ICLEI
Local Governments for Sustainability
CANADA

CITY OF ORILLIA

CLIMATE CHANGE ADAPTATION STRATEGY

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City of Orillia Climate Change Adaptation Strategy

1. Executive Summary

Increased droughts, flooding, and catastrophic weather events are evidence of climate change occurring on a global scale. Focused efforts on mitigating further damage are important with the understanding that change is already occurring. Locally, Orillia has experienced an increase in high-heat days, precipitation, and freeze-thaw cycles. These events have an impact on vulnerable populations, local businesses, agriculture, the environment, and City infrastructure. We have a responsibility to adapt and build resiliency within our Community.

This Climate Change Adaptation Strategy has been developed through Orillia's partnership with ICLEI Canada and consultation with staff and community stakeholders. Over the course of 18 months, the Community and Staff working groups met to identify 27 actions across 4 themes as well as specific implementation considerations that serve as a foundation for building a climate resilient City.

A collective vision was established to serve as the foundation for this important work at a local level. "The City of Orillia will be a healthy, resilient, and livable community that prioritizes sustainability and equitable access to services, shelter, food, and security in the face of our changing climate."

This is intended to be a living document that will continue to adapt and evolve as we build a resilient community.

2. Acknowledgements

Project Team

The City of Orillia's Climate Change Adaptation Strategy was coordinated by staff members at the City in coordination with ICLEI Canada:

Jasmine Lyn, Sustainability Coordinator
Mark Buma, Supervisor, Sustainable Operations
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Hiba Kariem, Climate Change Project Coordinator, ICLEI Canada
Robert Wilson, Climate Change Planner, ICLEI Canada

Stakeholders involved in plan development

The City of Orillia would also like to acknowledge the support and guidance of the Climate Adaptation Working Group (CAWG) throughout the development of this plan. Their contributions have been essential in the identification of local climate impacts, assessing vulnerabilities and risks, and identifying actions and their implementation considerations.

- Development Services and Engineering Department
- Business Development, Culture, and Tourism Department
- Environment and Infrastructure Services
- Hydro One
- Rama First Nation
- Sustainable Orillia
- Lakehead University
- Couchiching Conservancy
- Georgian College
- Simcoe Muskoka District Health Unit
- Bass Lakes Farms
- Green Orillia

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 cohorts 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

The development of this Plan was facilitated by the Municipality's participation in the ICLEI Canada-led 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 eleven 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.

The City of Orillia (the City) has a population of 35,320 people in the heart of Lake Country on the shores of Lake Couchiching and Lake Simcoe. The City is forecasted to grow to 50,000+ people by 2051 and is designated as a Primary Settlement Area as set out in the Province of Ontario's *Growth Plan.* Further details on the City can be found at **orillia.ca.**

Climate change is a global issue that starts with local action. Canada's climate is warming at twice the rate of the rest of the world according to Environment Canada. National climate trends show a steady rise in seasonal and annual temperatures, with more intense precipitation events throughout the year. Changes in Orillia include stronger windstorms, more frequent heavy rain events and warmer winters, which are impacting the community in a variety of ways.

The City is committed to taking action to combat climate change through greenhouse gas reductions and through adapting our natural, built, and social systems to these new conditions. New projects at the City include the Climate Change Action Plan (CCAP) and the Climate Change Adaptation Strategy, as well as investments in electric vehicle charging stations and LED lighting upgrades. Orillia continues to enhance programs for waste diversion, solar energy and promoting local sustainable businesses.

Intention of the Plan and Community Scope

The goal of this Climate Change Adaptation Strategy (CCAS) is to build upon the existing actions taken by the City of Orillia to address climate change and allow the City of Orillia to proactively identify opportunities for action that advance the community further towards climate resilience of its social, economic, built, and natural systems. The development of this Plan took a broad approach that involved the community as well as municipal administration. This plan intends 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 Orillia administration is the lead actor 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 multiple City staff, community groups and organizations.

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

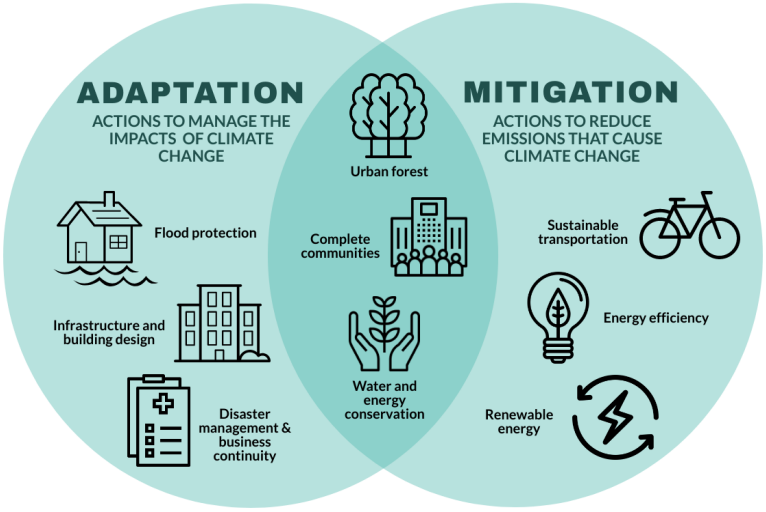


Figure 1: Overlap and Differences Between Adaptation and Mitigation (Source: ICLEI Canada, 2019)

4. Climate Change and Orillia

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 a 1-in-20-year storm event is likely to become 1-in-10-year storm event 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 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 recently released the National Adaptation Strategy outlining actions, objectives, and long-term transformational goals to increase Canada's resiliency to climate change. Following four guiding principles, including respecting jurisdictions and upholding Indigenous rights, advancing equity and environmental justice, proactive risk-based actions, and maximizing benefits and avoiding maladaptation, the Strategy identifies five 'key systems' to approach climate change adaptation action:

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

The Strategy affirms that reducing the impacts of climate change requires collaboration, coordination, and ambition at all levels of government, sets out clear priorities and shared goals to support existing efforts, and identifies new opportunities for actors, both big and small, to bolster adaptation efforts in their communities. It recognizes the important role that municipalities, institutions, businesses, and individuals play in adapting to a changing climate, and provides case study examples of implemented adaptation efforts to spur local action and the metrics necessary to monitor their impact.

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' 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.

Climate Change Projections for the City of Orillia

Climate change is an increasingly critical issue at the national and local levels. 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 their community's 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 Orillia. The *Climate Atlas of Canada*[x] was used to access downscaled regional climate data for the City of Orillia. The parameters included in this report are related to temperature and precipitation. Key findings include increased temperature, increased precipitation in fall, winter, and spring, and increased intensity of rainfall.

Summary of Projected Climate Change in Orillia

Tempertature

- Annual increase in mean temperature of approximately 2.1°C by 2050 and 4.3°C by 2080 from the baseline mean
- The number of hot days (>30°C) is currently averaging 7.9 days annually, is expected to increase to an average of 23.5 days by 2050 (297% increase), and to an average of 48.1 days by 2080 (608% increase)
- Heatwaves are expected to increase in length, frequency, and intensity with an approximate 6 heatwave events annually
- 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 60 mm by 2050 and 91mm 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
- Stable summer precipitation and increased average summer temperature is expected to lead to an increase in the frequency of 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

5. Vision Statement

Drawing on the contributions from internal and external stakeholders and their priority values for a Climate Change Adaptation Strategy, we are guided by the following Vision Statement:

"The City of Orillia will be a healthy, resilient, and livable community that prioritizes sustainability and equitable access to services, shelter, food, and security in the face of our changing climate."

6. Plan Development

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

Development of the Plan 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 below). As part of the Advancing Adaptation project, City of Orillia worked through and completed Milestones One, Two, and Three of the BARC Framework, culminating in the creation of this Climate Change Adaptation Strategy.

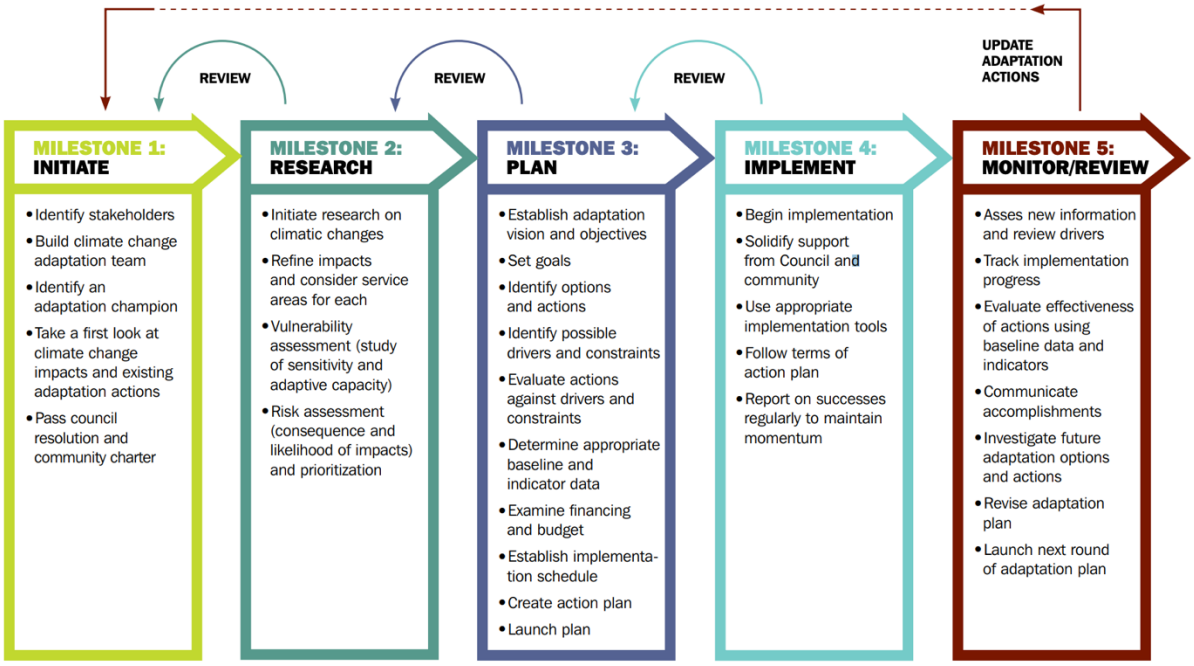


Figure 2: ICLEI Canada's Building Adaptive and Resilient Communities Framework

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 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 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.

Milestone One: Initiate

Fulfilling the criteria of Milestone One, the City of Orillia identified a core group of community stakeholders to participate in the adaptation planning process as part of a Climate Adaptation Working Group (CAWG).

Climate change is expected to impact a wide range of areas in the City of Orillia, from agriculture, infrastructure, land use, human health, and wellbeing, and more. As such, community stakeholders were identified by the City of Orillia 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). The project team provided subject matter knowledge and expertise while ensuring that the Adaptation Plan aligned with community needs.

Table 1: Community Partners and Stakeholders

- Bass Lake Farms
- Community Development Corporation
- Couchiching Conservancy
- Hydro One
- Green Orillia
- Georgian College
- Lakehead University
- Simcoe Muskoka District Health Unit
- Sustainable Orillia
- Rama First Nation

The working group was crucial in providing topic-specific knowledge and input, ensuring that the Plan aligned with community needs. By building upon the expertise of these individuals, the CCAS is reflective of a wide range of perspectives and identifies needs and priorities for the City of Orillia. Invitees to the working group participated in meetings and workshops to develop the CCAS and/or were kept informed of progress and were encouraged to provide feedback throughout the development of the Plan. Throughout the planning process, the working group was the central body to contribute to the CCAS.

To commence the Advancing Adaptation program, Orillia held a kickoff meeting on November 16, 2021. 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 acutely affected. Within this milestone, the City of Orillia scoped the climate change impacts and conducted both a vulnerability and risk assessment.

Impact Identification

Climate-related impact statements are the foundation of the vulnerability and risk assessment process 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 the City of Orillia. 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.

A total of 33 impact statements were developed covering a range of affected areas including infrastructure, the natural environment, public health and safety, employee productivity, and more. The statements have been further organized by climate event to help the CAWG better understand the focus and scope of each impact. Climate event categories include:

- Increased temperature
- Extreme heat days
- Changes in precipitation
- Increased wind 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.

To determine sensitivity, how the functionality of the community would be affected should the impact occur today is considered. This includes assessing 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, take advantage of opportunities, or 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 considered any plans, policies, and actions already in place to address this issue.

The vulnerability assessment 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 City is *sensitive* or has low *adaptive capacity* (ability to cope/recover). 27 Medium and High scoring impacts were brought forward to the risk assessment process. The complete results of the vulnerability assessment can be found in Appendix C.

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 31 impacts across twelve different consequence criteria.

Consequence criteria were divided into three categories – economic, social, and environmental. Each of the twelve criteria received 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.

This is intended to demonstrate that while certain impacts may not rank high in one category, they may have significant consequences in another. As such, both category risks and overall risk scores were used to prioritize the impacts moving forward into planning.

Based on the results of the risk assessment, the CAWG identified 13 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.

Priority Climate Change Impacts City of Orillia

Through the vulnerability and risk assessment process and results, we arrived at a list of *priority climate change impacts*, described in Table 1 below. Some impacts are inherently more or less negative or consequential than others and can vary widely for different demographic groups. For the list of priority impacts outlined below, examples of particular vulnerabilities for some impacts have been included in the table below. This is not an exhaustive explanation but is meant to help readers understand the complexity of addressing climate impacts and the necessity of doing so through an equity lens.

Table 2: Priority Climate Impacts for Orillia

Impact ID#	Impact Statement	Risk Ranking
30	Impact: Increase in the frequency and intensity of precipitation events causing increased flooding, resulting in more displacement or evacuation of residents from homes, physical injuries, and mental health impacts/stress.	Medium-High
12	Impact: Increase in the frequency/intensity of extreme weather & back-to-back events causing severe damage/mass system failures of life safety systems such as electricity, water, sanitary systems.	Medium-High
3	Impact: Increased frequency/intensity of extreme weather events leading to hazardous conditions, power outages, damage to homes/assets, etc. resulting in disproportionately higher health and safety impacts to vulnerable populations (i.e., older adults, those with pre-existing health conditions, individuals with constrained access to social and economic resources, populations unable to control power such as renters and children, etc.)	Medium-High
16	Increase in summer temperatures and hot days over 30 °C causing heatwaves leading to health and safety risks such as domestic violence/violent altercations, cardiovascular disorders, heat stress, food-borne/water-borne illnesses, etc. to vulnerable populations (i.e., seniors, women, children, those with chronic physical or mental health conditions, temporary migrant workers, those without air conditioning, etc.)	Medium-High
2	Impact: Increase in the frequency/intensity of extreme weather events resulting in higher mental & physical health implications for residents (from hazardous conditions, power outages, unsafe food safety practices, etc.).	Medium
18	Impact: Increased frequency and intensity of freezing rain mixed with snowfall resulting in more hazardous road/ sidewalk/ parking lot conditions, leading to more stress & damage to infrastructure and difficulty employing emergency protocols and conducting maintenance	Medium

	(i.e., watermain breaks, shorter lifespan, cracks/potholes, concrete corrosion, etc.).	
24	Impact: Increase in the frequency/intensity of extreme weather events resulting in loss of natural features (flora/fauna mortality, closures of parks, trails, green spaces etc.) and seasonal traditions (i.e., backyard rinks, decreased intensity of fall colours) leading to a loss of appreciation and interaction with the natural world.	Medium
23	Impact: Extreme heat paired with severe thunderstorms leading to increased damage to natural systems, resulting in a decreased ability for the natural systems to provide ecosystem services (i.e., reduced shading from extreme heat, landscape more vulnerable to flooding, depleted aquifer recharge abilities, reduced air quality from tree decline, etc.)	Medium
15	Impact: Increase in average annual temperatures and hot days over 30 °C causing higher tree, flora, marine, and overall wildlife mortality leading to disrupted/damaged ecosystems & disrupted food production (i.e., water cycle impacts, pollinator impacts, algal blooms leading to fish mortality, etc.)	Medium
27	Impact: Increase in hot days over 30 °C leading to increased damage to crops, flora and the natural ecosystem, resulting in disruptions in the natural food chain, food insecurity, and impacts to the livelihood of farmers & ancillary businesses.	Medium
21	Impact: Increase in hot days over 30 °C leading to heat stress on outdoor workers (i.e.: city staff, agriculture, and construction workers, etc.), those who use active transportation for mobility, and outdoor recreational activities (i.e.: watersports, hikers, etc.).	Medium
5	Impact: Increase in average annual temperatures and hot days over 30 °C causing more algal blooms and elevated lake bacteria levels, resulting in decreased water quality, drinking water, and beach closures (i.e., impacts to tourism).	Medium
14	Impact: Increased extreme weather events will create unsafe road and travel conditions, resulting in disruptions to transportation (active & vehicular), emergency services, and other essential services (i.e., food systems, medical care/hospitals, airports, etc.)	Medium

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-up and engagement with CAWG 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 in May 2022. At the workshop, participants were presented with a list of prioritized climate impacts and were asked to identify potential actions to increase resilience. In the workshop, it was important to acknowledge that adaptation actions can take many forms. When drafting new actions, participants were asked to consider different types of responses, such as:

• Research and monitoring • Early warning systems • Hazard information provision • Awareness raising and education • Alterations to operations and practices • Supporting existing plans	• Bylaws, policies, or plans • Technologies • Infrastructure (hard and soft) • Economic instruments • Forming partnerships

A total of 27 actions and associated sub-actions were identified by the CAWG. All actions were evaluated by the Project Team and were coalesced, edited, and streamlined where necessary. Following the workshop, the actions were further evaluated using action prioritization criteria. The purpose of this activity was to identify if the actions shortlisted were effective/urgent, affordable, feasible, acceptable, equitable, and flexible. The outcome of ranking these actions against these criteria resulted in an understanding as to which actions should be considered an urgent priority, and those which should be implemented in longer time horizons.

Implementation

Implementation workshops and focus groups were held with members of the CAWG to develop implementation schedules for each action. The implementation schedules are intended to be a living document and will be further refined as implementation progresses. Updates may be made to accommodate changes in policies, staff or financial resources, and unexpected extreme weather events. This flexibility will ensure that the City and its community partners are not constrained to certain parameters should new opportunities for implementation arise.

The implementation schedules were developed to identify and allocate resources required to implement priority actions. Alongside every priority action, the 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.

- **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.
- **Lead Organization**: department/organization 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 (i.e., short-term (<2 years), medium-term (2-5 years), long-term (5+ years)
- **Immediate Next Steps:** immediate next steps that need to be taken to kick-start implementation
- **Monitoring Metric:** indicator(s) to monitor the action and evaluate progress on achieving the identified objectives.

The complete implementation schedules for each action can be found in Appendix B.

7. The Path to a Climate Resilient Orillia: Themes and Actions

Actions that were identified and evaluated by the CAWG as part of the Implementation Schedule for the Adaption plan have been categorized into themes. The 27 actions identified in this plan can be categorized under four themes:

1. People and Health
2. Built Environment
3. Natural Environment
4. Energy and Economy

Each of the actions listed below are intended to guide Orillia in achieving our vision.

Theme #1 – People and Health

Climate change poses many complex health and safety concerns for Orillia's community. Over the coming years, Orillia is expected to see an increase in extreme weather events and precipitation events. Losses from such events, as well as safety concerns and mental and physical health implications, will affect us all. These events will also disproportionately affect those who are more vulnerable in our community as a result of racial, economic, social, and gender-based inequities. The strategies identified below aim to increase the resilience of the community to climate change-related impacts and to create a healthier and more vibrant community.

Action 1) Create an educational campaign to raise awareness about the risks associated with climate change (i.e., health impacts, property damage) and what residents can do to prepare.

Action 2) Improve monitoring, data collection, and notifications surrounding climate related extreme events and extreme weather/temperatures.

Action 3) Through partnerships, establish a vulnerable persons' registry to help guide emergency response and/or other assistance programs.

Action 4) Initiate work to support affordable and resilient housing to reduce potential climate-related displacement and impacts from extreme weather and temperatures.

Action 5) Continue to offer heating and cooling centre programming and interventions (e.g., community splash pads, access to pools, etc.).

Action 6) Work to consider all users of Orillia's transportation network (e.g., motorists, pedestrians, cyclists, transit users, etc.) in appropriate plans.

Action 7) Continue to alter City work schedules to respond to extreme heat events and maintain health and safety as a priority (i.e., task assignments).

Action 8) Through partnerships, promote and support community mental health initiatives to reduce anxiety and stress due to climate change, focusing on how to take climate action.

Action 9) Continue to incorporate the "Healthy Community Design: Policy Statements for Official Plans" from the SMDHU as part of Official Plan Updates.

Action 10) Promote the work of partner organizations to engage community members to be aware of vector-borne diseases, disease recognition and prevention.

Theme #2 – Built Environment

The built environment includes many types of infrastructure across the community – roads, signage, power systems, water treatment facilities, as well as our buildings, structures, and homes. In recent years, Orillia has felt the devastating impacts on private and public assets from flooding and other extreme weather. As such, the strategies identified below will target key infrastructure vulnerability, rethink the way we build, and support residents in protecting and increasing the resilience of their property and homes from future climate change.

Action 11) Complete the Stormwater Management Master Plan (SWMMP) update that includes storm water management measures and vegetation and nutrient management. Explore opportunities to conduct further studies which may include updates for flood protection and water quality management.

Action 12) Maintain the City's Salt Management Policy to align with emerging environmental practices to reduce contaminated run-off to water systems.

Action 13) Ensure redundancy in critical water treatment infrastructure such as pumps and sanitation equipment.

Action 14) Pursue the incorporation of Low Impact Development (LID) features, green infrastructure, and shading interventions into new development and redevelopment projects.

Action 15) Incorporate risks to existing infrastructure and identify how it can be made more resilient to impacts from extreme weather and temperatures into Master Plans and major City projects.

Action 16) Pursue Green Development Standards (GDS) as part of the Official Plan (OP) update, and have those standards include resilient building requirements.

Action 17) Encourage homeowners and landlords to improve the resilience of residential buildings to climate-related risks through upgrades and/or retrofits.

Theme #3 – **Natural Environment**

Our natural environment absorbs greenhouse gas emissions, cleans our air, provides us cooling from extreme heat, cleans and absorbs rainwater, allows our community to explore nature, and much more. Protecting and enhancing our natural assets is vital to becoming a resilient city. The strategies identified below aim to protect and enhance Orillia's natural environment and the services it provides while encouraging residents to engage in the growing of their food and gardens to further solidify our relationship with our surrounding environment.

Action 18) Continue to manage natural areas within the City.

Action 19) Work with local partners to enhance ecosystem function through more biodiverse planting, promoting native species and tree planting and preservation.

Action 20) The City will continue to promote community planting initiatives and continue to run the City-funded tree planting program to support the urban tree canopy.

Action 21) Encourage residents and businesses to reduce or eliminate chemical fertilizers in Orillia to reduce runoff to the lakes and streams.

Action 22) Work with appropriate partners to make monitoring information regarding nutrients and algal blooms in lakes Simcoe and Couchiching accessible to the public.

Action 23) Educate and promote backyard produce growing, community gardens, and shared garden allotments.

Theme #4 – Energy and Economy

Climate change poses risks to businesses and institutions, both in terms of assets, goods, and services, as well as human health risks for workers and those that are serviced through these institutions. The strategies below aim to improve energy availability and resiliency as well as business continuity in the face of extreme weather, to minimize damage and losses, ensure our community is protected, and that we are adapted, where possible, to the future economic shifts that come with a changing climate.

Action 24) Explore opportunities to strengthen the local food supply value chain by making it easier for agricultural producers to sell to retailers and restaurants through new platforms, education, sharing of best practices, etc.

Action 25) Explore opportunities for decentralized energy generation, storage, and distribution.

Action 26) Ensure all municipal-owned facilities providing critical services (i.e., water and wastewater systems, fire stations, evacuation centre etc.) have reliable back-up power systems in place.

Action 27) Assess new opportunities to promote "climate resilient" tourism activities as seasonal conditions change.

8. Implementation, Monitoring and Governance

Adaptation Plan Implementation and Governance

The Facilities, Climate Change and Operations division of the Environment and Infrastructure Services Department will lead the implementation of the Plan with the coordinated efforts of the CAWG.

Implementation of actions identified within the plan must be adaptable and flexible to meet the evolving needs of the community. Sufficient staffing and budgetary resources will be required to ensure that the vision of an adaptive resilient community will be realized.

Monitoring and Evaluation

The Facilities, Climate Change and Operations division will provide status updates to Council in conjunction with updates on the Climate Action Plan. Pending the adoption of our Climate Change Adaptation Strategy, report frequency will occur on an annual basis. Reporting conduit is to be determined at a later date.

The intention is for the Strategy to be formally reviewed in 2023. More specific timing is unknown as the City is in a transitional period with the recent inauguration of a new Mayor and new members of Council.

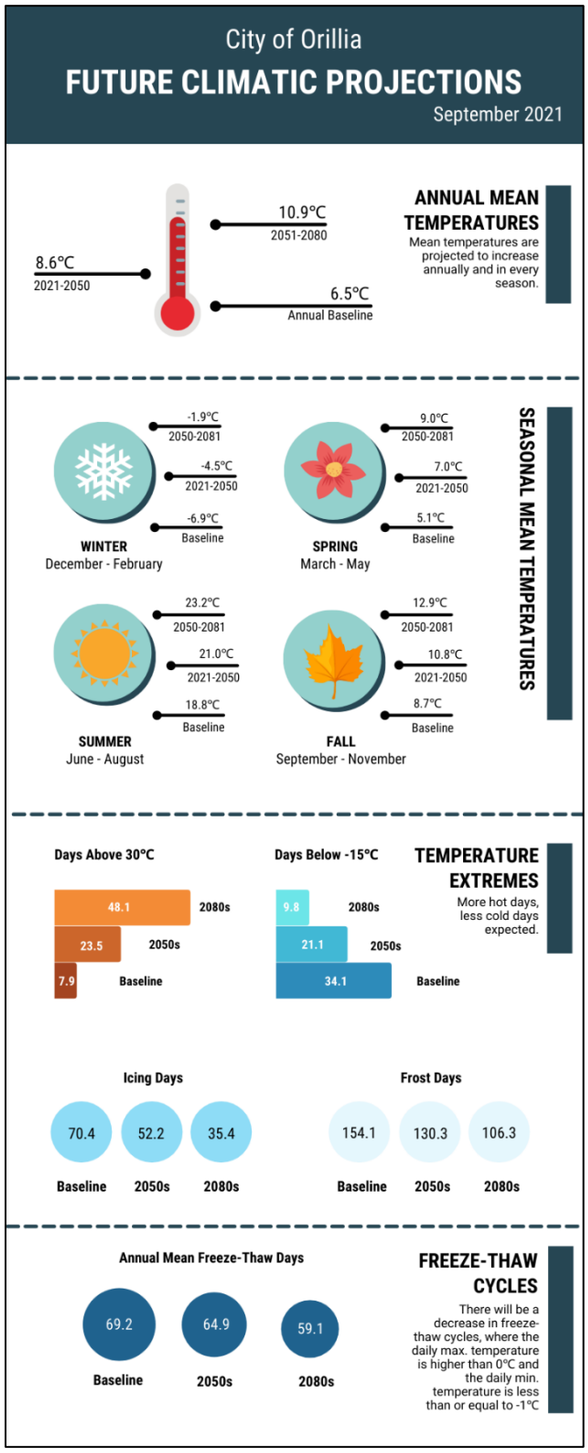
9. Call to Action

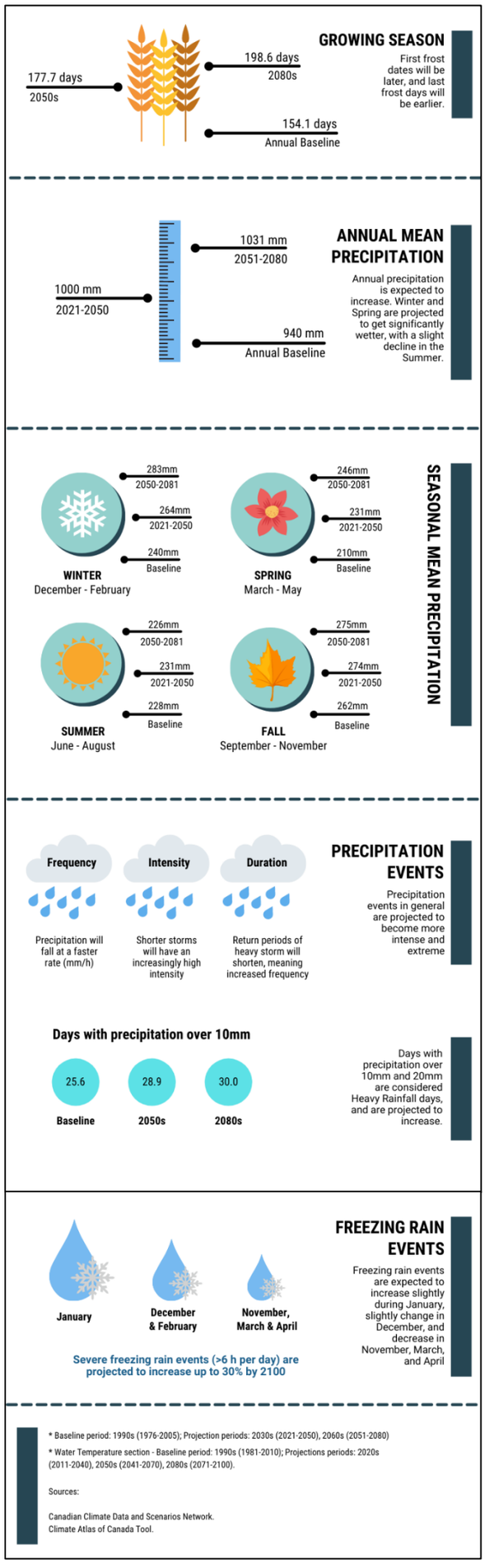
Orillia is committed to increasing the education and awareness of community members about climate adaptation and mitigation efforts as climate action requires involvement from the entire community. The CCAS is a tool to help the City staff and community members enhance climate resiliency in Orillia.

There are actions identified in this strategy for which every community member can contribute and achieve. The CCAS was developed in collaboration with community representatives and is intended to be a holistic approach to community adaptation. To ensure that community actions are being captured in updates to this Plan, please communicate the positive adaptation measures you are implementing in our community to the The Facilities, Climate Change and Operations division at rdick@orillia.ca.

10. Appendices

Appendix A: Climate Science Infographic





Appendix B: Implementation Schedule

Theme #1 – People and Health

Action 1) Create an educational campaign to raise awareness about the risks associated with climate change (i.e., health impacts, property damage) and what residents can do to prepare.

Action Scope/Details

- Integrating Emergency Preparedness into ongoing operations by the City.
- Develop educational materials in partnership with community organizations (i.e. students, school boards, etc.), and promote the campaign across the community through various media channels.

Supporting Actions

- Explore HARP (Heat Alert Response Plans)
- Create a community-wide campaign focused on emergency preparedness & emergency planning.
- Develop planning processes and emergency preparedness plans for the general public for extreme weather events.
- Engage with the insurance sector and see opportunities to educate the public from their perspective

Lead Organization(s)

- SMDHU

Potential Supporting Organization(s)/Partner(s)

- Sustainable Orillia
- Insurance sector

Current Practice

- The SMDHU currently has a campaign and materials to increase awareness about the risks from climate change.
- Rama First Nations has a community newsletter that includes notices/reminders about climate change, actions that members can undertake, and are developing a NZ plan.
- Green Orillia: social media, website, newsletter, and farmers market outreach.
- The City is continuously working to create evidence-informed materials and resources for the public, municipal and community partners.
- Engage the private sector through the CDC to support adaptation measures and post-extreme-event measures.
- Consider emergency response / clean up organizations and their experiences

Anticipated Timing
- Could begin 2023
- Medium-term: 2-5 years

Immediate Next Steps
- Form a committee to spearhead development and dissemination of materials
- Identify key areas for the campaign

Monitoring Metric
- Number of residents and businesses reached
- Pre and post -assessment, of City of Orillia and supporting organizations websites and social media interaction

Action 2) Improve monitoring, data collection, and notifications surrounding climate related extreme events and extreme weather/temperatures.

Action Scope/Details
- There isn't a high immediate (flash) flood risk for Orillia, so the City currently does not put out flood warnings. This may change in the future due to IDF curve indications

Supporting Actions
- Create a community-wide warning alert system for extreme weather events.
- Create a HARS - Heat Alert & Response System, focused on vulnerable groups.
- District of Muskoka has received funding to do flood plain mapping – identify opportunities for information sharing and support
- Partner with strong community partners who already monitor, collect, and notify the public of extreme events.

Potential Lead Organization(s)
- Environment and Infrastructure Services

Potential Supporting Organization(s)/Partner(s)
- District of Muskoka
- Conservation Authority

Current Practice
- The City shares warnings/alerts for extreme heat and cold days and has recently shared on social media if there is localized flooding but it is not a process.
- The Ministry of Environment/ fire station/ health unit publish warnings
- The City opens emergency shelters (heating/cooling) when the need arises

- Rama First Nation: notices go out through employees, website for extreme heat situations, and person-person communication identifying which facilities will be open when extreme weather events occur.
- Air quality monitoring and updates from the SMDHU
- The conservation authority publishes notes on flooding risks

Anticipated Timing

- Could begin 2023
- Medium-term: 2-5 years

Immediate Next Steps

- Reach out to Muskoka for more info on flood plain mapping and data sharing

Monitoring Metric

- Social media reach
- Community responses during events
- Warnings issued
- Kms of floodplains mapped

Action 3) Through partnerships, establish a vulnerable persons' registry to help guide emergency response and/or other assistance programs.

Action Scope/Details

- The registry will seek to reduce injuries or fatalities during emergencies by identifying ahead of time those who most need help and directing resources to them as needed.

Supporting Actions

- Work with the health unit or county to amalgamate their lists of vulnerable people, identify if such lists exist
- Community campaign to call for those who would like to be added to the list
- Collaborate with Ontario Works or social assistance programs to identify those who would like to be added to the list.
- Audit current resources and methods of communication with the increase of homelessness to see if there are sufficient levels and means to contact vulnerable people in the time of emergency.
- Engage the vulnerable population to see what information they want to receive and the best means for them to receive the information.

Potential Lead Organization(s)

- Simcoe County and Health Unit

Potential Supporting Organization(s)/Partner(s)

- **City of Orillia**

Current Practice

- The health unit or county might already keep track of vulnerable people

Anticipated Timing

- Medium-term: 2-5 years

Immediate Next Steps

- Explore collaborative approach between lead organization and supporting organizations.

Monitoring Metric

- Resulting partnerships
- Number of people registered for program
- Number of community members contacted during extreme weather events

Action 4) Initiate work to support affordable and resilient housing to reduce potential climate-related displacement and impacts from extreme weather and temperatures.

Action Scope/Details

- It is important that housing for vulnerable populations is included in infrastructure adaptation. Ensuring that people have safe, affordable places to live is part of resiliency and community preparedness.

Supporting Actions

- Work with the SMDHU and other community partners (common roof, lighthouse etc.) to determine best approaches to addressing affordable and resilient housing.
- Adding and/or expanding a resource page to the City's website to promote third party home retrofit funding for low-income households.
- The City is hiring an "affordable housing coordinator" to help address the lack of affordable housing in the City
- The City is exploring the feasibility of programs that would support homeowners with energy efficient home retrofits.

Potential Lead Organization(s)

- Simcoe County – Orillia pays significant funds to the County as the primary provider of affordable housing.

Potential Supporting Organization(s)/Partner(s)

- SMDHU
- Light House
- Common Roof
- City – Planning department

Current Practice

- Currently the local non-profits and the County provide safe, affordable housing however the demand exceeds the supply.
- SMDHU has resources on affordable housing and the health impacts of homelessness.
- Staff are exploring updates to the Affordable Action Housing Plan to incorporate people displaced as a result of climate change.

Anticipated Timing

- Already in place.
- Medium-term: 2-5 years

Immediate Next Steps

- Identify liaison to bridge gap between community partners and City of Orillia.

Monitoring Metric

- Number of affordable units built or secured
- Yearly shelter attendance

Action 5) Continue to offer heating and cooling centre programming and interventions (e.g., community splash pads, access to pools, etc.).

Action Scope/Details

- The City currently offers cooling and heating centres for the community during extreme events**.** The City will continue to do this to address needs.

Supporting Actions

- Partner with other community organizations that offer emergency services to promote the City centers.
- Identify alternative methods to traditional cooling centres (i.e.**,** temporary use hotel rooms with A/C).
- Explore opportunities purchase additional waterfront lands - there is great need for publicly owned waterfront.
- Explore potential barriers (i.e.**,** lack of transportation) that allows people to access cooling centres.

- Explore potential to collaborate with organizations like Helping Hands to provide the transportation needed in emergency situations OR free bus service on high heat days?

Potential Lead Organization(s)
- City of Orillia

Potential Supporting Organization(s)/Partner(s)
- Helping Hands and other local non-profits
- SMDHU
- City of Orillia Transit Advisory Committee

Current Practice
- Currently the City offers these services however the usage isn't widespread during extreme weather events.

Anticipated Timing
- Already in place
- Short-term: <2 years

Immediate Next Steps
- Creation and distribution of communications materials

Monitoring Metric
- Monitor/ track usage of the centres to assess how to improve offerings to the community.

Action 6) Work to consider all users of Orillia's transportation network (e.g., motorists, pedestrians, cyclists, transit users, etc.) in appropriate plans.

Action Scope/Details
- This action focuses on resilience in the active and public transportation factors in the community. It is important that people can mobilize in different ways to reach essential and emergency services.

Supporting Actions

- When the opportunity arises, complete an active transportation study for Orillia.
- Promote active transportation and explore potential for E bike rentals.
- Modernization of service/buses, including EV, may generate an increase in ridership.
- Increased promotion of public transit systems to increase ridership.
- Explore the potential to expand the City's trail networks and bike lanes where feasible.

Potential Lead Organization(s)

- City of Orillia Planning Dept.

Potential Supporting Organization(s)/Partner(s)

- City of Orillia Transit Advisory Committee
- City of Orillia Roads Dept.

Current Practice

- Currently the City offers public transit services however the usage is limited and could be expanded to allow for higher ridership.
- Adding bike lanes as road reconstruction takes place.

Anticipated Timing

- Already in place
- Medium-term: 2-5 years

Immediate Next Steps

- Complete a Fleet Optimization study

Monitoring Metric

- Completion/recommendations of the optimization study
- Transit ridership
- Cycle infrastructure ridership

Action 7) Continue to alter City work schedules to respond to extreme heat events and maintain health and safety as a priority (i.e., task assignments).

Action Scope/Details

- The City currently adjusts work schedules and tasks for outdoor workers (in-house and hired contractors) to account for extreme weather events (hot days, storm days etc.). Health and safety of the workers is priority and will continue to remain a priority at the City.

Supporting Actions

- Keep the Health and Safety plans up to date with latest weather information and best practices for workers

Potential Lead Organization(s)

- City of Orillia (Corporately for each department)

Potential Supporting Organization(s)/Partner(s)

- SMDHU

Current Practice

- In contracts the City specifies that H & S best practices must be followed
- City is bound by legislative requirements but manage workload to the best of staffs' ability.
- Watermain breaks and other emergency services are addressed immediately.
- Encourage staff to take extra breaks and drink lots of water – this is based on current Health and Safety Policy.
- Host regular staff meetings to discuss/plan for high heat days.

Anticipated Timing

- Already in place
- Short-term: <2 years

Immediate Next Steps

- Continue to monitor work schedules and provisions for staff during extreme heat events

Monitoring Metric

- Staff feedback
- Number of extreme heat days/extreme weather events where work was undertaken or postponed
- Number of employees or contractors unable to work due to extreme heat

Action 8) Through partnerships, promote and support community mental health initiatives to reduce anxiety and stress due to climate change, focusing on how to take climate action.

Action Scope/Details

- It is important that the City consider mental health impacts alongside physical health impacts. The mental health impact on residents is equally important.
- The City can play a supportive and collaborative role in promoting existing programs or initiatives run by non-profits and other organizations.

Supporting Actions

- Work closely with SMDHU and other organizations to promote and support climate action and climate-anxiety reducing activities.
- Advocating for mental health support – traditional supports for mental health well being and concerns, strengthen community networks and supports.
- Creating climate cafes, for the community to discuss concerns and actions.

Potential Lead Organization(s)

- SMDHU & City Communications team

Potential Supporting Organization(s)/Partner(s)

- The hospital
- Community health services
- School boards

Current Practice

- Currently the City supports other programs by SMDHU relating to health.

Anticipated Timing

- Begin 2023
- Medium-term: 2-5 years

Immediate Next Steps

- Work with the Health Unit to look at their existing resources and programs and how the City can help.

Monitoring Metric

- Resources downloaded from Orillia and partner websites/social media.

Action 9) Continue to incorporate the "Healthy Community Design: Policy Statements for Official Plans" from the SMDHU as part of Official Plan Updates

Action Scope/Details

- The City has previously listened to the input from the Health Unit for healthy guidelines into the Official Plan.
- These guidelines help in identifying ways that the Official Plan can consider community health on various scales into future strategic growth and initiatives.

Supporting Actions

- Liaise with Health Unit for their latest recommendations.
- Explore opportunities to collaborate with Simcoe County.
- Identify additional staff resources as required.

Potential Lead Organization(s)

- SMDHU

Potential Supporting Organization(s)/Partner(s)

- City - Planning

Current Practice

- Refer to the guidelines from the Health Unit when updating the Official Plan.
- Ongoing discussions with the Climate Change Exchange and Simcoe Muskoka District Health Unit on this topic.

Anticipated Timing

- Begin 2024
- Short-term: <2 years

Immediate Next Steps

- Continued presence/networking with local conservation organizations and municipalities.

Monitoring Metric

- Official Plan amendments related to Healthy Community Design.
- Ongoing work completed as part of Official Plan updates.

Action 10) Promote the work of partner organizations to engage community members to be aware of vector-borne diseases, disease recognition and prevention

Action Scope/Details

- City can play a supportive and collaborative role in promoting existing programs or initiatives run by non-profits and other orgs.
- Collaboration is key to creating resources. Sustainable Orillia can promote materials through websites and activities and events.

Supporting Actions

- Partner with community groups such as hospitals, SMDHU, the province etc. to understand the potential threats from vector-borne diseases and to promote their materials to the public.
- Identify key actions that different community actors can take to prevent the spread of diseases.
- Host educational workshops (lunch & learns) to local businesses to educate on risks and employee well-being for their employees.

Potential Lead Organization(s)

- SMDHU lead role in creating materials
- City – Environment and Infrastructure Services; Communications

Potential Supporting Organization(s)/Partner(s)

- School board, Lakehead**,** and Georgian Colleges

Current Practice

- Currently the SMDHU and the province publish guides and warnings regarding certain items of concern.
- Learn from similar campaigns that have taken place.
- Rama publishes updates on this in local newsletter.
- Conservation Authorities provide educational materials and events (for kids and other groups).
- Education at schools and day camps.

Anticipated Timing

- 2023
- Medium-term: 2-5 years

Immediate Next Steps

- Identify which areas we want to communicate to the public and what actions they can take**.**

Monitoring Metric

- Monitoring promotional materials that are shared, cases of diseases (Lyme disease, ticks etc.)
- Number of lunch and learns organized and the attendance at these events

Theme #2 – Built Environment

Action 11) Complete the Stormwater Management Master Plan (SWMMP) update that includes storm water management measures and vegetation and nutrient management. Explore opportunities to conduct further studies which may include updates for flood protection and water quality management
Action Scope/Details • All the metrics mentioned in the action indicate how the City can protect and make resilient the water infrastructure.
Supporting Actions • Incorporate actions at the water and wastewater treatment facilities to reduce the spread of vector-borne diseases. • Require planning storm infrastructure for 100-year storm events in the new SWMMP.
Potential Lead Organization(s) • City – Environment and Infrastructure Services / Development Services and Engineering
Potential Supporting Organization(s)/Partner(s)
Current Practice • Staff are currently working on an updated SWMMP.
Anticipated Timing • SWMMP will be complete 2023-2024 • Medium-term: 2-5 years
Immediate Next Steps • Complete the SWMMP for Orillia.
Monitoring Metric • Recommendations implemented from SWMMP.

Action 12) Maintain the City's Salt Management Policy to align with emerging environmental practices to reduce contaminated run-off to water systems

Action Scope/Details
- Salt reduction is important to maintain healthy aquatic ecosystems.
- The policy dictates what kind of snow/ice removal methods can be used and where.

Supporting Actions
- Continue to monitor and evaluate best practices.
- Try to quantify the volumes of salt application from the private sector to provide a fulsome view of salt application in the City.
- Explore avenues for policy creation/improvement through Source Water Protection and the Storm Water Management Plan.
- Explore alternative methods of separating salt from the water before it enters the system (i.e., riparian buffers).

Potential Lead Organization(s)
- City - Environment and Infrastructure Services

Potential Supporting Organization(s)/Partner(s)
- Local Business Associations
- Conservation Authorities

Current Practice
- Currently the program aims to reduce harmful impacts to local waterways.
- Salt sand mixture is being calibrated to maintain consistent quantity of salt over road kms.
- Wet application was tried but is not conducive to speeds or Orillia's transportation network.

Anticipated Timing
- Already in place
- Short-term: <2 years

Immediate Next Steps
- Establish benchmarking with other local municipalities.

Monitoring Metric
- A repository of examples from other municipalities.
- Salt used by City Roads dept.

Action 13) Ensure redundancy in critical water treatment infrastructure such as pumps and sanitation equipment

Action Scope/Details

- Ensures that a vital service to the community will remain intact during emergency events.
- Resilient water systems reduce the opportunity of diseases or infections spreading in the case of floods.

Supporting Actions

- Build up the City financial reserve and increase storm rates to invest in stormwater infrastructure.
- Monitor and test critical buildings and equipment frequently.

Potential Lead Organization(s)

- Environment and Infrastructure Services

Potential Supporting Organization(s)/Partner(s)

- Region of Simcoe

Current Practice

- Redundancy in these critical systems is the current practice. Due to requirements from the Ministry of Environment it is vital that critical systems have functioning back up infrastructure such as pumps and sanitation equipment. The City has in place good preparedness procedures and infrastructure in the case of emergencies.

Anticipated Timing

- Already in place
- Short-term: <2 years

Immediate Next Steps

- Ensure that water treatment and sanitary equipment operators include climate projections in decision-making and monitoring.

Monitoring Metric

- Track number of extreme weather events where capacity was challenged.

Action 14) Pursue the incorporation of Low Impact Development (LID) features, green infrastructure, and shading interventions into new development and redevelopment projects

Action Scope/Details

- More green, natural infrastructure helps to reduce surface runoff during heavy precipitation events, which is important to reducing damage to private and public infrastructure.
- Shading interventions help to keep areas and people cool during extreme heat events which reduces risk of injury (heat stroke, violent altercations) and fatalities.

Supporting Actions

- Identify key areas for additional green infrastructure
- Identify key areas for shading / cooling infrastructure
- Create City development policies that support LIDs and green infrastructure
- Work to enforce existing policies on re-development

Potential Lead Organization(s)

- City of Orillia - Planning

Potential Supporting Organization(s)/Partner(s)

- City of Orillia - Environmental and Infrastructure Services

Current Practice

- Evaluate current practice for shading and green spaces in new and re-developments.
- For re-development on waterfront properties the City experiences resistance on its requirement to naturalize 10% of the shore – identify ways to reduce friction and gain community buy-in.

Anticipated Timing

- Begin 2024
- Medium-term: 2-5 years

Immediate Next Steps

- Research into LID opportunities with Orillia's boundaries.

Action 15) Incorporate risks to existing infrastructure and identify how it can be made more resilient to impacts from extreme weather and temperatures into Master Plans and major City projects.

Action Scope/Details

- **The master plans (Stormwater Master Plan, Official Plan, Strategic Plan etc.) are vital tools that the City uses to guide growth and capital investment. They should include considerations for resiliency regarding electricity systems, back-up power, water and wastewater, and emergency services.**

Supporting Actions

- **Identify climate risks and potential risks clearly in the upcoming Master Plans and in Major Projects**
- **Indicate to the community the resilience lens that will be adopted in these plans/projects**
- **Update Parks, Recreation and Culture Master Plan and other softer plans with less stringent requirements – may be an area of focus for change.**
- **Work with consultants and engineers to procure firms that understand climate adaptation and mitigation for incorporation in capital write-ups and procurement processes.**
- **Receive input from City Fire Department on the Fire Master Plan and Emergency Management Plan.**
- **Identify Master Plans that are up for renewal prior to the Official Plan update in 2024.**
- **Improve upon the monitoring section within the Official Plan – more emphasis on climate metrics.**

Potential Lead Organization(s)

- **City of Orillia – Environment and Infrastructure Services/Development Services Engineering**

Potential Supporting Organization(s) Partners(s)

- **City of Orillia – Finance Department**

Current Practice

- **Currently the City does not apply a resilience lens to plans/projects however the lens can be added moving forward with staff and council buy-in.**
- **Climate Adaptation Strategies are now required by the Province in OP updates. – will help to inform new set of policies to recognize and plan for climate adaptation and mitigation (2024 review).**
- **DWQMS and Wastewater QMS are used to assess extreme weather impacts and risks to City drinking water system.**

Anticipated Timing

- **Begin 2024**
- **Medium-term: 2-5 years**

Immediate Next Steps

- **Educate staff on climate risks and opportunities for resilience.**

Monitoring Metric

- **Establishment of resources on City Climate webpage.**

Action 16) Pursue Green Development Standards (GDS) as part of the Official Plan (OP) update, and have those standards include resilient building requirements.

Action Scope/Details

- GDS identifies how new developments can be low-carbon and as in other jurisdictions a GDS can include resiliency measures to reduce risks of flooding, power loss, and be able to withstand extreme weather events.
- Establish GDS for new developments within the City and tie into the Official Plan.

Supporting Actions

- Include GDS precursors into the OP update in 2023-2024.
- Research types of resiliency measures other regions are including in their GDS.
- Research point-based incentives (green incentives) for bidders through Green Procurement.

Potential Lead Organization(s)

- City of Orillia - Planning

Potential Supporting Organization(s)/Partner(s)

- Development Services and Engineering, Environment and Infrastructure Services, Simcoe County?

Current Practice

- The City is currently exploring to include a GDS into the OP when those revisions begin in 2023-2024

Anticipated Timing

- 2024, with the OP review
- Medium-term: 2-5 years

Immediate Next Steps

- Continue to explore opportunities for collaboration and integration of GDS.

Monitoring Metric

- Development 'points' granted through procurement
- Number of GDS policies included in the Official Plan
- Permits granted with GDS inclusions/LEED certified buildings approved

Action 17) Encourage homeowners and landlords to improve the resilience of residential buildings to climate-related risks through upgrades and/or retrofits.

Action Scope/Details

- There is a need for buildings to be more resilient to extreme wind, storms, energy resilient and flood-proof in order to reduce impacts to the population and reduce costs to repair infrastructure.

Supporting Actions

- Identify the most vulnerable areas to climate change impacts and investigate effective ways to protect these areas.
- Work with community partners, homeowners**,** and landlords to prepare buildings and people for climate change from a variety of risks: heat, storms, cold, power outages, etc.
- Promote rainwater and grey water harvesting systems to the general public, emphasizing the ease and benefits of the systems.
- Promote LIDs to create opportunities for infiltration / treatment of heavy rainfall and reduce surface runoff.

Potential Lead Organization(s)

- City of Orillia Communications / Economic Development

Potential Supporting Organization(s)/Partner(s)

- Environment and Infrastructure Services

Current Practice

- Currently the City does not have a building resilience or retrofit program.
- Several grants currently available to homeowners for home energy improvements.

Anticipated Timing

- Begin 2023-2024
- Medium-term: 2-5 years

Immediate Next Steps

- Promote existing programs (i.e., SaveON Energy, IESO, Enbridge Home Winterproofing, etc.) through City website and include a “best-practice” scan for regional practices.

Monitoring Metric

- Establishment of web resources.
- Number of retrofits installed
- Website analytics: site visits, downloads, etc.
- Number of events or meetings hosted with homeowners and landlords

Theme #3 – Natural Environment

Action 18) Continue to manage natural areas within the City.

Action Scope/Details

- The City currently maintains parks and the Couchiching Conservancy maintains Scout Valley. Couchiching Conservancy also maintains the Grant Wetland Natural Reserve. Both parties work to maintain and preserve the existing flora within their jurisdictions.
- Preserving natural areas contributes to resiliency.

Supporting Actions

- Examine City policies to establish natural buffer areas along water bodies where warranted.
- Create a strong natural asset inventory that highly values existing natural features (trees, water bodies, marshes etc.).
- Partner with community groups for initiatives such as tree planting and protecting natural elements.
- Educate the community on value of natural areas through expansion of interpretive signage regarding local habitats, wetland preservation, etc.
- Increase native plant species and shifting towards planting more resilient flora to accommodate future climate needs.

Potential Lead Organization(s)

- City of Orillia – Environment and Infrastructure Services

Potential Supporting Organization(s)/Partner(s)

- Couchiching Conservancy
- Sustainable Orillia
- Environmental Advisory Committee

Current Practice

- Currently the City maintains its natural green spaces and uses interpretive signage on trail networks for wayfinding.
- The City is acquiring additional woodlots (to remain as woodlots) in West Orillia.
- Completion of a tree health inventory for City-owned woodlots.
- Old railbed regeneration (wildlife corridors).

Anticipated Timing

- 2023
- Short-term: <2 years

Immediate Next Steps

- Explore potential funding through Natural Infrastructure funds (federal)

Monitoring Metric

- Expansion of green space
- Signage installed and in what spaces
- Tree coverage increased
- Native species planted
- Kilometres of railbed regenerated

Action 19) Work with local partners to enhance ecosystem function through more biodiverse planting, promoting native species and tree planting and preservation.

Action Scope/Details

- Increase in diversity and the quantity of native, resilient plants that are planted is required.
- Increasing shading and reducing water runoff on properties.
- Developing planting and inspection plan as well as an assessment on impacts on the viewscape.

Supporting Actions

- Explore establishing or strengthening a tree policy that includes best practices.
- Increase collaboration with community partners to plant more native species off city property.
- Leverage Orillia's endorsement as a certified "Bee City" to support increased plantings.
- Increase education to community on benefits of trees for health, climate change and environment.
- Investigate implementation of a policy for urban planning, new developments that looks to enhance natural assets and ecosystem function.
- Collaborate with the LSRCA on communicating the economic benefits of green space.
- Establish a local native plant nursery at Lakehead Farm.
- Increase the number of "no mow zones" (naturalization zones) around the City.

Potential Lead Organization(s)

- Sustainable Orillia

Potential Supporting Organization(s)/Partner(s)

- Bee City
- Bird friendly Orillia
- Orillia Horticultural Society
- Green Orillia
- SMDHU
- Orillia Naturalist club

- Couchiching Conservancy
- Orillia Seed Library

Current Practice

- Currently the City runs a tree planting program with public funds to plant trees around the community and runs a garden program for its public parks. The tree program is annually reported (can be shared with the group if they please).
- Redevelopment / new development on the shoreline triggers need to plant 10% native species on the shoreline.

Anticipated Timing

- Already in place
- Short-term: <2 years

Immediate Next Steps

- Sustainable Orillia can lead: Increase communication around the national climate league data and highlight tree cover.

Monitoring Metric

- Number of new plantings.
- Monitoring growth of tree canopy in the City
- Tree canopy assessment – consider aerial

Action 20) The City will continue to promote community planting initiatives and continue to run the City-funded tree planting program to support the urban canopy.

Action Scope/Details

- Currently the City runs a tree planting program with public funds to plant trees around the community.
- This is an important step in increasing shading and reducing water runoff on properties. This project aims to grow the urban tree canopy**.**

Supporting Actions

- Explore establishing or strengthening a tree policy that incorporates best practices.
- Grow community interest in planting more trees.
- Potential to collaborate with post-secondary institutions to hire summer students for tree inventory updates.

Potential Lead Organization(s)

- City of Orillia

Potential Supporting Organization(s)/Partner(s)

- Environmental Advisory Committee (EAC)

Current Practice

- The tree program is annually reported (can be shared with the group if they please). For the past four years (2016 – 2020) the number of trees planted annually is less than 70.
- The program is overseen by EAC.
- Promotion of community tree plantings (past) but very little uptake.
- City has a contract to replace dead trees.
- Past GIS exercise to acquire green asset information.

Anticipated Timing

- Already in place
- long-term, 5+ years

Immediate Next Steps

- Update natural/green asset inventory.

Monitoring Metric

- Completed inventory.

Action 21) Encourage residents and businesses to reduce or eliminate chemical fertilizers in Orillia to reduce runoff to the lakes and streams.

Action Scope/Details

- Reducing the harmful chemicals that enter the waterway will protect the existing green and blue spaces in Orillia from algal blooms and water quality deterioration.
- The City does not have the jurisdiction to ban pesticides and fertilizers within the boundaries and there is a lot of use of these in the surrounding communities which run-off into Orillia. However, the City can encourage and educate residents on the harmful effects of these products.

Supporting Actions

- Increased use of Riparian Buffers to mitigate harmful runoff from surrounding lands into Orillia's catchment areas.
- Re-vegetate shoreline of lakes and streams (stop mowing grass to the edge of the waterline).
- Expand City tree planting program to include native planting that encompass more than just TREE planting.
- Enhance education about the Waste Diversion Site location to alleviate misperceptions around its proximity to the lake.

Potential Lead Organization(s)
- Environment and Infrastructure Services / Communications

Potential Supporting Organization(s)/Partner(s)
- Couchiching Conservancy
- LSRCA
- community groups
- Agricultural associations

Current Practice
- Currently the City has a pesticide bylaw, which includes fungicides, insecticides**,** and herbicides.

Anticipated Timing
- Already in place
- Medium-term: 2-5 years

Immediate Next Steps
- Explore opportunities for the LSRCA to provide public education opportunities for the community even though the City remains independent from the CA.

Monitoring Metric
- Nutrient monitoring in local water bodies
- Riparian areas reclaimed/revegetation

Action 22) Work with appropriate partners to make monitoring information regarding nutrients and algal blooms in lakes Simcoe and Couchiching accessible to the public.

Action Scope/Details
- Comprehensive data monitoring made accessible to the public can increase the public's awareness of water quality and potential risks. This information, when tied to clear action messages can increase protective behaviours and reduce risks. It may also increase awareness of how climate change is impacting the community.

Supporting Actions
- Identify indicators to monitoring nutrient and algal blooms in Lake Simcoe and Couchiching
- Identify appropriate partners
- Identify appropriate methods to communicate/ make accessible the monitoring data to the public.
    - Identify data appropriate to the public
    - Identify key messages to connect to data

- Establish data sharing agreements / processes
- Establish communication platform to inform the public
- Pilot test and revise the platform

Potential Lead Organization(s)

- Environment and Infrastructure Services/ Communications

Potential Supporting Organization(s)/Partner(s)

- SMDHU
- Conservation Authorities

Current Practice

- Conduct beach sampling for blue-green algae and overall safety of water.
- The city currently monitors certain factors relating to water treatment and wastewater.

Anticipated Timing

- Medium-term: 2-5 years

Immediate Next Steps

- Identify and reach out to appropriate partners. Establish working group. Identify indicators processes etc.

Monitoring Metric

- Qualitative indicators to capture perceived usefulness of products, indicators, key messages/ level of satisfaction by intended users. Indicators will depend on product developed.

Action 23) Educate and promote backyard produce growing, community gardens, and shared garden allotments.

Action Scope/Details

- Work with community partners, community gardens and local growers to educate and create spaces for more growing.

Supporting Actions

- Enhance education/communication about community garden initiatives within the City.
- Identify potential to designate open spaces for larger community gardens.
- Develop an urban agriculture plan/strategy.
- Explore collaboration opportunities with Sustainable Orillia and Rotary Club regarding youth-oriented sustainable practice and container gardens.

Potential Lead Organization(s)

- Sustainable Orillia

Potential Supporting Organization(s)/Partner(s)

- City – Communications

Current Practice

- The City currently has several community gardens and other non-profits have their own.
- Sustainable Orillia reports to the National Climate League on behalf of the City.
- Presently ~20 food-growing initiatives in the community not including people growing on their balconies or backyards.
- Backyard hens' program (eggs) presently includes 12 properties within the City.

Anticipated Timing

- Long-term: 5+ years

Immediate Next Steps

- Explore potential expansion of current practices.

Monitoring Metric

- Track number of gardens within the City
- Attendance at community events or youth events, etc.

Theme #4 – Energy and Economy

Action 24) Explore opportunities to strengthen the local food supply value chain by making it easier for agricultural producers to sell to retailers and restaurants through new platforms, education, sharing of best practices, etc.

Action Scope/Details

- This action will provide resiliency in the local food chain and will increase consumption of local food which benefits farmers and ancillary businesses, while increasing food security.

Supporting Actions

- Partner with the Lakehead Farm to investigate how the community can regenerate ecosystems while sustainably feeding the community.
- Explore opportunities to increase resiliency of warehouses and transportation of food during hot days, to reduce food spoilage/waste during electricity outages.
- Include Orillia Farmers Market into the conversation.
- Rama First Nation community farm.
- Develop Community shared agriculture program to help farmers find buyers/share holders.

Potential Lead Organization(s)

- City - Food Advisory Committee

Potential Supporting Organization(s)/Partner(s)

- City - Economic Development
- Orillia Farmer's Market and Orillia Fairgrounds Farmer's Market
- Rama First Nation community garden
- Sustainable Orillia Agriculture Team

Current Practice

- Sustainable Orillia's Sustainable Agriculture and Natural Environment Sector has recently published the third in a series of Food Maps - this one focuses on where local product from farmers and ranchers can be bought. there is a QR code we use to provide direct access to the map.

Anticipated Timing

- Begin discussion in 2023
- Medium-term: 2-5 years

Immediate Next Steps

- Start conversations with the Food Advisory Committee.
- Have focus group with the potential supporting organizations and the Economic Development team.

Monitoring Metric

- Number of farmers/farms engaged with
- Development of community agriculture program

Action 25) Explore opportunities for decentralized energy generation, storage, and distribution.

Action Scope/Details

- Decentralized energy generation, storage**,** and distribution permits energy resiliency in the case of power outages or grid damage, due to extreme weather events. As extreme weather events become more common it will be increasingly important for buildings and communities to have their own reliable power supply to adapt to grid outages.

Supporting Actions

- Evaluate possible locations for generation, storage**,** and distribution.
- Partner with community groups who may be interested in piloting such systems.
- Identify key locations (such as hospitals, community housing, emergency services) that would benefit the most from decentralized systems.
- Learn from other organizations/ jurisdictions that are piloting such systems.
- Partner with key stakeholders to develop a solar energy and storage strategy, including microgrids.

Potential Lead Organization(s)

- City of Orillia – Development Services and Engineering

Potential Supporting Organization(s)/Partner(s)

- Sustainable Orillia

Current Practice

- Currently City buildings have back up diesel generators just for critical facilities. These generators only feed the buildings they are located in and cannot provide energy to the grid or neighbouring buildings.

Anticipated Timing
- 2030
- Long-term (5+ years)

Immediate Next Steps
- Staff to explore SPEEDIER (micro grid) initiative in Parry Sound.
- Identify community partners

Monitoring Metric
- Set up of decentralized energy systems.

Action 26) Ensure all municipal-owned facilities providing critical services (i.e., water and wastewater systems, fire stations, evacuation centre etc.) have reliable back-up power systems in place.

Action Scope/Details
- It is important to have a large, easy to access evacuation center (ORC) in case of emergency
- The water and wastewater systems need to be able to function during emergency events such as power outages or severe storms to provide vital services to the community.

Supporting Actions
- Create strong emergency protocols for maintenance of critical City infrastructure in extreme events.
- Explore viability of solar carports and/or transit shelter solar to become more resilient.
- Upgrade old pump stations factoring in, physical space constraints.

Potential Lead Organization(s)
- City of Orillia - Environment and Infrastructure Services

Potential Supporting Organization(s)/Partner(s)
- City of Orillia - Development Services and Engineering

Current Practice
- Redundancy in these buildings is the current practice and these facilities are maintained regularly to provide emergency services should the need arise.
- If opportunities or new requirements arise to improve the resiliency of these facilities, the City acts to implement them at the earliest possible time.

- The City's emergency management team regularly evaluates the preparedness of the facilities to face emergencies.
- The fire stations (which are city-operated) have back up systems to keep the stations operable in case of emergencies.

Anticipated Timing

- Already in place
- Short-term (<2 years)

Immediate Next Steps

- Continue to monitor advancing technologies to improve existing service.

Monitoring Metric

- Assess viability of electric backup vs less GHG friendly sources of backup power.

Action 27) Assess new opportunities to promote "climate resilient" tourism activities as seasonal conditions change.

Action Scope/Details

- Orillia's tourist industry is a significant economic driver with key seasons being summer and winter. As the seasonal weather changes the tourist industry will have to adapt to new opportunities and challenges. For example, warmer winters means less snow-related activities such as snowshoeing, skiing, etc. therefore more activities should be offered in the fall/ spring to make up for the loss of the winter tourism that Orillia will see.

Supporting Actions

- Work to educate businesses/organizations on the predicted climate changes and their potential risks. Develop actions that those organizations can follow to be prepared for the new seasonal challenges.
- Potential collaboration with surrounding area tourism agencies with a focus on local tourism, local food supply, products, etc.
- Increase the offering of "all-season" activities that can attract tourists.

Potential Lead Organization(s)

- City of Orillia - Economic Development

Potential Supporting Organization(s)/Partner(s)

- City of Orillia – Environment and Infrastructure Services
- Business Improvement Associations

Current Practice

- Economic Development is exploring collaboration opportunities.
- The City is starting to consider and grow “off- or all-season” activities to enhance the resilience and strength of the local tourism offerings.

Anticipated Timing

- Medium-term (2-5 years)

Immediate Next Steps

- Explore opportunities to promote sustainable tourism (i.e., Agrotourism). Standards should be adopted for “ecotourism.”

Monitoring Metric

- Number of businesses engaged.

Appendix B: Risk and Vulnerability Assessment Outcomes

Impact ID	Impact	Vulnerability Ranking	Likelihood (/5)	Social Risk Score (/100)	Economic Risk Score (/100)	Environmental Risk Score (/100)	Total Risk Score (/300)	Overall Risk Ranking
1	Extreme events back-to-back (i.e., extreme windstorms followed by extreme thunderstorms) causing reduced ability for the natural environment (plants, animals, ecosystems) to cope, resulting in an increase of invasive species due to death of native wildlife populations.	High	3	33	30	45	108	**Medium-Low**
2	Increase in the frequency/intensity of extreme weather events resulting in higher mental & physical health implications for residents (from hazardous conditions, power outages, unsafe food safety practices, etc.).	High	4	48	60	48	156	**Medium**
3	Increased frequency/intensity of extreme weather events leading to hazardous conditions, power outages, damage to homes/assets, etc. resulting in disproportionately higher health and safety impacts to vulnerable populations (i.e., older adults, those with pre-existing health conditions, individuals with constrained access to social and economic resources, populations unable to control power such as renters and children, etc.)	High	4	60	60	48	168	**Medium-High**
4	Increase in average annual temperatures and hot days over 30 °C leading to an increased use of beaches & outdoor recreational areas resulting in more maintenance requirements of outdoor spaces.	High	5	30	35	40	105	**Medium-Low**
5	Increase in average annual temperatures and hot days over 30 °C causing more algal blooms and elevated lake bacteria levels, resulting in decreased water quality, drinking water, and beach closures (i.e., impacts to tourism).	High	4	36	48	40	124	**Medium**
6	Increase in intensity and frequency of precipitation events causing overburdened water & wastewater treatment plants, leading to lower water quality (in lakes, drinking water, etc.)	High	1	10	14	8	32	**Very Low**

7	Increase in intensity and frequency of precipitation events leading to increased flooding and damage to wetlands, causing increased rates of mortality in aquatic wildlife and/or replacement by aggressive invasive species.	High	3	21	24	42	87	**Medium-Low**
8	Increase in intensity and frequency of precipitation events leading to flooding/washouts of agricultural lands, causing crop damage.	High	4	36	44	40	120	**Medium-Low**
9	Increased frequency/intensity of extreme weather events leading to more frequent vehicle accidents and more legal and financial implications for the City (i.e., higher insurance premiums, claims against the City, etc.)	Medium	5	35	30	20	85	**Low**
10	Increase in average annual temperatures and hot days over 30 °C leading to stress on transformers and HVAC systems causing greater energy consumption, cost, maintenance, and reduced lifespans.	Medium	5	40	50	25	115	**Medium-Low**
11	Warmer summer temperatures causing an increase in water demand & stress to water treatment plants, leading to deterioration of infrastructure or inability of the system to meet demand (i.e., residents, parks, natural assets, etc.)	Medium	3	33	39	27	99	**Medium-Low**
12	Increase in the frequency/intensity of extreme weather & back-to-back events causing severe damage/mass system failures of life safety systems such as electricity, water, sanitary systems.	High	4	52	68	56	176	**Medium-High**
13	Increase in the frequency/intensity of extreme weather events causing increased damage to electrical infrastructure, resulting in more power outages (brownouts, blackouts) & service disruptions (business, flow of goods/services, etc.)	High	4	52	52	16	120	**Medium-Low**
14	Increased extreme weather events will create unsafe road and travel conditions, resulting in disruptions to transportation (active & vehicular), emergency services, and other essential services (i.e., food systems, medical care/hospitals, airports, etc.)	High	4	44	36	44	124	**Medium**
15	Increase in average annual temperatures and hot days over 30 °C causing higher tree, flora, marine, and overall wildlife mortality leading to disrupted/damaged ecosystems & disrupted food production (i.e., water cycle impacts, pollinator impacts, algal blooms leading to fish mortality, etc.)	High	4	32	40	64	136	**Medium**

16	Increase in summer temperatures and hot days over 30 °C causing heatwaves leading to health and safety risks such as domestic violence/violent altercations, cardiovascular disorders, heat stress, food-borne/water-borne illnesses, etc. to vulnerable populations (i.e. seniors, women, children, those with chronic physical or mental health conditions, temporary migrant workers, those without AC, etc.)	High	5	65	35	60	160	**Medium-High**
17	Increase in the frequency and intensity of precipitation events causing increased runoff from agriculture leading to decreased water quality from algal blooms (affecting drinking water quality, beach water quality, etc.).	High	2	20	20	16	56	**Low**
18	Increased frequency and intensity of freezing rain mixed with snowfall resulting in more hazardous road/ sidewalk/ parking lot conditions, leading to more stress & damage to infrastructure and difficulty employing emergency protocols and conducting maintenance (i.e., watermain breaks, shorter lifespan, cracks/potholes, concrete corrosion, etc.).	High	5	45	65	35	145	**Medium**
19	Increased frequency and intensity of freezing rain mixed with snowfall leading to increased salt use, causing decreased water quality in Lake Simcoe and Lake Couchiching (for wildlife, drinking water quality).	High	3	15	18	45	78	**Low**
20	Increased frequency/intensity of extreme weather events leading to increased damage to City-owned assets and infrastructure (i.e., buildings, signs, streetlights, roads, etc.) resulting in relocation/redevelopment of assets and infrastructure.	Medium	3	15	39	12	66	**Low**
21	Increase in hot days over 30 °C leading to heat stress on outdoor workers (i.e., city staff, agriculture, and construction workers, etc.), those who use active transportation for mobility, and outdoor recreational activities (i.e.: watersports, hikers, etc.).	Medium	4	52	28	48	128	**Medium**
22	Increase in intensity and frequency of precipitation events leading to flooding and damage to public recreational areas (i.e., parks, trails, ball diamonds, soccer fields, etc.) and increased maintenance requirements.	Medium	3	21	39	18	78	**Low**
23	Extreme heat paired with severe thunderstorms leading to increased damage to natural systems, resulting in a	High	4	32	48	60	140	**Medium**

	decreased ability for the natural systems to provide ecosystem services (i.e., reduced shading from extreme heat, landscape more vulnerable to flooding, depleted aquifer recharge abilities, reduced air quality from tree decline, etc.)							
24	Increase in the frequency/intensity of extreme weather events resulting in loss of natural features (flora/fauna mortality, closures of parks, trails, green spaces etc.) and seasonal traditions (i.e., backyard rinks, decreased intensity of fall colours) leading to a loss of interaction with the natural world.	High	4	48	36	60	144	**Medium**
25	Increase in summer temperatures and hot days over 30 °C leading to increased risk of wildfires, resulting in physical health impacts from lower air quality & mental health impacts on those that are displaced.	High	2	24	16	22	62	**Low**
26	Warmer winters leading to decreased winter tourism and recreation opportunities (i.e., skiing, skating, snowmobiling, ice fishing etc.)	High	4	44	36	28	108	**Medium-Low**
27	Increase in hot days over 30 °C leading to increased damage to crops, flora and the natural ecosystem, resulting in disruptions in the natural food chain, food insecurity, and impacts to the livelihood of farmers & ancillary businesses.	High	4	56	44	36	136	**Medium**
28	Increased frequency and intensity of precipitation events & warmer shoulder seasons resulting in increased standing water on City-owned property & higher pest/insect survival rates, resulting in an increased risk and spread of vector-borne diseases (i.e., West Nile, Lyme Disease) & new/emerging threats.	High	4	44	40	28	112	**Medium**
29	Increase in the frequency and intensity of precipitation events causing increased flooding, resulting in damage of private assets and infrastructure (i.e., homes, businesses, property, products/inventory, etc.)	High	4	36	48	28	112	**Medium**
30	Increase in the frequency and intensity of precipitation events causing increased flooding, resulting in more displacement or evacuation of residents from homes, physical injuries, and mental health impacts/stress.	High	4	64	64	52	180	**Medium-High**
31	Shifting precipitation patterns and increased dry days causing an increased demand for water (for landscaping, drinking,	High	2	16	18	28	62	**Low**

	irrigation, etc.) leading to water stress/shortage on natural systems.							
32	Increased frequency/intensity of extreme weather events leading to increased damage of City-owned assets and infrastructure (i.e., trees, signs, streetlights, buildings, roads, etc.), leading to increased threats to health and safety for outdoor workers.	Medium	3	36	45	24	105	**Medium-Low**
33	Increase in average annual temperatures and hot days over 30 °C resulting in increased stress & damage to roads, culverts, sidewalks, trails, and parking lots.	Medium	3	24	33	15	72	**Low**

Appendix 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 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
CCAP – Community 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

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