

Resilient Roots: Stratford's Climate Action Plan

Land Acknowledgment

We would like to begin by acknowledging that we are on the traditional, unceded territory of the Mi'kmaq people. For over 12,000 thousand years, the Mi'kmaq Nation has been the stewards 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 honor 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.

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Collaboration Acknowledgement

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Executive Summary

Resilient Roots: Stratford's Climate Action Plan (the Plan) serves as a guide to tackle the distinct challenges presented by climate change in our municipality. Primarily centered on adaptation, the Plan

aims to strengthen the community against both the immediate and long-term impacts of local climate hazards. The mitigation aspect of the Plan focuses on reducing greenhouse gas emissions by gradually incorporating renewable energy sources and improving energy efficiency in municipal operations. This mitigation portion is primarily addressed within Stratford's Community Energy Plan (CEP), though some recommendations are made in this plan. To connect readers and users with Stratford's other guiding documents, the Plan provides connections directly to Stratford's key plans, policies, and reports.

Forming the basis of the Plan is a comprehensive needs and risk assessment, resident surveys, Town staff input, assistance from various experts, and extensive research. Together, these elements identify concerns, needs, priorities, and climate vulnerabilities. The Plan emphasizes the integration of heightened climate change considerations across various aspects of community planning, encompassing private and municipal buildings, energy, transportation (both vehicular and active), climate emergency preparedness, water (potable, stormwater, and wastewater), and the natural environment. By safeguarding residents, infrastructure, and natural assets, Stratford contributes to the global endeavor to live more sustainably.

Climate Hazards, Local Climate Projections, Residents' Priorities and Concerns:

- The municipality is facing increased risks from climate change-induced hazards, including sea-level rise, coastal erosion, storm surge, flooding, more frequent extreme weather events, wildfires, and seasonal coastal ice loss.
- Temperatures are projected to increase throughout all seasons in Stratford. Extremely hot days (with temperatures above 29 degrees C) are projected to increase from two days per year on average (1971-2000) to between 23 and 53 days per year on average (2071-2100).
- Precipitation is projected to increase in all seasons in Stratford. By 2071-2100, there could be three to four more days with short duration, high intensity rainfall events.
- Despite increased precipitation totals, changes in rainfall patterns may involve prolonged periods without rain, leading to drought and possibly less groundwater recharge
- By 2100 sea levels in Stratford are projected to rise between 0.77m and 1.13m and under certain circumstances could potentially rise by 1.52m.
- 89% of residents are concerned with increased intensity and frequency in storms and/or extreme weather, 84% are concerned with coastal erosion, 73% with poverty as an impact of climate change, 72% with coastal flooding, and 72% with climate-related food insecurity, as the top five local climate concerns.

Action Section Highlights

1. Community Planning

Revise Zoning and Development Bylaws: Enhance Sustainable Subdivision Overlay for developer appeal, amend Official Plan for increased coastal setbacks, create an Erosion and Sediment Control Policy with stringent requirements for developments, update building codes to align with climate change standards, and increase greenspace dedication for forested areas in the interdepartmental review process.

2. Climate Emergency Preparedness

Comprehensive Emergency Preparedness: Develop an all-encompassing emergency response plan, accounting for local climate hazards, updating resource inventories, exploring mobile power sources,

enhancing citizen support through the Stratford Connect Mobile App, reviewing emergency evacuations with residents and providing training, identifying vulnerable groups, establishing effective communication channels, and conducting preparatory exercises.

Comprehensive Climate-Ready Infrastructure: Promote incremental adaptation of all Stratford buildings to local climate hazards and enhance emergency capacity of Town infrastructure, including creating additional response capacity at existing and future facilities. Collaborate with neighboring municipalities, such as Hazelbrook and Alexandra in preparing their own community emergency centres.

3. Transportation

Integrated Sustainable Transportation: Promote more sustainable commuting options to residents through broadcasting incentives and education, enhancing EV accessibility with strategic charging stations, electrifying municipal fleets, optimizing the T3 bus system, collaborating on an E-bike-share or scooter-share network, and enhancing active transportation areas and infrastructure.

4. Water, Wastewater, and Stormwater

Sustainable Stormwater Management: Implement effective stormwater measures, promoting natural practices like rain gardens and bioswales. Reduce infiltration, create localized plans for flood-prone areas, upgrade current infrastructure for inland flooding and storm surges, and update plans to align with CSA Group standards.

Resilient Wastewater Management: Safeguard coastal and inland wastewater infrastructure from climate hazards. Acquire backup generators, collaborate on shared treatment infrastructure, and ensure optimal protection against flooding and power outages.

Wellfield Capacity Enhancement: Implement wellfield protection plans considering climate hazards. Incorporate lightning protection, and continually increase capacity through native plantings and impervious surface prevention.

5. Natural Assets (wetlands, coastlines, and green spaces)

Improving Natural Assets: Promote nature-based solutions in collaboration with local stakeholders, work in increments to a full natural asset inventory and natural asset plans, utilizing diverse strategies such as green and blue solutions and locally sourced materials to enhance coastal resilience and ecological integrity; simultaneously, increase native plant coverage, conserve new green space and make existing green space more resilient, implement the Forest Management Plan, and educate on the importance of green spaces.

Conclusion

United in purpose, our municipality embarks on a transformative journey of sustainability and resilience. The Plan integrates diverse initiatives, forging a resilient community that thrives harmoniously with its natural surroundings. With foresight, innovation, and collective action, we embrace the challenge of climate change, securing a vibrant and sustainable future for all.

Introduction

Climate change is a both a global and local issue; rising temperatures, extreme weather events, and environmental degradation pose significant risks to our community, economy, and natural resources. We believe that by taking decisive action now, we can forge a path towards a more sustainable and livable Stratford for generations to come.

The purpose of this Climate Action Plan (the Plan) is to provide a roadmap for our collective efforts to reduce emissions, enhance resilience, and foster environmental equity. It is a collaborative effort involving input from community members, local organizations, government agencies, and environmental experts. Together, we have identified key priorities and actions that align with the unique needs and characteristics of Stratford.

This plan highlights Stratford's goals across various sectors such as land-use planning, emergency preparedness, transportation, stormwater, and natural assets. By actioning both mitigation and adaptation across these sectors, we aim to create a holistic and integrated approach that maximizes our impact and ensures a sustainable future for all residents.

Furthermore, the Plan is a living document that will evolve over time. As new technologies emerge, scientific knowledge advances, and community needs change, we will adapt our goals and actions accordingly. Periodic updates will ensure that our efforts remain aligned with the latest scientific findings, best practices, and community needs.

Limitations

Within the scope of this report, it is important to acknowledge certain limitations. Factors such as data availability, unknown variables, and the constantly evolving field of climate change mean that the information contained herein is subject to constraints within a specific time frame (although it can be updated).

The Town of Stratford faces challenges, many of which are common to other communities in PEI. These include increasing staff capacity issues as the Town grows rapidly, funding constraints, knowledge gaps in local-municipal research, the need to break out of silos and foster more fruitful collaborations and navigating boundaries between jurisdictions and private entities.

About Stratford

Stratford is adjacent to Prince Edward Island's capital city, Charlottetown, and is connected by the Hillsborough Bridge. The bridge has the highest provincial annual traffic volume, the average being approximately 31,000 vehicles per day.

SIDEBAR

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.

SIDEBAR

- [*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 and Watersheds

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

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

Stratford's Climate Profile

PEI's Building Resilience: Climate Adaptation Plan identifies seven hazards the province could be facing if proper adaptation measures are not taken. These are, coastal hazards, post-tropical storms, extreme heat events, heavy precipitation and flooding, earlier and warmer springs, severe ice storms and freezing rain, and seasonal droughts. This plan is based on Stratford's historical and current climate data, with projections up to 2100 on temperature, precipitation, and sea level rise. See Appendix A for further data and maps on temperature, precipitation and sea level rise.

Temperature

Temperatures are projected to increase throughout all seasons in Stratford. Earlier and warmer springs are a hazard identified by PEI's Climate Adaptation Plan. Temperature changes will impact farm (including but not limited to potential increase and spread in pests, stress on crops and crop variety) and

¹ Statistics Canada. (2023). Census Profile - 2021 Census of Population. Statistics Canada Catalogue number 98-316-X2021001. Ottawa. Released November 15, 2023.
<https://www12.statcan.gc.ca/census-recensement/2021/dp-pd/prof/index.cfm?Lang=E>

fisheries sectors (including but not limited to, increased bacterial and algae blooms, drop in certain species populations through water temperature sensitivity, e.g. lobsters and oysters), spread of invasive species and stress on biodiversity, and potentially increase the risk of wildfires. Extreme heat events (temperatures above 29°C for three consecutive days) have additional impacts on public health (including morbidity in vulnerable populations). In addition to impacts related to heat, a decreasing number of extremely cold days and notably the number of ice days, diminished our coastal ice buffers from wave action. With having less ice to buffer wave action, this leads to less protection in the colder months from erosion and harsh storm events.

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 projected to increase from 8 days (2011-2040) per year to 23 – 50 days (2071-2100) per year. Extremely cold days (temperatures below 15°C) are projected to decrease from 10 days (2011-2040) per year to 0-2 days (2071-2100) per year. In addition to having a decreasing number of extremely cold days throughout the time periods, ice days (entire day below 0°C) are projected to decrease from 51 days (2011-2040) per year to 35-20 days (2071-2100) per year.

Precipitation

Precipitation is projected to increase in all seasons. High intensity rainfall events are also more likely, leading to flash flooding and heavy snowfall events that disrupt transportation, damage crops, contaminate waterways, block access to communities and disrupt traffic routes, and hamper access to health care and EMS (emergency medical services). Changes in precipitation will affect multiple hazards identified in PEI's Climate Adaptation Plan, including post-tropical storms, heavy precipitation and flooding, and severe ice storms and freezing rain. Despite increased precipitation totals, changes in rainfall patterns may involve prolonged periods without rain, leading to drought and possibly less groundwater recharge².

Sea Level Rise

² 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>

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 circumstances could potentially rise by 1.52m. Most of Stratford's coastline is not low-lying and therefore the higher 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 \(CHIP\)](#)³.

Lessons from Post-Tropical Storm Fiona

In late September 2022 PEI and Atlantic Canada experienced the devastating impact of Post-Tropical Storm Fiona, a powerful storm that served as a stark reminder of the hazards of climate change. Reflecting on this event can uncover valuable lessons and guide our response to climate change.

Post-Tropical Storm Fiona left a lasting impression on the island, especially due to widespread power outages that lasted for weeks. The prolonged blackout served as a sobering reminder of the vulnerability of our infrastructure in the face of extreme weather events. It prompted us to recognize the need for robust and resilient energy systems, capable of withstanding the increasing intensity of storms and minimizing disruptions to essential services.

Fiona caused significant ecological damages, unprecedented in living memory. The mass erosion caused by Fiona highlighted the vulnerability of our coastal ecosystems, emphasizing the importance of preserving and restoring natural coastal features that protect our land. This event underscored the need for greater consideration and implementation of 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.⁴ Native forest plant species play a vital role in climate regulation, air purification, soil stabilization, groundwater infiltration, and wildlife habitat.

³ Province of PEI. (n.d.) Coastal Hazards Information Platform (CHIP).

<https://peigov.maps.arcgis.com/apps/instant/minimalist/index.html?appid=c0479ddcb4c94900901e56906b4ca092>

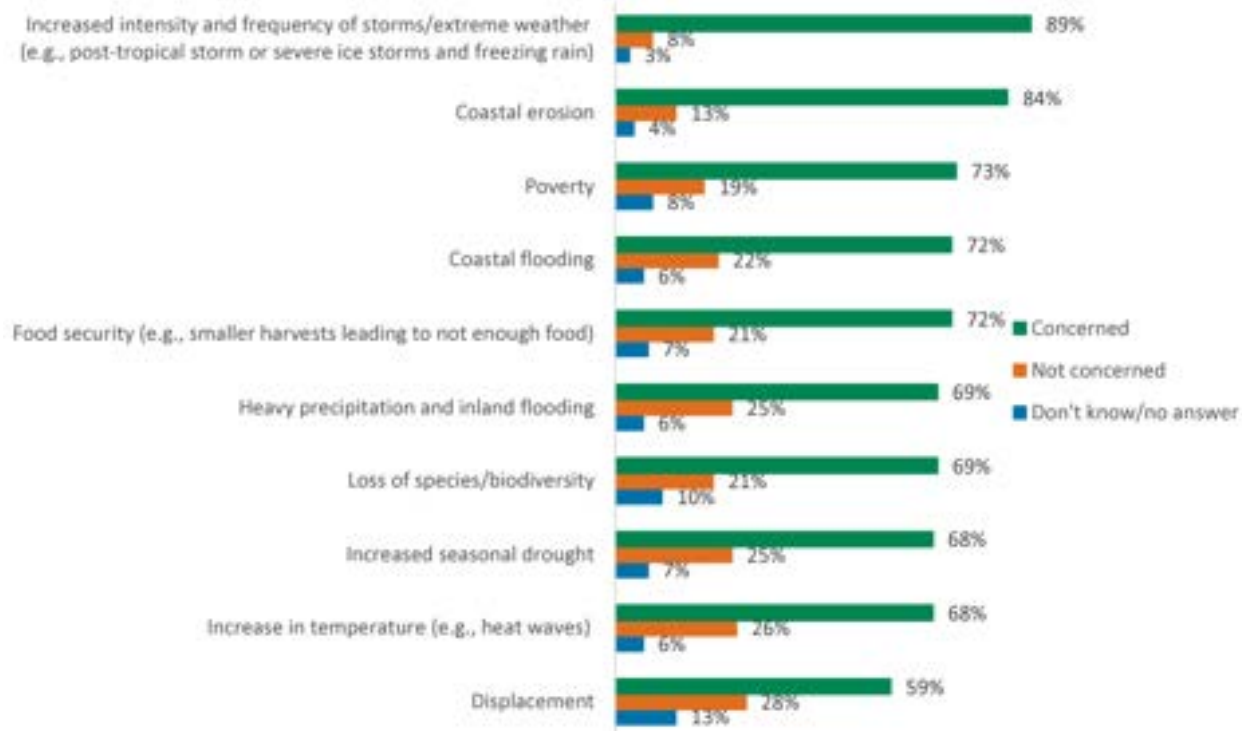
⁴ Ryan, C. (2023, October 19). Satellite images tell the tale of where Fiona took biggest toll on P.E.I. forests. CBC. <https://www.cbc.ca/news/canada/prince-edward-island/pei-environment-forestry-plan-committee-1.7001377>

Post-Tropical Storm Fiona also showcased the extraordinary power of community resilience and unity. Communities banded together, demonstrating the strength and compassion that can emerge in the face of adversity. This collective spirit highlighted the importance of fostering strong social networks, encouraging community preparedness, and nurturing a culture of resilience that can help us navigate the challenges of a changing climate.

As we reflect on the impacts of Fiona, we are reminded that climate change is an urgent and multifaceted challenge that demands our collective action. It calls upon us to build resilient infrastructure and be wise in the placement of future infrastructure, protect and restore our natural ecosystems, and foster a sense of community cohesion and preparedness. By embracing these lessons, we can work towards a more sustainable and resilient future for our municipality.

Stratford Residents' Climate Concerns

In Stratford's [2023 Annual Resident Survey](https://www.townofstratford.ca/residents/think_stratford/annual_resident_survey),⁵ the Town asked residents about their current and future concerns of the impacts of climate change. Residents were concerned about all of the current and future impacts described in the question, with 89% of residents concerned with increased intensity and frequency in storms and/or extreme weather. This may be due to the recent events residents experienced with Post-Tropical Storm Fiona. In addition, coastal erosion (84%), poverty (73%), and coastal flooding (72%) and food security (72%) being in the top 5 biggest concerns of residents.



⁵ Town of Stratford. (2023). Annual Resident Survey.
https://www.townofstratford.ca/residents/think_stratford/annual_resident_survey

Goals and Actions

The recommendations found in the sections below are meant to guide the Town in taking action to adapt to climate change and mitigate the effects of climate change. Some are specific to what are known needs and challenges, 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 physically included in this Plan, but rather are part of [Stratford's Community Energy Plan \(CEP\)](#). Further, as a municipality Stratford has some limits on its jurisdiction and so these recommendations represent what Stratford can achieve within its authority; in many areas Stratford can encourage, incentivise, and educate but cannot dictate or require.

Community Planning

SIDEBAR

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)⁶*

Municipal planning plays a crucial role in shaping local responses to climate change. The Plan emphasizes the importance of integrating climate considerations into local planning processes. 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 embracing proactive and forward-thinking practices, Stratford can create sustainable and climate-resilient communities, unlocking co-benefits such as improved public health, economic opportunities, and increase the natural beauty of Stratford .

⁶ 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>

*C – Community Planning goal label.

Goals	Recommended Actions	Key Performance Indicators (KPIs)
C1 Integrate climate change considerations into all aspects of community planning	1. Update the Sustainable Subdivision Overlay in the Zoning and Development Bylaw⁷ to ensure it is a viable and appealing choice for developers. 2. Amend the Official Plan⁸ and Zoning and Development Bylaw to increase horizontal coastal setbacks to reflect current rates of erosion, 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 center, taking into consideration climate change impacts such as intense rainfall, extreme heat, etc. that require built adaptation.	● Number of climate change objectives integrated into municipal planning documents
C2 Foster collaboration and partnerships with stakeholders	1. Engage residents, community organizations, neighboring 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.	● Number of meaningful partnerships and collaborations established

⁷ 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

⁸ 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

C3 Increase resources and capacity for implementation of the Plan	1. Increase staff capacity to fulfill 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.⁹	● Number of staff added in a sustainability and climate change capacity ● Number of projects completed that align with the Plan's actions
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Climate Emergency Preparedness

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

The Province plans to utilize Lion Electric's school buses equipped with vehicle-to-grid (V2G) technology to power emergency warming centres during power outages. The North Rustico Lions Club has been selected as the pilot site for this innovative approach.

- **Climate Change Risk:** More frequent and intense storms damage critical infrastructure and cause prolonged power outages, requiring emergency reception centres for residents with reliable power.
- **Solution:** Lion Electric buses feature V2G technology that allows chargers to draw power from the buses' batteries during emergencies. This technology enables electric buses to serve as mobile power sources, providing electricity to emergency heating centres in the absence of grid power.
 - **Financial Partnership and Project Coverage:** Lion Electric, the company providing the electric buses, will cover most of the project's costs, eliminating financial burdens on the town and the North Rustico Lions Club. The provincial government will fund any unforeseen expenses during the installation, such as additional public electric vehicle chargers.
 - **Scalability and Future Plans:** All electric buses on PEI can be upgraded to incorporate V2G technology, offering a scalable solution for other emergency warming centres across the province.

⁹ Net Zero. (2021). The Net Zero Initiative Framework. <https://www.net-zero-initiative.com/en/framework>

By harnessing electric buses to power warming centres during disasters, the North Rustico Lions Club and province are not only prioritizing environmental concerns but also demonstrating the potential for innovative technology to address critical community needs.¹⁰

SIDEBAR

The Province of PEI offers a free in-depth Coastal Hazard Assessments (CHA)¹¹ and Watershed Flood Projections Reports¹² for developers, coastal residents, and potential coastal property buyers. Intact and ClimateSense offer a free course on Protecting PEI Homes from Flooding (PPHF)¹³ and CLIMAtlantic provides public and free access to their online Coastal Adaptation Toolkit¹⁴. 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 emergency preparedness for local climate change impacts, we confront risks such as, rising sea levels, coastal erosion, more intense storms, and an increasing number of extreme heat days. Fiona resulted in insured damages alone exceeding \$220 million in PEI,¹⁵ with insurance payouts exceeding \$800 million for the Atlantic Canada region.¹⁶ By investing in comprehensive emergency preparedness, we can effectively safeguard the lives and properties of our residents, mitigate the impacts of climate-related disasters, and fortify our resilience in the face of evolving environmental conditions. This includes formulating evacuation strategies, securing essential equipment and infrastructure, encouraging residents to be proactive, coordinating with relevant agencies and stakeholders, and implementing initiatives to bolster our overall resilience.

¹⁰ 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>

¹¹ Province of Prince Edward Island. (2020, April 30). Coastal Hazard Assessment. <https://www.princeedwardisland.ca/en/service/coastal-hazard-assessment>

¹² 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>

¹³ Intact Centre on Climate Adaptation (University of Waterloo) and ClimateSense. (n.d.). Flood Protection Training – Intact Centre on Climate Adaptation. https://www.intactcentreclimateadaptation.ca/programs/home_flood_protect/training/#4th_PEI_Flooding_Erosion

¹⁴ CLIMAtlantic. (2023). Coastal Adaptation Toolkit. <https://climatlantic.ca/coastal-adaptation/>

¹⁵ 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>

¹⁶ 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>

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



*EM – Climate Emergency Preparedness goal label.

Goals	Recommended Actions	KPIs
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 (e.g., 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.	● Number of local climate hazards and preparedness measures covered in the EMO plan ● Number of emergency exercises per year ● Number of shared mobile power sources available during emergencies

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 (e.g., storm surge, extreme weather events, coastal erosion, and forest fires).	● Percentage of residents who are prepared for a 72 hour emergency ● Number of emergency volunteers
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.	● Number of individuals that can be accommodated at Town emergency centres
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.	● Number of emergency preparedness partnerships with nearby municipalities

Energy

As the global community grapples with the escalating threat of climate change, municipalities around the world have recognized the urgent need to address their energy systems to mitigate greenhouse gas emissions. In 2017, Stratford created the [Stratford Community Energy Plan](https://cdn5-hosted.civiclive.com/UserFiles/Servers/Server_11992779/File/Residents/Naturally%20Stratford/Community%20Energy%20Plan/CEP-Final-draft-Sept.13.pdf) (CEP),¹⁷ 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

¹⁷ Stratford Sustainability Committee. (2017). Stratford's Community Energy Plan to Reduce Greenhouse Gas Emissions. Town of Stratford.
https://cdn5-hosted.civiclive.com/UserFiles/Servers/Server_11992779/File/Residents/Naturally%20Stratford/Community%20Energy%20Plan/CEP-Final-draft-Sept.13.pdf

adoption, it should be updated to reflect advances in technology, new regional and global emissions reduction commitments, and completion of actions within the plan 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 comprehensive transportation electrification plan for the next two years to reduce greenhouse gas emissions.

- **Climate Change Risk:** Without mitigating greenhouse gas emissions from transportation, climate change will continue to progress and local air quality will worsen.
- **Solution:** A organizational electrification plan for the City, including initiatives such as:
 - adding 2,100 new electric Bixi bikes and 250 electric taxis
 - installing 660 level 2 and DC fast charging stations
 - implementing regulations mandating charging infrastructure 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 sustainable mobility and e-mobility sectors.¹⁸

SIDEBAR

¹⁸ 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/>

Electric vehicles have fewer moving parts compared to combustion engines, resulting in less frequent maintenance and lower production costs. While combustion engines typically have over 2,000 moving parts, electric vehicles typically have only 18-20 moving parts. Electric vehicles eliminate the need for oil changes, coolant flushes, mufflers, exhaust systems, radiators, fuel injections, gas tanks, valve trains, and more.¹⁹

SIDEBAR

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.²¹

The transportation sector significantly contributes to greenhouse gas emissions, air pollution, and energy consumption. By reimagining how we move people and goods, we can make significant strides in reducing our carbon footprint, improving air quality, and enhancing 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, though some still provide free charging. Apps like [PlugShare](#)²⁰ and [ChargeHub](#)²¹ helps drivers find available charging stations. EV uptake in Stratford is on the rise, and though current use of Town charging stations is not at full capacity, there is regional demand for Level 3 chargers, particularly for those travelling through Stratford.

In this section, and in alignment with [Stratford's Community Energy Plan](#) and [Active Transportation Plan](#) (T5 is directly taken from the Active Transportation Plan), we frame our goals and actions that promote sustainable public transit, active transportation, low to no emission transportation, and innovative solutions. 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, accelerating progress toward a sustainable transportation future.

*T – Transportation goal label.

Goals	Recommended Actions	KPIs
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.	Number of EV and low emission vehicle charging stations installed

¹⁹ Plugndrive. (2020). Electric Car Benefits. <https://www.plugndrive.ca/electric-vehicle-benefits/>

²⁰ Plug Share. (2019). PlugShare Map. <https://www.plugshare.com>

²¹ Charge Hub. (n.d.). Find every public charging station for electric cars. <https://chargehub.com/en/charging-stations-map.html>

	- Promote incentives as well as other opportunities for financing EV and low-emission vehicles (including bikes and scooters). - Provide education to residents on the benefits and accessibility of EV cars, bikes, and other low-emission transportation. - Work with Net Zero PEI and EV suppliers to offer EV test drives and demonstrations to residents.	- Number of public level 3 charging stations installed - Number of residents reporting low-emissions transportation use
T2 Improve T3 route and increase ridership	Review route optimization, connectivity, and intermunicipal (regional) services for the T3 bus system.	Average number of yearly transit users
T3 Advance municipal fleet electrification	- Replace and purchase new municipal vehicles with electric vehicles using Stratford's Sustainable Procurement Action Plan²². - Ensure the Asset Management Policy includes climate change impacts and savings. - Electrify municipal fleet in increments by targeting light duty and small equipment for greening and work up.	Number of green/low/no emission vehicles integrated into Stratford's municipal fleet
T4 Encourage sustainable commuting	- Promote carpooling among residents through the creation of safe ride-share and park-and-ride programs. - Promote safe and reliable platforms for sustainable commuting. - Collaborate with other municipalities to offer residents an E-bike-share or scooter-share network.	- Percentage of residents sustainably commuting - Number of e-bikes or e-scooters available to residents through sharing networks
T5 Enhance active transportation areas and infrastructure	- Expand regional links connecting neighbourhoods and destinations and create a network that explores the diverse landscape of Stratford and beyond. - Make active transportation an accessible and affordable choice for all residents and visitors, including people of all ages, abilities, races, genders, sexualities, and incomes. - Prioritize active transportation by encouraging behaviour change and a shift in attitude and values that have traditionally favoured private single-occupant vehicles.	- Kilometers of active pathway lanes constructed - Kilometers of physically separated cycling infrastructure

²² Town of Stratford & Reeve Consulting. (n.d.). Stratford's Sustainable Procurement Action Plan. https://docs.google.com/document/d/1SWiNp-WDV0ot7oszFsAvzNyb5ntnN3Awk4_WFTTCQKg/edit

	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.	● Number of new fountains along pathways ● Number of trees planted along pathways
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Water, Wastewater, and Stormwater

CASE STUDY: Charlottetown, PEI - Flood Risk Reduction Rebate Program

This case study explores Charlottetown's proactive flood program as a model for effective climate change risk mitigation:

- **Climate Change Risk:** Rising sea levels and increasingly heavy rain events cause increased flooding to a large portion of Charlottetown's downtown residential areas.
- **Solution:**
 - **2021:** Charlottetown staff completed risk assessments with homeowners and offered rebates for overland flood upgrades and repairs through a pilot program funded by PEI Climate Challenge Fund.
 - **2022:** The City broadened the program to a city-wide rebate program called the Charlottetown Flood Risk Reduction Rebate Program in partnership with Intact Public Entities, providing 75% of the cost of approved flood protection devices and the associated 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 underscores the importance of localized risk assessments, financial incentives, and a people-centric focus in climate change planning. This case study serves as a valuable example for municipalities aiming to enhance resilience and address specific vulnerabilities in their communities.²³

²³ 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>

Water, wastewater, and stormwater infrastructure in Stratford face challenges in rising sea levels, coastal erosion, run-off from agricultural fields during heavy precipitation, and the increased frequency and intensity of storms, especially along our coastal edges. We are integrating more consideration for our local climate hazards to better protect our water, wastewater, and stormwater infrastructure. More information can be found in Stratford's [Stormwater Management Plan](#)²⁴, Infiltration and Inflow Study, and [Climate Sense Coastal Infrastructure Report](#)²⁵.

*W - Water, Wastewater and Stormwater goal label.

Goals	Recommended Actions	KPIs
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, and naturalized retention ponds. 2. Upgrade current stormwater infrastructure to increase capacity to manage inland flooding and storm surge based on climate change predictions. 3. Reduce stormwater infiltration into the wastewater system by implementing the recommendations of Stratford's Infiltration and Inflow Study. 4. Consider creating localized stormwater management plans for flood-prone areas and areas that have reoccurring runoff issues during heavy precipitation events. 5. Update the Official Plan, Zoning and Development Bylaw, and other applicable plans to reflect certain relevant CSA Group Community Water Standards²⁶ that can be further locally shaped if need be.	● Number of improvements made to stormwater infrastructure ● Number of Infiltration and Inflow Study recommendations implemented
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.	● Number of improvements made to wastewater infrastructure
W3 Enhance capacity of wellsite areas to better cope	1. Create and implement wellfield protection plans that consider climate change hazards. 2. Implement lightning protection for wellfield infrastructure.	● Acres of native plant species planted in wellfield areas.

²⁴ Town of Stratford. (2003). Low Impact Development Guidelines Stormwater Management Plan Update. <https://www.townofstratford.ca/common/pages/DownloadFileByUrl.aspx?key=J3%2byWYQ2thLNprYnPsT4Rs6A%2bZ3pd1lr%2bIQaileGX7ZZVhibGRFqcezArn7349vX8Olyk7FoSpzabl5EttF%2ba%2bYojTO6UVOFKW5XC458UxiBTHu7FI4S1ola60sfzpyaW3Shd8shXFmdRuNDE778cYDlyFzaa55E2OVmJ9OYH6RlixMbe%2bzY0Tb1VDqVT1gGkU2YsUS8w0DIRysvGETutptR8HtYyloPkymPA8lxnFC4Kbzy85FEbn3XUxKBlitgT2kQ%3d%3d>

²⁵ Pokharel, A. (2021). Town of Stratford Coastal Vulnerabilities. ClimateSense & Town of Stratford.

²⁶ 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>

with climate hazards	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.	● Number of wellfields that have lightning protection ● Number of climate hazards considered in wellfield protection plans
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Natural Assets

It is crucial to balance Stratford's rapid development with preservation of natural assets to maintain a healthy environment and remain 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 a catalyst for the pre-conditions for economic growth²⁷. Unfortunately, insufficient valuing of natural assets, inadequate consideration of land-use, rapid or sprawling development, and environmentally harmful activities on private land hinder prosperity across all pillars: environmental, social, and economic. We recognize that growth and change are inevitable, and we strive to approach the ecological-development dynamic with a balanced perspective.

Stratford's natural assets provide many beneficial services and play an important role in adapting to and mitigating climate change. Some of the services our natural systems provide (if healthy) are lessening the burden of extreme weather events (heat and storms), sequestering carbon, managing stormwater and groundwater (ground infiltration, purification, and water storage capacity), and strengthening topography integrity (e.g., erosion management and natural bank stabilization).

*N - Natural Asset goal label.

Goals	Recommended Actions	KPIs
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.	● Number of natural asset types inventoried
N2 Work in increments to a full Natural	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.	● Number of natural asset management plans

²⁷ 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

Asset Management Plan	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.	● Creation of a full Natural Asset Management Plan OR fully incorporate natural assets into Stratford's Natural Asset Management Plan
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Wetlands and Coastlines

CASE STUDY: Province of PEI - Offshore Reefs for Shoreline Stabilization

Beginning in 2018, the Province installed multiple offshore, or intertidal, rock reefs at vulnerable 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 does not stand up to severe weather events such as Fiona; wave energy is not dissipated by rock walls, but simply directed elsewhere. Even without extreme weather events, hard armoring can accelerate shoreline erosion adjacent to the infrastructure if it is used as a stand-alone method.
- **Solution:** The Province installed large offshore, or intertidal, reefs constructed of native sandstone or armor stone to accumulate littoral sediment moving along the coastline behind the reef, reversing erosion at those locations.

UPEI is monitoring these shoreline stabilization techniques, recording changes to the shoreline, if shoreline protection measures are holding up from year to year, and status of nearby infrastructure. While the technique in this case study should be considered cautiously, the reefs are growing in success and allowing for sediment accumulation.²⁸

CASE STUDY: Stratford, PE - Solution for Sea-Level Rise at Fullerton's Marsh

²⁸ 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>

Fullerton's Marsh, located in an area historically bisected by the PEI Railway, faced sea level rise challenges stemming from the bisected wetland and deteriorating 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 bisected 67 hectares of marsh with the linear mound 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 the old rail-line dyke was deliberately breached, allowing for the first full tidal exchange between saltwater and freshwater in decades.

The strategic intervention by DUC in managing the Fullerton Creek Conservation Park, culminating in the deliberate breach of the rail-line dyke in 2020, has yielded positive ecological changes. These include stabilized sediments and heightened wildlife activity, showcasing the potential for effective conservation measures to restore and enhance sensitive wetland ecosystems.²⁹

Wetlands and coastlines are critical natural assets that require proactive protection against both human development and climate change. Wetlands have historically been undervalued and often lost to human activities like agriculture and urbanization. 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 15 kilometers of coastline within the municipal boundaries alone, varying by type most commonly between sandstone cliffs, till bluffs, salt marshes, and artificially protected shoreline. While wetlands and coastlines are afforded some protection under provincial legislation, 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 significant role of coastal wetlands. Despite occupying only 5% of land area, they store 50% of carbon in their ocean sediments, making them crucial for biodiversity, resilience, and livelihoods. Wetlands can store 10-100 times more carbon than forests, thanks to their efficient soil-building capabilities.³⁰ As for the protective role that wetlands play for nearby infrastructure, a study conducted in the United States found that coastal wetlands on estimate prevented over \$625 million in property damages during Post-Tropical Storm Sandy and reduced damages by an average of 10% throughout the Northeast. To further add, the Nature Conservancy and National Oceanic and Atmospheric Administration (NOAA) showed that areas

²⁹ 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/>

³⁰ 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>

behind existing salt marshes experienced 20% fewer property damages compared to areas where salt marshes were lost.³¹

* AQ - Wetlands and Coastlines goal label.

Goals	Recommended Actions	KPIs
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.	● Number of nature-based projects collaborated on with external organizations
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 financial incentives for residents near wetland and coastal areas to promote better access for residents to assist in positive actions towards wetland and coastal health as well as the preservation of their own property.	● Number of outreach events and activities conducted

Green Spaces

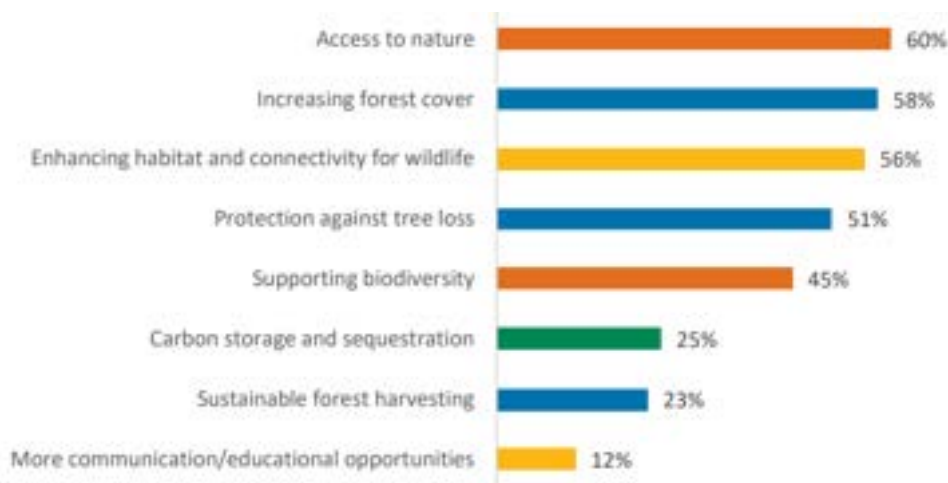
Green spaces provide essential services that contribute to economic prosperity, environmental stability, and the overall health of residents. Green space refers to areas of land covered predominantly by vegetation, such as parks, forests, gardens, natural reserves, agricultural land, and your own backyard.

This section of the Plan addresses these challenges and reaffirms our commitment to the long-term preservation and rehabilitation of local green spaces. Our efforts, including the Forest Management Plan

³¹ National Ocean and Atmospheric Administration. (2023). Wetland Benefits.
<https://coast.noaa.gov/states/fast-facts/wetland-benefits.html>

(FMP), [Municipal Parks Master Plan](#)³², [Active Transportation Plan](#)³³, Official Plan, and [Urban Core Plan](#)³⁴, contribute to the growth and conservation of urban green spaces.

With respect to forests in particular, Stratford residents responded in the [2023 Annual Resident Survey](#) what their most important aspects of forest management are, with 60% of residents indicating access to nature is the most important. This is closely followed by increasing forest cover (58%) and enhancing habitat and connectivity for wildlife (56%).



SIDEBAR

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 2050.³⁵
- "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".³⁶

³² 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_GSAG1NtyTl7lORhYdTYcFVw/edit?usp=sharing

³³ Upland Planning + Design. (2023, October). Town Of Stratford Active Transportation Plan.

https://drive.google.com/file/d/1ly7To-fil3LHcBsjMZBOLmax_EHLMev9/view?usp=sharing

³⁴ Reynolds, K. (2020). Urban Core Plan. The Town of Stratford.

<https://thegraygroup.ca/wp-content/uploads/2023/09/Stratford-Urban-Core-Plan-1.pdf>

³⁵ 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>

³⁶ 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>

- About 13% of forested areas lost at least 70% of trees on PEI for post tropical storm Fiona.³⁷

G – Green Spaces goal label.

Goals	Recommended Actions	KPIs
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.	• Number of native plants planted in Stratford • Number of native plants planted on residential properties through municipal programs
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 Guide³⁸ 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.	• Percentage increase in forested areas preserved or dedicated as greenspace • Acres of natural areas or green corridors preserved • Acres removed from mowing
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)³⁹ and the Province for forest management	• The percentage of urban land covered by trees • The reduction in the number of acres lost

³⁷ 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>

³⁸ Harper, J. (2022, September 1). FPEIM guide helps municipalities protect habitat. Federation of PEI Municipalities. <https://fpeim.ca/fpeim-guide-helps-municipalities-protect-habitat/>

³⁹ Sustainable Forest Alliance Inc. (SFA). (2023). Responsible woodlot management on Prince Edward Island. <https://peiforests.ca/>

	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.	due to development
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.	● Number of municipal green space areas that incorporate designated cooling areas, built shelters, and water fountains.
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 and buffer zones (including smaller residential gardens). 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.).	● Number of educational workshops and programs conducted on green spaces ● Percentage of residents undertaking nature-based improvements to their properties

Rooting our Resilience Deeper

In conclusion, "Resilient Roots: Stratford's Climate Action Plan" emerges as a vision centered on safeguarding our community against the immediate and future impacts of climate change, recognizing the need to adapt to local vulnerabilities and hazards such as, coastal erosion, extreme weather events, and sea-level rise. Concurrently, Stratford's mitigation strategies aim to reduce greenhouse gas emissions, fostering a gradual transition to renewable energy sources and heightened energy efficiency in municipal operations.

In rooting our resilience further and preparing for the challenges that lie ahead, the deliberate allocation of resources to the Plan's initiatives signifies a local commitment and investment. The Plan's comprehensive guiding actions in community planning, emergency preparedness, transportation, water utilities (potable water, wastewater, and stormwater), and natural assets collectively sculpt a more resilient, environmentally conscious, economically prosperous, and thriving place to live for our residents. This plan signifies our steadfast dedication to constructing a resilient community, attuned to climate considerations and well-prepared for the challenges that lie ahead.

Appendices

Appendix A

Temperature and precipitation data are from the national climate data portal, ClimateData.ca,⁴⁰ representing an average year across four periods of time. Sea level rise values are from Natural Resources Canada.⁴¹ 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

⁴⁰ 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

⁴¹ Government of Canada. (2016, July 6). Natural Resources Canada. <https://natural-resources.canada.ca/home>

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
50 th percentile (median)	0.11	0.19	0.24	0.33	0.40	0.48	0.59	0.70	0.77
95 th 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

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

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.

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: Communities of organisms that interact symbiotically within a specific environment.

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.

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 favor 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.