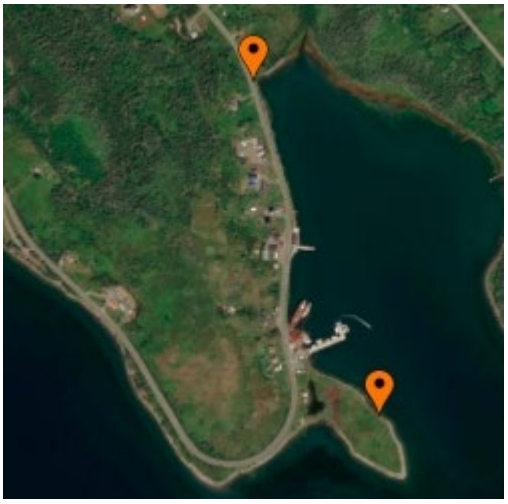
11.2 Highlight and provide information to other levels of government surrounding the at-risk area. Ensuring they are aware of the associated risk pertaining to the affected area allows for preventative planning and implementation of measures to address the issue.

Action Type	Cost	Leverage	Impact
Direct	Low	High	Medium

Wharf Loop – Ecum Secum

Located adjacent to the shore, the roadway is directly impacted by sea level rise and storm surge. The increase in extreme weather over the past decade have led to damage from increased wave action, high winds and rainwater washouts. The area is used as an access point for private residents and houses, and the wharf used by local fisher-people. Over the years there have been some minor road work completed, including shoulder rock; however, the area will require a more robust solution to combat the affects of climate change.

Marine Drive – Marie Joseph



During recent storms water levels along the roads edge have consistently risen to meet the roadway, and coupled with winds and waves each storm are leading to notable erosion along the coast side of the roadway. Lack of deep rooting plants to secure soil has resulted in continual run-off and loss following each season or exacerbated by extreme weather events. There is some rock to assist with reducing the effects on the roadway, however the current rock is quite small and has not been placed in a sustainable manner resulting in continual rock loss to the sea during high wind/sea events.

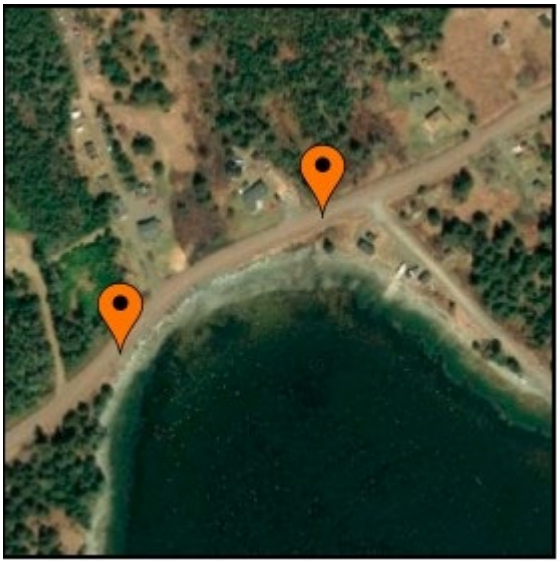
11.3 The wharfs located on this section of roadway supports the local fisher-people. Working with those whose livelihoods may be threatened by deterioration of the roadway and surrounding infrastructure, develop an agreement on best practices to address the threat considering the delicate nature of the fisheries in the area. This relationship will be beneficial if the need arises to take large scale steps to curb the threat (e.g., engineered solution) in ensuring all parties will be open to the discussion and solutions presented.

Action Type	Cost	Leverage	Impact
Partner	Low	Medium	Medium

Little Liscomb Wharf Road – Little Liscomb

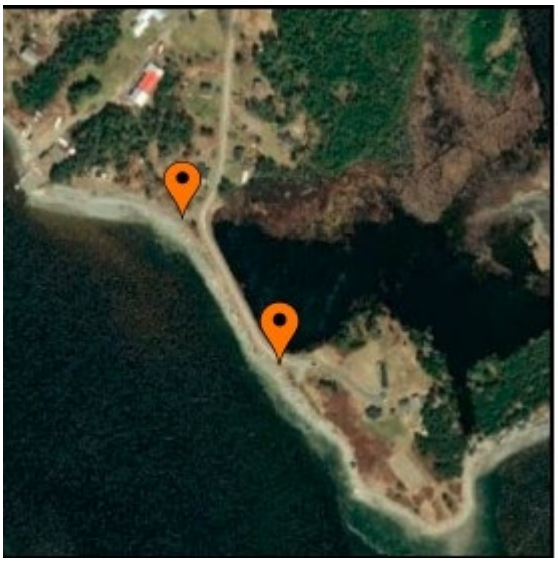
The highlighted area along the roads edge is prone to shoulder erosion due to proximity of roadway to waters edge. Storm surge, sea level rise and lack of deep-rooted perennial plant cover to slow down soil erosion have contributed to the continued deterioration of the road's edge. Previously the concern area has been fortified with armoured rock to reduce the erosion effects; however, continued impacts of climate change on the water's edge has resulted in deterioration of the roadway and flooding.

Jacks Cove – Little Liscomb Road



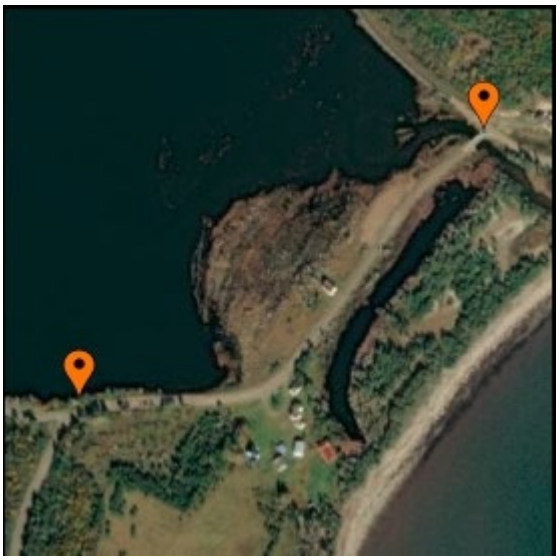
The highlighted area along the roads edge is prone to shoulder erosion due to proximity of roadway to waters edge. Storm surge, sea level rise and lack of deep-rooted perennial plant cover to slow down soil erosion have contributed to the continued deterioration of the road's edge. Previously the concern area has been fortified with armoured rock to reduce the erosion effects; however, continued impacts of climate change on the water's edge has resulted in deterioration of the roadway and flooding.

Sonora South – Sonora



Running along the coast the roadway takes significant damage from the seas, wind and rain. Following weather events, in which wind and wave activity are increasing, the swells will lift large rock on to the roadway causing blockages that require machinery to clear. The roadway is being eroded by sea level rise and lack of deep-rooted plantings to reduce runoff and protect the integrity of the roadway. Over the years attempts have been made to protect the roadway, including, placing of rock and minor rising of the roadway through gravel. The issues persists and have increased in the scale of damage to the roadway.

Sonora Road – Port Hilford



The section of Sonora Road being impacted runs along the brook joining Port Hilford Harbour to Indian Harbour Lake. The roadway experiences flooding, sediment build up, erosion and washouts. Over the past several years dredging, building up of the roadway, and installation of rock have all been used as tools to bolster the road against associated damage. To date flooding is still a high threat and erosion is ongoing.

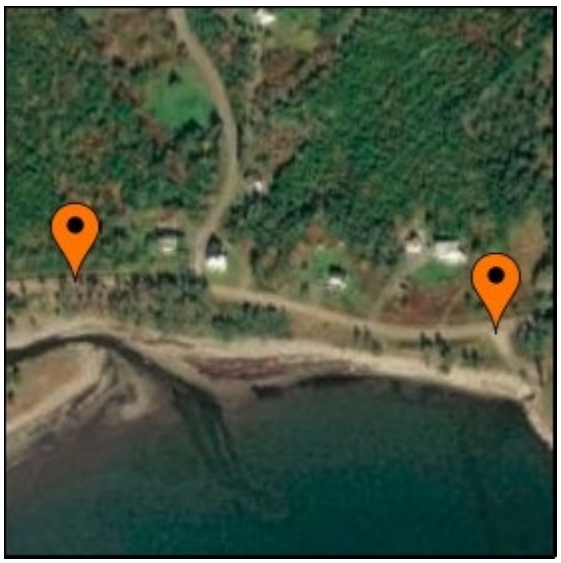
Highway 211/West Side Indian Harbour Lake – Indian Harbour Lake

With detrition of the wharf located in Port Hilford Harbor, which has previously acted as a breakwater, water and sediments has begun backwashing into the lake. The rising water levels, coupled with the increasing intensity of storms have led to negative effects that are felt in the lake and are threatening the roadways, residential homes and properties. Increased levels of erosion, higher rates of flooding and threats of extreme weather implications are high areas on concern in this space.

11.4 Engage with home and property owners in the effected area to catalogue current erosion levels to be used as a baseline for future measurements, provide education surrounding protection of property techniques from erosion, and to begin relationship building which will foster buy-in and in-put when developing issues addressing options.

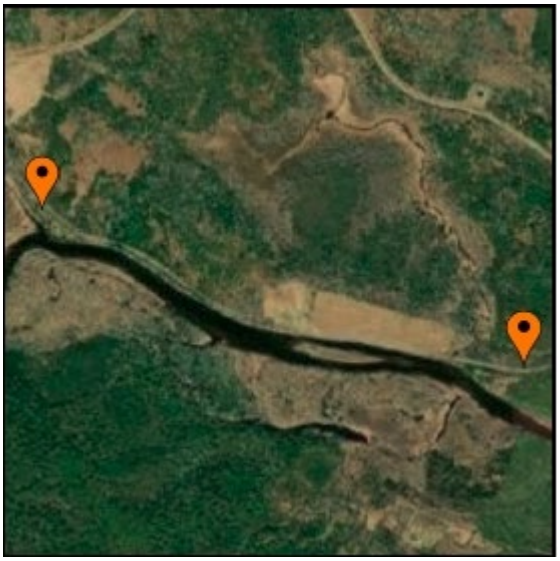
Action Type	Cost	Leverage	Impact
Partner	Low	Medium	Medium

Port Hilford – Highway 211



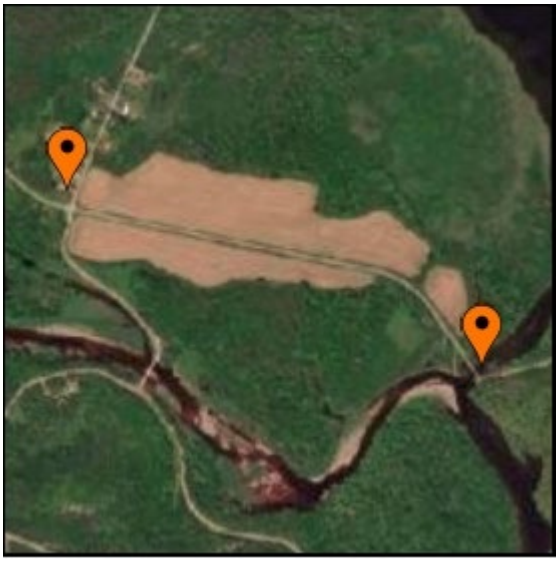
The bank supporting the roadway, which provides the only road access to the Western section of the municipality, is steadily eroding. Previously the bank had been able to support a small building and various trees, and in its current state there is only a small roadside remaining. Storm surge, erosion, sea level rise and detrition of the wharf that had previously acted as a breakwater for the beach area have all contributed to the rapid erosive state currently taking place.

Hattie Road – Glenelg



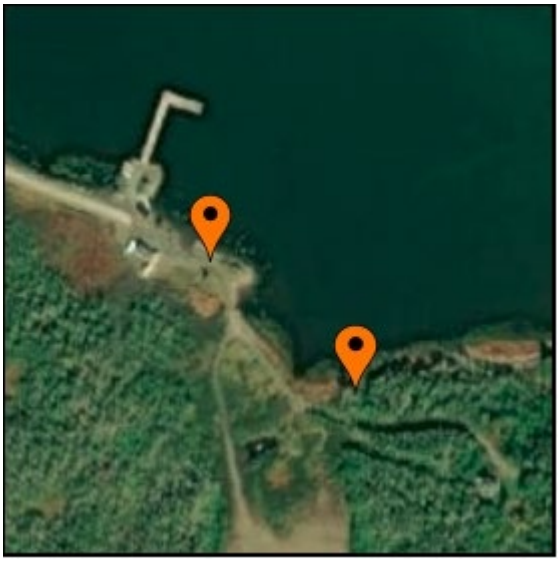
Proximity of the roadway to St. Mary's River places the roadway and residents at risk of flooding. Particularly during the spring thaw, associated ice run results in ice jams along this section of the river. The flooding, in the past, has blocked the road, washed out sections, created sediment pools on residential property and damaged buildings.

Highway 348 – Silver's Pool Bridge to Glenelg Church Road



The highlighted area lies directly along the St. Mary's River, and its direct proximity to the waterway and low-lying landscape makes it vulnerable to flooding. Flooding that has occurred along this roadway over the past several years has been caused by extreme weather events, ice jams and spring run-off. These events have resulted in closure of the road, damage to the agricultural fields and damage to infrastructure.

Neverfail Cove – Fisherman's Harbour Road



Located just east of the Fisherman's Harbour Wharf, the cove area has been hit particularly hard by erosion associated with sea level rise, storm surge and extreme weather events. The cove is used as an access point to launch boats for the locals, and while this use needs to be considered, the overall health of the cove and roadway must be addressed. In the past armoured rock has been brought in and remains on site to be installed along the roadway. There is very little vegetation to aid in soil management and clear exposure lines to the incoming sea winds present a threat.

12.0 Conclusion

Climate change resiliency, adaptation and mitigation will require a joint effort across all community members of the municipality. Residents may need to make choices or change behaviors to address the climate threat, businesses may be required to adopt innovative practices, and municipal decision makers may be the example of what it means to be a leader in the climate resiliency system. Providing resources, education and support to all the pillars of the community, from youth to council, will empower St. Mary's to take the steps required to meet climate change goals.

The improved resilience system provides guidance for all parties to move forward with positive and equitable efforts. These efforts may be achieved with resources, education and support championed for, or provided by, the Municipality. Through the pillars of the community it will empower the Municipality of the District of St. Mary's against the risks of climate change while meeting the reduction goals.

In order to cultivate the required changes to meet the municipal climate change goals and foster a community of climate resiliency, the committee compiled a short-list of action items. These items are the building blocks to meet the targets. Each action item was selected thoughtfully and weighed against its opportunities surrounding the environment, wellbeing and level of impact. Decision makers in the community are encouraged to include climate change action in their current and future planning.

Recommendations

Green House Gases

1.1 Electric vehicle charging stations provide an opportunity to encourage residents and visitors to the area with an alternative way to travel. In having access to charging stations, the Municipality shows an outward commitment to being climate forward and climate conscious.

2.10 Work with outside partners to pursue opportunities to invest in sustainable affordable housing. Funding programs such as the *Green Municipal Fund* offers funding and pilot project options that can cover up to 80% of project costs.

2.3 Canada *Greener Homes* grants offers up to a $5000 grant to homeowners for energy efficient upgrades including solar panels, heat pumps and smart thermostats. Providing education and awareness of the various funding programs available for energy efficient upgrades, the Municipality is empowering the residents to be proactive in addressing climate change in the home.

Temperature Fluctuations

3.7 Conduct a study of access to drinking water, including needs and barriers for residents that access clean drinking water. The reliance of drinking water from a secondary source (hauling water from a local drinking stream) for many rural residents creates a particular challenge that will need to be highlighted in the process of a study.

Sea Level Rise

4.4 Lobby for various sites along the coast to be included in the provincial groundwater monitoring program. To date there is only one monitoring site in Guysborough County and zero anywhere along the coast. The data from water monitoring locations could then be used to develop prediction mapping and planning for future water protection measures.

Extreme Weather

5.1 Plans to address given scenarios will need to be developed in partnership with EMO, local volunteer fire departments, provincial response and community organizations. Scenarios to consider planning may include: long-term power outage (winter/summer), roadway closures due to washout or downed trees.

Health and Wellness

6.13 Plan programs focused on coping with mental health such as meditation classes, art workshops and nature based activates.

Ecosystems

7.5 Encourage and provide information on sustainable forestry practices, such as forest certification, to encourage woodlot owners to shift their practices toward sustainability, including best practice guides. Highlight available funding opportunities associated with programs such as silviculture. Explore the possibility of training associated with assisted migration planting to inform woodlot owners of the technique, climate mitigation implications and benefit to their woodlots.

Municipal Buildings

8.6 Embankment monitoring, evaluation and response practices may be developed. These practices may begin by developing a baseline of current daily levels and some recent extreme weather event maximums. This will allow for clear indication of rising waters, or what to anticipate as capacity in the event of future weather events and make appropriate predictions to which responses may be modeled after.

Municipal Roads

9.3 Conclusive planning including immediate, intermediate, and long-term may be developed to ensure the safety and proper financial investment into road infrastructure. These plans may be developed on a singular roadway basis or with a whole approach. Considerations may include age of current infrastructure, current short-falls, climate threats and traffic density as examples.

Municipal Greenspaces and Trails

10.11 Wetlands naturally hold water and slowly release them to the surrounding areas in a slow and sustainable manner reducing the risk of flooding following extreme weather events. This process of releasing water benefits during drought or dry seasons where the slow release of water allows the surrounding lands to remain moist, reducing the risk of forest fire and ecosystem degradation. Protecting existing wetlands[PBT] and supporting the developing new ones[SWP] creates a natural water catchment and release system for storm events, vast rainfall, and during drought. Wetlands are some of the most diverse ecosystems in the world, and often provide habitat for at risk or threatened species.

Hazard Areas

12.1 The committee proposes an annual list of areas be complied and submitted to the province for consideration, similar to the paving of roads or the Gravel Road Program. In being proactive and submitting a list of concern areas to the Province, will not only bring those concerns to the attention of a higher levels of government, but will raise the hazard areas in the public conscious and that of local decision makers.

In the creation of the **Climate Change Action Plan**, the Municipality has signaled the commitment to climate action in St. Mary's and recognized the importance of building in climate resiliency for the Municipality. Focusing on positive community action, plus integrating resiliency-based practices and policies into the municipal toolbox will ensure the long-term viability of the area. Through continual commitment on the part of decision makers, use of the improved resilience framework, and encouragement of community involvement we have created the framework for climate success in The Municipality of the District of St. Mary's.

SSP—Streetscapes Plan
SP—Strategic Plan
ASP—Active Sherbrooke Plan
SW—Source Water Protection Plan
AL—Active Living Strategy

SWP—Stonewall Park
PP—Pioneer Park
PBT—Port Bickerton Lighthouse Trail

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