DISTRICT MUNICIPALITY OF MUSKOKA

REGIONAL CLIMATE CHANGE ADAPTATION PLAN

2023

Photo by: Rebecca Willison

ICLEI Local Governments for Sustainability CANADA

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Land Acknowledgement

This land acknowledgement is an expression of gratitude and appreciation to those on whose territory we gather, and as a way of honoring the Indigenous Peoples who have been living and working on this land for centuries. We honor all Indigenous Peoples – First Nations, Métis and Inuit – for their cultures, their languages, their wise teachings, and ways of being that have shaped this country since time began.

In Muskoka, we are on the traditional territory of the Anishnaabeg, which includes the Ojibwe, Odawa, and Potawatomi Nations, collectively known as the Three Fires Confederacy. The Huron-Wendat and the Haudenosaunee Nations have also walked on this territory over time. Southern portions of Muskoka were the traditional territory of the Wendat when they resided in Simcoe County between AD 1300 and 1650 and they travelled regularly through Muskoka during those centuries.

Today Muskoka is home to three sovereign nations: Wahta Mohawks First Nations, Moose Deer Point First Nation and the Moon River Métis. These lands are covered by the Williams Treaty (of 1923), the Robinson Huron Treaty of 1850 and the J. Collins land purchase (of 1785) and we must respect these treaties.

Indigenous Peoples have cared for this territory for the benefit of future generations and their stewardship throughout the ages is recognized.

G’chi miigwech.
Thank you very much.

Photo by: John McQuarrie

Regional Climate Change Adaptation Plan

1. Executive Summary

This adaptation plan outlines the actions that each Area Municipality (AM) within the District Municipality of Muskoka (the District or DMM) plans to take to address the most urgent and threatening impacts of climate change. The effects of climate change are already visible in Muskoka, and we know that these effects will continue to increase. To protect our families, our economies, and the environment in which we live from the impacts of climate change, we must adapt by altering our behaviours, our systems and – in some cases – our ways of life. We can undertake actions and activities specifically designed to reduce, minimize, or eliminate the adverse effects of a changing climate.

The District Municipality of Muskoka is an upper-tier municipality comprised of six lower-tier municipalities, five of which are participating in this Regional Climate Change Adaptation Plan ("ReCAP"). Participating Area Municipalities are the Towns of Huntsville, Bracebridge, and Gravenhurst, as well as the Townships of Muskoka Lakes and Lake of Bays. Each of the AMs are committed to advancing climate change adaptation planning across their municipal departments and throughout their communities. This report outlines the process that the AMs, in partnership with the DMM undertook with the support of ICLEI Canada to create the unique adaptation plans. Section 6 outlines the five unique chapters of the adaptation plan, one for each AM. The differences are based on the individual municipality's identification of its most prevalent climatic threats, its particular natural environment, its current infrastructure, the steps that the municipality has already taken to face climate change adaptation, as well as the capacity and resources of each municipality.

This plan was developed with support and guidance from ICLEI Canada through a collaborative process involving District Municipal staff, Area Municipality staff, and community stakeholders. Becoming a climate resilient and sustainable community is a collaborative effort, and community engagement and partnerships across the community will help implement this plan. The purpose of this Regional Climate Change Adaptation Plan is to provide each of the five Area Municipalities and their community with clear goals and actions to reduce the effects of climate change and improve resilience. 32 total priority action areas have been identified, with a varying number of the identified actions being applicable to each AM. The actions have been divided into five themes based on the area of work required of the action: Development and Infrastructure, Communication and Outreach, Adaptation Programs, Emergency Response Measures and Policy Change. The goal is for the chapters of the plan to be actionable and provide direction for each of the AMs in the path towards Muskoka's climate resiliency.

2. Acknowledgements

Project Team

The coordination of this project was done with representatives from each of the participating Area Municipalities and the Watershed & Environment team at the District Municipality of Muskoka. We would like to acknowledge the support and guidance of ICLEI Canada through the development of this plan:

- Hiba Kariem, Climate Change Project Coordinator, ICLEI Canada
- Robert Wilson, Climate Change Planner, ICLEI Canada

Committed collaboration and communication were crucial to developing and delivering this project. The participating Area Municipalities were supported by diverse staff teams led by their ReCAP representative:

- Arla Freitas Nissenthall, Planning Technician, Township of Lake of Bays
- Melissa Halford, Director of Development Services, Town of Gravenhurst
- Kirstin Maxwell, Director of Development Services, Town of Huntsville
- Corey Moore, Economic Development Officer, Township of Muskoka Lakes
- Stephen Rettie, Chief Administration Officer, Town of Bracebridge

The project was coordinated through the support of various staff from the District Municipality of Muskoka's Watershed & Environment Team, including Kevin Boyle, Christy Doyle, Cassie Emms, Jacquie Evans, and Lauren Valliere. Many District staff from other departments also contributed to advancing this project, including those from the Office of the CAO; Finance & Corporate Services; Community Services & Planning; and Engineering & Public Works.

Stakeholders involved in plan development

A community working group was established using many of the members that supported the District Municipality of Muskoka's New Leaf Climate Action Plan, plus some additional community stakeholders to ensure as many community voices as possible were heard. The following list reflects the groups and organizations that had members involved in the working group which is referred to as the New Leaf Community Working group (NLCWG).

Table 1 - Organizations in the New Leaf Community Working Group

- Muskoka Conservancy
- Lakeland Power
- Climate Action Muskoka
- Moose Deer Point First Nation
- Chamber of Commerce Representative from Gravenhurst
- Muskoka Watershed Council
- Friends of the Muskoka Watershed
- Muskoka Tourism and Marketing Association (MTMA)
- Westwind Forest Stewardship
- IDEA (Inclusion, Diversity, Equity, Anti-racism) Advisory group
- Muskoka Discovery Centre and Steamships

- Teams from the following AMs:
  - Town of Huntsville
  - Town of Bracebridge
  - Town of Gravenhurst
  - Township of Muskoka Lakes
  - Township of Lake of Bays
- Muskoka Paramedic Services and Emergency Management
- Simcoe Muskoka District Health Unit
- Gravenhurst Environmental Advisory Committee (GEAC)
- Trillium Lakelands District School Board
- Federation of Ontario Cottagers' Associations (FOCA)

Project funding statement

Advice, guidance, and support on the development of the adaptation plan was delivered by ICLEI Canada through the Vulnerability and Risk Assessment and Planning cohort of the Advancing Adaptation: Train the Trainer project, funded through the Ministry of Environment, Conservation and Parks alongside support from Environment and Climate Change Canada.

3. Introduction

Muskoka's climate is changing and as a result, the Muskoka of tomorrow will be drastically different than the Muskoka of the past. Climate change will bring significant changes to Muskoka's weather patterns, ecosystems, and infrastructure. It is necessary taking action to increase the resiliency of Muskoka against these climatic changes. In December of 2020, Muskoka District Council officially declared a Climate Emergency, a declaration that deepens the District's commitment to protecting Muskoka's economy, community, and ecosystems from the impacts of our changing climate. At that point, Muskoka District Council also approved "A New Leaf: Muskoka's Climate Strategy" to address climate change at both corporate and community levels. The New Leaf Climate Action Plan outlines actions that the District has committed to undertake to support climate action and resiliency, one of those actions is to support each of the Area Municipalities in the generation of their own regional climate adaptation plans, which is contained within this report.

The development of this plan was facilitated through the ICLEI Canada Advancing Adaptation project. Funded through a grant from the Ministry of the Environment, Conservation and Parks (MECP) under the Canada-Ontario Agreement (COA), Advancing Adaptation was a two-year initiative that engaged Ontario municipalities to build local capacity for climate change resilience and to advance efforts on adaptation. Centred around the creation and drafting of an implementation-ready local climate change adaptation plan, the train-the-trainer Adaptation Planning project, brought together a cohort of 11 local governments between June 2021 and December 2022, to participate in multiple training workshops to network, learn, and share experiences about adaptation planning. ICLEI Canada provided expert advice, one-on-one training and consultation throughout the entire planning process, planning resources, training on stakeholder engagement, and support in the drafting and review of the final adaptation plan.

This project was supported by the District Municipality of Muskoka's Watershed & Environment Team to coordinate the creation of a Regional Climate Adaptation Plan (ReCAP) for each of the five participating lower-tier Area Municipalities (AMs). Participating AMs include the Towns of Huntsville, Bracebridge, and Gravenhurst, and the Townships of Lake of Bays and Muskoka Lakes. This approach of promoted communication, collaboration, and exchange of resources among the participants.

Drawing on the contributions from internal and external stakeholders and their priority values for a Regional Climate Change Adaptation Plan, the following Vision Statement was developed to guide the overall intention and goal that is to be achieved with the plan:

"Muskoka will be a progressive and resilient leader in the increasingly urgent need to adapt to changing climate conditions, ensuring the protection of the natural environment and prosperous communities."

Intention of the Plan and Community Scope

The goal of the ReCAP is to build upon the existing actions taken by each of the AMs, which are listed in Section 6 in the individual chapters, which address climate change and allow the municipalities to identify opportunities for action that advance the community further towards the climate resilience of its social, economic, built, and natural systems. The development of the ReCAP took a broad approach and involved the community as well as municipal administration. The ReCAP intends to support organizations, institutions, businesses, vulnerable populations, and individuals of all ages in a proactive manner to prepare for current and future climate-related risks and changes. Although the AM staff may be the lead actors for many actions outlined in the plan, numerous climate-related risks extend beyond municipal jurisdiction, requiring the collaboration of important community service providers, local partnerships, and other levels of government. As such, the climate actions presented in this plan were co-developed using the knowledge and experience of many DMM and AM staff members, community groups and organizations.

This report first outlines the general actions that were taken by the AMs, DMM and the New Leaf Community Working Group with the assistance of ICLEI Canada to create the adaptation plan, and then secondly outlines the actionable portion of the plans which is divided into a chapter for each AM. Although climate change affects everyone and everywhere, the direct impacts vary significantly. Since each of the AMs are unique with varying populations, geographical size, financial capacity, staff capacity, built infrastructure, natural considerations and many more factors, it made the most sense to divide the action plan by AM. Although climate change impacts all AMs, since the path to climate resiliency is unique, each AM was able to tailor their plans and customize their intentions.

Adaptation vs. Mitigation

Climate change adaptation refers to any initiative or action that seeks to reduce the vulnerability of social, economic, built, and natural systems to a changing climate. Adaptation efforts may focus on changing individual behaviours, updating municipal by-laws and policies, enhancing the capacity of physical infrastructure, and improving ecological services. A community-based adaptation approach can further support local governments in building resilience while reducing vulnerability via meaningful engagement of communities and residents throughout the entire process of adaptation. A wide range of community stakeholders and actors should be involved allowing for a collaborative co-development of an adaptation plan that addresses climate risks across multiple sectors and systems. This process also recognizes and aims to shift the power dynamics between decision-makers and other actors within the participatory process. Traditional and local knowledge and assets of community members are incorporated and inform local adaptation planning and implementation.

Climate change mitigation refers to the implementation of policy, regulatory and project-based measures that contribute to the stabilization or reduction of greenhouse gas concentrations in the atmosphere. These include anti-idling by-laws, building retrofits to conserve energy, and transitioning to low-carbon energy sources.

The effects of climate change are wide-ranging and will require a diversity of responses. While mitigation efforts work to contain the long-term impacts of global warming, adaptation measures are needed to address the climate change impacts now and into the future. Adaptation is not meant to replace or undermine mitigation efforts, rather adaptation complements local government efforts to protect and improve their long-term sustainability. Where possible and appropriate, local governments can apply a low carbon resilience (LCR) lens which integrates mitigation and adaptation through municipal planning and decision-making approaches that reduce greenhouse gas (GHG) emissions and vulnerabilities to the impacts of climate change and realizes co-benefits of their activities[i].

Adaptation = Managing the unavoidable

Mitigation = Avoiding the unmanageable

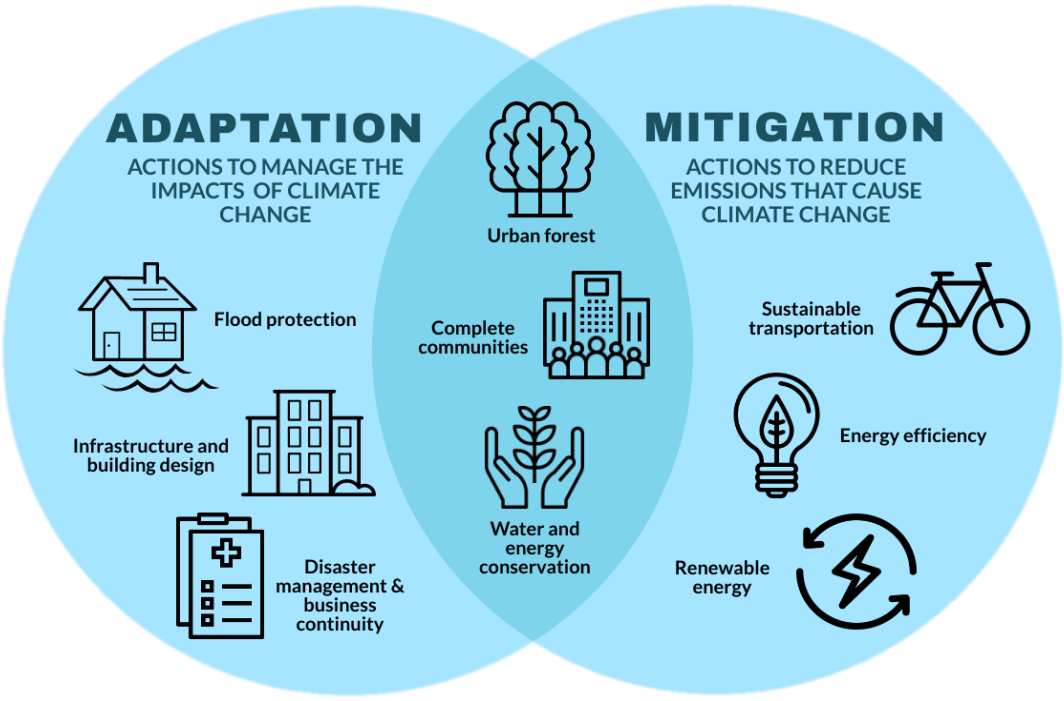


Figure 1: Overlap and Differences Between Adaptation and Mitigation (ICLEI Canada, 2019).

4. Climate Change in Muskoka

Climate Change Science:

Global and National Climate Change

Since the late 1800s, the Earth's temperature has risen by 1°C largely due to human activities[ii]. As fossil fuel extraction and consumption continue around the world, warming is accelerating at a faster rate. Earth's average surface temperature in 2020 tied 2016 for the hottest years since record-keeping began in the 1880s[iii]. The seven warmest years have taken place consecutively since 2015, and the 20 warmest years on record have occurred over the past 22 years[iv]. July 2019 was the second hottest month ever recorded, shrinking Arctic and Antarctic sea ice to historic lows 19.8% below average[v].

Similar to global trends, Canada has been warming over the last six decades, with annual average surface air temperatures over land warming by 1.7ºC since 1948, and even greater increases observed in the North, the Prairies, and northern British Columbia[vi]. This rate of warming is almost double the global average reported over the same period, meaning an increase of 2°C globally could result in a 3-4°C change in Canada. The record-setting 2021 summer heatwave in British Columbia saw temperatures reach 49.6°C and resulting in over 500 heat-related deaths.

Canada has also generally become wetter over the past several decades, with average annual precipitation across the country increasing by approximately 16% between 1950-2010. This increase is dominated by large changes in British Columbia and Atlantic Canada. Extreme precipitation events are also likely to become more intense and more frequent – recent studies show that 1-in-20-year storm events are likely to become 1-in-10-year storm events by the 2050s.

IPCC Direction

The United Nations Intergovernmental Panel on Climate Change (IPCC) is the UN institution tasked with assessing the scientific basis of climate change, its impacts and potential future risks, and potential response options. In its Sixth Assessment report (AR6), released in 2022, the IPCC declared with certainty the widespread impact of human-caused climatic changes. The report stated:

> "Human-induced climate change, including more frequent and intense extreme events, has caused widespread adverse impacts and related losses and damages to nature and people, beyond natural climate variability. The rise in weather and climate extremes has led to some irreversible impacts as natural and human systems are pushed beyond their ability to adapt"[vii].

The most urgent report to date, the AR6 report states that even with major reductions of GHG emissions in the short term (RCP2.5 scenario) there is greater than a 50% likelihood that global warming will reach or exceed 1.5°C in the near term. According to the report, "Global warming, reaching 1.5°C in the near-term, would cause unavoidable increases in multiple climate hazards and present multiple risks to ecosystems and humans. The level of risk will depend on concurrent

near-term trends in vulnerability, exposure, level of socioeconomic development, and adaptation"[viii]. Now more than ever, it is crucial that cities implement comprehensive, effective, and innovative responses between adaptation and mitigation efforts to advance sustainable development and to capitalize on the co-benefits these strategies can provide[ix].

Federal Policy Direction on Climate Adaptation

Canada was one of 195 countries to sign the Paris Agreement in December 2015. The Agreement aims to keep the global temperature to well below 2°C, and to drive efforts to limit the temperature increase even further to 1.5°C above pre-industrial levels. In terms of adaptation, the Agreement has a goal to enhance adaptive capacity, strengthen resilience and reduce vulnerability to global climate change, in line with the temperature goal.

In addition to signing onto the Paris Climate Agreement, the Government of Canada has also produced several policy documents that inform and guide decision-makers on climate change adaptation. In 2016, the Government of Canada released its Pan Canadian Framework on Clean Growth and Climate Change, which includes adaptation considerations and actions to improve climate resiliency. In November of 2022 the Government of Canada released Canada's National Adaptation Strategy with provincial, territorial, and municipal governments, Indigenous Peoples, and other key partners. The Strategy focuses on improving resiliency across five key systems including:

- Disaster resilience
- Health and wellbeing
- Nature and biodiversity
- Infrastructure
- Economy and workers

The framework recognizes the important role that municipalities will play in implementing climate solutions locally. While federal and provincial governments provide strategic focus, standards, and potential funding streams for adaptation, it will be up to local governments to tailor climate change adaptation strategies to their local circumstances and the unique set of climate change impacts they are already experiencing or expect to face.

Other resources developed by the Government of Canada include the National Issues Report *Health of Canadians in a Changing Climate* to provide a national perspective on how climate is impacting Canadian communities, the environment, and its economies. The *Map of Adaptation Actions* is a repository of case studies from across Canada that explores how communities and sectors are adapting to a changing climate.

Provincial Policy Direction on Climate Adaptation

The Government of Ontario's *A Made-in-Ontario Environment Plan* issued in 2018 addresses climate change through both mitigation and adaptation strategies. These strategies include emissions performance standards and regulations to reduce emissions from the transportation sector, programs to enhance and expand public transit networks, funding for extreme-weather resistant infrastructure, a province-wide multi-sector provincial climate change impact assessment,

and the *Protecting People and Property: Ontario's Flooding Strategy* to reduce flood risk. Additionally, the Provincial Policy Statement has been updated to include direction for planning authorities to prepare for the impacts of a changing climate, including climate change decision-making in land-use and development policy, and enhanced stormwater management policies to enhance climate resilience. During the 2019 flooding events, the damage was so significant across Ontario and specifically Muskoka, that the province appointed a Special Advisor on Flooding who created an independent review and consultation of the flooding events. After the DMM and three AMs declared a state of emergency, Muskoka was one of three areas provincially that was studied during the investigation for the report. The recommendations from this report are extremely relevant to Muskoka and have supported many of the projects around Integrated Watershed Management.

Climate Change Projections for Muskoka

Climate change is an increasingly critical issue at the global, national, provincial, and local level. Recent events in Canada including flooding, ice storms, wildfires, heat domes, and other occurrences of extreme weather over the past several decades have highlighted the need to be prepared for ongoing challenges. The most prevalent issues facing the Muskoka region related to climate change have historically been flooding, increased temperatures, extreme wind events and intense rainfall. The data in the table below comes from the Climate Science Report completed by ICLEI Canada and the Planning for Climate Change in Muskoka report completed by the Muskoka Watershed Council. The Climate Atlas of Canada tool was used to collect downscaled climate projections, using a baseline of 1976-2005. Within the tool, the Region of Huntsville data point was selected to collect this information, as it was the best available area with long-range observed historical data and future climate projections for the District. For the projections indicated in the table, RCP8.5, the business-as-usual scenario was used.

Photo by: Rebecca Willison

Summary of Projected Climate Change in Muskoka

Tempertature 	• Annual increase in mean temperature of approximately 2.2°C by 2050 and 4.4°C by 2080 from the baseline mean • The number of hot days (>30°C) is currently averaging 4.6 days, which is expected to increase to an average of 27.2 days by 2050 (491% increase), and to an average of 38.1 days by 2080 (728% increase) • Heatwaves are expected to increase in length, frequency, and intensity. Muskoka can expect approximately 5 heatwave events annually by 2080 • Increased surface temperature in lakes, rivers, and streams which can impact wetlands, habitats, biodiversity, bacteria, algae, and aquatic species • The mean winter temperature will increase from -9.6°C to -7.2°C by 2050 and to -4.4°C by 2080
Precipitation 	• Annual increase in precipitation of 64 mm by 2050 and 97mm by 2080 • Spring precipitation is expected to increase by nearly 10% by 2050 and by nearly 17% by 2080 which is expected to impact flooding conditions • Decrease in summer precipitation which is expected to lead to drought conditions
Extreme Weather Events 	• Heavy precipitation days are expected to increase by approximately 11% for 10 mm days and by 21% for 20 mm days by 2050 • Extreme precipitation events are expected to increase in intensity, duration, and frequency

Local Climate Change Significance in Muskoka

Fire

- In 2018, the Parry Sound "33" fire consumed over 11,362 hectares and burned from mid-July to the end of October, News article can be found here.
- Fighting forest fires in Ontario cost $212 million in 2018, significantly surpassing the base budget of $70 million.

Invasive Species

- Muskoka's lakes have seen an increase in confirmed blue-green algal blooms, as discussed in the article attached here.
- Many invasive species including Japanese knotweed, phragmites or giant hogweed are species that have migrated to Muskoka due to human movements, but the warming climate allows them to become more easily established and invade which has a significant impact on the native species and ecological movements.
- Ticks have become increasingly prevalent in Muskoka due to increased temperatures and warmer weather patterns and are a serious threat to human health. The instances of Black Legged Ticks carrying Lyme disease is also on the rise with rising temperatures which can be linked to climate change.

Photo by: Brandon Scott

Tornado

- Muskoka has been severely affected by tornados and there were three tornado storm events on June 10th, 2020.
- During this storm a Tornado touched down in Baysville and had a 5.6 km long path, up to 140 m. wide, with winds up to 145 km/hr. Bracebridge was hit by a tornado with winds reaching 150 km/hr. and the most destructive event was around Mary Lake where a tornado with winds reaching 190 km/hr. and a path of 24.6 kms destroyed trees in its path. News articles found here and here.
- Another tornado incident occurred on July 14th/15th 2021 with winds reaching 190 km/hr. in Dwight as explained here and here.
- These events have left thousands of residents without power, damaged many houses and buildings and blocked roads due to down trees. News articles found here.

Photo by: Lyndsie McGregor

Flooding

- Over the past decade, there have been three major flood events in Muskoka (2013, 2016, 2019).
- In 2019, flooding levels were the highest in Muskoka's recorded history at three of the four major water flow stations. The 2019 flood was labelled as the second '100 – year flood' in just 6 years, following the 2013 flood. News article about this flood can be found here. Road washouts left several routes and neighborhoods without access.
- The 2019 floods caused the District, the Towns of Huntsville and Bracebridge and the Township of Muskoka Lakes to declare a state of emergency. Support from the Canadian Armed Forces was required to support flood prevention efforts.
- The 2019 flood caused significant damage at the Muskoka Wharf (Gravenhurst), news articles can be found here, and here. Many properties, both private and public, across Muskoka were also impacted.
- Much of Muskoka's existing municipal infrastructure, such as roads, bridges, buildings, drinking water/wastewater systems, and stormwater management systems, were not constructed to withstand the climate that Muskoka is expected have by mid-century.

Photo by: Lyndsie McGregor

5. Plan Development

ICLEI Canada's Building Adaptive and Resilient Communities (BARC) Framework

Development of the ReCAP was guided by ICLEI Canada's Building Adaptive and Resilient Communities (BARC program). BARC is a five-milestone Planning framework for local governments aimed at preparing communities for the impacts of climate change. BARC is a comprehensive planning methodology that guides municipalities through areas of research and climate impact assessment methods, plan development, action-setting processes, implementation planning, and monitoring and review strategies (see Figure 2). As part of the Advancing Adaptation project, the Area Municipalities with the support of the District of Muskoka worked through and completed Milestone One, Two, and Three of the BARC Framework, culminating in the creation of the ReCAP.

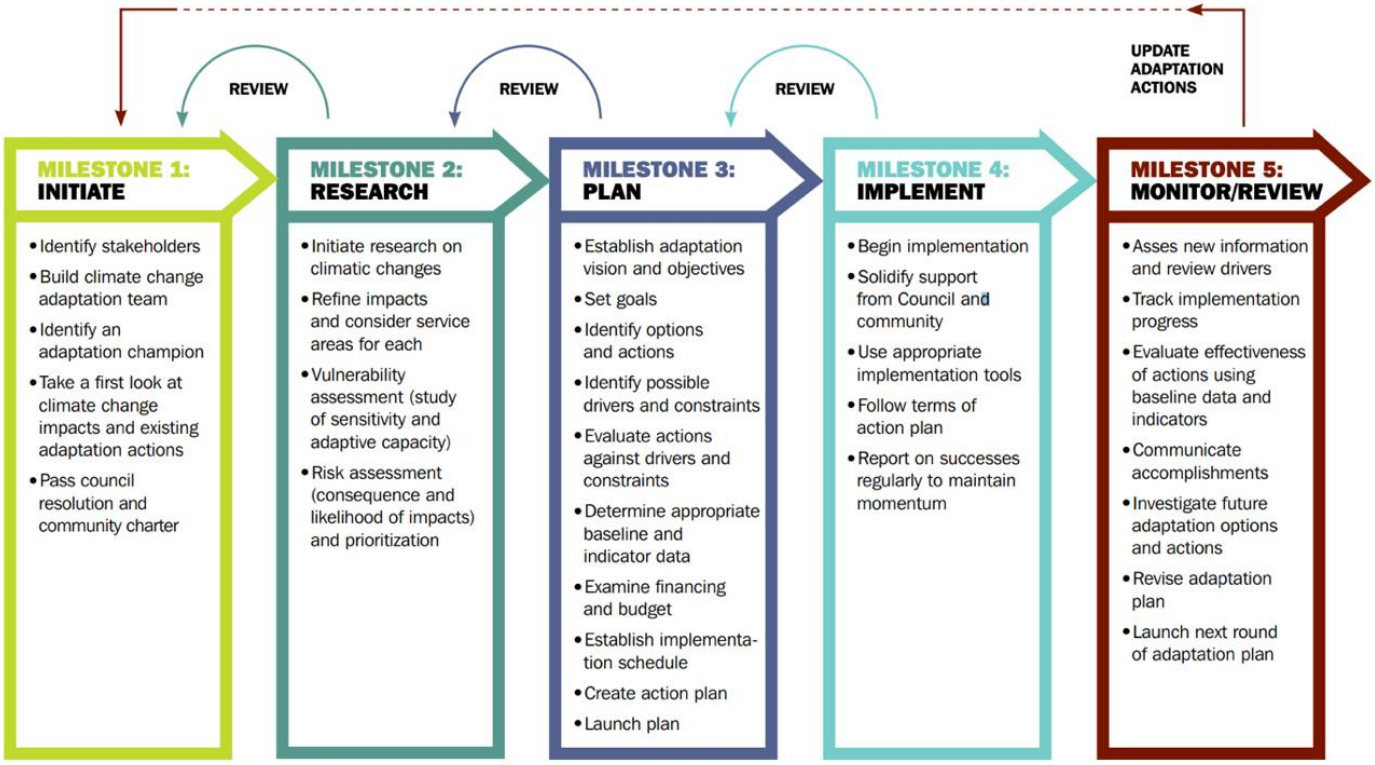


Figure 2: ICLEI Canada's Building Adaptive and Resilient Communities Framework

Milestones

Milestone One – Initiate

Within this milestone, communities identify stakeholders to review and understand existing knowledge on how the regional climate is changing, followed by a brainstorming exercise to identify potential climate change impacts.

Milestone Two – Research

The second milestone is meant to further develop a community's understanding of climate change impacts and the major service areas which are likely to feel these impacts most acutely. Within this milestone, a municipality will scope the climate change impacts for the region and conduct both a vulnerability and risk assessment.

Milestone Three – Plan

The third milestone provides guidance on how to establish a vision, set adaptation goals and objectives, identify adaptation options, and examine possible constraints and drivers to various actions. From there, a community will draft a Local Adaptation Strategy. Baseline data is collected and recorded, financing and budget issues are addressed, an implementation schedule is drafted, implementation responsibilities are determined, and progress and effectiveness indicators are identified in the ReCAP.

Milestone Four – Implement

In the fourth milestone, communities work to ensure that they have the approval and support of council, municipal staff, and the community in order to move forward on implementation. Communities will also make sure they have the appropriate implementation tools to ensure the ongoing success of the Strategy.

Milestone Five – Monitor & Review

The fifth and final milestone serves to assess whether the goals and objectives of the Strategy have been achieved, and helps communities identify any problems that have been encountered and develop solutions. Additionally, the fifth milestone helps communities communicate their progress to council and the general public.

Plan Structure

As the area municipalities worked through each milestone, the local distinctions between the AMs became increasingly obvious in the Planning Milestone (Milestone three) as the implementation actions were discussed. Since this stage involved reflecting on current practices and assigning more specific actions to their owners (lead or supporting organizations) it was important to note the full range of various input from all participating municipalities. For this reason, the chapters in the Action Plans for a Climate Resilient Muskoka section are unique to the Area Municipalities.

Milestone One: Initiate

Fulfilling the criteria of Milestone One, the District identified and invited a core group of community stakeholders to participate in the adaptation planning process as part of a climate change adaptation working group. These group members were part of the original community group who supported the generation of the District's New Leaf Climate Action plan and are referred to as the New Leaf Community Working Group (NLCWG).

Climate change is expected to impact a wide range of areas in Muskoka, from tourism, infrastructure, land use, human health, and wellbeing, and more. As such, community stakeholders were identified to participate in the adaptation planning process, representing a range of organizations that can play a key role in local resilience and service delivery (see Table 1 on Page 6/7). The project team provided subject matter knowledge and expertise, while ensuring that the ReCAP is aligned with community needs.

The NLCWG was crucial in providing specific knowledge, input, and ensuring that the plan aligned with community needs. By building upon the expertise of these individuals, the ReCAP is reflective of a wide range of perspectives and identifies needs and priorities for each of the AMs. Invitees to the working group participated in meetings and workshops to develop the ReCAP and/or were kept informed of progress and were encouraged to provide feedback throughout the development of the plan.

To commence the Advancing Adaptation program, the District held a kickoff meeting. The purpose of this workshop was to scope the Advancing Adaptation program, outline the findings of the Climate Science Report and potential climate impacts the community would face, and begin the impact identification phase of Milestone Two.

Milestone Two: Research

Milestone two focused on developing a community's understanding of climate change impacts and the major service areas which are likely to be most affected. Within this milestone, the NLCWG scoped the climate change impacts and conduct both a vulnerability and risk assessment.

Impact Identification

Climate-related impact statements are the foundation of the vulnerability and risk assessment processes and must be tailored to each municipality's context. These are concise statements that outline locally relevant projected threats and how these changes are expected to affect the built, natural, social, and economic systems across Muskoka. They bring together knowledge of climate change and projected changes into the medium and long-term as well as knowledge of the local conditions in the jurisdiction that is being studied.

Nearly 50 potential impacts were identified but through revisions and discussions this was reduced to 37. These impacts cover a range of affected areas including infrastructure, the natural environment, public health and safety, tourism, and more. Impact statements have been further organized by climate event to help the NLCWG better understand the focus and scope of each

impact. Climate event categories include changes in temperature, changes in precipitation, changes in water temperatures and levels, and extreme weather events.

Vulnerability Assessment

A vulnerability assessment was conducted for each impact statement to identify how vulnerable the community is to various impacts, and to prioritize areas of focus. Vulnerability is a function of two criteria – the sensitivity of the community to a given climate change impact, and its adaptive capacity, or ability to cope, with given climate change impacts.

Sensitivity is determined by assessing how the functionality of the community would be affected should the impact occur today is considered. This includes considering how the impact would affect the community's ability to deliver and access services, maintain regular functionality, etc. In contrast, adaptive capacity refers to the ability of systems, institutions, individuals, and other assets to adjust to potential damage, to take advantage of opportunities, or to respond to consequences. To determine adaptive capacity, participants considered the time and resources required to restore the community or assets to its previous functionality should the impact occur today, as well as consider any plans, policies, and actions already in place to address this issue.

The vulnerability assessment was carried out using an online survey and was completed by the NLCWG. The results provided a first look at prioritization of impacts before doing a more in-depth consideration of future risk. Vulnerability rankings that are "high" indicate the impacts to which the District is *sensitive* or has low *adaptive capacity*. 28 Medium and High scoring impacts were brought forward to the risk assessment process.

Risk Assessment

The risk assessment process is used to further analyze and prioritize which risks are most pertinent in a climate-adjusted future. Risk is the combination of the probability of an event occurring and its negative consequences. It can be expressed as a function of *likelihood* x *consequence*. In this case, *likelihood* refers to the probability of a projected impact occurring, and *consequence* refers to the known or estimated outcomes of a particular climate change impact.

When determining likelihood, both recurring (flooding, extreme weather) and slow-onset events (biodiversity loss, shifting eco regions) were considered and rated on a scale of 1 – 5, with 1 being 'rare', and 5 being 'almost certain'. These ratings were informed both by the localized climate change projections, as well as local knowledge and expertise of current conditions.

Consequences referred to the known or estimated consequences of a particular impact. To determine consequences, the working group assessed the 28 impacts across twelve different consequence criteria. Consequence criteria were divided into three categories – economic, social, and environmental. Each of the twelve criteria receive a score from 1 – 5, ranking from 'negligible' to 'catastrophic'. As such, each impact receives a risk score for each category, as well as one overall risk score.

Based on the results of the risk assessment, the NLCWG identified 12 impacts to move forward into planning. Impacts were prioritized if they had an overall risk score of medium or higher, or if

they had an overall risk score of medium-low but at least one category-specific risk score that was medium or higher. This was done to ensure that impacts that posed a significant risk to a specific category were not left out of the process.

Photo by: Lyndsie McGregor

Priority Climate Change Impacts

Through the vulnerability and risk assessment process and results (the full results of which are shown in Appendix B), we arrived at a list of 12 *priority climate change impact statements*, described in Table 2 below. Some impacts are inherently more or less negative or consequential than others and can vary widely for different demographic groups.

Table 2: Priority Climate Change Impact Statements

Priority Climate Change Impact Statements
Increased frequency and intensity of precipitation events resulting in more flooding, leading to increased municipal infrastructure damage (i.e., buildings, roads, bridges, trees, streetlights, signs, etc.), associated costs, and staff-impacts.
Increase in hot days over 30°C, increase in water temperatures, increase in heatwaves and the frequency of violent summer storms/precipitation events, and changes in wind patterns (longer periods of calm) leading to an increased frequency of algal blooms (and elevated lake bacteria levels) resulting to a decline in drinking water quality and loss of recreational and tourism opportunities (beach closures, outdoor events, etc.).
Increase in annual average temperatures & increased frequency and intensity of precipitation events leading to shifting eco regions for flora and fauna, resulting in an increase in human health and safety implications (i.e., change in infectious disease patterns: food-borne, water-borne, vector-borne, etc.) for the community (i.e., residents, businesses, etc.).
Increase in average winter temperatures leading to decreased ice safety on lakes and wetlands and less snow resulting in decreased winter recreation & tourism (i.e., shortened snowmobiling season, ice fishing, use of outdoor rinks, etc.).
Increase in the frequency/intensity of extreme weather events (e.g., ice storms, windstorms, tornadoes, snowstorms, etc.) / Increase in severe freezing rain events (especially in January) leading to increased likelihood for damage to electrical infrastructure resulting in more power outages (brownouts, blackouts, extreme cold) & service disruptions (business, flow of goods/services, etc.).
Increased average annual temperatures leading to less snow coverage and changes to habitat resulting in impacts to traditional land uses, and harvest practises of Indigenous communities (i.e., loss of habitat for traditional FN food sources, horseshoe hare & stouts changing colour in winter no longer match surroundings, many species shift north, plants and animals used to make medicines shift north, etc.)
Increase in hot days over 30°C, extended heatwaves leading to unsafe outdoor working conditions and loss of productivity for construction, maintenance, landscaping, etc.
Increase in hot days over 30°C leading to increased waterfront and park use and deterioration of infrastructure (i.e., roads, bridges, etc.), requiring more maintenance & repair of assets, crowding, transportation systems, AM assets (parking area, trails, public beaches), etc.
Increased average temperatures leading to shifting eco-regions for flora and fauna and longer growing seasons resulting in increased survival & spread of invasive species (e.g., gypsy moths, emerald ash borer, etc.), wetlands drying up, more tree mortality, and decreased forest health (i.e., hemlock woolly algid, sugar maple shift north, beech bark disease spread to reduce food availability for wildlife).
Increase in precipitation leading to higher water flows resulting in increased erosion which impacts both natural and built systems (road, bridges, aquatic health, riparian zones etc.).

Increase in hot days over 30°C leading to heatwaves resulting in health impacts to vulnerable populations and outdoor workers.
Increase in the frequency/intensity of extreme weather events (e.g. ice storms, wind storms, tornadoes, snowstorms, etc.) and increased frequency/intensity of precipitation events leading to unsafe/hazardous road and travel conditions and flooding of roads and bridges resulting in disruptions to all transportation (active and vehicular, school buses), emergency services, public transit systems, and other essential services (i.e. food systems, medical care/hospitals, fire, police, paramedic, airports, etc.).
Increased water temperatures leading to disrupted/damaged aquatic species habitat and ecosystems, resulting in increased fish mortality, increased algal blooms, and changing breeding patterns (i.e., subsequent food web impacts).

Milestone Three: Plan

Guided by BARC Milestone Three, the adaptation planning process was community-focused, convening a wide range of community stakeholders at multiple municipality-led workshops, allowing for a collaborative co-development of the adaptation plan. The planning process involved multiple steps, including performing a gap analysis and identifying additional follow-ups and engagement with NLCWG members, establishing a final list of prioritized risks, establishing a long-term adaptation vision, goals, and objectives, identifying and prioritizing adaptation action options with considerations for implementation (including the development of implementation schedules), and developing a monitoring and review process.

Action Identification and Prioritization

An action brainstorming workshop was held with the working group where a total of 73 potential actions and supporting actions were identified. All actions were reviewed by the Project Team to edit and refine the actions and the result was a prioritization of each action as urgent, high, medium, or low. 32 total priority action areas were identified, with a varying number of the identified actions being applicable to each AM, the process was continued with the 32 priority actions list.

Implementation

An implementation workshop was held with the NLCWG, and subsequent focus group discussions were had with the senior leadership teams within each AM to identify implementation considerations for each action. This was completed for the urgent, high, and medium-priority actions, and where applicable, some actions were combined or condensed. The implementation schedules are intended to be a living document and will be further refined as implementation progresses.

The individual Area Municipal Action Plans in Section 6 indicate the actions that will be undertaken by each AM as well as the individual supporting actions and immediate next steps they will need to complete. A more fulsome description of these items is as follows:

- **Action Name**: the name of the identified action.
- **Immediate Next Steps:** immediate next steps that need to be taken.

- **Supporting Actions**: actions to help support the implementation of the action, or steps that need to be taken before the action itself can be considered.

Further to this, there are implementation schedules for each AM in Appendixes C to G that detail other implementation considerations required to complete the priority actions. Each Implementation Schedule includes:

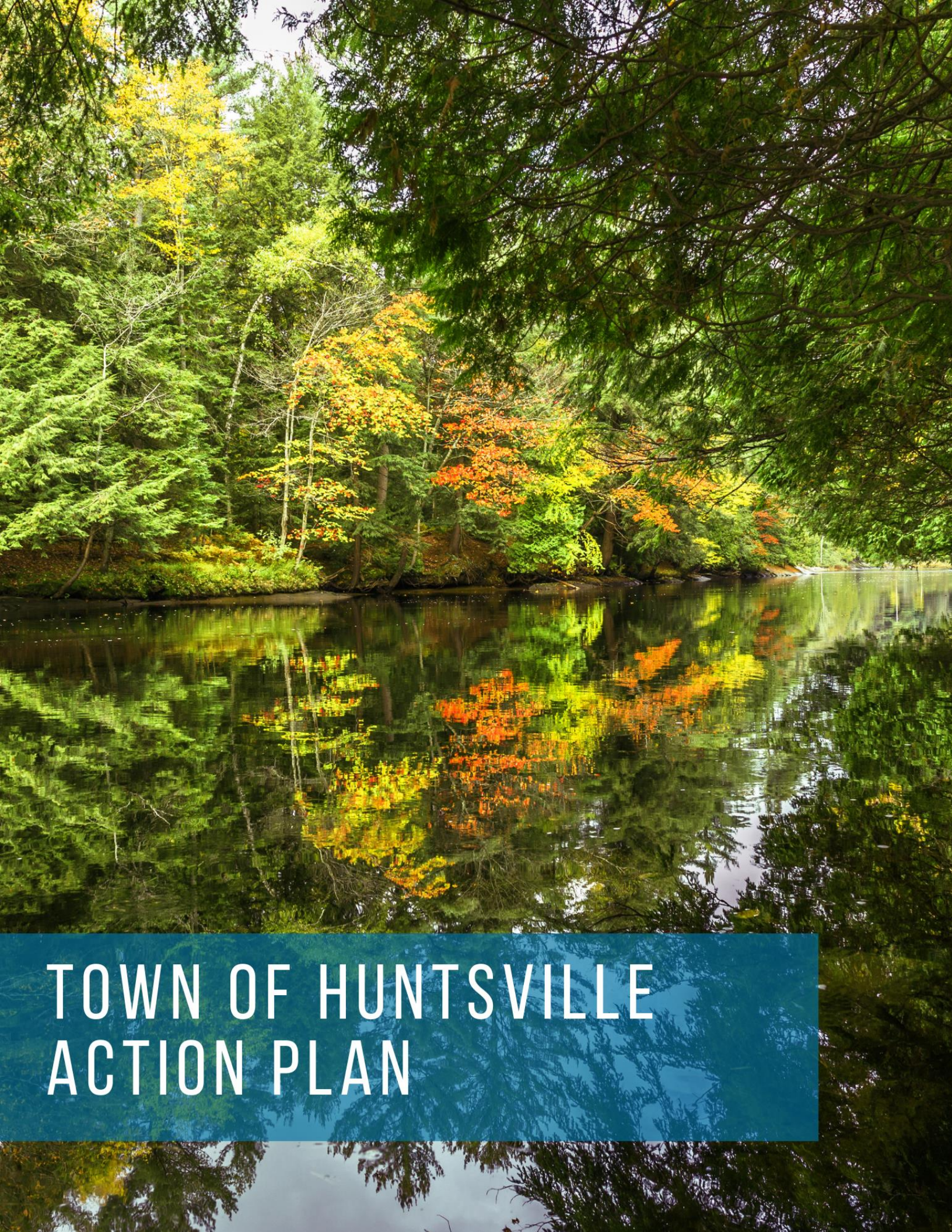
- **Action Name**: the name of the identified action.
- **Action Details**: description of the intent of the action, what it hopes to achieve, and its relative scope.
- **Lead Organization(s)**: department(s)/organization(s) that will lead implementation.
- **Potential Supporting Organization(s):** the department(s)/organization(s) that will support implementation of the action.
- **Current Practice:** related programs, initiatives, or policies that are already underway or happening that speak to or are in alignment with the action.
- **Anticipated timing:** How long implementation of action would take: short-term (<2 years), medium-term (2-5 years), long-term (5+ years).
- **Monitoring Metric:** indicator(s) to monitor the action and evaluate progress on achieving the identified objectives.

6. Action Plans for a Climate Resilient Muskoka

Each of the following five chapters outline some background information and details of each AM, as well as the specific actions that each AM will be undertaking to move towards the climate resiliency vision. There are many commonalities between the AMs since many of the actions require support from all the communities, but there are differences in the specific actions for each AM based on their unique capacity, needs and priorities. These subsections break down the action items based on the area of work required to implement.

The actions in each plan are divided based on action area and include the following areas:

- Development and Infrastructure.
- Communication and Educational Awareness.
- Adaptation Programs.
- Emergency Response Measures.
- Policy Change.



TOWN OF HUNTSVILLE ACTION PLAN

Chapter 1: Town of Huntsville Action Plan

The Town of Huntsville's Municipal vision statement is:
Huntsville is a vibrant, inclusive healthy community which inspires innovation and growth, celebrates the arts, culture, and heritage, promotes recreation while developing a resilient economy founded on social caring and environmental stewardship.

With a year-round population of more than 20,000 and a seasonal population of 28,000, the Town of Huntsville has the highest year round population of the municipalities in the District Municipality of Muskoka. In addition to Huntsville's historic downtown core, the Town is comprised of the communities of Port Sydney, Utterson, and Novar.

The Town of Huntsville is located on the southern edge of the Canadian Shield and possesses a breathtaking rugged landscape of lakes, granite hills, and forests. In addition to the countless smaller lakes within the Town's boundary, there are several large lakes such as Mary Lake, Fairy Lake, and Skeleton Lake, and other large lakes straddling neighboring municipalities, including Peninsula Lake and Lake of Bays. This natural and diverse scenery, as well as the Town's proximity to the urban population of Southern Ontario and its location as the western gateway to Algonquin Provincial Park, offers high-quality living, various recreational opportunities, and has supported the town in becoming a culturally vibrant community.

As the community faces disruption due to global economic impacts, climate change and other stressors, the need to cultivate resilience is clear. Huntsville is striving to increase its capacity to adapt, prepare and overcome internal and external pressures and stresses. Community resiliency enables people, businesses, and neighborhoods to strengthen essential functions, manage change and bounce back from unforeseen events. The following initiatives to help reduce the Town of Huntsville's environmental impact have been undertaken:

- Huntsville declared a climate emergency in 2021 which sparked conversation throughout the Town about integrating climate change mitigation and adaptation into the municipal plans.
- The Town has adopted an Official Plan which includes policies to guide growth and incorporate climate resiliency as a lens through which to review all development. Both the Official Plan and newly adopted Community Planning Permit by-law (replaces Zoning By-law) include requirements to protect vegetation and wetlands. Further, the Community Planning Permit System requires a permit in many instances for vegetation removal and site alteration, which allows the municipality to better regulate these activities.
- Incorporating climate adaptation into the 2019-2023 strategic plan in the themes of protecting the natural environment, incorporating sustainability principles into planning and development policies and processes, as well as in capital improvements by ensuring infrastructure is built with a sustainability and climate change lens.
- All capital infrastructure work that the Town approves moving forward is reviewed with the recognition of changing and increasing significant weather events, to ensure that it will function appropriately and not cause ever-increasing repair costs.

- Solar panels have been installed on several Town buildings (Canada Summit Centre (CSC) and Port Sydney Fire Hall)
- Partnered with electricity providers to incorporate vehicle charging stations at municipal facilities
- Replacement of all streetlights with LED bulbs.
- Replacement of manual light switches with motion sensors in most public spaces.

This climate adaptation plan, and specifically the actions outlined below are the next steps in Huntsville's commitment to addressing climate change moving forward.

Theme #1 – Development & Infrastructure

Action 1: Work with power providers to ensure new electrical infrastructure is resilient where possible	
Immediate Action 1.1	Establish communications steps with provider.
Immediate Action 1.2	Seek best practices and next steps from Bracebridge.
Supporting Action 1. a	Huntsville and District to advocate with Lakeland Power, Hydro One, Lexicon etc. to ensure energy infrastructure is adequately protected and resilient to extreme weather events and temperature (including underground services, etc.).
Supporting Action 1. b	Review the current communications process during power outages.
Supporting Action 1. c	Investigate acquisition of data around power outages/challenges/failures – Seek support from Bracebridge.
Supporting Action 1. d	Investigate the utilized planning process and policy around underground servicing in new developments – share this as best practice with other AMs.

Action 2: Review or develop policies that encourage the incorporation of Low Impact Development (LID) features and green infrastructure into new development and redevelopment projects.	
Immediate Action 2.1	Review legal hurdles to Green Development Standards.
Supporting Action 2. a	Investigate how this is going to impact cost and future maintenance when AM takes over infrastructure.
Supporting Action 2. b	Investigate municipal best practices from other municipalities.

Action 3: Assess the resilience of existing Municipal infrastructure (i.e., buildings, roads, water/wastewater infrastructure, etc.) to climate-related risks from extreme weather, temperatures, and flooding and plan for implementation of recommendations.	
Immediate Action 3.1	Research best practices on how to incorporate climate resilience into asset management.
Supporting Action 3. a	Add a climate lens to asset management of municipal infrastructure to include provisions to increase resilience to climatic threats.
Supporting Action 3. b	Review grants for assessing climate risk to buildings.
Supporting Action 3. c	Use climate change resources (floodplain mapping, IDF curves, culvert sizing, etc.) in Asset Management and risk assessment processes for new and existing assessments.

Action 4: Explore requiring drainage and grading plans for all new development (urban and rural), where possible	
Immediate Action 3 .1	Review internal policies and best practices. Share any best practices with other AMs.
Supporting Action 4. a	Develop formal policies related to backwater valve systems re SMP as part of Development Standards review.
Supporting Action 4. b	Review how this could be incorporated into the site plan agreements or other planning policies.

Action 5: Area Municipalities to partner with the District to explore structural mitigation options to prevent flooding.	
Immediate Action 5.1	Support District as needed in the Integrated Watershed Management (IWM) Structural Flood Mitigation Project.
Immediate Action 5.2	When the project is complete: • Review the results to determine relevance and next steps • Consider a partnership for when the project is done
Supporting Action 5. a	Assess and prioritize the project list at the high level (not Area Municipalities specific) – look at through the IWM lens.
Supporting Action 5. b	Look at localized solutions – rain gardens, reducing hard scaping, increasing permeable surfaces. • Investigate changes on a local level to help increase the lag between a precipitation event and water reaching body • Look at planning barriers • Investigate opportunity to change how public infrastructure is hard scaped, look into policy and procedure changes.

Action 6: Review results of District septic study to determine next collaborative steps	
Immediate Action 6.1	Review of septic systems 25 years old commencing in January 2023. Issue District septic study to Area Municipal staff, schedule a meeting to determine next collaborative steps.
Supporting Action 6. a	Area Municipalities to work with District to standardize/enhance septic approach and reinspection across Muskoka.
Supporting Action 6. b	Compare best practises between AMs to look for improvements in current Huntsville practices.
Supporting Action 6. c	Organize a meeting with the Chief Building Officers (CBOs) and District on the results of the study and to share best practises.

Action 7: Municipalities to review their Urban Stormwater Management Plans (SMP) where applicable	
Immediate Action 7.1	Share best practices around current SMP with other AMs.
Supporting Action 7. a	Review and assess SMP to ensure they are being completed with a climate mitigation and adaptation lens.

Action 8: Explore opportunities to make the internet more affordable and accessible for vulnerable populations.	
Immediate Action 8.1	Communicate to the public that free internet access is available at all urban facilities (CSC, Town Hall, Library and Port Sydney Hall).
Immediate Action 8.2	Assess availability of free internet access within Huntsville.
Immediate Action 8.3	Look for quick wins (library or Municipal buildings adding boosters and free internet).
Supporting Action 8. a	Look into the possibility of free public internet access in Municipal buildings for all new/planned builds moving forward.
Supporting Action 8. b	Share best practices with other AMs to support them in implementing free internet access in their buildings.
Supporting Action 8. c	Area Municipalities to continue to support the District broadband initiative.
Supporting Action 8. d	Identify local internet “hot spots” – what businesses are already offering free internet near their vicinity/in their establishments and communicate this list to vulnerable populations.
Supporting Action 8. e	Councillors to advocate for resources/funding to provide further access to the internet in upper levels of government.
Supporting Action 8. f	Municipalities to look for ways to make the internet more accessible to vulnerable populations.

Action 9: Monitor urban/rural tree removal by-law and tree-cutting by-law to ensure adequate from a climate change lens	
Immediate Action 9.1	Create a communication plan to ensure community is aware of changes to the by-law.
Immediate Action 9.2	Investigate the creation of an Urban tree inventory.
Immediate Action 9.3	Review the tree-cutting by-law for municipal lands.
Supporting Action 9. a	Review policies for canopy requirements on town/township lands (considering geography and landscape).
Supporting Action 9. b	Review greenspace/parkland requirements in the Planning Act for new development (i.e., not just accept cash-in-lieu and/or increase cash requirements).
Supporting Action 9. c	Review reporting and enforcement mechanisms to ensure trees/greenspace is protected, and Area Municipalities to share best practices and successes/lessons learned.

Theme #2 – Communication & Educational Awareness

Action 10: Create an educational program for residents to protect their assets from floods.	
Immediate action 10.1	Continue to print/distribute/promote the existing guide to flood prevention and recovery that was made by the District.
Immediate action 10.2	Investigate other ways to educate residents.
Supporting Action 10. a	Review municipal emergency communication portion of website and communication strategy and ensure it is up-to-date and includes advice for 72-hour kits, noting water requirements for that period.
Supporting Action 10. b	Expand education program to include 'Here is what you have to do before, during and after a flood' – health tips, disposal, well water, septic, preparing shoreline, removing loose equipment, planting native shoreline vegetation to reduce erosion, etc.
Supporting Action 10. c	Educate public on what services are provided by who (Province, Area Municipalities, District).
Supporting Action 10. d	Review the District's and other AM's emergency plans for alignment and sharing best practices.
Supporting Action 10. e	Enhance education material around most common emergencies encountered in Muskoka and specifically Huntsville.
Supporting Action 10. f	Improve communications around spring freshet.
Supporting Action 10. g	Expand the emergency plans to include education.

Action 11: Compare best practices with communicating watershed advisory statements and improve process where required.	
Immediate Action 11.1	Share best practices with all other AMs around pre-designed website that is ready in case flooding occurs.
Supporting Action 11. a	Encourage and promote use of Voyent Alert system through Town communications.
Supporting Action 11. b	Review current Municipal communication strategy for communicating this information and communicate current practices with all AMs. Based on review, update/improve the Huntsville communications strategy.

Action 12: Identify opportunities to increase knowledge about climate change impacts in the community.	
Immediate Action 12.1	Include climate change references in staff reports and work with DMM to do so.
Immediate Action 12.2	Incorporate climate change messaging into Huntsville's Communications Plan.
Supporting Action 12.3	Provide additional emergency management training and improve external communications to improve climate change awareness and education.
Supporting Action 12. a	Look to gather information pre- and post- communications on level of knowledge around climate change risks and preparedness to help inform future communications and resources.
Supporting Action 12. b	Partner with external organizations to understand communication best practices around climate change and the specifics of different population groups and climate events.
Supporting Action 12. c	Explore opportunities to distribute free/subsidized emergency preparedness kits.
Supporting Action 12. d	Coordinate consistent messaging across Muskoka by various actors (Area Municipalities, public health, involved organizations).

Action 13: Encourage community members to check on family, friends and neighbors during of extreme weather events (i.e., heat, cold, ice/windstorms, flooding, etc.)	
Immediate Action 13.1	Conduct desktop research on what other/neighboring communities have done and work with community partners, facilitate meetings/space to investigate solutions.
Immediate Action 13.2	Review current practice with the Emergency Management and Control Group (EMCG) and determine if it needs augmented.
Supporting Action 13. a	Pilot a neighborhood check-in program in one community and build a framework that can be discussed and implemented by other neighborhood groups.
Supporting Action 13. b	Identify existing informal/formal check-ins that might be happening to identify what works and any lessons learned.

Supporting Action 13. c	Identify methods to build social networks between communities (e.g., community events like a street BBQ, sharing questions to discuss around climate change and impacts).
Supporting Action 13. d	Explore partnerships with local service providers to roll out program.
Supporting Action 13. e	Create community champions program for checking on neighbours during extreme weather events.

Action 14: Work with Simcoe Muskoka District Health Unit to improve communication regarding beach/lake closures with respect to blue-green algae or other health related closures.	
Immediate Action 14.1	Schedule a meeting with Health Unit, Area Municipal and District staff to discuss collaboration on this subject.
Supporting Action 14. a	Review the Simcoe Muskoka District Health Unit (SMDHU) communication process and any role the Area Municipality plays in it (e.g., blue green algae – AMs post signage).
Supporting Action 14. b	Look for ways to improve communication strategy.

Action 15: Create educational material (i.e., rack card, seminar, etc.) for commercial businesses to better understand climate change risks, adaptation, mitigation	
Immediate Action 15.1	Review current strategies/plans – if it incorporates that messaging through an eco-sustainable lens.
Immediate Action 15.2	Research if a similar program already exists in another municipality, communicate best practices and share information.
Supporting Action 15. a	Partner with Business Improvement Area (BIA), RTO12, and chambers etc. to identify opportunities from extended summer season and take advantage without damage to ecosystems.
Supporting Action 15. b	Work with BIAs and Chambers on a sustainability initiative.
Supporting Action 15. c	Encourage local agritourism with the longer growing season.
Supporting Action 15. d	Look for opportunities to incentivise businesses for best in practice climate resiliency measures.
Supporting Action 15. e	Work with local business on continuity plans, including funding/insurance to ensure seamless operation during events.
Supporting Action 15. f	Review marketing and communication campaigns to ensure an even distribution for recommendations of tourist visits and if possible, identify if areas are over sold.
Supporting Action 15. g	Huntsville Municipal Accommodation Tax funding to look at sustainable tourism and help businesses consider climate as part of their operating plans.

Theme #3 – Adaptation Programs

Action 16: Explore grant opportunities for home efficiency and resiliency.	
Immediate Action 16.1	Finalize the Federation of Canadian Municipalities (FCM) grant application and engage service provider to deliver program.
Supporting Action 16. a	Encourage homeowners and landlords to improve the resilience of residential buildings to climate-related risks through upgrades and/or retrofits.
Supporting Action 16. b	Explore other grant programs that provide funding to municipalities for these programs.
Supporting Action 16. c	Share best practices with other AMs around the FCM Community Energy Financing Program once it is fully in place in Huntsville.

Action 17: Conduct a review of Municipal processes to find ways to better optimize salt use to balance ecosystem health and community safety	
Immediate Action 17.1	Investigate GPS replacement that provides capability to measure, more exactly, the volume of sand/salt we are placing on roads.
Immediate Action 17.2	Use best practices shared by Bracebridge around data collection and tracking.
Immediate Action 17.3	Share best practices around salt: sand mixing ratio with other AMs.
Immediate Action 17.4	Evaluate the effect of brine and the runoff in the face of increasing rainy weather events in the winter, i.e., we may look to avoid the application of brine to municipal roadways.
Supporting Action 17. a	Develop a minimalist application approach through the use of the GPS data, combined with a specific monitoring program designed with increased patrols at specific intervals after application (based on GPS data) and monitoring specific public complaints about ice/slip conditions of roadways.
Supporting Action 17. b	Create educational material for residents and visitors on proper road salt application and the impacts of salt on ecosystems.
Supporting Action 17. c	Investigate process for pre-treated application of salt (support from District and Gravenhurst).
Supporting Action 17. d	Partner with MWC or other organizations to map out sensitive or high chloride areas.
Supporting Action 17. e	Continue to advocate for liability changes at the provincial level.

Action 18: Continue to support and expand the Friends of the Muskoka Watershed residential wood ash recycling program to the forest to increase forest resilience to drought and insect damage	
Immediate Action 18.1	Investigate potential to implement in urban parks to increase tree strength and resiliency to invasive species, drought, blow down, etc.
Immediate Action 18.2	Continue to support the ASHMuskoka program with Friends of the Muskoka Watershed.
Supporting Action 18. a	Continue to promote communications around the ASH program.

Action 19: Explore a rain barrel program for Muskoka residents	
Immediate Action 19.1	Review lessons learned from District program.
Immediate Action 19.2	Investigate cost/budgeting requirements.
Immediate Action 19.3	Investigate a communications strategy.
Supporting Action 19. a	Implement communications / education on this type of program.
Supporting Action 19. b	Investigate subsidies or partnerships with companies that make rain barrels.
Supporting Action 19. c	Review how it can be implemented for parks or community gardens (including schools, libraries) and recreational programs.
Supporting Action 19. d	Create education program on how to make your own rain barrel at home.

Action 20: Area Municipalities to explore the addition of educational signage for reduction of spread of invasive species (including around waterways and boat transportation)	
Immediate Action 20.1	Review enforcement (by-law) tools.
Immediate Action 20.2	Communicate with the Federation of Ontario Cottagers' Associations (FOCA) to get signs about invasive species.
Immediate Action 20.3	Communicate with Public Works staff to locate areas of invasive species – locations of signage (enhance signage in these areas).
Immediate Action 20.4	Seek ways to support Muskoka Watershed Council efforts on hiring seasonal employee.
Supporting Action 20. a	Continue to develop and deliver educational program on reporting/identifying invasive species.
Supporting Action 20. b	Explore grant opportunities and seek funding to support education.

Action 21: Implement a "safe ice" campaign / alternative solutions for businesses	
Immediate Action 21.1	Publish data about ice thickness and provide safety suggestions that going on ice is a high-risk activity.
Immediate Action 21.3	Research other municipal practices and adopt best practices.
Immediate Action 21.4	Inquire with fire department practices.
Supporting Action 21. a	Work with partner organizations to safe ice use campaign with educational material for full time and seasonal residence about safe practices and how to get out of the ice.
Supporting Action 21. b	Inquire with OPP to see if they are tracking data about ice incidents.

Action 22: Review public transit policies and ensure that people can access the service during inclement weather (i.e., shelter, online apps with up-to-date schedule, plow snowbanks).	
Immediate Action 22.1	Look into opportunities and grants for improving bus stops.
Supporting Action 22. a	Identify best practices used elsewhere for similarly sized communities.
Supporting Action 22. b	Ensure all users of transportation network are considered (i.e., users of all ages, differently abled individuals, motorists, pedestrians, cyclists, etc.).
Supporting Action 22. c	Working with DMM to investigate the following: • Access to areas that are currently not services • Integration of Huntsville / District systems for timing/locations • What a transit hub could look like • Transit master plan
Supporting Action 22. d	Consider climate lens when looking to expand services, i.e., make climate-resilient/mitigative choices – e.g., electric vehicles, where possible.

Theme #4 – Emergency Response Measures

Action 23: Develop a formal plan to stockpile/identify quick sources of sandbags and materials during emergencies	
Immediate Action 23.1	Consult with the Towns of Gravenhurst and Bracebridge to learn their current practices.
Immediate Action 23.2	Review contaminated bag disposal process.
Immediate Action 23.3	Review policy around activating volunteers to assist in filling sandbags.
Supporting Action 23. a	Increase awareness to staff and public around District stockpile of sandbags.

Action 24: Investigate ways that the District and Area Municipalities can collaborate to track weather events and associated damage.	
Immediate Action 24.1	Research best practices from other AMs.
Immediate Action 24.2	Share current practice around 511 with other AMs.
Immediate Action 24.3	Emergency Control Groups (ECG) meet to review.
Immediate Action 24.4	Review current practices and assess what is working and what is not ideal.
Supporting Action 24. a	Create system to track dollars spent on repairs, access prevented, and areas impacted to extreme weather events and flooding.
Supporting Action 24. b	Use tracked data to support communications plan (yearly flooding or extreme weather events data can support a communications plan for alerts and messaging).

Action 25: Coordinate municipal efforts to improve and expand warming and cooling interventions employed during extreme weather events.	
Immediate Action 25.1	Review which buildings have generators and explore options for additional stations, specifically options in Port Sydney, Utterson and Aspdin Hall.
Immediate Action 25.2	Review current guidelines and thresholds established for cooling/warming interventions.
Supporting Action 25. a	Assess the current communications strategy, communicate best practices with other AMs.
Supporting Action 25. b	Establish updated guidelines for when to enact these facilities.
Supporting Action 25. c	Update communications process for notifying general population and vulnerable populations when and where to access the facilities.
Supporting Action 25. d	Conduct a needs assessment for where the cooling/warming interventions are most required based on populations and geography and how to get people to these centres.
Supporting Action 25. d	Review buildings to determine which have adequate generators capacity.

Action 26: Review and improve response and support for vulnerable populations during extreme weather events/flooding.	
Immediate Action 26.1	Conduct review of current practices around communications.
Immediate Action 26.2	Share current practices with other AMs.
Immediate Action 26.3	Partner with external organizations to determine how and what additional support can be provided to vulnerable populations during /after extreme weather events.
Supporting Action 26. a	Reach out to neighboring/other communities to connect and explore on methods they utilize to address climate impacts.

Supporting Action 26. b	Increase communications to create to improve awareness of the resources that exist to support vulnerable populations using different methods.
Supporting Action 26. c	Conduct a needs assessment to identify the various vulnerable populations that exist, what the specific populations need, what they have access to and what improvements need to be made. (partner with SMDHU on this).

Action 27: Review Municipal Emergency plan to ensure it complies and incorporates District information	
Immediate Action 27.1	Ensure updated floodplain mapping is used for the next review of the emergency plan.
Supporting Action 27. a	Review existing emergency management and evacuation management plans to ensure evacuation routes are not on flood planes, and emergency response is appropriate.

Theme #5 – Policy Change

Action 28: Ensure municipal policies encourage community food, water retention (rain garden, bioswales, etc.) and pollination gardens.	
Immediate Action 28.1	Look to amend by-laws that allow pollinator gardens on boulevards/front lawns/street corners.
Supporting Action 28. a	Encourage homeowners and landlords to improve the resilience of residential buildings to climate-related risks through upgrades and/or retrofits, informing of FCM grant program opportunities.
Supporting Action 28. b	Enact small changes to landscaping, placement of downspouts, rain gardens and bioswales to reduce flooding.
Supporting Action 28. c	Shift from annual to perennial plants in all Town of Huntsville gardens.

Action 29: Implement consistent flood plain mapping policy in area municipal zoning by-law and official plans	
Immediate action 29.1	Research best practices and amend to tailor to Muskoka.
Immediate action 29.2	Hold a meeting with all AMs and District planning Directors to determine how to achieve harmonization.
Supporting Action 29. a	Review planning policy around flood mitigation for waterfront or other property owners (i.e., temporary berm).
Supporting Action 29. b	Review areas with single access points and review opportunities for redundant access to increase the resiliency of the single point.
Supporting Action 29. c	Review results of second phase of the floodplain mapping project to identify more at-risk communities.

Action 30: Review, update, and expand internal/external policies and plans to ensure appropriate notification of extreme weather events, road closures, power outages, etc.	
Immediate action 30.1	Reviewing current practices within Huntsville and share best practices with others.
Immediate action 30.2	Review HTE's robust policies and investigate if there is potential to expand to include/share other notices (i.e., Environment Canada).
Supporting Action 30. a	Consult with others (e.g., Simcoe Muskoka District Health Unit and departments across Area Municipalities, and others) who have the expertise to create new or updated policies and messages.
Supporting Action 30. b	Ensuring availability of information regarding services that are accessible (or inaccessible) during extreme weather events.
Supporting Action 30. c	Link with action 3.

Involves themes 2 and 4 also

7. Implementation, Monitoring and Governance

Adaptation Plan Implementation and Governance

Each Area Municipality will lead the charge for the actions outlined in their regional climate adaptation plan. This will require coordination, support and engagement from many key departments and leaders within each organization, as well as community stakeholders. The Area Municipalities have decided the specific next steps for their action plans based on capacity, resources, and immediate threats to their community, which are outlined above in the action plans. The implementation of this plan involves several key steps including but not limited to the following actions:

- Establish internal ownership for actions (where necessary) and prioritize the action list
- Collaboration and communication between AMs and DMM
- Increase awareness and interest around issues and projects within the community
- Establish stakeholder groups if needed (project and AM specific)
- Develop communications strategies
- Develop reporting structure

The implementation of these action plans must be considered a priority within each AM. These plans must remain flexible as they need to adapt to continually changing needs and circumstances within each community to ensure the long-term resiliency.

Monitoring and evaluation

This adaptation plan is intended to be a living document that will be reviewed and updated by each AM as needed. The status of the action plan will be monitored as progress occurs for each of the AMs. Moving forward, a formal review and update will occur if there are significant changes required to the plan, otherwise, the plans will be formally updated every five years.

Funding

The actions outlined in the plan vary in terms of cost, timeline, and level of priority. Many of the actions require little to no funding and can be completed within existing budgets. Many of the actions are also already being addressed by community groups and stakeholders. For these projects, those groups will be leveraged as a great resource to further the community's resiliency to climate changes. Developing partnerships and gaining support from community groups and stakeholders will be a key step in furthering the implementation of the outlined initiatives.

Funding sources are constantly sought after to further advance climate action throughout Muskoka. Many grants and funding programs will be investigated as outlined in the action plans and if applicable grants are available the AMs and DMM should prioritize acquiring that funding to further climate resiliency. Moving forward, the goal is to incorporate the budget for many of the climate actions into each annual municipal budget.

Communication, Education and Outreach

Each Area Municipality, along with the District Municipality will continue to initiate, support, and engage in outreach and educational programs that support climate adaptation and mitigation education and efforts. Since education and outreach are such a key part of raising awareness on the issues of climate change, these areas will be a focal point in each of the AMs moving forward. Although each AM will take a different approach to the specifics of how the community will be educated and informed, overall, this will be a priority action throughout Muskoka. Once the ReCAP has been approved by each council, the AM will be required to provide access to this plan on their municipal website.

As outlined in the action plan, one of the main takeaways from this entire project is the benefit of strong inter-district communication amongst the Area Municipalities and the District Municipality. Many of the immediate and supporting actions involve communicating current practices and best practices amongst the AMs and DMM which will require strong and open streams of communication. During the process of creating this plan, many inter-district relationships were strengthened, which will ultimately support the continuation of communication between parallel departments between AMs.

Photo by: John McQuarrie

8. Call to Action

For members of the public including individuals, families, businesses, educators, or anyone seeking to take action around climate change there are many ways to help on a local level. There are many volunteer groups, individual actions, community outreach programs and involvement opportunities to support both climate change mitigation and adaptation actions, some of which are outlined below.

- Stay informed and provide input where applicable to the Area Municipalities and District Municipality through the respective environment and engagement pages. Get involved in community outreach events about climate change. Educate yourself and be an advocate for climate change education and action within your community.
    - District Municipality of Muskoka EnviroHub and Engage Page.
    - Town of Huntsville Environment Page and My Huntsville Engagement Page.
    - Town of Bracebridge Environment Page and Engage Page.
    - Town of Gravenhurst Engage Page.
    - Township of Muskoka Lakes Environment Page and Engage Page.
    - Township of Lake of Bays Community Plan and Engage Page.
- Anyone interested in Volunteering throughout Muskoka is encouraged to checkout one of the many Muskoka-region Organizations for volunteer opportunities: Muskoka Volunteer Opportunities
- Always be prepared for emergencies with these three steps: know the risks, make a plan, and prepare an emergency kit. This will help support emergency preparedness in the case of a climate emergency or any other emergency. Learn more here.
- Plant native plants and native pollinator gardens to support biodiversity. Information from Muskoka Watershed Council about Healthy Lawns and Gardens, Naturally is available online.
- Check in on your neighbours, family and friends during extreme weather events and climate emergencies to ensure everyone is safe and has adequate supplies.
- Be flood ready, especially if your home / property is on a known flood plain. This resource from the Government of Canada details how to prepare your property for a flood, and why you shouldn't wait for the water.
- If your property is a woodlot, follow the steps outlined in this resource from Muskoka Watershed Council on how woodlot owners can take action towards climate change.
- Sign up for Voyent Alert. By downloading the Voyent Alert! app and registering, residents and visitors can select to receive notifications from a wide variety of communication channels including mobile apps, text/SMS alerting, email or voice calling.
- Create a rain garden at your home or business to help reduce the effects of increased precipitation in Muskoka. Rain gardens increase water retention which reduces local effects of flooding during extreme rain events, and they can also increase pollutant filtration so that urban stormwater systems are less effected by lawn fertilizers, pesticides,

oils, and other chemicals from man-made infrastructure. Resources about creating a rain garden can be found here.

- Keep your wood ash and donate to the Friends of the Muskoka Watershed Wood Ash program- ASHMuskoka. Wood ash recovered from residential wood stoves can be scattered in forests to replenish calcium levels in soil and water, which increases forest health and resiliency.
- Learn about and participate in Algae Monitoring Program. Muskoka Watershed Council developed the Algae Monitoring Program to collect information on the distribution, abundance, and seasonal cycles algae across Muskoka area lakes so that, over time, it may be possible to identify conditions favoring algae, detect trends in phytoplankton abundance, and provide management advice.
- Ensure your property has a natural edge. Muskoka Watershed Council offers Watersheds Canada's popular The Natural Edge program in the Muskoka area. Shorelines are one of the richest environments on earth, but they are also among the most threatened. Habitat loss and degradation, water quality impairments, and increasing pressures from shoreline development can deteriorate our lakes and rivers, making them a priority for environmental stewardship and restoration. Protecting your shoreline can help support ecosystems and lake health which has countless environment, social and financial benefits.
- Support natural stormwater management techniques such as rain barrels or porous pavement at your home or business. Resources and information can be found here.
- Clean Muskoka Together is a year-round Muskoka-wide community litter clean-up program in partnership with the DMM and Area Municipality partners. This program provides all the tools you need to help keep Muskoka beautiful, including gloves, recycling bags and specially marked garbage bags.

Photo by: John McQuarrie

9. Conclusion

As previously stated, the vision of this project is: *Muskoka will be a progressive and resilient leader in the urgent need to adapt to changing climate conditions, ensuring the protection of the natural environment and prosperous communities.* Throughout the development of the ReCAP, this vision has remained top of mind. This plan will support Muskoka's municipalities drive forward their resiliency against the significant and high-risk impacts of climate change.

Everyone has a part to play in our goal of adapting to climate change. Environmental, financial, and social responsibilities are key pillars of a resilient community. The actions outlined in this plan are not only actionable by the Area Municipalities and the District of Muskoka, but also by the individual, as each of us can make an impact in transitioning Muskoka into a more climate change-aware and resilient community.

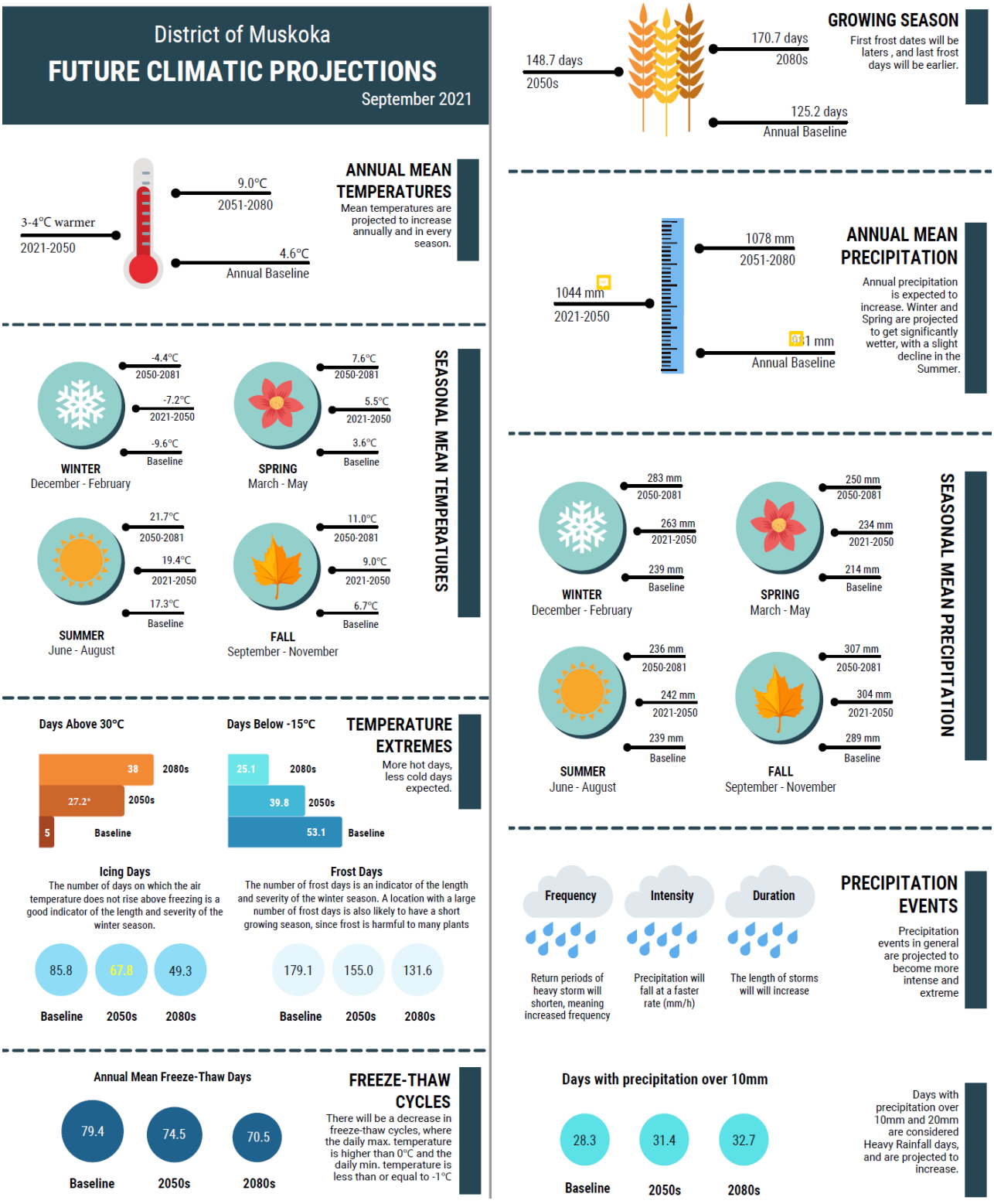
This process and report were completed with an overarching view of Muskoka as a whole, as well as with a specific lens for each Area Municipality. In doing so, communication, collaboration, and resource-sharing have happened throughout the District of Muskoka. As the action plans are specific to each Area Municipality, the next steps are tailored to their local circumstances and as such, are very actionable.

The key to success for many of these actions is communication, and in doing this adaptation planning process with a District wide lens, the lines of communication have been opened. This report will be a living document that will be utilized as an action plan and when needed it will be reviewed and modified so as to continue being a useful action plan.

Adaptation is an extremely important aspect of climate change since it can have the highest local impact on how Muskoka is affected by climate change. With many climate science projections showing a higher likelihood of more extreme weather events, heat waves, precipitation, and flooding events locally, Muskoka needs to be prepared for these events to reduce the financial, social, and environmental impacts of those events when they occur.

10. Appendices

Appendix A: Climate Science Infographic



January

December & February

November, March & April

Severe freezing rain events (>6 h per day) are projected to increase up to 30% by 2100

FREEZING RAIN EVENTS

Freezing rain events are expected to increase slightly during January, slightly change in December, and decrease in November, March, and April

Present

2041-2070

2071-2100

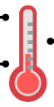
TREE COVERAGE AND DISTRIBUTION

Tree coverage for the primary forest species of Eastern White Pine, Sugar Maple, and White Spruce is expected to decrease and shift northward as seasonal and annual temperature increases

Maximum Surface Temperature of Lake Huron

28.1°C
2080s

24.5°C
2020s



26.2°C
2050s

22.5°C
Lake Basin max. surface temp* in 2014

20%
Loss of coldwater (<19°C) stream habitat

WATER TEMPERATURES

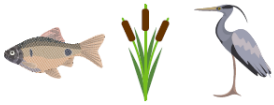
Lake basin temperatures will increase. This can negatively impact wetlands, habitats, and biodiversity.

*This includes all wetlands and tributaries

WATER LEVELS

Lake water levels are expected to be lower as water shortages and temperatures increase. Ice cover break-up dates are expected to be earlier while freeze-up dates are expected to be later. Projected warming, particularly in winter months, and less ice cover results in greater loss of water through evaporation.

In the long term, projections of warmer temperatures translate into expectations of lower water levels in the Great Lakes system.



Loss of wetland water budget and abundance of wetland vegetation, birds, and fish communities

* Baseline period: 1990s (1976-2005); Projection periods: 2030s (2021-2050), 2060s (2051-2080)

* Water Temperature section - Baseline period: 1990s (1981-2010); Projections periods: 2020s (2011-2040), 2050s (2041-2070), 2080s (2071-2100).

Sources:

Canadian Climate Data and Scenarios Network

Climate Atlas of Canada Tool.

Planning for Climate Change in Muskoka, Muskoka Watershed Council.

Appendix B: Vulnerability and Risk Assessment Outcomes

Impact ID	Impact Statement	Vulnerability Ranking	Likelihood (/5)	Social Risk Score (/100)	Economic Risk Score (/100)	Environmental Risk Score (/100)	Total Risk Score (/300)	Overall Risk Ranking
1	Increase in summer temperatures and changing summer precipitation patterns leading to the death of ground vegetation resulting in decreased wildlife food sources	Medium	2	12	12	12	36	**Very Low**
2	Increased average temperatures leading to shifting eco-regions for flora and fauna and longer growing seasons resulting in increased survival & spread of invasive species (e.g., gypsy moths, emerald ash borer, etc.), wetlands drying up, more tree mortality, and decreased forest health (i.e., hemlock woolly algid, sugar maple shift north, beech bark disease spread to reduce food availability for wildlife)	High	3	27	33	33	93	**Medium-low**
3	Increased average annual temperatures leading to less snow coverage and changes to habitat resulting in impacts to traditional land uses, and harvest practises of Indigenous communities (i.e., loss of habitat for traditional FN food sources, horseshoe hare & stouts changing colour in winter no longer match surroundings, many species shift north, plants and animals used to make medicines shift north, etc.)	Medium	3	45	36	21	102	**Medium-low**
4	Increase in hot days over 30°C, increase in water temperatures, increase in heatwaves and the frequency of violent summer storms/precipitation events, and changes in wind patterns (longer periods of calm) leading to an increased frequency of algal blooms (and elevated lake bacteria levels) resulting to a decline in drinking water quality and loss of recreational and tourism opportunities (beach closures, outdoor events, etc.)	High	4	56	40	24	120	**Medium-low**

5	Increase in annual average temperatures & increased frequency and intensity of precipitation events leading to shifting eco regions for flora and fauna, resulting in an increase in human health and safety implications (i.e., change in infectious disease patterns: food-borne, water-borne, vector-borne, etc.) for the community (i.e., residents, businesses, etc.)	Medium	3	39	30	36	105	**Medium-low**
6	Increased water temperatures leading to disrupted/damaged aquatic species habitat and ecosystems, resulting in increased fish mortality, increased algal blooms, and changing breeding patterns (i.e., subsequent food web impacts)	High	3	30	27	24	81	**Low**
7	Increase in summer temperatures resulting in increased likelihood of wildfires, leading to damaged/disrupted ecosystems and subsequent loss of ecosystem functions (i.e., loss of carbon sequestration capacity, decreased ability of forests to hold water contributing to increased risk of flooding, etc.) and damage/loss of corporate assets (e.g., infrastructure, buildings, etc.) and personal property (e.g., homes, assets, etc.)	High	2	28	26	24	78	**Low**
8	Increased rain and warmer temperatures in winter leading to reduced lake ice resulting in damaged/disrupted ecosystems (i.e., warmer water temperatures affecting habitats, low water levels, etc.)	High	2	20	14	10	44	**Very Low**
9	Decreased summer precipitation and increased summer temperatures resulting in more demand for irrigation for agriculture, potable water, and golf courses resulting in increased stress on water availability.	Medium	3	27	33	18	78	**Low**
10	Decreased summer precipitation and increased summer temperatures resulting in lower water levels in lakes, rivers, and wetlands resulting in impacts on animal migration and feeding areas	Medium	2	14	8	12	34	**Very Low**
11	Increase in precipitation leading to higher water flows resulting in increased erosion which impacts both natural and built systems (road, bridges, aquatic health, riparian zones etc.)	High	4	32	32	28	92	**Medium-low**
12	Increase in the frequency/intensity of extreme weather events and flooding leading to damage natural features resulting in tree falls, loss of ecosystem goods and services, water contamination (i.e., reduced shading from extreme heat, landscape more vulnerable to	High	2	16	20	18	54	**Low**

	flooding, depleted aquifer recharge abilities, reduced air quality from tree decline, water contamination from septic or sewer overflow, etc.)							
13	Increase in hot days over 30°C leading to heatwaves resulting in health impacts to vulnerable populations and outdoor workers	High/Medium	4	36	32	24	92	**Medium-low**
14	Increase in average annual temperatures leading to more dry days, lower water levels and increased likelihood of wildfires resulting in impacts on human health and safety (i.e., increased physical health impacts from lower air quality, mental health impacts on those that are displaced, physical safety concerns, boat safety)	Medium	2	20	20	20	60	**Low**
15	Increased average annual temperatures and increased frequency/intensity of extreme weather events in southern Ontario resulting in an influx of forced migration due to climate change into the area (e.g., from Toronto - too hot in the city)	High	1	7	8	8	23	**Very Low**
16	Increase in average winter temperatures leading to decreased ice safety on lakes and wetlands and less snow resulting in decreased winter recreation & tourism (i.e., shortened snowmobiling season, ice fishing, use of outdoor rinks, etc.)	High	4	48	32	24	104	**Medium-low**
17	Increase in average annual temperatures leading to more pressure on the power grid, resulting in increased power outages (i.e., blackouts, brownouts) and reduced power production	High	1	9	8	5	22	**Very Low**
18	Increase in hot days over 30°C, extended heatwaves leading to unsafe outdoor working conditions and loss of productivity for construction, maintenance, landscaping, etc.	High	4	24	32	40	96	**Medium-low**
19	Warmer winters resulting in icy road conditions, leading to increased salt use resulting in increased run-off into the natural environment, and declines in water quality, and increased maintenance costs	High	3	24	15	33	72	**Low**
20	Increased frequency and intensity of precipitation events leading to increased flooding resulting in damage to private assets and infrastructure (i.e., homes, businesses, property, products/inventory, etc.)	High	3	27	30	15	72	**Low**
21	Increased frequency/intensity of extreme weather and precipitation events resulting in power outages, flooding of homes, businesses, and institutions causing more displacement or evacuation of residents, and physical and mental health	Medium	3	24	24	15	63	**Low**

	implications (i.e., from hazardous conditions, mold, unsafe food handling, food insecurity)							
22	Increased frequency and intensity of precipitation events resulting in more flooding, leading to increased municipal infrastructure damage (i.e., buildings, roads, bridges, trees, streetlights, signs, etc.) & associated costs and staff-impacts	High	4	36	64	40	140	**Medium**
23	Increase in the frequency/intensity of extreme weather events (e.g. ice storms, wind storms, tornadoes, snowstorms, etc.) and increased frequency/intensity of precipitation events leading to unsafe/hazardous road and travel conditions and flooding of roads and bridges resulting in disruptions to all transportation (active and vehicular, school buses), emergency services, public transit systems, and other essential services (i.e. food systems, medical care/hospitals, fire, police, paramedic, airports, etc.).	High	3	33	39	18	90	**Medium-low**
24	Increase in the frequency/intensity of extreme weather events (e.g., ice storms, windstorms, tornadoes, snowstorms, etc.) / Increase in severe freezing rain events (especially in January) leading to increased likelihood for damage to electrical infrastructure resulting in more power outages (brownouts, blackouts, extreme cold) & service disruptions (business, flow of goods/services, etc.)	High	4	44	40	20	104	**Medium-low**
25	Increase in hot days over 30°C leading to increased demand for outdoor shaded recreation/indoor cooling facilities resulting in increased need for cooling centres to operate outside of business hours (i.e., more maintenance to operate) and increased costs to municipalities	Medium	4	24	28	20	72	**Low**
26	Increase in hot days over 30°C leading to increased waterfront and park use and deterioration of infrastructure (i.e., roads, bridges, etc.), requiring more maintenance & repair of assets, crowding, transportation systems, AM assets (parking area, trails, public beaches), etc.	High	4	24	44	28	96	**Medium-low**
27	Increase in average annual temperature resulting in an increased pressure on water and wastewater facilities	Medium	3	24	30	24	78	**Low**
28	Increase in the frequency/intensity of extreme weather events increases probability of damage to buried infrastructure (i.e., water, utilities, telecommunications, power, etc.)	Medium	3	21	36	18	75	**Low**

Appendix C: Implementation Schedule for the Town of Huntsville

Action ID	Action	Description	Anticipated Timing	Lead Organization(s)/Department(s)	Supporting Organization(s)/Department(s)	Current Practices	Monitoring Metric(s)
1	Work with power providers to ensure new electrical infrastructure is resilient where possible	Muskoka experiences frequent power outages due to the size of the area and age of infrastructure. Challenges with size of area with heavily wooded areas cause disruptions.	Medium-term (2-5 years)	• Lakeland/Hydro • Town of Huntsville Operations & Development Services Divisions	• Lakeland, Hydro one, Lexicon, All other power providers that service the area.	• Prescribe requirements/development standards for new development • Access to municipal lands provided	• New subdivisions burying power infrastructure where feasible • Data and analytics – are there less outages? • Installation and maintenance practise improvements
2	Review or develop policies that encourage the incorporation of Low Impact Development (LID) features and green infrastructure into new development and redevelopment projects.	Green development standards can be used to build resilience in future builds.	Medium-term (2-5 years)	• Town of Huntsville Development Services and Operations Divisions	• Planning departments within other Area Municipalities • Other Municipal governments including the City of Whitby	• Building codes and Official Plans (established framework) • LID is encouraged but not required	• Number of applications with LID design received and approved
3	Assess the resilience of existing Municipal infrastructure (i.e., buildings, roads, water/wastewater infrastructure, etc.) to climate-related risks from extreme weather, temperatures, and flooding and plan for implementation of recommendations.	To ensure municipal infrastructure is protected from climate related risks. Municipalities need to understand emerging threats and develop strategies to ensure important services and infrastructure operate as expected. To this end, it is important for municipalities to consider the effects of climate change at every stage of an asset's lifecycle, from planning and design to maintenance and replacement. This requires municipalities to fully integrate climate change with their asset management practices	Medium-term (2-5 years)	• Town of Huntsville Operations • District of Muskoka Engineering and Public Works Department	• DMM Engineering and Public Works Department for flooding • Power providers for service • Internet providers for service	• Buildings not currently assessed (AC units, building envelope)	• Less infrastructure damage from extreme weather events and other climate related events
4	Explore requiring drainage and grading plans for all new development (urban and rural), where possible	To prevent flooding and reduce adverse affects of flooding on property owners	Medium-term (2-5 years)	• Town of Huntsville Development Services Division	• Ministry of Municipal Affairs and Housing (MMAH) • Developers • DMM Engineering and Public Works Department • DMM Planning Department	• Not all new developments require drainage /grading plans, can be requested by the Chief Building Official as part of a Building Permit • Huntsville is part of new Community Planning Permit by-law, it will be required on most new developments where potential for impacts will occur	• Number of grading/drainage plans received

Action ID	Action	Description	Anticipated Timing	Lead Organization(s)/Department(s)	Supporting Organization(s)/Department(s)	Current Practices	Monitoring Metric(s)
5	Area Municipalities to partner with the District to explore structural mitigation options to prevent flooding.	To protect municipal and private infrastructure from flood damage and to protect human health and wellbeing.	Long-term (5+ years)	• Town of Huntsville Development Services and Operations Divisions	• District of Muskoka Environment team • Ministry of Natural Resources and Forestry (MNRF)	• District has initiated a structure flood mitigation project	• Number of roads that are passable during flood conditions that were not previously • Number of buildings not flooding due to mitigation measures • Flooding experience less frequently in flood prone areas
6	Review results of District septic study to determine next collaborative steps	To ensure private septic systems are properly functioning and to protect water quality	Medium-term (2-5 years)	• Town of Huntsville Building Department	• DMM Engineering and Public Works Department and Planning Department	• Huntsville property standards by law updated to include septic monitoring • Policies in place in Huntsville Official Plan to ensure they are located appropriately • Monitoring remains with AMs	• Number of septic systems managed appropriately • Number of septic systems upgraded/replaced as a result of by-law amendment
7	Municipalities to review their Urban Stormwater Management Plans (SMP) where applicable	Reduce Urban Flooding	Medium-term (2-5 years)	• Town of Huntsville Operations Division	• DMM Engineering and Public Works Department • DMM Planning Department	• Huntsville has Urban Stormwater Management Plan	• Comparison between annual flooding data to see if there are any improvements
8	Explore opportunities to make internet more affordable and accessible for vulnerable populations.	Access to affordable or free internet allows vulnerable populations to access services remotely, or that require the internet.	Medium-term (2-5 years)	• Town of Huntsville IT Department, Facilities Department, Community Services	• Muskoka Libraries • Area Municipal facilities • Salvation Army • Habitat for Humanity • District Homelessness staff • Investigate working with internet service providers to explore subsidy/discounted rates?	• Huntsville provides public internet at many of its public facilities including the Canada Summit Centre, Town Hall, Library, and Port Sydney Hall.	• Number of public locations with internet access available • Number of communications to share this information • Qualitative survey: what are barriers to access internet by the public?
9	Monitor urban/rural tree removal by-law and tree cutting by-law to ensure adequate from a climate change lens	Trees have many positive impacts on mitigating floods. A consistent policy approach is needed.	Medium-term (2-5 years)	• Town of Huntsville Planning Department, By-law Department	• DMM Planning Departments • Muskoka Watershed Council • Friends of the Muskoka Watershed • Garden centres / educate community on maintaining tree health	• Huntsville has adopted a by-law, anticipated to be in force at the end of January 2023, which will limit vegetation removal in urban areas	• Monitor tree canopy aerial data year by year • Percent of municipalities subject to a tree cutting by-law
10	Create an educational program for residents to protect their assets from floods.	To ensure residents in floodplains are equipped and prepared for floods	Medium-term (2-5 years)	• Town of Huntsville Fire Department, Marketing Dept. • DMM Emergency Services	• Area municipalities • DMM Climate Initiatives Coordinator • Fire Departments • Police • Paramedics	• District has published a guide to flood prevention and recovery	• Number of communications sent out • Website analytics • Social media uptake

Action ID	Action	Description	Anticipated Timing	Lead Organization(s)/Department(s)	Supporting Organization(s)/Department(s)	Current Practices	Monitoring Metric(s)
					• Ministry of Natural Resources and Forestry (MNRF)		
11	Compare best practices with communicating watershed advisory statements and improve process where required.	To ensure the community is aware of advisories and message is distributed efficiently	Medium-term (2-5 years)	• Town of Huntsville Fire Department and Marketing Department	• Ministry of Northern Development, Mines, Natural Resource and Forestry • Local Media	• Town of Huntsville has solid procedure for this. Websites are prepared in advance and go live when needed.	• Percentage of community aware of advisory statements • Timeliness and effectiveness of watershed advisory statements
12	Identify opportunities to increase knowledge about climate change impacts in the community and improve personal preparedness of community members (including vulnerable populations, employees)	A 2019 study out of Lakehead University found that 43% of Canadians failed a general Climate Change knowledge test and 46% failed to identify CO2 as the main cause of Climate change. We need to increase climate change knowledge and awareness.	Medium-term (2-5 years)	• Town of Huntsville Fire Department	• Salvation Army • Habitat for Humanity • Libraries • Schools • Climate Action Muskoka • Simcoe Muskoka District Health Unit (SMDHU) • SM Climate Change exchange • Muskoka Watershed Council	• SMDHU – climate/health specific messaging exists, messaging around climate health risks (i.e., heat, cold, VBDs, extreme weather) around increasing adaptive capacity, and some messaging around links between climate change and health • CAPE, Ontario Clean Air Alliance (for research purposes – what is already being done, information exists)	• Number of communications around climate change risks • Different populations being targeted with messaging (who is being reached and how) • Qualitatively: acceptability and accessibility of those messages. Pre and post event surveys – is there a change in knowledge?
13	Encourage community members to check on family, friends and neighbours during of extreme weather events (i.e., heat, cold, ice/windstorms, flooding, etc.)	Lakehead University research from 2020 indicted that people trust their neighbours when talking about climate change more than either Governments or Non-Profits.	Medium-term (2-5 years)	• Town of Huntsville Marketing Department	• Salvation Army • Habitat for Humanity • Libraries • Neighborhood associations/groups • Lake associations • Churches • Service groups (lion club)	• Emergency Control Group / Plan – community looking after community – already in place as part of our Emergency management plan.	• Number of check-ins conducted during extreme weather event • Number of uptakes of framework (if created) • Qualitative – survey to assess social cohesion, can be conducted by neighborhood group/association
14	Work with Simcoe Muskoka District Health Unit to improve communication regarding beach/lake closures with respect to blue-green algae or other health related closures	Ensure that the community is aware of closures/health concerns	Medium-term (2-5 years)	• SMDHU • Town of Huntsville Marketing/Parks Departments	• Huntsville • District of Muskoka Environment team and communications department • Muskoka Watershed Council • Local Media	• Health Unit issues email to Area Municipal/District staff, and AMs communicate through press releases and on social media • AM parks staff post beaches of concern • SMDHU Safe Water team conducts water inspections and then put out warnings	• Time between confirmed bloom and issued communication is decreased • Community members are more aware of closures/health concerns • Health outcomes • Number of beach closures • Number of alerts • Surveillance data for water monitoring

Action ID	Action	Description	Anticipated Timing	Lead Organization(s)/Department(s)	Supporting Organization(s)/Department(s)	Current Practices	Monitoring Metric(s)
15	Create educational material (i.e., rack card, seminar, etc.) for commercial businesses to better understand climate change risks, adaptation, mitigation	• Encourage businesses to have a role in climate adaptation • So that businesses can continue their operation as the climate changes • So that businesses can create strategies to adapt and mitigate to climate change • Could expand to internal employees	Long-term (5+ years)	• RTO12 • Muskoka Tourism • Chambers of Commerce (CoC) to ensure key messaging incorporates ecotourism	• Town of Huntsville Economic Development	• RTO12 is looking at sustainable tourism initiatives • CoC may have attempted to initiate a program	• Survey local businesses to gauge how prepared they feel about climatic changes/how climate change would affect their business • Number of strategies that incorporate a sustainable focus
16	Explore grant opportunities for home efficiency and resiliency.	Improving home resiliency to climate change impacts through exploring available grants.	Long-term (5+ years)	• Town of Huntsville Development Services, Finance Department	• Federation of Canadian Municipalities • Province of Ontario • Power providers: HydroOne, Lakeland Power • The District of Muskoka Climate Initiatives Coordinator • Builders for Climate Action	• LEEDS certification • Builders for Climate Action – working with Feds, other communities, have a tool to measure carbon footprint for materials (for builders) • Better Homes Huntsville study (FCM / CAP) – in progress	• Uptake on potential grant applications • Uptake on programs • Number of green homes constructed • Retrofits
17	Conduct a review of Municipal processes to find ways to better optimize salt use to balance ecosystem health and community safety	Supporting salt reduction has both financial and environmental benefits.	Medium-term (2-5 years)	• Town of Huntsville Operations Division	• Muskoka Watershed Council • Friends of the Muskoka Watershed • Ministry of Transportation Ontario (MTO) • Smart about Salt • Other AMs	• Huntsville collects and recycles sand. Uses premix of 3-5% salt into sand. Use only sand in rural areas. • Minimum application standards to meet service levels	• Vehicle accidents rate • Chloride levels in lakes/soil adjacent to roads are minimized
18	Continue to support and expand Friends of Muskoka Watershed residential wood ash recycling program to the forest to increase forest resilience to drought and insect damage	• To supplement forest soil with calcium as it helps tree growth rates • Increase of carbon sequestration of 20-40% • Increase water retention • Increase evapotranspiration • Increase trees resiliency to drought, invasive species, blow down etc. • Increase community involvement/awareness with environmental stewardship programs	Medium-term (2-5 years)	• Friends of the Muskoka Watershed	• DMM Environment team • Federation of Ontario Cottagers Association (FOCA) • Muskoka Watershed Council • Westwind Forestry	• District is supporting this program by offering space at Rosewarne Landfill. Additional support could be provided through communications, project funds, etc. • FOCA current promotes communications	• More community members volunteer to participate • Community is more aware of the project
19	Explore a rain barrel program for Muskoka residents	• To decrease water quantity entering the system • To prepare for extreme drought (on-site water storage) • Save $ on water bills	Medium-term (2-5 years)	• Town of Huntsville Development Services Division • Schools • Libraries	• DMM Climate Initiatives Coordinator	• There is no rain barrel program in place for Muskoka	• A rain barrel program is in place and the community partakes • Number of barrels used in the community and where (urban vs rural)

Action ID	Action	Description	Anticipated Timing	Lead Organization(s)/Department(s)	Supporting Organization(s)/Department(s)	Current Practices	Monitoring Metric(s)
		• Save $ on water treatment • Increase community involvement/awareness with environmental stewardship programs		• Social Committees • Lions Clubs • Rotary Clubs			• Which organizations (schools/libraries/community orgs) are implementing
20	Area Municipalities to explore the addition of educational signage for reduction of spread of invasive species (including around waterways and boat transportation)	• To help decrease the spread of invasive species • Increase community involvement/awareness with environmental stewardship programs • To improve biodiversity despite of climate change	Medium-term (2-5 years)	• Town of Huntsville Operations and Development Services Divisions	• Muskoka Watershed Council • Ontario Federation of Anglers and Hunters • Ducks Unlimited • Federation of Ontario Cottagers Association (FOCA) • Invasive species centre • Lake associations	• The Muskoka Watershed Council hires a seasonal employee to attend events to raise awareness of invasive species. • FOCA has signs created already – signs available: Clean Drain Dry – it's the law now.	• Signage installed • Increase in community awareness of invasive species and their impacts • Less Invasive species reporting • EDDMapS • Containment of invasive species
21	Implement a "safe ice" campaign / alternative solutions for businesses	• To educate the public about ice conditions and ice safety • Projections indicate by ~2080, ice on an average year will not be thick enough recreational purposes on lakes • Contractors / businesses use ice to access islands • Tourism – ice hockey, snowmobiling	Medium-term (2-5 years)	• Town of Huntsville Fire Department • Emergency Services / Responders	• SMDHU • DMM Communications department • Snowmobile clubs	• OPP, Fire and Federation of Ontario Cottagers Association (FOCA) have programs in place: https://foca.on.ca/no-ice-is-100-safe/ • Social media updates during spring thaw	• Reduction in number of ice-related accidents and fatalities • Survey businesses/contractors to see if they are aware of less ice, and how they plan to address that.
22	Review public transit policies and ensure that people can access the service during inclement weather (i.e., shelter, online apps with up-to-date schedule, plow snowbanks).	Inclement weather can be a deterrent to public transit use. For many vulnerable populations it is their main source of transportation to access services.	Long-term (5+ years)	• Bracebridge, Huntsville, and the District to co-ordinate District-wide integration of Transit Hubs	• Transportation providers	• Bus shelters are not always accessible, and are difficult to maintain in the winter • Huntsville bus stops on request – not just at designated stops	• Geographical area covered through public transit • Ridership • Qualitative assessment of what barriers are in increasing ridership
23	Develop formal plan to stockpile/identify quick sources of sandbags and material in emergency situations	To ensure sandbags are readily available for flooding situations when needed.	Medium-term (2-5 years)	• Town of Huntsville Operations Division	• Province to potentially supply during state of emergency • Look to suppliers for retainer or agreement for access	• Sandbags are available at operations centre	• Number of sandbags on hand at all times • Put service contract in place ahead of time to have these supplies ready for when needed
24	Investigate ways that the District and Area Municipalities can collaborate to track weather events and associated damage.	In order to qualify for emergency response funds, better tracking needs to occur.	Long-term (5+ years)	• Town of Huntsville Operations and Development Services Divisions	• Ministry of Natural Resources and Forestry (MNRF) • DMM • Emergency Services (MERC) • Fire Departments	• Areas and DMM collaborate/share information through ECG	• Number of municipalities using 511 • Number of proactive communications for extreme weather events per year – need to record benchmark for year one • A tracking system in place to track damage and costs associated with extreme weather.

Action ID	Action	Description	Anticipated Timing	Lead Organization(s)/Department(s)	Supporting Organization(s)/Department(s)	Current Practices	Monitoring Metric(s)
25	Coordinate municipal efforts to improve and expand warming and cooling interventions employed during extreme weather events.	Extreme heat is impacting Canadian Communities more and more, and particularly vulnerable and senior populations. Muskoka and this area of Ontario is warming at twice the global average. Extreme cold days also pose a threat. Common in rural areas.	Short-term (< 2 years)	• Town of Huntsville Community Services	• Salvation Army • Habitat for Humanity • District Homelessness staff • Simcoe Muskoka District Health Unit (SMDHU) • Community Emergency Management Coordinators • The legal clinic (those in touch with vulnerable populations) • Mental health organizations (e.g., Alcoholics Anonymous, other orgs that work with those who experience schizophrenia, Alzheimer's group, seniors' groups, other support groups, etc.) • Schools/daycares	• Canada Summit Centre is designated building for Huntsville • Town provides communications via media alerts and social media • District of Muskoka Voyent Alert System • Existing Communications plans • Access to bus pickup can be done with simple phone call to our provider	• Number of hospital visits, heat/cold related hospitalizations • Number of visits to heating/cooling facilities • Number of days interventions are available • Surveys on reception of cooling/warming interventions post-event (i.e., who came? Who didn't? did they have the resources they needed at these centres, like food, charging stations, magazines, seating, activities for kids, etc.)
26	Review and improve response and support for vulnerable populations during extreme weather events/flooding.	Climate change disproportionately impacts vulnerable populations. Extreme events are likely to cause more impact on vulnerable populations.	Medium-term (2-5 years)	• District Municipality of Muskoka	• Salvation Army • Habitat for Humanity • District Homelessness staff • Local Non-profits (GAP) • local fire departments • First Nation and Metis organizations • Lions' clubs • Women's institute	• Vulnerability assessment by SMDHU exists – who are the vulnerable populations.	• Number of injuries/hospital visits by climatic event • Number of emergency calls to paramedics
27	Review Municipal Emergency plan to ensure it complies and incorporates District information and addresses disasters caused by climate change.	Over the past several years the District has acquired a significant area of up-to-date flood plain mapping (FPM). These results will be expanded in early 2023 with the completion of the ongoing second phase of FPM. Some areas have not updated emergency plans with new information or evacuation plans where required.	Medium-term (2-5 years)	• Emergency Control Group for Town of Huntsville	• Muskoka Emergency Response Committee (MERC) • Fire Departments • SMDHU (Emergency response team)	• Emergency Plan is reviewed Annually	• Review and update plan as new information is available
28	Ensure municipal policies encourage community food, water retention (rain garden, bioswales, etc.) and pollination gardens	• To support biodiversity with pollinators and gardens. • Rain gardens retain more rain than a lawn or regular garden which reduces flooding impacts.	Medium-term (2-5 years)	• Town of Huntsville Development Services	• Muskoka heritage foundation (native plant sales) • Muskoka Watershed Council • Horticultural Societies	• Huntsville protects monarch habitats • Community Living Huntsville's (LH) community garden	• Number of sign ups for community gardens • Pounds (lbs) of food is grown per year • Number of pollinator habitats created/protected

Action ID	Action	Description	Anticipated Timing	Lead Organization(s)/Department(s)	Supporting Organization(s)/Department(s)	Current Practices	Monitoring Metric(s)
		To provide Muskokan's with access to fresh vegetables			• Trillium Lakelands District Schoolboard (High School) • Greenhouse/Horticulture/Garden programs	• Klahanie Community Garden in River Mill Park • Property standard bylaws prevent in some cases • CIP in Downtown HTE provides framework for grants for greening around buildings	• Number of community gardens and participation numbers
29	Implement consistent flood plain mapping policy in area municipal zoning by law and official plans	Significant flooding events have occurred in 2008, 2013, 2016, and the worst in 2019 which resulted in states of emergency at the Muskoka Lakes, Huntsville, Bracebridge, and the District. Damage was extensive and each Area Municipalities qualifies for emergency funds build back better.	Medium-term (2-5 years)	• Town of Huntsville Planning Department • District Planning department	• MNRF • Emergency services • Muskoka Emergency Response Committee (MERC)	• Huntsville takes photos during freshet to truth • Councils can still approve development in flood prone lands • Staff use updated mapping as a best practise	• Harmonized FPM policy
30	Review, update, and expand internal/external policies and plans to ensure appropriate notification of extreme weather events, road closures, power outages, etc.	This area of Canada is warming at twice the global average which means adaptation work is crucial to prepare for the changing climatic conditions. The 2019 flood resulted in Bracebridge, Huntsville and Muskoka Lakes applying and getting 'Build back better' funding from the province for over $3 million.	Medium-term (2-5 years)	• Area municipalities • Emergency Services	• Environment Canada – for support with alerts through existing program • Electrical companies – to communicate information about outages	• Environment Canada does have existing notifications system • District of Muskoka Alert System • SMDHU – policies and procedures in place for own internal staff (could look to gathering lessons learned? Look into this further)	• Social media uptake • Number of reads • Number of web page views

Appendix H: Glossary of Terms

Adaptation: Includes any initiatives or actions in response to actual or projected climate change impacts and which reduce the effects of climate change on built, natural, and social systems.

Adaptive Capacity: The ability of built, natural and social systems to adjust to climate change (including climate variability and extremes), to moderate potential damage, to take advantage of opportunities, or to cope with the consequences.

Baseline: A climatological baseline is a reference period, typically three decades (or 30 years), that is used to compare fluctuations of climate between one period and another. Baselines can also be called references or reference periods.

Climate: The weather of a place averaged over a period of time, often 30 years. Climate information includes the statistical weather information that tells us about the normal weather, as well as the range of weather extremes for a location.

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

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

Climate Change Data and Scenarios Tool: The Canadian Climate Data and Scenarios (CCDS) site was originally launched in February 2005 with support from Environment and Climate Change Canada, the Climate Change Adaptation Fund (CCAF) and the University of Regina. The CCDS supports climate change impact and adaptation research in Canada through the provision of climate model and observational data.

Climate Data Canada: Offers local climate data and advanced customization options to allow for a better understanding of changes likely to be experienced by Canadian communities. Climate Data Canada is a collaboration between Environment and Climate Change Canada, the Computer Research Institute of Montréal, Ouranos, the Pacific Climate Impacts Consortium, the Prairie Climate Centre, and HabitatSeven.

Climate Projections: Climate projections are a projection of the response of the climate system to emissions or concentration scenarios of greenhouse gases and aerosols. These projections depend upon the climate change (or emission) scenario used, which are based on assumptions concerning future socioeconomic and technological developments that may or may not be realized and are therefore subject to uncertainty.

Climate Change Scenario: A climate change scenario is the difference between a future climate scenario and the current climate. It is a simplified representation of future climate based on comprehensive scientific analyses of the potential consequences of anthropogenic climate change. It is meant to be a plausible representation of the future emission amounts based on a coherent and consistent set of assumptions about driving forces (such as demographic and socioeconomic development, technological change) and their key relationships.

Ensemble Approach: An ensemble approach uses the average of all global climate models (GCMs) for temperature and precipitation. Research has shown that running many models provides the most realistic projection of annual and seasonal temperature and precipitation than using a single model.

Extreme Weather Event: A meteorological event that is rare at a place and time of year, such as an intense storm, tornado, hailstorm, flood or heat wave, and is beyond the normal range of activity. An extreme weather event would normally occur very rarely or fall into the tenth percentile of probability.

Greenhouse Gas (GHG) Emissions: Greenhouse gases are those gaseous constituents of the atmosphere, both natural and anthropogenic, that absorb and emit radiation at specific wavelengths within the spectrum of thermal infrared radiation, emitted by the Earth's surface, the atmosphere itself, and by clouds. Water vapour (H2O), carbon dioxide (CO2), methane (CH4), nitrous oxide (N2O), ozone (O3), and chlorofluorocarbons (CFCs) are the six primary greenhouse gases in the Earth's atmosphere in order of abundance.

Climate Impact: The effects of existing or forecast changes in climate on built, natural, and human systems. One can distinguish between potential impacts (impacts that may occur given a projected change in climate, without considering adaptation) and residual impacts (impacts of climate change that would occur after adaptation).

Impact Statement: Climate-related impact statements are concise statements that outline locally relevant projected threats and how those changes are expected to affect the built, natural, social, and economic systems of the municipality.

Low Carbon Resilience (LCR): an approach to climate action that encourages coordination and co-evaluation of mitigation and adaptation measures to reduce greenhouse gas emissions while also building resilience. Applying a LCR lens bridges the gap between mitigation and adaptation silos by finding alignment in planning, policies, and programs. LCR brings with it a number of operational benefits and climate action synergies including cost savings and resource efficiencies, reduced reliance on grey infrastructure, improved flood and heat management, improved carbon sequestration, as well as a number of co-benefits for health, air quality, infrastructure, equity, preserving ecosystem health and biodiversity.

Mitigation: The promotion of policy, regulatory and project-based measures that contribute to the stabilization or reduction of greenhouse gas concentrations in the atmosphere. Renewable

energy programs, energy efficiency frameworks and substitution of fossil fuels are examples of climate change mitigation measures.

Representative Concentration Pathways: Representative Concentration Pathways (RCPs) are four greenhouse gas concentration (not emissions) trajectories adopted by the IPCC for its fifth Assessment Report (AR5) in 2014. It supersedes the Special Report on Emissions Scenarios (SRES) projections published in 2000. For information on the Shared Socio-economic Pathways (SSPs) in the 6th Assessment Report (AR6) see below.

Resilience: The capacity of a system, community or society exposed to hazards to adapt, by resisting or changing in order to reach and maintain an acceptable level of functioning and structure.

Risk: The combination of the likelihood of an event occurring and its negative consequences. Risk can be expressed as a function where Risk = *likelihood x consequence*. In this case, *likelihood* refers to the probability of a projected impact occurring, and *consequence* refers to the known or estimated outcomes of a particular climate change impact.

Shared Socio-economic Pathways (SSP): The SSPs describe five different storylines of alternate socio-economic developments, including: sustainable development, regional rivalry, inequality, fossil-fueled development, and middle-of-the-road development**.** While the Representative Concentration Pathways (RCPs) focus on mitigation targets to address the physical climate, the SSPs focus on the storylines and associated socio-economic ramifications of different scenarios including different challenges for climate adaptation and mitigation. The SSPs are featured in the IPCC's Sixth Assessment Report (AR6) that was launched in 2021.

Sensitivity: Measures the degree to which the community will be affected when exposed to a climate related impact. Sensitivity reflects the ability of the community to function (functionality) as normal when an impact occurs.

Vulnerability: Vulnerability refers to the susceptibility of the community to harm arising from climate change impacts. It is a function of a community's sensitivity to climate change and its capacity to adapt to climate change impacts.

Weather: The day-to-day state of the atmosphere, and its short-term variation in minutes to weeks.

Acronyms

BARC – Building Adaptive and Resilient Communities
ReCAP – Regional Climate Adaptation Plan
IPCC – Intergovernmental Panel on Climate Change
LCR – Low Carbon Resilience
LID – Low Impact Development
NBS – Nature-based Solutions
RCP – Representative Concentration Pathways
SSP - Shared Socio-economic Pathways
AM – Area Municipality
DMM – District Municipality of Muskoka
SMDHU - Simcoe Muskoka District Health Unit
BIA - Business Improvement Area
IWM – Integrated Watershed Management
FPM – Flood Plain Mapping
LOB – Lake of Bays
TML – Township of Muskoka Lakes
FOCA – Federation of Ontario Cottagers' Associations
CSC - Canada Summit Centre

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