



Resilient Roots:

Stratford's Climate Action Plan

townofstratford.ca

LAND ACKNOWLEDGEMENT

We acknowledge that we are on the traditional, taken territory of the Mi'kmaq people. For over 12,000 years, the Mi'kmaq Nation has been the keepers of this land we now call Prince Edward Island, known as Epekwitk. We express our deep gratitude and respect for the Epekwitnewaq Mi'kmaq elders, past and present, who have cared for and nurtured this land.

We recognize the enduring presence, knowledge, and contributions of the Mi'kmaq people, whose vibrant culture and rich heritage continue to shape the identity of this region. We honour their connection to the land, waters, and all living beings that inhabit these territories.

Let us reflect on the ongoing challenges faced by the Mi'kmaq people and the importance of reconciliation. May we strive for understanding, justice, and equality as we work together to build a future that respects the rights and aspirations of all Indigenous peoples.

In the spirit of reconciliation, we commit to fostering meaningful relationships with the Mi'kmaq community and engaging in ongoing dialogue, recognizing the need to listen, learn, and take meaningful action towards reconciliation.

We are all Treaty People.

Wela'liq. Thank you.



COLLABORATION ACKNOWLEDGEMENTS

Funders and Facilitators

Resilient Roots: Stratford's Climate Action Plan (the Plan) was made possible through the Government of PEI's Climate Challenge Fund and facilitated through the Federation of PEI Municipalities (FPEIM) and the Clean Foundation.

Danelle Finney, Author, Community Climate Advisor, FPEIM

Contributors: This Plan represents the culmination of efforts invested by many parties who offered their expertise and advice to the research and insights compiled in the Plan. We are grateful for the support, time, and consideration of Stratford staff, committees and Council, external organizations, residents, and **Madeleine Crowell** (Environmental Sustainability Coordinator, Town of Stratford) for coordinating Stratford's input.

CLEAN FOUNDATION

Ramona Doyle, Vice President, Program Development

Mike Proud, Manager, PEI Programs

Katie Giles, Senior Manager, Energy Department

Lily Reaman, Manager, PEI Engagement and Workforce Development

FEDERATION OF PEI MUNICIPALITIES

John Dewey, Executive Director

Julie McMurrer, Administrative Assistant

Satyajit Sen, Policy and Special Projects Advisor

Lori Mayne, Communications and Member Services Officer

CLIMATLANTIC INC.

Emma Poirier, Climate Change Science and Adaptation Specialist

Cassandra Gautreau, Climate Project Coordinator

STRATFORD AREA WATERSHED IMPROVEMENT GROUP

Kaylee Busniuk, Watershed Coordinator

Lily McLaine, Watershed Project Manager

PROVINCE OF PEI

Erin Kielly, Senior Advisor, Programs and Outreach, Environment, Energy and Climate Action

GRAPHCOM.CA

Layout & Editing

Special thanks to Winston Maund for contributing many of the photos found throughout this document.

TABLE OF CONTENTS

Land Acknowledgement	1
Collaboration Acknowledgements	2
Executive Summary	4
Introduction	7
Limitations	8
About Stratford	8
Natural Landscape & Watersheds	9
Stratford's Climate Profile	9
Lessons from Post-Tropical Storm Fiona	12
Stratford Residents' Climate Concerns	13
Goals & Actions	14
<i>Measuring Success</i>	14
<i>Community Planning</i>	14
<i>Climate Emergency Readiness</i>	16
<i>Energy</i>	19
<i>Transportation</i>	19
<i>Water, Wastewater & Stormwater</i>	22
<i>Natural Assets</i>	24
<i>Wetlands & Coastlines</i>	25
<i>Green Spaces</i>	28
Strengthening Our Roots	30
References	31
Appendices	35
<i>Appendix A - Climate Profile</i>	35
<i>Appendix B - List of Acronyms</i>	38
<i>Appendix C - Action Tables Goal Labels</i>	38
<i>Appendix D - Glossary</i>	39

EXECUTIVE SUMMARY

Resilient Roots: Stratford's Climate Action Plan (the Plan) is a guide for dealing with the one of a kind problems that climate change brings to our community (municipality). The main idea behind the Plan is to make changes that build a stronger community against climate threats that are taking place now and those that will take place in the future. The part of the Plan that focuses on lessening the impact of greenhouse gas emissions (gases from human activity that trap heat and lead to climate change) suggests that we increase our use of renewable energy sources (solar, wind, etc.) and that we use electricity in a more thoughtful way within the municipality. Ideas for dealing with this can be found in Stratford's Community Energy Plan (CEP), and also here in this document. You'll find links in the Plan that will take you directly to the Town of Stratford's key plans, policies, and reports.



The Plan is put together by looking at what is needed to help improve Stratford's resilience to local climate hazards by examining climate change risks to the municipality through a needs and risk assessment, in-depth research, input from various environmental experts, and Stratford's residents' views. The Plan places importance on ways we can take action against the impacts of climate change across our community, including private (i.e. homes) and municipal buildings, energy, transportation (both vehicular and human powered), being prepared for climate emergencies, water (potable/drinkable, stormwater, and wastewater), and the natural environment. By safeguarding residents, infrastructure, and natural assets, Stratford contributes to the global endeavour to live more sustainably.

Climate Threats, Local Climate Estimates, Residents' Major Concerns:

- *The municipality is facing increased risks caused by climate change, including rising sea levels (sea-level rise), coastal damage (erosion), unusually high levels of seawater during storms (storm surge), flooding, extreme weather events happening more often (e.g. heatwaves, heavy rainfall), wildfires, and seasonal loss of ice located close to the coast.*
- *Temperatures are expected to rise in Stratford in all seasons. Extremely hot days (with temperatures above 29°C) are expected to increase from two days per year on average (during the years between 1971 to 2000) to between 23 and 53 days per year on average (from years 2071 to 2100).*
- *Rainfall is expected to rise in all seasons in Stratford. By 2071 through 2100, there could be three to four more days with heavy rain falling over a short period.*
- *Despite more rainfall in total, the change in the way that it falls could mean longer periods with no rain, leading to drought and the possibility that groundwater would be renewed less often.*
- *By 2100 sea levels in Stratford are expected to rise between 0.77m and 1.13m. Under certain conditions, it could rise by 1.52m.*

The top five concerns for Stratford residents: 89% of residents are concerned about stronger storms and more powerful weather taking place more often, 84% are concerned with coastal erosion, 73% with poverty as a result of climate change, 72% with seawater flooding land areas (coastal flooding), and 72% with problems getting enough good quality food (food insecurity) due to climate changes.

Action Section Highlights

1. COMMUNITY PLANNING



Revise Zoning and Development Bylaws: Strengthen Stratford's method of encouraging design and development plans for subdivisions that take climate change into account at all stages ("Sustainable Subdivision Overlay"), change Stratford's "Official Plan" to set requirements for building along the coast (coastal setbacks) further back, create an Erosion and Sediment Control Policy for development that has strict requirements for controlling runoff, update building codes to meet climate change standards, and increase efforts across all levels at the Town of Stratford (interdepartmental review process) to save forested areas.

2. CLIMATE EMERGENCY READINESS



Full Emergency Readiness: Create an all around emergency response plan that looks at local climate risks, updates supplies for things that may be needed in a climate emergency, finds power sources that can be moved from place to place (mobile power sources), increases support for the community by promoting the Stratford Connect Mobile App, educating and training residents in emergency evacuation plans, identifying those who might be at risk during a climate emergency (e.g. seniors), creating working secure ways to communicate during a climate emergency, and holding run throughs of potential emergencies.



Full Climate-Friendly Framework: Encourage all Stratford buildings to make changes in stages to prepare for local climate risks and to strengthen the ability of the town to deal with emergencies, including buildings that are already built or that are to be built. Join forces with neighbouring communities, such as Hazelbrook and Alexandra, in preparing their own community emergency centres.

3. TRANSPORTATION



Green Transportation Opportunities: Encourage more environmentally-friendly options for travelling (i.e. to and from work) by sharing options with residents through media and education, increase accessibility to electric vehicles (EV) by locating charging stations in easy to reach places, change vehicles used by the municipality from gas and diesel to include electric, ensure that the T3 bus system is being used to its full ability, create a group that shares E-bikes or scooters, and increase the amount of bike lanes, walking paths, etc., (active transportation areas and its supports).

4. WATER, USED WATER, AND STORMWATER



Eco-Friendly Stormwater Management: Put in place stormwater measures that have been proven to work and that encourage the use of natural ways to reduce water contamination like rain gardens and bioswales (depressions in the earth that collect rainwater, soak it into the ground, and filter out pollution). Reduce the amount of water soaked into the earth (infiltration), create plans specifically for areas of Stratford where floods are most likely to happen, upgrade current community systems to better deal with inland flooding and storm surges, and update water management plans to meet Canadian Standards (CSA Group) guidelines.



Strong Wastewater Management: Protect coastal and inland wastewater (water that has already been used) supports from climate risks. Collect backup generators, cooperate with others on shared water treatment supports, and make sure the maximum protection against flooding and power outages is in place.



Increased Wellfield Capacity: Put in place plans that protect the area surrounding wells (wellfields) that takes climate risks into consideration. Create protections against damage caused by lightning, and continue increasing the benefits of wellfields by growing plants that are native to the community. Create less human-made hard surfaces around wellsites that don't allow water to sink into the earth (impervious surface prevention).

5. NATURAL RESOURCES (WETLANDS, COASTLINES, AND GREEN SPACES)



Improving Natural Resources: Promote green (i.e. parks, open space, trees, gardens, green roofs and walls) and blue (i.e. water infrastructure, ponds, coastlines, ocean, streams, and stormwater systems) nature-based or hybrid actions (mix of man-made or engineered methods and natural methods) in collaboration with other local groups, and source used material locally. Work in stages to create management plans for all the nature-based assets that are in Stratford. Establish more plants that are native to the area, save existing green space and create new green spaces, put the “Forest Management Plan” into action, and educate on the importance of green spaces.



Conclusion

The Plan makes use of various actions, creating a community that is able to bounce back from threats and that succeeds along with our natural surroundings. By planning ahead and acting together, we make ourselves ready for the challenges of climate change, protecting an exciting and continuing future for everyone.

Please Note: For explanation of terms, please see the Glossary on page 39 of the document.

INTRODUCTION

Climate change is both a worldwide and local issue; rising temperatures, extreme weather events (heatwaves, hurricanes, etc.), and damage to the environment create major threats to our community, economy, and natural resources. We believe that by taking strong action now, we can create a path towards a lasting and livable Stratford for generations to come.

The purpose of this Climate Action Plan (the Plan) is to provide a roadmap for our joint efforts to reduce greenhouse gas emissions, increase the strength of infrastructure, adapt to climate risks, and enhance Stratford's natural spaces. It is a joint effort involving input from community members, local organizations, government departments, and environmental experts. Together, we have identified prime concerns and actions that meet with the particular needs and makeup of Stratford.

We note that addressing the needs of everyone (equity) is an important part of the climate change discussion, and we strive to be proactive in addressing issues that hinder access to environmentally-friendly local food, clean water, housing, employment, public transportation, active transportation pathways (cycling lanes, walking paths, etc.), natural spaces, energy, better environmental education, health supports, and community connection. This Plan takes into consideration the needs of everyone in Stratford (equity relationship).



This Plan highlights Stratford's goals across various groups (sectors) such as land-use planning, emergency readiness, transportation, stormwater, and natural assets. By putting into action both harm and emission reduction (mitigation) and making changes in response to climate change (adaptation) across these groups, our aim is to take a holistic approach that becomes part of the day to day habits and behaviour of the community and ensures an ongoing future for all residents.

The Plan is also a document that can change over time as demands change. As new technologies appear, scientific knowledge progresses, and community needs change, so will some details of our goals and actions. Regular updates will make sure that our work stays in line with the latest science, generally accepted systems and best practices, and needs of the community.

LIMITATIONS

It is important to note that there were limitations in putting this report together, including not having access to certain data, unexpected or unknown elements, and the constantly developing field of climate change science and study means that the information found in this report is a reflection of the time in which it was written (although it can be updated).

The Town of Stratford faces challenges, many of which are common to other municipalities on PEI. These include staff capacity issues at the Town in keeping up with rapid growth in the community, the rules and limits that come with funding, the knowledge gaps in local-municipal research, the need for understanding outside of our own experience and expertise, and the challenge in tackling issues between jurisdictions and private entities.

ABOUT STRATFORD

Stratford is close to Prince Edward Island's capital city, Charlottetown, and is connected to the city by the Hillsborough Bridge. The bridge has high traffic volume, with a daily average of 31,000 back and forth crossings.

In early times Adoosak (Mi'kmaq name for the Stratford area) was inhabited and tended to by the Mi'kmaq through the spring and summer months. The area was settled by the Acadians and then the British through the 1800's. Farming, shipbuilding, and brickmaking were common activities in the area. In 1995 the communities Southport, Bunbury, Cross Roads, Keppoch-Kinlock, and Battery Point amalgamated into the present day Town of Stratford.

- 2021 Census: Stratford had a total of 4,667 private dwellings and a population of 10,927.
- population increase of 12.5% since the 2016 Census.
- From 2011 to 2021: Number of private residential dwellings in Stratford increased from 3,509 to 4,667.¹

NATURAL LANDSCAPE & WATERSHEDS



The Town of Stratford is a community located along a coast (coastal community) and is bound by the Hillsborough River, Charlottetown Harbour, Hillsborough Bay, and Fullerton's Marsh. The municipality has roughly 15 kilometres of coastline.

The Town is committed to keeping its natural environment for present and future generations. The Stratford Area Watershed Improvement Group (SAWIG) was formed by concerned community members in 2009. SAWIG works with residents, businesses, and government representatives to develop watershed management plans to address environmental concerns. The Town understands the importance of managing and maintaining the health of rivers, streams, and water bodies in and around the Stratford area, and considers watershed management necessary to the health of the community.

STRATFORD'S CLIMATE PROFILE

The Province of PEI's Building Resilience: Climate Adaptation Plan² points out seven risks the province could be facing if the right steps aren't taken to prepare for climate change. These are: coastal risks (erosion, storms, etc.), post-tropical storms (post-tropical refers to the cooling of the temperature at the centre of a storm system), extreme heat events, heavy precipitation (rainfall) and flooding, earlier and warmer springs, severe ice storms and freezing rain, and seasonal droughts. These hazards will continue to exist, but taking steps to prepare before they occur will help reduce the risks. This plan is based on Stratford's collected past and current climate information, including temperature, precipitation (water that falls to the earth), and sea level rise as far as 2100. See Appendix A for more information and maps on temperature, precipitation and sea level rise.

Temperature and precipitation data are from the national climate data portal, ClimateData.ca,³ representing an average year across four periods of time. Sea level rise values are from Natural Resources Canada.⁴ All values are from the latest international models (CMIP6). Results are comparable between scenarios through mid-century (2041-2070). Results for the end of the century (2071-2100) are shown for both low emission (SSP2-4.5) and high emission scenarios (SSP5-8.5). All sea level rise data are for the high emissions scenario (SSP5-8.5).

Temperature

Temperatures are projected to rise through each season of the year in Stratford. Springtimes that are warmer and arrive earlier is a hazard identified by PEI's Climate Adaptation Plan. Temperature changes will affect farming (including but not limited to, possibly more pests spread across wider areas, difficulty in growing crops and less successful varieties of crops) and fisheries (including but not limited to, much more bacteria and algae, drop in the number of certain species because of changing water temperature, e.g. lobsters and oysters), spread of invasive species (species that aren't native to the area and that compete with native species for food, space, etc.), and stress on biodiversity (the variety of species in an area), and could increase the risk of wildfires. Extreme heat events (temperatures above 29°C for three consecutive days) have additional impacts on public health (including death [morbidity] in vulnerable populations such as seniors). In addition to changes caused by increased heat, with fewer extremely cold days and days in which ice builds up would create less of an ice barrier (buffer) between the waves and our shores. Our surrounding coastal ice is important in lessening erosion, and is very useful during harsh storms.

Table 1: Temperature projections for PEI

Climate Index	1971 - 2000	2011 - 2040	2041 - 2070	2071 - 2100 [low]	2071 - 2100 [high]
Extremely hot days (> 29°C)	2 days	8 days	23 days	23 days	53 days
Extremely cold days (< -15°C)	23 days	10 days	2 days	2 days	0 days
Ice days (entire day below 0°C)	69 days	51 days	36 days	35 days	20 days

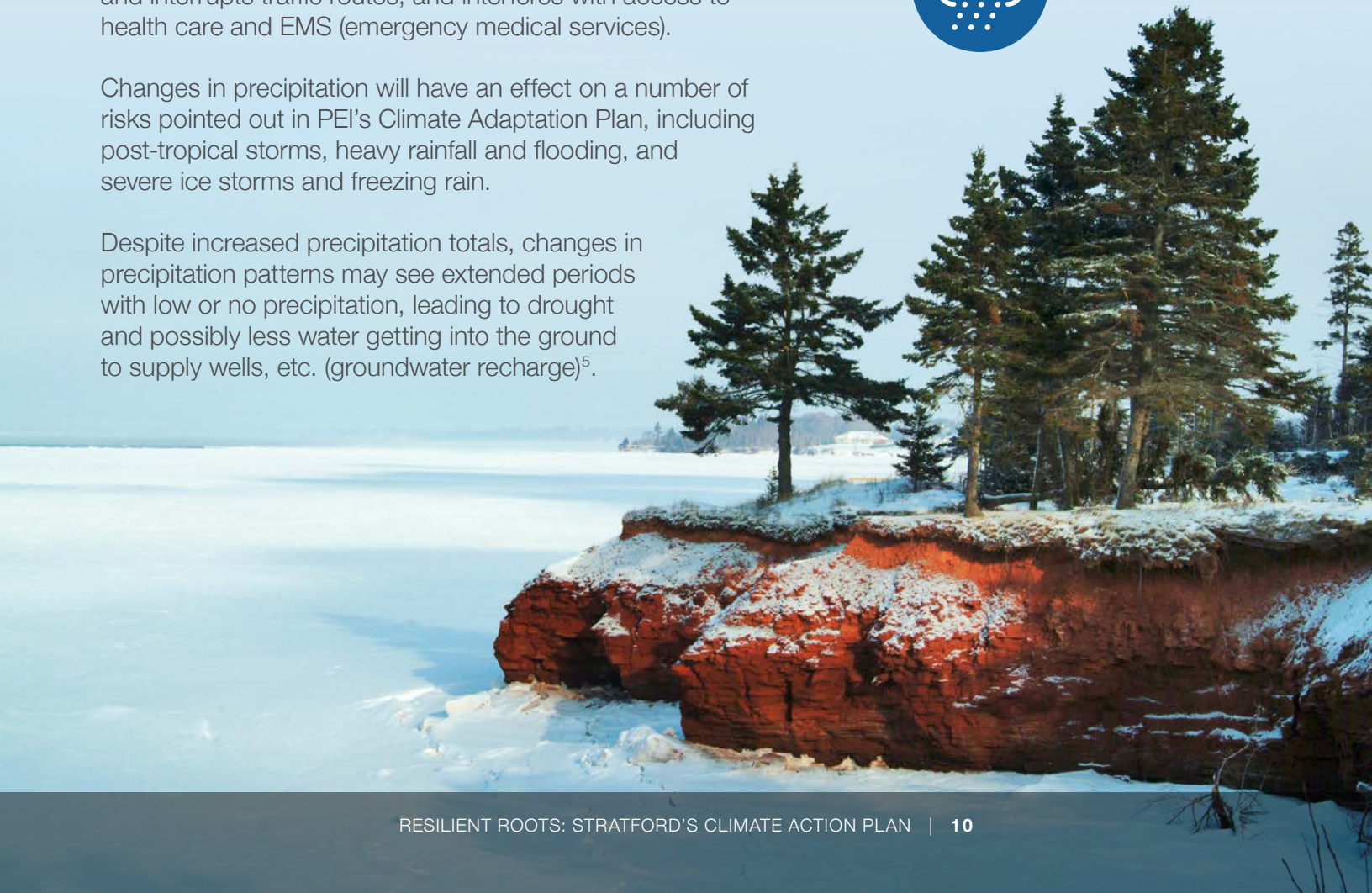
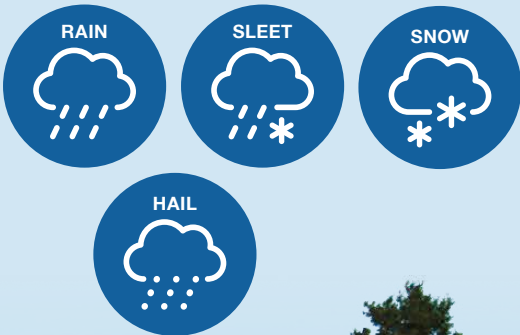
Extremely hot days (temperatures above 29°C) are expected to occur more frequently, from 8 days (2011-2040) per year to 23–50 days (2071-2100) per year. Extremely cold days (temperatures below 15°C) are expected to occur less frequently, from 10 days (2011-2040) per year to 0-2 days (2071-2100) per year. Also, "ice days" (an entire day below 0°C) are projected to occur less frequently, from 51 days (2011-2040) per year to 35-20 days (2071-2100) per year.

Precipitation

Precipitation is expected to increase in every season throughout the year. Precipitation in which more rain, snow, sleet, ect. falls over a shorter period (high intensity) is also more likely, leading to flash flooding, freezing rain, and heavy snowfall that interferes with transportation, damages crops, pollutes waterways, blocks entry and exits to and from communities and interrupts traffic routes, and interferes with access to health care and EMS (emergency medical services).

Changes in precipitation will have an effect on a number of risks pointed out in PEI’s Climate Adaptation Plan, including post-tropical storms, heavy rainfall and flooding, and severe ice storms and freezing rain.

Despite increased precipitation totals, changes in precipitation patterns may see extended periods with low or no precipitation, leading to drought and possibly less water getting into the ground to supply wells, etc. (groundwater recharge)⁵.



Sea Level Rise

By the year 2050, sea levels in Stratford are projected to rise by 0.33-0.48m and by the year 2100, sea levels are projected to rise by 0.77–1.13m and under certain conditions could rise by 1.52m.

Most of Stratford's coastline is not low-lying and therefore the higher shoreline slopes (bluffs) will withstand some of the increased flooding and storm surge effects of sea level rise, however they remain highly erodible and are at risk of increased erosion from climate change.



Image: Stewart Cove area of Stratford is vulnerable to sea level rise, as shown on the Climate Hazard Information Platform (CHIP)⁶.



LESSONS FROM POST-TROPICAL STORM FIONA

In late September of 2022, P.E.I. and Atlantic Canada experienced the destructive impact of Post-Tropical Storm Fiona, a powerful storm that was a strong reminder of the challenges posed by climate change. Studying this event allows us to find useful lessons that can direct us in working to address a changing climate.

Post-Tropical Storm Fiona left a lasting impression on the Island, especially due to widespread power outages that lasted for weeks. The lengthy blackout was a difficult reminder of how easy it is to damage key parts of our communities and the services they provide (infrastructure) when extreme weather happens. It forced us to understand that we need a strong energy supply that can last through powerful storms, be repaired quickly, and minimise disruptions to essential municipal services.

The large-scale loss of soil (erosion) caused by Fiona pointed out how fragile our coastal ecosystems are, stressing the importance of keeping and building back up the natural coastal features that protect our land. This event highlights the need for more thought and action taken in nature-based remedies.

The storm also took a toll on our forests, with about 13% of forested areas losing at least 70% of trees in PEI.⁷ Native forest plants play a major role in regulating the climate, purifying the air, maintaining soil, replacing groundwater, and keeping areas liveable for wildlife (habitat).

Post-Tropical Storm Fiona also showed us the incredible power of communities working together and rebuilding. The storm brought neighbours and strangers together to offer support, assistance, and comfort during a time of trouble. Communities came together, showing the strength and kindness that can come forward during difficult times. This community spirit pointed out the importance of encouraging strong social connections and community readiness, and of creating a way of life that is able to rebuild and change as we deal with the challenges of a changing climate.

Looking back on the way Post-Tropical Storm Fiona affected us, we are reminded that climate change is an immediate and all-around challenge, that means we must act together. It tells us that we need to build strong community support (built and social infrastructure), protect and repair our natural ecosystems, and create a sense of community togetherness and readiness. By taking these lessons to heart, we can work towards a more resilient future for our community that is able to survive from climate threats.



STRATFORD RESIDENTS' CLIMATE CONCERNS

In Stratford's 2023 Annual Resident Survey,⁸ the Town asked residents about their current and future climate change impact concerns. Residents were concerned about all the impacts included in the survey, with 89% of residents concerned about more frequent and intense storms and/or extreme weather.

This may be because of the recent experiences residents had with Post-Tropical Storm Fiona.

Also in the top 5 biggest concerns of residents were: coastal erosion (84%), poverty (73%), and coastal flooding (72%) and food security (72%).

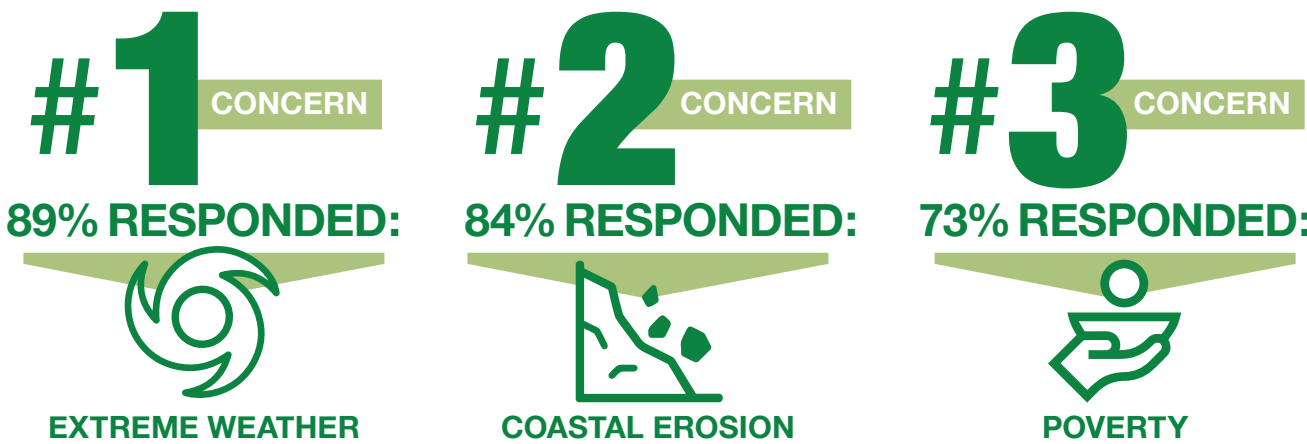


TABLE 4 - HIGHEST CONCERNS:

# 1	Increased intensity and frequency of storms/extreme weather (e.g., post-tropical storm or severe ice storms and freezing rain)	# 5	Food security (e.g., smaller harvests leading to not enough food)
# 2	Coastal erosion	# 6	Heavy precipitation and inland flooding
# 3	Poverty	# 7	Loss of species/biodiversity
# 4	Coastal flooding	# 8	Increased seasonal drought
		# 9	Increase in temperature (e.g., heat waves)
		# 10	Displacement



GOALS & ACTIONS

The suggestions/recommendations that follow are meant to guide the Town in taking proactive action to prepare for climate change and to lessen its effects. Some goals and actions address needs and challenges that we know are at stake, while others are more general and open to further research, new funding opportunities, or new resident feedback. The recommendations for the section on energy are not included in this Plan, but can be found in Stratford’s Community Energy Plan (CEP). Also, as a municipality, Stratford can only make changes within its legal control (jurisdiction), and these recommendations take into account only what Stratford has within its authority; in many areas, however, Stratford can only encourage, promote incentives, and educate, but cannot require.

Measuring Success

To measure how well the Plan has been put into action, all steps will be reported on within five years of putting the Plan in place, and again within 10 years if an updated plan has not taken its place. Each action will be reported on, recording whether it’s not yet completed, partially completed, or fully completed. Actions that cannot be measured will have a description of the work undertaken to date, or any other work that has been done that matches the overall goal of the action. If all the actions for a specific goal have been completed, that goal will be considered to have been achieved.

Community Planning

Planning within a municipality affects the ways in which residents can respond to climate change. The Plan stresses the importance of taking climate into account when planning locally. Effective municipal planning for climate change requires a multi-faceted and multi-sectoral approach that understands vulnerabilities, engages stakeholders, and implements strategies to mitigate emissions and enhance resilience through adaptation. By taking a forward-thinking approach, Stratford can create an ongoing and climate-strong community, with the additional benefits of improved public health, financial opportunities, and more natural beauty.

Benefits of Good Planning

- Fewer land use conflicts
- More efficient and cost-effective development, use and maintenance of infrastructure
- Predictability for landowners
- Protection of natural resources
- Clean and healthy environment
- Better quality of life for residents
- Climate resilience and preparedness
- Low carbon lifestyles that reduce greenhouse gas emissions

Consequences of Not Planning

- Conflicting land uses
- Urban sprawl and rural ribbon development
- Unpredictable development
- Loss of natural assets, biodiversity, and vulnerable habitat
- Expensive and inefficient delivery of services
- High cost to maintain infrastructure
- Increased climate vulnerability
- High dependence on personal vehicles (increased emissions)⁹

Community Climate Planning Goal and Action Table

*C - Community Planning goal label.

Goals	Recommended Actions
C1 Integrate climate change considerations into all aspects of community planning.	1. Update the Sustainable Subdivision Overlay in the Zoning and Development Bylaw¹⁰ to ensure it is a viable and appealing choice for developers. 2. Amend the Official Plan¹¹ and Zoning and Development Bylaw to increase horizontal and vertical coastal setbacks to reflect current rates of erosion and flood zones and at minimum meet provincial setbacks, and to incorporate future climate considerations into land use and building regulations. 3. Limit densification and development pressures in coastal areas. 4. Update building codes and standards (e.g., fire and energy) as soon as new codes and standards become available that consider climate change. 5. Create an Erosion and Sediment Control Policy and update the Zoning and Development Bylaw to ensure more stringent requirements for developments. 6. Update the Official Plan and Zoning and Development Bylaw to increase consideration for forested and natural areas in greenspace dedication as part of the interdepartmental review process. 7. Increase and improve mixed-use zoning and higher density development in the urban centre (showcase Shape Stratford),¹² taking into consideration climate change impacts such as intense rainfall, extreme heat, etc. that require built adaptation.
C2 Foster collaboration and partnerships with stakeholders.	1. Engage residents, community organizations, neighbouring municipalities, and stakeholders in the planning process. 2. Foster partnerships with local businesses, academic institutions, different levels of government, watersheds, and non-profit organizations to leverage expertise, resources, and funding for climate-responsive planning initiatives and co-benefits. 3. Ensure equitable access to resources and opportunities within the community through inclusive and participatory planning processes.
C3 Increase resources and capacity for implementation of the Plan.	1. Increase staff capacity to fulfil Stratford's climate goals and access funding for climate change initiatives. 2. Increase the proportion of Stratford's budget allocated to climate change initiatives and consider climate budgeting as a framework. 3. Increase training and education of staff throughout all departments and Council on climate change. 4. Collaborate with the province and other relevant organizations on climate action programs. E.g., Net Zero framework,¹³ and the Provincial Climate Adaptation Plan.



CASE STUDY: North Rustico, PEI
Using Electric Buses for Emergency Warming Centres

The Province plans to use Lion Electric's electric-powered school buses equipped with vehicle-to-grid (V2G) technology so that pre-charged buses can feed power to emergency warming centres during power outages. The North Rustico Lions Club has been selected as the site where this will be tested.

Climate Change Risk: *More frequent and intense storms damage important infrastructure and cause extended power outages, that means more emergency reception centres with ongoing power are needed for residents.*

Solution: *Lion Electric buses feature V2G technology that allows chargers to draw power from the buses' batteries during emergencies. This technology permits electric buses to act as mobile power sources, providing electricity to emergency heating centres when the power goes out.*

Financial Partnership Covers Project Cost: *Lion Electric, the company providing the electric buses, will cover most of the project's costs, meaning there is little to no cost to the town and the North Rustico Lions Club. The provincial government will cover any unexpected expenses during setup, such as additional public electric vehicle chargers.*

Changing Project Size & Future Plans: *All electric buses on PEI can be upgraded to use V2G technology, increasing or decreasing as needed (scalability) for other emergency warming centres across the province.*

By using electric buses to power warming centres during disasters, the North Rustico Lions Club and province are not only highlighting environmental concerns, but also showing the possibilities for creative technology to address urgent community needs.¹⁴

The Province of PEI offers a free in-depth Coastal Hazard Assessments (CHA) and Watershed Flood Projections Reports¹⁵ for developers, coastal residents, and potential coastal property buyers.

Intact and ClimateSense offer a free course on Protecting PEI Homes from Flooding (PPHF)¹⁶ and CLIMAtlantic provides public and free access to their online Coastal Adaptation Toolkit¹⁷.

Residents and community organizations can utilize the toolkit to provide a general assessment of at-risk coastal infrastructure and provide a list of potential solutions to be examined further by a professional.

In preparing for climate emergencies, we must take into consideration risks such as rising sea levels, coastal erosion, more intense storms, and an increasing number of extreme heat days. Fiona resulted in more than \$220 million being paid out in insurance in PEI,¹⁸ and more than \$800 million for the Atlantic Canada region.¹⁹

By being emergency-ready, we can protect the lives and properties of our residents, reduce the impacts of climate-related disasters, and strengthen our ability to bounce back in the face of changing environmental situations.

This includes creating evacuation plans, securing access to essential equipment and infrastructure, encouraging residents to be proactive, coordinating with invested agencies and stakeholders, and putting in place strategies to strengthen our overall resilience.

Twenty-six percent (26%) of residents in Stratford used the reception centre following Post-Tropical Storm Fiona, and when asked, Stratford residents said the most important service for a reception centre is water for drinking, bathrooms, and showers, followed closely by access to electricity to charge essential devices.

IMPORTANT RECEPTION CENTRE SERVICES:

- # 1 Access to water for drinking, bathrooms, and showers
- # 2 Access to electricity to charge essential devices
- # 3 Extended operating hours of the reception centre
- # 4 Access to internet, television, and radio for essential communications and news
- # 5 Availability of volunteers or emergency responders to conduct check-ins on vulnerable persons
- # 6 Availability of Town staff for local updates on essential services and available support for residents
- # 7 Provide additional reception centre locations across the municipality

26% 
OF RESIDENTS: **USED RECEPTION CENTRE AFTER FIONA**

Climate Emergency Preparedness Goal and Action Table

*EM – Climate Emergency Preparedness goal label.

Goals	Recommended Actions
EM1 Finalize and implement Emergency Response Plan.	1. Ensure all local climate change hazards are considered in the emergency response plan and create response plans specific to different types of climate emergencies. 2. Keep updated inventory of local organizations and resources for climate emergencies, expanding beyond municipal, emergency, and utility organizations. 3. Explore shared mobile power sources for use during prolonged power outages (i.e. electric school buses). 4. Enhance the Stratford Connect Mobile App to include climate safety information and support for citizens, particularly seniors and individuals with accessibility barriers, during climate crises. 5. Identify vulnerable groups so they can be readily assisted by first responders during emergencies. 6. Identify communication channels that are available during an emergency to communicate critical information to residents and incorporate communication into the emergency response plan. 7. Carry out exercises to prepare for implementation of the emergency response plan.
EM2 Enhance community preparedness to climate change-related emergencies.	1. Conduct education and awareness campaigns to increase climate emergency preparedness among residents. 2. Promote climate emergency preparedness through regular Town channels, including information on 72-hour emergency kits (including pets) and checklists, generator safety, sump pump maintenance, and property preparedness measures. 3. Identify ways to maintain up-to-date emergency response volunteer lists without incurring liability. 4. Collaborate and work with existing volunteer organizations that specialize in emergency response/recovery. 5. Remove barriers and provide financial incentives to staff to take on emergency response roles. 6. Promote incremental adaptation for all Stratford buildings to local climate hazards (i.e. storm surge, extreme weather events, coastal erosion, and forest fires).
EM3 Update emergency centre infrastructure and capacity for climate emergency preparation.	1. Increase emergency capacity of Town infrastructure as per the Town's Emergency Response Plan. 2. Create added capacity for emergency response at existing and future Town facilities.
EM4 Foster partnerships with nearby municipalities in increasing emergency service connectivity.	1. Discuss with nearby municipalities such as Hazelbrook and Alexandra about preparing their own community emergency centres, to provide more connectivity for residents in and near neighbouring municipalities as well as increase the region's capacity for climate emergencies.

Energy

As the world deals with the growing threat of climate change, municipalities around the world have recognized the urgent need to address their energy systems to reduce greenhouse gas emissions. In 2017, Stratford created the Stratford Community Energy Plan (CEP),²⁰ and the goals and actions related to energy can be found within the CEP. As Stratford's CEP is now over five years since its adoption, it should be updated to reflect advances in technology, new regional and global emissions reduction commitments, and completion of actions within the document and resulting emissions reductions in Stratford.

Transportation

CASE STUDY: City of Montreal, Quebec Six-Point “Transportation Electrification” Plan

The City of Montreal has launched a plan for the next two years to switch over to electric vehicles in order to reduce greenhouse gas emissions.

Climate Change Risk: *Without reducing greenhouse gas emissions from transportation, climate change will continue to progress, and local air quality will worsen.*

Solution: *A plan to switch over to electrical vehicles throughout the City (organizational electrification plan), including initiatives such as:*

- adding 2,100 new electric Bixi bikes and 250 electric taxis
- installing 660 level 2 and DC fast charging stations
- putting in place laws requiring equipment for charging electric vehicles in new buildings
- replacing older municipal fleet vehicles with electric vehicles

Montreal is also looking at establishing the first so-called “low-emission zone” to eliminate air and noise pollution caused by gasoline-powered vehicles. Additionally, the city is investing \$13 million in businesses associated with environmentally-friendly transportation (sustainable mobility) and e-mobility.²¹





It is estimated that the average Canadian driver, travelling 20,000 km per year, can save as much as \$2,000 per year on fuel alone using an electric vehicle. With the price of fossil fuels constantly fluctuating and rising, the financial savings from operating electric vehicles and other low to no emission transportation options will only increase.²²

The transportation sector contributes greatly to greenhouse gas emissions, air pollution, and energy use. By rethinking how we move people and goods, we can make significant strides in reducing our carbon footprint, improving air quality and residents' quality of life.

Stratford currently has 11 EV charging stations for public use; four of which are Chargepoint stations installed by the Town of Stratford. None of the total chargers in Stratford are fast chargers (Level 3), though some still provide free charging. Apps like PlugShare²³ and ChargeHub²⁴ help drivers find available charging stations. EV use in Stratford is on the rise, and though current use of Town charging stations is not at full capacity, there is demand in the region for Level 3 chargers, particularly from those travelling through Stratford.

In this section, we set goals and actions that encourage sustainable public transit, active transportation, low to no emission transportation, and innovative solutions in line with Stratford's Community Energy Plan and Active Transportation Plan (T5 is directly taken from the Active Transportation Plan). We aim to build an accessible, affordable, and environmentally friendly transportation network over time. We also seek partnerships with regional and provincial stakeholders to leverage their expertise and resources, speeding up progress toward a sustainable transportation future.

Transportation Goal and Action Table

*T – Transportation goal label.

Goals	Recommended Actions
T1 Promote electric and low-emission transportation.	1. Increase EV accessibility by installing charging stations within the Town at strategic locations and increase the number of public level 3 chargers. 2. Promote incentives as well as other opportunities for financing EV and low-emission vehicles (including bikes and scooters). 3. Provide education to residents on the benefits and accessibility of EV cars, bikes, and other low-emission transportation. 4. Work with Net Zero PEI and EV suppliers to offer EV test drives and demonstrations to residents. 5. Research the potential and local viability of other low-emission transportation technologies (i.e. hydro, biofuels, etc.).
T2 Improve T3 route and increase ridership.	1. Review route optimization, connectivity, and intermunicipal (regional) services for the T3 bus system. 2. Advocate for a higher frequency of weekend and weeknight routes, and increased connection to more natural areas.
T3 Advance municipal fleet electrification.	1. Replace and purchase new municipal vehicles with electric vehicles using Stratford's Sustainable Procurement Action Plan²⁵. 2. Ensure the Asset Management Policy includes climate change impacts and savings. 3. Electrify municipal fleet in increments by targeting light duty and small equipment for greening and work up.
T4 Encourage sustainable commuting.	1. Promote carpooling among residents through the creation of safe ride-share and park-and-ride programs. 2. Promote safe and reliable platforms for sustainable commuting. 3. Collaborate with other municipalities to offer residents an E-bike-share or scooter-share network.
T5 Enhance active transportation areas and infrastructure.	1. Expand regional links connecting neighbourhoods and destinations and create a network that explores the diverse landscape of Stratford and beyond. 2. Make active transportation an accessible and affordable choice for all residents and visitors, including people of all ages, abilities, races, genders, sexualities, and incomes. 3. Prioritize active transportation by encouraging behaviour change and a shift in attitude and values that have traditionally favoured private single-occupant vehicles. 4. Reduce Stratford's carbon footprint by increasing the uptake of active transportation and limiting car use. 5. Highlight the benefits of active transportation in creating an environmentally, socially, and economically sustainable and healthy Town. 6. Encourage exploration by creating a network of streets and trails that are well connected and intuitive to navigate by active transportation. 7. Draw new visitors and residents to experience Stratford's natural beauty and high quality of life.

CASE STUDY: Charlottetown, PEI Flood Risk Reduction Rebate Program

This case study explores Charlottetown's forward-looking flood program as a model for effective climate change risk reduction:

Climate Change Risk: *Rising sea levels and increasingly heavy rains cause more flooding to a large portion of Charlottetown's downtown residential areas.*

Solution:

2021: *Charlottetown staff worked with homeowners to complete risk assessments and offered rebates for flooding overland flood upgrades and repairs through a pilot program funded by PEI Climate Challenge Fund.*

2022: *The City broadened the rebate program city-wide under the name Charlottetown Flood Risk Reduction Rebate Program in partnership with Intact Public Entities (insurance program provider), providing 75% of the cost of approved flood protection items and the labour to install them. Rebates covered sump pumps, backup battery systems for sump pumps, water alarm/detection devices, and backwater valves for a total amount of \$1,000 per property.*

The City of Charlottetown's strategic response highlights the importance of area-specific risk assessments, financial encouragement, and a focus on people in climate change planning. This case study serves as an important example for municipalities that want to strengthen their ability to bounce back and address specific weaknesses in their communities.²⁶

Water, wastewater, and stormwater infrastructure in Stratford face vulnerabilities, especially along our coastal edge, from rising sea levels, coastal erosion, run-off from agricultural fields during heavy rainfall, and with storms increasing in frequency and intensity. We are increasingly considering our local climate hazards to better protect our water, wastewater, and stormwater infrastructure. More information can be found in Stratford's Stormwater Management Plan²⁷, Infiltration and Inflow Study, and Climate Sense Coastal Infrastructure Report²⁸.



Water, Wastewater and Stormwater Goal and Action Table

*W - Water, Wastewater and Stormwater goal label.

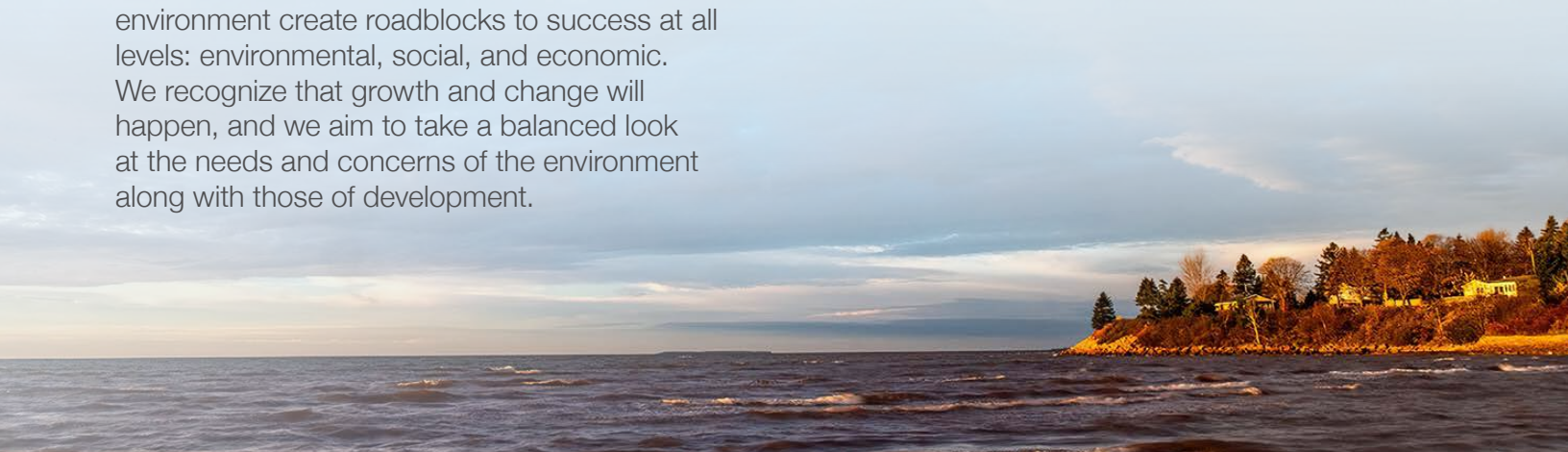
Goals	Recommended Actions
W1 Implement effective stormwater management measures to better cope with climate hazards.	1. Lead by example and promote the use of natural or low-cost stormwater management practices, such as rain gardens, bioswales, naturalized retention ponds. 2. Offer or showcase home flood resiliency programs. 3. Upgrade current stormwater infrastructure to increase capacity to manage inland flooding and storm surge based on climate change predictions. 4. Reduce stormwater infiltration into the wastewater system by implementing the recommendations of Stratford's Infiltration and Inflow Study. 5. Consider creating localized stormwater management plans for flood-prone areas and areas that have reoccurring runoff issues during heavy precipitation events. 6. Update the Official Plan, Zoning and Development Bylaw, and other applicable plans to reflect certain relevant CSA Group Community Water Standards²⁹ that can be further locally shaped if need be.
W2 Ensure effective wastewater management to better cope with climate hazards.	1. Protect coastal wastewater infrastructure vulnerable to climate hazards such as storm surge and coastal erosion. 2. Protect inland wastewater infrastructure vulnerable to climate hazards such as flooding and power outages. 3. Acquire backup generators for critical wastewater infrastructure. 4. Continue collaboration with Chartretown in upgrading and optimizing shared wastewater treatment infrastructure.
W3 Enhance capacity of wellsite areas to better cope with climate hazards.	1. Create and implement wellfield protection plans that consider climate change hazards. 2. Implement lightning protection for wellfield infrastructure. 3. Continually increase the capacity of wellfield sites to infiltrate groundwater and lessen the amount of impervious surfaces through native tree, shrub, and ground cover plantings.



Natural Assets

It is important to balance Stratford’s quick growth with keeping its natural assets so that it maintains a healthy environment and remains an attractive place to live. Natural assets like our forests, wetlands, and coastlines have long been a draw for visitors and residents alike, and attractive and well-designed urban environments can serve as an inspiration to create conditions for economic growth³⁰. Unfortunately, not placing enough value on natural assets, not using land wisely, rapid development that is too spread out, and activities on private land that are harmful to the environment create roadblocks to success at all levels: environmental, social, and economic. We recognize that growth and change will happen, and we aim to take a balanced look at the needs and concerns of the environment along with those of development.

Stratford’s natural assets provide many helpful services and play an important role in adapting to and mitigating climate change. Some of the services our natural systems provide when healthy are lessening the stress of extreme weather events, capturing and sequestering carbon, managing stormwater and groundwater (purification and water storage ability), and strengthening the health of the land’s physical makeup (topography integrity) through erosion management and using natural methods to secure banks.



Natural Asset Goal and Action Table

*N - Natural Asset goal label.

Goals	Recommended Actions
N1 Work in increments to a full Natural Asset Inventory.	1. Prioritize assessment of natural assets condition, risk and defining their level of service. 2. Update current natural asset inventory data and include changes caused by Post-Tropical Storm Fiona. 3. Look into suitable inventory databases.
N2 Work in increments to a full Natural Asset Management Plan.	1. Consider further study of natural assets and their climate hazards that are not well studied to date. 2. In advance of a Natural Asset Management Plan, continue to create management plans for individual natural assets. 3. Create a full Natural Asset Management Plan or fully incorporate natural assets into Stratford’s Asset Management Plan. 4. Update the Official Plan and other strategic plans to incorporate natural asset management.

CASE STUDY: Province of PEI Offshore Reefs for Shoreline Stabilization

Beginning in 2018, the Province installed a number of offshore, or intertidal (areas that experience both high tide and low tide) rock reefs at exposed coastal sites in PEI to protect infrastructure like bridges, causeways, and lighthouses.

Sites: *Souris Causeway, Cape Traverse, Cedar Dunes Provincial Park and West Point Lighthouse, Crowbush Golf Course, Grand Tracadie Beach, Jacques Cartier Provincial Park, Miminegash Harbour, and the Panmure Island Causeway.*

Climate Change Risk: *Evidence shows hard armoring (human-made structures made of solid materials) does not stand up to severe weather events such as Fiona; the energy and strength of waves is not reduced by rock walls, but is simply directed elsewhere. Even without extreme weather events, hard armoring can increase shoreline erosion if it is used as a stand-alone method.*

Solution: *The Province installed large offshore, or intertidal, reefs constructed of native sandstone or armour stone to gather sand and sediment moving along the coastline behind the reef, reversing erosion at those locations.*

UPEI is monitoring these methods of maintaining shoreline, recording changes to the shoreline, whether or not steps to protect the shoreline are holding up from year to year, and the status of nearby infrastructure. While the method in this case study should be looked at with some caution, the reefs are growing in success and allowing for sediment gathering.³¹



CASE STUDY: Stratford, PE

Solution for Sea-Level Rise at Fullerton's Marsh

Fullerton's Marsh, located in an area split in the past by the PEI Railway, faced sea level rise challenges due to the divided wetland and weakening dyke structure. Ducks Unlimited Canada (DUC) assumed management of the marsh in 1980, aiming to address these issues and promote sustainable ecological practices.

Historical Context: *In the 1800s the PEI Railway split 67 hectares of marsh by using a "linear mound" that was built to support the tracks. The mounded "tracks acted like a dyke separating the south end of the marsh from saltwater flowing in from the Hillsborough River via Fullerton's Creek".*

Climate Change Risk: *Rising sea level, sinking land, stronger and higher waves and the erosion of the dyke structure.*

Solution: *In 2020, water was deliberately released by breaching the old rail-line dyke, allowing for the first full "tidal exchange" between saltwater and freshwater in decades.*

The planned involvement of DUC in managing the Fullerton Creek Conservation Park, resulting in the deliberate breach of the rail-line dyke in 2020, has seen positive ecological changes. These include stabilized sediments and increased wildlife activity, showcasing the potential for effective conservation measures to restore and strengthen sensitive wetland ecosystems.³²

Wetlands and coastlines are important natural assets that need forward-thinking protection against both human development and climate change. Wetlands have usually not been appreciated and often disappear due to human activities like agriculture and development. However, there is a growing awareness of their importance, and efforts are being made to protect, create, and restore them. As well, Stratford has over 22 kilometres of coastline within the municipal boundaries alone, with different types, usually sandstone cliffs, steep sand shoreline (till bluff), salt marshes, and artificially protected shoreline.³³ While wetlands and coastlines are given some protection under provincial ruling, there is still much that can be done to better protect and enhance these natural assets in Stratford.

During the Ocean Action Agenda at the 2023 World Economic Forum, speakers highlighted the important role of coastal wetlands. Although they only make up 5% of land area, they store 50% of carbon in their ocean sediments, making wetlands essential for biodiversity, resilience, and livelihoods. Wetlands can store 10-100 times more carbon than forests, thanks to their efficiency in building soil.³⁴ As for the protective role that wetlands play for nearby infrastructure, a study conducted in the United States estimated that coastal wetlands stopped more than \$625 million in property damages from happening during Post-Tropical Storm Sandy and reduced damages by an average of 10% throughout the Northeast. Further, the Nature Conservancy and National Oceanic and Atmospheric Administration (NOAA) showed that areas located behind existing salt marshes experienced 20% less property damage compared to areas where salt marshes were lost.³⁵

Wetlands and Coastlines Goal and Action Table

*AQ - Wetlands and Coastlines goal label.

Goals	Recommended Actions
AQ1 Work in partnership to promote nature-based solutions in and around coastlines and wetlands.	1. Promote green (inland) and blue (in or periodically submerged by water) nature-based solutions to maintain and enhance local ecological integrity of coastlines, watercourses, and wetlands in collaboration with local watersheds, and the province. 2. Utilize hard engineering techniques only when appropriate and where green engineering techniques are not a suitable option. 3. Collaborate with other organizations, such as SAWIG, that share the same goals and can provide expertise on nature-based coastal and wetland projects.
AQ2 Increase awareness of the value of wetlands and coastlines.	1. Raise awareness on the value of healthy wetlands and coastlines for climate change adaptation and mitigation through workshops, educational materials, and community events. 2. Encourage residents near wetlands and coastal areas to protect their own home through utilization of free assessment and guiding tools. 3. Research and showcase financial incentives for residents near wetland and coastal areas to provide better access to residents in contributing a positive impact on wetland and coastal health, as well as increase preservation of their own property.



Green Spaces

Green spaces provide essential services that contribute to economic growth, environmental wellbeing, and the overall health of residents. Green space refers to areas of land covered predominantly by vegetation, such as parks, forests, gardens, natural reserves, agricultural land, and your own backyard.

This section of the Plan addresses challenges faced by green spaces and restates our commitment to the long-term maintenance and repair of local green spaces. Our efforts, including the Forest Management Plan (FMP), Municipal Parks Master Plan³⁶, Active Transportation Plan³⁷, Official Plan, and Urban Core Plan³⁸, contribute to the growth and conservation of urban green spaces.

In the 2023 Annual Resident Survey, 60% of residents suggested that they consider access to nature the most important part of forest management. This was followed closely at 58% with growing the amount of forested area forest cover and at 56% with strengthening the natural area for wildlife, and connecting with it.



Quick status on our land:

- Since 2001, more than 20% of PEI’s agricultural land has been lost. In addition, over the previous three censuses, from 2006 to 2016, PEI showed an average loss of 3.6 percent of its farmland every five years. If the current rate continues, half of the farmland the province had in 2021 will be gone before 2050.³⁹
- “An analysis on PEI’s forests showed that the amount of forested land on PEI had fallen 20% between 1990 and 2020, with most of that decline occurring between 2010 and 2020”.⁴⁰
- About 13% of forested areas lost at least 70% of trees on PEI from Post Tropical Storm Fiona.⁴¹

TOP CONCERNS FOR GREEN SPACES:

- | | |
|---|--|
| # 1 Access to nature | # 5 Supporting biodiversity |
| # 2 Increasing forest cover | # 6 Carbon storage and sequestration |
| # 3 Enhancing habitat and connectivity for wildlife | # 7 Sustainable forest harvesting |
| # 4 Protection against tree loss | # 8 More communication educational opportunities |

Green Spaces Goal and Action Table

G – Green Spaces goal label.

Goals	Recommended Actions
G1 Increase native plant coverage throughout Stratford.	1. Work with organizations such as SAWIG to plant more native trees, shrubs, and ground cover throughout Stratford. 2. Increase opportunities for residential plantings. 3. Encourage the Province to plant or allow planting of appropriate native street trees in right-of-ways (not too close to powerlines or using shorter shrub species). 4. Implement the planting recommendations of the FMP. 5. Review Dangerous and Unsightly Premises Bylaw to allow for naturalized lawns.
G2 Acquire and enhance public green space areas for conservation, rehabilitation, and recreation.	1. Pursue areas for acquisition to protect as green space based on connectivity, presence of sensitive habitat, or as per recommendation from the FMP. 2. Incorporate FPEIM Protecting Habitat Guide⁴² into green space decision-making. 3. Enhance active transportation routes along green corridors. 4. Enhance forested properties based on the recommendations of the FMP. 5. Increase public access to green spaces. 6. Utilize available programs that enhance climate resiliency of green spaces such as native planting, invasive species management, native seed collection and dispersal, forest management, etc.
G3 Sustainably manage urban forests.	1. Manage tree debris from Post-Tropical Storm Fiona and future storms as per recommendations in the FMP. 2. Manage forested areas owned by the Town as per recommendations in the FMP. 3. Coordinate opportunities with the Sustainable Forest Alliance (SFA)⁴³ and the Province for forest management funding, services, and expertise, and even revenue opportunities (carbon offsets, sale of timber, etc.). 4. Share information about the SFA, Provincial Forest Enhancement Program, and other programs with resident woodlot owners. 5. Create a tree bylaw aimed at development and large-scale tree loss. 6. Better incorporate tree protection and planting into the Zoning and Development Bylaw and the Official Plan.
G4 Incorporate human health-green space relationship in green space management.	1. Increase tree canopy to provide cooling spaces, install water fountains to help prevent dehydration from extreme heat, and use built structures to protect the public from harsh climate change exacerbated elements. 2. Research municipal-provincial-federal relationship to shift policies, enhance fiscal responsibility, and equitable cost sharing for health services and green spaces. 3. Assist with the start-up of community gardens that is led by local community groups.
G5 Provide education on the importance of green spaces in the context of climate change.	1. Increase local understanding of, and a business case for, green spaces that can compete with other desired land-uses. 2. Promote and educate on the importance of sustainable agriculture, buffer zones (including smaller residential gardens), and available programs (e.g., ALUS and RALP). 3. Host local organizations to provide educational events that enable residents to enhance their properties with locally compatible nature-based techniques (gardening, invasive species management, native plant selection, invasive plant removal, delayed mowing, etc.).

STRENGTHENING OUR ROOTS

In conclusion, "Resilient Roots: Stratford's Climate Action Plan" has emerged as a vision centred on protecting our community against the immediate and future impacts of climate change, understanding the need to make changes that take into account local vulnerabilities and hazards, such as coastal erosion, extreme weather events, and sea-level rise. At the same time, Stratford's reduction strategies aim to lessen greenhouse gas emissions, creating a transition over time to renewable energy sources and increased energy efficiency in municipal operations.

In strengthening our infrastructure and preparing for the challenges that lie ahead, the well-planned sharing of resources in reaching the goals of the Plan shows a local commitment and investment. The Plan's comprehensive guidelines for actions in community planning, emergency readiness, transportation, water utilities (potable water, wastewater, and stormwater), and natural assets together create a more flexible, environmentally aware, financially successful, and thriving place to live for our residents. This plan shows our dedication in creating a strong community, in tune to climate needs and well-prepared for the challenges that lie ahead.



REFERENCES

1. Statistics Canada. (2023). *Census Profile - 2021 Census of Population*. Statistics Canada Catalogue number 98-316-X2021001. Ottawa. Released November 15, 2023.
2. Province of PEI. (2022, October 26). *Building Resilience: Climate Adaptation Plan*. https://www.princeedwardisland.ca/sites/default/files/publications/building_resilience_climate_adaptation_plan_oct_2022.pdf
3. Environment and Climate Change Canada. (2023). *Climate Data Canada - Stratford, PE*. https://climatedata.ca/explore/location/?loc=BAEWW&location-select-temperature=tx_max&location-select-precipitation=r1mm&location-select-other=frost_days
4. Government of Canada. (2016, July 6). *Natural Resources Canada*. <https://natural-resources.canada.ca/home>
5. Bhatti, Ahmad Zeeshan, Aitazaz Ahsan Farooque, Nicholas Krouglicof, Wayne Peters, Qing Li, and Bishnu Acharya. (2022). *Prospective Climates, and Water Availabilities under Different Projections of Environmental Changes in Prince Edward Island, Canada*. *Water* 14, no. 5: 740. <https://doi.org/10.3390/w14050740>
6. Province of PEI. (2020, April 30). *Coastal Hazards Information Platform (CHIP)*. <https://peigov.maps.arcgis.com/apps/instant/minimalist/index.html?appid=c0479ddcb4c94900901e56906b4ca092>
7. Ryan, C. (2023, October 19). *Satellite images tell the tale of where Fiona took biggest toll on P.E.I. forests*. CBC. <https://www.cbc.ca/news/canada/prince-edward-island/pei-environment-forestry-plan-committee-1.7001377>
8. Town of Stratford. (2023). *Annual Resident Survey*. https://www.townofstratford.ca/residents/think_stratford/annual_resident_survey
9. Parnham, H. (2022, September 21). *Planning for Climate Change [presentation]*. FPEIM. <https://fpeim.ca/wp-content/uploads/2022/09/Planning-for-Climate-Change-Workshop-Slides-Sept.-21-2022.pdf>
10. Town of Stratford. (2019). *Town of Stratford Zoning and Development Bylaw #45*. https://cdnsm5-hosted.civiclive.com/UserFiles/Servers/Server_11992779/File/Government/Bylaws%20Policies/Bylaws/45%20August%202023.pdf
11. Town of Stratford. (2014). *Imagine Stratford - Town of Stratford Official Plan*. https://cdnsm5-hosted.civiclive.com/UserFiles/Servers/Server_11992779/File/2014-Official-Plan-Merged-Doc1.pdf
12. Town of Stratford. (2022). *Shape Stratford*. <https://www.shape.townofstratford.ca/>

13. Net Zero. (2021). *The Net Zero Initiative Framework*.
<https://www.net-zero-initiative.com/en/framework>
14. Nguyen, T. (2023, April 27). *P.E.I. to use electric buses to power warming centres during emergencies*. CBC.
<https://www.cbc.ca/news/canada/prince-edward-island/pei-electric-buses-emergency-1.6824770>
15. Province Of Prince Edward Island. (2021, November 24). *Watershed Flood Projections Reports*.
<https://www.princeedwardisland.ca/en/feature/watershed-flood-projections-reports#/service/Watershed/WatershedSearch>
16. Intact Centre on Climate Adaptation (University of Waterloo) and ClimateSense. (n.d.). *Flood Protection Training – Intact Centre on Climate Adaptation*.
https://www.intactcentrecclimateadaptation.ca/programs/home_flood_protect/training/#4th_PEI_Flooding_Erosion
17. CLIMAtlantic. (2023). *Coastal Adaptation Toolkit*.
<https://climatlantic.ca/coastal-adaptation/>
18. The Canadian Press. (2022, October 19). *Post-tropical storm Fiona most costly weather event to ever hit Atlantic Canada, new estimate says CBC*. CBC.
<https://www.cbc.ca/news/canada/nova-scotia/fiona-atlantic-canada-insured-damages-660-million-1.6621583>
19. Insurance Bureau of Canada. (January 5, 2023). *Insured Damages from Hurricane Fiona Now Over \$800 Million*.
<http://www.ibc.ca/ns/resources/media-centre/media-releases/insured-damages-from-hurricane-fiona-now-over-800-million>
20. Stratford Sustainability Committee. (2017). *Stratford's Community Energy Plan to Reduce Greenhouse Gas Emissions*. Town of Stratford.
https://cdn5-hosted.civicle.com/UserFiles/Servers/Server_11992779/File/Residents/Naturally%20Stratford/Community%20Energy%20Plan/CEP-Final-draft-Sept.13.pdf
21. Lorinc, J. (2021, December 9). *Cities pushing zero-emission vehicles keep Canada's climate goals in sight*. Electric Autonomy Canada.
<https://electricautonomy.ca/2021/12/09/cities-zero-emission-transportation/>
22. Plugndrive. (2020). *Electric Car Benefits*.
<https://www.plugndrive.ca/electric-vehicle-benefits/>
23. Plug Share. (2019). *PlugShare Map*.
<https://www.plugshare.com>
24. Charge Hub. (n.d.). *Find every public charging station for electric cars*.
<https://chargehub.com/en/charging-stations-map.html>

25. Town of Stratford & Reeve Consulting. (n.d.). *Stratford's Sustainable Procurement Action Plan*.
https://docs.google.com/document/d/1SWiNp-WDV0ot7oszFsAvzNyb5ntnN3Awk4_WFTTCQKg/edit
26. Intact Public Entities. (n.d.). *Prince Edward Island Charlottetown Flood Risk Reduction Rebate Program*. City of Charlottetown.
<https://www.intactpublicentities.ca/the-intact-foundation/city-of-charlottetown-prince-edward-island>
27. Town of Stratford. (2003). *Low Impact Development Guidelines Stormwater Management Plan Update*.
[https://www.townofstratford.ca/cms/DocContainerLinks.aspx?key=11992779-11992863-13672650-335079-15206838-1#:~:text=Stormwater%20Management%20Plan%20%2D%20Low%20Impact%20Development%20Guidelines%20\(2012\).pdf](https://www.townofstratford.ca/cms/DocContainerLinks.aspx?key=11992779-11992863-13672650-335079-15206838-1#:~:text=Stormwater%20Management%20Plan%20%2D%20Low%20Impact%20Development%20Guidelines%20(2012).pdf)
28. Pokharel, A. (2021). *Town of Stratford Coastal Vulnerabilities*. ClimateSense & Town of Stratford.
29. Canadian Standards Association Group. (2022, July). *The Municipal How-to Guide for CSA Community Water Standards*.
<https://fpeim.ca/wp-content/uploads/2023/10/CSAGroup-Municipal-WaterStandards-How-To-Guide.pdf>
30. Hotte, N., Nesbitt, L., Barron, S. S., Cowan, J., & Cheng, Z., Cindy. (2015). *The Social and Economic Values of Canada's Urban Forests: A National Synthesis* (pp. 50). Faculty of Forestry, University of British Columbia.
https://forestry.sites.olt.ubc.ca/files/2015/06/CFSreport_Final_Table5Edits_20150605-v7.pdf
31. Russell, N. (2023, November). *How P.E.I. is exploring new ways to protect the coastline from future Fionas*. CBC.
<https://www.cbc.ca/news/canada/prince-edward-island/pei-coastline-infrastructure-monitoring-fiona-1.7014121>
32. Ducks Unlimited Canada. (2020, November 23). *A saltwater solution for sea-level rise at Fullerton's Marsh*.
<https://www.ducks.ca/stories/atlantic/fullertons-marsh/>
33. Parnham, H., Jardine, D., Kennedy, C., Weatherbie, C., Keefe, G., Pang, T., Kinay, P., Wang, X. and Farooque, A. (2023) *Prince Edward Island State of the Coast Report 2023*. Canadian Centre for Climate Change and Adaptation, St. Peters Bay, Canada. Report submitted to the Department of Environment, Energy and Climate Action, Government of Prince Edward Island.
https://www.princeedwardisland.ca/sites/default/files/publications/2023_pei_state_of_the_coast.pdf
34. Sinkevicius, V., Godrej, N., Teleki, K., Cousens, E., Gomez Briones, C. (2023). *Where the Land Meets the Sea*. World Economic Forum.
<https://www.weforum.org/events/world-economic-forum-annual-meeting-2023/sessions/earth-s-kidneys-where-the-land-meets-the-sea>
35. National Ocean and Atmospheric Administration. (2023). *Wetland Benefits*.
<https://coast.noaa.gov/states/fast-facts/wetland-benefits.html>

36. Haute Nature Landscape Architecture and Garden Design. (2022, March 11). *Town of Stratford's Municipal Parks Master Plan*.
https://docs.google.com/document/d/1nQXGS3kNXz8Kvknth_F_GSAG1NtyTI7I0RhYdTYcFVw/edit?usp=sharing
37. Upland Planning + Design. (2023, October). *Town Of Stratford Active Transportation Plan*.
https://drive.google.com/file/d/1ly7To-fil3LHcBsjMZBOImax_EHLMev9/view?usp=sharing
38. Reynolds, K. (2020). *Urban Core Plan*. The Town of Stratford.
<https://thegraygroup.ca/wp-content/uploads/2023/09/Stratford-Urban-Core-Plan-1.pdf>
39. Yarr, K. (2023, February 6). *Rate of farmland loss on P.E.I. more than triples*. CBC.
<https://www.cbc.ca/news/canada/prince-edward-island/pei-farmland-loss-1.6736714>
40. Campbell, K., & Minister of Environment. (2022, December 21). *Report on P.E.I. forests delayed, but also superseded by Fiona damage*. CBC.
<https://www.cbc.ca/news/canada/prince-edward-island/pei-forests-report-delay-fiona-1.6692773>
41. Ryan, C. (2023, October 19). *Satellite images tell the tale of where Fiona took biggest toll on P.E.I. forests*. CBC.
<https://www.cbc.ca/news/canada/prince-edward-island/pei-environment-forestry-plan-committee-1.7001377>
42. Harper, J. (2022, September 1). *FPEIM guide helps municipalities protect habitat*. Federation of PEI Municipalities.
<https://fpeim.ca/fpeim-guide-helps-municipalities-protect-habitat/>
43. Sustainable Forest Alliance Inc. (SFA). (2023). *Responsible woodlot management on Prince Edward Island*.
<https://peiforests.ca/>



APPENDICES

Appendix A - Climate Profile

Temperature and precipitation data are from the national climate data portal, ClimateData.ca,³ representing an average year across four periods of time. Sea level rise values are from Natural Resources Canada.⁴ All values are from the latest international models (CMIP6). Results are comparable between scenarios through mid-century (2041-2070). Results for the end of the century (2071-2100) are shown for both low emission (SSP2-4.5) and high emission scenarios (SSP5-8.5). All sea level rise data are for the high emissions scenario (SSP5-8.5).

Table 1: Temperature

Climate Index	1971 - 2000	2011 - 2040	2041 - 2070	2071 - 2100 [low]	2071 - 2100 [high]
Average temperature: Spring (°C)	3.2	5.0	6.8	7.0	8.9
Average temperature: Summer (°C)	17.3	19.2	21.1	21.2	23.9
Average temperature: Fall (°C)	8.8	10.4	12.3	12.2	14.7
Average temperature: Winter (°C)	-5.7	-3.3	-1.1	-1.0	1.0
Hottest day (°C)	29.7	31.4	33.3	33.6	36.1
Extremely hot days (> 29°C)	2 days	8 days	23 days	23 days	53 days
Coldest day (°C)	-23.9	-20.0	-15.9	-15.6	-11.7
Extremely cold days (< -15°C)	23 days	10 days	2 days	2 days	0 days
Ice days (entire day below 0°C)	69 days	51 days	36 days	35 days	20 days
Last spring frost (date)	May 8	Apr 29	Apr 16	Apr 14	Mar 31
First fall frost (date)	Oct 24	Nov 3	Nov 12	Nov 13	Nov 24
Frost free season	168 days	187 days	208 days	213 days	236 days
Growing degree days (base 5°C)	1733	2084	2513	2536	3149
Heating degree days (threshold 18°C)	4513	3930	3378	3348	2829

Table 2: Precipitation changes in PEI projected with climate change

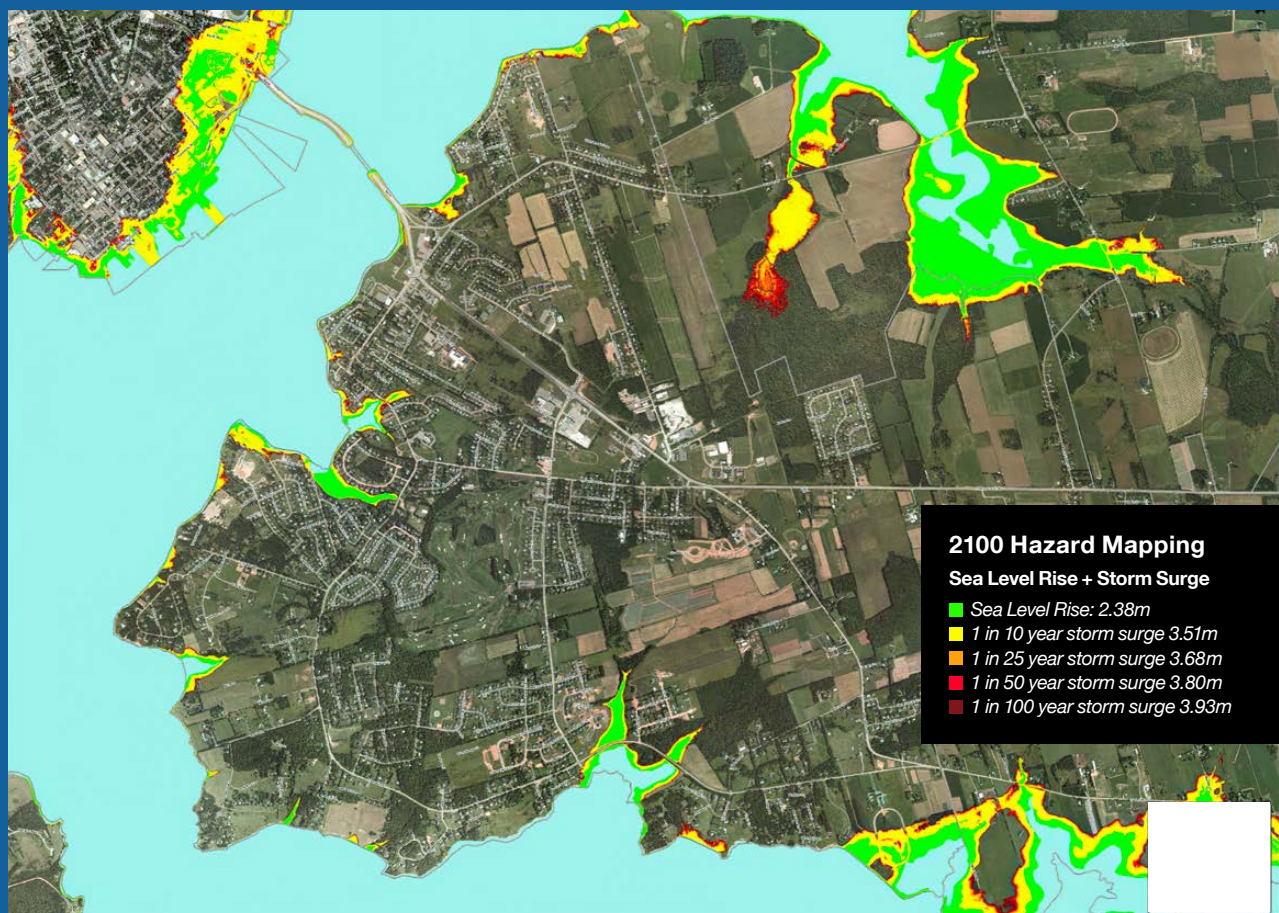
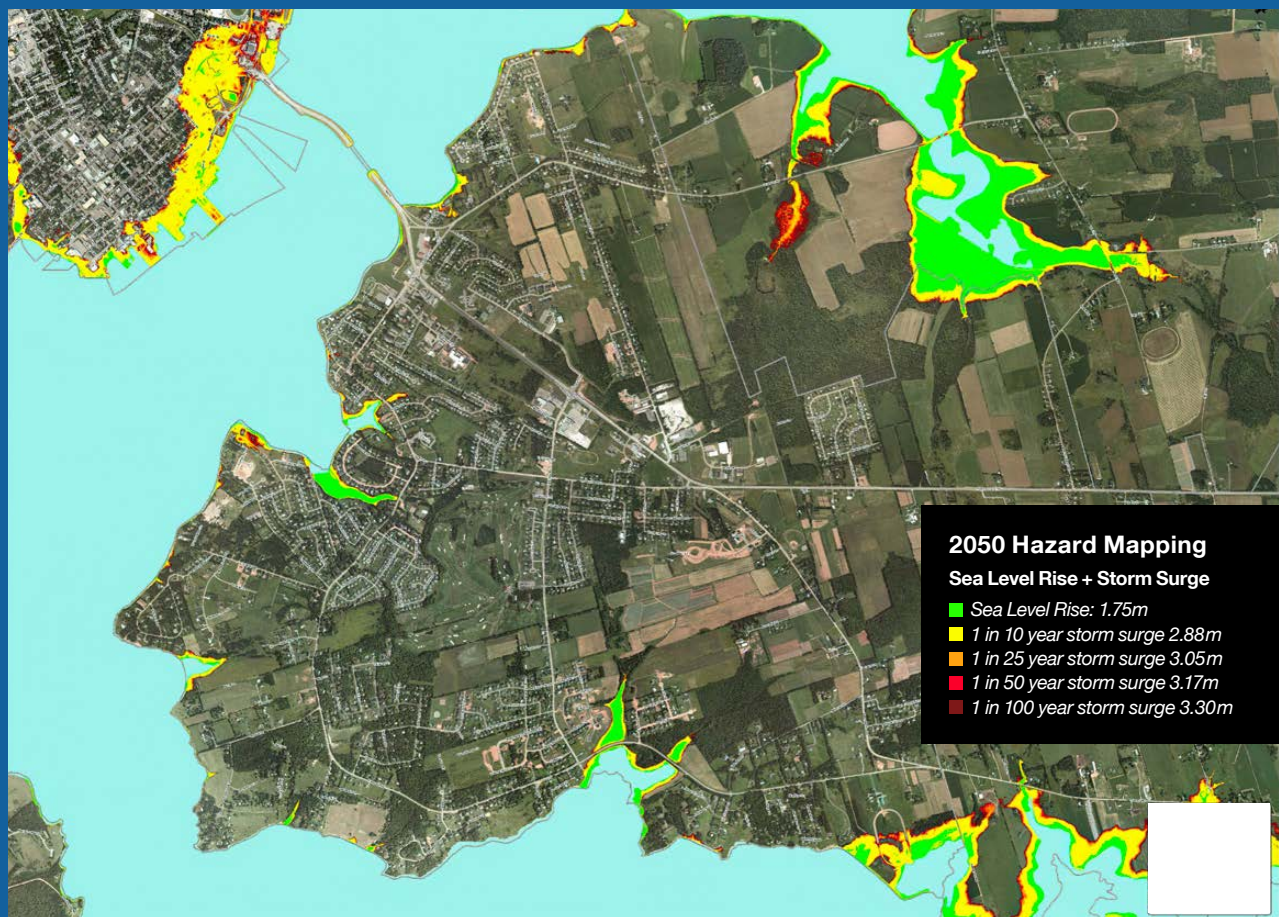
Climate Index	1971 - 2000	2011 - 2040	2041 - 2070	2071 - 2100 [low]	2071 - 2100 [high]
Total precipitation: Spring (mm)	244	265	276	280	289
Total precipitation: Summer (mm)	246	264	273	267	267
Total precipitation: Fall (mm)	307	314	321	318	325
Total precipitation: Winter (mm)	293	311	331	329	353
Wet days (1-19 mm)	147 days	148 days	147 days	147 days	145 days
Very wet days (> 20 mm)	10 days	12 days	13 days	13 days	14 days
Maximum one-day precipitation (mm)	48	52	56	56	60

Table 3: Sea level rise (meters)

Year	2020	2030	2040	2050	2060	2070	2080	2090	2100
50th percentile (median)	0.11	0.19	0.24	0.33	0.40	0.48	0.59	0.70	0.77
95th percentile	0.18	0.30	0.35	0.48	0.58	0.71	0.86	1.01	1.13
Enhanced risk scenario									1.52

The 50th percentile, equal to the median, is the value at which half of the models fall under; and the 95th percentile represents the value at which 95% of the model results fall under and represents the models that are resulting in higher sea levels. The enhanced scenario is the scenario that considers low-likelihood but high impact ice sheet processes.





Appendix B - List of Acronyms

ALUS: Alternative Land Use Services

CEP: Community Energy Plan

CHA: Coastal Hazards Assessment

CSA: Canadian Standards Association

EMO: Emergency Measures Organization

EMS: Emergency Medical Services

EV: Electric Vehicle

FMP: Forest Management Plan

FPEIM: Federation of PEI Municipalities

GDD: Growing Degree Days
(temperature 5 °C and warmer)

GHG: Greenhouse Gas

HDD: Heating Degree Days
(temperatures 18°C and colder)

HVAC: Heating Ventilation and Air Conditioning

NOAA: National Oceanic and
Atmospheric Administration

NGO: Not-Government Organization

PEI: Prince Edward Island

PPHF: Protecting PEI Homes from
Flooding Course

RALP: Resilient Agricultural
Landscapes Program

SAWIG: Stratford Area Watershed
Improvement Group

SFA: Sustainable Forest Alliance

RE: Renewable Energy

Appendix C - Action Tables Goal Labels

AQ: Wetlands and Coastlines

C: Community Planning

EM: Climate Emergency Preparedness

G: Green Spaces

N: Natural Assets

T: Transportation

W: Water, Wastewater, and Stormwater



Appendix D - Glossary

Adaptation: Adjusting to the actual or expected climate and taking actions to reduce the impacts while also taking advantage of new opportunities provided under a changing climate.

Adaptive capacity: The ability of a human or natural system to adjust to climate change (including climate variability and extremes) by moderating potential damages, taking advantage of opportunities, or coping with the consequences.

Average temperature: Describes the average temperature for the 24-hour day. The average temperature is an environmental indicator with many applications in agriculture, engineering, health, energy management, recreation, and more.

Biodiversity: Short for biological diversity; is the variety of all living things on Earth and their interactions from genes to ecosystems, and can encompass the evolutionary, ecological, and cultural processes that sustain life.

Capacity: The combination of all the strengths, attributes, and resources available to an individual, community, society, or organization, which can be used to achieve established goals.

Climate Hazards: Refer to specific natural events or phenomena that have the potential to cause harm, damage, or disruption to human societies, ecosystems, or infrastructure. These hazards are often triggered or exacerbated by climate-related factors such as temperature changes, precipitation patterns, and extreme weather events. Examples of climate hazards include hurricanes, droughts, floods, heatwaves, wildfires, and sea-level rise. These events can have immediate and direct impacts on communities and environments.

Climate resilience: Generally defined as the capacity of a system to maintain function in the face of stresses imposed by climate change and to adapt the system to be better prepared for future climate impacts.

Climate Risks: The potential for adverse effects or negative consequences resulting from exposure to climate hazards. Climate risks consider both the likelihood of a hazard occurring and the vulnerability of a system (such as a community, economy, or ecosystem) to that hazard. In other words, climate risks arise from the interaction between a hazard, the exposed elements, and their susceptibility or resilience to the hazard's impacts.

Coastline: A line that forms the boundary between the land and the ocean.

Coldest day: Describes the lowest nighttime temperature. In general, the coldest day of the year occurs during the winter months. Cold temperatures affect our health and safety, determine what plants and animals can live in the area, limit, or enable outdoor activities, define how we design our buildings and vehicles, and shape our transportation and energy use.

Ecosystems: The complex process and interrelationships of living organisms (e.g., biotic: plants, animals, fungi, microbes, etc.) interacting with their physical environment (e.g., abiotic: minerals, climate, weather, soil, water, sunlight, and landscape properties) in a particular geographic area.

Ecosystem service: Any positive benefit that wildlife or ecosystems provide to people. The benefits can be direct or indirect—small or large, societal or economic.

Enhance Asset/green-grey assets: A hybrid between a natural asset and engineered asset. Examples are: Rain gardens, bioswales, urban trees, urban parks, biomimicry, stormwater ponds, living shorelines, oyster-tecture/oyster reefs, etc.

Engineered Assets/grey assets: Human made and engineered infrastructure.

Equity: Is the fair and respectful treatment of all people. This involves the creation of opportunities and reduction of disparities in opportunities and outcomes for diverse communities.

Erosion: The process whereby wind, water, and other forces apply wear to materials such as rocks and soils, transporting materials away from their source.

Extremely cold days: Describes the number of days where the lowest temperature of the day is colder than -15°C. This index gives an indication of the number of very cold days.

Extremely hot days: Describes the number of days where the daytime high temperature is warmer than 29°C. PEI's temperature threshold is when two or more consecutive days of daytime maximum temperatures are expected to reach 28°C or warmer and nighttime minimum temperatures are expected to fall to 18°C or warmer.

First fall frost: Marks the approximate end of the growing season for frost-sensitive crops and plants. When the lowest temperature of the day is colder than 0°C for one consecutive day (after July 15th) the date of the first fall frost is established.

Frost-free season: The Frost-Free Season is the approximate length of the growing season during which there are no freezing temperatures to kill or damage frost-sensitive plants. This index describes the number of days between the Last Spring Frost and the First Fall Frost.

Green Spaces: Refers to areas of land covered predominantly by vegetation, such as parks, gardens, open areas for recreation, and natural reserves. They provide recreational opportunities, support biodiversity, and offer ecosystem services like air purification and temperature regulation. Green spaces mitigate climate change impacts, improve resilience, and promote sustainable practices. They enhance the quality of life and create a healthier urban environment by fostering a harmonious relationship between humans and nature.

Growing degree days (temperatures 5°C or warmer): Growing degree days (GDD) are a measure of whether climate conditions are warm enough to support plant and insect growth. When the daily average temperature is warmer than the threshold temperature, growing degree days are accumulated. For forage crops and canola, a threshold temperature of 5°C is generally used.

Heating degree days (temperatures 18°C or colder): Heating degree days (HDDs) give an indication of the amount of space heating (e.g., from a gas boiler/furnace, baseboard electric heating or fireplace) that may be required to maintain comfortable conditions inside a building during cooler months. When the daily average temperature is colder than the threshold temperature (18°C), HDDs are accumulated. Threshold values may vary, but 17°C or 18°C are commonly used in Canada. Larger HDD values indicate a greater need for space heating.

Hottest day: Describes the warmest daytime temperature. In general, the hottest day of the year occurs during the summer months. When temperatures are very hot, people – especially the elderly – are much more likely to suffer from heat exhaustion and heat stroke. Many outdoor activities become dangerous or impossible in very high temperatures.

Ice days: Describe the number of days where the warmest temperature of the day is not above 0°C. In other words, this index indicates the number of days when temperatures have remained below freezing for the entire 24-hour period. This index is an indicator of the length and severity of the winter season.

Last spring frost: Marks the approximate beginning of the growing season for frost-sensitive crops and plants. When the lowest temperature of the day remains above 0°C for one consecutive day (before July 15th) the date of the last spring frost is established.

Marginalized: Describes the person or group that is being treated insignificantly, pushed to the margins of society and rendered powerless.

Maximum one-day precipitation: Describes the largest amount of precipitation that falls within a single 24-hour day. This index is commonly referred to as the wettest day of the year.

Mitigation: Actions limiting the magnitude and rate of future climate change by reducing greenhouse gas emissions and/or advancing nature-based solutions.

Natural Assets: A valuable resource provided by nature that provides ecosystem services and benefits for people. Examples are: bodies of water such as lakes, rivers, ponds, streams, creeks, watersheds, aquifers, wetlands, foreshores (part of a shore between the high-water and low-water marks), minerals, air quality, soil, biodiversity, forests, parks, soil, agricultural land (some include it while others do not), cleared land, built-up pervious, fields, etc.

Resilience: The ability of a system and its component parts to anticipate, absorb, accommodate, or recover in a timely and efficient manner, including through ensuring the preservation, restoration, or improvement of its essential basic structures and functions.

Sea level change: The change in ocean level relative to land. Attributed to thermal expansion of water and meltwater from glaciers, ice caps, and ice sheets, along with vertical motion of the land. Projected sea level change is relative to 1986-2005 conditions.

Seasons: Seasons are divided into standard meteorological seasons: winter includes December, January, February; spring March, April, May; summer includes June, July, August; and fall includes September, October, November.

Total precipitation: Describes the total amount of precipitation (rain and snow combined) that falls. Precipitation significantly impacts water availability, agricultural practices, electricity generation and wildfire suppression.

Very wet days: Describes the number of days where at least 20 mm of precipitation falls. Short duration, high intensity rainfall events may lead to flash flooding; heavy snowfall events disrupt transportation.

Vulnerability: The sensitivity or predisposition to be adversely affected by climate change. Vulnerability encompasses a variety of concepts and elements including sensitivity or susceptibility to harm and lack of capacity to cope and adapt.

Watershed: An area of land, bounded by topographical high points, where all surface water and groundwater drains to a specific point or waterbody.

Wet days: Describes the number of days where at least 1 mm of precipitation falls. This index generally captures every day when there is measurable precipitation.

Wetlands: Areas where water covers the soil or is present either at or near the surface of the soil all year or for varying periods of time during the year, including during the growing season. Wetlands may support both aquatic and terrestrial species. The prolonged presence of water creates conditions that favour the growth of specially adapted plants (hydrophytes) and promote the development of characteristic wetland (hydric) soils. There are two general categories of wetlands, coastal/tidal wetlands and inland/non-tidal wetlands.



RESILIENT ROOTS:
STRATFORD'S CLIMATE
ACTION PLAN

