FACT SHEET:
CLIMATE CHANGE IMPACTS AND ADAPTATION FOR URBAN REGIONS

Impacts for Urban Regions

There are several climate-related impact impacts that are expected to have implications for urban regions in Ontario. They include:

- Extreme heat events
- Intense precipitation and flooding
- High winds and storms
- Water quantity and quality issues
- Variable temperatures and precipitation
- Air quality or smog events

Though these events and trends are expected to affect communities all over the province, residents in urban areas are particularly vulnerable to their effects. This fact sheet outlines urban vulnerability to climate-related events and the adaptation strategies that can be undertaken to minimize risk to urban populations.

Damage from leamington tornado, Chatham-Kent Daily Paper , 2010

Urban Vulnerability to Climate-related Impacts

Urban areas are particularly vulnerable to climate-related impacts due to their built environment, population density and aging built form, among other factors.

The Built Environment:

The urban built environment contributes greatly to a region's vulnerability with regard to climate-related risks by:

- Decreasing the amount of area with permeable surfaces, thereby limiting the amount of rainwater that can be absorbed by the ground and contributing to stress on municipal stormwater systems.
- The use of asphalt, concrete, tar, and other building materials that absorb and store heat contributing to the urban heat island effect.
- The presence of high-rise residential buildings which are more vulnerable to wind and heat events due to their height.

Population Density:

The higher population density in municipalities can contribute to vulnerability because it can exert stress on municipal and essential services needed to protect the population from climate-related impacts. These services include:

- Electricity – During heat waves people demand more electricity for air conditioning to keep cool. The combined stress of this new demand makes the electricity system more vulnerable to collapse which can lead to greater vulnerability.

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Peterborough Flood, 2004 NRCAN

Population Density Continued

- Sewer and stormwater systems – High population densities can stress sewer systems. This is particularly problematic where combined sewer and stormwater systems exist. During intense precipitation events, cross-contamination of stormwater is more likely to occur if sewer systems are already stressed.
- Water treatment – Increased levels of people demanding potable water can put stress on water treatment facilities. During heat events or after flooding events, when there is a greater demand for water, these systems can be overwhelmed.
- Health – In urban regions, public health units can be stressed by the demand placed on them by large populations. This makes it more difficult for them to address climate-related health concerns or vulnerable populations. Additionally, some health issues are exacerbated by urban living. Air quality and smog events are closely linked to the pollution produced in urban areas.
- Emergency Management – Larger populations complicate emergency management responses during a climate-related event such as a flood or tornado by increasing demand for emergency services.

Aging Infrastructure:

Infrastructure is also vulnerable to climate-related impacts. This is especially true when infrastructure is already aging and unable to perform at its peak capacity. In Ontario, we are facing an infrastructure deficit. Continuous underinvestment in infrastructure has resulted in a mass of critical infrastructure that will need to be replaced and improved over the next decade. Examples of vulnerable infrastructure are:

- Roads
- Communication lines
- Sewers
- Energy-related infrastructure
- Water treatment plants
- Hospitals
- Schools
- Bridges

Adaptation options to address climate-related impacts in urban areas

Adaptation means taking action to protect our built and social environments. There are several actions that municipalities can take to prevent damage related to climate change impacts. These include building adaptive capacity and delivering adaptation options. The following table gives some examples of the types of action that can be taken.

Category	Type of Adaptation
Building adaptive capacity	Research and monitoring to better identify potential impacts and prioritize adaptation efforts
	Education for the public and stakeholders about potential risks and building the capacity to respond
	Creating partnerships and organizational structures to support adaptation
	Guidance and regulations that promote or require adaptive action
Delivering adaptation options	Interventions to reduce existing pressures on systems that are vulnerable to climate change
	Interventions to increase the resilience of systems in the face of extreme weather and climate change
	Creating buffer zones or relocation programs that protect vulnerable urban systems
	Actions to fortify vulnerable structures and systems
	Forecasting and early warning systems
	Emergency response systems to more effectively respond to extreme weather events

New overland flow system for Black Creek in Toronto. This was designed to prevent flood water from accumulating on the road and to prevent it from overwhelming the culvert capacity. It was built in response to the 2005 storm that washed away sections of Finch Avenue.