



TOWN OF AJAX

# *Ajax Climate* RISK & RESILIENCY PLAN

June 2019



Town of  
*Ajax*  
By the Lake

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# Executive Summary

The primary purpose of this Ajax Climate Risk and Resiliency Plan (ACRRP) is to provide Town Council and staff with a strategic planning framework and a way forward to address current and future climate change risks. It aims to reduce the environmental, social, and economic impacts on the community as a result of predicted changes in precipitation, temperature and extreme weather, while providing a vision that encourages coordinated action through collaboration, leadership, and engagement.

The Town's commitment to climate change readiness is evident in several of the Town's current strategic planning documents, previous initiatives, partnerships, and the significant work completed to date. The Town's Official Plan acknowledges and recognizes that climate change is occurring rapidly, and as such has set out a number of goals that plan to "moderate potential damages, take advantages of opportunities, and better cope with the consequences."

Ajax has joined the Partners for Climate Protection led by the Federation of Canadian Municipalities with the commitment to reducing greenhouse gas emissions by 6% by 2020, an undertaking that was achieved five years early.

In addition, the Town has participated in the International Council for Local Environmental Initiatives (ICLEI)-led Train-the-Trainer project within the Great Lakes Region with the intent of building capacity within its municipal departments to educate and prepare municipal staff for adaptation planning.

Complementing these actions taken to date, the Town is building on significant work to identify the risks and vulnerabilities that the community faces today and into the future, in order to create a framework for focused actions. The work undertaken to map these risks and vulnerabilities directly informed the objectives outlined in this Plan and the actions contained in the accompanying Implementation Strategy.

Today's complex climate issues require an inclusive whole-of-community approach, one that yields meaningful knowledge and insight to inform the way forward. The ACRRP was developed through thoughtful and meaningful engagement with Town staff, community stakeholders and members of the public using surveys, workshop sessions and focus groups in an attempt to foster participatory action. Feedback garnered from this engagement was

critical in formulating the visioning, action planning and strategies to make the plan achievable.

The eight objectives presented within this Plan are the basis for action over the next decade, creating a foundation for a more resilient Ajax into the future. The eight high-level objectives are:

**OBJECTIVE #1:** Town residents, priority populations and businesses are communicated with about emergency preparedness and have access to emergency resources and information.

**OBJECTIVE #2:** Existing and future critical and social infrastructure is adapted to withstand the impacts of climate change.

**OBJECTIVE #3:** The Town has implemented supporting plans, programs and policies to manage human health impacts resulting from climate change.

**OBJECTIVE #4:** Emergency plans are in place for transportation and accessibility within the Town.

**OBJECTIVE #5:** Naturalized urban areas and green infrastructure within the Town are enhanced to be resilient and supportive of biodiversity, to help protect critical and social infrastructure from climate change impacts, and are planned and maintained to limit conflicts with critical infrastructure.

**OBJECTIVE #6:** Natural heritage systems across the Town have been protected, restored and expanded to support biodiversity and improve their overall resiliency to climate change impacts.

**OBJECTIVE #7:** Town staff are equipped with improved decision making tools to identify areas of high vulnerability and risk of flooding and erosion.

**OBJECTIVE #8:** Stormwater infrastructure resiliency has been enhanced across areas of known high flooding risk.

By taking action now, the Town can proactively position itself in a manner that addresses the inevitable effects of the complex dynamics of climate change, securing its future as a resilient community with a robust infrastructural network, strengthened community partnerships and healthy and resilient natural systems.

# Message from the Mayor of Ajax

Since 2013, the Town has been impacted by extreme climatic events including localized flooding, significant drought and violent storms that resulted in property damages, energy and transportation disruptions and ecological impacts. The reality of climate change is evident, and recent reports from Natural Resources Canada and Durham Regions Future Climate (2040-2029) report, suggests annual temperatures will continue to increase, bringing less snow in the winter and heavier rain storms year round.

Together, we can prepare our community by putting proactive measures in place so we can respond to the likelihood of Town disruptions in the future.

The Town has worked in collaboration with neighbouring municipalities and regions, stakeholders and the community to develop a strategic framework that supports the greater adaptive capacity and resilience to the impacts of climate change. The Ajax Climate Risk and Resiliency Plan outlines and addresses risks in three key areas; emergency preparedness and response, natural systems and storm water, flooding and erosion. We believe this plan achieves a high level of preparedness that is required for an

increasingly volatile climate. However, our work is not over.

Over the course of the 10-year vision, a collective approach plays a critical factor to ensuring the successful implementation of the plan. The goals and objectives that have been established, demonstrate the Town's commitment and identifies each department's critical role.

We look forward to working with the community throughout the implementation of this plan and carrying out the vision and building a climate ready Ajax.

Sincerely,



A handwritten signature in black ink, appearing to read 'Shaun Collier'. The signature is fluid and cursive, written over a white background.

Mayor Shaun Collier, Town of Ajax

# Acknowledgements

The Climate Adaptation Steering Committee oversees the development of the project. The committee consists of municipal staff from a range of departments. Together, they help ensure that a community-wide approach is being taken to complete the project. The Town would like to thank the following people for their dedication and hard work:

## Ajax Steering Committee

- Jade Schofield (Environmental Sustainability)
- Stev Andis (Planning and Development Services)
- Craig Blencowe (Forestry/ Horticulture)
- Cayla Da Silva (Community Development)
- Chris Walker (GIS)
- Charmaine Chowdhry (Finance)
- Mark Somerville (Fire)
- Rick Chalmers (Asset/ Engineering)
- Sean McCullough (Policy Planning)
- Stephen Ruddy (Stormwater)

## NASA Develop

- Lance Watkins
- Huntington Keith
- Eleanor Dhuyvetter

- Dean Blumenfield
- Elizabeth Dyer

## ICLEI Canada (ICLEI Great Lakes Climate Adaptation Project)

- Meaghan Meany
- Hana Lapp
- Christina Schwantes

## Dillon Consulting Limited (GIS Based Risk Assessment Model, ACCRP & Implementation Plan)

- Ravi Mahabir
- Morgan Boyco
- Zahra Jaffer
- Yena Ahadzie
- David Restivo
- Janny Pape
- Geoff MacDonald
- Christina Baker
- Filiz Tamer
- Caitlin Vandermeer
- Michael Preston
- Paul Donahue

# 1.0 Introduction

## A Resilient Ajax is Possible

Climate change is one of the defining challenges of our time, and Ajax is planning to be future-ready.

The reality of climate change has been felt in the Town of Ajax for a number of years, with an increase in extreme rain and ice storm events and drought conditions, resulting in property damage, energy and transportation disruptions, injury, and economic impacts in the community. According to Durham Region's Future Climate (2040-2049), by the late 2040s, there will be less snow and more rain in the winter, rainstorm events will be more extreme, wind chill will be reduced, and average annual temperatures will increase. Natural Resources Canada recently released its first major national assessment of the state of climate change in the country. Canada's Changing Climate Report (2019) warns that both past and future warming in Canada is, on average,

about double the magnitude of global warming.

The effects of widespread warming are already evident in many parts of the country and are only projected to intensify in the future.

Local impacts of extreme climate events in Ajax have already included:

- Localized flooding, including the 2017 floods;
- Significant drought in 2016;
- Violent storm damage, including impacts from the 2013 ice storm;
- Threats to human health and safety including vector borne diseases such as Lyme Disease and West Nile virus;
- Ecosystem changes;
- Disruption to electricity supply; and
- Disruptions to transportation and communication services.

In order to respond to the likelihood of more such disruptions in the future, the Town of Ajax must identify and prioritize the work that needs to be completed to enable the community to adapt to the risks that climate change poses.

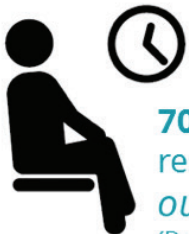
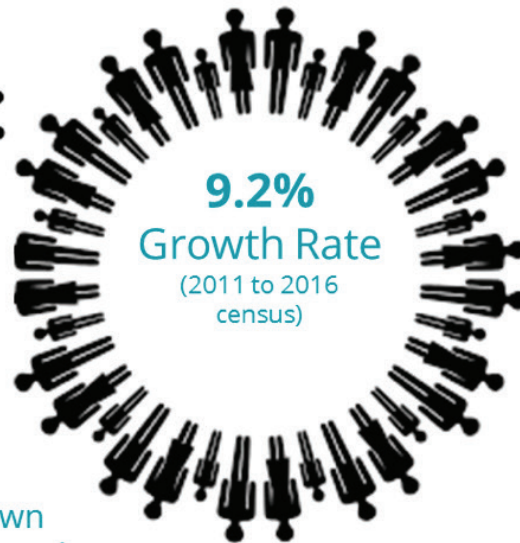
This Ajax Climate Risk and Resiliency Plan (ACRRP) represents an important tool that will be used to directly support the Town of Ajax's Asset Management Plan and long term budget forecast, specifically for issues related to natural systems, stormwater flooding and erosion, and emergency preparedness and response plans.

The ACRRP will also help support stakeholders and the Town's community partners in their work, to ensure that the impacts of climate change to our community are addressed proactively, and that resiliency is a top priority across the municipality.



Rotary Park, Ajax, Ontario. Photo Credit: Edson Inniss

# Ajax at a Glance



70% of Town residents work *outside Ajax*  
(Durham Region Workforce Report, 2016)

99% of households in the Town of Ajax are urban  
(Durham Region, 2015)

## Key Economic Sectors<sup>1</sup>



<sup>1</sup>Town of Ajax, 2019 (<https://www.ajax.ca/en/business-and-growth/community-profile.aspx#Key-Sectors>)

# 1.1. A Local Lens on Climate Change

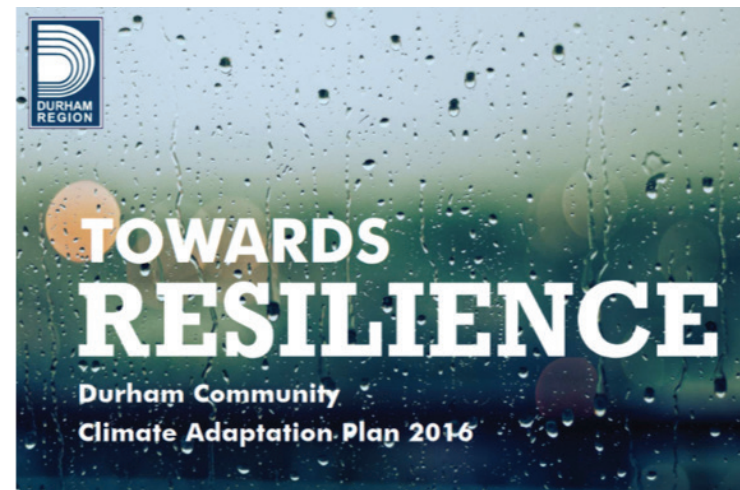
## The Regional Perspective

In 2014, the Durham Region Roundtable on Climate Change (DRRCC) commissioned a future climate forecasting and reporting exercise that resulted in a report entitled Durham Region's Future Climate (2040-2049). The report compared the climate in the Region for the period 2000-2009 to the projected climate from 2040-2049. The study was undertaken to inform five key areas of planning in Durham:

- Infrastructure upgrades and new design criteria;
- Extreme weather and emergency response programs;
- Business continuity programs;
- Improved urban and rural design for resilience; and
- Programs and measures to protect human health and property.

A detailed analysis of current and projected climate was developed for eight (8) sites across the region, including Ajax. A summary of the key findings with respect to the anticipated climate changes in the Town is illustrated on the following page.

The study formed the basis of the Durham Community Climate Adaptation Plan (2016), which identifies the need to build resilience to climate change impacts in a number of key areas, including buildings, utilities, roads, human health, the natural environment, and food security.



Vision for the Durham Community Climate Adaptation Plan

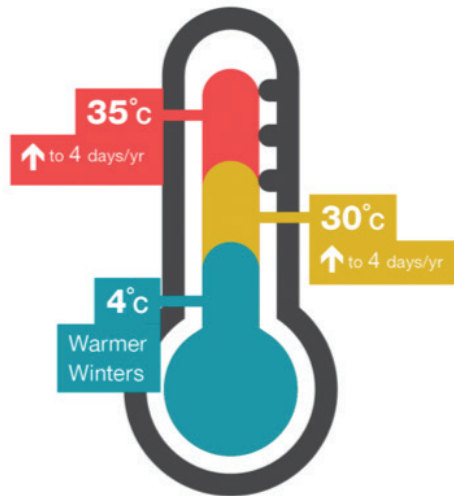


In the face of a changing climate, Durham region remains a liveable, resilient and prosperous community through at least mid-century.

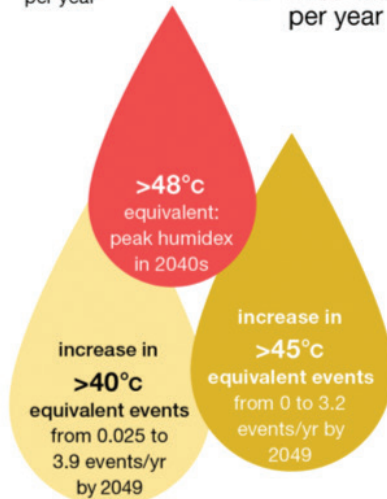


# Future Climate in Ajax: 2049

## Warmer



from **0.025** Heat waves per year to **3.9** Heat waves per year



## Wetter

Increased overall precipitation, with fewer high intensity snow events



2 to 5 events/year



January:



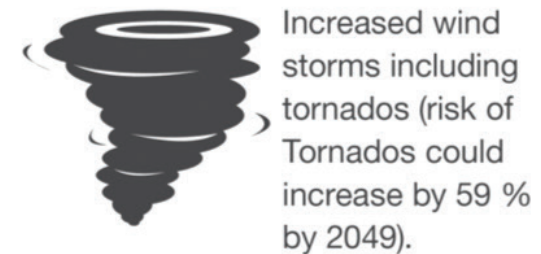
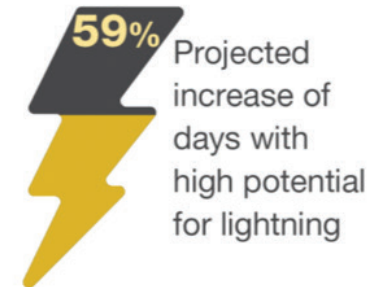
February:



## Wilder



Increase in violent storms



## The Community Perspective in Ajax

The projected impacts of climate change are wide-ranging, and encompass risks to property, infrastructure damage, service disruptions, human injury and economic loss for Ajax. The potential for health and wellbeing impacts are also significant, with the most vulnerable populations in the community experiencing a disproportionate level of the resulting effects.

Given recent trends and events, the Town is committed to taking action through a number of key initiatives.

These include joining the network of Partners for Climate Protection (led by the Federation of Canadian Municipalities) in 2011, completing a framework for reducing greenhouse gas emissions, and the development of a Corporate Energy Conservation Demand Management Plan to better manage the Town's own consumption of energy.

These initiatives are focused on climate change mitigation, aimed at reducing the flow of greenhouse gases into the atmosphere. In addition, the Town has participated in the ICLEI - Local Governments for Sustainability Train-the-Trainer project with the intent of building capacity within municipal departments to educate and prepare municipal staff for adaptation planning.

## Community Health and Wellbeing Impacts of Climate Change



**Temperature-related health impacts**



**Vector borne diseases**



**Extreme weather**



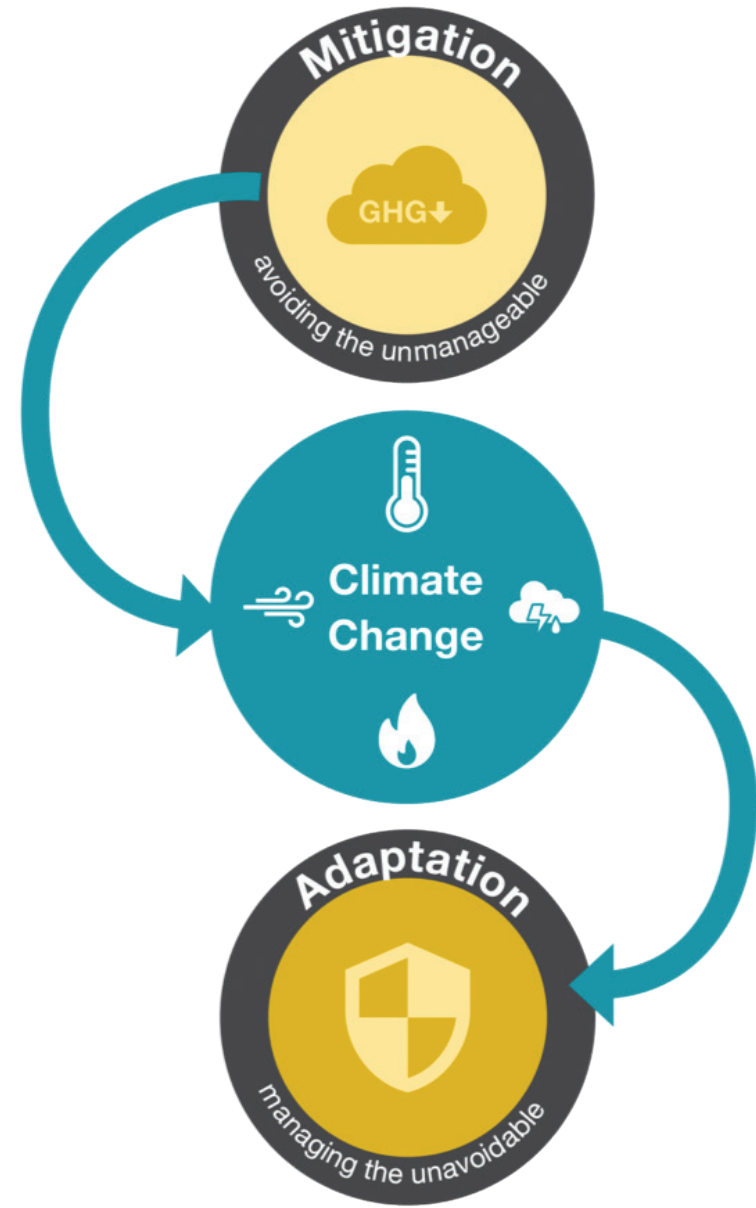
**Increased exposure to ultraviolet rays**



**Water- and flood-borne contamination**

Following the framework established in the Ajax Official Plan, the Town has initiated a process to chart a course in adaptation planning. Whereas mitigation is about doing our part to prevent unmanageable climate changes, adaptation planning is about equipping our community to adapt to the degree of change that can no longer be avoided. The Ajax Official Plan was the first in Ontario to integrate climate adaptation policies into local land use planning. The policies ensure the climate change lens is used in the decision making process so that development is resilient. The Official Plan policies also direct the Town to “develop and implement an integrated Climate Change Action Plan”.

## Understanding Climate Change Action: Mitigation and Adaptation



In preparation for the development of this ACRRP, Ajax participated in ICLEI's 2017 Great Lakes Climate Adaptation Project, which provided Town staff with training on the identification of climate related risks and vulnerabilities, and methods to engage stakeholders in meaningful dialogue around addressing the impacts of climate change.

A Vulnerability Assessment was conducted as a measure of the community's susceptibility to climate change impacts.

There are two key factors measured to assess vulnerability:

- Sensitivity, which refers to the degree of impact experienced by the community; and
- Adaptive Capacity, which refers to the ability of the community to adjust in light of climate change impacts with minimal resources, cost, or disruption.

A Risk Assessment was also conducted, in which risk is defined as a combination of two main elements:

- Likelihood, which is the probability of an event occurring; and
- Consequence, the known or anticipated impact of the event.

The result of the vulnerability and risk assessments was a list of predicted impacts which would result in high risk and/or high vulnerability.

“ Even after introducing significant measures to reduce greenhouse gas (GHG) emissions, some additional degree of climate change is unavoidable and will have significant economic, social and environmental impacts on Canadian communities.

To reduce the negative impacts of this change and to take advantage of new opportunities presented, Canadians will need to adapt.

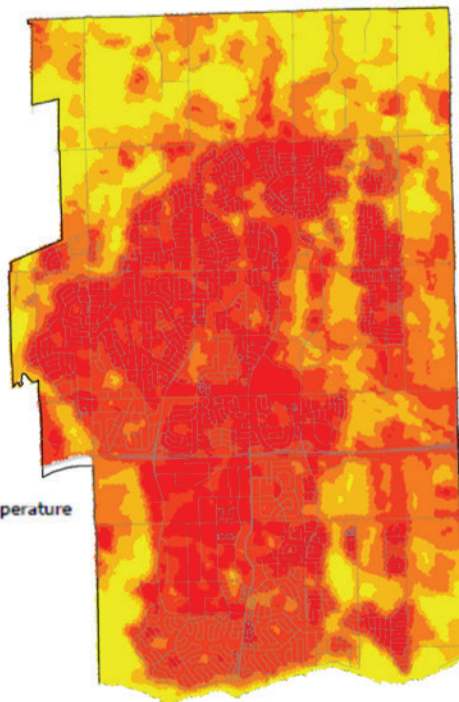
*Natural Resources Canada, 2015*

## Modelling Heat Risk: The NASA Develop Study

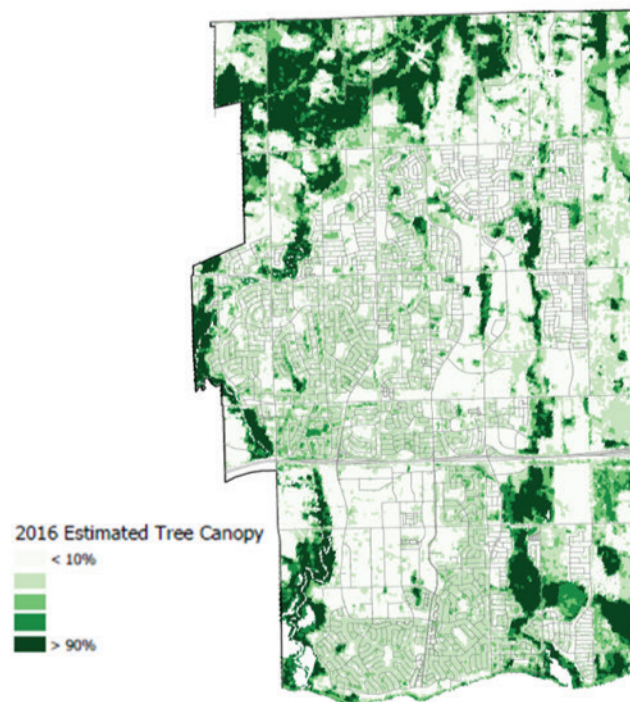
In 2018, the Town of Ajax formed a partnership with NASA Develop to conduct a study that utilized satellite data and remote sensing techniques to model tree canopy and surface temperatures. The Ajax Urban Development Study's objectives included determining the relationship between climate and tree health, identifying resident populations that would be impacted the most by predicted changes in climate, and identifying areas that would benefit the most from added tree cover.

The resulting outputs illustrated the relationship between surface temperature, forest cover, and social vulnerability. This study has assisted the adaptation planning process by helping to identify where Ajax residents might be particularly vulnerable to increasing temperatures due to limited tree canopy coverage and where early urban forestry actions are needed to mitigate potential climate impacts on tree cover.

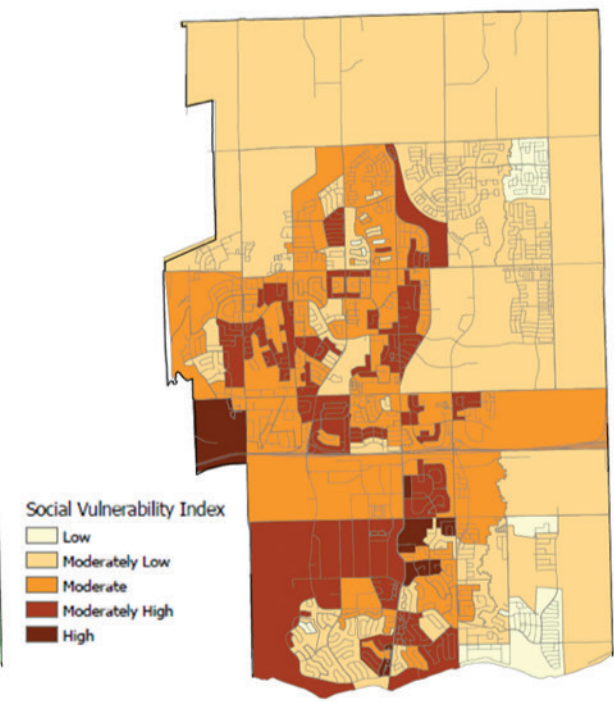
Surface Temp



Forest Cover

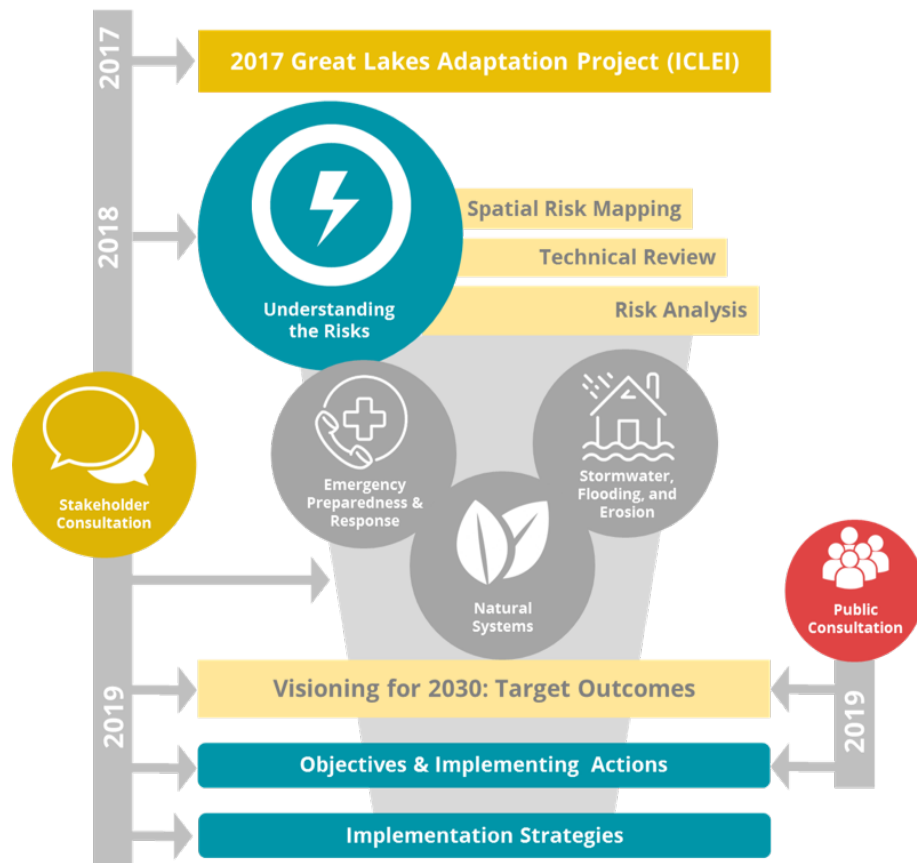


Social Vulnerability



# 1.2. Understanding Risk: An Ajax-Focused Approach

## Developing the Ajax Climate Risk and Resiliency Plan: The Process



The foundation of climate adaptation planning is an understanding of the risks that threaten a community. In an effort to clarify the existing and potential risks within Ajax as a result of climate change and build on the background work described in Section 1.1, the Town initiated a Community Climate Study in 2017. The study explored three strategic focus areas, which were drawn from the Vulnerability and Risk Assessments described previously:

- Focus Area #1: Emergency Preparedness and Response;
- Focus Area #2: Natural Systems; and
- Focus Area #3: Stormwater, Flooding and Erosion.

These areas of potential impact were assessed through the lens of specific climate change stressors, primarily the severity, intensity and frequency of extreme weather events, temperature, and precipitation. Each of the three studies concluded with identifying potential climate impacts within the Town of Ajax.

The key outcomes and highlighted findings from each of

the three studies are summarized in Sections 2.3 to 2.5 of this document.

A significant outcome of the Town's Community Climate Study included the creation of a Geographic Information System (GIS)-based tool for the Town of Ajax that included, in part, a robust inventory of data layers for stormwater systems, overland flooding, natural capital, building stock, and demographics. A key component of the mapping included an assessment of the impacts of various threats that climate change scenarios might produce within Ajax. This model will serve as a flexible tool that can continuously be added to in future years to allow for the identification, assessment, evaluation, and ultimately management of climate risks.

Objectives and programs that are outlined in the Durham Community Climate Adaptation Plan also highlight cross-sectoral programs with the Town of Ajax and paths to achieving climate change resilience. These include programs such as the Protect Our Outside Workers and Social Infrastructure for Emergency Resilience initiatives. There are also overlaps between the responsibilities of the Region and the Town within sectors including Building, Electrical, Flooding, Human Health, Roads, and Natural Environment.

## The Importance of Infrastructure

The term 'infrastructure' can refer to a range of built assets as well as programs and services. For purposes of the ACRRP, three main types of infrastructure are identified and referenced:

**Critical infrastructure:** The physical and information technology facilities, networks, services, and assets which, if disrupted or destroyed, would have a serious impact on the health, safety, security, or economic well-being of our communities. This includes bridges, roads, and utilities such as water, wastewater, and telecommunications.

**Green infrastructure:** Both natural and engineered vegetative systems and green technologies that provide a range of services and benefits for society, including absorbing climate change impacts such as flooding. Examples include woodlots, wetlands (both natural and engineered), meadows, green roofs, urban farms, parks, bioswales, and stormwater ponds.

**Social infrastructure:** Schools, hospitals, emergency services, community support, public space, libraries and cultural institutions that support our community's resilience every day.

## Engaging the Community and Stakeholders

In developing the ACRRP, the Town of Ajax has worked with multiple municipalities across the Great Lakes region as well as a number of stakeholders and partners who provide services in Ajax, including internal departments such as Transportation, Policy Planning, Parks, Community Development, Asset Management, Forestry; external agencies including Durham Region Public Health, Durham Region Police Services and Durham Region Transit; Conservation Authorities (Toronto and Region Conservation Authority (TRCA) and Central Lake Ontario Conservation Authority (CLOCA)); chambers of commerce; utility companies (Elexicon Energy and Enbridge Inc.); local non-governmental organizations (NGOs); school boards; and others.

In-depth, focused stakeholder workshops were held at key points in the project, providing timely and critical feedback to the decisions being made around risk and vulnerability assessment, visioning, action planning, and development of implementation strategies to operationalize the Plan.

The goal of the engagement approach was to enable participants to work collaboratively to identify realistic and achievable adaptation actions, developing and prioritizing actions and objectives to be achieved in a 10-

year time horizon. Workshop participants were provided with an overview of the three-phase risk resiliency project, including a description of the risk and vulnerability studies that led to the identification of climate change related risks for the Town of Ajax.

Development of the ACRRP also involved a three-month public engagement effort via the project website, online surveys, and in-person consultation at Town events such as Earth Hour and Green Living Days, and at pop-up events at Town library and community centre facilities. In all, approximately 200 participants provided input on what concerns them the most regarding weather and the changing climate. Residents provided the Town with their views on what needs to be done to ensure the Town is resilient to the impacts of climate change, what extreme weather events concern them the most, and their level of preparedness in the face of extreme weather. This valuable feedback was used in the refinement of the ACRRP and Implementation Strategy.



ACRRP Stakeholder Workshops

# 2.0 Planning for Resilience

## 2.1. A Framework for Success

The Vision for this Plan was developed in collaboration with key stakeholders, and provides the basis for the goals, objectives, and actions that follow.

Vision Statement: A climate-ready Ajax that is Collaborative, Leading, Engaging, Action-oriented, and Resilient.

This 10-year vision encourages coordinated action and real progress to be advanced in response to multiple climate related threats across three main strategic focus areas.

Framework for the Ajax Climate Risk and Resiliency Plan



## 2.2. Achievable, Impactful Goals

The following goals outline the broad primary outcomes that the Town and its community partners will need to meet in order to achieve the vision of a climate-ready Ajax and set the stage for the Objectives of the ACRRP:

1. **Collaborative:** Develop a system of policies and programs across all divisions in the Town that work in sync to support the Vision.
2. **Leading:** Create a resilient and livable community by supporting innovation and partnerships that encourage integration of climate change considerations into all levels of municipal and community services.
3. **Engaging:** Encourage all members of the community to take individual action and share information to assist in the ongoing tracking and monitoring of progress, and seek input on ways to improve on a continuous basis.
4. **Action-oriented:** Leverage past progress and set the stage for future advancements in building resiliency by

creating and implementing achievable and impactful actions for the next decade.

5. **Resilient:** Enhance the ability of our community's systems and structures to absorb the shocks of climate change related events and impacts, and return to normal functioning without major delays.

## 2.3. Focus Area #1: Emergency Preparedness & Response

### Overview

The complexity of any emergency depends on a combination of factors such as the severity, intensity or duration of an event and the nature of the assets, services or demographics impacted. The Town of Ajax is responsible for developing, managing and implementing its own emergency management programs through emergency planning, annual exercises, training, and public education.

Emergencies within the community (e.g., fire, police, medical, public works, power outages, flood control, etc.) are addressed through the response capabilities of local agencies or by activating predetermined emergency response plans and procedures. With a changing climate that is characterized by more severe, intense and frequent temperature, precipitation and extreme weather events, it is likely that the demand for emergency services will increase, presenting new challenges to key preparedness and response agencies that are tasked with delivering emergency services to the community.

As climate-related events become more prevalent so too will the demand for these emergency services and the

need for timely and effective response. A further concern for emergency personnel are the unique challenges and risks that climate change poses to priority populations who may be disproportionately affected by disaster or are unable to evacuate or secure their own safety in a crisis due to physical or cognitive limitations.

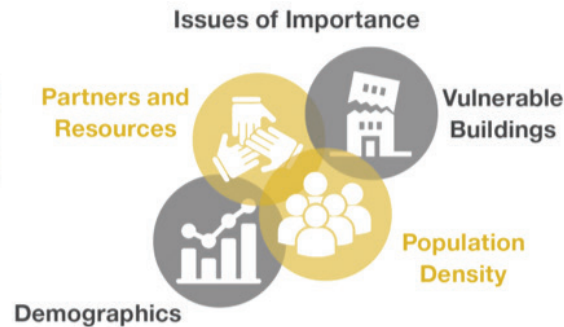
Through a commitment to proactive planning, the Town of Ajax can build its resiliency and enhance its adaptive capacity to manage the growing trend of extreme weather and climate-based events. Ongoing evaluation of capacity gaps in the Town's most vulnerable infrastructure and an assessment of the needs of those most at risk within the community will strengthen Town assets, increase preparedness and build a more resilient Ajax that is prepared to face the challenges to come.

Key objectives to better prepare Ajax for climate related disruptions to emergency services and response include a focus on vulnerable populations, improving infrastructure resiliency, increasing awareness and preparedness, offering supporting programs and policies to manage human health impacts, and having emergency plans in place.

# Emergency Preparedness & Response: Findings of the Climate Change Study



## Key Outcomes



Growth in the downtown core will increase the need for shelter capacity.

Climatic Event	Cold Related Events	Year-Round Hazards	
<p><b>Heat Related Events</b></p>	<p><b>Cold Related Events</b></p>	<p><b>Year-Round Hazards</b></p>	
At Risk	<p>Long-Term Care Facilities Healthcare Facilities Crowds</p>	<p>Long-Term Care Facilities Healthcare Facilities Schools Roads</p>	<p>Institutions Travel Economy Automated Systems Supply of goods &amp; services</p>
Response	<ul style="list-style-type: none"> <li>• Shelter or cooling centres</li> <li>• Municipal Tree Maintenance Program</li> <li>• Cooling equipment</li> <li>• Water supply, distribution, and rationing</li> <li>• Debris clean-up</li> <li>• Evacuation, particularly of priority populations</li> </ul>	<ul style="list-style-type: none"> <li>• Warming centres</li> <li>• Generators and fuel for essential services</li> <li>• Heating equipment</li> <li>• Emergency shelter</li> <li>• Building collapse response</li> <li>• Search and rescue</li> <li>• Drop in/reception centres</li> </ul>	<ul style="list-style-type: none"> <li>• Environment Canada alerts</li> <li>• Communication to the public</li> <li>• Managing hazardous materials</li> <li>• Disaster and emergency financial assistance</li> <li>• Evacuation centres and medium to long-term accommodation</li> <li>• Emergency medical services</li> <li>• Critical infrastructure resilience</li> <li>• Care and protection of animals</li> <li>• Spoiled food and debris disposal</li> <li>• Road/bridge clearing and maintenance</li> </ul>

# Current & Future State

As climate change persists, emergency preparedness and response efforts will need to assess the existing emergency management framework and incorporate the unique needs and circumstances of the community's diverse residents and the state of its infrastructure into future planning efforts.

## Ajax Today

The Town of Ajax and its community partners are responsible for a number of core emergency services, with several plans and processes in place essential to the overall collective response to local emergencies and disasters. With more frequent and severe weather-related events on the horizon, these measures will likely be exceeded. Disruptions to essential services and damage to infrastructure and displacement of the Town's most at-risk populations will need to be addressed with adaptation and action.

The Town has identified and spatially mapped key critical assets and buildings at risk from flood-specific hazards as well as their priority populations, exploring the challenges that these individuals might face in an emergency situation. There is an opportunity to improve spatial mapping of these populations and consideration should be given to the development of priority population-

specific emergency planning that takes into account the needs and circumstances of those individuals. The benefits of this approach include a shared understanding of the community, and increased preparedness of Town staff to effectively respond to climate related disasters.

## A Decade of Building Resilience: Inspiring 2030

In 2030, the Town has assessed its municipal assets and essential services for vulnerability to climate stressors and taken action towards building resilience into its infrastructure. Along with key providers, the community will have assessed its key vulnerabilities (regionally and locally). These actions will address capacity gaps and include measures like asset relocation, built-in redundancy, improved communications and information sharing through constructive community and stakeholder partnerships.

Through additional analysis and mapping, the Town can determine the areas and demographic groups that are most at-risk within the community, and implement measures that

plan, prepare, and mitigate the impacts of climate change to those populations. Ajax residents are being made aware of the resources available to them during an emergency situation, and emergency information and notifications are accessible to the majority of the Town's residents.

Additional means of evacuation are identified and emergency routes optimized for efficient and timely response of emergency responders to areas in need during extreme weather events. Detailed response plans and proactive emergency planning have decreased the exposure of climate stressors on the residents of Ajax, and increased the community's adaptive capacity and resilience to climate change in the long-term.

## 2.4. Focus Area #2: Natural Systems

### Overview

The assets that comprise the Town's natural systems consist of private and municipally-owned trees, wetlands, grasslands, woodlots, creeks and riparian habitat, fauna, habitats and other variations of vegetation and natural space.

The benefits of these natural resources can be categorized into three types of services: provisional, regulating, and cultural. The provisional services of an urban forest include food, fuel and shading, in addition to supporting biodiversity and providing habitat for a range of flora and fauna. Potential regulating services relate to temperature moderation, water filtration, water quantity and flow control, pollination, and air quality control. Finally, natural systems can also benefit overall community well-being and health by creating opportunities for recreation, education, heritage and improved mental health.

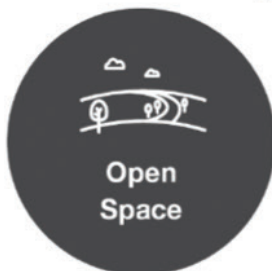
As temperatures rise, precipitation levels and weather patterns fluctuate, less adaptable species may become compromised or disappear entirely, having profound implications on local ecosystems and biological diversity. These impacts can include effects on the ecosystem as a whole, on their individual component species and on ecological interactions, weakening the natural infrastructure that communities depend on. A resilient natural environment is crucial for animal habitat. A healthy ecosystem requires the presence of an assortment of plant and wildlife species. If one or more species is removed from this environment, the ecosystem could be compromised, introducing invasive species into the natural environment. This is of specific concern as there are many vulnerable urban forests/trees within the Town.

## Natural Systems: Findings of the Climate Change Study

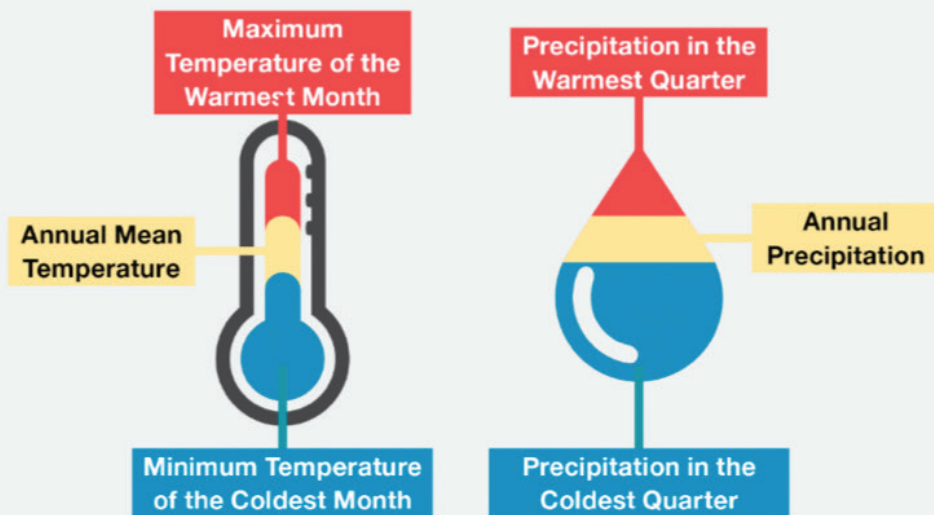


### Key Outcomes

#### Areas of Potential Vulnerability



Six Natural Resource Canada bioclimatic variables were used in the Bioclimatic Assessment for each tree species



- Tree monitoring and protection is critical to adaptation efforts
- Tool developed to spatially analyze risks to trees within the Town



- Surface temperature (heat island effect) mapped in proximity to vulnerable trees, parks, and natural areas
- Locations exposed to extreme heat that would benefit most from planting identified
- Priority watering and forestry management areas identified



- Low - moderate vulnerability of urban forests/trees
- Vulnerable trees in potential conflict with overhead infrastructure identified
- Potential natural systems stress predicted based on projected changes in weather patterns

# Current and Future State

As extreme weather patterns persist due to climate change, enhancing natural systems can help provide the community with some relief by alleviating some of the impacts through expanding naturalized areas and green infrastructure.

## Ajax Today

To date, Ajax has developed and implemented a number of initiatives to ensure that its natural infrastructure continues to benefit the Town's environment and residents. These include education programs, ongoing maintenance and pruning measures, the implementation of tree plans and policies, as well as incentivizing to a degree the greening of private property.

The Town's Urban Forest Management Plan (2010) and Natural Capital Report (2018) identified and evaluated potential vulnerabilities of Ajax's natural capital assets in response to predicted climate conditions. These studies assessed potential risks to the urban tree canopy, impacts of climate change to species at risk as well as several other areas susceptible to climate variability. Going forward, there is a need for ongoing monitoring of natural systems and building upon the existing detailed data sets to more reliably predict the climate vulnerability of urban forest composition.

## A Decade of Building Resilience: Inspiring 2030

The natural landscape of Ajax supports healthy ecosystems, and its urban forests have been expanded to include adaptive species and the addition of green infrastructure, improving the Town's overall resilience to climate change impacts.

A more detailed analysis of the vegetation and trees present in natural areas has contributed to the development of a robust data set to guide action in anticipation of future climate scenarios. Building capacity within the Town's GIS staff has ensured that there is a mix of general understanding and expertise which allows opportunities for additional modelling as future studies and initiatives are required. A structured, asset management-based approach to the Town's natural capital inventory addresses declining natural infrastructure quality by prioritizing the health of local ecosystems, and supporting a diverse range of species to thrive.

Collaboration and shared strategic goals among internal and external stakeholders has encouraged and fostered efficient use of a wider range of available resources and the coordination of natural area adaptation and resilience activities. These activities include planting programs, by-laws, and management guidelines that have been strengthened and built upon to enhance the urban forest in the long-term and to preserve the Town's natural assets.

## 2.5. Focus Area #3: Stormwater, Flooding and Erosion

### Overview

The Town of Ajax is working towards equipping staff with better decision-making tools to anticipate flooding and erosion risks while trying to maintain and further build infrastructure that is resilient to the natural elements.

Stormwater management, overland flooding, and erosion are three main areas of risk that have been highlighted as being elevated in Ajax due to climate change.

Stormwater management systems are especially important for utility and Conservation Authority infrastructure. Ponds and other slow-release systems help filter urban runoff and slow down the release of flows to lakes and rivers after a major storm event.

The development of new standards for managing the risk

of urban flooding, ongoing updating of floodplain and erosion risk mapping, and addressing key infrastructure deficiencies are crucial to limiting property and health risks. Additionally, green infrastructure (e.g., rain gardens) which replaces grey infrastructure (e.g., stormwater pipes) can be used to alleviate impacts of heavy rainfall. Effective flood mitigation strategies will require improved modelling using updated data, relying on partnerships with Conservation Authorities, the Region, and community partners.

Key objectives in the management of stormwater, flooding, and erosion risk include improving the proactive planning and decision-making tools at the disposal of Town staff, and investing in critical and social infrastructure resilience.

# Stormwater, Flooding and Erosion: Findings of the Climate Change Study



## Key Outcomes

Potentially vulnerable areas identified

Overland flow path modelled

Tested under current and future climate conditions

Fluvial (Riverine)

Water Surface Events

- No significant increases to riverine flooding or risk of exceeding Regional Flood Line
- Most flooding in woodland or floodplains

Culvert Performance

- Major culverts' performance satisfactory for 100-year storms
- Further in-field observations required

Stream Bank Erosion Potential

- **Vulnerable areas:** Potential areas with higher vulnerability to erosion identified
- recent erosion control projects require reinforcement

Pluvial (Urban Flooding)

Storm Sewer Nodes

- Simulations showed increases in storm sewer nodes surcharged in climate change conditions
- Capacity limitations in 1:100-year storm scenarios

Detailed Sub-Model Area

- Town-wide model versus sub-area model have generally similar results
- Further build-out recommended

# Current and Future State

Increased stormwater, flooding and erosion due to climate change presents critical risks to the wellbeing of the community, and can result in significant economic impacts from property and infrastructure damage.

## Ajax Today

Urban development in Ajax over the past decade has created significant pressures on stormwater infrastructure, and revealed critical issues related to overland flooding and erosion risk for river and lakefront properties. Ajax's ability to provide services is also reliant on critical and social infrastructure that is at risk of being impacted by water damage and flooding following an extreme weather event. The importance of a multifaceted approach to managing these risks is also linked to the ability of emergency crews to respond effectively in a climate change-related event.

Existing undersized infrastructure, which does not comply with today's standards, can put public and private properties at risk of flooding due to heavy rainfall.

Erosion, especially along the south shore of the Town that borders Lake Ontario, is an area of concern. Alongside Conservation Authorities and the federal government, the Town is working hard to ensure its infrastructure at the waterfront is resilient to the effects of high water levels and wave action and to equip its staff with the proper decision making tools so that they feel confident evaluating risk and providing solutions.

## A Decade of Building Resilience: Inspiring 2030

A decade on, the Town has implemented a number of key actions to address vulnerabilities of social and critical infrastructure, to limit the risk of damage caused by weather events. Deficiencies in the Town's infrastructure have been upgraded, where necessary, to provide appropriate levels of service.

Town staff have invested time in building-out the spatial analysis of stormwater, flooding, and erosion vulnerable areas, and are applying this to inform new policies, by-laws, and projects to manage risk and inform residents of improvements that can be made to private property.

The economic, social, and environmental costs of storm damage have been reduced by leveraging the best available information to predict where the greatest risks lie and taking proactive steps to invest in infrastructure improvements. Naturalized areas have been expanded to improve capacity to absorb stormwater runoff overland flows, and the Town will continue working in tandem with community residents to make more informed decisions with regard to planning for future growth and development in Ajax.

# 3.0 Defining the Objectives

The ACRRP objectives, actions, and implementation strategies provide direction in each of the three main strategic focus areas. There are a total of 8 Objectives for the ACRRP, identified below. The implementing actions are outlined in the accompanying Implementation Strategy for the ACRRP.

The objectives represent the measureable steps the Town of Ajax will need to take in order to achieve the vision for limiting climate risk and improving community resiliency.

**OBJECTIVE #1: Town residents, priority populations and businesses are communicated with about emergency preparedness and have access to emergency resources and information.**

Strong communication and accessible education materials are central to the timely awareness of imminent risks, especially for priority populations. An individual's vulnerability to climate variability can be influenced by their exposure to a hazard or stressor, their level of sensitivity to the effect of that hazard, or their capacity to adapt. All of these factors can have lasting and consequential effects on the health, life, safety and overall well-being of certain demographic groups.

**OBJECTIVE #2: Existing and future critical and social infrastructure is adapted to withstand the impacts of climate change.**

There are two main categories of infrastructure that are related to this objective: social infrastructure and critical infrastructure. Damage to the Town's infrastructure could lead to service disruption or loss of service entirely with the potential for widespread social, environmental and economic impacts on the community. Adapting the community's assets, essential services and most vulnerable buildings to withstand the impacts of climate change involves locating these types of facilities, determining the degree to which they are at risk and reinforcing or relocating them, if needed, to less vulnerable areas.

**OBJECTIVE #3: The Town has implemented supporting plans, programs and policies to manage human health impacts resulting from climate change.**

There is an increased exposure to climate stressors for the residents of Ajax, and in particular for those who may spend significant periods of time outdoors. Developing an extreme temperature sub-plan and incorporating this

into the Town's Emergency Response Plan (ERP) may reduce heat and cold-related mortality. Encouraging and supporting the provision of more shaded areas on private and public property will help provide relief and protection from ultraviolet rays reducing their risk to heat stroke or other heat related illnesses.

**OBJECTIVE #4: Emergency plans are in place for transportation and accessibility within the Town.**

Transportation systems and routes within the community should be examined as the Town works in collaboration with Durham Region Transit to identify detour routes for transit and roadways in the event of an emergency. Encouraging and supporting telecommuting can reduce the potential that residents of the Town will face unsafe travel conditions in a storm event. The Town will need an updated system to disseminate information during extreme weather events. Road closures along heavily used corridors (e.g., Highway 401) will require alternate access and emergency evacuation route sub-plans.

**OBJECTIVE #5: Naturalized urban areas and green infrastructure within the Town are enhanced to be resilient and supportive of biodiversity, to help protect critical and social infrastructure from climate change impacts, and are planned and maintained to limit conflicts with critical infrastructure.**

Climate change can compromise the vitality of urban

forests. In order to ensure current and future generations can enjoy naturalized areas within the Town, a number of related policies, management plans and data must be updated and enhanced. A strong emphasis is being placed on increasing tree planting on both public and private lands. Increasing tree planting on private lands will require a review of existing incentive programs and the development of a neighbourhood tree planting action plan.

Increasing tree canopy is one way to mitigate the increase in areas susceptible to the Heat Island Effect. Planting plans for naturalized areas should consider pollinator population growth and include supportive species that are tolerant to seasonal variability. Stormwater storage and the development of wetland habitat to support biodiversity would be most successful and best executed in partnership with Conservation Authorities and other local groups. Integrating green infrastructure considerations into the Town's Development Approvals process can encourage the expansion of more naturalized areas. In addition, the implementation of sustainability considerations for new development such as Low Impact Development and passive cooling techniques will provide long-term benefits towards a more resilient community.

**OBJECTIVE #6: Natural heritage systems across the Town have been protected, restored and expanded to support biodiversity and improve their overall resiliency to climate change impacts.**

The components that make up the Town's natural heritage system include forests, wetlands and meadows. These natural features provide services to support human prosperity and well-being, as well as providing habitat and ecological functions for plants and wildlife.

In partnership with Conservation Authorities and community groups, the Town is committed to working towards protection and enhancement of its natural heritage system to be able to withstand the impacts of changing temperature and precipitation patterns resulting from climate change. This includes supporting biodiversity and ecosystem health of natural areas, expanding forested areas and tree cover adjacent to watercourses, developing education programs to limit pollution and the spread of invasive species, and supporting decision-making with improved information on vulnerable habitats.

**OBJECTIVE #7: Town staff are equipped with improved decision making tools to identify areas of high vulnerability and risk of flooding and erosion.**

In order to build a stormwater system that is more resilient to intense rainfall events, there is a need to fill in the data gaps in the Town's GIS model. This will aid Town staff in identifying the most at-risk areas. It should include up-to-

date details on stormwater infrastructure and modelling to allow for enhanced identification of spatial risks. This can be used to inform future infrastructure improvements and new projects to increase stormwater infiltration and to include stormwater infrastructure maintenance in the long-term maintenance plans. Similarly, the Town needs to develop a detailed shoreline and erosion potential analysis to inform relocation and/or ongoing rehabilitation of critical infrastructure and improve infiltration on private property (i.e., retrofitting existing properties and new builds). Ongoing communication and partnerships on erosion mapping and flood risk information with Conservation Authorities, utilities stakeholders, owners and operators is critical to fostering community-wide resilience.

**OBJECTIVE #8: Stormwater infrastructure resiliency has been enhanced across areas of known high flooding risk.**

Capacity deficiencies found through an enhanced GIS model of the Town's stormwater management system can be mitigated through future capital projects targeting these areas. Further implementation of the recommendations from the South Ajax Outfall Water Quality Retrofit Study will also improve stormwater quality and management. Updating mapping to identify key stormwater pipe and culvert crossings under roads, especially in high-risk areas, can also help inform future capital projects, aimed at improving capacity of these systems.

# 4.0 Conclusion

The ACRRP identifies a path forward over the next decade for the Town to proactively prepare for climate change. This Plan is accompanied by an Implementation Strategy, which will require continuous monitoring and review of the adaptation actions outlined therein. The key objectives presented in this plan will help the Town further develop its emergency management, natural systems, and stormwater, flooding and erosion programs. Overall, the ACRRP is designed to improve the Town's adaptive capacity to achieve each objective presented.

The Town can achieve the high level of preparedness that is required for an increasingly volatile climate by focusing on infrastructure that is valuable, services to priority populations, and strengthening policies related to emergency management. For the Town's natural systems, it is important that departments work together to facilitate monitoring programs and to lay the groundwork for increased green infrastructure on public and private lands.

Lastly, the Town will work to strengthen their decision-making tools as well as their critical and social infrastructure to further their stormwater, flooding and erosion related resiliency plan. The objectives laid out in this plan lay the foundation for Ajax, including stakeholders and community partners, to work as a community to ensure resiliency is a top priority.

# 5.0 Glossary

The following glossary of terms used in the ACRRP are based on definitions provided in the Canadian Institute of Planners (CIP) Climate Change Glossary of Terms, supplemented with additional defined terms to enhance the legibility of the document.

**Adaptation:** Adjustment in natural or human systems in response to actual or expected climatic stimuli or their effects, which moderates harm or exploits beneficial opportunities. Several types of adaptation can be distinguished, including anticipatory (before an event) and institutional (after an event) adaptation.

**Climate change:** Climate change refers to any change (higher or lower) in climate over time, whether due to natural variability (defined below) or as a result of human activity (anthropogenic). Climate change is any systematic change in the long-term statistics of climate elements (such as temperature, sea level, precipitation, humidity, or winds) sustained over several decades or longer. Climate change may be due to natural external forces, such as changes in solar emission or slow changes in the earth's orbital elements, natural internal processes of the climate system, or anthropogenic forces.

**Climate:** Climate is long-term (months to many years) and weather is short term (today, tomorrow, a week). Technically, climate is a statistical description of the mean and variability of relevant quantities over a period of time, ranging from months to thousands or millions of years. These quantities are most often surface variables such as temperature, precipitation, and wind. The World Meteorological Organization (WMO) considers 30 years to be a "normal" period.

**Critical infrastructure:** Critical infrastructures are those physical and information technology facilities, networks, services, and assets which, if disrupted or destroyed, would have a serious impact on the health, safety, security, or economic well-being of our communities. This includes bridges, roads, and utilities such as water, wastewater, and telecommunications.

**Extreme weather:** Extreme weather is an event out of the norm that seems to be happening with greater frequency. A thunderstorm, for example, to be extreme would be one that lasts a shorter time than typical for the area, while including more intense periods of rain, stronger winds than usual and may result in more community damage. Weather forecasts more regularly predict extreme weather events, ironically making these events the “new norm”.

**Green infrastructure:** The natural and engineered vegetative systems and green technologies that provide a range of services and benefits for society, including absorbing climate change impacts such as flooding. Examples include woodlots, wetlands (both natural and engineered), meadows, green roofs, urban farms, parks, bioswales, and stormwater ponds.

**Greenhouse gases (GHGs):** Greenhouse gases are generated by the burning of fossil fuels: gasoline, diesel fuel, natural gas, propane. Burning of fossil fuels generates CO<sub>2</sub> which effectively absorbs thermal infrared radiation, emitted by the Earth’s surface, by the atmosphere itself due to the same gases, and by clouds.

**Mitigation:** Mitigation is a type of intervention used to reduce the anthropogenic forcing of the climate system; it includes strategies and measures to reduce greenhouse gas sources and emissions including the use of ‘sinks’, which are natural features that absorb carbon, such as

forests. Planners address mitigation through intensification, active transportation, promoting public transit, encouraging the use of renewable energy, and reducing fossil fuel use with vehicle traffic.

**Priority population:** A Town of Ajax term that refers to individuals who are at risk or who may be impacted more severely by the effects of climate change than others.

**Resilience:** The ability of systems and communities to absorb the impacts of climate change and respond by continuing to function and maintain services, while also innovating and evolving to create stronger pathways to reducing the net effects of these impacts.

**Risk:** The potential for consequences where something of value is at stake and where the outcome is uncertain, recognizing the diversity of values. Risk is often represented as probability of occurrence of hazardous events or trends multiplied by the impacts if these events or trends occur. Risk results from the interaction of vulnerability, exposure, and hazard. In climate change planning, disaster risks are those that could potentially lead to losses in lives, health status, livelihoods, assets, and services, which could occur to a particular community or a society over some specified future time period.

**Social infrastructure:** Schools, hospitals, emergency services, community support, public space, libraries and cultural institutions.



*Helping #CDNmuni take action on climate change.*

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