



Climate Change Plan

2022

The Town of Annapolis Royal



Land Acknowledgment

Annapolis Royal is located in Mi'kma'ki, the ancestral and unceded territory of the Mi'kmaq people. Signed in 1725 between the Mi'kmaq and Wolastoqiyik (Maliseet) and the British Crown, the Treaty of Peace and Friendship was a form of recognition and guidelines for establishing rules for an ongoing relationship between nations. This treaty did not deal with the surrender of lands and resources. The Mi'kmaq people have developed a sustainable and respectful relationship with nature for hundreds of years. Medicine, culture, art, and livelihoods all depended on this relationship. In turn, the Mi'kmaq paid their respects through sustainable resource management and offerings to the land such as tobacco. Many Indigenous people continue these practices today and carry these traditions onward to the next generation. Moving forward in a world affected by climate change, elders, scholars and other Indigenous knowledge holders carry valuable knowledge to help governments and decision-makers address climate change.



Acknowledgments

Annapolis Royal Town Council

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Executive Summary

Climate change remains one of the greatest threats to humans in history. Floods, natural disasters, and unpredictable weather patterns have negatively impacted individuals, communities, and governments for decades and will continue to inflict impacts on a growing scale. As a result, Town Hall, Council, the Environment Advisory Committee (EAC), local businesses, and residents have expressed increasing concerns about rising sea levels' effects on Annapolis Royal. As a result, EAC collectively decided that a new Climate Change Plan (CCP) was necessary for taking definitive actions toward addressing climate change. Annapolis Royal's CCP acknowledges that understanding the risks involved is the first step in combating climate change on a community and individual scale.

Annapolis Royal has recognized the threats of climate change for decades and continues to seek solutions to protect and safeguard The Town's environmental, economic and social integrity. Annapolis Royal hopes that this document aids in understanding climate change and the threats to Annapolis Royal. In addition, this CCP provides a snapshot of the past, present, and future in Annapolis Royal regarding climate change and the pathway forward to addressing this small but mighty Town's climate change challenges.



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Mayor's Address

Since 1998, The Town of Annapolis Royal has recognized and begun to address the issues relating to our changing climate. With the assistance of partners, including the Centre for Geomatic Sciences (COGS) at the Nova Scotia Community College (NSCC), Clean Annapolis River Project (CARP), and the Federation of Canadian Municipalities Partners for Climate Protection Program, successive Town councils and staff have received valuable information on the potential impacts for Annapolis Royal and area through various studies, reports and LIDAR mapping.

This Climate Change Plan provides direction for us concerning what we can all do to mitigate the adverse effects of climate change and adapt to our changing environment.

The environment we live in is the envelope that contains all life; we now have the opportunity to choose a future with or without clean air, water and soil. We can choose to do nothing, or we can choose to care and do what we can to reduce our carbon footprint and change the trajectory for the future.



Amery Boyer

Mayor

Town of Annapolis Royal

A handwritten signature of Amery Boyer in blue ink, written in a cursive style.

Introduction

The Town of Annapolis Royal in Nova Scotia, Canada, has been concerned with climate change for decades. Annapolis Royal has made great strides in learning about the changing climate through years of partnering with organizations and neighbouring communities and identifying this tiny Town's risks. This document explains climate change, the risks and areas of focus for Annapolis Royal, potential impact areas, goals, and further details on solutions such as adaptation and mitigation strategies. In 2021, EAC members and Council discussed creating a new CCP. The Town's vision was to create a document that would support Annapolis Royal in addressing climate change topics and act as a "living" document. The climate is evolving and changing regularly; this climate change document will reflect that. Annapolis Royal's CCP will adapt to environmental shifts to guide the work needed to overcome future climate change challenges. EAC will review this plan periodically to ensure that the document remains relevant and valuable to the community for years to come. The Town remains optimistic about the future as The Town adapts to risks such as flooding and sea-level rise.

It is now more critical than ever for communities to start addressing climate change locally, with local governments taking the lead. Documents, feasibility studies, surveys, and risk assessments, all related to climate change, are utilized in Town Hall regularly to obtain more information and financial support to adapt to climate change. This CCP adds to this growing list of essential documents that Annapolis Royal needs to apply the appropriate measures to address what the present and future environment holds. The Town recognizes that stakeholders, minority groups, neighbouring communities, and visitors play a role in maintaining a safe, vibrant, and sustainable space to enjoy. This CCP can bring clarity to each group about the challenges that the Town will face in the foreseeable future. Transformation into a sustainable, green community is possible, and the Town of Annapolis hopes everyone joins in pledging to shift behaviours to tackle climate change as a community.



What is a Climate Change Plan?

Climate change plans (CCP) are crucial in addressing climate change for any community. CCPs focus on environmental challenges and how they can affect a specific geographic area. CCPs are unique to each location and may contain other valuable documents related to climate change in the area. Plans may also act as supporting documents to help municipal staff submit funding applications. Municipalities across Canada are compiling information on historical data, current weather, and climate events while predicting and preparing for the future by creating plans to help support adaptation to climate change for their communities. Town Council, the EAC, and staff of Annapolis Royal hope that the Climate Change Plan will provide insight into the past, present, and Annapolis Royal's future concerning climate change.

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Why is a Climate Change Plan Important to Annapolis Royal?

The Town of Annapolis Royal is highly susceptible to climate change. As a coastal community, sea-level rise is the biggest threat to The Town. Therefore, implementing a climate change plan is essential to guide Annapolis Royal and support resilience to climate change. In addition, Annapolis Royal's CCP will also help prioritize actions needed to reach identified climate change goals successfully. Finally, Annapolis Royal's CPP will provide community members with a document to aid in understanding the changing climate and prevention measures against climate change challenges. Local governments play a critical role in managing the risks of a changing environment. Municipalities are on the front lines of addressing climate change, and plans are essential for local governments to move forward with adapting to the changing climate.

Understanding Climate Change

Climate Change refers to long-term shifts in temperature and weather patterns (United Nations, 2020). Climate change can happen naturally as the earth's orbit shifts, ocean currents change, and volcanos erupt. These natural phenomena have contributed to the changing climate for billions of years and will continue for billions more. However, since the mid-1800s, human activity has exhausted the planet's capacity to keep up with the demands on natural resources. Human activities such as burning fossil fuels like natural gas, oil and coal are the main drivers of greenhouse gas (GHG) emissions resulting in the rise of global temperatures. It has become evident that the earth is showing signs of stress, and outcomes of climate change present themselves in numerous ways, not just global warming. The planet is a complex system that relies on other aspects of the environment to help support it. Glaciers melting, coral reefs dying, and loss of old-growth forests compromise the unified system sustaining life on earth as we know it. Nature has begun to fight back through intense droughts, rising sea-levels, severe weather patterns, declining biodiversity, permafrost melt and much more. However, suppose activity continues around the business-as-usual model. In that case, humans will continue to exacerbate climate change through persistent acts of deforestation, unsustainable agricultural/land-use practices, and burning fossil fuels. In that case, the adverse environmental effects will continue to intensify. The time to foster community resilience against climate change is now. Transitioning to renewable energy sources, incorporating sustainable practices into everyday life, creating means of active transportation, advocating for more robust policies and regulations to support sustainability and becoming informed of climate change risks most prominent in the area are only some of the ways people can help to address climate change at the local level. Climate change is the single biggest challenge of our time; With municipalities influencing roughly half of Canada's GHG emissions, it's essential to scale up local solutions to transition to a resilient, low-carbon future by 2050.



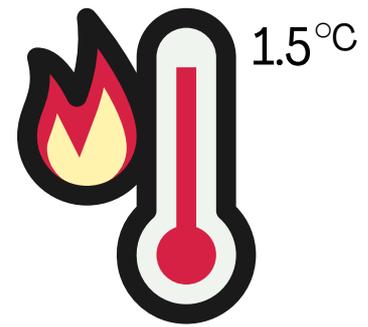
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Climate Change Projections

Assessments of observational datasets and historical temperature rise have provided a better scientific understanding of how human-related GHG emissions affect the planet. Since the Paris agreement of 2015, countries have agreed to cut GHG emissions to pursue efforts to limit global temperature rise from reaching 1.5°C above pre-industrial levels (United Nations, 2015). Limiting global temperature rise to 1.5°C would help lower the chances of increased severity of climate change impacts.



Human activities have caused an estimated average of 1.0°C of global warming above the pre-industrial level, indicating a range between 0.8 and 1.2°C globally. If the current emission rates persist, global warming will reach 1.5°C between 2030 and 2052 (IPCC 2018). The number of people affected by natural disasters in 2018 was 68.5 million, with floods, storms and droughts accounting for 94% of the total affected people (Fawzy, S., Osman, A.I., Doran, J. et al., 2020). If the projections continue to rise, the number of those affected due to climate change will grow.

Climate Change Statistics

Health Canada estimates air pollution, including air pollution from human sources in North America, contributes to 15,300 premature deaths per year in Canada (Health Canada, 2021).

Nine of the ten warmest years have occurred during the last 25 years, with 2010 being the warmest on record. Canada's coldest year since 1948 occurred in 1972 at 2.0°C below the reference value (Environment and Climate Change Canada, 2022).

Sea ice in the Atlantic Ocean has declined in winter by 7.5% per decade since 1969. This is consistent with observed upper-ocean warming, which varies in magnitude across the Atlantic region (Cohen, S., Bush, E., Zhang, X., Gillett, N., Bonsal, B. et al., p.424-443, 2019).

Food waste accounts for 10 percent of global greenhouse gas emissions, and over 17 percent of food produced is wasted (United Nations, 2022).

Relative sea-level in the region is increasing due to the combined effect of sea-level rise (~1.6 mm/yr) and land subsidence (~1.6 mm/yr). For example, between 1900 and 2016, sea-level at Halifax increased by 3.28 ± 0.19 mm/yr (S. Parker and M. Smith, Parks Canada, 2019).

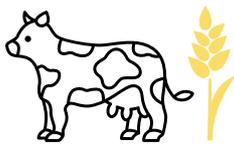
One in a 100-year storm is predicted to become one in a ten-year storm by 2050. Such a storm drops from 50 – 70 MMS/hr (S. Parker and M. Smith, Parks Canada, 2019).

The Driver of Climate Change

Greenhouse gas (GHG) Emissions

GHG emissions blanket the earth's atmosphere, trapping the sun's heat and preventing it from escaping. This is a natural phenomenon known as the greenhouse effect, which keeps the planet at a suitable temperature to sustain all living things. Without the greenhouse effect, the earth would not be a viable place to live. Gases such as carbon dioxide (CO₂), methane, nitrous oxide, and water vapour occur naturally and protect the planet from overheating. However, due to increased CO₂, methane, and nitrous oxide levels from human activity, the atmosphere's temperature has accelerated, creating global warming. Without the ability to exit the atmosphere, significant greenhouse gas emissions (GHG) become trapped, causing the planet's temperature to rise. Listed below are the seven primary global warming contributors due to human activity. For Annapolis Royal, reducing the production of GHG emissions in the community and corporate sector is a way to mitigate climate change and support alternative solutions to address threats such as global warming.

Main contributors to GHG emissions



Agriculture



Permafrost



Vehicle & Air travel Emissions



Landfills



Industries



Deforestation



Non-renewable Energy Production

Impacts of Climate Change

The impacts of climate change are interrelated, affecting every aspect of civilization. For example, drought can compromise drinking water and lead to low crop yields, and flooding from storms and sea-level rise threaten ecosystems and built infrastructure. Further, hazards to human populations from intense heat waves, flooding, and other risks endanger the health of all - especially vulnerable people. Moreover, temperatures will continue to increase due to the existing atmospheric emissions, and climate change's impacts will gradually intensify. Therefore, The Town of Annapolis Royal must consider the climate change impacts listed below when preparing for the future effects of climate change.



Intense heat waves



Shorter or longer seasons



Severe weather



Sea level rise



Drought

Climate Change Goals

- 1.** Pledge to be a climate-smart community
- 2.** Set goals, and plan for climate action
- 3.** Increase community use of renewable energy
- 4.** Reduce greenhouse gas (GHG) emissions through climate-smart initiatives
- 5.** Enhance community resilience and prepare for the effects of climate change
- 6.** Support the development of a green innovation economy
- 7.** Commit to an evolving process of climate action



Guiding Principles for Climate Change Plan

1

Conserving and enhancing biodiversity and ecosystems

2

Improved coordination between neighbouring communities to pinpoint priorities and possibilities to address climate change challenges.

3

Create opportunities for community engagement amongst local government, stakeholders, and citizens.

4

Maximize long-term sustainability and co-benefits of adaptation and mitigation actions with local economic, social, and environmental priorities.

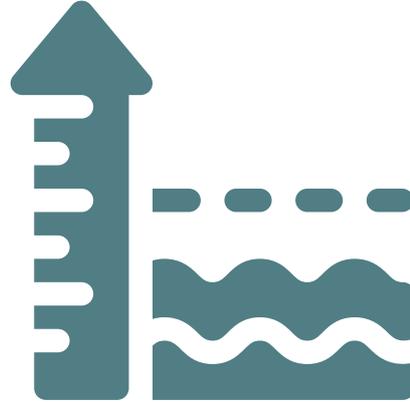
Climate Action Timeline



Areas of Focus

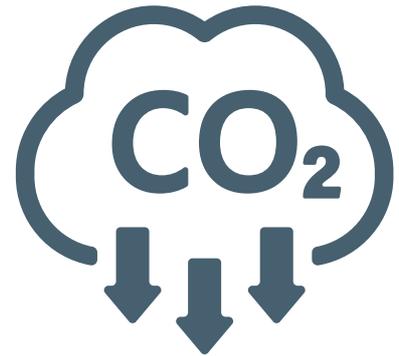
Sea-level Rise

Effects of Sea-level rise
Addressing Sea-level rise



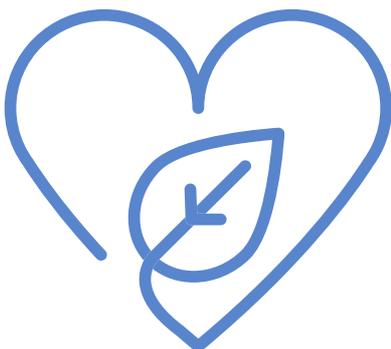
CO₂ Emissions

Effects of excess CO₂ Emissions
Reducing CO₂ Emissions



Preserving Annapolis Royal's Natural Environment

Annapolis Royal's Natural Assets



Sea-level Rise

The melting ice sheets, glaciers, and ocean thermal expansion from global warming raise water levels in the world's oceans. Human activities such as burning fossil fuels are one of the main drivers of global warming, causing the melting process to accelerate and posing a severe threat to coastal areas. Effects of sea-level rise may include flooding, storm surges, erosion, and the destruction of critical aquatic ecosystems such as wetlands and coastal estuaries. Sea-level rise will continue, and with higher water levels, most effects of sea-level rise will only carry higher risk impacts as time progresses. Sea level rise affects areas differently due to local, regional, and hemispheric factors. Water surrounds many communities across coastlines, regions can experience different weather patterns, e.g. higher or lower precipitation rates, and the northern hemisphere is warming faster than the southern hemisphere. In coastal areas of Nova Scotia, a combination of all three factors results in sea-level changes in each coastal area. In Nova Scotia, the increase in sea-level was 0.30 m in the Twentieth Century and the global mean sea-level will gradually increase to 1.6 m by 2100 if the melting of polar ice caps continues (MCCAP p. 4, 2014). Annapolis Royal is recognized as a coastal community and will face the following challenges due to sea-level rise. Acknowledging the issue is no longer enough; action carried through mitigative and adaptive solutions will need to be taken in Annapolis Royal to address sea-level rise.

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High Tide

Low Tide

Effects of Sea-level Rise

Flooding

Flooding occurs when large amounts of water overflow beyond the standard coastline limit. Based on historical flooding events, flooding commonly occurs with snow melt, high tides, heavy rainfall, storm surge or a combination of these (Nova Scotia Gov., n.d). Annapolis Royal is a coastal community susceptible to all the weather events commonly associated with flooding. Heavy rainfall will occur most frequently in the winter, with decreasing precipitation in the summer and the risk of drought in the area (MCCAP, p.g 12, 2014). Combined with snow melt, high tides and increased rainfall in the early spring, flooding risks throughout Annapolis Royal exist, especially in the downtown and lower part of St. George Street. Much of Annapolis Royal's land was reclaimed after the creation of dykes in the 17th century within a naturally receding landscape (Bottomley, p. 19, 2022). Flooding will continue to threaten the community of Annapolis Royal as climate change progresses and water levels rise. With the knowledge, resources, and tools available to the community, such as the Flood Risk Assessment created by John Bottomley Ph.D. this year, Annapolis Royal is well aware of the threat and will continue to adapt accordingly.



Storm Surges

Storm surge is a natural event of increasing water levels connected to low atmospheric pressure created by weather events such as cyclones and measured through the elevation in water levels beyond the average tidal level, not considering waves (Bottomley, p. 16, 2022). Storm surges have occurred throughout history in Annapolis Royal and will continue to occur as climate change creates more opportunities for severe weather events. Storm surges create flash flooding, and while temporary, storm surges can cause substantial damage to the natural and built assets of Annapolis Royal (MCCAP, p. 6, 2014). In addition, floods from storm surges will interfere with access to emergency services, homes, and businesses which may compromise the health and safety of residents (MCCAP, pg. 8, 2014). Therefore, community awareness sessions, home and business flood evaluations, and opportunities to adapt, such as seawalls, living shorelines, restoration of salt marshes and dyke reinforcements, should be considered as the Town continues to plan for future storm surges. Furthermore, storm surges naturally occur within the natural world. However, due to the impacts of climate change, storm surges are increasing each year, creating higher flood levels around the low-lying areas of Annapolis Royal.

Erosion

Erosion occurs from waves, tidal action, wind, surface runoff, and storm surges, slowly deteriorating coastal rocks, soils and sediment along the shorelines. Climate change has accelerated the erosion rate around coastal areas such as Annapolis Royal, resulting in faster deterioration of flood protection structures such as dykes. In addition, freeze-thaw conditions combined with high water tables can fracture essential infrastructure such as subsurface pipes and water mains, speeding the erosion process (MCCAP, pg. 11, 2014). Shoreline erosion often poses a concern for humans by jeopardizing roads, infrastructure, agriculture, transportation, and other valuable community services. Coastal communities like Annapolis Royal are beginning to face the challenge of protecting the shoreline from erosion through hard and/or soft solutions or relocating further inland, known as climate migration. No single solution can solve coastal erosion for every community; depending on shoreline types and sediment present, local decision-makers must consider the uniqueness of the coastline and the specific characteristics that define them.

Nevertheless, living shorelines can be an excellent adaptation method to tackle erosion and help the coastline reach a more stable state. Also known as ecosystem services, living shorelines improve water quality and diversify coastal habitats. In addition, living shoreline approaches such as coastal forests, salt marshes, vegetated slopes, and dunes protect shores from erosion and provide flood protection. Erosion is a natural process that transpires over time as the water hits the coastlines. However, with climate change increasing the amount of erosion from extreme weather, Annapolis Royal will need to consider solutions such as living coastlines and other forms of coastal protection.

Hazards from Sea level rise



Compromised access to emergency services



Infrastructure damage



Disturbance of natural ecosystems



Water contamination



Obstruction of roadways



Addressing Sea-level rise and Flooding

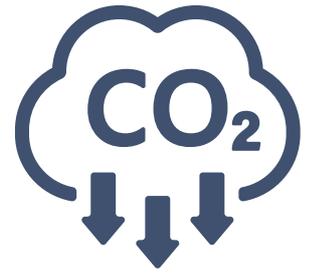
Addressing sea-level is Annapolis Royal's most important climate change challenge. For decades Annapolis Royal has found ways to gain vital resources and information on how sea-level rise will affect the area. For example, flood risk assessments completed with LIDAR data, water model software and historical tidal and flood records have demonstrated that the Town's probability of flooding will increase due to climate change (Bottomley, p. 29, 2022). In 2019, The Town took advantage of an FCM-sponsored Atlantic Infrastructure Management Network grant (AIM) program to assess its water system. In 2021, Council approved participation in a 2nd AIM grant to look at the rest of its infrastructure, such as the sewage treatment system. Capital requirement projections will be developed, including life-cycle costs, level of service, and adaptation and mitigation-based solutions. Annapolis Royal recognizes that community development in environmentally sensitive areas may cause risks to foundation stability and create high water tables and other unsuitable circumstances for substantial growth. The Town utilizes documents like the Land Use By-law and zoning maps for development in environmentally sensitive areas and site-specific development examinations (Municipal Planning Strategy p. 30, 2020). The Town of Annapolis Royal will continue seeking opportunities to support studies and projects to protect Annapolis Royal from sea-level rise. Sea-level rise will continue threatening Annapolis Royal in the coming decades, especially in the downtown core. Continuing the development of resources such as the Annapolis Royal Flood Risk Assessment will further support efforts to mitigate and adapt to sea-level rise in the Town.

Relevant publications indicating the risks of sea-level rise for the area are listed in John Bottomley's Flood Risk Assessment (FRA) on pages 5 and 6. In addition, residents of Annapolis Royal may access this document along with other relevant publications on climate change on The Town's official website: <https://annapolisroyal.com/Town-hall/council-and-committees/environment-advisory-committee/>

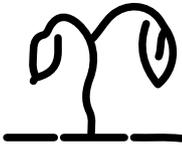


CO₂ Emissions

Carbon dioxide, commonly known as CO₂ is one of the primary GHG surrounding the Earth's atmosphere emitted through human activities. While CO₂ emissions may seem alarming, CO₂ serves a natural purpose in the Earth's atmosphere in small amounts. Since CO₂ classifies as a GHG emission because it absorbs heat from the Earth's surface and disperses it in different directions, including back toward the Planet's exterior surface, this heat distribution process in the atmosphere, known as the greenhouse effect, keeps global surface temperatures above freezing, stabilizing the climate. However, the mass burning of fossil fuels like coal, oil and natural gas creates excessive amounts of CO₂ in the atmosphere, accelerating the greenhouse effect by causing global temperature to climb.



Natural Sources of Carbon Dioxide



Decomposition of organic matter



Volcanic eruptions



Forest fires



Oceans

Reducing CO₂ Emissions

Reducing the CO₂ emissions emitted into the atmosphere is essential to slow climate change. Lowering emissions is significant because as the temperature in the atmosphere continues to rise, climate change impacts will become increasingly dangerous. Therefore, industrial, corporate and community entities and individuals need to address the production of emissions within their respective sector. The shift toward renewable energy from nonrenewable energy sources has proven to be an effective way to combat the rise of carbon emissions.

Examples of nonrenewable to renewable energy sources

Nonrenewable to Renewable



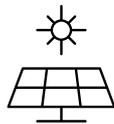
Coal



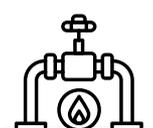
Tidal Power



Oil



Solar Energy



Natural Gas



Wind Energy

Environmental Advisory Committee (EAC) Recommendations to Address CO₂ Emissions

Regulate land-use

Limit international travel

Low carbon capital item replacement

Encourage the use of solar panels and curtains

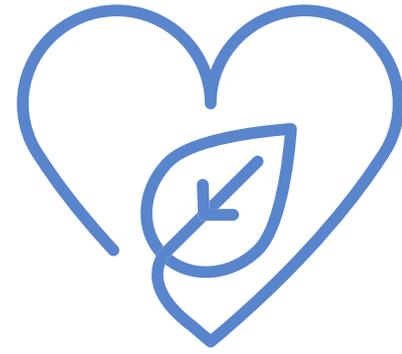
Encourage the reduction of food and energy waste

Increase number of tree plantings in the community



Preserving the Natural Environment

Healthy, natural environments support ecosystems by cleaning the water and air, maintaining rich soils full of nutrients, and providing food for those who need it. Without the natural environment supporting these valuable ecosystem services, severe impacts would occur on the planet. For example, species of animals, plants, fungi, and others would be lost due to habitat disruption, affecting the food web and significantly diminishing the quality of life on the planet. In addition, ecosystems of the earth can be resilient, adjusting accordingly to changes within the environment, such as temperature rise or changing weather patterns. However, many years of deforestation, overfishing, emissions, and destruction have created holes in organisms' interdependent relationships within an ecosystem, risking the system's collapse altogether. Therefore, Annapolis Royal will continue to protect identified natural ecosystems within the community, such as the remaining salt marshes and wetland areas.



Annapolis Royal's Natural Beauty

Salt marshes were once a prominent ecosystem in the Annapolis Royal area. Covering the Annapolis basin area, salt marsh ecosystems once provided valuable services such as coastline protection and strengthening the natural area's overall health. For example, salt marshes are the buffer between land and sea, shielding coastal areas like Annapolis Royal from flooding, erosion, and storm surges. In addition, they act as filters for nutrients, run-off, pollution and even heavy metals. Finally, salt marshes in the area would provide food and habitat for terrestrial and aquatic species through extensive vegetative systems (MMCAP p. 25, 2014). Unfortunately, most salt marshes in the area were reduced or altered due to land development. In addition, the construction of the causeway, the dykes, and agricultural land clearing greatly influenced the marshes. The last salt marsh of great significance is located in the Annapolis basin area and covers approximately 83 hectares (MMCAP p. 25, 2014). Annapolis Royal may be a small Town, but it possesses many natural attributes that residents and tourists appreciate and admire. Unfortunately, much of the land in Annapolis Royal and the surrounding area has been cultivated for agriculture or infrastructure development, leaving few forest systems intact. Thus, acknowledging, appreciating and preserving the natural environment in Annapolis Royal is essential in moving forward for environmental stewardship and prosperity.

Threats to the Natural Environment



Alien plant and invasive animal species



Litter and pollution



Seasonal and everyday weather pattern shifts

For more information about what The Town of Annapolis is doing to address some of these threats, visit The Town of Annapolis Royals By-laws and Policies page to view documents such as the Alien invasive species policy.

<https://annapolisroyal.com/Town-hall/policies-and-by-laws/>

The ecological integrity and biodiversity of Annapolis Royal is threatened by pollution, climate change, and invasive species.



Areas of Impact due to Climate Change

Tourism

Tourism boosts economies, creates jobs, and provides visitors with the experience of different areas on a national and international scale. Annapolis Royal's tourism sector peaks July-September with shoulder months June and October also bringing in increased visitors compared to November through April. Many businesses in Annapolis Royal follow the tourism season, limiting hours or closing during quieter months. Many factors contribute to visitors coming to a specific location. Affordability, health and safety, attractions, and accommodations all influence tourists' destination choices. Annapolis Royal is home to historical sites, such as Fort Anne, the historic gardens, and many historically preserved homes and infrastructure that intrigue visitors from all corners of the world. However, climate change is having an increasing influence on tourism. The appeal of Nova Scotia's coastlines, beaches, and seafood largely depends on the environment. In other coastal communities in Nova Scotia, like Annapolis Royal, tourism largely depends on the fishing industry for culinary purposes, natural beauty and infrastructure along coastlines such as boardwalks/wharves, and gift shops. Climate change can impact all these sectors through flooding risks, loss of aquatic species, and infrastructure damage.

Annapolis Royal is a major tourist destination in Nova Scotia. Figures from Tourism Nova Scotia indicate that since 2010, the Annapolis – Fundy Bay region has attracted approximately 350,000 tourist bed-nights per year, excluding campsites.

"July, August and September are the high season months with June and October being shoulder season months with still considerable numbers of visitors. Approximately 85% of these bed-nights are spent in hotels, motels or B&Bs. Total visitation to the region approaches 1,000,000 individuals per annum including campsites campsites" (Bottomley, p. 42, 2022).



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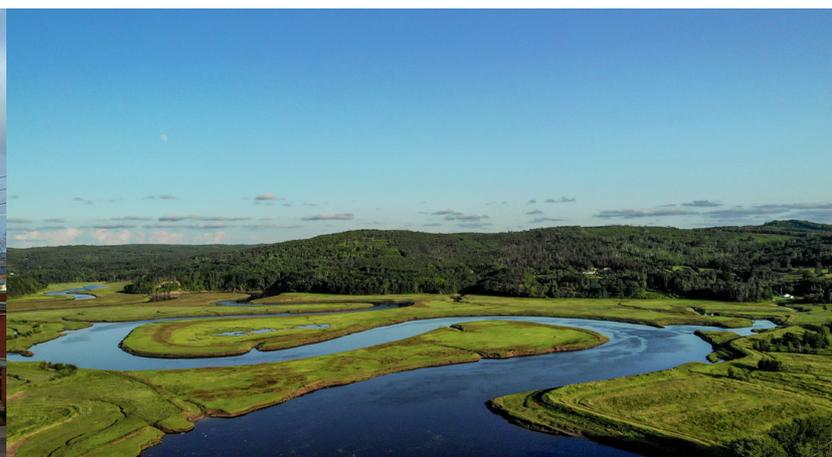


Natural and Built Environment

The built environment refers to areas of land fundamentally transformed and influenced due to human activity. In contrast to the built environment, the natural environment refers to areas with limited impact due to human activity. Physical infrastructure includes roads, bridges, urban spaces, and any infrastructure for human benefit. However, due to its historical significance, much of Annapolis Royal's infrastructure has been created with little regard for future climate impacts. Climate change has brought extreme weather that produces heavy rains, wind, snow, floods, and other natural weather occurrences. Some variables increase the severity of weather events and threaten existing infrastructure and facilities in Annapolis Royal. Severe storms such as hurricanes bring heavy winds and rainfall to the area, generating the risk of flooding and damage to homes, businesses, roadways, and bridges, especially those located on lower St. George Street. Annapolis Royal has worked hard on finding solutions to protect the community from flooding resulting in the inundation of the Town. In addition, numerous organizations have completed research to support Annapolis Royal's efforts in safeguarding its built infrastructure, such as the Town's integrated assets management work by AIMN (Atlantic Infrastructure Management Network).

The natural environment consists of areas with little to no impact from humans. The natural environment is what fundamentally supports life and ecosystems. Without the natural environment, natural resources such as air and water and ecological systems that work to produce soil to grow food to sustain life would become compromised. Demographic, weather, and temperature all play vital roles in how the natural environment functions. The natural environment changes drastically from continent to continent resulting in different weather patterns, temperatures, and climates. Nova Scotia lies in the mid-temperate zone and experiences ample precipitation, a wide but not extreme temperature range, a late and short summer, skies that are often cloudy or overcast, coastal fog and changing weather conditions from day to day (N.S Museum p.94, 2013). Nova Scotia is susceptible to these climate patterns due to exposure to the sea surrounding most of the Province. The sea is influential in managing and moderating Nova Scotia's climate. As a result, the damp environment has created lush and wet conditions for organisms to form working ecosystems.

Annapolis Royal is home to old-growth trees, vital waterways such as the estuary, and stunning coastal features. However, native species, natural vegetation, and channels are all being affected due to climate change. Water availability affected by drought can influence the types of vegetation that will flourish and facilitate the spread of invasive species. Storm events and surges can increase sediment load in a watercourse, alter the foreshore environment and damage environmentally sensitive areas (MCCAP p.25-26, 2014). One of Annapolis Royal's guiding principles for climate action focuses on protecting and enhancing the biodiversity in the area; keeping this in mind, Annapolis Royal hopes to move forward with new and innovative ideas to protect and safeguard the natural environment.



Health & Safety

Climate change can influence human health and safety in various ways. Each season, storms and natural disasters carry different risks; depending on the geographical location, the probability of some events happening is higher than others. For example, Annapolis Royal and the surrounding areas experience storms that create storm surges resulting in flooding. Saskatchewan communities are experiencing severe forest and grassland fires, increasing invasive species issues. As a result, some existing health threats, such as heatstroke and respiratory health issues, will intensify, and new health threats will emerge. However, age, location, and resources can affect someone's capacity to adapt to risks, such as elderly and low-income households. Ensuring resources are available when disaster strikes is challenging for residents with tight budgets and fixed incomes; thus, organizations such as the Regional Emergency Management Organization (REMO) support Annapolis Royal and surrounding areas to access life-saving resources in times of emergency.

One of Annapolis Royal's most significant health and safety threats is floodwaters carrying debris and contaminants. In addition, floodwaters paired with heavy rains can strain drainage and waste management systems. High, fast floodwaters increase the risk of drowning, injury and fatalities (MMCAP, p. 9, 2014). Another considerable risk due to climate change is the spread of diseases from animals and bacteria. Therefore, The Town of Annapolis Royal has partnered with the County of Annapolis and The Town of Middleton to create REMO. REMO addresses and coordinates responses to emergencies over the three jurisdictions. It recommends that each household always have 72 hours of available resources such as water, food, and first aid supplies. In addition, REMO has created a regional emergency plan to address situations that affect human health, the environment, and property. The plan outlines significant effects that can negatively impact Annapolis Royal, such as prolonged power outages from hurricanes, blizzards, and freezing rain, and actions when moving forward to ensure health and safety are a top priority.

72 hours of supplies readily available



Learn about threats in your area

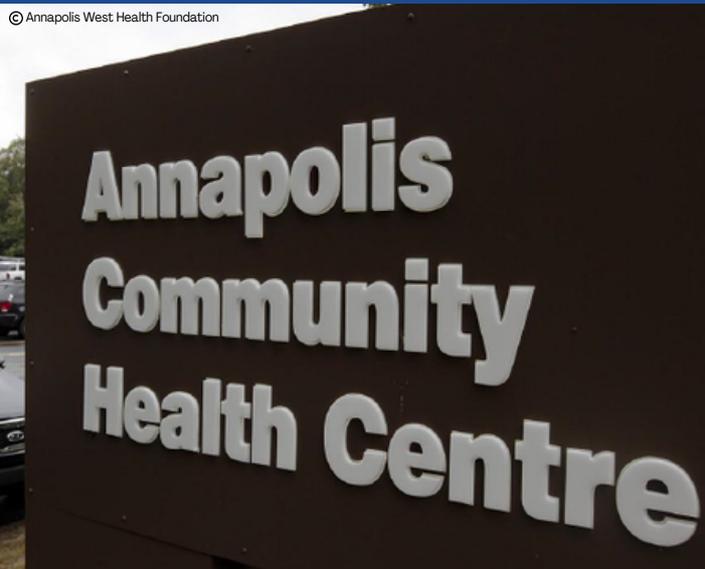


Understand the health risks related to climate change

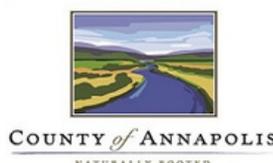


REMO website: <https://annapoliscounty.ca/legislative-services/emergency-management-remo>

© Annapolis West Health Foundation



© Annapolis Royal Fire Department



Initiatives

Over the years, The Town of Annapolis Royal has implemented fourteen specific initiatives relating to the environment. Each initiative aimed to produce positive results in combating climate change, such as lowering local greenhouse gas (GHG) emissions locally by reducing the speed limit in Town to 40 km/h and establishing an anti-idling policy.

- 1.** Bicycle Loan program
- 2.** Brownfield site remediation
- 3.** Energy management for Town-owned properties
- 4.** Idling control policy
- 5.** Invasive alien species policy
- 6.** LED holiday light exchange
- 7.** LED streetlight conversion pilot project
- 8.** Procurement policy emphasizing sustainability as a goal
- 9.** Reducing the speed limit to 40 km/h in Town
- 10.** Renewable environmental-related by-laws.
 - a.** Reviewed existing by-law to ensure it applies to existing and future technologies
- 11.** Tree canopy inventory and urban forest management
- 12.** Water conservation initiatives
- 13.** Separation of stormwater and sewer systems
- 14.** Zero waste enhancements



Partnering Organizations

Global Covenant of Mayors for Climate & Energy

The Global Covenant of Mayors (GCoM) Canada is a coalition between the Federation of Canadian Municipalities, Local Governments for Sustainability (ICLEI) Canada, the Global Covenant of Mayors Secretariat and the International Urban Cooperation Project supported by funding from the European Union (GCoM, 2016). Established in 2008, the Global Covenant of Mayors for Climate & Energy is an international partnership of communities and local governments with a long-term vision of encouraging and supporting voluntary action to combat climate change. GCoM has evolved into the most prominent global alliance for climate leadership; with over 11,500 participating communities, GCoM represents over 1 billion people across 142 countries on six different continents. GCoM strives to address climate change through programs to help communities cut GHG emissions and prepare for the future impacts of climate change.

Increasingly, communities and local governments across the globe are heeding the call to action. With nations working towards the goals of the Paris Climate Agreement, community involvement could not be more pressing when addressing GHG emissions and finding adaptive solutions to climate change. Annapolis Royal recognizes the movement's importance and commitment to adapting to climate change. The Town of Annapolis Royal is proud to have become a member of GCoM on September 16th, 2022.



Partners for Climate Change Protection

The Partners for Climate Protection (PCP) program is available and funded through ICLEI—Local Governments for Sustainability (ICLEI) Canada and the Federation of Canadian Municipalities. The Town of Annapolis Royal joined PCP in 2003 and has since completed milestone three. Since the establishment of this program, over 500 municipalities in all Provinces and Territories of Canada have participated, resulting in 70% of the Canadian population being represented in some capacity by PCP.

The program follows a five-step Milestone framework to guide communities in taking action against climate change. The Milestones listed below help municipalities implement lasting and environmentally sustainable changes to reduce emissions.

PCP is managed and delivered by FCM and ICLEI—Local Governments for Sustainability Canada (ICLEI Canada) and receives financial support from the Government of Canada and ICLEI Canada (FCM, 2000).

Annapolis Royal is here



- Milestone one:** GHG emissions inventory and forecast emission reduction target
- Milestone two:** Develop emission reduction targets
- Milestone three:** Develop a local action plan
- Milestone four:** Implement the local action plan or set of activities
- Milestone five:** Monitor progress and report results



Recommended Programs

Shared Solar Program

On April 7, 2021, the Nova Scotia government introduced Bill 97, amendments to the N.S. Electricity Act aimed at growing the solar industry in Nova Scotia, increasing opportunities for individuals, communities, and businesses to choose electricity generated from renewable sources – and opening up opportunities for solar project development in N.S. (N.S. Gov., 2021). Since the amendment of Bill 97 in 2021, the Nova Scotia Government has begun looking for new pathways to clean, renewable energy sources to grow options for residential solar use. Shared Solar programs will become a unique opportunity for Nova Scotians to adopt renewable energy regardless of home type, such as apartments. This community-oriented program created by the Government of Nova Scotia supports the implementation of solar gardens across the Province and encourages the transition to renewable energy. The Town of Annapolis Royal has been seeking opportunities to implement its community solar garden project that will be located in space available by the waste treatment facility. This project is in the early stages of development, with the main focus currently on obtaining information on other community models.

Solar gardens are open areas with the desired amount of solar photovoltaic (P.V.) systems to generate electricity for participating subscribers. The government will provide further information on this program shortly. Annapolis Royal should take full advantage of this Shared Solar program to help address energy barriers such as low-income housing and support the reduction of GHG emissions in the town.



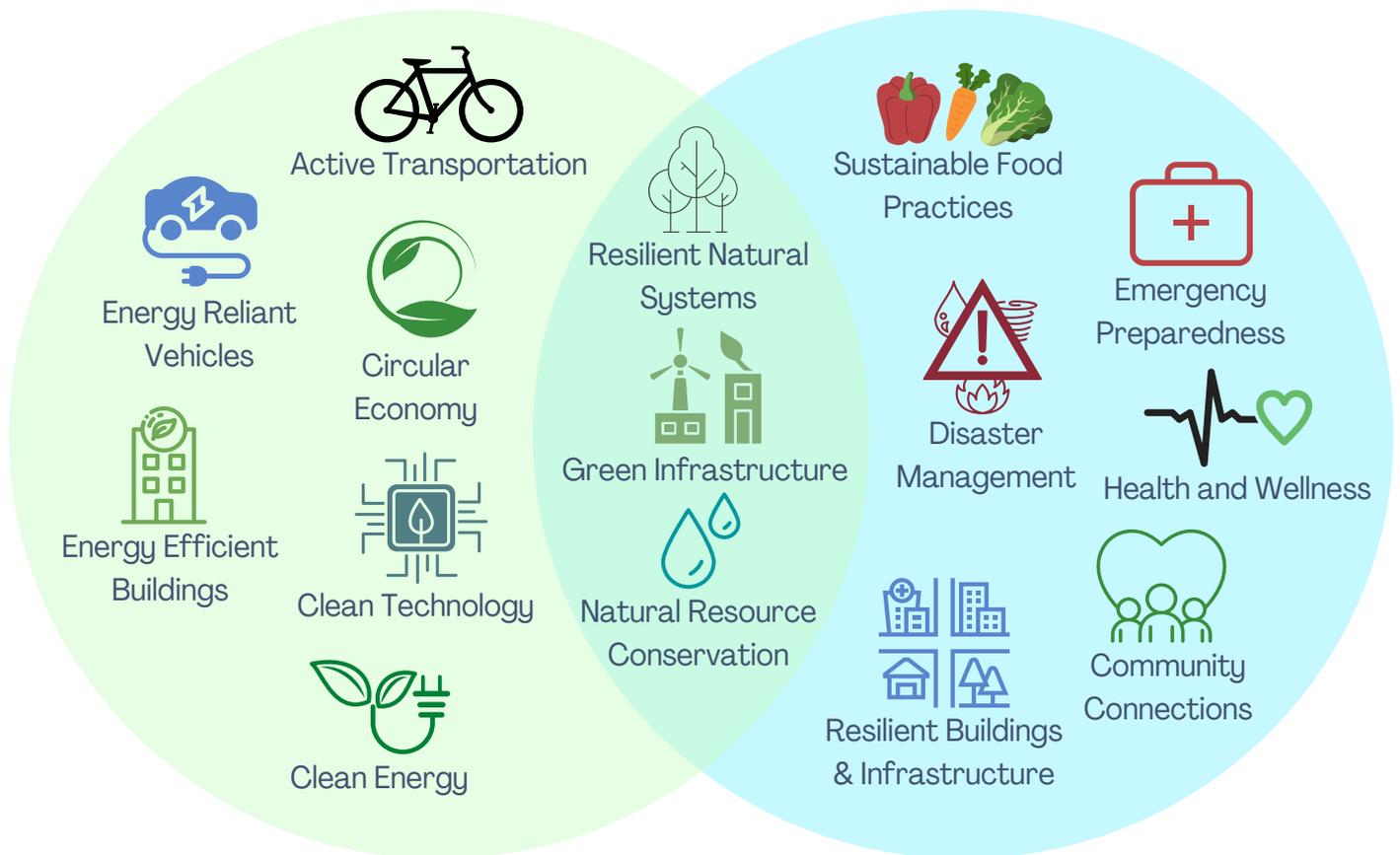
Community Solar Garden Pilot was created by Nova Scotia Power in Amherst Industrial Park.

Pace Program

Property Assessed Clean Energy (PACE) programs are ways to finance energy efficiency advancements and cleaner energy solutions for residential dwellings. Energy efficiency upgrades and transitions to renewable energy, such as installing solar panels, can prove to be an expense many homeowners cannot bear. PACE programs support participants with low-cost upfront financing to support efficient dwelling upgrades and break down barriers to the affordability of home efficiency. PACE programs are available in communities such as Bridgewater, the District of Lunenburg, Amherst, New Glasgow and other communities across Nova Scotia. Annapolis Royal should reevaluate implementing a PACE program within the community or in partnership with the County of Annapolis Royal. The PACE program will provide information and support to residents on energy consumption, how energy consumption can be reduced, the most cost-effective clean energy measures, and overall equipping homeowners with the tools to invest in their homes and receive long-term benefits in economic and environmental ways.

Nova Scotia PACE

Mitigation & Adaptation



Mitigate to Prevent

Mitigation strategies focus on concrete actions to reduce GHG emissions and prevent the atmosphere from rising temperature.

Adapt to Prepare

Adaptation focuses on proactive behaviours and solutions to protect a community's social, environmental, and economic systems.

Mitigation and adaptation both aim to address climate change. The difference between mitigation and adaptation is how each method approaches climate change challenges. Mitigation approaches seek to reduce GHG emissions produced and released into the atmosphere to slow or halt temperature rise. In contrast, adaptation acknowledges the inevitable impacts of climate change. Adaptation prepares communities through flood risk assessments, emergency preparedness procedures, and newly built infrastructure modelled with environmental considerations. While these approaches may seem very different, mitigation and adaptation initiatives are not always mutually exclusive and can have combined advantages. The fewer global emissions emitted from mitigative solutions, the more manageable it will become for communities to adapt. Adaptation and mitigation are both needed to accomplish climate change goals. Mitigation solutions at the personal level can be made by reducing emissions in everyday life. For example, adopting clean energy through installing solar panels, switching to a hybrid or electric vehicle, expressing support to local representatives on climate-smart policies, and choosing active transportation as much as possible are ways to reduce personal carbon footprints.

Mitigating Climate Change

Climate change mitigation includes efforts to reduce or prevent the emission of greenhouse gases. Mitigation can suggest adopting new technologies, renewable energies, and consumer and changing industry behaviours (UNEP, 2021). Mitigation efforts do not present immediate results on climate change. Instead, mitigation actions take decades to affect global temperatures making adaptation measures the immediate response to climate change. Mitigation efforts rely on the steps to transition from fossil fuel dependence to clean, renewable energy.

Actions toward reaching net zero carbon emissions are not the only solutions to mitigate the effects of climate change. Trees and forests store carbon and then release oxygen back into the air. The bigger the trees, the more carbon storage they contain, resulting in old-growth forests and jungles such as the Amazon becoming one of the world's most valuable ecosystems. Clear-cutting trees for agriculture and material purposes degrade the ecosystem's services. In addition, the stored carbon from the trees is released into the atmosphere in the form of carbon dioxide, further contributing to global warming. The results of Mitigation efforts such as reducing carbon emissions, deforestation, and restoration of natural habitats will not be apparent until the coming decades as shifts in global temperatures change over a long period. This is not to say mitigative measures are unnecessary; mitigation efforts are seen as measures to implement now or soon to create a positive impact sooner for the future of the planet and people.

Finding Mitigation Solutions

Mitigation strategies incorporate retrofitting buildings for energy efficiency, embracing renewable power sources like solar and wind, developing innovative active transportation strategies to promote walking, biking, transit and electric vehicles, and sustainable land, forest, and natural space use. For example, Annapolis Royal is home to many large, beautiful trees. Knowing the importance of trees in storing carbon, the Town of Annapolis Royal should consider adopting a policy to protect trees of considerable size from deforestation unless they pose a risk of injury. Other mitigative solutions for Annapolis Royal include increasing EV charging stations around the Town to promote the use of electric vehicles, conducting a walkability assessment for downtown, and enforcing policies such as the idling control policy and the invasive alien species policy. In addition, the Town has taken steps to mitigate climate change by reducing the speed limit from 50 km/h to 40 km/h in the downtown area. The Town will continue seeking ways to incorporate mitigative solutions into planning, policies and by-laws. Lowering emissions will not only help with temperature rise but also reduce health-related illnesses due to poor air quality and heatwaves and also deliver economic benefits by supporting jobs within the green sector. Green technology, installation and retrofitting will provide a steady employment boost to the local economy if local businesses and contractors are used for the projects. However, mitigation is no longer enough to address the climate challenge challenges in Annapolis Royal. Therefore, adaptation is also necessary to address climate change.



PV system located on the roof of the Community Hub on Ritchie Street, Annapolis Royal

Photo courtesy of CARP's website <https://www.annapolisriver.ca/home>

Adapting to Climate Change

Adaptation involves efforts to minimize the impacts of climate change. The world is already experiencing changes in temperature, weather and seasonal patterns, and slow onset events such as sea-level rise. Climate change will continue, and the more communities avoid implementing adaptive measures, the greater the cost to adapt to climate change. According to the Insurance of Bureau of Canada, the expenses of inaction on climate adaptation increase over time. For example, severe weather events across Canada in 2019 resulted in \$1.3 billion of insured damages (IBC, 2020). This statistic only accounts for insured damages from extreme weather, thus making the overall cost of climate change much higher in 2019. In addition, resources such as food, water, fuel, building materials, and other human necessities are rising in cost due to depleting resources, low crop yields, and pollution contaminating waterways. Adaptation is imperative to address climate change challenges in Annapolis Royal and to ensure that necessary measures are taken to protect the Town's economic, environmental, social, and historical integrity. Adaptation measures can come in the form of policy changes and adjusting to the expected shifts in the climate (Government of Canada, 2015). Anticipated environmental changes include sea-level rise, frequent and extreme weather events, flooding, and other changes that can have social, ecological and economic impacts on Annapolis Royal, which are discussed further in this report. Adapting to life in a changing environment can be challenging and involves adjusting to present and expected future climate changes. However, adopting innovative ways to address climate change can help reduce infrastructure damage, the loss of life and the amount of devastation for a community.

Finding Adaptive Solutions

Adaptation solutions vary from community to community based on different needs to adapt. Adaptation requires understanding local risks and developing plans to address threats such as sea-level rise. Documents such as flood risk assessments (FRA) and emergency preparedness plans help implement systems and strategies to react to the impacts Annapolis Royal is experiencing today and in the foreseeable future. Adapting to climate change can be done by diversifying crops to handle changing weather patterns and seasons, creating stronger connections within the community to address the challenges together, properly managing natural resources in the context of climate change and promoting wellness and health to ensure residents can adjust to changes in the environment. There are also nature-based solutions that aid in adapting to climate change. Nature-based solutions protect, restore, and manage ecosystems that benefit people while enhancing biodiversity and improving the function of services ecosystems provide. For example, watersheds preserve water while regulating the streamflow of rivers, lakes, and groundwater sources while supporting wildlife and plants. Solutions to restore and strengthen ecosystems should be considered when managing climate risk and growing resilience. The Municipal Climate Change Action Plan (MCCAP), created in 2014, outlines adaptation strategies that are still relevant today. Below are the suggestions provided in this MCCAP document:

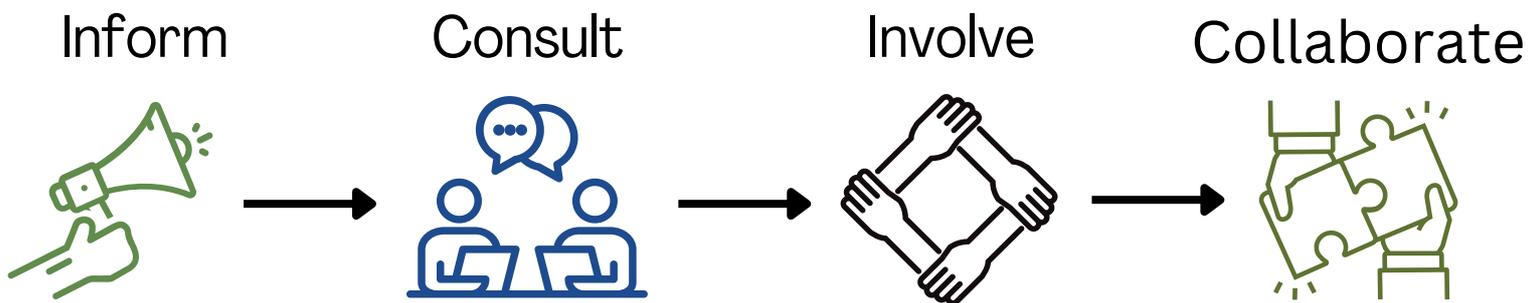
- Account for sea-level rise in shoreline infrastructure design and maintenance
- Additional emergency preparedness considerations
- Education
 - Access to information on climate change
 - Encourage discussions to talk about identified risks
- Increase the size of levies and infill at the water's edge
- Build additional protective structures (breakwaters seawalls and soft solutions such as beach nourishment)
- Provide targeted workshops for land-use planners and other decision-makers (MCCAP p. 26-27, 2014)

Community Engagement

Community engagement is a critical component in addressing climate change. With the growing concern for climate change and the challenges to follow, the importance of community engagement for equitable decisions that improve the livability of local communities has never been so crucial.

Residents of communities are the ones who are directly affected by climate change challenges. Residents share lived experiences, insights, and ideas and provide valuable information to those who can implement change within the community. In addition, community members who are informed and educated on the issues at hand may contribute meaningfully to engagement and have the capacity to help guide discussions with other residents. Overall, including the diverse voices of those affected by climate change helps drive the narrative of community empowerment and community-based solutions.

Community engagement improves efficiency, transparency, and legitimacy amongst stakeholders resulting in high approval ratings for initiatives to combat climate change. When local leaders make informed decisions by engaging with and carefully mapping out residents' needs, opinions and visions, it becomes easier to promote sustainable decisions by recognizing and communicating the needs and interests of different parties such as business and property owners. Climate change and addressing its challenges is a growing concern on local, national and international levels. Therefore, The Town of Annapolis Royal will continue to assure transparency around climate change and value residents' thoughts, ideas, and opinions.

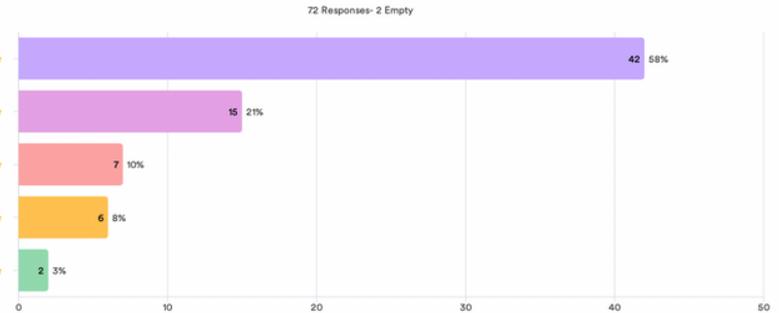


Climate Change Survey

The Town of Annapolis Royal conducted a climate change survey at the beginning of June 2022 that lasted three weeks. Residents received the survey via Mailchimp and the Town's Facebook page. Seventy-four participants took the 10-question survey and submitted results anonymously through the survey website, email, and physical copies at The Town Hall. The climate change survey's primary focus was to gain a better insight into how community members in Annapolis Royal understand climate change and the effects of climate change relating to Annapolis Royal.

The overall results showed deep concern for climate change and the impact of sea-level rise in Annapolis Royal. The response reflected a profound respect for sea-level rise, which was predictable due to Annapolis Royal being a small coastal community with most of its assets at risk from rising sea-levels. Residents displayed high interest in a community engagement event on climate change. In August, Annapolis Royal hosted its first community engagement session centred on climate change challenges. Clean energy technologies such as wind, solar, and tidal were also of high interest among participants. A previous survey by CARP outlined the need for energy efficiency and renewable energy, further amplifying the need for the transition to green energy. Annapolis Royal will use the data collected from these surveys as helpful information when planning community engagement events centred around climate change.

How concerned are you about climate change on a scale of 1-5?



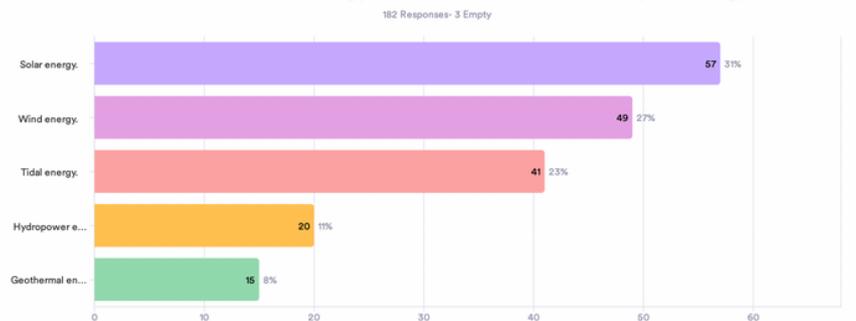
Data	Response	%
★★★★★	42	58%
★★★★☆	15	21%
★★★☆☆	7	10%
★★☆☆☆	6	8%
★☆☆☆☆	2	3%

Annapolis Royal is a coastal community under threat from sea-level rise. On a scale of 1-5, how concerned are you with this climate change challenge?



Data	Response	%
★★★★★	40	56%
★★★★☆	16	23%
★★★☆☆	9	13%
★★☆☆☆	3	4%
★☆☆☆☆	3	4%

What form(s) of renewable energy would best suit Annapolis Royal's energy needs?



Data	Response	%
Solar energy.	57	31%
Wind energy.	49	27%
Tidal energy.	41	23%
Hydropower energy.	20	11%
Geothermal energy.	15	8%

*Residents may review the full survey results through Town hall upon request.

Climate Change Community Engagement Session

On August 25th, 2022, the Town of Annapolis Royal held a community engagement session focused on four topics related to climate change. Over the course of two hours, community members in groups of four or five rotated to discuss for 30 minutes the subjects listed below. Each table included a facilitator to guide the conversation and large pieces of paper and markers to write down ideas, thoughts and highlight discussions. The main points/themes presented during the engagement session are listed below. In addition, a full report discussing the details of the engagement sessions will be completed.

Sea level Rise and Flooding

- The importance of transparency and ensuring community members are aware of risks and vulnerability.
- Risks related to wastewater treatment settlement ponds.
- Visual representations of sea-level rise risk for Annapolis Royal, such as art installations.
- The discussion of adaptation with sea walls and dykes.

Roles and Collaboration for Tackling Climate Change Issues

- Identification of which groups are part of tackling climate change issues (Individuals, groups/organizations, local, provincial, and federal government).
- The role of local government as an essential communicator to the provincial and federal government for resources and support.
- The roles of individuals in putting pressure on politicians to reinforce and establish climate change policies and initiatives.

Reducing Greenhouse Gas (GHG) Emissions in Annapolis Royal

- Revisit policies such as the anti-idling policy
- Increased EV charging stations.
- Solar gardens, wind farms, and tidal power.
- Education programs on bike safety, renewable energies, and biodiversity.

Community Resilience against Climate Change

- Discussions surrounding the development of environmental and health impact assessments.
- Bike rentals to promote active transportation
- Strengthen the Town's communication with residents during emergencies.
- Identification of challenges on personal and community levels towards resilience, such as regulatory hurdles.



Moving Forward

Sea-level Rise Project

The Town has commissioned the Atlantic Infrastructure Management Network (AIMN) to identify solutions to address sea level rise for the Downtown core. Funding for this project came from Parks Canada (\$25,000) and the Province of Nova Scotia (\$43,000). An engineering report is expected by December 2022.

Tidal Power Pilot Project

In partnership with Soluna Energy Inc. and the towns of Kentville and Middleton, the Town has submitted a proposal to receive financial support for a small-scale community tidal power project. The pilot project's objective is to utilize shallow water tidal turbines to generate renewable energy for the Town and its partners. The estimated cost for this project is \$335,000 over two fiscal years, from April 1st, 2023, to September 30th, 2025. If the Town's application is successful, FCM will cover up to 80% of the project's cost, leaving 20% (\$67,000) to be funded through the partners.

The Tidal Feed-in Tariff Program encourages the development of tidal energy projects such as Annapolis Royal's Tidal Energy Pilot Project. This program aims to support developers in testing and to deploy large-scale tidal energy projects. The Town and its partners are poised to take advantage of this program if the successful pilot tidal power project.

Towards a Net-zero community

Since the release of the CARP Mercer's Energy Planning Report by Jackemen, the Town has begun to implement the recommendations. Based on energy analysis for Town Hall, Public works, ARVFD, the Comfort station, and the Community Pool, the Town has completed building envelope upgrades in Town Hall and installed two heat pumps on both levels of the building. The Town recently submitted a grant to continue energy-efficient upgrades for Town Hall, and Public Works under the Toward Net-zero Homes and Communities Program funded through The Department of Natural Resources Canada.

Renewable Energy

Solar: The Town is investigating the potential for installing a Community Solar Garden Farm near the wastewater treatment facility.

Geothermal: The Town is revisiting the possibility of using geothermal energy as a form of power generation for The Town.

Wind: Despite being a windy area due to exposure to the ocean and the wind currents moving through the Fundy area, no windmills are currently operating in the Town. Research into small-scale and micro-generation wind energy is being conducted to open more opportunities for businesses and homeowners to choose wind as another renewable energy option.

Integrated Asset Management Planning

In 2022, the Town of A.R approved the development of an integrated asset management program for all Town infrastructure assets through the Atlantic Infrastructure Management Network (AIMN). This follows a previous study of the Town's water system that was completed under an AIMN training program undertaken by staff in 2019. The outcomes of the program are to update the Town's asset management policy, complete the condition evaluation of Town infrastructure for all service areas (from streets and sidewalks to the wastewater filtration system), determine existing and desired service levels, mainly through the lens of our changing climate, create twenty-year projections of infrastructure spending for sustainable service delivery, create a five-year list of priority capital projects and develop a five-year capital financing plan. It is expected that this work will be completed by March 31, 2023.

Support

The Town will continue to support federal, provincial, municipal, and community-level initiatives that align with The Town's sustainability and environmental vision. EAC will soon re-evaluate programs A.R has not taken advantage of in the past, such as the PACE program.

Committees & Organizations

Clean Annapolis River Project

Clean Annapolis River Project (CARP) is a charitable, non-profit organization incorporated in 1990 with a mission to enhance the ecological health of the Annapolis River watershed for current and future generations through science, leadership, and community engagement.

Over the years that CARP has operated, the organization has built strong ties with numerous partners from within the charitable sector, academic institutions, community organizations, stakeholder groups, and government partners at the Municipal, Provincial, and Federal levels. CARP has delivered a wide range of environmental enhancement, education, research, and monitoring projects and is recognized as a regional leader in environmental stewardship.



Environmental Advisory Committee

The Environment Advisory Committee (EAC) was established in March 2018. The motion establishing the Committee states: 'The mandate of the Environment Advisory Committee is to recommend proactive measures, educate, promote, and provide feedback on environmental issues related to sustainability, advocacy, and stewardship within t\he Town of Annapolis Royal.

Many issues have been discussed, including how best to address the question of one-use plastics, the efficiency of The Town's idling policy, how to deal with discarded cigarette butts, the value of Extended Producer Responsibility, the potential for sustainable energy production and the like. In addition, a critical approach has been to try and find ways to educate the public concerning an issue and suggest how behaviours can be changed to effect an improvement.

The most consistently addressed issue has been the impact of climate change on The Town and its operations. Briefing notes submitted to Council for information in early 2021 identified an increase in the frequency of extreme weather events, including hurricanes, hotter summers and warmer winters, changes in the rainfall, an increase in the number and variety of invasive species and the spread of diseases currently not found in Nova Scotia, as likely impacts. However, the biggest single issue identified was the threat of rising sea-levels. As a result, much of the work of the EAC over the past eighteen months concerns this threat. This resulted in the submission to Council in March 2022 of a Flood Risk Assessment for Annapolis Royal. This document informed an application to the National Cost-Sharing Program for Heritage Places for funds to conduct a preliminary engineering assessment of works needed to mitigate the likely impacts of sea-level rise.



Potential Partners for Climate Change Action

- Atlantic Infrastructure Management Network (AIM)
- Alternative Resource Energy Authority and Flood Control Canada
- Clean Annapolis River Project (CARP)
- Clean Foundation
- Centre of Geographic Sciences (COGS) with Nova Scotia Community College (NSCC)
- Dentiballis Marsh
- Ecology Action Centre
- Emera Energy
- Federation of Canadian Municipalities (FCM)
- FCM Green Funds: Low Carbon Communities
- Municipal, Provincial, Federal Government, Natural Resources Canada
- Nova Scotia Power
- Soluna Energy

Canada

NOVA SCOTIA



Potential Funding Opportunities for Climate Change Action

Annapolis Royal staff are working consistently to find funding to help support climate change initiatives and projects within the. However, funding opportunities can change or be discontinued, resulting in other funding programs. Staff will continue to work hard to find new programs and applications to address climate change challenges.

Atlantic Infrastructure Network

Clean Foundation Science Program

Community Sparks Program

Disaster Mitigation and Adaptation Fund

Federation of Canadian Municipalities Partners for Climate Change

Green Municipal Fund

Municipal, Provincial, and Federal

Nova Scotia Property Assessed Clean Energy Financing Program



Acronyms

AGRG	Applied Geomatics Research Group
AIM	Atlantic Infrastructure Management Network
CARP	Clean Annapolis River Project
CBCL	Engineering consultants
CCP	Climate Change Plan
CO2	Carbon Dioxide
COGS	Centre for Geomatic Sciences
FCM	Federation of Canadian Municipalities
GCoM	Global Covenant of Mayors for Climate & Energy
GHG	Green House Gas Emissions
ICLEI	International Council for Local Environmental Initiatives
LIDAR	Light Detection and Ranging
MCCAP	Municipal Climate Change Action Plan
NCSPHP	National Cost-Sharing Program for Heritage Places
NRCan	Natural Resources Canada
NSCC	Nova Scotia Community College
NSPI	Nova Scotia Power Inc.
PACE	Property Assessed Clean Energy
PCP	Partners for Climate Change
UN	United Nations

Glossary

Active Transportation: Includes all forms of travel methods that only require human energy. This includes but is not limited to walking, biking, canoeing, skiing, and skateboarding.

Adaptation: Adjust natural or human systems to a new or changing environment. Adaptation to climate change refers to natural or human systems adjusting to actual or expected climatic stimuli or their effects, which moderate harm or exploit beneficial opportunities.

Business-as-usual model: A scenario to help estimate future patterns of human activity that concentrates on what would happen if there was no significant change in people's perspectives and priorities toward lowering greenhouse gas emissions.

Carbon Footprint: Measuring the impact activities have on the amount of carbon dioxide produced through burning fossil fuels (usually expressed as CO₂ emissions produced in tonnes).

Climate Change: A change of climate that alters the composition of the global atmosphere and is in addition to natural climate variability observed over periods.

Climate-Smart: An individual, group, community, or government that prioritizes conservation and green space development and supports the transition from fossil fuels to renewable energy.

Energy Efficiency: Using less energy to provide the same service.

Exacerbate: Increasing the severity and intensity of an issue already under great strain.

Greenhouse Gas: Gases that form within the Earth's atmosphere and trap heat, causing global temperatures to rise. Carbon dioxide, methane, fluorinated gases, and nitrous oxide are leading greenhouse gases.

Green Innovation: A new process of creating technology and production methods that aim to reduce negative impacts on the environment, such as carbon offset shipping and packaging improvements.

Global Warming: A result of greenhouse gas emissions trapped within the Earth's atmosphere, causing temperatures worldwide to rise.

Hard and Soft Solutions: Refer to engineering methods to reduce coastal erosion. Soft solutions focus on more natural solutions such as beach nourishment, dune building, wetland restoration, and more. Hard solutions concentrate on the construction of seawalls, headlands, offshore breakwaters, and more.

Mitigation: Measures undertaken to limit the adverse impact of natural, environmental degradation and technological hazards. In climate change, mitigation means human intervention to reduce the sources or enhance the sinks of greenhouse gases.

Phenomena: Events that may be observed and studied that are typically unusual, difficult to understand, or explained thoroughly.

Pre-industrial Levels: A period before the beginning of the industrial revolution.

Renewable Energy Technologies: Technologies that produce sustainable clean energy from sources such as the sun, wind, plants, or water. Renewable Energy Technologies could include biomass, geothermal, hydrogen, hydropower, ocean, solar energy, and wind turbines.

Resilience: Resilience is the ability of a social or ecological system to absorb disturbances while retaining the same basic structure and ways of functioning, the same capacity for self-organization and the same power to adapt to stress and change. Increased resilience is the objective of adaptation actions. (e.g. Can we maintain a comfortable outdoor environment given changing demands, climate, and levels of development?)

Risk: Risk measures an uncertain event's expected outcome, estimated by combining an event's likelihood with the desired consequence. The concept of risk helps to grapple with uncertainties and allows for comparing potential impacts.

Surface Runoff: Water, often carrying debris and pollution, slides off the surface of the land into waterways such as streams, lakes, and oceans

Thermal Expansion: This occurs when water gets warm, which causes the volume of water to increase.

Vulnerability: The degree to which a system is susceptible to, or unable to cope with, adverse effects of climate change, including climate variability and extremes. Vulnerability is the function of the character, magnitude, and rate of climate variation to which a system is exposed, its sensitivity, and its adaptive capacity.

Weather: Weather is the short-term, day-to-day condition of the atmosphere and can be described concerning heat, moisture, air pressure, cloudiness, wind, sunshine, precipitation, etc.

Bibliography

- Bottomley, J. (2022, March). Flood Risk Assessment of Annapolis Royal. Flood Risk Assessment.
- Cohen, S., Bush, E., Zhang, X., Gillett, N., Bonsal, B., Derksen, C., Flato, G., Greenan, B., Watson, E (2019): Synthesis of Findings for Canada's Regions; Chapter 8 in Canada's Changing Climate Report, (ed.) E. Bush and D.S. Lemmen; Government of Canada, Ottawa, Ontario, p. 424–443.
- Environment and Climate Change Canada (2022) Canadian Environmental Sustainability Indicators: Temperature change in Canada. www.canada.ca/en/environment-climate-change/services/environmental-indicators/temperaturechange.html.
- Fawzy, S., Osman, A.I., Doran, J. et al. Strategies for mitigation of climate change: a review. *Environ Chem Lett* 18, 2069–2094 (2020). <https://doi.org/10.1007/s10311-020-01059-w>
- Global Covenant of Mayors for Climate & Energy. (2016, June). Global Covenant of Mayors. Retrieved June 9, 2022, from <https://www.globalcovenantofmayors.org/>
- Government of Canada. (2015). CHAPTER 1: An Introduction to Climate Change Adaptation. Retrieved May 24, 2022, from <https://www.nrcan.gc.ca/changements-climatiques/impacts-adaptation/chapter-1-introduction-climate-change-adaptation/10081>
- Government of Nova Scotia. (2021, April). Bill no.97. Nova Scotia Legislature. https://nsllegislature.ca/legc/bills/63rd_3rd/1st_read/b097.htm
- Government of Nova Scotia. (n.d). Flooding. Environment and Climate Change. <https://novascotia.ca/nse/climate-change/nsfaf-flooding.asp>
- Health Canada. (2021). Health Impacts of Air Pollution in Canada 2021 Report. Retrieved September 3, 2022, from <https://www.canada.ca/en/health-canada/services/publications/healthy-living/2021-health-effects-indoor-air-pollution.html>
- IPCC. (2018) Global warming of 1.5 °C. In: Masson-Delmotte V, Zhai P, Pörtner H-O, Roberts D, Skea J, Shukla PR, Pirani A, Moufouma-Okia W, Péan C, Pidcock R, Connors S, Matthews JBR, Chen Y, Zhou X, Gomis MI, Lonnoy E, Maycock T, Tignor M, Waterfield T (eds) An IPCC special report on the impacts of global warming of 1.5 °C above pre-industrial levels and related global greenhouse gas emission pathways, in the context of strengthening the global response to the threat of climate change, sustainable development, and efforts to eradicate poverty. https://www.ipcc.ch/site/assets/uploads/sites/2/2019/06/SR15_Full_Report_High_Res.pdf.
- Kejimikujic National Park and Historic Site, S. Parker and M. Smith, Parks Canada, (2019)
- Maxwell, J. (2012, April). Town of Annapolis Royal: Partners for climate protection milestone 5. Clean Annapolis River Project.
- Nova Scotia Museum of Natural History. (2013, November). The dynamics of nova scotia's climate T5.1 (Volume 1).
- Partners for Climate Protection (2000). Federation of Canadian Municipalities. Retrieved May 12, 2022, from <https://fcm.ca/en/programs/partners-climate-protection>
- Severe weather caused \$1.3 billion in insured damage in 2019 (2020, January). Insurance Bureau of Canada. Retrieved August 15, 2022, from <http://www.ibc.ca/ab/resources/media-centre/media-releases/severe-weather-caused-1-3-billion-in-insured-damage-in-2019>
- Town of Annapolis Royal Municipal Planning Strategy. (2020). Town of Annapolis Royal. Retrieved May 18, 2022, from <https://annapolisroyal.com/municipal-planning-strategy-2019/>
- Town of Annapolis Royal Municipal Climate Change Action Plan. CBCL Consulting Engineers, Halifax. 2014
- United Nations. (2015, December). Paris agreement (Page 3). https://unfccc.int/sites/default/files/english_paris_agreement.pdf