



# YORK REGION CLIMATE CHANGE AND HEALTH VULNERABILITY ASSESSMENT



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**York Region**

# SUMMARY REPORT

## York Region Climate Change and Health Vulnerability Assessment

*“Climate change will be the defining issue for health systems in the 21st century. Health professionals have the knowledge, cultural authority and responsibility to protect health from climate change.”<sup>1</sup>*

*World Health Organization*

Climate change is unequivocally occurring and poses severe risks to the natural environment and human populations worldwide. As the impacts of climate change are no longer avoidable, government agencies and communities need to take measures to adapt to future climate conditions and protect the environment and human health.

The purpose of this assessment is to better understand how York Region communities may be vulnerable to the impacts of climate change from a health perspective. The findings highlight how climate change may potentially impact a wide range of health issues through various pathways. In particular, there is strong evidence that climate change will increase the risk of extreme heat events, vector-borne diseases and extreme weather events. Certain populations will be more impacted from climate change than others, including seniors and low-income individuals. Local factors such as urban heat islands, floodplains, and an aging population can increase this vulnerability for York Region residents.

This vulnerability assessment will help inform adaptation planning, ensuring greater resiliency to future climate change impacts in York Region.

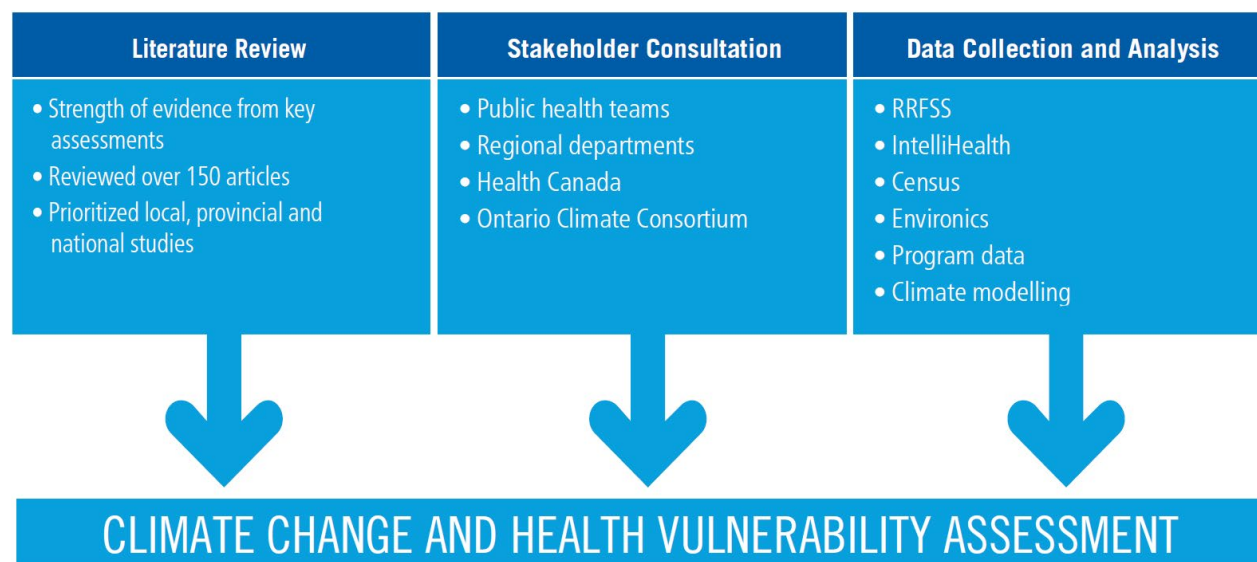
## ASSESSMENT APPROACH

Using a framework developed by the World Health Organization and Ontario Ministry of Health, and through the review of literature, health data and analysis of local programming (Figure A), this assessment provides an analysis of potential climate change impacts to human health within York Region. This assessment covers a broad range of topic areas, including: extreme temperatures, extreme weather events, air quality, vector-borne disease, food safety and security, safe water and UV exposure.

**Mitigation:** Measures to reduce or capture greenhouse gas emissions to help reduce the severity of future impacts from climate change.

**Adaptation:** Measures to prepare for and cope with the negative impacts of climate change that are expected to occur.

**Figure A: Examples of research, consultation and data that informed the assessment.**



When assessing climate change impacts on health, three determinants of vulnerability were considered:

1. **Exposure** of populations to climate change impacts such as extreme heat
2. **Sensitivity** or degree in which populations are affected, such as seniors who are more sensitive to extreme temperatures
3. **Adaptive capacity** of populations or institutions to respond to climate change impacts, such as having home air conditioners or access to cooling centres

## CLIMATE CHANGE IMPACTS EXPECTED IN YORK REGION

*“Canada’s climate has warmed and will warm further in the future, driven by human influence.”<sup>2</sup>*

*Canada’s Changing Climate Report, 2019*

The Intergovernmental Panel on Climate Change (IPCC) stated that current atmospheric levels of key greenhouse gases are the highest in at least the last 800,000 years. The influence of human systems is clear with climate change impacting the earth’s atmosphere, weather patterns, oceans and glaciers. With the persistence of greenhouse gases already released into the atmosphere, climate change impacts will continue for hundreds of years even if emissions are completely eliminated. Continued emissions will result in more severe impacts on the global climate. As a result, in addition to efforts to reduce greenhouse gases, communities will need to adapt to future changes in climate that are unavoidable.<sup>3</sup>

**In recent decades, York Region has experienced changes to local climate conditions.** Warming trends are evident in many areas across Canada contributing to more extreme heat, longer growing seasons and reduced snow and ice-cover periods, with trends projected to



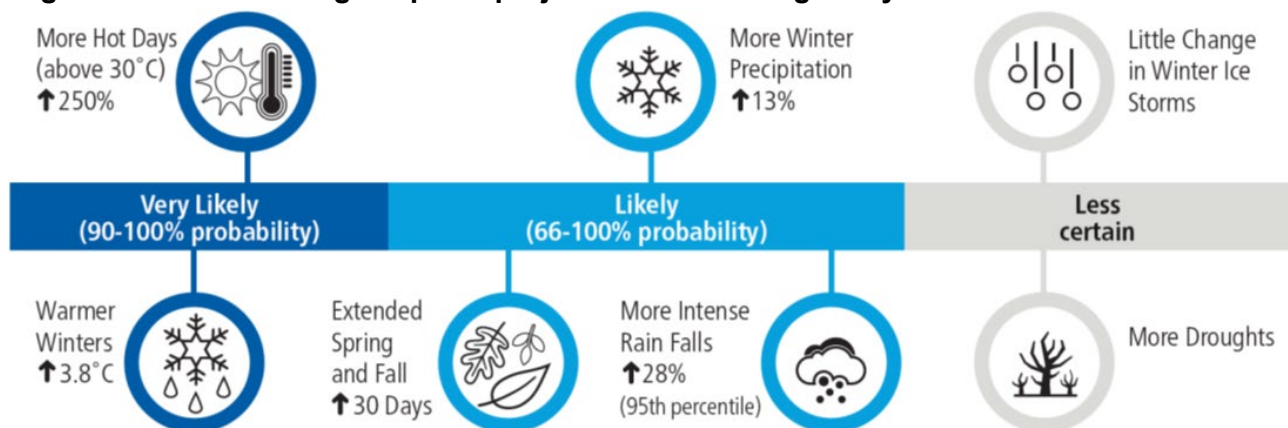
continue. The recent spread of blacklegged ticks and Lyme disease across southern Ontario and within York Region is also largely attributed to changing climate conditions.

Historically, York Region has experienced extreme weather events resulting in property damage or loss, major power outages, damage to infrastructure and ultimately, impacts on human health. For example, on December 21 and 22, 2013, a significant ice storm event in York Region resulted in loss of power to more than 92,000 homes, road closures and tree damage. More recently, an extreme rainfall event on June 23, 2017 resulted in severe flooding and impacted multiple water and wastewater facilities across York Region.

**Climate change is expected to impact York Region in numerous ways by the 2050s.**

- Temperatures will very likely increase, with the largest increase occurring during the summer and winter seasons
- Precipitation levels will likely increase in most months and annually, with most precipitation taking place during the winter and spring seasons
- Extreme precipitation events, particularly during the summer, are likely to increase in frequency
- The growing season will likely extend by approximately 30 days per year
- Projections for droughts and ice storms are limited, but suggest an increase in drought conditions and minimal changes in ice storm conditions<sup>4</sup> (Figure B)<sup>a</sup>

**Figure B: Climate change impacts projected for York Region by the 2050s.**



Source: Fausto E et al. Historical and Future Climate Trends in York Region. Toronto: Ontario Climate Consortium; 2015. Fig.B, Climate change impacts projected for York Region by the 2050s. Adapted and modified with permission from the copyright holder.

**Future climate change adaptation planning should consider a wide range of climate scenarios to ensure greater resiliency and better preparedness for future events.** These projections provide an understanding of how climate change will impact York Region on average, but a range of future weather conditions are still possible. For example, while York Region will experience warmer winters, it is still possible to experience extreme cold events. Additionally,

<sup>a</sup> Projections used Representative Concentration Pathway (RCP) 8.5 scenario which assumes growing emissions continuing until the end of the twenty-first century.

while certain weather conditions may not occur frequently (e.g. drought, major storms) their impacts can have serious implications to human health.

## HOW CLIMATE CHANGE CAN IMPACT HUMAN HEALTH IN YORK REGION







**There is strong, supportive scientific evidence that climate change will impact extreme heat events and heat-related illnesses, the spread and activity of vector-borne diseases and mental health impacts from extreme weather events.** However, due to multiple mediating factors - environmental, behavioural and existing institutional - it is difficult to apply the research findings to York Region's context for other impacts such as food safety and security, water safety for drinking water and recreational beaches, air quality and extreme weather events, and their impact on disease and injuries (Table A).

**Floodplains and urban heat islands are important local factors that can influence health risks from climate change.** York Region floodplains can play an important role in multiple health impacts including food safety and security, water safety, mental health, injury and property damage. Current floodplain maps provide an understanding of river and lake flood risk in York Region with the largest area of the floodplain located in the major river systems connecting to Lake Simcoe (e.g. Holland Marsh and Black River). Other areas, such as significant groundwater recharge areas, may also be vulnerable as the soil and groundwater systems are more sensitive to heavy rainfall events. These impacts would be most relevant to smaller drinking water systems and private well users, which tend to be located in more rural communities.

Urban heat islands (UHI) can also play a significant role in intensifying extreme heat events. Urban areas and higher density suburban communities in York Region tend to have the greatest UHI impacts.



**Table A. Overview of climate change health impacts within York Region**

	<b>Climate Drivers</b>	<b>Exposure Route</b>	<b>Potential Impacts on Human Health</b>
 <p><b>Extreme Heat</b></p>	Increase in frequency and severity of heat events.	Elevated temperatures with larger impacts in urban heat islands. Decrease in cold days may reduce exposure to extreme cold conditions. <b>Areas most impacted by UHI include Richmond Hill, Markham and Vaughan.</b>	More heat-related illnesses and deaths and can contribute to other health outcomes. <b>From 2007 to 2017, there were 497 heat-related and 410 cold-related emergency department visits in York Region.</b>
 <p><b>Outdoor Air Quality</b></p>	Increase in temperature, changes in precipitation, and longer growing season.	Lead to poor air quality episodes, extended and more active pollen season and wildfire events creating smoke plumes. <b>York Region air quality has improved but more modelling is needed to determine future impacts.</b>	Increased respiratory and cardiovascular outcomes and premature deaths. <b>In recent years, common air pollutants have resulted in over 250 annual non-accidental deaths in York Region.</b>
 <p><b>Vector-Borne Infection</b></p>	Changes in precipitation, increased temperatures and longer growing season.	Longer seasons with greater vector activity and expansion of vectors range. <b>Blacklegged tick populations are increasing with most of York Region in an estimated risk area for Lyme disease.</b>	Increased risk to existing vector-borne diseases such as West Nile virus and Lyme disease, and the emergence of new diseases in Canada such as babesiosis, snowshoe hare virus. <b>Overall, Lyme disease activity has increased across Ontario with York Region experiencing 23 confirmed and probable cases in 2017.</b>
 <p><b>Water-Related</b></p>	Increase in precipitation, temperature, extreme precipitation and droughts.	Impact water sources, recreational beaches and risk of algal blooms. <b>Existing floodplains and significant groundwater recharge areas within York Region may be more impacted by heavy precipitation events.</b>	Potential increased risk of exposure to pathogens and contaminants in drinking water. <b>Most water- and foodborne illnesses in York Region show a seasonal trend, peaking during the summer months or early fall. However, it is difficult to determine what impact climate change will have in the future.<sup>6</sup></b>
 <p><b>Food-Related</b></p>	Increase in precipitation, temperature, longer growing season, and extreme precipitation.	Impact growth and survival of foodborne pathogens and impact food security. <b>York Region has over 70,000 hectares of designated agricultural land and more than 3,000 food premises are inspected annually by Public Health.</b>	Increased risk of exposure to foodborne pathogens and risks to food insecurity, such as malnutrition. <b>Although the growing season in York Region is expected to increase by 30 days, it is difficult to determine how food safety and food security will be impacted locally.</b>
 <p><b>Extreme Weather</b></p>	Increase in extreme weather events such as extreme precipitation, flooding droughts and ice storms.	Major impacts on local infrastructure, disruptions of services and damage to residential properties. <b>Residents living in floodplains are at an increased risk from heavy precipitation and flooding events.</b>	Increased risk of injuries, death, mental health impacts and food- and waterborne disease outbreaks. <b>There is limited hospital data linked to extreme weather events in York Region.</b>



## POPULATIONS VULNERABLE TO CLIMATE CHANGE









**With the wide range of populations in York Region, the impacts of climate change will not be felt equally.** In the context of climate change, vulnerable populations are those at greater risk for health impacts due to increased sensitivity, reduced capacity to respond and/or increased exposure. Seniors, children, those with low socioeconomic status, and those with mental health conditions have a higher vulnerability from multiple climate drivers and exposure routes (Table B). The proportion of seniors (65 years of age and older) in York Region is projected to increase to 20% by 2031.<sup>8</sup> Other vulnerable groups, such as new immigrants, also make up a large portion of York Region residents, particularly in the southern municipalities. A combination of factors (e.g. low socioeconomic status seniors with chronic disease), can also make certain individuals more susceptible to future climate change impacts.

**It is important that health equity be considered for future adaptation planning.** Building resiliency to climate change will require measures that address not only the needs of the general population but also those most vulnerable to climate-health impacts. It will require sufficient, accessible services and supports for those most impacted by climate change, and must be relevant for the diverse York Region population.

**Currently, there is limited information on community resiliency related to climate-health impacts.** While the current assessment provides valuable insight on how communities may better prepare for future climate change impacts, there is still limited information on perceptions and behaviours of local residents towards climate change and health and how these perceptions may differ between households and different climate-vulnerable populations.



**Table B. Populations vulnerable to climate change impacts and York Region trends.**

	<b>Vulnerability to climate change<sup>b</sup></b>	<b>York Region trends</b>
 <p><b>Children</b></p>	Higher sensitivity to environmental exposures, behaviours that increase exposure risk and greater dependence on caregivers.	Children (0-15 years of age) represented around 20% of the population in York Region in 2016. <sup>7</sup>
 <p><b>Seniors</b></p>	Higher sensitivity to environmental exposures, more likely to have existing chronic diseases (e.g. cardiovascular disease) and increased risk of falls leading to fatal and non-fatal injuries.	York Region's senior population is growing faster than any other age group, with 1 in 5 residents predicted to be 65 years or older by 2031. <sup>8</sup>
 <p><b>Low socioeconomic status (SES) individuals</b></p>	Higher likelihood of suffering from chronic medical conditions. Reduced ability to adapt due to limited social support and/or financial resources. Tend to reside in areas with older infrastructure and increased exposure (e.g. urban heat islands).	Between 2000 and 2012, the number of low-income residents had grown faster compared to the overall population. <sup>9</sup>
 <p><b>Recent immigrants</b></p>	May speak limited or no English and/or French and have more barriers accessing community services related to climate change. May also experience lower SES compared to the general population and have greater exposure to climate change impacts.	Compared to Ontario, a larger portion of York Region new permanent residents had no ability to speak English or French in 2016. <sup>10</sup> New immigrants in York Region are more likely to be unemployed and have lower incomes compared to the general population. <sup>11</sup>
 <p><b>Outdoor workers and activity</b></p>	Likely to experience increased exposure to climate impacts (e.g., extreme heat, vector-borne diseases).	In 2016, there were approximately 130,000 people working in construction, manufacturing, accommodation and food service industry, and agriculture or primary industries in York Region. <sup>12</sup>
 <p><b>Socially isolated individuals</b></p>	Lack of social support and strong social networks, reducing adaptability and increasing susceptibility to climate change impacts.	Between 2011 and 2016, there was a 24% increase in the number of one person households in York Region, with 41% being seniors. <sup>10</sup>
 <p><b>Individuals with existing chronic diseases</b></p>	Increased susceptibility to environmental exposures such as temperature, poor air quality, vector-borne disease and food- and waterborne diseases.	Senior populations reported having relatively poorer health indicators such as perceived health, being overweight, arthritis and higher blood pressure. <sup>12</sup>
 <p><b>Individuals with mental health conditions</b></p>	Those with existing mental health conditions more likely to experience adverse mental health outcomes as a result of exposure (e.g. extreme heat). Extreme weather events can increase the risk of new cases of mental health illnesses.	Between 2012 and 2016 there was a 40% increase in mental health related calls to York Region Police and York Region Paramedic Services. <sup>13</sup>

<sup>b</sup> Note that individuals may fit into multiple categories that can increase their vulnerability.



## ADAPTIVE CAPACITY: EXISTING SERVICES TO ADDRESS CLIMATE CHANGE HEALTH IMPACTS

York Region offers numerous programs and services that help address the current and future health impacts of climate change.

### Early notification systems related to weather conditions

- Monitor extreme temperature or weather conditions and provide notification to the public and local stakeholders during periods of extreme heat and cold
- Monitor air quality alerts from the Ministry of the Environment, Conservation and Parks to provide notification to the public and local stakeholders

### Provincially-mandated programs for addressing food and water impacts, and extreme weather events

- Conduct food and water safety inspections and investigations
- Emergency preparedness and response planning to address emergency events such as extreme weather

### Surveillance programs that monitor diseases that can relate to climate change

- Surveillance activities for vectors and human cases of vector-borne diseases
- Surveillance programs that investigate infectious diseases related to food and water
- Conduct surveys on residents' behaviours and knowledge on various health issues

### Health promotion activities that target topics and issues relating to climate change

- Vector-borne diseases promotional campaign Fight the Bite
- Extreme heat promotional material and resources
- Food safety promotional resources and campaigns to reduce or eliminate foodborne pathogen exposure
- Air Quality Health Index promotional material and resources

### Regional Plans, initiatives, and strategies which support adaptation and address vulnerable populations

- Development of the Regional Climate Change Action Plan involving collaboration across York Region, local municipalities and communities
- The York Region Official Plan that includes important policies for incorporating health considerations into community design, such as adaptation measures for addressing urban heat islands and air quality
- The Regional Forest Management Plan and Greening Strategy that provide important measures for mitigating greenhouse gases and enhancing resiliency to climate change
- The Public Health Branch Mental Health Initiative which integrates mental health promotion into Public Health programs and services
- The Seniors Strategy, which examines the changing senior population, defines the Region's role in serving seniors, and sets the course for action to best support the aging population over the next 10 to 20 years

Stakeholders at provincial and federal levels are also invaluable in supporting local level resiliency and adaptation measures. Federal agencies such as Environment and Climate Change Canada provide weather information and climate modelling to support future planning (e.g., weather alerts, wildfire surveillance and climate change modelling), and federal health agencies (Health Canada and Public Health Agency of Canada) provide research and support to local health units. Provincial agencies such as the Ontario Ministry of Health provide protocols and guidelines for local health units that support addressing climate change health impacts. Additionally, Public Health Ontario provides research and assessment support on health impacts related to environmental exposures and provides direction to local health units on health surveillance needs based on national and provincial surveillance results.

## STRENGTHS AND LIMITATIONS OF THE ASSESSMENT

This assessment provides a comprehensive overview of a wide range of potential climate change impacts on health. In particular, the strengths of the assessment include:

- Reviewing the latest research and data to understand impacts in York Region
- Highlighting local vulnerabilities and gaps in knowledge
- Identifying opportunities for future climate change adaptation planning

While this assessment provides valuable insight into climate change health risks for York Region, it also identifies multiple limitations:

- **Available scientific evidence**
  - Limitations in climate projection data including uncertainties in existing models predicting extreme weather events and uncertainties in future emissions
  - Limited evidence on more complex exposure pathways with multiple mediating factors such as food security, food and water safety and extreme weather events
- **Local information to better understand vulnerabilities in York Region**
  - Limited data on mediating environmental factors to climate change impacts - assessment of local air quality including pollen at a higher spatial resolution and updated floodplain maps that include urban flooding risk
  - Limited data to understand local population health and risk factors - health outcome data only focused on more severe cases such as hospital visits and admissions or limited information on vulnerability of private wells used for drinking water
  - Limited information on adaptive capacity - residents' knowledge, behaviours and barriers to adaptation measures

**Many of the health outcomes have limited data available and are unable to be associated with a specific exposure route.** Hospital and reportable diseases data are likely underestimating the health burden as many cases may go unreported or are challenging to link to climate change exposure route(s). Enteric disease rates provide an indication of potential food and water sources but attributing specific sources can be difficult. Similarly, asthma and allergies provide an

understanding of respiratory health outcomes but further analysis is needed to link climate change to local air quality health impacts.

**Further analysis is required to help develop the most relevant indicators for future surveillance, including criteria for syndromic surveillance, and to model the future impacts of climate change on health.** Future adaptation planning will need a strong understanding of the linkages between climate variables and health outcomes, such as heavy rainfall or flooding events with food- and waterborne illnesses, and extreme heat events with health outcomes such as mental health. Research has shown that many of these health outcomes may increase in volume and/or frequency, such as increased emergency room visits for heat-related illness due to longer and warmer summers.

Many of these datasets also involve other stakeholders such as diseases of public health significance and vector-borne disease surveillance from provincial Ministries or flood mapping from Conservation Authorities. As a result, it will be important to consult other agencies on available datasets and opportunities to advance data collection that can help inform future surveillance activities and better understand health impacts from climate change.

## NEXT STEPS: ADAPTATION PLANNING FOR MORE RESILIENT COMMUNITIES

***“Tackling climate change could be the greatest global health opportunity of the 21st century.”<sup>14</sup>***

*Lancet Commission on Health and Climate Change*

Following the next steps of the World Health Organization framework, this vulnerability assessment will help guide and inform adaptation planning to build resiliency to future climate change health impacts. There are also opportunities to align public health adaptation planning measures with existing initiatives such as the Regional Climate Change Action Plan, which covers mitigation and adaptation at a community and corporate level.

Health adaptation planning involves multiple approaches:

- Further research and analysis to better understand impacts and climate-vulnerable populations within the Region
- Establishing integrated, ongoing climate change and health surveillance
- Coordinating programming and collaborating with key stakeholders across sectors
- Health promotion activities
- Developing policies and measures that support climate change mitigation and adaptation

As conditions that increase or decrease vulnerability can change over time, adaptation needs to be an iterative approach that can adjust measures to different future scenarios.

**Adaptation planning requires all levels of government, stakeholders and the community to work collaboratively to address future impacts from climate change.** Ensuring a resilient



system will require activities from public health and stakeholders that are directly engaged with vulnerable populations (e.g. long-term care homes, community support organizations, schools, child care centres), and stakeholders addressing exposure routes (e.g. Conservation Authorities and water safety and emergency planning for extreme weather events).

**Climate change is one of the most important public health challenges of this century but it also presents a public health opportunity.** Addressing climate change health impacts can also provide important co-benefit opportunities:

- Climate change mitigation - reducing air pollutants that are also greenhouse gases
- Supporting other public health issues - built environment, health equity, healthy living
- Better engagement and collaboration with stakeholders such as community partners
- Supporting implementation of Regional Official Plan policies
- Supporting York Region initiatives - Health Equity program, Seniors Strategy, Greening Strategy and others

Addressing future impacts of climate change will present a public health opportunity to address multiple factors impacting human health including extreme temperatures and weather, water and food safety, vector-borne diseases, air quality and emergency preparedness. It is imperative for public health to continue its efforts to address the future health impacts of climate change to support the creation of more resilient communities in York Region.

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