

**Report to  
Rapport au:**

**Standing Committee on Environmental Protection, Water and Waste Management  
Comité permanent de la protection de l'environnement, de l'eau et de la gestion  
des déchets**

**16 June 2020 / 16 juin 2020**

**and Council  
et au Conseil**

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**Ward: CITY WIDE / À L'ÉCHELLE DE LA VILLE      File Number: ACS2020-PIE-EDP-0014**

**SUBJECT: Climate Change Master Plan - Climate Projections for the National  
Capital Region**

**OBJET: Plan directeur sur les changements climatiques – Projections  
climatiques pour la région de la capitale nationale.**

## REPORT RECOMMENDATION

**That the Standing Committee on Environmental Protection, Water and Waste Management recommend that Council receive the report on the Climate Projections for the National Capital Region as summarized in this report and attached as Document 1.**

## RECOMMANDATION DU RAPPORT

**Que le Comité permanent de la protection de l'environnement, de l'eau et de la gestion des déchets recommande au Conseil de prendre connaissance du rapport sur les projections climatiques pour la région de la capitale nationale, comme le précisent le présent rapport et le document 1 ci-joint.**

## BACKGROUND

In April 2019, City Council approved a motion to declare a climate emergency ([ACS2019-CCS-ENV-0005](#)) for the purposes of naming, framing and deepening our commitment to protecting our economy, our ecosystems and our community from climate change. As part of the declaration Council directed staff to:

- Develop mitigation and adaptation priorities for 2019-2024 to embed climate change considerations across all elements of City business, and
- Complete a vulnerability assessment and develop a climate resiliency strategy to reduce the impacts of a changing climate.

In January 2020, Council approved the Climate Change Master Plan ([ACS2019-PIE-EDP-0053](#)) which included the following five-year priority projects:

- Undertake a climate vulnerability assessment and develop a Climate Resiliency Strategy,
- Apply a climate lens to the new Official Plan and its supporting documents, and
- Apply a climate lens to asset management and capital projects.

Municipalities are required under the *Planning Act* and the Provincial Policy Statement to prepare for the impacts of a changing climate.

## DISCUSSION

### Overview of Report

This report shares the findings of the study: Climate Projections in the National Capital Region. It provides a comprehensive analysis of future climate conditions in the National Capital Region to 2100. The report includes projected changes in temperature, rainfall, snow, wind and extreme events such as freezing rain, tornadoes and storms. Data is provided for three time horizons – 2030s, 2050s and 2080s – under both moderate and high greenhouse gas emission scenarios<sup>1</sup>. This report represents the first phase in a three-phase process to develop a Climate Resiliency Strategy. Future climate information will be used to undertake climate vulnerability and risk assessments (Phase 2) and develop an Adaptation and Resiliency Plan (Phase 3).

This comprehensive technical report includes two volumes:

- Volume 1 includes:
  - An Executive Summary – a seven-page summary of the study and its key findings.
  - The Main Report (78 pages) – an overview of the project, methodology, findings and implications. It includes results and interpretation for key climate indices for the region.
  - Appendices A to E – additional material on climate modeling, methodology, guidelines for reading plots, precipitation extremes and references.
- Volume 2 (285 pages) includes:
  - Appendices F and G provide plots and tabular data for 178 climate indices.

### Context and Rationale

In April 2019, Environment and Climate Change Canada released [Canada's Changing Climate Report](#) stating that, on average, Canada is warming at twice the rate of the rest of the world and that the effects of warming will intensify in the future. Over the coming decades Ottawa will be much warmer and wetter, with a greater chance of extreme

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<sup>1</sup> Two global greenhouse gas emission scenarios were used in this study: a moderate emission scenario Representative Concentration Pathway (RCP) 4.5 and a high emission scenario (RCP 8.5). These scenarios represent two possible futures: the current trajectory (RCP 8.5), and rapid global action is taken to drastically reduce global emissions and meet the 2015 Paris Agreement targets (RCP 4.5).

weather<sup>2</sup>. The changing climate will have significant and direct impacts on Ottawa's health and safety, infrastructure, local economy and environment. Indeed, in recent years Ottawa has felt the impacts of severe weather, through the Ottawa River flooding in 2017 and 2019, the tornadoes in 2018 and 2019, and the extreme heat during the Canada 150 celebrations.

While national data provides useful overall trends, it is limited by both the number and type of climate indices, as well as downscaling to the local region.

These regional climate projections were developed as a joint project between the City and the National Capital Commission (NCC), with technical advice from Environment and Climate Change Canada and input from select regional stakeholders including the Ville de Gatineau and conservation authorities. Climate science specialists were commissioned to conduct the study using the most advanced modeling, methodology and data.

The report differs from other climate data for the region in that it includes:

- One-hundred seventy-eight indices downscaled to the NCC.
- Advanced modeling methods based on multiple global and regional ensembles.
- Analysis of spatial variation.
- Characterization of uncertainty and discussion on how to manage data uncertainty.

The report and data are publicly available to support widespread understanding and use.

## **Key Findings**

The primary climate information in this report includes:

- Temperature indices including seasonal shifts, changes in average and extreme temperatures, freeze-thaw cycles, etc.
- Precipitation indices including seasonal shifts, changes in total amounts and extremes for rain and snow, snow depth and cover, etc.
- Indices for wind, humidity and combined conditions such as humidex, wind chill, winter rain, etc.

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<sup>2</sup> Climate Atlas of Canada. Region: OTTAWA. July 10, 2019. [https://climateatlas.ca/report\\_v2/grid/299](https://climateatlas.ca/report_v2/grid/299)

- Projections related to extreme weather events and hazards such as freezing rain, winter storms, extreme wind and tornadoes, lightning, drought and wildfire, based on literature review.

Overall, Ottawa's future climate is expected to be much warmer year-round, with fewer cold extremes and significant increases in the number of extreme heat days (>30°C). Rainfall is expected to increase in both volume and intensity. Seasons will shift, with earlier springs and later falls. Warmer winters will have less snow, more rain and more freeze-thaw events. While the uncertainty is greater for projecting extreme events, future conditions favour an increase in extreme weather such as freezing rain, tornadoes, winter storms or droughts.

## Future Climate in Canada's Capital Region

	What to expect*	2030's	2050's	2080's	
<b>Temperature</b> 	Average temperature	↑ 1.8°C	↑ 3.2°C	↑ 5.3°C	
	Very hot days (above 30°C)	2.5 times more	4 times more	6.5 times more	
	Very cold days (below -10°C)	20% less	35% less	63% less	
<b>Seasons</b> 	Winters shorter by	4 weeks	5 weeks	8 weeks	
	Springs earlier by	2 weeks	2 weeks	4 weeks	
	Winter freeze-thaw	↑ 13%	↑ 33%	↑ 54%	
<b>Precipitation</b> 	Fall-winter-spring precipitation	↑ 5%	↑ 8%	↑ 12%	
	Intense precipitation	↑ 5%	↑ 14%	↑ 19%	
	Snowfall	↓ 10%	↓ 20%	↓ 44%	
<b>Extreme events</b> 	Possible increases in freezing rain				
	Warming favours conditions conducive to storms, wildfires				

\* For a high carbon emission scenario (RCP 8.5)

More certainty → Less certainty

## Implications and Limitations

This study did not examine specific risks and vulnerabilities. These will be assessed in Phase 2. However, potential impacts are generally well known and are expected to include implications for:

- **Health and Safety** – A warmer and wetter climate conducive to extreme events will have wide-ranging repercussions for public health and safety. For example, flooding, heat waves, wildfires and extended power outages have great impacts on those directly affected and put an added strain on emergency services. Wildfires increase the concentration of airborne particulate matter, impacting air quality. Conditions that are favourable for transmission of vector-borne illnesses, such as Lyme disease and West Nile virus, will be more common.
- **Water Services** – More intense precipitation, including winter rain, can increase risks of flooding, erosion, wastewater overflows and leachate generation at landfills. High winds combined with freezing rain may increase power outages, requiring back-up power systems. Summer low flows may increase the risk of odours in the wastewater collection system.
- **Buildings, Real Estate and Planning** – Energy demands are expected to shift seasonally, with heating requirements decreasing in the winter months and cooling demands increasing during the summer months. Roof and foundation drainage systems of buildings may be impacted by more intense precipitation. For new construction, climate change will influence future editions of the National Building Code of Canada. Municipal planning must account for climate impacts, including future flood risks.
- **Transportation** – Climate change will impact both transportation infrastructure (e.g. heat or freeze-thaw impacts on road condition, or flooding) and operations (e.g. through power outages). A changing climate could also bring potential opportunities to the transportation sector such as longer construction seasons.
- **Natural Assets, Tourism and Recreation** – Shorter, warmer winters with less snow will negatively impact winter recreation. Drier and warmer summers may impact plant and animal species, potentially favouring invasive species. Agriculture may benefit from a longer growing season but face variable precipitation.

This climate projections study cannot project the future likelihood of riverine flooding. While the report provides insight on key parameters that affect flooding such as snowpack, rainfall and temperature, an analysis of future flooding risk requires data for the entire Ottawa watershed (an area 23 times larger than the National Capital Region) as well as complex modelling that factors land use and hydrology. The City uses flood risk management tools such as floodplain mapping and the Spring Freshet Task Force to understand and prepare for flood risks.

### **Next steps**

Building climate resiliency ensures that Ottawa is a city where everyone can live, work and play in all future climate conditions. This requires planning and action at all scales, and across all sectors and service areas. It is important to understand the impacts and risks of climate change, assess the adequacy of current adaptation measures, identify where Ottawa is vulnerable, and prioritize actions to address these gaps.

There are three phases in building climate resiliency:

- Phase 1: Understand future climate conditions (this report)
- Phase 2: Assess risks and vulnerabilities
- Phase 3: Develop a resiliency strategy and action plan to address key risks

With the completion of this report, staff will shift into Phase 2. In keeping with Council's direction to embed climate change across all elements of City business, vulnerability and risk assessments will occur across all service areas and at many scales (policy, program and project). Many current City initiatives will be able to use the results in their planning including:

- New Official Plan and supporting Master Plans for Infrastructure, Transportation, Greenspace and Urban Forest, Parks and Solid Waste.
- Comprehensive Asset Management and the development of service area Asset Management Plans (including to meet [Asset Management regulations](#)).
- Environmental assessments including for transportation planning (and to meet [guidelines for environmental assessments](#)).
- Infrastructure design guidelines and standards.
- Climate risk assessments of specific projects or infrastructure.

In addition to these specific projects and plans, staff will conduct a city-wide vulnerability and risk assessment to examine potential impacts across all City services and develop an overall City Resiliency Strategy. This will be undertaken in close collaboration with all City departments and align with other risk assessments being led by Ottawa Public Health and Emergency and Protective Services. NCC will undertake its own vulnerability assessment and adaptation planning for its assets and services.

The methodology will build on best practices for multi-sector adaptation planning, including [ICLEI's Building Adaptive and Resilient Communities program](#). Staff are currently participating in an FCM-supported project for the [Global Covenant of Mayors for Climate and Energy in Canada](#) to advance action on climate mitigation and adaptation. Ottawa was selected as one of 25 municipalities in Canada to participate in this project.

The city-wide vulnerability assessment will cover all City services, programs and assets including:

- Public health and safety including disease prevention (e.g., West Nile and Lyme disease) and reducing impacts on vulnerable populations.
- Physical infrastructure including the design, construction and operation of roads, bridges, pedestrian and cycling infrastructure, water, wastewater, and stormwater infrastructure, parking lots, fleet, buildings, recreational facilities and waste management infrastructure.
- Natural areas and assets such as wetlands, forests, watercourses, ravines, conservation areas, groundwater, street trees, and biodiversity.
- Agriculture and other climate-sensitive economic activity.
- Recreation and tourism.
- Emergency Management Program goals of prevention, mitigation, preparedness, and response and recovery.

The city-wide vulnerability and risk assessment will be undertaken in 2020 and used to develop a Climate Resiliency Strategy in 2021. Staff will provide an update as part of the annual Climate Change Master Plan update by the end of 2020. Staff will concurrently work with departments to support their use of the projections in vulnerability and risk assessments for specific projects or programs.

The impacts of climate change are broader than City services. By making the data publicly available, the findings can be used by any group, organization, institution business or agency in the region.

A recent report by the Federation of Canadian Municipalities and the Insurance Bureau of Canada estimated the required investments in local public infrastructure to help communities adapt to the changing climate and reduce risk from extreme weather. On average, an annual investment of 0.26 per cent of national GDP is required to be cost-shared by all three levels of government<sup>3</sup>. Financial requirements to implement the City's action plan and undertake more detailed risk assessments will be identified in future budgets, subject to funding.

## **RURAL IMPLICATIONS**

Climate change affects all residents, businesses, lands, services and assets. As such, the climate projections will be used to inform vulnerability and risk assessments and guide resiliency planning across the City. An example of a specific rural implication is that agriculture may benefit from longer growing seasons yet be negatively impacted by more variable water availability.

## **CONSULTATION**

The Regional Climate Projections study has benefitted from the following consultations to date:

- An internal working group was formed with departmental staff to serve as focal points for their service areas and guide all phases of the development of a Climate Resiliency Strategy. This group continues to grow.
- Technical specialists from Environment and Climate Change Canada's Centre for Climate Services provided technical expertise throughout the project on the scope of work, modeling methodology and provision of downscaled data.
- About 60 City of Ottawa and NCC staff participated in a workshop on July 9, 2019 to determine the most suitable climate indices to support future risk assessments and guide climate adaptation and resiliency planning. The Ville de Gatineau and conservation authorities also participated.
- Staff participated in a second workshop on February 26, 2020 where the findings were presented along with advice on how to use the information in the report.

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<sup>3</sup> <https://fcm.ca/en/resources/investing-in-canadas-future>

- Regular communication with the Ville de Gatineau, Public Services Procurement Canada and Hydro Ottawa has occurred throughout this project. These agencies commissioned climate projections for their respective vulnerability assessments and adaptation planning. As described above, the City-NCC study builds on this work by providing a larger list of climate indices based on the most advanced climate modeling and data. The attached technical report includes a comparison the methodologies and findings from these respective studies to facilitate consistent interpretation and application.
- Staff have participated in discussions on the creation of a regional Community of Practice on climate adaptation with representatives from federal departments, NCC, City of Ottawa, Ville de Gatineau, Hydro Ottawa and others.

Consultation and engagement will continue moving forward including:

- Information sessions with City departments and Ottawa Public Health to share the findings and discuss application across service areas.
- Information sessions with regional stakeholders (in collaboration with the NCC).
- Sharing findings and next steps through the inter-agency Community of Practice.
- Development of an engagement plan for Phase 2 and 3.

### **COMMENTS BY THE WARD COUNCILLORS**

This is a City-wide report – not applicable.

### **LEGAL IMPLICATIONS**

There are no legal impediments to Committee and Council's receipt of this report.

### **RISK MANAGEMENT IMPLICATIONS**

There are no risk implications in receiving this report. There are risk implications if the data in this report is not considered in City plans, programs and projects.

The robust climate projections in this report are intended to reduce the risks associated with a changing climate. They serve as an input to risk and vulnerability assessments and resiliency planning for projects, programs and plans. Phase 2 and Phase 3 of the Climate Resiliency Strategy will guide this process.

## **ASSET MANAGEMENT IMPLICATIONS**

The recommendations documented in this report are consistent with the City's [Comprehensive Asset Management \(CAM\) Program](#) objectives. The implementation of the Comprehensive Asset Management program enables the City to effectively manage existing and new infrastructure to maximize benefits, reduce risk, and provide safe and reliable levels of service to community users. This is done in a socially, culturally, environmentally, and economically conscious manner.

Through O.Reg. 588/17, the City is committed to consider climate change in the delivery of service, operations and maintenance, and life cycle management. The climate projections in this report will inform risk assessments and contribute to asset resiliency planning as part of the CAM Program.

## **FINANCIAL IMPLICATIONS**

There are no direct financial implications.

## **ACCESSIBILITY IMPACTS**

An accessible version of the technical report will be available. Accessibility impacts will be assessed as part of climate vulnerability assessments and resiliency planning.

## **ENVIRONMENTAL IMPLICATIONS**

The climate projections in this report will support climate risk and vulnerability assessments and resiliency planning. Municipalities are required under the Planning Act and the Provincial Policy Statement to prepare for the impacts of a changing climate. The report further supports the City's ability to comply with regulations and guidelines on asset management planning and environmental assessments and meet requirements for federal funding.

## **TERM OF COUNCIL PRIORITIES**

This project aligns with the 2019-2022 Term of Council Priority Environmental Stewardship, to grow and protect a healthy, beautiful and vibrant city that can adapt to change.

## **SUPPORTING DOCUMENTATION**

Document 1 Technical Report: Climate Projections for the National Capital Region (Volume 1) attached to this report

Document 2 Technical Report: Climate Projections for the National Capital Region (Volume 2) attached to this report

Document 3 Rapport technique: Projections climatiques pour la région de la capitale nationale (Volume 1) attached to this report

Document 4 Rapport technique: Projections climatiques pour la région de la capitale nationale (Volume 2) attached to this report

## **DISPOSITION**

Planning, Infrastructure and Economic Development will make the information available for public use and use the climate projections to inform a city-wide vulnerability assessment and resiliency strategy. All departments will use climate projections data to inform their respective vulnerability and risk assessments and resiliency planning.