Climate Adaptation Plan

September 16\textsuperscript{th} 2019
AGENDA

• Changing Climate and Extreme Weather
• Local Impacts and Future Projections
• Actions to Address Climate Change
• Pelham’s Corporate Climate Change Adaptation Plan
• Supporting Documentation
• Niagara Adapts
Changing Climate and Extreme Weather

**Climate vs Weather**

**Climate:** The average atmospheric conditions of a specific place over a long period of time (usually 30 years)

**Weather:** The atmospheric conditions of a specific place over a short period of time (usually 24 hours)

**Climate Change** is this process in which both direct and indirect human activity alter the average temperature and weather patterns in a particular place. Climate change is currently occurring throughout the world, which is a result of global warming.
Changing Climate and Extreme Weather

**Climate Adaptation:**

“Managing the unavoidable” or “reducing damages that can’t be avoided”

- Any initiative or action that reduces the vulnerability of social, ecological, physical and economic systems to changing climate conditions, while also exploiting the beneficial opportunities.
- According to a study conducted by the National Roundtable on the Environment and Economy, costs associated with climate change will increase from $5 billion per year to $43 billion by the 2050’s
  - This includes greater health costs due to degraded air quality, economic losses from the frequency of invasive species and flooding from intense rain storms
Local Impacts and Future Projections

Current Impacts in Niagara
• Heat waves of 3 or more consecutive days
• More frequent episodes of rain and less snow during winter seasons
• Increase of thunderstorms with heavy rain, strong winds and hailstorm-like conditions
• Increase in average numbers of freeze-thaw cycles

Future Projections according to the Intergovernmental Panel on Climate Change (IPCC)
• Increase in average annual temperature of 3-4°C
• A 20% decrease in summer rainfall by the 2050’s
• Increase in disease and pest outbreaks (i.e. West Nile virus and Lyme disease)
# Pelham’s Weather Modeling Projections

<table>
<thead>
<tr>
<th>Climate Variable</th>
<th>1976-2005</th>
<th>2021-2050 Projection</th>
<th>2100 Projection</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Temperature (°C)</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Average/yr</td>
<td>9°C</td>
<td>12°C</td>
<td>15°C</td>
</tr>
<tr>
<td>Spring</td>
<td>7°C</td>
<td>8.8°C</td>
<td>10.7°C</td>
</tr>
<tr>
<td>Summer</td>
<td>20.5°C</td>
<td>22.6°C</td>
<td>24.8°C</td>
</tr>
<tr>
<td>Fall</td>
<td>10.8°C</td>
<td>13°C</td>
<td>15°C</td>
</tr>
<tr>
<td>Winter</td>
<td>-3.1°C</td>
<td>-0.8°C</td>
<td>1.5°C</td>
</tr>
<tr>
<td><strong>Extremes (°C)</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Heat (max)</td>
<td>33°C</td>
<td>36°C</td>
<td>39°C</td>
</tr>
<tr>
<td>Cold (min)</td>
<td>-20°C</td>
<td>-13°C</td>
<td>-8°C</td>
</tr>
<tr>
<td>Days/Yr +30°C</td>
<td>8</td>
<td>43</td>
<td>93</td>
</tr>
<tr>
<td>Cooling Degree Days (CDD)</td>
<td>321</td>
<td>667</td>
<td>1192</td>
</tr>
<tr>
<td>Heating Degree Days (HDD)</td>
<td>3399</td>
<td>2667</td>
<td>2022</td>
</tr>
<tr>
<td>Freeze-Free Days (&gt;0°C)</td>
<td>3658</td>
<td>4489</td>
<td>5520</td>
</tr>
<tr>
<td><strong>Precipitation (mm)</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total Annual</td>
<td>884 mm</td>
<td>1046 mm</td>
<td>983 mm</td>
</tr>
<tr>
<td>Average Spring</td>
<td>224 mm</td>
<td>247 mm</td>
<td>260 mm</td>
</tr>
<tr>
<td>Average Summer</td>
<td>221 mm</td>
<td>224 mm</td>
<td>222 mm</td>
</tr>
<tr>
<td>Average Fall</td>
<td>239 mm</td>
<td>246 mm</td>
<td>246 mm</td>
</tr>
<tr>
<td>Average Winter</td>
<td>208 mm</td>
<td>230 mm</td>
<td>246 mm</td>
</tr>
<tr>
<td><strong>Extreme Precipitation (mm)</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Average Annual # of Wet Days (&gt;10mm) / Yr</td>
<td>7 days/yr</td>
<td>9 days/yr</td>
<td>9 days/yr</td>
</tr>
<tr>
<td>Average Annual # of Wet Days (&gt;20mm) / Yr</td>
<td>7 days/yr</td>
<td>9 days/yr</td>
<td>9 days/yr</td>
</tr>
<tr>
<td>Maximum Precipitation On a Single Day / Yr</td>
<td>38 mm</td>
<td>40 mm</td>
<td>40 mm</td>
</tr>
<tr>
<td><strong>Frost (days)</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Frost-Free Season (days)</td>
<td>168 days</td>
<td>207 days</td>
<td>229 days</td>
</tr>
<tr>
<td>Date of Last Spring Frost</td>
<td>April 21</td>
<td>April 12</td>
<td>April 3</td>
</tr>
<tr>
<td>Date of First Fall Frost</td>
<td>Oct 29</td>
<td>Nov 8</td>
<td>Nov 21</td>
</tr>
<tr>
<td>Average Annual # of Ice Days (below 0°C)</td>
<td>48 days/yr</td>
<td>26 days/yr</td>
<td>6 days/yr</td>
</tr>
<tr>
<td><strong>Tropical Nights</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Average Annual # of Tropical Nights (&gt;18°C)</td>
<td>27 days/yr</td>
<td>64 days/yr</td>
<td>106 days/yr</td>
</tr>
<tr>
<td>Average Annual # of Tropical Nights (&gt;20°C)</td>
<td>10 days/yr</td>
<td>40 days/yr</td>
<td>85 days/yr</td>
</tr>
<tr>
<td>Average Annual # of Tropical Nights (&gt;22°C)</td>
<td>1 days/yr</td>
<td>18 days/yr</td>
<td>60 days/yr</td>
</tr>
</tbody>
</table>
Impacts in Pelham

**AGRICULTURE**
- ↑ in invasive weed species and other weed-related pests (i.e. Gypsy Moth, Emerald Ash Borer, Dog-Strangling Vine, etc.)
- ↑ in energy consumption and costs due to cooling requirements for greenhouse operators
- Damage to crops due to heavy down pours & drastic winds

**ECOSYSTEMS**
- Depleting ecosystem services (i.e. provisioning, regulating, supporting & cultural services)
- Threats to woodlands due to ↓ rainfall and ↑ heat, creating high vulnerability to forest fires
- Stress to urban ecosystems; difficulty to maintain or expand urban tree canopy
- ↑ in strong winds, damaging Town-owned infrastructure (i.e. Pelham Arches)
- ↑ freeze thaw cycles, deteriorating concrete in roads

**INFRASTRUCTURE**
- ↑ in intense rainfalls on impermeable surfaces, causing likelihood of overland floods and contaminated water. Pollutants from the road, lawn & garden chemicals, animal feces are likely to be released into a nearby stream or lake
- Shift in distribution of electricity – intense storms can shut down electrical lines and discontinue services for long periods of time
- ↑ demand for energy, leading to potential blackouts and/or brownouts

**ELECTRICITY DEMAND, SUPPLY AND DISTRIBUTION**
- Tourism is likely to have many opportunities, such as warmer weather, resulting with prolonged tourist seasons
- HOWEVER, much of the tourist industry in Niagara relies heavily on natural processes, which have adversely been affected by extreme weather
- Heat stress and ↓ in air quality
- Disease outbreaks (i.e. West Nile virus and Lyme disease)
- More foodborne illnesses

**TOURISM AND RECREATION**
- ↑ in energy costs and consumption
- ↑ in insurance fees
- Downtime for businesses that are affected by power outages and/or floods
- ↑ in emergency response costs (i.e. police, fire and paramedic)

**HUMAN HEALTH AND WELL BEING**
- In 2009 a tornado in Vaughn left $730,000 worth of damages for the municipality, without including the $88 million to both businesses and home owners

**ECONOMY**
- ↑ in emergency costs and consumption
- ↑ in insurance fees
- Downtime for businesses that are affected by power outages and/or floods
- ↑ in emergency response costs (i.e. police, fire and paramedic)
Impacts in 2019

- **Windstorm – February 2019**
  - Pelham Arches were destroyed due to southwest winds with frequent gusts of 100 to 110 km/h
  - $110,000 to replace

- **Gypsy Moth Infestation – May 2019**
  - $77,000 to spray only selected areas
Actions to Address Climate Change

**Adaptation**

"Managing the unavoidable"

- Permeable surfaces
- Upgrade and prepare sewers, culverts and overflow routes for intense rainfalls
- Disconnect downspouts
- Basement sewer backflow valve
- Prepare & update emergency heat response team
- Identification and control programs for invasive species

**Mitigation**

"Avoiding the unmanageable"

- Installation of green roofs
- Expand and enhance tree canopy
- Local food
- Shade programs
- Enhanced insulated buildings
- Combined heat and power systems
- Fuel efficiency and electric vehicles
- Capture landfill gas
- Renewable energy
- Encouragement of active transportation (i.e. walking and/or biking)

Public Works
Pelham’s Climate Adaptation Plan

Purpose

• The purpose of the Corporate Climate Change Adaptation Plan is to increase the adaptive capacity and resiliency of the Town of Pelham’s assets and services to current and future climate impacts, and to integrate climate change adaptation practices into day-to-day operations.

Outcome

• Staff will have sufficient knowledge on;
  ✓ Climate change preparation,
  ✓ Protection of property and;
  ✓ A stronger understanding on the lifecycle, costs and conditions of the Town’s current assets – an essential piece of knowledge for the Town’s Asset Management Plan
  ✓ The recommendations of this plan will also align with the corresponding elements within the Town’s Engineering Design Manual, with a particular emphasis on storm water management and mitigation.

Scope

• The scope of this project is limited to the Town of Pelham and will recognize the adaptive capacities and resiliencies for Town-related operations and facilities.
  ✓ It will integrate the activities and data drawn from Brock University’s Niagara Adapts partnership
Amongst the six main priorities stated in the Town’s most recent strategic plan (2019), one states that:

- The Town wishes to “grow revenue through the promotion of [their] cultural assets while protecting [their] environmental assets”

To accomplish this priority, actions listed in the plan indicate that:

- The Town will “introduce best practices related to climate change and for the protection and preservation of environmental assets” as well as
- “Educate and create community awareness in regards to [the] importance of environmental assets and climate change impacts”
Pelham’s Official Plan

- Indirectly mentions the need to understand the natural environment in order to manage climate risks. Components of the plan include the commitment to
  - “Maintain, enhance or restore ecosystem health and integrity”
  - “Protect natural resources” and
  - “Ensure that all infrastructure including sanitary sewers, water distribution and storm water management facilities, public services facilities, and roads meet the needs of present and future residents and businesses”

Pelham’s Strategic Plans – 2011; 2014; 2015; 2016; 2017; 2019

- Preceding priorities mentioned in the Town’s former strategic plans also support the development of a climate adaptation plan indirectly. Priorities such as
  - “Continu[ing] [to] develop sustainability programs for Town infrastructure (2011)
  - Protecting natural systems while maintaining the rural landscape (2014; 2015) and
  - “Determin[ing] the implications of severe storm events” (2015; 2016; 2017) evidently show that as a municipal government, it’s the Town’s responsibility to anticipate the severity of environmental patterns and extreme weather and to reduce the damages that cannot be avoided
“Adopt-A-Road Program” (S701-11) and “Adopt-A-Trail Program” (S701-12)

- Demonstrates commitment to creating a cleaner environment and more beautiful road, trail or park system within Pelham by
  - Adopting a section of land and periodically keeping it clean of litter and debris

“Tree Management Policy” (S802-01)

- Demonstrates commitment to strive for not net loss of trees on urban boulevards, and where practical and viable, in parks and rural areas
  - Every effort shall be made to increase tree planting and greening in the Town, barring conditions related to invasive pests or diseases
  - Strive to plant native species, while still increasing the species diversity of trees and avoiding monoculture plantings
Climate Adaptation Plan

PROJECT TEAM
- Deanna Allen
- Derek Young
- Dr. Jessica Blythe
- Dr. Ryan Plummer

ADAPTATION STEERING COMMITTEE
- Administration Services
- Community Planning & Development
- Corporate Services
- Fire & By-Law Services
- Public Works
- Recreation, Culture & Wellness

STAKEHOLDER ADVISORY COMMITTEE
- TBD

COMMUNITY
- Residents
- Businesses

The Town of Pelham Climate Adaptation Plan

Public Works
Niagara Adapts Involvement with the Plan

• Brock will provide support in climate change analysis, risk and opportunity assessment, as well as the preparation and evaluation of an adaptation plan through interactive workshops and online learning platforms.
  • Other municipalities that are involved;
    ✓ City of St. Catharines
    ✓ Niagara Falls
    ✓ Town of Grimsby
    ✓ Town of Lincoln
    ✓ Niagara-on-the-Lake
    ✓ Welland

Upcoming Events

• Workshop 2 – Climate Change Impacts Analysis – August 16th 2019
  • Review the available climate change data for each municipality, downscaling, climate projections, and scope potential impacts
# Meetings

## Community Involvement

- Ongoing community engagement
- Method: online and in-person surveys, workshops, community booths, etc.

## Senior Management Team (SMT) and Council

- Update SMT and Council on a quarterly basis
- Method: provide updates, discuss obstacles, request feedback
Proposed Timeline

Establish Climate Adaptation Team
Identification of project stakeholders
Gather baseline data on current state of the municipality

2019

Develop Climate Adaptation Steering Committee (ASC)
Council resolution to support climate adaptation pledge
Climate change impacts analysis

2020

Identify Stakeholder Advisory Committee
Vulnerability adaptive capacity assessment
Define technical gaps and data

2021

Identify and prioritize adaptation options
Community engagement
Consultation with stakeholders
Initiate draft for CCCAP

Review best practices for implementation of climate change adaptation plans
Develop draft low impact development guidelines for Engineering Design Manual
Stakeholder engagement for adaptation

Consult with stakeholders regarding low impact development
Revise the draft engineering design manual

Finalize draft for CCCAP and present to Council for endorsement of revised development guidelines/new manual
Knowledge mobilization

Consult with stakeholders regarding low impact development
Revise the draft engineering design manual

Knowledge mobilization