

# Is Your Municipality Storm Ready?

## Climate change and municipal adaptation in the Great Lakes and St. Lawrence Region

The impacts of climate change continue to advance in the Great Lakes and St. Lawrence Region. More frequent and more erratic weather events, and a steadily increasing trend in temperature and rainfall are evident across the region. Warmer temperatures are expected to continue their march north, with some models predicting that, by 2050, Southern Ontario’s humid continental climate will feel more like the humid subtropical climate of the state of Kentucky. (See comparison in Figure 1 on page 10.)

*Is a subtropical climate in Southern Ontario’s future?*

### Why Adapt Now? Escalating Costs and Municipal Liability

The impacts of erratic weather are already being felt in municipalities across the Great Lakes and the St. Lawrence Region, often at significant expense. Not only are municipalities incurring costs to respond to and clean up after storms, and to repair damaged infrastructure, they are also facing legal repercussions for failing to adapt to climate change. Municipalities increasingly have a responsibility to adjust their “standard of care” in light of the changing information on climate. Relying on outdated standards or processes can be considered negligent if new information suggests that they should be reconsidered.

### Municipal liability changing with the climate

In Ontario, both statutory and common law point to the need for municipa-



The June 2012 flood event in Thunder Bay, Ontario. Photo: City of Thunder Bay

lities to adapt their operations and infrastructure to a changing climate, or risk being sued for negligence.

Two class-action lawsuits have been launched in Ontario in recent years, raising the profile of municipal liability for climate impacts in Ontario. The 2012 flood in Thunder Bay has prompted a \$320 million CAD class-action lawsuit against the municipality. Likewise, reoccurring flooding in Mississauga is the subject of a \$200 million CAD class-action suit against the municipality, conservation authority, and provincial government.

Extreme weather costs are frequently being incurred by Cities Initiative members:

- In 2011, a tornado tore through the lakeside town of Goderich, Ontario, tragically resulting in one death and



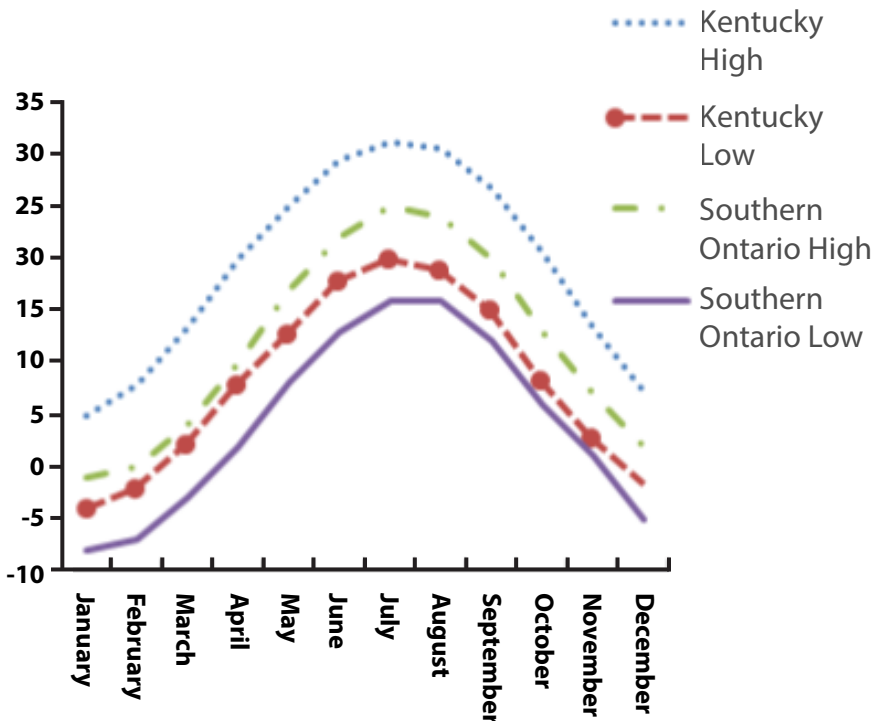
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Figure 1

### Comparison of Ontario and Kentucky's annual temperature fluctuations



37 injuries, and \$150 million CAD in damages.

- ▶ The 2012 thunderstorm in Thunder Bay, Ontario triggered extensive flooding, causing damage to municipal infrastructure and facilities, as well as private buildings. The total estimated cost of the flood disaster event is \$43.9 million CAD.
- ▶ In 2013, intense rainfall over several hours generated urban flooding in Toronto, causing significant damage to both public and private property throughout the city. The City of Toronto's estimate for storm costs is \$70.1 million CAD.

#### Predicting weather changes in your municipality

Some municipal staff have expressed frustration with the lack of information available on the anticipated changes to the climate in their local area. This type of downscaled predictive modelling would be enormously valuable to municipalities that are faced with making multimillion dollar investments in infrastructure that will serve the commu-

nity for the next 50 to 100 years. Some municipalities, like the City of Toronto, have worked with climatologists to do this type of modelling at a scale that can inform these decisions. But, not all municipalities have these resources at their disposal.

In the absence of this localized predictive modelling, some trends should be taken into consideration, because they will affect everything from wastewater and stormwater management, to land use planning, road and bridge maintenance, building standards, parks and urban forestry, and public health services and emergency planning.

#### Intense storms, intense stormwater run-off

More frequent and severe storms are already hitting communities, and are expected to double in frequency, particularly in winter and spring, by the end of this century in the region. Combined with intensive land use practices, these storms are already causing stronger flooding, erosion, sewer overflows, and increased run-off of pollutants into waterways,

resulting in beach closures, and massive algal blooms caused by higher nutrient levels. In 2011, a 5000 square kilometre mass of algae covered the western end of Lake Erie.

#### More rain, more drought

Winter snow days are expected to be reduced by half, replaced by rain. Rain will increase by 10 to 20 percent in winter and spring months in the region, with rapid snow melts, that can exceed stormwater conveyance capacity and cause flooding. There will be five to 15 percent less rain in the summer, leading to drier soil and periods of drought, possibly affecting water supply.

#### Temperatures on the rise

Temperatures in the region are expected to increase by up to three degrees Celsius by 2050, and eight degrees Celsius by 2100. This will lead to an additional two to four weeks of temperatures over 35°C each year. These extended heat waves will disproportionately affect vulnerable populations like the elderly, children, and people with respiratory problems.

#### Low water levels

Despite higher water levels over the past year, water levels in the Great Lakes have been on a downward slope over the last 30 years, reaching historic lows at the end of 2012 in Lakes Michigan and Huron. This is largely attributed to more rapid evaporation of surface waters due to rising temperatures. Low water levels have a direct economic impact on communities, affecting tourism and recreation, shipping, and property values, as well as municipal drinking water, stormwater, and wastewater operations.

#### Unpredictable winter conditions

While the trend is towards shorter and wetter winters, this year's polar vortex showed just how unpredictable and erratic weather is becoming, even during winter months. Warmer weather followed by fast freezes are resulting in more frequent ice storms. The one experienced in the Greater Toronto area at the end of 2013 caused enormous disruption – including the closure of Pearson International Airport and electricity blackouts

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lasting five to six days in some areas. Fast spring snow melts combined with precipitation events causing flooding are also becoming more common.

### **Municipal Adaptation and Resiliency: Out with the Old (Assumptions), In with the New (Projections)**

If your municipal policies, standards, and built infrastructure reflect *old assumptions* about weather, they need to be reviewed and adapted to *future climate projections*, to protect residents, businesses, and public assets from extreme storms, rapid snow melts, low water levels, extended heat waves, and drought.

Timely adaptation and building community resiliency can lessen the severity and reduce the costs of climate change impacts. Though it may seem like a daunting task, climate adaptation is nothing new. Following Hurricane Hazel in 1954, Ontario developed regulations that restricted developments on flood plains that have helped municipalities in times of heavy rains.

While the threats posed by climate change are known, municipal action on adaptation has been slow. Only a handful of Ontario municipalities have adopted comprehensive adaptation strategies. This is due, in part, to a lack of resources and an absence of clear information about what weather to plan for. However, when you scratch the surface, it is

evident that there are many actions being taken that may not be part of a comprehensive strategy, but that are still being integrated into current operations.

For instance, municipalities have moved forward with changes to building code standards, or have introduced incentives for backflow valve installation; they have revised their intensity-duration-frequency (IDF) curves and other infrastructure design specifications; they have begun installing permeable pavement and other green infrastructure; they have increased the number of cooling centres based on assessments of vulnerable populations and heat island mapping within the municipality; they have increased their tree canopy and revised their shade policies. These are all important steps towards adaptation.

Nevertheless, more needs to be done. These efforts need to be significantly expanded to meet the risks and liability posed by climate change.

### **The Municipal Adaptation and Resiliency Service**

With financial support from the Ontario Government, the Cities Initiative has launched the Municipal Adaptation and Resiliency Service (MARS) to help municipalities expand and accelerate their adaptation activities. MARS is designed to help municipalities of any size and at any stage of the adaptation process. The service consists of:

1. **A Call to Action** by Cities Initiative member municipalities, describing what adaptation efforts they will be undertaking over the next two years.
2. **MARS Climate Adaptation Portal**, a one-stop shop to find essential climate and adaptation information and resources, hosted by the Ontario Centre for Climate Impacts and Adaptation Resources.
3. **Climate Adaptation Training Webinars** on adaptation in a range of municipal operations, from wastewater to land use planning, from parks to public health, hosted by the Clean Air Partnership.
4. **MARS Awards** for progress and innovation in adaptation, to be presented to member municipalities in 2015.
5. **Demonstration projects** showcasing innovative approaches to adaptation in select member municipalities.

In its first phase, the MARS program was introduced to Ontario Cities Initiative members. It is being expanded into Quebec and the eight Great Lake states over the course of 2014, to become the first regionally-specific, binational adaptation program of its kind in North America, facilitating the sharing of information and best practices throughout the Great Lakes and St. Lawrence Region.

More information on MARS is online at <[www.glslicities.org/mars.cfm](http://www.glslicities.org/mars.cfm)>. **MW**

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