

2022

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COMMUNITY CLIMATE CHANGE ADAPTATION PLAN

Collaborative and Resilient



TIMMINS

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Our goal is to increase knowledge and awareness of climate change, impacts, and adaptation strategies to improve our resilience to climate change..

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1. Executive Summary

The City of Timmins is committed to advancing climate change adaptation planning across municipal departments and throughout our community. We are focused on increasing knowledge and awareness of climate change, impacts, and adaptation strategies to improve our resilience to climate change.

The City of Timmins (City) recognizes the impacts and opportunities of climate change on our community and the Corporation. The City has taken steps to create and foster a more sustainable culture across our community and Corporation through climate change mitigation planning, climate change risk and vulnerability assessments, waste diversion programs and as a Bee City.

This Plan was developed with support and guidance from ICLEI Canada through a collaborative process involving municipal staff and community stakeholders. The purpose of this Community Climate Change Adaptation Plan (Plan) is to provide the Corporation of the City of Timmins (Corporation) and the community with clear goals and actions to reduce the effects of climate change and improve resilience. We have identified 10 goals with 26 supporting actions to proactively address climate change. Becoming a climate resilient and sustainable community is a collaborative effort. We will be engaging the community and developing partnerships across the community to help implement this Plan.



2. Acknowledgements

Project Team

The City of Timmins Community Climate Change Adaptation Plan was coordinated by the Environmental Services Department. We would like to acknowledge the support and guidance of ICLEI Canada throughout the development of the Plan.

Stakeholder Involvement and Plan Development

The City of Timmins would like to thank all those that contributed to the development of this Plan. This Plan is a significant step towards our journey to a more climate resilient community. The input and feedback provided by the stakeholders were essential to the insight and development of the goals and actions included in this Plan.

This Plan was made possible by the collective effort and contributions of a variety of municipal staff and community partners. We acknowledge that not all key stakeholders within the community had the opportunity to provide feedback. However, the City of Timmins is committed to working with community partners during the implementation of this Plan.

We acknowledge contributions from:

Community Partners	The Corporation of the City of Timmins Municipal Departments
Mattagami Region Conservation Authority	Environmental Services
Porcupine Health Unit	Golden Manor
Pan American Silver	Administration
Ministry of Northern Development, Mines, Natural Resources and Forestry	Public Works
Canadian Red Cross	Engineering
Timmins & District Hospital	Fire Department
Public members	Parks and Recreation
	Financial Services

Guidance and support on the development of the Plan was delivered by ICLEI Canada through the Planning cohort of the Advancing Adaptation Project. Supported through the Canada-Ontario Agreement (COA) Respecting the Great Lakes, with funding from the Ontario Ministry of Environment Climate and Parks and Environment and Climate Change Canada, the Advancing Adaptation project aims to build the capacity of local governments throughout the Great Lakes watershed. The City of Timmins is part of this project, and the development of this Plan is the culmination of the locally led adaptation planning process being undertaken between July 2021 and May 2022. Centered around sharing information, peer networking, and technical support, the Advancing Adaptation project worked with more than thirty municipalities within Ontario basin that were at various stages of the adaptation planning continuum.

3. Introduction

Goal, Intention and Community Scope of the Plan

The goal of this Community Climate Change Adaptation Plan is to build upon existing work to address climate change and enable the City to proactively take action to build climate resilience across the community. The development of this Plan took a broad approach that involved the community as well as municipal staff. The intent of this plan is to help organizations, institutions, businesses, vulnerable populations, and individuals of all ages adapt to current and future climate-related risks and opportunities. Although the City of Timmins is the lead actor for many actions outlined in the Plan, numerous climate-related risks extend beyond the 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 multiple City staff, community groups, and organizations.

Weather Impacts in Our Community

Communities across Canada are experiencing the impacts of climate change. Flooding, extreme rain events and extreme heat episodes are examples of events that Timmins has experienced. Regardless of the cause of the events, we are committed to reducing vulnerabilities across our community and improve our resiliency.

In June of 2020, the City received ~121mm of rain over a 3 day period, with 83mm of this coming in one day. The unconfirmed 1 in 100 year rain event caused significant damage to the MRCA trail system and caused many of the local water courses and lakes to rise significantly. A flood warning was issued for the Mattagami River and a watershed conditions statement was issued for Porcupine Lake. Typically, flood messaging has been issued in the spring to coincide with the freshet, but we are seeing more and more messaging throughout the year with evolving precipitation patterns.

Over the last 15 years, from 2006 to 2021, the Timmins Flood Advisory Committee has issued 12 flood warnings.



The Mattagami Region Conservation Authority’s Timmins Flood Advisory Committee issues flood messaging to municipal emergency management officials and the media. Messaging ranges from normal conditions to flood warnings. The flood warning message is issued when “flooding is imminent or already occurring in specific watercourses or municipalities. Municipalities and individuals should take action to deal with flood conditions. This may include road closures and evacuations.”ⁱ

Between 2018 and 2021, the Porcupine Health Unit shared 18 heat warnings.

From July 24, 2019, to July 29, 2019, our community experienced a 5-day extreme heat event. The month was marked by five days surpassing the 30°C mark and the average temperature (18.7°C) exceeded the historical average (17.5°C). This extreme heat event posed serious health risks to vulnerable populations such as children, people experiencing housing instability, older adults, and people living with chronic illnesses. [It also posed many issues for local agriculture and business operations.](#)

With dynamic adaptation and mitigation plans, the City of Timmins’ goal is to reduce the negative impacts of climate change for the whole community.

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.

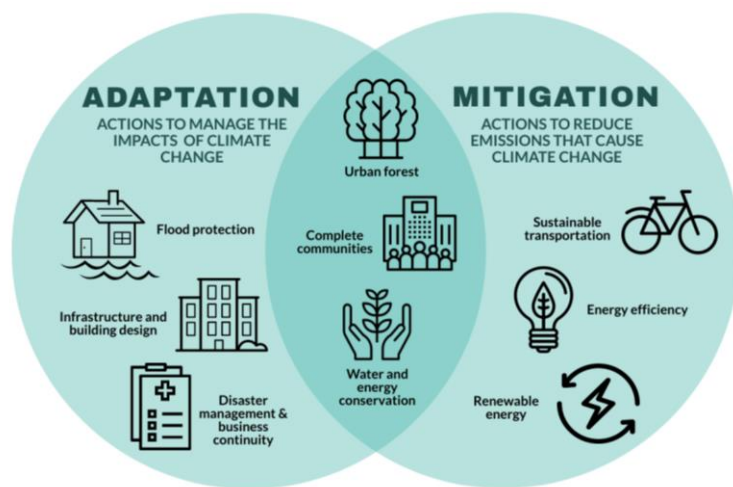


Figure 1: Adaptation, mitigation, and low-carbon resilient actions. Source: ICLEI Canada, 2019

ADAPTATION = managing the unavoidable

MITIGATION = avoiding the unmanageable

Climate change mitigation refers to the implementation of policy, regulatory and project-based measures that contribute to the stabilization or reduction of greenhouse gasses (GHG) 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 GHG emissions and vulnerabilities to the impacts of climate change and realizes co-benefits of their activities (Figure 1)ⁱⁱ.

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 increase in global temperature to well below two degrees Celsius, and to drive efforts to limit the temperature increase even further to 1.5 degrees Celsius 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. Updated in 2020, the Government of Canada committed to develop Canada's first National Adaptation Strategy with provincial, territorial, and municipal governments, Indigenous Peoples, and other key partners. A major focus has been put on the development of Expert Advisory Tables to focus on:

- Health and Wellbeing
- Resilient Natural and Built Infrastructure
- Thriving Natural Environment
- Strong and Resilient Economy
- Disaster Resilience and Security

The framework recognizes the important role that municipalities will play in implementing climate solutions locally. The strategy is set to be completed in the summer of 2022. 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 explore 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’ 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, include climate change decision making in land-use and development policy, and enhanced stormwater management policies to enhance climate resilience.

City of Timmins’ Commitment to Climate Change

The City of Timmins has established a framework of sustainability referred to as Sustainable Timmins (Figure 2). This framework includes several pillars of sustainability including climate change mitigation and adaptation planning. It is important to note that each of the pillars foster a more sustainable community and the framework identifies the interconnectedness of each of the pillars.

The City of Timmins is committed to improving the health and sustainability of our community. One community program that simultaneously supports sustainability and improves climate change resilience is ‘Bee City’ Timmins (Figure 3). As a Bee City, we support and strengthen our commitment to educate, celebrate and improve pollinator habitats across our community; this community program provides numerous co-benefits including climate change adaptation and resiliency. Co-benefits include enhanced greenspaces, physical and mental health improvements and promotion of local food systems.

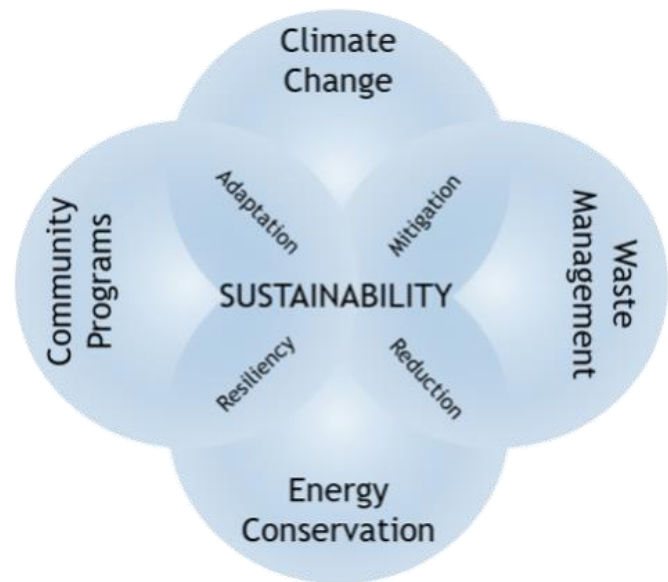


Figure 2: Sustainable Timmins – Community and Corporate Sustainability Framework

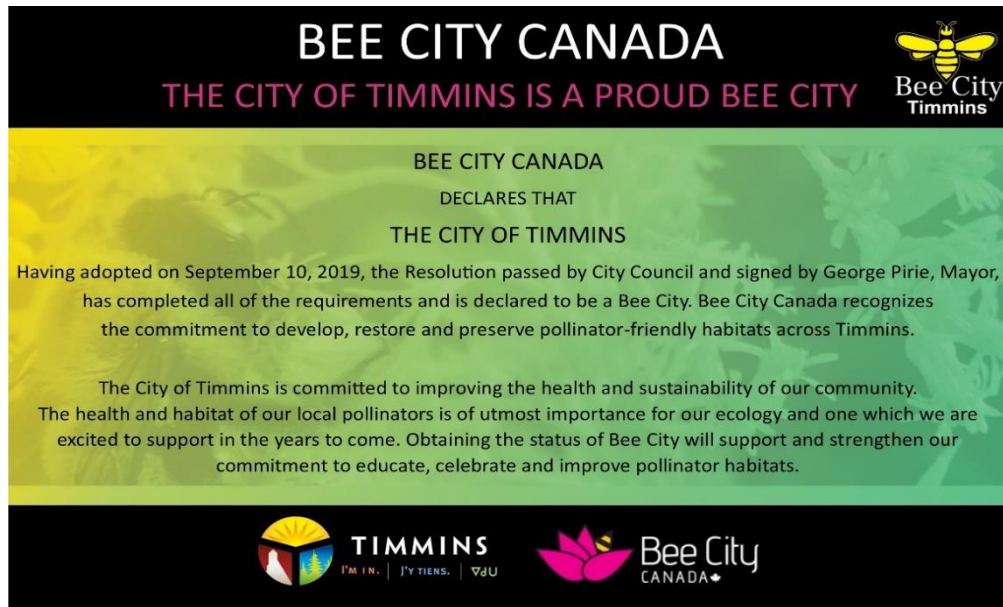


Figure 3: City of Timmins Bee City Canada Declaration

Climate Change Mitigation Planning

Around the world, communities are embracing strategies for reducing the effects of greenhouse gas (GHG) emissions. In 2018, the City of Timmins, in an effort to reduce GHG emissions, joined over 498 Canadian municipalities in the Partners for Climate Protection (PCP) program, which offers an established and stepwise framework for climate action at the municipal level. In its [Official Plan](#), the City identified the desire to build a strong, safe, and sustainable community as a strategic priority. We believe that implementing the *City of Timmins Greenhouse Gas Emissions Reduction Plan* with clear and achievable targets, combined with other related efforts, the City will meet its strategic priority while serving as an example and leader in climate change mitigation.

Climate Change Adaptation Planning

The City of Timmins began advancing climate change adaptation planning across

municipal departments as part of the Northern Climate Change Network (NCCN) between 2018 and 2020. The NCCN was a learning network of municipalities in northern Ontario working to assess and manage the risks and impacts of climate change. With support from the Ontario Centre for Climate Impacts and Adaptation Resources (OCCIAR) now the Climate Risk Institute, selected northern Ontario municipalities assessed their vulnerability to climate change and increased their capacity and knowledge to develop adaptation solutions.

Through the NCCN project, the City's Environmental Services Department led workshops to identify and assess risks and vulnerabilities associated with climate change. During these workshops, participants from a range of municipal departments, were engaged to identify and assess a number of climate change risks as they relate to the environment, health & safety, and

infrastructure & services. This work led to the creation of the Corporate Climate Change Risk Assessment Report which was a fundamental step in the climate change adaptation process.

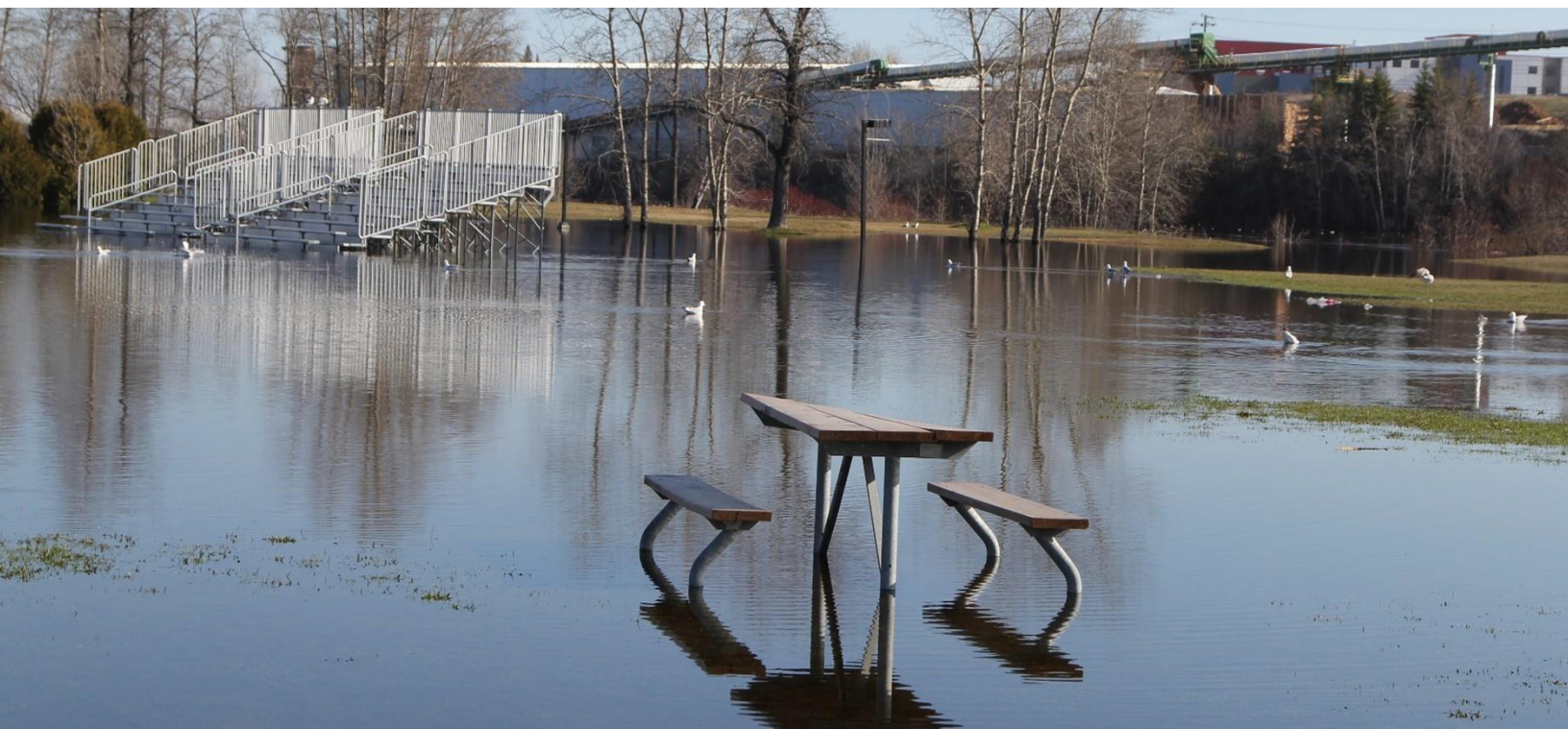
The City, in partnership with the Mattagami Region Source Protection Authority, participated in a Climate Change Vulnerability Assessment pilot study led by Conservation Ontario. The study included the use of the science-based Climate Change Vulnerability Assessment Tool and accompanying guidance document to assess climate change vulnerability into source water quality risk assessments under the *Clean Water Act*.



4. Climate Change Impacts and Issues

Climate Change Science

Since the late 1800s, the Earth's temperature has risen by 1°C largely due to human activitiesⁱⁱⁱ. As fossil fuel extraction and consumption continues 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^{iv}. The seven warmest years having taken place consecutively since 2015, and the 20 warmest years on record have occurred over the past 22 years^v. July 2019 was the second hottest month ever recorded, shrinking Arctic and Antarctic sea ice to historic lows 19.8% below average^{vi}.



Similar to global trends, Canada has been warming over the last six decades, with annual average surface air temperatures over land warming by 1.7°C since 1948, and even greater increases observed in the North, the Prairies, and northern British Columbia^{vii}. 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 a 1-in-20-year storm event are

likely to become 1-in-10-year storm events by the 2050s.

Climate Change Projections for the City of Timmins

Climate change is an increasingly critical issue at the national 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 goal of the Advancing Adaptation project is to build capacity within Ontario municipalities to better understand impacts resulting from climate change and develop localized climate change adaptation plans to address community priority risks.

Climate changes experienced in Ontario include increasing annual and seasonal temperatures as well as more extreme heat days, changes to precipitation patterns, and increased frequency of extreme weather events.

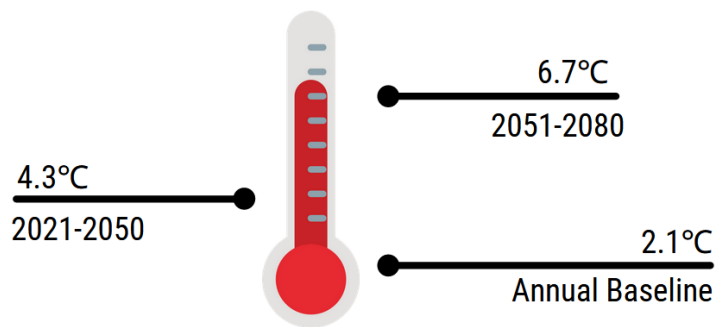


The following data highlights the projected impacts of climate change on the City of Timmins. The *Climate Atlas of Canada*^{viii} was used to access relevant downscaled regional climate data. The key parameters included in this report are related to temperature and precipitation. Appendix A provides an infographic summary of the projected climate data for the City of Timmins.

Regional climate projections predict the City of Timmins is likely to experience increased temperatures, increased precipitation in fall, winter, and spring, and increased rainfall intensity.

Temperature

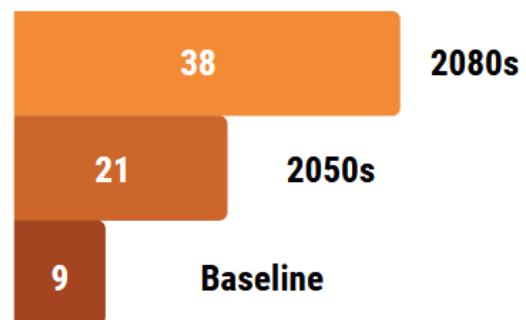
Temperatures in the City of Timmins are expected to rise in congruence with the provincial changes observed in the data above. The Climate Atlas of Canada tool was used to collect downscaled climate projections, using a baseline of 1976-2005. Within the tool, the Timmins climate station was selected to collect this information, as it was the best available area with long-range observed historical data and future climate projections for the City of Timmins.



In the City of Timmins, there is a projected annual temperature increase between 4.3°C in the immediate future (2021-2050) and 6.7°C by 2080 from the baseline mean under the high emission scenario.

Hot Days

Days where the daily maximum temperatures exceed 30°C present the greatest threats to community health due to heat-related illnesses. Examples of these include heat cramps, heat edema, heat exhaustion, or heat stroke. Specific groups, such as those who work outside, infants and young children, older adults (over the age of 65), those with chronic medical conditions, people experiencing homelessness, people planning outdoor sports or activities, and those with limited mobility may be more adversely affected^{ix}. Moreover, while higher summer temperatures increase electricity demand for cooling, at the same time, it also can lower the ability of transmission lines to carry power, possibly leading to electricity reliability issues during heat waves^x.



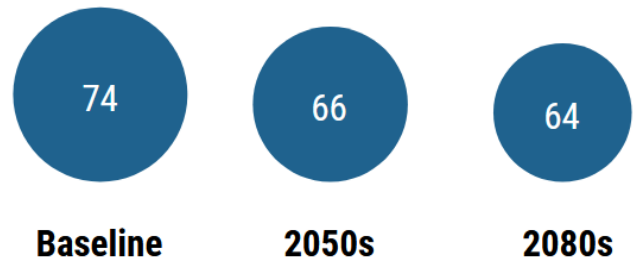
The baseline average number of days when the maximum temperature was greater than or equal to 30°C was 9 days for the City of Timmins. This is expected to increase to an average of 38 days in the 2051-2080 period under the high emission scenario. This means there will be close to 4 times more days above 30°C by 2080 in the city.

With regards to the average length of heat waves (in days), the City of Timmins experienced an average of 2 days of heatwave conditions in the baseline period. In the 2051-2080 period, according to the high emission scenario, the City of Timmins can expect to see an average heatwave event occurring for 6 days – over 3 times the current length.

Overall, heatwave events are projected to occur more frequently and for longer periods of time. These changes become more pronounced as time goes on, and with regards to the higher emissions scenarios. Sustained over several days at a time, these extreme temperatures will have significant impacts on the health of individuals in our community – heat illnesses can manifest quickly, and lead to long-term health problems and even death. Overexposure to extreme heat is especially dangerous for children and elderly adults, and those who work outside or are physically active in the outdoors^{xi}.

Freeze-Thaw Cycles

A freeze-thaw cycle is any day where the minimum temperature is below 0°C and the maximum temperature is above 0°C. The high emission scenario ensembles project that freeze-thaw cycles will decrease due to overall warmer temperatures. This is likely due to the fact that overall, the days are getting warmer, and the City of Timmins is likely to experience a decrease in the number of days that reach a minimum temperature below 0°C.

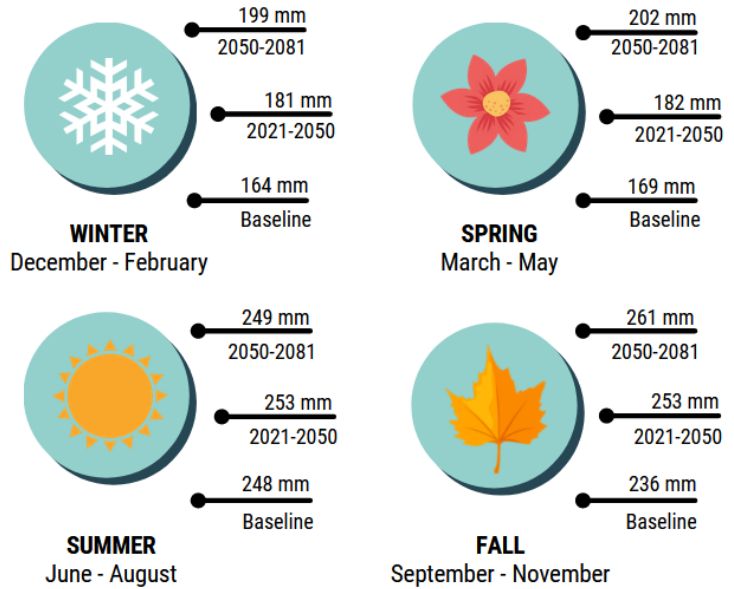


Under these conditions, it is likely that some water at the surface was both liquid and ice at some point during the 24-hour period. Freeze-thaw cycles can have major impacts on infrastructure. Water expands when it freezes, so the freezing, melting, and refreezing of water can over time cause significant damage to roadways, sidewalks, and other outdoor structures. Potholes that form during the spring, or during mid-winter melts, are good examples of the damage caused by this process.

Precipitation

On a seasonal basis, spring, winter and autumn precipitation accumulations are projected to increase by the end of the century with spring and winter experiencing the greatest increases. These seasonal trends, including relatively stable summer rainfall amounts paired with the projected increases in summer temperatures and heatwave lengths may lead to increased instances of drought.

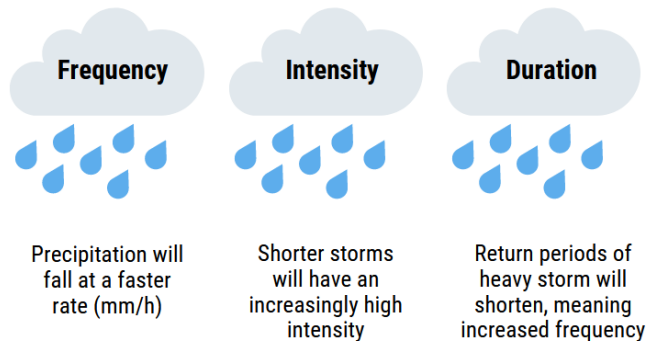
For the City of Timmins, the baseline average annual precipitation 817 mm. In the high emission scenario, the City of Timmins can expect to experience an average annual precipitation of 869 mm during 2021-2050 and 912 mm during 2051-2080.



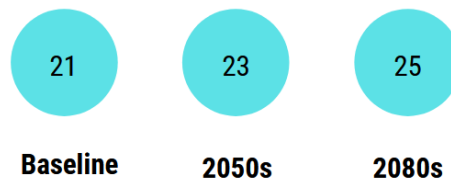
Heavy or Extreme Precipitation

Heavy Precipitation Days are days on which at least a total of 10 mm of rain or frozen precipitation falls. Frozen precipitation is measured according to its liquid equivalent: 10 cm of snow is usually about 10 mm of precipitation. Maximum (Max)-5 Day precipitation indicate the amount of precipitation that falls on the five wettest days of the year respectively.

Across the City of Timmins, heavy precipitation days are expected to increase by approximately 4 days for 10 mm days according to the high emission scenario by 2051-2080. Max 5-day events are also expected to increase across the City of Timmins, from a baseline of 59 mm to 67 mm by 2051-2080 for the high emission scenario.



Days with precipitation over 10mm



Impacts and Issues

The City of Timmins is committed to advancing climate change adaptation planning across both municipal departments and the community to reduce vulnerabilities and improve resilience. The City is focused on increasing knowledge and awareness of climate change, impacts, and adaptation. From a municipal perspective, climate change impacts were identified with respect to risks associated with the three pillars of sustainability: Health and Safety (people), Infrastructure and Services (Operations and finances), and Environment.

Health & Safety (People): Understanding the consequences of climate change through the eyes of people – including municipal staff, businesses, institutions, industry, community organizations and the residents of the City of Timmins. Identifying health-related climate change impacts on vulnerable populations is key to establishing adaptation strategies to reduce adverse outcomes.

Infrastructure and Services (Operations and Finances): There are significant assets and operations throughout the community that in turn have an impact on the economic and financial health of residents and local businesses/stakeholders. Infrastructure plays an important role in in our community which reduces a wider range of impacts including health and transportation.

Environment: Climate change impacts can lead to various consequences for the environment, including water, air, ecosystems and/or land.

The impacts of climate change are being felt across the community; the following (Table 1) represents the priority impacts identified through the corporate and community vulnerability and risk assessment process established between 2019 and 2021.

For more information on the City of Timmins’ Risk/Vulnerability assessment, refer to the plan development process outlined in the following section of this document.

Table 1: Priority impacts for the community of Timmins

Climatic Event: Early Spring - Increased spring temperatures.
Impact Statements:
<ul style="list-style-type: none"> ● Increased temperatures in the spring/winter period causing rapid or early spring melt resulting in flooding and/or water contamination (road washouts, bypasses, sewer backups, stormwater failures, frozen culverts). ● Increased temperatures in the spring/winter period leading to an increase in vector borne diseases (i.e., ticks), resulting in demand for health services, emergency response, hospitalization, and negative health outcomes. ● Changes in seasonal temperatures may lead to shifting eco regions for flora and fauna communities and can lead to increased spread of invasive species and changes in native species. ● Increased temperatures in the spring/winter period can lead to faster/earlier thawing and snowmelt causing a potential increase in contamination of drinking and recreational water sources due to flooding and/or bypasses.

Climatic Event: Extreme Heat - Increase in days with temperatures >30°C.

Impact Statements:

- Increase in wildfires causing population displacement, leading to increased financial costs.
- Increase in extreme heat days or heatwaves (over 30°C) leading to health risks to vulnerable populations (e.g., cardiovascular disorders, heat stress, etc.).
- Decrease in local air quality due to extreme heat and/or wildfire activity resulting in population displacement, demand for health services, emergency response, hospitalization, and negative health outcomes.
- Increase in extreme heat days (over 30°C) causing an increased demand for water and wastewater services, electricity, refrigeration, and bottled water in case of emergencies.

Climatic Event: Rain in Winter - Increased frequency of precipitation as rain in place of snow.

Impact Statements:

- Increase in precipitation as rain in place of snow causing hazardous travel conditions leading to accidents and road closures.
- Increase in precipitation as rain in place of snow can lead to an increase in the use of road salt to clear slippery surfaces (roads, sidewalks, and parking lots) resulting in increased sodium affecting the drinking water source and ecosystem.
- Increase in precipitation as freezing rain in place of snow causing an increased in power failures.
- Increase in precipitation as rain in place of snow causing an increased occurrence of slippery surfaces and roads, resulting in accidents/injuries.

Climatic Event: Extreme Rainfall - Increased frequency and intensity of precipitation events

Impact Statements:

- Increase frequency and intensity of precipitation events causing delays in outdoor city operations and outdoor events/community spaces.
- Increase frequency and intensity of precipitation events causing stress on built infrastructure, water contamination and flooding resulting in displacement, and increased demand on emergency services.
- Increase frequency and intensity of precipitation events causing increased stress and demand on aging infrastructure and built environment resulting in additional costs.

5. Plan Development

BARC Methodology

Building Adaptive and Resilient Communities (BARC) Framework

Development of the Plan was guided by ICLEI Canada's Building Adaptive and Resilient Communities (BARC) Framework. BARC is a five-milestone planning framework for communities aimed at preparing them for the impacts of climate change. BARC is a comprehensive planning methodology that guides users through areas of research and climate impact identification, vulnerability and risk assessment, plan development, implementation planning, and monitoring and review strategies (Figure 4). As part of the Advancing Adaptation project, the City of Timmins worked through and completed Milestone 3 of the framework, as well as a review and reassessment of Milestones 1 and 2, and which culminated in the creation of this Plan.



impacts for the region and conduct both a vulnerability and risk assessment.

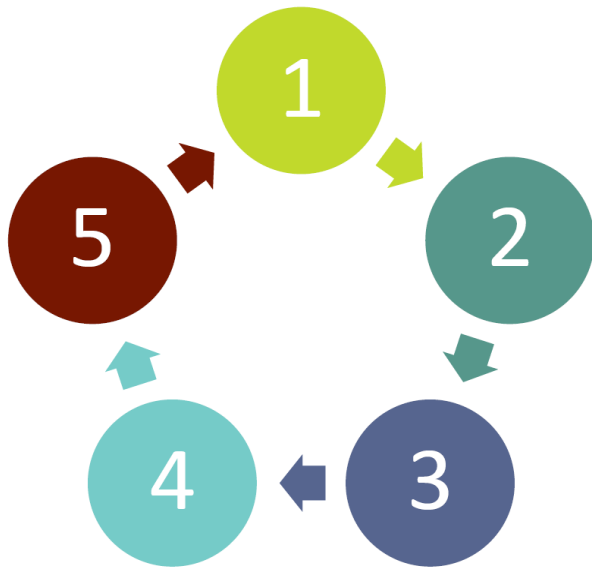


Figure 4: ICLEI Canada’s Building Adaptive and Resilient Communities Framework

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

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 Plan.

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 Development Process

Vulnerability and Risk Assessment

Through the Northern Climate Change Network (NCCN), the City initiated a corporate climate change risk assessment in 2018 and 2019. A comprehensive list of climate impacts was provided to representatives of various departments across the City to identify climate change impacts from the perspective of their department. They were also encouraged to add impacts to the list. Based on the most common climatic events within the list of impacts, the risk and impact statements were then grouped into the following climate change scenarios:

- Scenario #1: Rain in winter
- Scenario #2: Early spring
- Scenario #3: Heavy rainfall
- Scenario #4: Extreme heat

The results of the preliminary impact review were used to prepare for the risk assessment workshop where participants were asked to review and rate the impacts to examine intersections between climate-related risks. The climate change impact statements were organized to measure risks associated with the three pillars of sustainability: Health and Safety (people), Infrastructure and Services (operations and finances), and Environment. The municipal participants were asked to review the list of risks and determine the likelihood and consequence of the various risks from the perspective of their department (Figure 5).

Event/ Risk Scenario	Frequency / Likelihood Range (Planning period: 2050s)				
	1 - Very Low	2 - Low	3 - Moderate	4 - High	5 - Very High
	Not likely to occur in planning period	May occur once between 30 and 50 years	May occur once between 10 and 30 years	Likely to occur at least once a decade	Likely to occur once or more annually

Likelihood: The frequency table describes the probability or frequency of occurrence of a specific event or risk scenario. The scale ranges from events that are almost certain to occur to those that are almost certain not to occur within the planning period.

	Consequence / Impact (environment, health & safety, infrastructure & services)				
	1 - Very Low	2 - Low	3 - Moderate	4 - High	5 - Very High
Event/ Risk Scenario Environment	Negligible impact on water quality or ecosystems	Small impacts to ecosystems, biodiversity and water quality	Compromised water quality and short-term impacts on ecosystems and biodiversity, recovery possible	Clear evidence of water quality issues, high impact to ecosystems and biodiversity. Potential for long lasting impact/health	Regular, significant or permanent impacts to water quality, long-term impacts on ecosystem health, loss of biodiversity across wider area
Event/ Risk Scenario Health & Safety	No noticeable impacts to staff, contractors or residents	Recognized as a possible but distant risk	Minor injury	Significant health and safety consequences for smaller number of individuals, or high consequence for larger number of individuals	Significant health and safety risks for large number of staff and population, including increased mortality
Event/ Risk Scenario Infrastructure & Services	No or limited damage to infrastructure or services	Small variations in annual operating and maintenance costs but still within the average range	Some impact on departmental budgets, infrastructure damage and City finances	High but manageable impact on departmental budgets occurring with increased frequency. Replacement and/or repair of assets required	Extensive damage to assets and infrastructure requiring extensive replacement or major repairs. Significant and ongoing impact to City or Departmental budgets on frequent basis.

Consequence: The consequence table describes the level of impact/severity resulting from a specific event or risk scenario. When determining the consequence of each event, consider health and safety, environmental, and infrastructure and services impacts.

Figure 5: Frequency & Consequence Tables - Corporate Climate Change Risk Assessment

The risk outcomes summarized in The Corporate Climate Change Risk Assessment Report were initially organized and illustrated on heat risk maps based on risks to Health & Safety, Infrastructure & Services, and Environment. The risk outcomes were from the viewpoint of the Corporation of the City of Timmins’ municipal departments and not with respect to the community.

In 2021, to advance community climate change adaptation planning, the Environmental Services Department reviewed the risk outcomes and heat risk maps (Figure 6) and organized the highest priority impact statements (risks scoring equal to or greater than 12) to be included in the community climate change adaptation planning process. As such, fifteen (15) final impact statements were included with consideration of the effects/consequences of each impact on the community. The community impact statements are available in Appendix B - risk and vulnerability assessment outcomes of this Plan.

Overall Consequence	Extreme (5)	5	10	15	20	25
	Major (4)	4	8	12	16	20
	Moderate (3)	3	6	9	12	15
	Low (2)	2	4	6	8	10
	Very Low (1)	1	2	3	4	5
		Very Low (1)	Low (2)	Moderate (3)	High (4)	Very High (5)
Frequency/Probability						
		<p>Extreme Risk: Immediate controls required</p> <p>High Risk: High priority control measures required</p> <p>Moderate Risk: Some controls required to reduce risks to lower levels</p> <p>Low Risk: Controls not likely required</p> <p>Negligible Risk: Scenarios do not require further consideration</p>				

Figure 6: Heat Risk Map – Corporate Climate Change Risk Assessment

To support the City of Timmins’ planning process, in 2021, ICLEI Canada conducted a gap analysis of the impacts and results of risk and vulnerability assessments provided by the City of Timmins to apply a diversity, equity, and inclusion (DEI) lens that ensures alignment with the BARC process and accounts for vulnerable populations that may be at greater risk to the effects of climate impacts. These groups include: seniors, Indigenous Peoples, low-income residents, persons with low literacy levels, transient populations, persons with a disability, medically dependent persons, children and youth, women, new immigrants and cultural minorities, among other populations.

Adaptation Planning

BARC Milestone 3: Plan

The development of this Plan was facilitated by the City's participation in the Advancing Adaptation project. With financial support 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. Centered around the creation and drafting of an implementation-ready local climate change adaptation plan, the Advancing Adaptation project, brought together a cohort of municipalities between June 2021 and April 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, consultation, planning resources, training on stakeholder engagement, and support in the drafting and review of the final adaptation plan.

Guided by BARC Milestone 3, the adaptation planning process was community-focused, and each participating municipality convened a wide range of community stakeholders at two municipality-led workshops, allowing for a collaborative co-development of the adaptation plan. The planning process involved multiple steps, including: conducting a current status assessment; performing a gap analysis and identifying additional work needed; 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 Process

To kick-off the Plans' development City staff led a community action brainstorming workshop in December of 2021. Invitations were sent to municipal department representatives and community stakeholders to identify community goals and actions to achieve our vision of a climate resilient community. Goals and actions were collected for each of the four climate change scenarios (rain in winter, in early spring, heavy rainfall, and extreme heat) and their respective impact statements. The data was gathered on a document-sharing platform and made available to the workshop participants for several days beyond the workshop.

The Environmental Services Department developed a climate change action survey as well as a background document for the community to gather climate action goals and objectives. The survey was available on the City of Timmins website. Following this, staff completed a full review of the brainstorming actions to shortlist the actions through action prioritization activity considering urgency, affordability, feasibility, acceptability, equitability, and flexibility. Each of the actions were reviewed to find common themes, identify any gaps, and ensure that each of the goals identified had supporting actions.

As there are several goals and actions that support adaptation against multiple climatic threats, City staff opted for identifying common themes as a structure for the Plan's layout. Upon review of the goals and actions, four themes emerged:

- Infrastructure & Operations
- Green Infrastructure & Environment
- Public Health & Safety
- Community Resilience

Discussion of implementation considerations and review process: A second workshop was held with municipal representatives and community stakeholders to provide input on implementation planning. Stakeholders were encouraged to identify additional supporting actions, current initiatives that align with the identified actions, constraints, lead/supporting organizations, next steps, and monitoring metrics for each of the identify goals and their respective supporting actions.

Engagement and outreach approach: The community climate change action survey was promoted on the City of Timmins' social media platforms and the Communications Department put out a media release to promote feedback from the community regarding the Plan with respect to action identification. Subsequently, the local news station requested an interview, and an article was also released regarding the work that the City of Timmins is doing to adapt to climate change and encouraged the community to complete the survey.



6. The Path to a Climate Resilient Timmins

Vision

The City of Timmins is committed to advancing climate change adaptation planning across municipal departments and throughout our community. We are focused on increasing knowledge and awareness of climate change, impacts, and adaptation strategies to improve our resilience to climate change.

The goals and supporting actions in this Plan are the fundamental pieces to the action path that will move the City of Timmins closer to our vision of a climate resilient community. The following tables include the overarching goals and actions that will help our communities achieve the shared vision of becoming climate resilient and are presented in themed groups (Tables 2-5).

Goals and Supporting Actions

Infrastructure and Operations

Table 2: Infrastructure and operations goals and supporting actions

Infrastructure & Operations
Goal: Improve resilience of infrastructure and operations to reduce vulnerabilities associated with climate change.
Supporting Actions: <ul style="list-style-type: none">● Ensure infrastructure developments and projects consider climate change mitigation and adaptation measures.● Conduct an infrastructure risk assessment to determine priority risks to assets under climate projections.● Educate the public and businesses on developing adaptation and mitigation strategies.● Integrate climate change mitigation and adaptation into day-to-day decision making and practices.
Goal: Improve resource management and innovation to mitigate and adapt to climate change
Supporting Actions: <ul style="list-style-type: none">● Provide climate change adaptation education and resources to assist community members and businesses to maintain operations.● Promote piloting alternative and innovative products/projects.



Green Infrastructure and Environment

Table 3: Green infrastructure and environment goals and supporting actions

Green Infrastructure & Environment
Goal: Increase green infrastructure practices and projects throughout the community.
Supporting Actions: <ul style="list-style-type: none">● Run a rain barrel incentive program to increase uptake of barrels on resident property to promote the use of storm water best management practices on private property. Implement a rain garden information session and demonstrate effects on storm water.● Initiate education and awareness campaign on drought tolerant species that can be used instead of traditional grasses.
Goal: Develop and enhance multi-use green spaces.
Supporting Actions: <ul style="list-style-type: none">● Create sustainable and healthy communities - human health and planetary health spaces that incorporate more than just shade but address mental, emotional, and spiritual health● Promote the use of green spaces across the community and encourage feedback to improve spaces for multi-use.● Include consideration of green infrastructure and adaptation strategies in planning process.



Public Health and Safety

Table 4: Public health and safety goals and supporting actions

Public Health & Safety
Goal: Generate education and awareness of human health impacts associated with the effects of climate change.
Supporting Actions: <ul style="list-style-type: none">● Create an education campaign about recognizing, reporting, and controlling invasive species on private and public properties.● Develop education and public awareness on human health impacts associated with the effects of climate change, including but not limited to increase in diseases like Lyme disease and West Nile Virus, blue-green algae, and invasive species.
Goal: Protect public health safety when experiencing climate emergencies.
Supporting Actions: <ul style="list-style-type: none">● Run an education and awareness campaign on extreme heat - how to prepare, where to go during heatwaves, important health tips.● Protect public health and safety associated with recreational water.● Provide public emergency notices as a preventative measure as well as at the onset of the emergency.
Goal: Reduce vulnerabilities of climate change impacts on vulnerable populations.
Supporting Actions: <ul style="list-style-type: none">● Develop a communication strategy for emergency preparedness, response, and recovery at the resident level Protect public health and safety associated with recreational water.● Initiate outreach and training with public, groups, and businesses to learn and plan for how they can support vulnerable populations.● Identify access to shelter and hydration stations.● Identify cooling stations and mechanisms for vulnerable population and workers.



Community Resilience

Table 5: Community resilience goals, actions and supporting actions

Community Resilience
Goal: Increase awareness and knowledge of climate change effects and adaptation strategies to residents, local businesses, and organizations.
Supporting Actions: <ul style="list-style-type: none">● Develop a recognition program for community members or organizations that have demonstrated success related to climate change adaptation.● Develop education and outreach strategy including community outreach (virtual and in-person) to inform residents about climatic threats and adaptation strategies.
Goal: Enhance local biodiversity.
Supporting Actions: <ul style="list-style-type: none">● Provide access to more community gardens.● Encourage community members to plant gardens with native species.● Promote gardens over lawns.● Promote urban agriculture and how to grow food.
Goal: Enhance Community Emergency Response Strategy.
Supporting Actions: <ul style="list-style-type: none">● Review and update Emergency Response and Recovery Plans relative to climate hazards● Develop property and neighbourhood resilience strategies.



Opportunities

Climate change adaptation planning often focuses on the consequences and impacts related to a changing climate. However, it is important to consider opportunities as well. The aim of this Plan is to improve our community from an environmental, social, and economic standpoint. Focusing on the positive outcomes and co-benefits, while taking urgent action to address the negative impacts, will help to build a sustainable culture that we can all be proud of.

Potential opportunities include:

- warmer temperatures could reduce cold-related injuries
- increased use of green spaces
- increased participation in recreational activities
- more participation in active transportation
- potential for increased summer tourism
- longer growing season can improve food production and therefore improve access
- longer construction season

Adaptive strategies are taking place throughout our community and the Corporation. We continuously develop adaptation strategies to mitigate risks to staff, vulnerable populations, and our environment, often without realizing or acknowledging that these are adaptation strategies. There are without a doubt, countless adaptation strategies that have been developed and implemented across the community. Examples of existing adaptation strategies and actions that are taking place include:

- Local community gardens
- Departmental specific risk assessments that consider climate change including but not limited to the Drinking Water Quality Management System
- Improved access to cycling lanes
- Porcupine Health Unit's active community education campaigns
- Community access to splash pads
- Adjusting work hours around peak temperature to prevent heat-related illnesses



7. Implementation, Monitoring and Governance

Adaptation Plan Implementation and Governance

The City of Timmins Environmental Services Department will lead the implementation of this Plan which will require coordination and cooperation within the Corporation and with community stakeholders. The implementation of this Plan involves several key steps including but not limited to:

- Research and data collection
- Establish stakeholder groups
- Develop an understanding of stakeholder roles and responsibilities
- Build partnerships
- Develop a communication and engagement strategy
- Develop a reporting structure

Preliminary action planning was developed with stakeholders during the second, however, the implementation of these actions must be flexible and ongoing to meet the changing needs of the community and ensure access to sufficient resources (staff, budget, and prioritization of needs) to allow for long-term resilience building.



Monitoring and evaluation

The Environmental Services Department will provide an update on the status of this Plan to Council on an annual basis as part of the annual Sustainable Timmins update. The status of the plan goals and actions will be communicated with appropriate stakeholders on a frequency suitable to the initiatives that are relevant to respective stakeholder groups.

This Plan is intended to be a living document that will reviewed and updated by the Environmental Services Department as new information becomes available. Moving forward, a formal update will be completed should there be significant changes required to the Plan, otherwise the plan will be formally updated every five (5) years.

Funding

The Plan goals and supporting actions vary in terms of cost, timeline, and level of priority. There are several actions identified in this Plan that are low-cost and can be completed within existing budgets. In addition, many community stakeholders are already taking action and implementing

adaptation strategies – that are included within this plan – as part of their day-to-day business. This Plan seeks to incorporate existing practices and develop partnerships and support amongst stakeholders to further the implementation of new initiatives.

To help implementation move forward, the City of Timmins' Environmental Services Department will provide communication to the Corporation and community on various funding opportunities as they become available.

Communication, Education and Outreach

The City of Timmins is committed to developing a communication and engagement strategy to ensure this Plan is shared and promoted throughout the community.

The fundamental actions that will be utilized to communicate the goals and actions within this Plan during implementation include:

- Provide access to this Plan on the City of Timmins' website once the Plan has been endorsed by Council;
- Develop communication and outreach campaigns;
- Host education and awareness sessions; and provide avenues for continuous feedback.



8. Call to Action

The City of Timmins is committed to advancing climate change adaptation planning across municipal departments and throughout our community. We are focused on increasing knowledge and awareness of climate change, impacts, and adaptation strategies to improve our resilience to climate change. This Plan is the tool to help us achieve our vision of a climate resilient Timmins.

We all have a part to play in advancing sustainability across our community. Environmental, social, and financial responsibility are cornerstones to a resilient community. There are actions within this Plan that everyone can contribute to and achieve – we can all lead by example. This Plan is intended to be a holistic view of community adaptation. Therefore, we encourage communication with the City of Timmins' Environmental Services Department (environmental.services@timmins.ca) to ensure community actions and projects that are taking place are included in Plan updates.

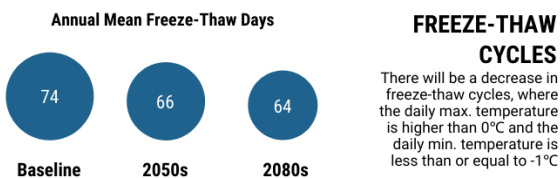
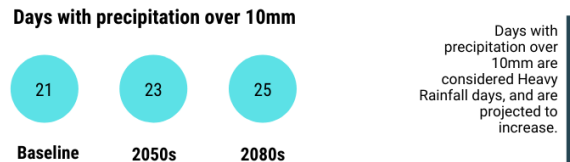
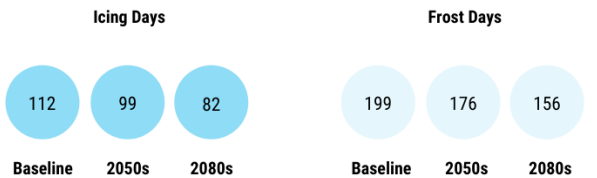
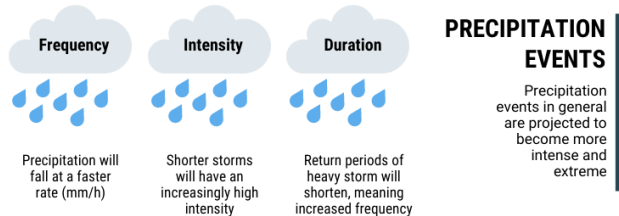
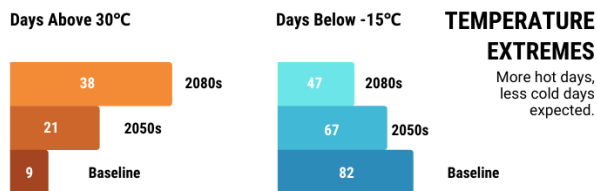
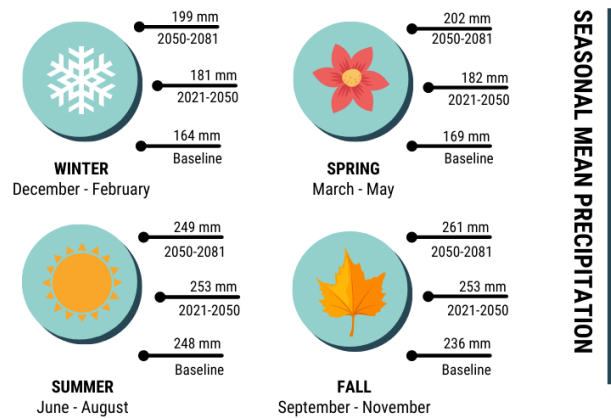
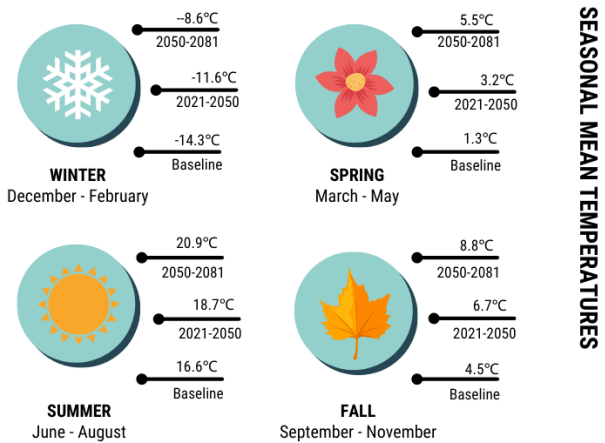
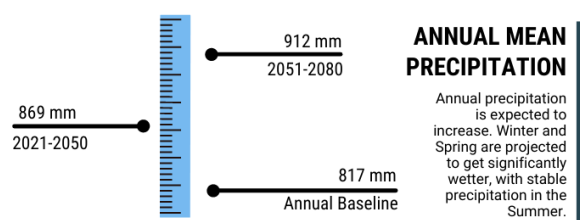
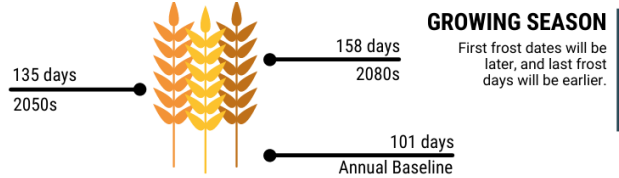
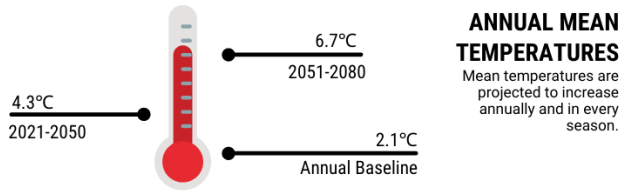
This Plan was developed to be YOUR PLAN, OUR PLAN, and together we will create a climate resilient Timmins.



9. Appendices

A: Climate Change Projections for the City of Timmins

City of Timmins FUTURE CLIMATIC PROJECTIONS April 2022



B: Risk/Vulnerability Assessment Outcomes

City of Timmins Climate Change Risk Statements				
Climatic threat	Final Impact Statement	Risk Score	Effects and/or consequences for municipal operations	Effects and/or consequence for vulnerable populations*
Extreme Heat	Increase in wildfires causing population displacement, leading to increased financial costs.	25	Population displacement results in extra costs associated with temporary and/or long-term shelters.	Low-income residents, persons with a disability, medically dependent persons will be disproportionately affected by the financial implications of displacement.
Increased spring temperatures	Increased temperatures in the spring/winter period can lead to faster/earlier thawing and snowmelt causing a potential increase in contamination of drinking and recreational water sources due to flooding and/or bypasses.	25	Increased stress on water and wastewater facilities. Increased worker stress and demand on employees and resources.	Economically vulnerable populations who rely on public utilities and recreational waters.
Increased frequency of precipitation as rain in place of snow	Increase in precipitation as rain in place of snow causing hazardous travel conditions leading to accidents and road closures.	20	Hazardous travel conditions leading to supply chain delays (fuel, road salt, medications, and food), travel interruptions (road, air) and employee absence resulting in extra costs or service delays.	Economically vulnerable populations who rely on public transportation
Increased frequency of precipitation as rain in place of snow	Increase in precipitation as rain in place of snow can lead to an increase in the use of road salt to clear slippery surfaces (roads, sidewalks, and parking lots) resulting in increased sodium affecting the drinking water source and ecosystem.	20	Increased issuance of drinking water advisories and resources to reduce sodium in drinking water system.	Medically dependent and infants who rely on public utilities with low-sodium restrictions will be affected.
Increased frequency and intensity of precipitation events	Increase frequency and intensity of precipitation events causing stress on built infrastructure, water contamination and flooding resulting in displacement, and increased demand on emergency services.	20	Increased stress and resources on municipal operations and services (water, wastewater, buildings, employee demand).	Low-income residents, persons with a disability and medically dependent persons will be disproportionately affected by the financial implications of flooding and displacement.
Extreme Heat	Increase in extreme heat days or heatwaves (over 30°C) leading to health risks to vulnerable populations (e.g., cardiovascular disorders, heat stress, etc.)	20	Increase in resident/employee heat related illnesses increases demand for health services, emergency response, hospitalization, and negative health outcomes.	Elderly, children, unhoused populations will be disproportionately affected by extreme heat days.
Extreme Heat	Decrease in local air quality due to extreme heat and/or wildfire activity resulting in population displacement, demand for health services, emergency response, hospitalization, and negative health outcomes.	20	Increase in stress and municipal resources to plan outdoor work in a safe manner and emergency response.	Elderly, medically dependent persons, low-income residents, and unhoused populations will be disproportionately affected by extreme heat days. Including social isolation to avoid exposure.

Extreme Heat	Increase in extreme heat days (over 30°C) causing an increased demand for water and wastewater services, electricity, refrigeration, and bottled water in case of emergencies.	20	Increased demand on utilities during extreme heat events to meet community needs. Increased demand on workforce can lead to heat related issues and illnesses.	Low income, unhoused populations and elderly residents will be disproportionately affected by extreme heat days. Including social isolation to avoid exposure.
Increased spring temperatures	Increased temperatures in the spring/winter period causing rapid or early spring melt resulting in flooding and/or water contamination (road washouts, bypasses, sewer backups, stormwater failures, frozen culverts)	20	Increased stress and resources on municipal operations and services (water, wastewater, buildings, safe roads, employee demands)	Low-income residents dealing with financial constraints associated with sewer backups.
Increased frequency of precipitation as rain in place of snow	Increase in precipitation as freezing rain in place of snow causing an increased in power failures.	16	Increased power failures and damages to building infrastructure leads to operational challenges resulting in extra costs (back-up power, EMS, medical equipment and reduced service capacity, employee demand).	Medically dependent persons relying on medical equipment that requires power will be disproportionately affected.
Increased frequency and intensity of precipitation events	Increase frequency and intensity of precipitation events causing increased stress and demand on aging infrastructure and built environment resulting in additional costs.	16	Increased demand to maintain municipal operations and services including repair to damaged infrastructure.	Low-income residents dealing with financial constraints associated with infrastructure damage.
Increased spring temperatures	Increased temperatures in the spring/winter period leading to an increase in vector borne diseases (i.e., ticks), resulting in demand for health services, emergency response, hospitalization, and negative health outcomes.	16	Increased demand of resources and response.	Children and youth and new immigrants who are unaware of the local vector borne diseases will be at risk.
Increased frequency of precipitation as rain in place of snow	Increase in precipitation as rain in place of snow causing an increased occurrence of slippery surfaces and roads, resulting in accidents/injuries.	12	Increased demand to maintain municipal operations and services including transportation, safe roads, and sidewalks	Seniors and low-income residents will be disproportionately affected by injuries from slippery surfaces and roads.
Increased spring temperatures	Changes in seasonal temperatures may lead to shifting eco regions for flora and fauna communities and can lead to increased spread of invasive species and changes in native species	12	Increase monitoring and response on environmental health, invasive species, and environmental risks.	Indigenous population and low-income residents relying on local biodiversity and ecosystem health for food.
Increased frequency and intensity of precipitation events	Increase frequency and intensity of precipitation events causing delays in outdoor city operations and outdoor events/community spaces.	12	Causes delays in outdoor city operations and outdoor events resulting in extra costs and cancellations (set-up delays, decreased outdoor recreation)	Children and youth, low-income residents, Indigenous populations, transient population, new immigrants, and unhoused populations will be disproportionately affected by reduced access to community spaces.

C: 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 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).

Impacts of a changing climate: means the present and future consequences from changes in weather patterns at local and regional levels including extreme weather events and increased climate variability. ^{xii}

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 $Risk = likelihood \times consequence$. 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.

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.

D: Acronyms

AR6 – Sixth Assessment Report

BARC – Building Adaptive and Resilient Communities

COA – Canada-Ontario Agreement

DEI – Diversity Equity and Inclusion

GHG – Greenhouse Gas

ICLEI – International Council for Local Environmental Initiatives

IPCC – Intergovernmental Panel on Climate Change

LCR – Low Carbon Resilience

MECP – Ministry of the Environment, Conservation and Parks

NCCN – Northern Climate Change Network

OCCIAR – Ontario Centre for Climate Impacts and Adaptation Resources

PCP – Partners for Climate Protection

PHU – Porcupine Health Unit

RCP – Representative Concentration Pathways

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