

CLIMATE CHANGE RESILIENCE

# USING CLIMATE INFORMATION TO DRIVE ADAPTATION

FIVE LOCAL GOVERNMENT  
CASE STUDIES FROM  
ACROSS CANADA

October 2021



FEDERATION  
OF CANADIAN  
MUNICIPALITIES

FÉDÉRATION  
CANADIENNE DES  
MUNICIPALITÉS



Environment and  
Climate Change Canada

Environnement et  
Changement climatique Canada

# Municipal Climate Services Collaborative (MCSC)

- The Federation of Canadian Municipalities (FCM) and Environment and Climate Change Canada (ECCC) developed five local government case-studies via the Municipal Climate Services Collaborative (MCSC)
- MCSC created in 2019 and comprised of 25 municipal, research, consulting and regional climate organizations:
  - Enhance and promote the uptake of municipal climate information, products and services to integrate climate change in strategic planning and decision-making processes.



## Grand Forks, BC

Resilience to riverine flooding

## Quinte Conservation, ON

Enhanced drought management

## Windsor, ON

Integrating climate risks into municipal projects

## L'Islet, QC

Developing a multi-risk adaptation plan

## Saint John, NB

Adapting to floods and storm surges



# The Five Case-Studies

- Five diverse studies, which highlight the use of climate information in local government adaptation processes.
- The studies:
  - Demonstrate how local governments used **climate information and data** to inform their impact, risk and vulnerability assessments to increase resilience to climate-related events;
  - Share **adaptation strategies** and which measures have been implemented to date,
  - Examine **opportunities** and **challenges** within the adaptation planning processes.
  - Provide a **resource** for others seeking to use climate data and information in their resilience efforts.
  - Offer **differing community perspectives**, pertaining to size, governance models, hazards being addressed, and stages within the adaptation planning process.

# Grand Forks, British Columbia

## Resilience to Riverine Flooding



Population: 4,049  
Size: 10.43 km<sup>2</sup> and surrounding agricultural areas  
Location: Between the Kettle and Granby Rivers, bounded by mountains of southern interior BC  
Economy: Agriculture, commercial and professional services, manufacturing

### CLIMATE-RELATED EVENT

- Record flood event of the Kettle & Granby rivers in 2018
- Significant impacts on commercial, residential, industrial and agricultural sectors

### FLOOD RECOVERY PLAN

- Flood recovery plan, floodplain hazard mapping & development of flood mitigation / adaptation options.
- Options include: (1) update floodplain bylaws/raise buildings (2) enhance flood & erosion protection (3) develop flood protection infrastructure (4) initiate home buyout and floodplain restoration

### CLIMATE DATA USED

- Hydrological modelling driven by projected future climate data. Use of open source model RAVEN
- Models provided data for future flood frequency analysis at two key points in Grand Forks.
- Historical data from Pacific Climate Impacts Consortium (PCIC) and downscaled future data from 6 Global Circulation Models (GCMs)



## FLOOD MITIGATION ACTIONS

- Enhance flood protection to withstand peak flows 10% higher than the 2018 flood event
- Dike design complete and construction to commence in 2022
- Acquisition of private properties in floodplain
- Establishment of natural wetland and enhanced drainage and development restrictions



## OPPORTUNITIES & CHALLENGES

- Hydrological models can be used for droughts & water management
- Recognition of the value of natural assets
- Uncertainties in hydrological modelling and difficulty in modeling cumulative climate change effects
- Funding constraints and uncertainties





**Above:** Record flood event of the Kettle and Granby Rivers in 2018 affecting many Grand Forks neighbourhoods.

**Below:** Installation of revetment on the Kettle River to curb erosion after 2018 and 2020 freshets.



**Above:** Plan of existing dyke removal, natural flood plain rehabilitation and future dyke location in Grand Forks, BC.

**Below:** Acquired properties by the Flood Mitigation Program; this land will serve as a natural floodplain.



# Quinte Conservation, Ontario

## Enhanced drought management



Population: 130,000  
Size: 6,600 km<sup>2</sup> includes Belleville, Prince Edward County and surrounding rural areas  
Location: Southeastern Ontario & includes the Moira, Napanee and Salmon river watersheds  
Economy: Agriculture, commercial , industrial, professional services, tourism

### CLIMATE-RELATED EVENTS

- More than half the years since 2001 have had low water conditions
- Summer of 2016 required a Level 3 drought response – serious problem with water supply meeting demand

### DROUGHT PLAN DEVELOPMENT

- 2016 drought raised awareness of water issues, but more action was required
- Development of the [Quinte Region Drought Plan](#) (2021) directed by a steering committee of diverse stakeholders

### CLIMATE DATA USED

- Existing water budget model used, based on data from Ontario's [Source Water Protection Program](#) and climate data from ECCC and NRCan
- Streamflow data from gauges on waterways
- Groundwater level data from 30 wells



## KEY POINTS OF THE DROUGHT PLAN

- Details the triggers and actions for each low water threshold
- Low water conditions response led by *A Low Water Response Team*
- Outlining of roles and responsibilities and adaptive measures to be taken
- Focus on sustainable community water supply

## OPPORTUNITIES & CHALLENGES

- The development of the drought plan has increased interest in water issues.
- Education about water issues and conservation is an opportunity but requires ongoing effort.
- Finite capital and staff resources to address drought mitigation and adaptation





Some of the lake level gauges that have been installed in the Quinte region.



Level 2 low water threshold in the Quinte Conservation region.

# Windsor, Ontario

## Integrating climate risks into municipal projects



Population: 336,000 (2020 estimate)  
Size: 146.3 km<sup>2</sup> or 1,023 km<sup>2</sup> for the greater metropolitan area  
Location: Southernmost Canadian city along the Detroit River with Lake St. Clair to the north; sparse natural cover and limited topographical grade  
Economy: Manufacturing, tourism, professional services, education and government services

### CLIMATE-RELATED EVENTS

- Significant rainfall events in 2016 and 2017 led to severe flooding in several neighbourhoods
- Other climate impacts include extreme heat and high wind storms, creating increased risks of tree damage, vector-borne diseases and insect pests

### ADAPTATION PLAN DEVELOPMENT

- Municipality developed a second, more comprehensive, Climate Change Adaptation Plan in 2020
- Includes steps to accelerate adaptation action
- Incorporated input from key stakeholders and the public
- Accompanied by a Guidance Document to help staff assess and address climate risks

### CLIMATE DATA USED

- Risk Assessment Guidance Document included data from ClimateData.ca and research by University of Waterloo's Interdisciplinary Centre on Climate Change.
- Examination of municipal hazard maps
- Developed models using different climate futures



## RISK ASSESSMENT GUIDANCE DOCUMENT

- Guidance document is to be used in all council reports to ensure climate risks are assessed and addressed.
- So far, projects such as tree trimming and upgrades of municipal facilities, have used the Guidance Document.
- The Guidance Document facilitates opportunities to highlight initiatives that support adaptation and greenhouse gas mitigation.

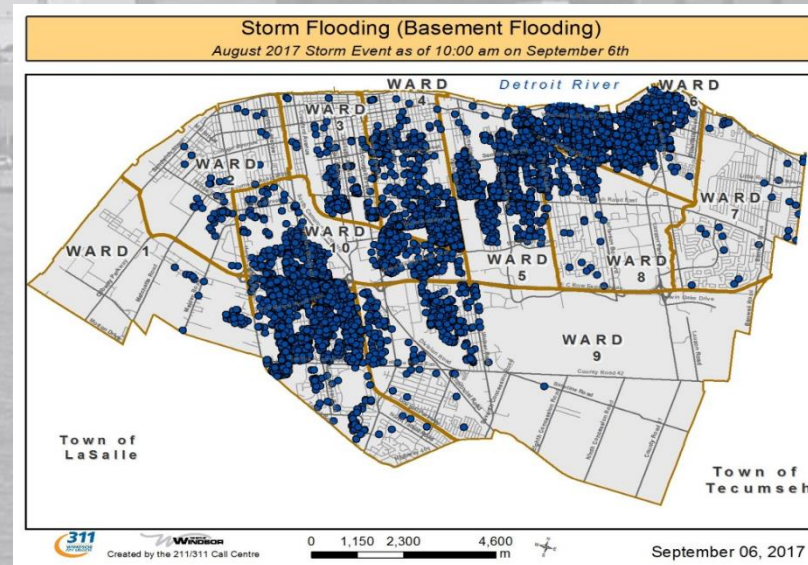
## OPPORTUNITIES & CHALLENGES

- Increased training on how climate change may affect projects and how to use the climate lens guidance document.
- Delayed training on the use of the Guidance due to COVID-19, though online seminars have resumed.
- Next steps include developing a more streamlined guidance and integrating a climate risk section into budget documents.





Flood hazard maps of Windsor, which were used for the guidance document



Flooding in Windsor neighbourhoods in 2017.

# L'Islet, Quebec

## Developing a Multi-Risk Adaptation Plan



Population: 3,827 (2016 census)  
Size: 120 km<sup>2</sup> includes urban and agricultural areas  
Location: On the flood plain of the south shore of the St. Lawrence River between Quebec City and Rivière-du-Loup  
Economy: Agriculture, commercial and professional services, tourism

### CLIMATE-RELATED EVENTS

- Significant coastal flooding events in 2020, impacting residential, agricultural, heritage and recreational areas
- Extended heatwaves, lack of summer precipitation & associated droughts

### ADAPTATION PLAN DEVELOPMENT

- Proactive climate change resilience planning
- Climate change vulnerability and risk assessment and Adaptation Plan (2018)
- Several public consultations to seek input on climate change hazards, vulnerabilities, risks and adaptation actions

### CLIMATE DATA USED

- Historical climate & river flowrate data from Ouranos
- Additional historic data from the Quebec government and Environment & Climate Change Canada
- Projected future data and models from NRCan (Le Quebec en evolution) and Ouranos

## VULNERABILITIES, RISKS & ADAPTATION PLAN

- Identified significant vulnerabilities and risks to shoreline infrastructure, heritage and residential buildings, aging and agricultural populations, biodiversity and drinking water
- Identified 32 adaptation actions to address the risks, with goal to implement 60% of these actions by 2025
- Currently implementing certain actions, including tree planting along shoreline and flood proofing of new developments.



## OPPORTUNITIES & CHALLENGES

- Adaptation plan development increased community engagement on climate change and enhanced communication.
- More consistent financial and political support required
- Continued need for citizen champions







Heritage buildings at risk of flood damage in L'Islet

Public consultations for the climate change adaptation plan



# Saint John, New Brunswick

## Adapting to Floods & Storm Surges



Population: 70,785 (2017 estimate)  
Size: 315.5 km<sup>2</sup>  
Location: On the Bay of Fundy in the Kennebecasis Valley at the mouth of the Saint John River  
Economy: Small-scale manufacturing, service sector, forestry industry, commercial, tourism

### CLIMATE-RELATED EVENTS

- Historic spring freshet flooding of the Saint John River in 2018 and 2019, impacting residences and city infrastructure
- Significant storm surges causing coastal erosion
- Overland flooding in winter months

### ADAPTATION PLAN DEVELOPMENT

- City worked with Atlantic Coastal Action Program to develop a [Climate Change Adaptation Plan for Saint John](#) (2020).
- Plan considers climate risks and vulnerabilities within development projects
- Solicited citizen input on areas at risk, via [Maptionnaire](#)
- Risk assessment for municipal infrastructure, via [PIEVC](#)

### CLIMATE DATA USED

- Provincial climate and sea level rise data from ACASA, NOAA and the [Climate Atlas of Canada](#)
- Data fed into Geographic Information System (GIS)
- Flood hazard maps were developed for Saint John

## KEY ADAPTATION ACTIONS

- Adaptation actions include reducing shoreline erosion, protecting natural spaces and incorporating climate change into community planning
- Actions completed include building a two-metre extension to the seawall, as well as changes to new developments on the waterfront and the raising of pumping stations.

## OPPORTUNITIES & CHALLENGES

- Adaptation plan offered opportunity for important collaboration and a wide range of perspectives from community stakeholders
- Challenges included adequate consideration of isolated and vulnerable communities and comprehensive public engagement.

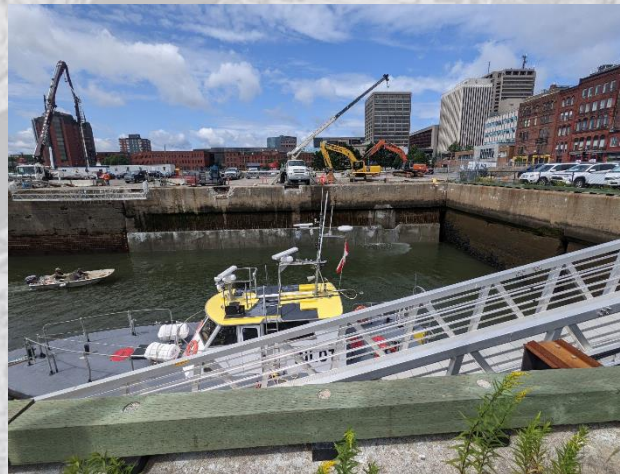




**Left:** Flooding at Musquash Pumping Station out side of Saint John, NB



**Above:** Raising electrical equipment and floor in electrical room and raising floor in pump bay at Musquash Pumping Station.



**Above:** Refacing of part of the seawall in Saint John, NB



**Above:** Rendering of the future Paradise Row Substation in Saint John, NB

## Additional Resources

### Looking for more resources?

- Check out [ChangingClimate.ca](http://ChangingClimate.ca), your one-stop-shop for examples of climate change impacts and [Map of Adaptation Actions](#) for case-studies across Canada.

### Need climate data to support your adaptation actions?

- Visit [ClimateData.ca](http://ClimateData.ca) to access historical and future climate data, custom analysis tools, training materials, and much more.

