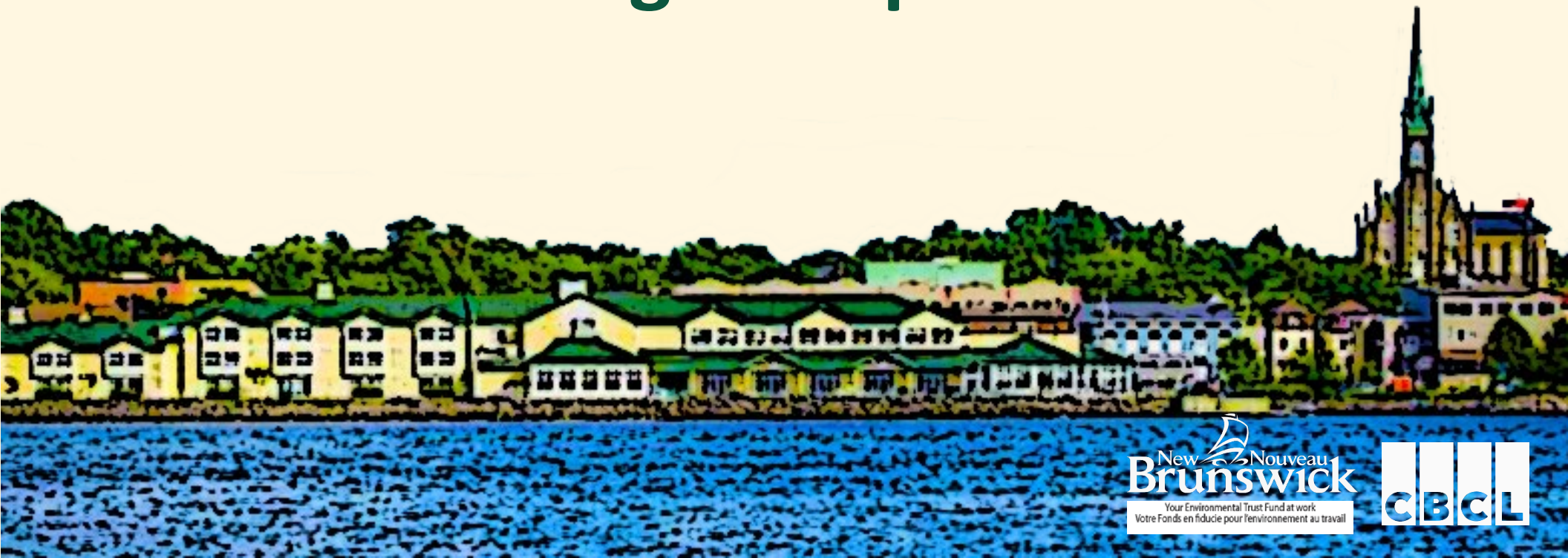


City of Miramichi

Climate Change Adaptation Plan



City of Miramichi

Climate Change Adaptation Plan

In 2018, the City of Miramichi began preparing a Municipal Climate Change Adaptation Plan (Plan) to address climate change and extreme weather vulnerabilities within the municipality. Areas studied include municipal infrastructure, recreational facilities, municipal buildings, emergency services, tourism and economic development, and environment. Additionally, the impacts of climate change on the Municipal Development Plan were also explored as part of the 2019 updates. In 2019, the City began stakeholder and public engagement to further enhance the findings of the Plan with input from the community.

The goal of the Plan is to identify the impacts of climate change on the municipality and use a risk-based prioritization process to narrow down a list of actionable adaptation options. Climate change data for temperature, wind, precipitation, river and sea ice,

sea level rise, storm surge, lightening and forest fires were investigated as part of the Plan. Adaptation measures were then developed for the most vulnerable areas of the City. Although important for municipal planning, a comprehensive greenhouse gas (GHG) mitigation and energy efficiency strategy was not included in this project.

Key Infrastructure Components

A preliminary risk assessment was completed with representatives from City departments such as engineering and public works, tourism and economic development, police, fire, EMO, recreation, and the Greater Miramichi Regional Service Commission (planning authority). Representatives from each department provided input on historical extreme weather events and perspectives on how climate change will impact the community and municipal operations. The findings of this workshop narrowed down the following key areas of the City where climate change is thought to have the greatest impacts:

Engineering & Public Works

- Sewer Collection System
- Wastewater Treatment Plants
- Stormwater Collection and Drainage Systems
- Stormwater Storage Systems (Detention/Retention/Underground)
- Water Distribution System
- Water Treatment & Groundwater Wells
- Transportation Infrastructure
- Wharves and Docks
- River Bank Erosion Protection (Rip-rap)
- Municipal Buildings
- Design Guidelines
- Stormwater Management Policies

Recreation

Sports Fields (Grass and Turf)
Walking and Hiking Trails
Winter Recreational Activities/Sites
Pools and Public Swimming
Tree Planting and Downtown Beatification
Public Spaces
Arenas/ Indoor Sports Facilities
Recreation Centers

Economic Development & Tourism

Recreation Facilities (Indoor Events)
Events Owned by City (Striper Cup)
Outdoor Event Facilities
Development Policies
Public Spaces
Waterfront and Downtown
Recreational Fishing
Winter Recreation

Electrical & Power

Power Outages
Lighting
Communications (Phones and Internet)
Controls and Instrumentation
Backup and Emergency Power

Public Works (Operation & Maintenance)

Snow Clearing
Asphalt Re-surfacing and Pothole Maintenance
Sewer Collection and Sewage Lift Stations (SLSs)
Water Distribution and Pumping
Treatment Facilities

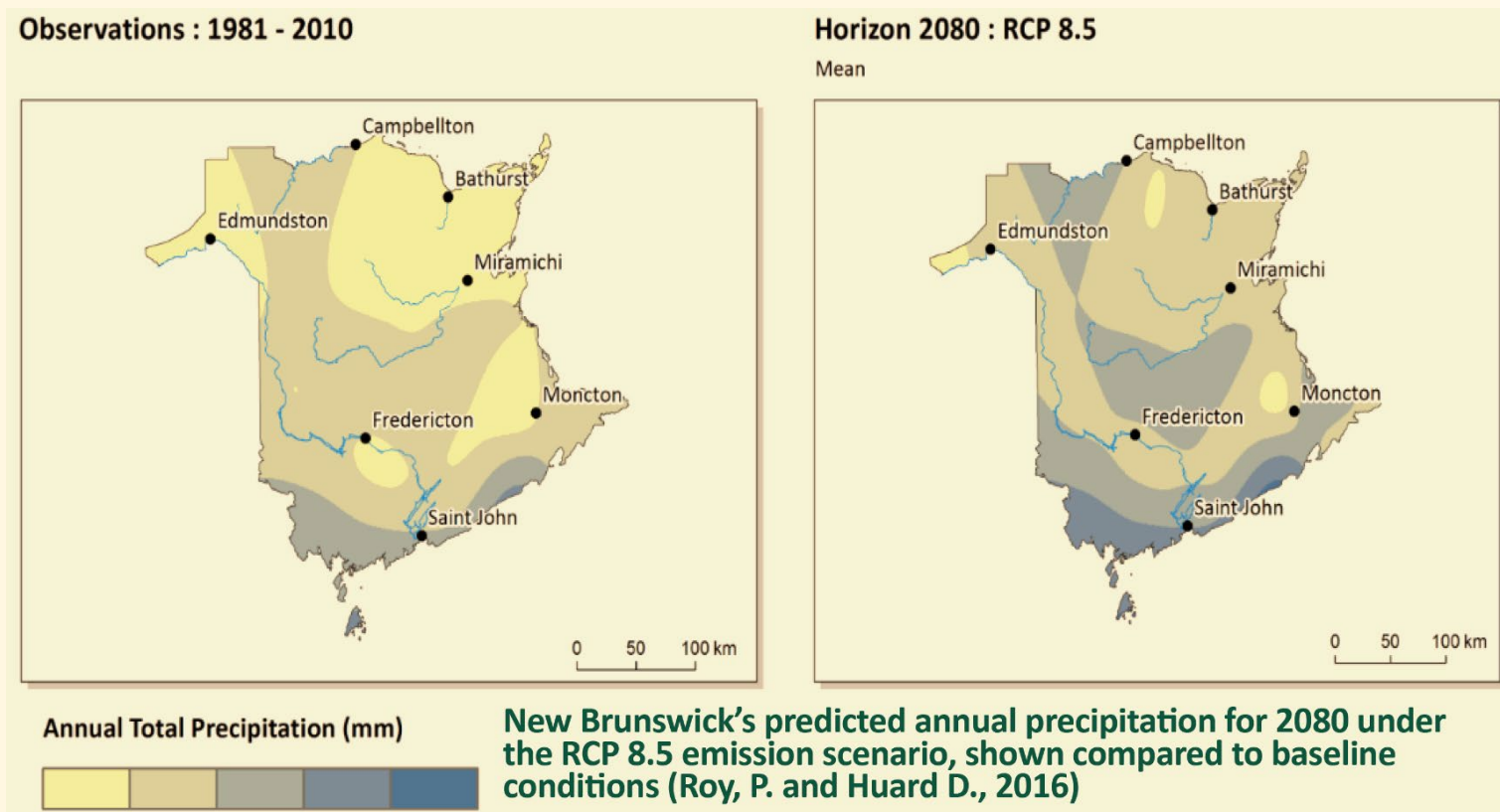
Environment

Tree and Plant Health
Fish Populations (Miramichi Atlantic Salmon)
Wetlands and Natural Stormwater Retention Features
Coastal Erosion Sites and Waterfront
Water Quality in River

Climate Data Analysis

Measurements of local weather and water trends have historically been used to predict the probability of extreme weather occurring in the future. Historical data is no longer adequate for predicting future weather due to climate change. For this reason, modeling software such as global circulation model

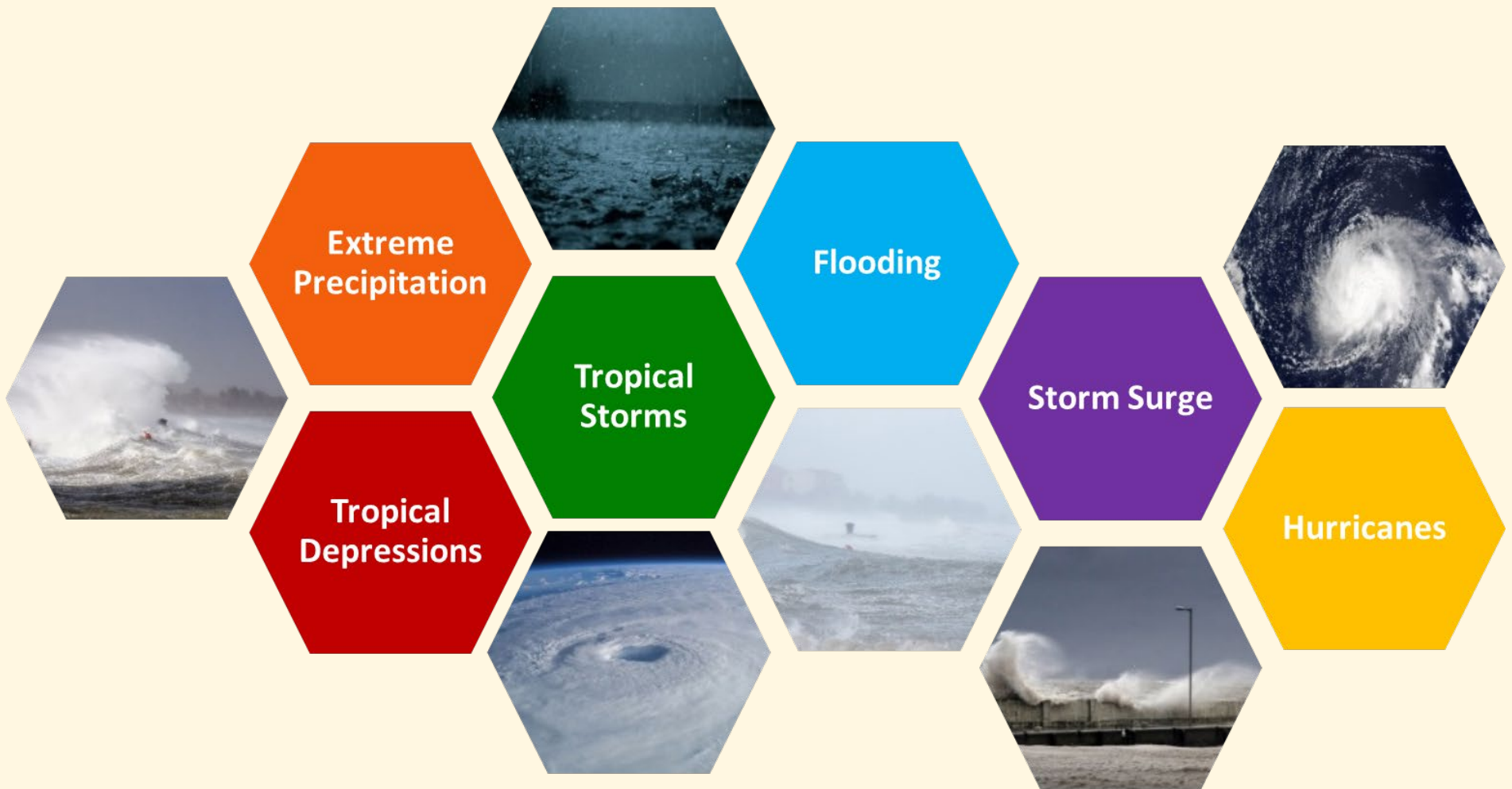
(GCM) projections are used along with literature research. The following figure displays projected changes of annual total precipitation for year 2080. In Miramichi, precipitation is expected to rise by a few 100 mm.



Major findings of the climate change assessment

- ▶ Sea level is expected to rise by 0.4m over the period of 2010-2050 and up to 1.75m by 2100.
 - ▶ Total annual precipitation is expected to increase by a few 100mm by the 2080s.
 - ▶ Extreme rainfall events are predicted to increase in intensity.
 - ▶ Severity and frequency of freezing rain events is expected to increase.
 - ▶ Variability for both temperature and precipitation is expected to increase the frequency of flash freezing events.
 - ▶ Snow cover is expected to decrease and the probability of having a white Christmas is on the decline.
 - ▶ Extreme weather events are projected to become more frequent.
 - ▶ Temperatures are projected to rise.
- ▶ The projected increase in summer temperatures and increase in frequency of droughts will create more favourable conditions for wildfires in the future.
 - ▶ Warmer temperatures expected in the colder months could extend the number of freeze-thaw cycles typically observed in a year in the short term. In the long term however, freeze-thaw cycles are projected to decrease.
 - ▶ A small shift in average temperature can cause extreme weather events to happen more often. Low pressure systems are dissipated by cold atmospheric and oceanic temperatures. As climate models predict an average global temperature increase of up to 6deg.C in New Brunswick by 2100, extreme weather will become more common in the region and storms will hit Atlantic Canada with increased strength (DELG, 2019).

Examples of extreme weather:



Risk and Vulnerability Assessment

A vulnerability assessment is used to identify locations, individuals, or infrastructure that is already or may become vulnerable to climate change and extreme weather. The risk assessment considers the impact to people, the economy, and the environment. There are many factors to consider in assigning flood risk and vulnerability, including: climate change, land use changes, proximity and depth of flooding, vulnerable populations, and access to essential services (Source: Intact Centre on Climate Adaptation):

Vulnerability is computed as the product of likelihood and severity. Each risk score is then categorized into level of risk (extreme risk, high risk, moderate risk, low risk or negligible risk) in order to determine which key areas or assets should be prioritized for climate change adaptation. The following figure demonstrates the risk description where moderate – extreme risks require adaptation and low risk is optional.

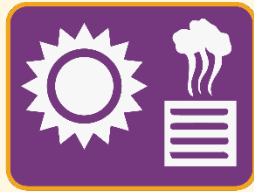
Risk Description



The resulting top 10 highest ranked municipal impacts for climate change adaptation



Winter storms and extended power outages



Low flow in collection system



Extreme rainfall and flooding



Accelerated coastal erosion



Increased road maintenance



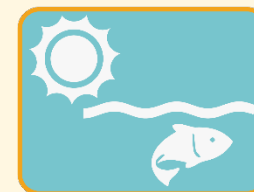
Drought impacts on water levels



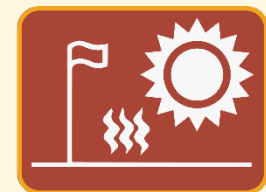
Sea level rise and storm surge flooding



Longer heatwaves and increased fire weather



Difficult conditions for Atlantic salmon



More water demands for maintenance of sports fields



Adaptation

Climate change adaptation measures have been proposed for the top 10 ranked vulnerabilities listed above. The purpose of each recommended action is to improve community resilience to climate change. Proposed climate change adaptation measures for each of the top 10 areas of priority are summarized below.

1 - Winter Storms and Extended Power Outages

- ▶ Building community awareness.
- ▶ Creating and updating a community Emergency Response Plan.
- ▶ Installing backup power at Golden Hawk.
- ▶ Arranging NB-EMO training and exercises for extreme weather.
- ▶ Develop a database of essential items required during a power outage as well as food preparation options and community volunteers.
- ▶ Visual signage is required for the Emergency Center during an emergency. Visitor registration sheets and identification cards for Recreation staff.

- ▶ Emergency Center Preparation - stocked and stored coolers or totes with emergency essential such as water, cutlery, cooking utensils, batteries, etc.

2 - Sea Level Rise and Storm Surge Flooding

- ▶ Prevent, Retreat, Accommodate or Protect for infrastructure.
- ▶ Update the Municipal Development Plan based on projected flood elevations.

3 - Heatwaves and Fire Hazards

- ▶ Enroll in Canada's Fire Smart Communities
- ▶ Community Group/ Committee for emergency preparedness.
- ▶ Enhancing Firefighting capacity through access to training for wildfire prevention and management.
- ▶ Summer Fire Safety Program, including regular social media reminders with best practices.
- ▶ Embrace Fire Prevention Week through community events and education on wildfire safety and management.

4 - Impacts on Atlantic Salmon

- ▶ Riparian Forest Shading including strategic tree planting and strict adherence to clearing restrictions within buffer zones.
- ▶ Fish habitat enhancement projects such as the creation of deep pools near groundwater sources and clearing river blockages.
- ▶ Seasonal Fishing pool closures during heat waves.
- ▶ Ensuring access to cold water refugia by releasing blockages or clearing restrictions.
- ▶ Protection of local hydrology.
- ▶ Public education and outreach plan.

5 - Extreme Rainfall and Flooding

- ▶ Create Climate Change adjusted IDF's for designers of storm water infrastructure.
- ▶ Continue sewer separation by identifying source of extraneous flows.
- ▶ Work with DELG to update riverine flood delineation.
- ▶ Model sewer collection system to identify areas of limited capacity and profile flood risk.

- ▶ Raise community awareness of residential overland flood protection measures for home owners.
- ▶ Continue with backflow prevention programs to reduce residential basement flooding.
- ▶ Consider a net zero runoff policy for new development.

6 - Coastal Erosion and River Bank Stabilization

- ▶ Identification of vulnerable sites through more detailed study to determine if a living shoreline or coastal structure is required for each site.

7 - Impacts of Climate Change on Road Expectancy

- ▶ Street light energy efficiencies through the installation of LEDs and the use of solar for variable signage (temporary) and parking meters.
- ▶ Adjust LOS targets for winter maintenance
- ▶ Public communications on de-icing measures, road salt is only effective when used at specific

temperature and can contaminate water sources when it is carried by surface runoff.

- ▶ Work with NBDTI and UNB to get ahead of upcoming change to mixtures.

8 - Groundwater Resources during Drought

- ▶ Establish current aquifer yield and the regional water budget and to test climate change scenarios.
- ▶ Monitor aquifer and surface water conditions – focus on drought seasons.
- ▶ Monitor production well performance – focus on drought seasons.
- ▶ Education and stewardship program to promote water conservation. Open house sessions, community flyers, as well as promotion on website, newspaper ads, or social media.
- ▶ Establish framework to anticipate and manage periods of water stress.
- ▶ Conduct operator training for periods of water stress. Provide training and mechanism to monitor implementation.
- ▶ Reassess aquifer yield periodically.
- ▶ Develop asset management plan for well field(s).

9 - Low Flow Conditions in Collection System

- ▶ Investigation of summer odor control measures.

10 - Landscaping and Maintenance in Heat

- ▶ Implement drought preparedness best practices for grass field maintenance, including watering, soil testing, and fertilizing, aerating, mowing and field usage restrictions. Consider drought tolerant ornamental plantings.
- ▶ Install irrigation systems on non-irrigated sports fields over time for priority fields.
- ▶ Develop field restriction policy for artificial turf fields for periods when field temperatures can impact player comfort/safety.
- ▶ Replace artificial turf system with “cooler” materials that reflect UV rays and do not retain as much heat.

Next steps

The results of the risk and vulnerability assessment presented herein are reflective of input from various City representatives in the Miramichi Police Force, Fire Department, Engineering, Public Works, Recreation, Economic Development and Tourism departments, as well as the Greater Miramichi Regional Service Commission. Contributions from these City departments and officials, as well as input from NB Power, DELG, and the local provincial forest operations, allowed for a comprehensive assessment that is tailored to the needs of the City of Miramichi. The Plan has been designed with flexibility to allow municipal departments to tackle and support these resilience initiatives as project budgets and personnel schedules allow.

Currently, the City is reaching out to the public in order to understand how climate change is impacting the lives of residents and local businesses.

Information collected during community outreach will prompt updates to the information and priorities identified in this report.