KINGSTON

Climate CHANGE Adaptation Plan

Land Acknowledgement

We acknowledge that the City of Kingston is located on the traditional homeland of the Anishinaabe, Haudenosaunee and the Huron-Wendat, and we thank these nations for their care and stewardship over this shared land.

Fostering a strong connection with the land, waters and all living things is an essential component of building a resilient community.

We are deeply grateful to have the guidance of Indigenous voices embedded within the Climate Change Adaptation Working Group. The profound understanding of, and care for, our ecological systems is fundamental to our climate work. We extend our sincere thanks to these members for their engagement, and for the knowledge shared throughout the development of the plan.

In this plan, and in all work done by the City of Kingston, we are committed to working with Indigenous Peoples and all residents to pursue a united path of reconciliation. Together, we can work towards a sustainable future for generations to come.

Climate Change Adaptation Plan

Executive Summary

Like many communities across Canada, Kingston is beginning to experience the effects of a changing climate—through events such as flooding, heatwaves, shifting freeze-thaw cycles, and periods of poor air quality. Looking ahead, trends like rising temperatures, increased precipitation, and more frequent extreme weather are expected to shape the city's future. In response, and with a focus on supporting all residents equitably, the City of Kingston has developed a comprehensive Climate Change Adaptation Plan to build local resilience and safeguard the health, infrastructure, and services that support daily life.

Developed through a collaborative process guided by ICLEI Canada's Building Adaptive and Resilient Communities (BARC) framework, the plan reflects local knowledge, community input, and climate science. A diverse working group and regular public engagement helped shape 28 strategies to strengthen resilience across Kingston's infrastructure, ecosystems, and social systems—addressing both municipal operations and broader community needs. Key priorities include improving the resilience of homes and infrastructure, supporting frontline populations and local food systems, expanding nature-based solutions, enhancing emergency communications, and strengthening energy systems. Each strategy is designed not only to reduce risks but also to deliver co-benefits—such as improved health and wellbeing, greater operational efficiency, enhanced biodiversity, and alignment with Kingston's Climate Leadership Plan and broader mitigation goals.

The plan outlines priority climate impacts, adaptation strategies, and implementation details, including indicators to guide and evaluate progress. It emphasizes shared responsibility and forward-thinking governance. Implementation will be a collaborative effort, carried out in partnership by City departments, utilities, public health agencies, Indigenous and equity-deserving groups, and community organizations. Progress will be measured through process- and outcome-based indicators, with annual public reporting and a formal review every five years to ensure the plan remains responsive to new data, lived experience, and evolving conditions.

Above all, this plan affirms Kingston's commitment to inclusive, community-driven climate action—protecting what matters most and building a safe, thriving future for all.

Acknowledgements

This Plan reflects the hard work, dedication, and collaboration of many individuals and organizations.

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Our sincere appreciation extends to the numerous members of the Climate Change Adaptation Working Group. Your invaluable contributions of time, expert knowledge, and thoughtful insights have played a pivotal role in the development of this Plan.

It is through your dedicated involvement that we have ensured that the Plan embodies a shared vision poised to benefit Kingston for many years ahead.

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Community Contributions

We are grateful to Kingston's residents, businesses, and community organizations for participating in surveys and in-person discussions, providing the insights that shaped this Plan's goals and actions.

Introduction*

Kingston is located at the east end of Lake Ontario and characterized by urban lands abutting Lake Ontario, the St. Lawrence River and the Great Cataraqui River, and rural areas comprised of inland lakes and a variety of natural heritage features and resources.

The fluidity of space and occupancy of the Kingston region is very complex and multi-faceted. The area, originally known by the First Nations Haudenosaunee Peoples as Katarokwi (now Kingston), has historically been shared with Anishinaabe First Nations groups for gathering, camping and trading.

Kingston is known for its rich and diverse heritage as a military, trading, commercial, and penal centre. It is the home of Queen's University (1841) and the Royal Military College of Canada (1874). Kingston's economy and development are influenced by its proximity to Toronto, Montreal, Ottawa, and the United States. Kingston now serves as the commercial and institutional focus for the wider region of eastern Ontario. The growing population continues to represent diverse cultural, language and faith-based identities, while Kingston's substantial scenic, historic and leisure assets attract tourists from around the world.

The Growing Challenge of Climate Change

Climate change is an increasingly critical issue in Canada and has been felt in cities and towns across the country. Recent events, including intense heat waves, wildfires and ice storms have highlighted the need for communities to be prepared for ongoing climate impacts.

The City of Kingston is already experiencing the impacts of climate change. The region has faced a range of significant climatic events including extended periods of poor air quality due to unprecedented wildfires across the country in 2023; powerful storms causing flooding, power outages and hazardous travel conditions in 2017, 2018, 2019 and 2023; a heatwave in 2018 that sent 13 people to Kingston General Hospital due to heat stroke and heat exhaustion and an ice storm in March 2025 that caused widespread power outages, significant damage, and a prolonged cleanup effort across the region. These events have had significant effects on the infrastructure, economy, and daily lives of the residents, as well as on Kingston's natural environment, emphasizing the necessity to anticipate and plan for ongoing challenges, especially as the climate continues to change in the coming decades.

* Sources for this section can be found on page 86.

To support informed decision-making and planning, past climate trends and future climate projections for Kingston were assessed. This climate data informs what kind of climate change impacts are expected to occur across the community and surrounding area over the next century. The following bullets outline Kingson's climate trends and projections:

- **Temperature:** Significant warming across all seasons is expected, along with increase in the frequency of days above 30°C and a decline in days below -15°C.
- **Precipitation:** Precipitation events in general are expected to become more intense. Annual precipitation is expected to increase, with winter and spring projected to become significantly wetter.
- **Growing season:** First frost dates will be later in the year and last frost dates will be earlier, contributing to a longer growing season.
- **Freeze Thaw Days:** Although freeze-thaw cycles are projected to decrease overall due to warmer temperatures, feedback provided by this plan's project working group underscored that Kingston has been experiencing a higher frequency of freeze-thaw cycles in the shoulder seasons than in previous years.

Projections in this report are focused on temperature, precipitation, agricultural indices, freshwater indices, and extreme weather (e.g. freezing rain). A more complete graphic breakdown of these results is included within the Climate Science Infographic in Appendix B.

To address the impacts of our changing climate and adapt accordingly, the City of Kingston is developing a Climate Change Adaptation Plan (CCAP). Whereas Kingston is also advancing work to reduce greenhouse gas emissions, this Climate Change Adaptation Plan focuses on preparing for the impacts of climate change already underway and projected to occur. The City is following ICLEI Canada's Building Adaptive and Resilient Communities (BARC) framework, which provides a structured approach to adaptation planning. The CCAP was completed between February 2023 and July 2025, and includes the completion of Milestones One, Two, and Three of the BARC Program.

What Causes Climate Change

Climate change refers to the long-term changes in global weather patterns that result from the build-up of heat trapping greenhouse gases (GHGs) in our atmosphere. The greenhouse effect is the process through which heat is trapped near the Earth's surface by GHGs. The greenhouse effect is essential to life on Earth but the rapid increase of GHGs being released to the atmosphere from human activity since the industrial revolution has increased the concentration of carbon dioxide in the atmosphere by nearly 50% since 1750.

Since the late 1800s, the Earth's temperature has risen by 1.1°C, largely due to human activities. As fossil fuel extraction and consumption continue around the world, warming is accelerating at a faster rate. Earth's average surface temperature in 2024 was confirmed as the warmest year on record since record-keeping began in the 1880s. The ten warmest years on record have all occurred in the last decade (2015-2024) and July 2024 was the Earth's warmest month on record, making it the 14th consecutive record-warm month.

Similar to global trends, Canada has been warming over the last six decades, with annual average surface air temperatures over land warming by 2.0°C since 1948, and even greater increases observed in the North and northern parts of the Prairies, Ontario, Quebec, and British Columbia. 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, resulting in over 600 heat-related deaths.

Canada has also generally become wetter over the past several decades, with average annual precipitation across the country increasing by approximately 20% from 1948 to 2012. This increase is dominated by large changes in eastern Manitoba, western and southern Ontario, 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 a 1-in-10-year storm event by the 2050s.

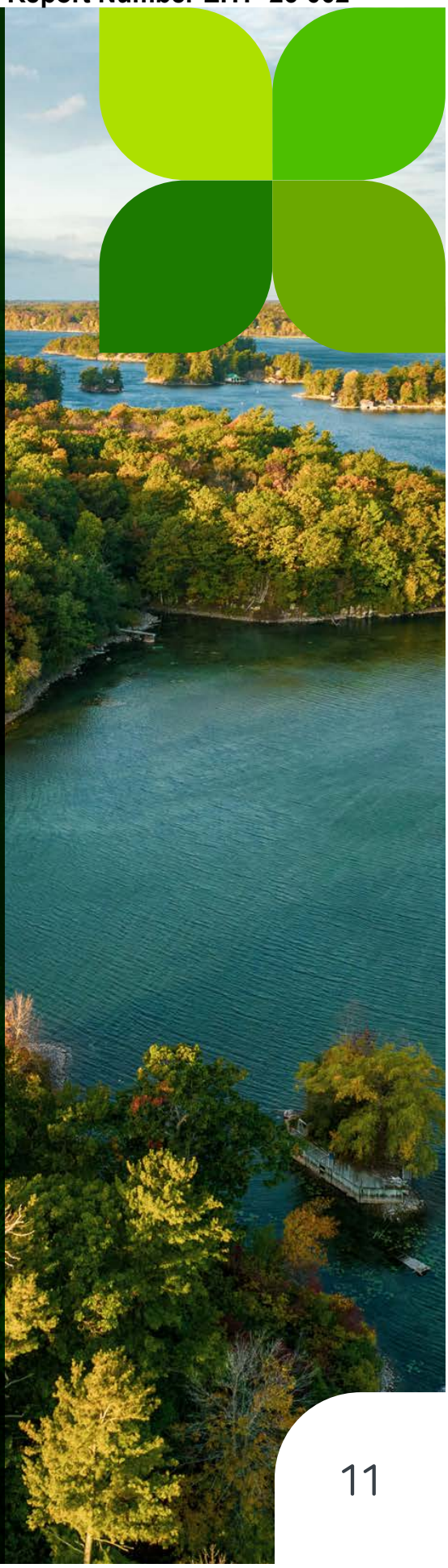
Addressing climate change necessitates a dual approach: minimizing future changes to the climate and adapting to the changes that are already underway.

Adaptation and Mitigation

Two complementary approaches to address climate change at the local level are climate change adaptation and climate change mitigation (see Figure 1 on next page).

Climate Change Adaptation involves measures that help us anticipate, prepare for, and recover from the impacts of climate change. Adaptation examples include maintaining early warning systems, enhancing the resilience of buildings and infrastructure to be able to withstand extreme weather events, restoring natural landscapes that act as buffers, and updating operating & maintenance procedures to reflect changing conditions. This work can also be understood as “managing the unavoidable”.

Climate Change Mitigation involves measures that reduce our GHG emissions and improve energy efficiency. Mitigation examples include conducting energy efficiency retrofits in our buildings, fuel switching away from fossil fuel sources of energy such as natural gas and petroleum, reducing waste and reigning in over-consumption, promoting higher uptake of active transportation, and transitioning to renewable energy sources. Investing in climate mitigation measures not only has the potential to reduce energy consumption costs across the community and improve air quality, it also can reduce the total amount and cost of adaptation work needed in the future. This work can also be understood as “avoiding the unmanageable”.



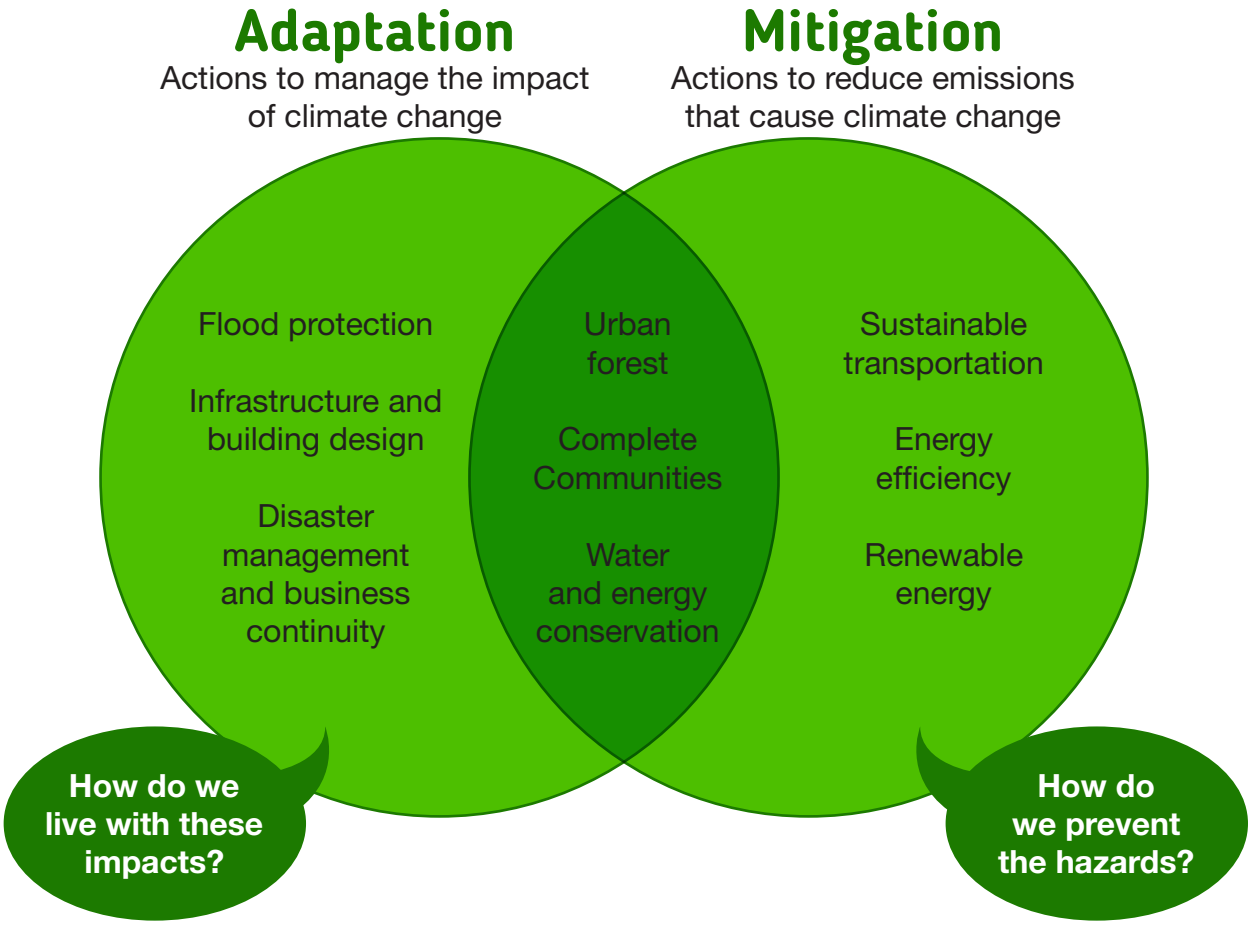


Figure 1: Climate mitigation and adaptation Venn diagram

This plan is focused primarily on climate change adaptation. However, given the wide-ranging effects of climate change impacts, adaptation efforts are designed to work in tandem with Kingston's longstanding work in mitigation. Where possible and appropriate, local governments can apply a low carbon resilience (LCR) lens which integrates adaptation and mitigation through municipal planning and decision-making approaches that reduce GHG emissions and vulnerabilities to the impacts of climate change, and realizes co-benefits of their activities. There are a number of adaptation actions laid out in this plan that have the potential to realize climate mitigation co-benefits.

Climate Change Adaptation Plan

Policy Direction on Adaptation

International

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 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 latest and most pressing findings from the AR6 Report state that even with major reductions of GHG emissions in the short term, 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". In order to limit warming to 1.5°C, global net zero CO2 emissions must be reached by the early 2050s[xii]. Considering this, it is imperative now more than ever that local governments implement comprehensive, effective, and innovative responses between adaptation and mitigation efforts to advance sustainable development and to leverage the mutual benefits these approaches can offer.

Federal

In addition to signing onto the Paris Agreement, the Government of Canada has produced several policy documents that inform and guide decision-makers on climate change adaptation and mitigation. Most recently, Canada's first National Adaptation Strategy was released in June 2023 and outlines a shared path to a more climate-resilient Canada.

This whole-of-society blueprint guides action in Canada to better adapt to and prepare for the impacts of climate change and addresses key climate risks in Canada. It emphasizes the crucial role of local governments in tailoring and implementing climate adaptation measures to address specific local challenges and vulnerabilities. These strategies complement other national strategies that build resilience and reduce greenhouse gas emissions, including Canada's 2030 Emission Reduction Plan, National Housing Strategy, Poverty Reduction Strategy, Canadian Wildland Fire Strategy, the Emergency Management Strategy for Canada, and others. The National Adaptation Strategy was developed over several years with the involvement of provincial, territorial, and municipal governments, Indigenous Peoples, and other key partners.

Provincial

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.

Local

Since 2009, the City of Kingston has been working ambitiously to be Canada's most sustainable city. The City has spent the last decade advancing plans and programs to guide the community towards this goal. The 2014 Climate Action Plan represented a significant first step towards defining community actions to reduce carbon emissions and build resilience in the face of climate change. In 2019, the City of Kingston became the first municipality in Ontario to declare climate change an emergency and released its Strategic Plan which includes goals such as demonstrating leadership on climate action; increasing housing affordability; improving walkability, roads and transportation; strengthening economic development opportunities; and fostering healthy citizens and vibrant spaces. In 2021, the City released its Climate Leadership Plan to assess the impact of programs and actions taken by the City to reduce greenhouse gases, and outline steps that need to be taken to achieve the City's goal of being carbon neutral by 2040. The Plan promotes collaborative action including the City and community partners and provides guidance on opportunities and adaptation measures to make Kingston more resilient to changing climate conditions and extreme weather.

The Role of Local Governments in Climate Action

The National Adaptation Strategy underscores the crucial role of local governments in leading climate action at the local level. While the federal and provincial/territorial levels of government establish broad strategies, standards, and funding frameworks, it is local governments that are responsible for translating them into tailored strategies to fit their unique local contexts and to implement those strategies.

Local governments influence a wide range of critical areas, including but not limited to land use planning, zoning, and building codes, as well as emergency preparedness, disaster response, and transportation. Consequently, municipal governments are uniquely positioned and hold a vested interest in planning and adapting to these changes. Climate change also affects energy use, water and wastewater management, urban forestry, and biodiversity conservation, requiring municipalities to proactively integrate climate action into their policies, regulations, and long-term planning.

Intention of the Plan and Community Scope

The purpose of the Climate Change Adaptation Plan is to continually improve Kingston's resilience to extreme weather and climate change impacts by increasing our local adaptive capacity and decreasing our sensitivity to these changes. This plan emphasizes a collaborative and community-based approach to build climate resilience via meaningful engagement of organizations and residents through the entire planning and implementation process. By involving a wide range of partners and individuals, Kingston has been able to co-develop an adaptation plan that addresses climate risks across multiple sectors and systems.

Vision Statement

Kingston is a resilient city where the community adapts to climate change through collective action. By integrating innovative solutions and forming strong partnerships, we will enhance our well-being and sustainability in the places where we live, work, and play, ensuring a safe and prosperous future for all.

Our Approach

Municipalities across Canada are increasingly recognizing the need to proactively respond to the local impacts of climate change. In Kingston, climate adaptation is essential to ensuring the city's social, environmental, and economic systems can continue to thrive in the face of a changing climate. This plan outlines a coordinated, long-term approach to adaptation that builds on Kingston's previous efforts, while reflecting current realities and future risks. As Kingston continues to advance work to reduce greenhouse gas emissions, this Climate Change Adaptation Plan focuses on preparing for the impacts of climate change already underway and projected to occur.

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

The City of Kingston partnered with ICLEI Canada to guide the development of the Climate Change Adaptation Plan using the Building Adaptive and Resilient Communities (BARC) framework. ICLEI Canada also supported the process through technical guidance, facilitation, engagement, research and analysis.

BARC offers a structured five-milestone approach tailored to support communities in enhancing their preparedness for climate change impacts. It provides a thorough planning process, encompassing collaborator identification and engagement, analysis of historical climate trends and future climate projections, identification of climate impacts, vulnerability and risk assessments, plan formulation, implementation strategies, and methods for ongoing monitoring and evaluation. Designed in Canada, the BARC framework is adaptable to meet the unique needs and contexts of different communities with the overarching aim of safeguarding community residents, assets, and economic well-being. It adopts a systemic perspective on municipal climate adaptation and has been implemented by numerous municipalities across the country. In developing this plan, Kingston has achieved the framework's initial three milestones. Visit **ICLEICanada.org** for more information on the BARC methodology

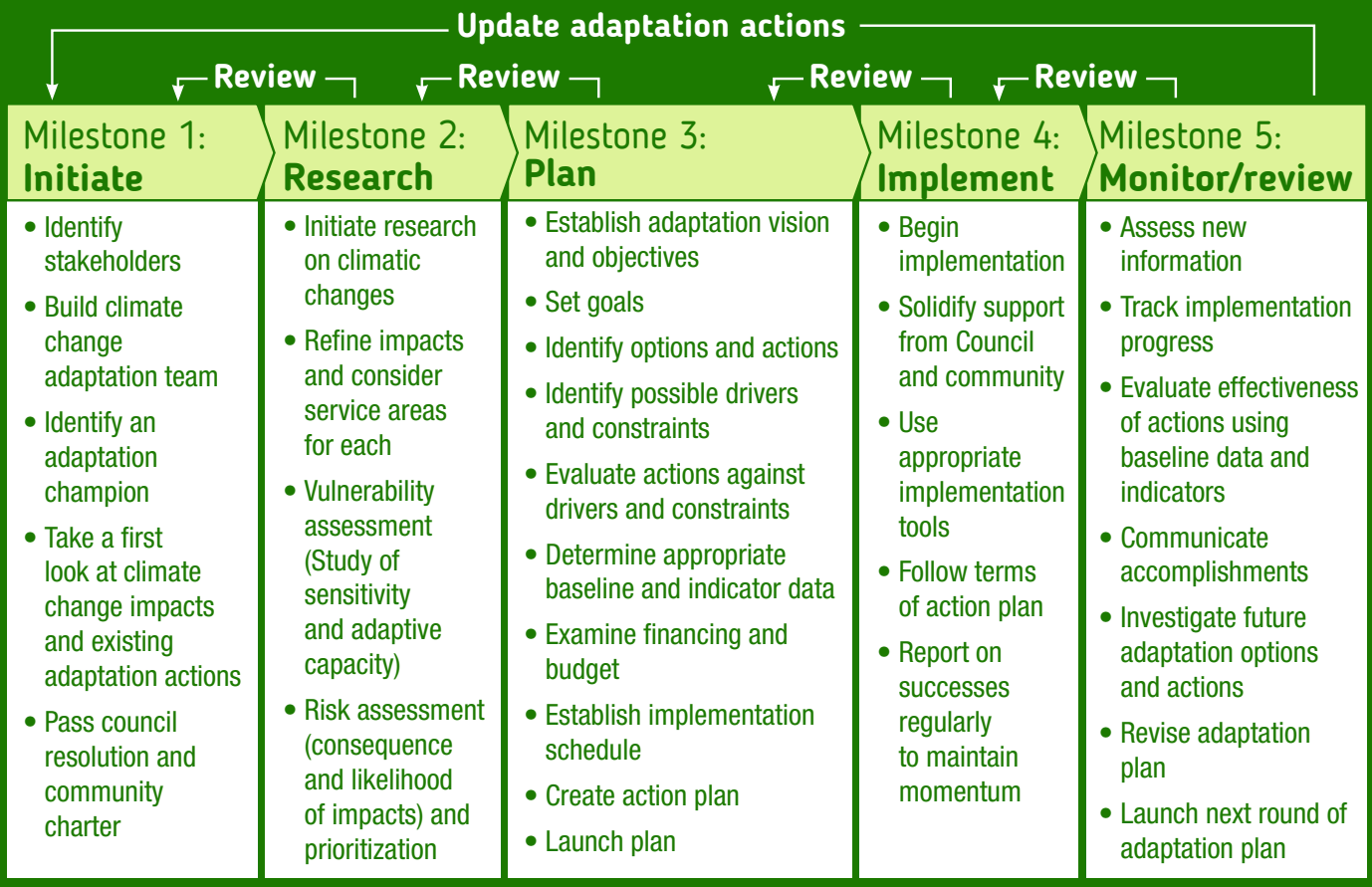


Figure 2: BARC 5-Milestone Framework

MILESTONE 1 - INITIATE

Within this milestone, the community identifies 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 2 - 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 experience these impacts. Within this milestone, a municipality will scope the climate change impacts for the region and conduct both a vulnerability and risk assessment.

MILESTONE 3 - 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 for various actions. From there, the community will draft a Local Adaptation Plan. This includes addressing financing and budget issues, drafting an implementation schedule, outlining overarching implementation responsibilities, and identifying indicators to track and evaluate progress and outcomes.

MILESTONE 4 - IMPLEMENT

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

MILESTONE 5 - MONITOR & REVIEW

The fifth milestone serves to assess whether the goals and objectives of the plan have been achieved. At this stage, the community identifies any problems that have been encountered and develops solutions. Additionally, the fifth milestone helps communities communicate progress updates to council and to the general public.

Key Project Steps

Project Planning, Engagement Planning, and Forming Working Groups

In fulfilling the criteria of Milestone One, the City of Kingston worked with ICLEI Canada to identify and establish a Working Group composed of City staff and representatives from community organizations and institutions, reflecting Kingston's diverse population and systems to guide the adaptation planning process and build a shared foundation for long-term climate action. Working Group members were drawn from departments impacted by climate change, as well as those with knowledge of the broader needs, lived experiences, and equity concerns of Kingston residents.

While the BARC methodology provides a structured framework for assessing municipal impacts, vulnerabilities and risks, it also emphasizes the value of partnership and collaboration. The Working Group played a central role throughout the planning process - contributing to impact identification, shaping the vulnerability and risk assessments, co-developing adaptation actions, and discussing implementation considerations to ensure local relevance and alignment. A full list of participants is included in the Acknowledgements section. More information on how Kingston engaged the community can also be found in the Engagement section.

Climate Science and Future Climate Change Projections

To support evidence-based decision-making and adaptation planning, ICLEI Canada worked with the City to develop high-level climate science infographics based on existing climate data and projections. Key findings from the analysis, which drew on national and regional climate modelling resources including climatedata.ca and the Climate Atlas of Canada, were synthesized into accessible formats for public and staff use. The projections outlined below represent expected trends in Kingston's climate over the 21st century and serve as a foundation for understanding the city's climate risks.

Key Climate Trends for Kingston:

- **Temperature:** All temperature indices show significant warming across seasons, with an increase in the frequency of days above 30°C and a decline in days below -15°C.
- **Precipitation:** Precipitation events are expected to become more intense overall. Annual precipitation is expected to increase and winter and spring seasons are projected to become significantly wetter.
- **Growing season:** First frost dates are expected to happen later in the calendar year while last frost dates are expected to happen earlier, contributing to a longer growing season.
- **Freeze-Thaw Days:** Freeze-thaw cycles are projected to decrease due to overall warmer temperatures. However, feedback provided by the Working Group on this projection underscores an important nuance, if not a discrepancy: Kingston has already been experiencing a higher frequency of freeze-thaw cycles in the shoulder seasons than in previous years.

A visual summary of Kingston's future climate is included in **Appendix B - Future Climate Projections Infographic**.

Impact Identification and Impact Statements

A key first step in Kingston's adaptation planning process was to identify how projected climate changes could affect the community's built, natural, social, and economic systems. On February 21st, 2024, the City hosted a workshop with the Working Group to initiate this conversation. The workshop outlined climate projections, introduced the framework for the planning process and laid the groundwork for drafting locally relevant climate impact statements.

In the context of the BARC framework, climate impact statements are comprehensive statements that outline projected climate-related changes and their potential consequences on the systems that support the community. These statements are tailored to the local context and form the basis of the vulnerability and risk assessments. They reflect both scientific projections and community knowledge and are developed by answering the following questions:

- What are the climatic changes we are concerned about?
- What hazards are associated with these changes?
- What are the consequences associated with these hazards?

The Working Group began by identifying existing weather-related stressors in the community, then assessed how those challenges might be intensified by future climate change. This process generated an initial list of over 100 draft climate impact statements, which were reviewed and refined to eliminate overlap, ensure clarity and alignment with projected climate hazards. In the end, 42 impact statements were finalized and used to inform the next phases of assessment and planning.

The finalized impact statements reflect potential effects across a wide range of areas – including infrastructure, health and safety, emergency response, biodiversity, tourism, and employee productivity. For greater clarity and to allow for cross-comparison, the statements were grouped into categories based on the type of climate event/ trend, including:

- Increase in temperature (annual; seasonal)
- Increase in frequency and duration of hot days (> 30°C)
- Occurrence of freeze-thaw days
- Changes in frequency and intensity of precipitation events (annual; seasonal)
- Increased frequency and intensity of extreme weather events (e.g. wind, thunderstorms, freezing rain)

These impact statements served as the foundation for the vulnerability and risk assessments that followed, helping the City and its partners better understand which climate challenges are most urgent and where to focus adaptation efforts.

Vulnerability Assessment

Following the identification of climate impact statements, the City of Kingston undertook a structured vulnerability and risk assessment process to evaluate how each impact might affect the city and to prioritize where adaptation action is most needed.

The vulnerability assessment was designed to assess how sensitive Kingston is to each climate impact and how well-positioned the City and community are to respond or recover. Vulnerability is defined as a function of two core criteria:

- Sensitivity – the degree to which the impact would affect the City's ability to function or deliver services if it occurred today.
- Adaptive Capacity – the ability of the City or community to cope with, respond to, and recover from the impact, including existing policies, resources, and institutional capacity.

The assessment was carried out over the course of August 2024 using an online survey that was completed by members of the Working Group. Respondents were asked to assign vulnerability rankings to each of the 42 finalized impact statements, assuming that the impact were to occur today. Each impact was scored on a scale from low to high vulnerability:

Low Vulnerability

Not very/not at all vulnerable to harm arising from the impact. Systems and supports are in place to manage the impact.

Medium Vulnerability

Somewhat vulnerable to harm arising from the impact. Systems may be partially disrupted or under strain.

High Vulnerability

Very vulnerable to harm arising from the impact. Significant disruption, damage, or cost would likely occur.

Impacts that received 'high' or 'medium-high' vulnerability scores were advanced to the next phase of the assessment. Eight impacts with medium scores were also identified as priority areas by the Project Team. This first step helped narrow the focus to 33 impacts for more in-depth analysis and provided an initial indication of where Kingston is most sensitive or lacking in adaptive capacity.

Risk Assessment

The risk assessment built on the vulnerability findings to explore the likelihood and potential consequences of each impact in a future climate-adjusted context. Risk is understood as a combination of:

- **Likelihood** – the probability of the impact occurring in the future, informed by local climate projections, historical data, and expert input.
- **Consequence** – the severity of outcomes if the impact were to occur, evaluated across three domains: social, economic, and environmental.

To help in the assessment of likelihood, a scale was developed to differentiate between recurrent and slow-onset impacts. The table below outlines the scale used:

Likelihood	Rating	Recurrent Impact	Slow Onset
Almost Certain	**5**	At least once per year (Annual chance: 100%)	95% or greater chance of occurrence in the next 50 years
Likely	**4**	Once in 1 to 5 years (Annual chance: 20%-100%)	65% to 90% chance of occurrence in the next 50 years
Possible	**3**	Once in 5 to 10 years (Annual chance: 10% to 20%)	35%-65% chance of occurrence in the next 50 years
Unlikely	**2**	Once in 10 to 50 years (Annual chance: 2% to 10%)	5% to 35% chance of occurrence in the next 50 years
Very Unlikely	**1**	Once in 50 years or more (Annual chance: <2%)	Less than 5% chance of occurrence in the next 50 years

Figure 3: Likelihood Matrix

Each consequence category included four criteria, as outlined in the table below:

Social Consequences	Economic Consequences	Environmental Consequences
Health & Safety	Property Damage	Air
Displacement	Local Economy & Growth	Soil and Vegetation
Loss of Livelihood	Community Livability	Water
Cultural Aspects	Public Administration	Ecosystem Function

Figure 4: Consequence Criteria

A second workshop was held on May 28, 2024, where the Working Group scored each impact against the criteria above. Each impact received an individual score for each category, and a composite overall risk score was also calculated. This helped ensure that impacts with serious social, environmental, or economic implications were not overlooked, even if their overall scores were more moderate.

Prioritized Climate Impacts

Using the results of the vulnerability and risk assessments, 22 impact statements were carried forward as priority climate impacts into Milestone 3 - Planning. These impacts were considered most pressing due to their combination of high likelihood and significant consequences. The remaining impacts that ranked lower will continue to be monitored and revisited in future updates of the plan, or as new opportunities/ data come to light. The full list of scored impacts can be found in **Appendix C**.

Action Development and Prioritization

With a clear understanding of Kingston's priority climate impacts, attention was then turned to identifying practical, locally relevant actions that could build resilience across systems, services, and communities. The action development process was collaborative, iterative and grounded in both local expertise and best practices in municipal climate adaptation.

Identifying Actions

On September 17, 2024, Kingston hosted a Visioning, Objectives and Action Identification workshop with the Working Group. Participants were presented with the list of 22 prioritized climate impacts identified through the vulnerability and risk assessment process and were invited to brainstorm adaptation actions that could help reduce those risks and increase resilience.

Participants were encouraged to consider a wide range of adaptation approaches – proactive or reactive, structural or policy-based – and to draw on their own experiences and knowledge of ongoing work. Action ideas spanned categories such as:

- Research and monitoring
- Operational changes and service delivery improvements
- Public education and awareness
- Infrastructure upgrades (green, blue, and grey infrastructure)
- Policy, planning, and regulatory updates
- Partnerships and collaboration
- Equity- and health-focused initiatives

This exercise resulted in 100+ proposed action ideas. These were subsequently reviewed by the Project Team to address any gaps, align ideas with national and regional best practices, consolidate similar suggestions, and ensure each action was clearly scoped.

The result was a refined set of 28 strategies that consist of one to five supporting actions each. Together these form the core of this plan.

Prioritizing Actions

To support implementation planning, the City undertook a prioritization exercise to rank each of the 28 actions. This process used a set of criteria adapted from the Canadian Communities Guidebook for Adaptation to Climate Change and was designed to reflect both local realities and broader principles of effective adaptation planning. Actions were evaluated against the following six criteria:

Criteria	Definition
Effectiveness/Urgency	How critical the action is to addressing a priority risk, and how time-sensitive it is.
Affordability	Whether the action can be completed within available or expected budgets.
Feasibility	Whether there is sufficient capacity (human, technical, legal, etc.) to implement the action.
Acceptability	The degree of support or opposition anticipated from stakeholders or decision-makers.
Equity	Whether the action provides benefits to equity-deserving communities.
Flexibility	Whether the action is scalable, adaptable, or represents a no-regrets investment.

Each action was reviewed and scored against these criteria, with input from the Project Team and additional consultation with the Working Group as needed. The Project Team was able to classify actions into three levels of priority, each with suggested timelines for implementation:

- **'Urgent' priority actions -** recommending implementation in the short-term (i.e. <2 years).
- **'High' priority actions -** recommending implementation in the medium-term (i.e. 2-5 years).
- **'Medium' priority actions -** recommending implementation in the long-term (i.e. 5+ years).

This prioritization process helps Kingston align actions with its internal capacity, funding realities, and community priorities—ensuring that adaptation efforts begin where they are most needed and most feasible.

Notes on Scope

While this plan focuses on actions related to the City's highest-priority climate impacts, it does not imply that other impacts are unimportant. Climate change is interconnected and dynamic, and additional actions may be developed over time as needs, opportunities, and conditions evolve. The actions outlined in the plan represent a strong starting point for long-term resilience, and the City remains committed to integrating climate considerations across departments and decision-making processes.

Action Validation

The complete set of 28 actions was then presented to the Working Group for their review on November 6, 2024. This review was conducted through an action validation activity designed to ensure the actions were both comprehensive and actionable. The activity also provided the Working Group with an opportunity to review all the shortlisted actions at a glance, helping them consider the plan's scope and ensure alignment across actions.

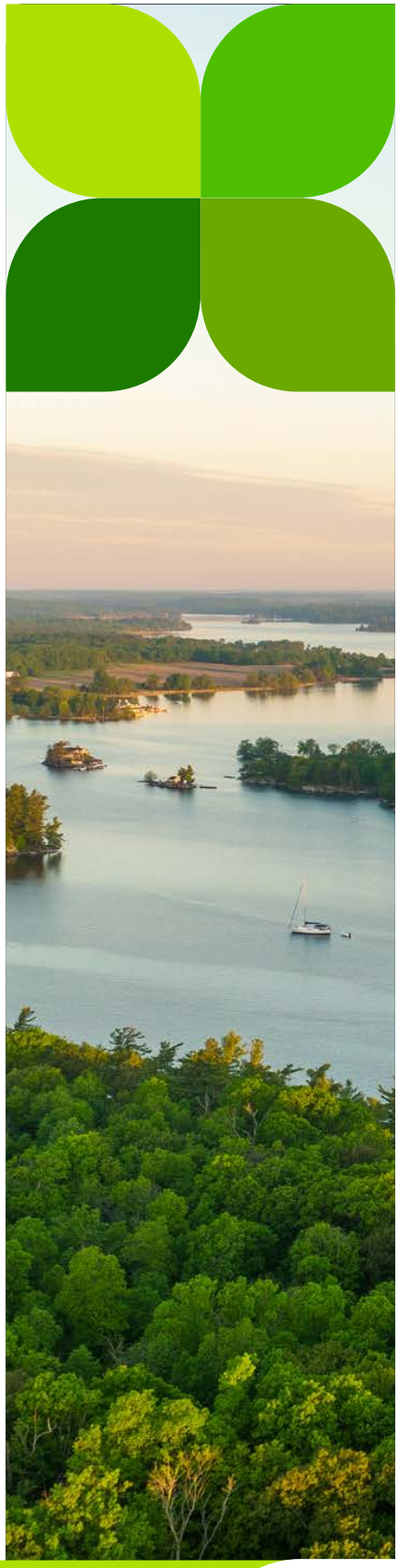
During the workshop, participants reviewed each action in detail, provided general feedback and responding to targeted questions, such as sharing insights on work already underway relevant to each action, potential lead and supporting departments/ organizations for action implementation, and any other additional considerations for effective implementation.

Creating Implementation Schedules

Once actions were finalized, small-scale meetings were held with working group members to discuss implementation schedules for each action. These meetings focused on identifying relevant implementation considerations for all actions. This included confirming implementation responsibilities and immediate next steps, discussing feasible timelines for implementation, addressing budget requirements, and identifying effective monitoring metrics to track progress. The resulting implementation schedules provide a roadmap for moving forward on each action.

Plan Finalization

The Climate Change Adaptation Plan was developed as a comprehensive document, integrating all finalized themes, goals, and actions and supporting sections into a cohesive strategy to address climate change in Kingston. The plan underwent a thorough review and refinement to ensure clarity, alignment with community priorities, and feasibility of implementation. The final plan was presented to City Council in December 2025.



Engagement

Community collaboration is at the heart of the Climate Change Adaptation Plan.

To supplement the work conducted by the members of the working group, the project team conducted two phases of public engagement at the “Inform” and “Consult” levels of the IAP2 spectrum of public participation. Members of the community were invited to visit the Get Involved Kingston platform to learn more about the plan, review data and findings to date, and provide their own input to validate community priorities and incorporate Kingston’s vision for addressing climate change.

August 2024: The Risk and Vulnerability survey helped the working group prioritize climate risks that our community is most concerned about. Respondents were invited to:

- Identify which places and spaces they love in the community, considering various social, economic, built and natural spaces.
- Select which of the 18 high-priority impacts they were most concerned about
- Rank which government-led and community-led actions and strategies they felt were most important to address the risks
- Share other considerations for the plan

February 2024: The Action Prioritization phase offered an open-ended environment for participants to reflect on plan actions, identify potential barriers and share opportunities for implementation.

- Each action category was set up as an online forum, listing all associated actions for participants to review
- Respondents had the opportunity to share their own feedback by commenting, replying or engaging with others’ comments and by ‘liking’ or ‘disliking’ posts

High-level insights

Engagement opportunities were promoted through digital platforms, newsletters, press releases, as well as print and online advertising. Working group members were invited to share the opportunity with their own networks for expanded reach.

The project team hosted pop-up events at libraries, farmers' markets and City facilities, giving community members the chance to learn more about the Adaptation Plan process and provide input on the project.

Throughout both phases of engagement, 2,800+ users visited the Climate Change Adaptation Project page, resulting in over 740 total contributions (surveys completed and engagements on the action forums).

- Participants consistently emphasized risks that impact people as being highest priority, specifically health effects of higher temperatures and extreme weather, especially for marginalized populations. There were also concerns about infrastructure vulnerabilities and how the City could adapt
- Overall, there was support for the City of Kingston adopting proactive measures and sustainable practices, with a focus on measurable implementation strategies, clearly defined outcomes and ongoing input from the community.

Community input reflected a strong interest in Climate Adaptation. The City will continue to promote public participation throughout the implementation of the plan, maintaining Kingston's commitment to Climate Leadership.

Our Governance

Effective local climate action relies on informed, accountable, and forward-thinking governance. The actions under this theme integrate climate considerations into municipal decision-making— from infrastructure planning and budgeting to emergency preparedness and internal operations. By aligning policies, procedures, and staff training with climate goals, the City can lead by example and ensure that every decision contributes to a more resilient and sustainable future.

These actions aim to strengthen Kingston's capacity to adapt to climate change by embedding resilience into planning processes, increasing awareness among staff and Council, enhancing emergency response systems, and developing strategies to address climate risks. By fostering flexibility within operations and prioritizing coordinated action across departments, the City is building a governance model that tackles current challenges and prepares for future ones.

Strategy 1:

Ensure climate risks and resilience are integrated into all municipal planning, budgeting, and operational procedures.

Integrating climate risks and resilience into municipal planning, budgeting, and operations will help to protect Kingston's infrastructure, reduce long-term costs, and ensure that future developments are designed with climate impacts in mind. The adoption of a climate lens across the City's policies and procedures and finding alignment between the Official Plan and the evolving building standard landscape will be critical.

Goals Supported

Adaptation	Mitigation
●	●

Lead: City of Kingston staff, Planning Services, and Utilities Kingston Infrastructure team.

Supporting Actions		Action Type	Status	Timeline
1.1	Incorporate climate change considerations into the City's capital plans, master plans, and maintenance procedures to protect public infrastructure from climate-related risks.	Policy	In Progress	●○○
1.2	Investigate updating building codes and development standards that could be applied through a voluntary or mandatory framework to ensure all new builds and renovations meet climate resilience and energy efficiency requirements.	Policy, Regulation	Planned	●●○
1.3	Continue to work with utilities and with provincial and federal governments to lobby for better climate resilience programming and funding, as well as continuing to collect and share climate-related data.	Partnerships	In Progress	●○○
1.4	Continue to emphasize climate resilience within land-use planning and zoning regulations to avoid development in high-risk areas (e.g. floodplains).	Policy	In Progress	●○○

Strategy 2:

Enhance the City's emergency preparedness and response capabilities to address climate-related risks.

Enhancing emergency preparedness and response capabilities will enable the City to act quickly and effectively during climate-related emergencies by improving emergency plans, updating communication systems, and coordinating with public health partners to protect residents from emerging risks like heatwaves and floods.

Goals Supported

Adaptation	Mitigation
●	●

Lead: City of Kingston Emergency Management Division.

Supporting Actions		Action Type	Status	Timeline
2.1	Update and test emergency response plans regularly, including conducting annual emergency exercises and providing IMS (Incident Management System) training for City personnel.	Procedure	In Progress	Ongoing
2.2	Partner with South East Health Unit to continue to monitor climate-related risks like heatwaves, extreme weather events, and vector-borne diseases, ensuring timely interventions and public health responses.	Partnerships	Planned	Ongoing
2.3	Implement an integrated City-led emergency communication system, including SMS/text alerts, social media updates, and traditional media channels.	Project/ Program	Planned	●○○
2.4	Review and update emergency infrastructure (e.g. evacuation routes, shelters) to accommodate climate-related emergencies (e.g. floods or heatwaves).	Project/ Program	In Progress	Ongoing

Strategy 3:

Continue to develop a comprehensive 'Heat Response Plan' that outlines short- and long-term strategies and consider implementing others.

Developing a comprehensive Heat Response Plan will protect highly exposed populations during extreme heat events by improving public alert systems, expanding access to cooling infrastructure, implementing shading solutions, and encouraging proactive cooling practices to prevent health risks and energy system strain.

Goals Supported

Adaptation	Mitigation
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Lead: City of Kingston Climate Leadership Division.

Supporting Actions		Action Type	Status	Timeline
3.1	Improve the City's heat alert system and support business in heat/emergency planning.	Project/ Program	In Progress	●○○
3.2	Formally identify emergency relief locations, cooling infrastructure, public education, and any other protocols for protecting vulnerable populations.	Policy	In Progress	●○○
3.3	Conduct a citywide shade audit and implement shading and cooling solutions in public spaces.	Study, Project/ Program	Planned	●○○
3.4	Advise event planners and public organizers to hold outdoor events during cooler parts of the day (early morning or evening).	Engagement and Education	Planned	●○○
3.5	Encourage residents and businesses to participate in 'pre-cooling' initiatives by cooling buildings before peak heat hours, reducing energy consumption and preventing grid overload during extreme warm temperatures.	Engagement and Education	Planned	●○○

Strategy 4:

Promote flexibility within municipal operations to reduce vulnerabilities during extreme weather.

Promoting flexibility within municipal operations during extreme weather events can significantly reduce risks to employee safety, maintain essential services, and decrease energy demand. By enabling adaptive work practices, supporting energy-saving initiatives, and adjusting resource allocation based on climate data, Kingston can better manage disruptions caused by storms, heatwaves, and flooding. This approach will improve the City's ability to respond to climate-related challenges efficiently, enhance public safety, reduce operational costs, and ensure that key services continue to function even during extreme weather events.

Goals Supported

Adaptation	Mitigation
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Lead: City of Kingston, Division-lead initiative.

Supporting Actions		Action Type	Status	Timeline
4.1	Allow for flexible work hours and operations during extreme weather events (e.g. peak heat, storms).	Policy, Procedure	Planned	●○○
4.2	Promote energy-saving initiatives such as peak shaving programs to reduce energy demand during extreme weather.	Project/ Program	In Progress	●○○

Strategy 5:

Increase climate change awareness and understanding of climate action within staff and Council.

Increasing climate change awareness among City staff and Council will help to strengthen institutional capacity, support informed decision-making, and encourage greater interdepartmental collaboration, ensuring that climate action is integrated consistently and effectively across municipal policies and processes.

Lead: City of Kingston Climate Leadership Division, Communications Team, Learning and Development Team, and Organizational Change Management Team.

Goals Supported

Adaptation	Mitigation
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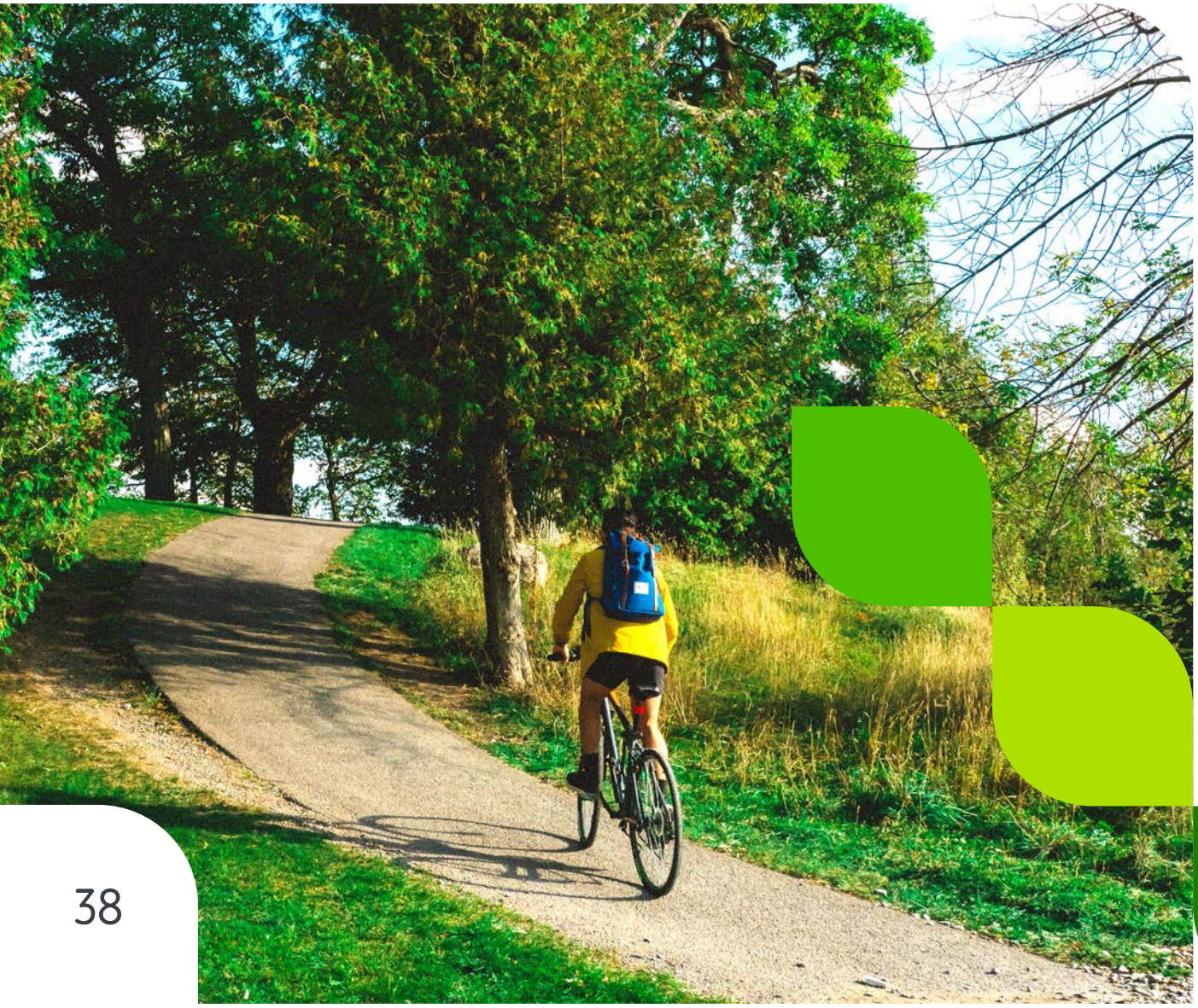
	Supporting Actions	Action Type	Status	Timeline
5.1	Conduct regular training sessions for City staff and Council with community members on climate adaptation and mitigation best practices to expand interdepartmental collaboration and capacity.	Engagement and Education	In Progress	●○○

Our Community

As climate change intensifies, strong, connected communities are key to resilience in Kingston. The actions under this theme empower residents, local organizations, and sectors to adapt together through inclusive, place-based initiatives. Building social resilience goes beyond responding to emergencies; it involves creating lasting support networks, expanding collaboration opportunities, and empowering community-led efforts to ensure no one is left behind.

These actions enhance emergency preparedness, promote equitable climate adaptation, and strengthen local food systems through regenerative farming, community gardens, and local procurement. By embedding climate justice, accessibility, and reconciliation into all efforts, Kingston strives to ensure that everyone is supported and equipped to contribute to—and benefit from—climate resilience.



Strategy 6:

Empower the community to strengthen emergency preparedness in the face of climate-related hazards.

Empowering residents to prepare for climate-related emergencies through education, partnerships, and community-led initiatives will build social resilience, improve collective response capacity, and ensure neighborhoods are better connected and supported during extreme events.

Lead: City of Kingston Climate Leadership Division and Emergency Management Division.

Goals Supported

Adaptation	Mitigation
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Supporting Actions		Action Type	Status	Timeline
6.1	Continue to inform and engage residents through various educational efforts to help them prepare for emergencies and take proactive safety measures.	Engagement and Education	In Progress	Ongoing
6.2	Help build community-based support networks that provide assistance during emergencies.	Project/ Program, Partnerships	Planned	●● ○
6.3	Collaborate with local organizations, including local school boards, to extend emergency preparedness education to all residents including school-aged children.	Partnerships, Engagement and Education	In Progress	Ongoing
6.4	Encourage community-led emergency preparedness programs, such as neighborhood readiness groups or local emergency coordinators during extreme weather events.	Project/ Program	In Progress	Ongoing

Strategy 7:

Strengthen Kingston's Climate Change Adaptation Plan by embedding climate justice, accessibility, and reconciliation into all adaptation efforts by continuously assessing and refining both existing and new programming to ensure communities most exposed or sensitive to climate impacts are proportionately supported and adjustments are made as hazards and community feedback evolve.

Embedding climate justice, accessibility, and reconciliation into all adaptation efforts aims to ensure that communities least responsible for and most affected by climate impacts are equitably supported, while inclusive decision-making and ongoing staff training help to align climate adaptation work with broader equity, diversity, and reconciliation goals.

Goals Supported

Adaptation	Mitigation
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Lead: City of Kingston Climate Leadership Division and Utilities Kingston.

Supporting Actions		Action Type	Status	Timeline
7.1	Collaborate with the City's Community Development, Wellbeing and IIDEA department to ensure that climate justice considerations are embedded into all programming, helping to align Adaptation Plan actions with broader diversity and equity initiatives already in place.	Policy	Planned	●○○
7.2	Collaborate with the City's Community Development, Wellbeing and IIDEA department to continue/improve offering regular training for City staff to deepen understanding of climate justice, systemic inequities, and Indigenous rights.	Engagement and Education	In Progress	Ongoing
7.3	Work to develop clear mechanisms (such as advisory boards or periodic community consultations) that bring in perspectives from communities or individuals who are more exposed or sensitive to climate impacts, ensuring that their experiences and insights inform every stage of planning and implementation.	Engagement and Education	Planned	●○○

Strategy 8:

Support the agricultural community in adapting climate resilient practices, enhancing soil health and implementing regenerative farming methods where feasible.

Supporting the agricultural community in adopting climate-resilient practices and regenerative farming methods will help safeguard local food systems, enhance soil health, and empower farmers to proactively adapt to changing climate conditions such as extreme weather, drought, and shifting growing seasons.

Lead: City of Kingston Rural Economic and Development Division and Community Development, Wellbeing and IIDEA department.

Goals Supported

Adaptation	Mitigation
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Supporting Actions		Action Type	Status	Timeline
8.1	Encourage regenerative farming practices and foster collaboration between students, researchers and farms.	Engagement and Education	In Progress	●○○
8.2	Partner with youth by providing access to land and resources to engage them in agriculture and promote entry into the sector.	Program/ Project, Partnerships	Planned	●○○
8.3	Promote urban gardening and agriculture governance model/ policies to ensure soil health in urban settings.	Policy	Planned	Ongoing
8.4	Celebrate key agricultural events to raise awareness and build community engagement through initiatives like the Rural Community Program Fund	Engagement and Education	Planned	Ongoing

Strategy 9:

Support existing community food gardens and establish new gardens across the City.

Expanding and supporting community food gardens will help increase access to fresh, local produce, promote healthy eating, foster positive community engagement, support local training and upskilling, ultimately strengthening our local food systems in the face of climate change and other potential disruptions.

Goals Supported

Adaptation **Mitigation**

Lead: City of Kingston Community Development, Wellbeing and IIDEA department and Rural Economic and Development Division.

Supporting Actions		Action Type	Status	Timeline
9.1	Encourage participation in existing community food gardens and identify opportunities to initiate new community food gardens.	Program/ Project, Partnerships	In Progress	Ongoing
9.2	Educate residents on the benefits of eating locally grown, seasonal produce.	Engagement and Education	In Progress	Ongoing

Strategy 10:

Explore a food procurement policy that encourages restaurants to source local ingredients from local farms and producers and support farmers to have ease of restrictions and greater opportunities to grow, store, sell and distribute their food.

Encouraging local food procurement and reducing barriers for farmers to grow, store, sell, and distribute their products will strengthen the regional food economy, lower emissions from food transport, and increase community access to fresh, locally sourced ingredients.

Lead: City of Kingston Rural Economic and Development Division, Community Development, Wellbeing and IIDEA department, Tourism Kingston, KFL&A Public Health, the Canadian Food Inspection Agency, and the Ministry of Agriculture, Food and Agribusiness.

Goals Supported

Adaptation	Mitigation
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Supporting Actions		Action Type	Status	Timeline
10.1	Encourage restaurants to prioritize purchasing locally sourced ingredients through tax breaks, recognition programs, etc.	Project/ Program	Planned	●○○
10.2	City to consider the adoption of a local food procurement policy with a goal to increase sales and distribution opportunities for local producers in the region.	Policy	Planned	●●○

Our Natural Environment

Kingston's natural ecosystems are vital allies in the face of climate change. Trees, wetlands, shorelines, and diverse landscapes provide essential services—such as stormwater management, cooling, air purification, and carbon sequestration—that help buffer communities from climate impacts while supporting ecological health. This theme emphasizes the protection, restoration, and expansion of these natural assets to build climate resilience and reduce long-term costs.

These actions focus on strengthening the urban tree canopy, encouraging the planting of native species and sustainable landscaping, improving ecosystem management, and protecting water quality. Together, they aim to enhance biodiversity, safeguard drinking water sources, and ensure Kingston's natural areas continue to thrive. By partnering with residents and embracing nature-based solutions, the City is fostering a greener, healthier, and more climate-resilient future.

Strategy 11:

Continue to develop an urban tree canopy strategy and policies to preserve and enhance Kingston's urban canopy.

The development of an urban tree canopy strategy will help to preserve and expand Kingston's natural landscape and green infrastructure by implementing policies that promote equitable tree access, protect biodiversity through connected green corridors, and mitigate urban heat island effects—strengthening climate resilience across neighbourhoods.

Lead: City of Kingston Public Works, Planning Services, Environmental Division, and Community Development, Wellbeing and IIDEA department

Goals Supported

Adaptation	Mitigation
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Supporting Actions		Action Type	Status	Timeline
11.1	Continue developing programs and strategies that guide the City toward meeting the 3-30-300 urban canopy framework, preparing the municipality to evaluate the feasibility of formally adopting it in the future.	Policy	In Progress	●●●
11.2	Ongoing support for implementing the Forest Management Strategy, a 24-year plan designed to sustain, expand, promote, engage with, and celebrate the Rural and Urban Forest as a vital community resource.	Policy, Regulation	Planned	●○○
11.3	Integrate green corridors into the strategy to connect urban spaces, tree canopy and parks to support biodiversity and mitigate urban heat island.	Project/ Program	In Progress	●●●

Strategy 12:

Incentivize property owners to adopt natural/ diverse landscaping practices.

Incentivizing property owners to adopt natural and diverse landscaping practices will increase biodiversity, support pollinators, improve soil and water health, and reduce emissions from conventional lawn care, while educating residents on the ecological and aesthetic benefits of sustainable yard design and care

Goals Supported

Adaptation	Mitigation
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Lead: City of Kingston Climate Leadership Division and Community Development and Wellbeing Division.

Supporting Actions		Action Type	Status	Timeline
12.1	Incentivize property owners to plant more native species, food gardens/ wildflower meadows, avoid turf grass and mitigate invasive species.	Policy	Planned	●●○
12.2	Educate residents on sustainable/ multi-use lawns, rain gardens/ perennial gardens.	Engagement and Education	In Progress	●○○
12.3	Revise the lawn care bylaw to permit a greater diversity of naturalized yards, to support wildlife, and promote the benefits of green roofs to the community.	Policy	Planned	●○○

Strategy 13:

Monitor all local ecosystems and implement measures to preserve and enhance Kingston's natural assets and essential ecosystems.

Monitoring and enhancing Kingston's ecosystems helps to protect critical natural assets like wetlands and shorelines, ensure better watershed stewardship, and inform more effective policy and land-use decisions through up-to-date data collection and collaborative conservation efforts.

Goals Supported

Adaptation	Mitigation
●	●

Lead: City of Kingston Climate Leadership Division and Planning Services and Public Works.

Supporting Actions		Action Type	Status	Timeline
13.1	Collect data across various departments and community partners and update natural asset inventory.	Study	In Progress	Ongoing
13.2	Work towards preserving and restoring wetlands and broaden Kingston residents' understanding of how neighbourhoods and City fit into Kingston's watersheds.	Engagement and Education	In Progress	●●●
13.3	Ongoing support for implementing the Forest Management Strategy, a 24-year plan designed to sustain, expand, promote, engage with, and celebrate the Rural and Urban Forest as a vital community resource.	Policy, Regulation	Planned	●○○

Strategy 14:

Promote awareness and best practices for preventing water contamination and ensuring safe usage.

Promoting water safety and contamination prevention aims to protect public health, preserve water quality, and supports resilient stormwater management by expanding public awareness, encouraging organic practices, and promoting lot-level interventions that reduce runoff and pollution.

Lead: Sustainable Kingston, City of Kingston Climate Leadership Division, Planning Services, Building Services, Cataraqui Region Conservation Authority.

Goals Supported

Adaptation	Mitigation
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Supporting Actions		Action Type	Status	Timeline
14.1	Continue and expand communication about lake/ water usage safety, especially in the summer.	Engagement and Education	In Progress	Ongoing
14.2	Promote small-scale stormwater management strategies at the lot level; adoption of organic practices to eliminate toxins going into waterways. • Lot level resilience criteria to be introduced upon council approval.	Engagement and Education	Planned	●○○
14.3	Educate residents on safe design and operation of rainwater harvesting systems for OBC approved non-potable uses, including cross-connection controls, labeling, and maintenance to prevent contamination.	Engagement and Education	Planned	●○○

Strategy 15:

Ensure that private wells are insured/ protected against water contamination (i.e., leaching/ leaks).

Protecting private wells from contamination through proper maintenance guidance and potential insurance support will safeguard drinking water sources, reduce public health risks, and help rural and well-dependent residents adapt to climate-driven water quality challenges.

Goals Supported

Adaptation	Mitigation
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Lead: KFL&A Public Health, City of Kingston Rural Economic and Community Development, Utilities Kingston.

Supporting Actions		Action Type	Status	Timeline
15.1	Provide guidance and/or funding for well-owners to be insured and to provide proper maintenance to prevent contamination, leaching, leaks, etc.	Project/ Program	Planned	●●○

Strategy 16:

Incorporate nature-based solutions (e.g., green infrastructure and rain gardens) to enhance stormwater management in urban areas and reduce flood risks.

Incorporating nature-based solutions, such as green infrastructure and rain gardens can provide significant benefits in the face of climate change. These natural systems help absorb and slow down rainfall, reducing runoff and minimizing the risk of flooding in urban areas. By improving water quality and enhancing local biodiversity, nature-based solutions also make the city more resilient to extreme weather events, like heavy storms. Additionally, they can reduce the strain on traditional drainage systems, lower maintenance costs, and create more green spaces for residents to enjoy, contributing to a healthier, more sustainable urban environment.

Goals Supported

Adaptation	Mitigation
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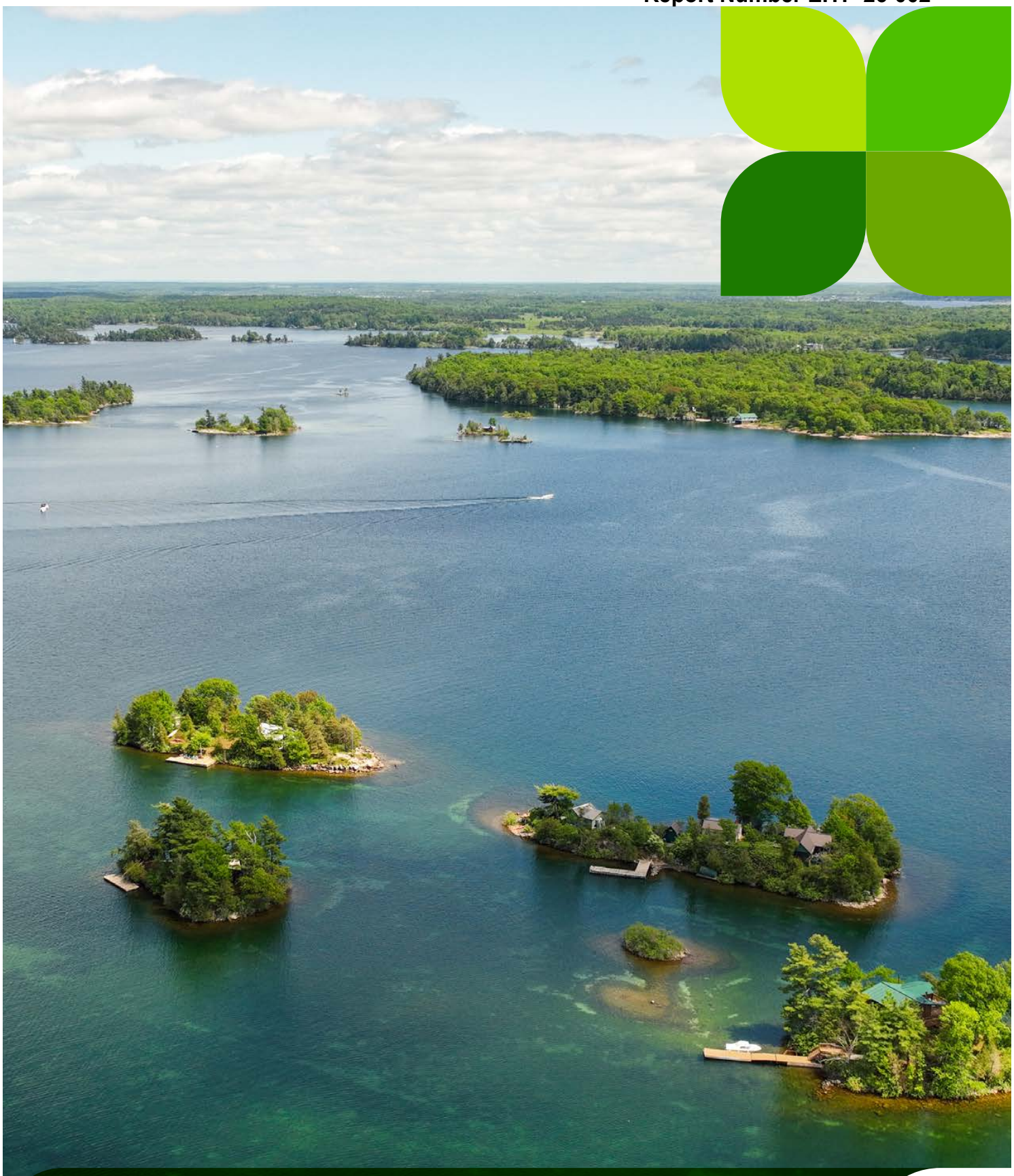
Lead: City of Kingston Climate Leadership Division and Public Works.

Supporting Actions		Action Type	Status	Timeline
16.1	Expand the use of green infrastructure (e.g. bioswales, rain gardens, permeable surfaces, and green roofs) into new urban developments.	Policy, Regulation	In Progress	●○○
16.2	Encourage/ incentivize the use of rainwater harvesting systems in residential and commercial properties (e.g. through rebates of tax breaks for installations).	Policy	Planned	●○○
16.3	Use more green infrastructure in public spaces such as parks, roadways, etc., particularly in high-risk flooding zones.	Project/ Program	In Progress	●○○



Our Built Environment

As climate change increasingly impacts our built environment, it is crucial for Kingston to ensure that the spaces where we live, work, and play are resilient, adaptive, and sustainable. This section outlines actions to fortify the city's infrastructure and housing against climate impacts. These actions focus on enhancing community-wide resilience through retrofitting, low-impact development, smarter, denser communities, and diversified transportation options.

Expanding acceptable alternative water sources within buildings such as rainwater for approved non-potable uses advances resilience and sustainability by lowering demand for potable water, reducing utility costs, and decreasing both stormwater treatment loads and runoff.

By raising awareness about flood resilience and supporting floodproofing financing, Kingston can better protect homes and businesses from future flood risks. Upgrading stormwater management and implementing real-time monitoring systems will improve the city's response to heavy precipitation and extreme weather. While regional energy resilience extends beyond direct municipal control, advocating for stronger energy systems and exploring innovative solutions like grid-level storage, microgrids, and utility partnerships is essential. Together, these actions will ensure our built systems are ready for climate challenges, enhancing both infrastructure sustainability and community well-being.

Strategy 17:

Encourage property owners and developers to improve the resilience of residential and commercial buildings through retrofits and/or design and material upgrades.

By enhancing buildings' ability to withstand extreme weather events, such as flooding, heatwaves, and heavy storms, these upgrades can reduce damage and repair costs while improving energy efficiency and lowering utility bills. Resilient buildings can also contribute to better indoor air quality and comfort for occupants, boosting public health and productivity. These efforts can help Kingston meet its climate adaptation goals, attract environmentally conscious investment, and support long-term economic stability by minimizing climate-related disruptions to local businesses and homes.

Goals Supported

Adaptation	Mitigation
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Lead: City of Kingston Climate Leadership Division and Building Services, Utilities.

Supporting Actions		Action Type	Status	Timeline
17.1	For existing buildings: Upgrade insulation, windows, heating/cooling systems to reduce energy consumption and improve comfort during extreme weather.	Policy	Planned	●○○
17.2	For new and existing buildings: Encourage the use of cool roofs, green roofs and reflective pavements to reduce the urban heat island (UHI) effect; and prioritize the installation of heat pumps over air conditioners and oil/gas-powered furnaces.	Policy	Planned	●●●
17.3	For new buildings: Prioritize the adoption of more temperature resilient materials.	Policy	In Progress	Ongoing
17.4	Promote regular preventative maintenance of buildings to protect against climate-related wear and tear.	Engagement and Education	Planned	●○○
17.5	Promote the use of rainwater harvesting systems in new construction and retrofits to supply OBC approved non-potable fixtures to conserve water and reduce stormwater runoff.	Engagement and Education	Planned	●○○

Strategy 18:

Prioritize 'low impact development' (LID) in city planning and design for urban, high-density areas and outlying areas.

LID strategies, such as green roofs, permeable pavements, and natural stormwater management, help reduce runoff, mitigate flooding, and enhance local water quality. By promoting green spaces and incorporating sustainable building practices, LID can also reduce the urban heat island effect, improve air quality, and increase biodiversity. These approaches not only make urban areas more livable and attractive but also enhance the city's ability to manage climate-related risks, reduce infrastructure costs, and support long-term sustainability in both urban and suburban environments.

Lead: City of Kingston Climate Leadership Division, Planning Services, and Engineering Division.

Goals Supported

Adaptation	Mitigation
●	●

Supporting Actions		Action Type	Status	Timeline
18.1	Promote low impact development designs in private and public projects to enhance water retention, reduce runoff and minimize impermeable surfaces (e.g. permeable pavements, bioswales, green roofs).	Policy, Engagement and Education	In Progress	●●○
18.2	Explore land-use policies to encourage the use of green infrastructure in new urban developments, especially in high-density areas.	Policy	In Progress	●●○
18.3	Incorporate urban tree canopies and green infrastructure in new development guidelines to improve stormwater management and reduce heat in high-density areas.	Policy	In Progress	●●○

Strategy 19:

Prioritize 'smart density' in city planning and design to enhance urban resilience.

By focusing on compact, well-planned developments that integrate mixed-use zoning, efficient public transportation, and green infrastructure, smart density can reduce sprawl, minimize energy consumption, and lower greenhouse gas emissions. Concentrating development in key areas also makes it easier to protect natural spaces, reduces reliance on cars, and encourages walking and cycling, all of which contribute to healthier, more sustainable communities. Additionally, higher-density areas are more efficient at managing resources like water and energy, making them better equipped to adapt to climate challenges such as flooding, heatwaves, and extreme weather events.

Goals Supported

Adaptation	Mitigation
●	●

Lead: City of Kingston Planning Services, Kingston Transit and Transportation Services, Public Works, and Engineering Division.

Supporting Actions		Action Type	Status	Timeline
19.1	Promote compact, mixed-use developments that maximize land use efficiency (housing, retail, etc.) and reduce reliance on private vehicles.	Policy	In Progress	●●●
19.2	Integrate green corridors linkages and urban tree canopies in smart density developments.	Policy	In Progress	●○○

Strategy 20:

Diversify mobility options and provide reliable access to transportation alternatives, including public transit.

The expansion of transportation choices such as biking, walking, and low-emission public transit can reduce traffic congestion, lower greenhouse gas emissions, and improve air quality. Increased mobility options also make the city more inclusive, providing equitable access for residents who rely on public transit or alternative modes of transportation. These changes can help Kingston adapt to extreme weather events by ensuring that residents can still move efficiently and safely, while also reducing the overall carbon footprint of the city's transportation system.

Lead: City of Kingston Transit and Transportation Services, and Communications and Public Engagement Division.

Goals Supported

Adaptation	Mitigation
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Supporting Actions		Action Type	Status	Timeline
20.1	Expand reliable transportation alternatives (e.g. public transit, cycling lanes, pedestrian pathways) and integrate redundancy in transit services to ensure continued access during extreme weather events.	Policy, Project/ Program	In Progress	●●○
20.2	Prioritize public transit and explore implementing options such as dedicated bus lanes and transit signal priority to enhance access during extreme weather conditions.	Policy	Planned	●●○

Built Environment - Flood Resilience

The following strategies and supporting actions relate to how the City of Kingston and our community can better anticipate, respond to and recover from localized flooding events.

Strategy 21:

Launch a comprehensive public education campaign to educate residents on flood prevention measures and property protection strategies.

Kingston can work to reduce the financial and emotional toll of flood damage by increasing awareness of flood risks and equipping residents with practical knowledge on how to safeguard their properties. Educated property owners are more likely to invest in floodproofing measures, such as sump pumps, waterproofing, and proper landscaping, which can help minimize flood-related damages. Additionally, fostering a culture of preparedness strengthens community resilience, encourages proactive actions, and reduces the burden on emergency services during extreme weather events, ultimately leading to a more climate-adaptive and safer city.

Goals Supported

Adaptation	Mitigation
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Lead: City of Kingston Climate Leadership and Utilities Kingston.

Supporting Actions		Action Type	Status	Timeline
21.1	Provide residents with information on improving drainage, modifying roof standards, and other home upgrades to prevent flooding, including targeted messaging to residents who live within known flood prone areas.	Engagement and Education	In Progress	●○○
21.2	Promote outdoor measures such as landscaping techniques (e.g., rain gardens, permeable pavements, pocket forests) to reduce runoff and prevent flooding.	Engagement and Education	In Progress	●○○

Strategy 22:

Explore financial incentives programs to support homeowners in floodproofing their properties.

By offering financial assistance, the City can encourage more homeowners to invest in flood mitigation measures such as elevated foundations, flood barriers, and improved drainage systems. This can reduce the overall cost of flood damage to both private and public infrastructure, lowering the need for costly emergency responses and repairs. Additionally, these programs can promote community-wide preparedness, enhance property values by making homes more resilient, and ensure that more residents are equipped to handle increasing flood risks due to climate change, ultimately contributing to a safer, more sustainable Kingston.

Goals Supported

Adaptation	Mitigation
●	●

Lead: City of Kingston Climate Leadership Division and Utilities Kingston.

Supporting Actions		Action Type	Status	Timeline
22.1	Partner with local contractors and businesses to provide discounted services for floodproofing homes, making these upgrades more affordable.	Policy Partnerships	Planned	●○○
22.2	Explore tax breaks or other incentive mechanisms for floodproofing homes.	Policy	Planned	●○○

Strategy 23:

Upgrade the stormwater management system to include a dedicated stormwater draining system.

By improving the City's ability to manage heavy rainfall and runoff, this upgrade would reduce the risk of flooding in both urban and suburban areas, protecting homes, businesses, and infrastructure. A more efficient drainage system can also prevent stormwater pollution from reaching local waterways, improving water quality and reducing environmental damage. With the increased frequency of extreme weather events, this proactive investment would enhance the city's resilience, lower long-term repair costs, and ensure safer, more sustainable urban living for Kingston residents.

Lead: City of Kingston Engineering Division and Utilities Kingston.

Goals Supported

Adaptation	Mitigation
●	●

Supporting Actions		Action Type	Status	Timeline
23.1	Develop a dedicated stormwater drainage system and stormwater systems to reduce flooding risks.	Project/ Program	In Progress	●●●
23.2	Consider aligning sewage fees with the percentage of impermeable surfaces (i.e. % of hardscape) and integrate private/public drainage systems to handle increasing runoff (i.e. multi-level approach).	Policy	Planned	●○○

Strategy 24:

Implement real-time monitoring and early warning systems for stormwater levels.

Implementing real-time monitoring and early warning systems for stormwater levels in Kingston can provide critical benefits in the face of climate change. These systems allow the City to track and respond to rising water levels in real-time, enabling quicker, more informed decisions during heavy rainfall or flooding events. Early warnings would give residents and businesses time to prepare, minimizing damage to properties and infrastructure. Additionally, these systems could enhance the efficiency of emergency response teams, help prioritize resource allocation, and ultimately reduce the economic and social impacts of flooding, making Kingston more resilient to the often unpredictable effects of climate change.

Goals Supported

Adaptation	Mitigation
●	●

Lead: Utilities Kingston and Cataraqui Region Conservation Authority

Supporting Actions		Action Type	Status	Timeline
24.1	Determine which public communication methods will be used to inform residents of stormwater risks during extreme weather (e.g. SMS, social media, etc.).	Engagement and Education	In Progress	●○○
24.2	Integrate stormwater data into emergency response systems to better coordinate response and resource allocation.	Project/ Program	In Progress	Ongoing

Built Environment - Energy Systems

The following strategies and supporting actions relate to how the City of Kingston and our community can improve our energy resilience in the face of climate impacts and other disruptions.

Strategy 25:

Lobby for grid resilience through promoting the adoption of smart technologies and decentralized energy systems.

By advocating for a more robust and flexible energy grid, the city can reduce its reliance on centralized power sources, making it less vulnerable to widespread outages caused by extreme weather events. Smart technologies, such as real-time grid monitoring and automated energy distribution, can optimize energy use and improve efficiency, while decentralized systems like microgrids can ensure local power supply during emergencies. This enhanced resilience would not only safeguard Kingston's energy infrastructure but also support sustainability goals by integrating renewable energy sources, reducing carbon emissions, and ensuring a more reliable power system for residents and businesses.

Goals Supported

Adaptation	Mitigation
●	●

Lead: City of Kingston Climate Leadership Division.

Supporting Actions		Action Type	Status	Timeline
25.1	Promote the adoption of smart grid technology and initiatives, considering the integration of bi-directional charging and neighbourhood grids.	Policy	Planned	●●○
25.2	Support decentralized, non-carbon renewable energy production through distributed energy resources (DERs) such as solar and wind.	Policy	Planned	●●○

Strategy 26:

Strengthen grid level energy resilience through storage solutions.

Strengthening of energy resilience through grid-level storage solutions can provide Kingston with essential benefits as climate change intensifies. Energy storage systems, such as large-scale batteries, can store excess energy generated during periods of low demand and release it during peak demand or during power outages caused by extreme weather events. This helps to stabilize the grid, reduce the likelihood of blackouts, and ensure a reliable power supply even during disruptions. By integrating energy storage, Kingston can also better incorporate renewable energy sources like solar and wind, making the city's energy system more sustainable, efficient, and adaptable to climate-related challenges. This investment in energy resilience will not only improve the city's overall infrastructure but also contribute to reducing greenhouse gas emissions and enhancing long-term sustainability.

Goals Supported

Adaptation	Mitigation
●	●

Lead: Utilities Kingston and City of Kingston.

Supporting Actions		Action Type	Status	Timeline
26.1	Encourage the installation of battery storage systems to store renewable energy during grid outages.	Policy Partnerships	Planned	●●○

Strategy 27:

Support local energy resilience through policy and community initiatives for both existing buildings and new development.

By focusing on local energy resilience, Kingston aims to ensure residents and businesses can continue to function in the face of our changing climate without major disruptions. This area of work requires exploring and integrating where possible existing infrastructure initiatives and new development. These initiatives could reduce dependency on external energy sources, ensuring a more stable and reliable power supply during extreme weather events like storms or heatwaves. Additionally, strengthening local energy infrastructure can help the City adapt to fluctuating energy demands, reduce energy costs, support local economic growth, and improve long-term resilience to climate-related disruptions.

Goals Supported

Adaptation	Mitigation
●	●

Lead: Utilities Kingston, City of Kingston Council, Planning Services, and Building Services.

Supporting Actions		Action Type	Status	Timeline
27.1	Explore how to incentivize community-based energy projects that enhance climate resilience (e.g. community solar projects).	Policy	Planned	●●●
27.2	Continue to educate residents and businesses on energy resilience measures, energy storage, and renewable energy solutions.	Engagement and Education	In Progress	●○○

Strategy 28:

Build critical infrastructure resilience through microgrids and utility partnerships.

Building critical infrastructure resilience through microgrids and utility partnerships can offer Kingston significant benefits in adapting to climate change. Microgrids, which operate independently or alongside the main grid, can provide reliable, localized power during extreme weather events or grid failures, ensuring that essential services and vulnerable populations continue to have access to energy. Partnering with utilities to integrate these systems can enhance the city's energy flexibility, reduce dependency on external power sources, and allow for better management of renewable energy resources. This approach not only strengthens Kingston's energy security but also supports a transition to a more sustainable and resilient energy system, helping the City mitigate the impacts of climate change while promoting long-term environmental and economic stability.

Goals Supported

Adaptation	Mitigation
●	●

Lead: City of Kingston, Utilities Kingston and Kingston Hydro.

Supporting Actions		Action Type	Status	Timeline
28.1	Establish microgrids for essential services (e.g. hospitals, emergency services) that can operate independently during outages caused by extreme weather.	Project/ Program	Planned	●●●
28.2	Work with utility partners to improve infrastructure resilience such as managing vegetation around power lines to prevent storm-related outages.	Policy, Partnerships	In Progress	●○○

Indicators, Monitoring, and Evaluation

Indicators

Indicators have been developed through the engagement and planning process to help track the implementation of climate strategies and supporting actions. Indicators used in this plan can be categorized into two types: process-based indicators and outcome-based indicators. Process-based indicators measure or track progress towards achieving a specific target, activities, or output, while outcome-based indicators measure whether expected effects or changes are being achieved.

Plan Monitoring and Evaluation

Monitoring and evaluation are critical to the climate change planning process, ensuring that Kingston's actions are executed as intended and lessons learned are captured for continuous improvement. Additionally, monitoring and evaluation provide an opportunity to communicate and celebrate our successes and accomplishments on the climate adaptation journey. Establishing specific indicators and targets for each strategy and supporting action will help track action progress. Kingston will also strive to adopt a learning-oriented approach to implementation – one that embraces the iterative nature of climate work.

Adjustments to the plan are expected over time due to changes in federal and provincial legislation and regulations, how lived experience in the face of climate change impacts changes, emergent insights and developments, and technological advancements. To remain relevant, the plan will exist as a living document and it is recommended that a formal review be undertaken every five years. It is also recommended that progress on implementation be reported annually, at minimum. These reports will be made publicly available and will be presented to Council, fostering accountability and transparency. By staying committed to this approach, Kingston can ensure that its Plan remains effective and responsive to changing circumstances and new opportunities.

Building a Resilient Future for Kingston

The City of Kingston's Climate Change Adaptation Plan marks a pivotal step toward safeguarding our community, environment, and economy from the growing impacts of climate change. By embracing proactive, inclusive, and science-based strategies, Kingston is laying the foundation for a more resilient and equitable future.

A Shared Vision for Resilience

Climate change is no longer a distant threat—it is a present reality. Kingston is already experiencing hotter summers, more intense rainfall, and an increase in extreme weather events. These changes affect every aspect of life, from public health and infrastructure to biodiversity and local economies. This plan acknowledges that while climate change affects everyone, its impacts are not felt equally. Vulnerable populations—such as seniors, low-income households, and those with pre-existing health conditions—face disproportionate risks. Our adaptation efforts must therefore be rooted in equity and inclusion.

Action Through Collaboration

The development of this plan has been a collaborative effort, guided by the expertise of ICLEI Canada and shaped by input from community members, local organizations, and City staff. This collective approach ensures that adaptation actions are locally relevant, community-driven, and aligned with other municipal strategies, including the Climate Leadership Plan and the Official Plan.

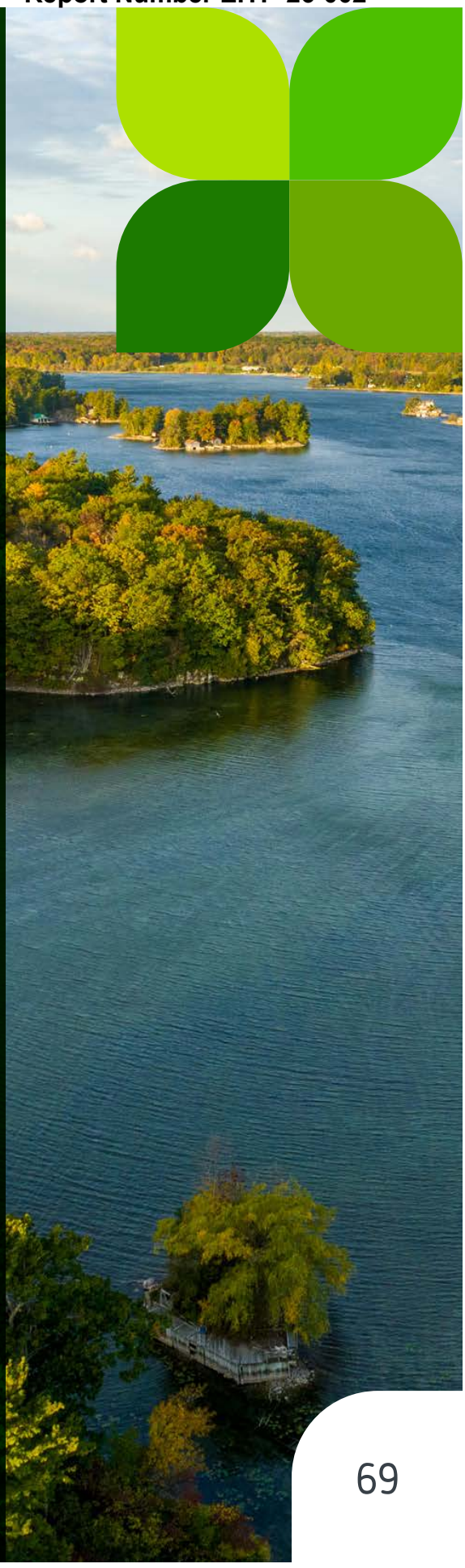
Key areas of focus include:

- Strengthening infrastructure to withstand extreme weather
- Protecting natural assets like wetlands and tree canopies
- Enhancing emergency preparedness and public health systems
- Supporting local food systems and energy resilience
- Fostering climate literacy and community engagement

A Call to Action

Adaptation is a shared responsibility. While the City will lead many initiatives, success depends on the active participation of residents, businesses, institutions, and community groups. Everyone has a role to play in building a climate-resilient Kingston.

Let this plan be a catalyst for action, innovation, and hope. Together, we can transform the challenges of climate change into opportunities for a healthier, more sustainable, and more resilient Kingston.



Appendix A

Glossary of Terms and Acronyms

Glossary

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

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

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

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

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

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

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

Climate Justice: Climate Justice recognizes the disproportionate impacts of climate change on low-income communities and communities of color around the world, the people and places least responsible for the problem. It seeks solutions that address the root causes of climate change and in doing so, simultaneously address a broad range of social, racial, and environmental injustices.

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 is 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, and 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, hail storm, 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 an 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.

Low Impact Development: Low impact development (LID) practices are ways of dealing with stormwater runoff in cities to prevent issues such as floods, erosion, sedimentation, and pollution. Unlike conventional stormwater management methods, LID mimics natural water cycles by increasing the infiltration of stormwater into the soil, where it gets absorbed by plants or filtered into underground aquifers.

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.

Microgrid: A microgrid is a self-contained electrical network that allows you to generate your own electricity on-site and use it when you need it most (e.g. solar panels). Microgrids can be community-centered initiatives undertaken to meet the needs of users. They may feature a range of components, such as solar panels, energy storage units and tools for managing buildings' energy use.

Reconciliation: The hard work of reconciliation and structural reform necessary to transition this country into a respectful and safe place for Indigenous Peoples will take years. It calls upon all Canadians to recognize the ideas and structures that created the residential schools in the first place, and to rise against these outdated and deeply oppressive ways of thinking. Reconciliation is about establishing and maintaining respectful relationships between Indigenous Peoples, Canadians, and the Canadian government. It acknowledges that we do not yet live as a society that is based on mutual respect and understanding. We live in a manner that is profoundly disrespectful to the environment and land, to Indigenous Peoples, and to the idea of true equality, and so we must work together to transform this country into a place based on true principles of respect, equality and justice.

Regenerative Farming: Regenerative farming or regenerative agriculture considers every aspect of the land's ecological system, from the soil, to the water, to the diversity of plant life, ensuring every part of the ecosystem is healthy and working well together. It also improves biodiversity and increases the land's resilience to climate change.

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.

Riparian Areas/Riparian Buffer: Riparian areas are the transition areas between the aquatic (water) and terrestrial (uplands) lands, where the extra water results in moist soils supporting water-loving vegetation. They are the green belts you see around rivers, lakes, wetlands, and streams.

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) which 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.

Smart Density: Smart density means compact, well-connected and thoughtful development that promotes sustainable, resilient and comfortable living.

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

BIPOC – Black, Indigenous, and People of Color

CCAP – Climate Change Adaptation Plan

CODN – Cost of Doing Nothing

IIDEA – Indigenization, Inclusion, Diversity, Equity, and Accessibility

IPCC – Intergovernmental Panel on Climate Change

LCR – Low Carbon Resilience

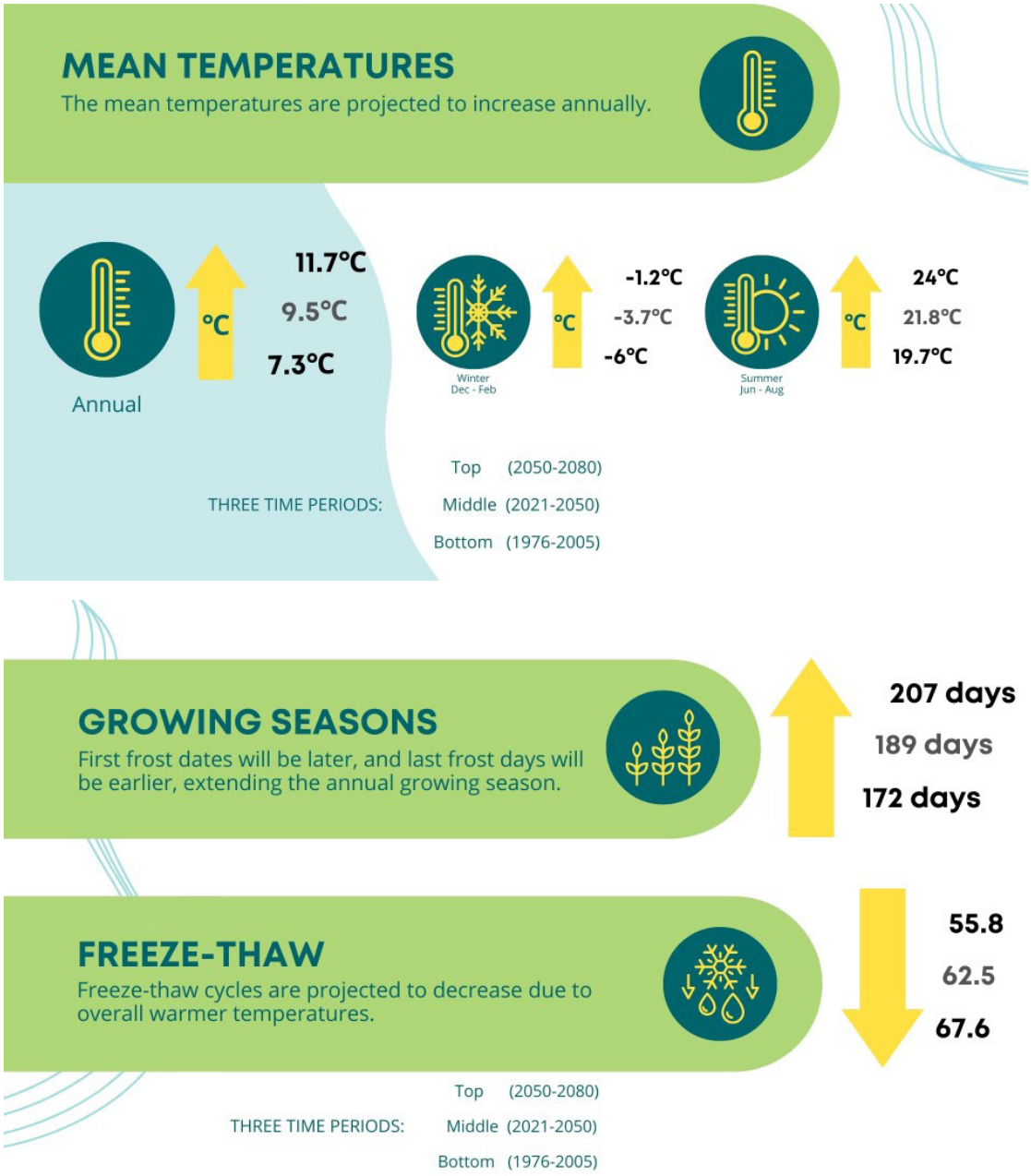
LID – Low Impact Development

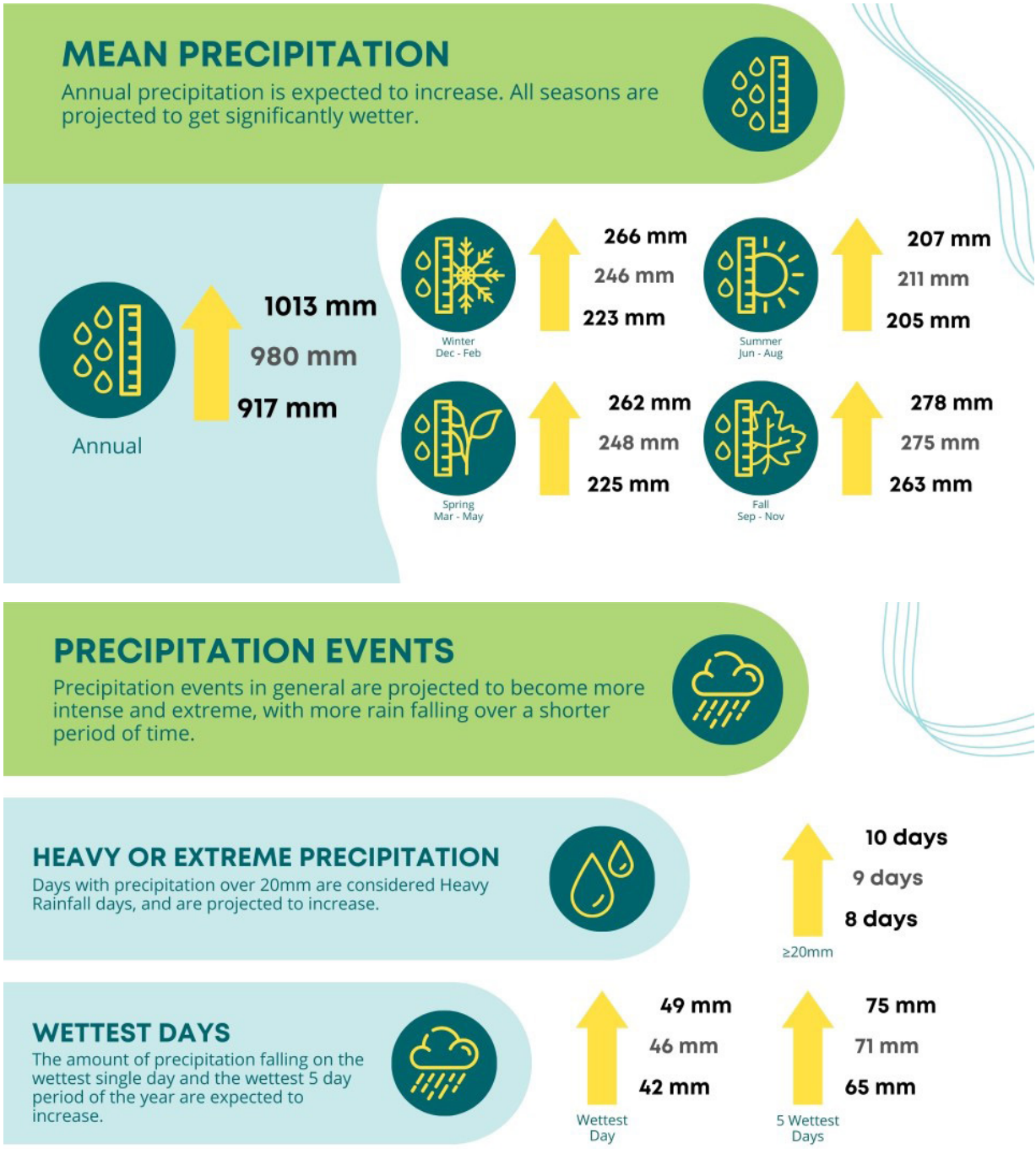
RCP – Representative Concentration Pathways

SSP – Shared Socio-economic Pathways

Appendix B

Future Climate Projections Infographic




MEAN PRECIPITATION
Annual precipitation is expected to increase. All seasons are projected to get significantly wetter.
1013 mm
980 mm
917 mm
Annual
Winter
Dec - Feb
266 mm
246 mm
223 mm
Summer
Jun - Aug
207 mm
211 mm
205 mm
Spring
Mar - May
262 mm
248 mm
225 mm
Fall
Sep - Nov
278 mm
275 mm
263 mm
PRECIPITATION EVENTS
Precipitation events in general are projected to become more intense and extreme, with more rain falling over a shorter period of time.
HEAVY OR EXTREME PRECIPITATION
Days with precipitation over 20mm are considered Heavy Rainfall days, and are projected to increase.
10 days
9 days
8 days
≥20mm
WETTEST DAYS
The amount of precipitation falling on the wettest single day and the wettest 5 day period of the year are expected to increase.
49 mm
46 mm
42 mm
Wettest Day
75 mm
71 mm
65 mm
5 Wettest Days

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Appendix C

Detailed Vulnerability and Risk Assessment Results

Impact Statement	Vulnerability Ranking	Likelihood (/5)	Social Risk Score (/100)	Economic Risk Score (/100)	Environmental Risk Score (/100)	Total Risk Score (/300)	Overall Risk Ranking
Impact 31: Increase in the frequency/intensity of extreme weather events & back-to-back events resulting in higher mental & physical health implications (from hazardous travel/living conditions, displacement/evacuation, emotional loss and climate stress, power outages, unsafe food safety practices, boil advisories, disruptions to social gatherings and social events etc.) for residents, especially vulnerable populations (e.g. seniors, socially isolated, children, those with chronic health conditions, low-income households, etc.).	Medium-High	5	100	95	100	295	Extreme
Impact 15: Increase in average annual temperatures leading to drier soil and the drying out/ loss of wetlands, increasing chances of wildfire and resulting in the loss of wildlife (i.e. habitat, breeding grounds, altering normal distribution, etc.) and reduction of ecosystem services (e.g., flood prevention, water/ air filtration, carbon capture, etc.).	High	5	95	95	100	290	Extreme
Impact 38: Increase in average annual temperatures and changing precipitation patterns leading to greater regional forest fire risk and worsening air quality, resulting in greater health impacts to residents and workers, especially vulnerable populations (e.g. those with pre-existing conditions, children, farmers, outdoor workers, seniors, etc.).	High	5	85	90	90	255	Very High

Impact Statement	Vulnerability Ranking	Likelihood (/5)	Social Risk Score (/100)	Economic Risk Score (/100)	Environmental Risk Score (/100)	Total Risk Score (/300)	Overall Risk Ranking
Impact 4: Increased frequency and duration of hot days (>30°C), resulting in project delays, reduced short term productivity (e.g. from heat stress to workers) and increased need to redesign infrastructure to adhere to higher resiliency standards (i.e. more research, heat-safety training, staff capacity, cost, etc.).	High	5	85	65	75	225	High
Impact 40: Increase in the frequency and/or intensity of windstorms and other extreme weather events resulting in damage and/or toppling of trees leading to shifting species/keystone species distributions (e.g. birch & pine trees starting to disappear from the area) and disruption of plant/ vegetation growth.	Medium-High	4	68	64	52	184	Medium-High
Impact 30: Increase in extreme weather events resulting in higher demand for emergency shelters and services (i.e. warming/cooling centres, power generation, shelters, emergency response, etc.) leading to an increased strain on emergency planning and resources and potential lack of access to healthcare, supplies, and support, potentially overwhelming the City's emergency services and ability to manage the existing opioid epidemic in Kingston.	High	5	60	75	45	180	Medium-High
Impact 6: Increase in average annual temperatures and frequency/intensity of precipitation (esp. in winter and spring), causing disrupted growth cycles and growing regions of plants/crops (including maple syrup production), leading to reduced crop/ livestock yield and implications for agricultural community (i.e. reduced income, mental health implications, etc.).	High	4	56	56	65	176	Medium-High

Impact Statement	Vulnerability Ranking	Likelihood (/5)	Social Risk Score (/100)	Economic Risk Score (/100)	Environmental Risk Score (/100)	Total Risk Score (/300)	Overall Risk Ranking
Impact 34: Increased wind events and extreme rainfall (particularly in spring) resulting in prolonged flooding and/or prolonged elevated water levels leading to disruptions to/shutdowns of island ferries, flooded docks, and marine infrastructure; disrupting tour boat operations on the Rideau Canal to the Thousand Islands, significantly impacting major economic drivers in the region.	Medium	4	52	64	56	172	Medium-High
Impact 3: Increase in the frequency/duration of hot days (>30 °C) resulting in heatwaves coupled with the urban heat island effect and reduced air quality, leading to health and safety risks (e.g. heat stress, mental health issues, domestic violence/ violent altercations, cardiovascular disorders, food-borne/water-borne illnesses, death, etc.) especially to vulnerable populations (e.g. outdoor workers, seniors, women, children, those with chronic health conditions, temporary foreign workers, those without AC, etc.)	High	5	70	50	50	170	Medium-High
Impact 14: Increased average annual temperatures resulting in the heating up of lakes/ bodies of water and increased algae blooms and bacteria levels/counts, leading to deteriorating lake health and water quality, disruption of aquatic/keystone species populations and wildlife migration patterns also impacting rural and/or Indigenous communities that rely on hunting/ fishing.	High	5	60	45	55	160	Medium-High
Impact 16: Increased frequency and duration of hot days (>30°C), resulting in increased demand and pressure on electric grid, causing more power outages (blackouts and brown outs) and service disruptions (i.e. business, flow of goods/services, etc.).	High	4	60	60	36	156	Medium

Impact Statement	Vulnerability Ranking	Likelihood (/5)	Social Risk Score (/100)	Economic Risk Score (/100)	Environmental Risk Score (/100)	Total Risk Score (/300)	Overall Risk Ranking
Impact 2: Increase in frequency/duration of hot days (>30°C) coupled with urban heat island effect leading to reduced use of outdoor recreational space that are lacking in cooling/shading facilities, cancellation of outdoor events and disruption to tourism/local business traffic (e.g. Sunday markets, Kington Buskers Rendezvous, Fort Henry, Princess promenade, skeleton park arts, film festival etc.).	High	5	65	60	20	145	Medium
Impact 21: Increased frequency and intensity of precipitation events resulting in increased roof leaks, overland flooding, riverbanks overflow, atypical on-site flooding patterns leading to damage (e.g., mold growth) of private assets and infrastructure (i.e. homes, basement apartments, businesses, marine infrastructure, property, products/inventory, etc.) and higher insurance rates, premiums and/or availability of coverage.	Medium	4	48	48	48	144	Medium
Impact 12: Increased annual temperatures and heat waves resulting in stressed forest ecosystems and the drying out of soil and wetlands, leading to the die-back of tree canopy, changes in the pace and degree of spread of diseases and pests (e.g., emerald ash borer, oakwood fungus, oak wilt, hemlock wooly adelgid, spotted lanternfly, and Asian longhorned beetle), decline in drought resistant species and increase in drought tolerant species (e.g., non-native fire-prone grass species).	High	4	36	44	60	140	Medium

Impact Statement	Vulnerability Ranking	Likelihood (/5)	Social Risk Score (/100)	Economic Risk Score (/100)	Environmental Risk Score (/100)	Total Risk Score (/300)	Overall Risk Ranking
Impact 26: Increased frequency and intensity of precipitation events resulting in more overland flooding, greater runoff of contaminants (e.g. chloride/mineral, agricultural runoff, and metal concentrations) and sediment loading into streams and rivers (i.e. eutrophication), leading to reduced groundwater and drinking water supply/ quality, loss of wildlife habitat (e.g. natural shellfish beds, riparian habitats, ability to reproduce, etc.) and culturally significant landscapes, trees and plants.	Medium	4	48	48	44	140	Medium
Impact 9: Increased frequency and duration of hot days (>30˚C) resulting in deterioration of transportation infrastructure and increased maintenance requirements for bridges, roads, rural roads, railways, culverts, sidewalks, trails, and parking lots.	Medium	4	48	60	32	140	Medium
Impact 5: Increase in average summer temperatures leading to an increased demand for indoor and air-conditioned spaces (e.g., recreation centres, pools) and shaded or cooled outdoor areas (e.g., splash pads, trees).	High	5	55	50	30	135	Medium
Impact 33: Increased frequency, severity, and length of extreme weather (especially high wind events) and changing water levels, resulting in increased erosion along shorelines and destruction/ disappearance of breeding habitat, leading to significant damage to terrestrial and aquatic ecosystems and impacts to fishing and farming (i.e. crop loss/damage, animal mortality, etc.).	High	4	40	48	44	132	Medium
Impact 17: Increased frequency and intensity of precipitation events (especially in winter and spring) and freezing rain events resulting in rapid melting and refreezing, leading to hazardous travelling conditions for pedestrians, cyclists, vehicles, etc.	High	5	55	40	35	130	Medium

Impact Statement	Vulnerability Ranking	Likelihood (/5)	Social Risk Score (/100)	Economic Risk Score (/100)	Environmental Risk Score (/100)	Total Risk Score (/300)	Overall Risk Ranking
Impact 11: Increase in average annual temperatures and occurrence of freeze-thaw days resulting in altered species distribution and phenology (i.e., pollinators and flowers not being active at the same time) and stunted vegetation growth/ impact to tree health, leading to reduced pollination and reduced wildlife populations.	High	4	36	32	56	124	Medium
Impact 22: Increased frequency and intensity of precipitation events, resulting in overburdening and stress on stormwater systems and wastewater treatment facilities, including more bypass discharges to local watercourses, contaminating local water, water service disruptions.	Medium	4	40	48	36	124	Medium
Impact 8: Increased frequency and duration of hot days (>30˚C) resulting in increased AC demand, energy demand and building cooling costs, as well as increased physical damage to buildings as a result of heat stress on materials (e.g., heritage buildings) and building systems, (e.g. assets do not reach their intended end of life cycle and/or require major/costly maintenance during a skilled trade shortage).	High	5	50	45	25	120	Medium-Low
Impact 37: Increase in the frequency and/or intensity of extreme weather events leads to falling trees and other objects which can cause damages to powerlines, water main breaks, and overall utility infrastructures causing more power outages, service interruption and damage to energy systems (transmission stations, buildings, utility infrastructure) and telecommunications lines.	Medium	4	32	52	32	116	Medium-Low
Impact 28: Increase in frequency, severity, and length of extreme weather events resulting in health and safety concerns and damage to natural assets, leading to a reduction in outdoor recreation, events, and tourism.	Medium	3	36	36	42	114	Medium-Low

Impact Statement	Vulnerability Ranking	Likelihood (/5)	Social Risk Score (/100)	Economic Risk Score (/100)	Environmental Risk Score (/100)	Total Risk Score (/300)	Overall Risk Ranking
Impact 36: Increased frequency/intensity of extreme weather events (e.g. ice storms, windstorms, thunderstorms, hailstorm, tornado, etc.) leading to increased damage of private assets and infrastructure (e.g. vehicles, homes, businesses, inventory/goods, etc.) from fallen trees, downed powerlines, and other objects.	Medium	4	24	52	32	108	Medium-Low
Impact 19: Increased precipitation and increased average annual temperatures resulting in more standing water and ideal conditions for vectors, leading to increased risk/ spread of vector-borne diseases from insects and pests (e.g. mosquitos, agricultural pests, etc.).	High	5	40	35	35	105	Medium-Low
Impact 23: Increased frequency and intensity of winter precipitation events (e.g. snowfall, ice, freezing rain etc.) and other extreme weather events resulting in increased structural load on buildings and damage to City-owned assets and infrastructure (i.e. buildings, roads, SWM infrastructure, sports fields, bridges, trails, trees, streetlights, etc.) leading to increased maintenance requirements (e.g. snow ploughing, road salt, repairs, etc.), disruptions to operations (e.g., building down time, traffic accidents, administrative burdens - planning, revision, etc.) and potential injuries.	Medium	4	32	44	24	100	Medium-Low
Impact 20: Increased frequency and intensity of precipitation events, resulting in overburdening and stress on stormwater systems and wastewater treatment facilities and more bypass discharges to local watercourses, leading to the contamination of local water (e.g., e coli) and water service disruptions.	Medium	4	28	36	28	90	Medium-Low

Impact Statement	Vulnerability Ranking	Likelihood (/5)	Social Risk Score (/100)	Economic Risk Score (/100)	Environmental Risk Score (/100)	Total Risk Score (/300)	Overall Risk Ranking
Impact 32: Increase in the frequency/intensity of extreme weather events globally leading to increased immigration to Kingston by climate migrants, increasing the population and adding stress to already strained services (housing, healthcare, transportation, community services etc.)	High	5	35	35	20	90	Medium-Low
Impact 7: Increase in average annual temperatures and frequency and/or intensity of precipitation (esp. in winter and spring) causing crop stress and altered or reduced crop/livestock yield and impacted community gardens, affecting the local food system/ availability.	High	4	32	24	28	84	Low
Impact 10: Increased seasonal occurrence of freeze-thaw cycles resulting in critical infrastructure malfunctions (e.g., water/ wastewater treatment, road hazards) and increased maintenance requirements and costs for building and transportation systems.	Medium	4	16	16	16	48	Low

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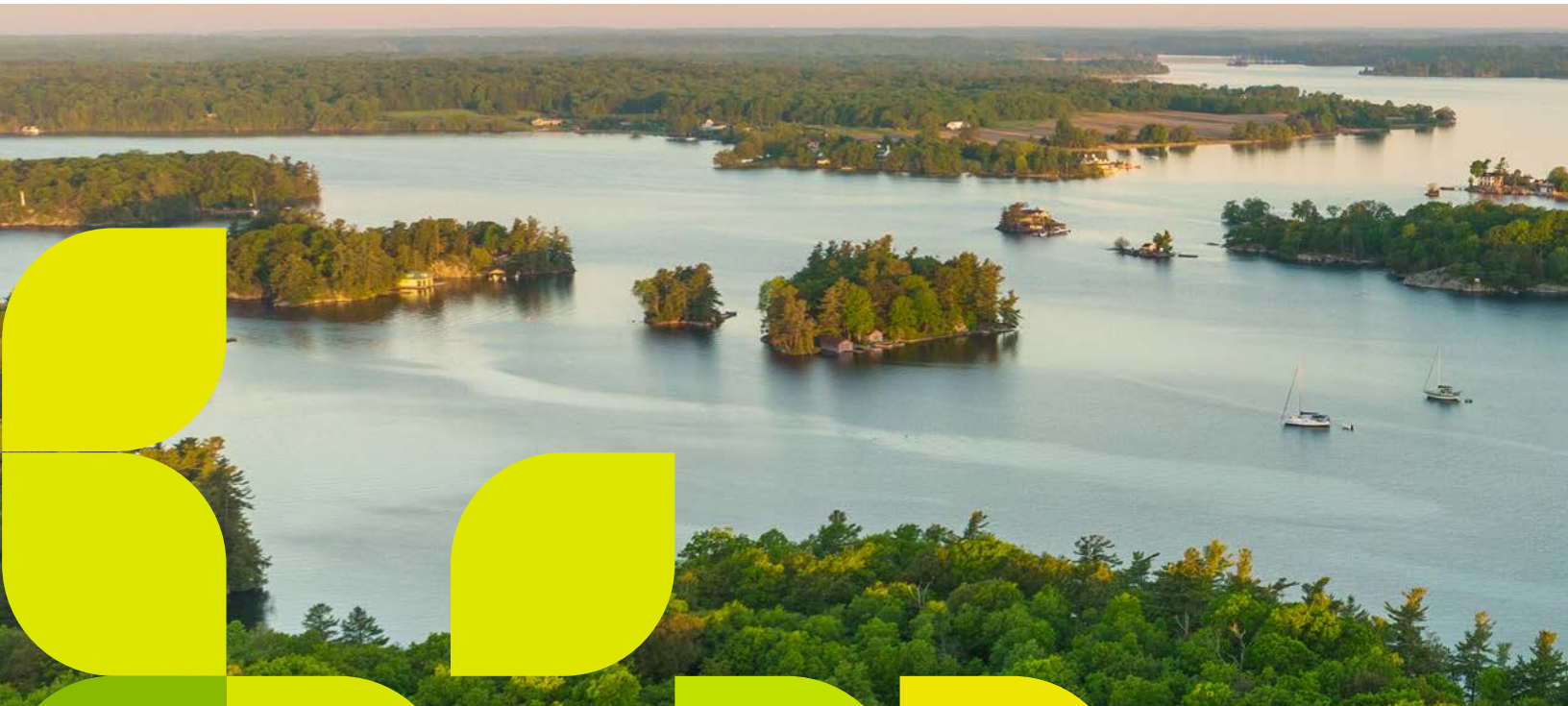

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