

URBAN HEAT ISLANDS AND CLIMATE CHANGE

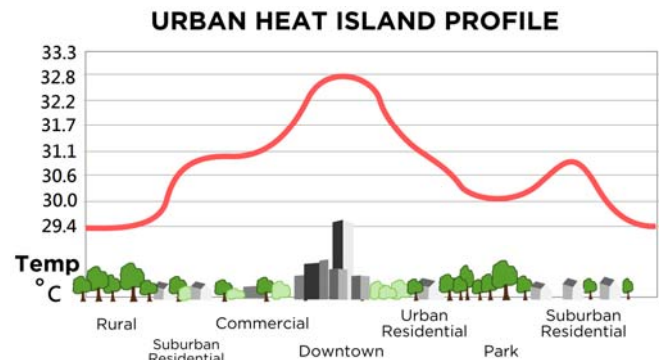
Adapting to Rising Urban Temperatures

Emissions from heat sources together with heat accumulated and re-radiated back into the environment leads to what is known as the Urban Heat Island effect (UHI). The UHI coupled with increased temperatures due to climate change is anticipated to bring significant heat waves throughout urban areas in Peel. Most affected will be areas of Peel which have had vegetation removed in place of dark surfaces such as asphalt roads and black rooftops.

Other factors contributing to the UHI include:

- Reduced permeable surfaces.
- Tall buildings and narrow streets.
- Decrease in surface waters.
- Concentration of heat generating activities in urban areas, e.g. motor vehicles, factories and homes.

Mitigation and adaptation strategies are very important aspects for the planning and retrofit of resilient cityscapes. Adaptation strategies help residents and businesses better adjust to changes as a result of climate change and increased temperatures. Mitigation strategies reduce residents' and businesses' impact on the environment. Curbside planting of trees is considered the best adaptation and mitigation strategy, as it reduces surface runoff, acts as a cooling agent and as carbon sinks that capture carbon dioxide from the atmosphere. Living roofs and vegetated surfaces offer the second highest cooling reduction, followed by surfaces covered with light colours, which reflect a large portion of solar energy back into space (high albedo).



Sketch of an Urban Heat Island Profile Based on Late Afternoon Temperatures



Curbside Tree Planting



Living 'Green' Roof



White Roof

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Heat and Health

We can all feel the effects of heat on our health, but populations who are more at risk include:

- The elderly.
- Those with existing health conditions, i.e. heart disease.
- Infants and preschool children.
- People who exercise vigorously or are involved in strenuous work outdoors.
- People taking certain medications.
- Extremely obese persons.

Other key factors include:

- Lack of air conditioning.
- Lack of access to transportation.
- Individuals living alone.
- Individuals living on higher floors of multi-story buildings.

It is important to understand where 'hotspots' are located in relation to at-risk populations to allow for further examination. A Geographic Information System (GIS) is a powerful tool for locating these specific areas utilizing spatial analysis tools and the ability to create site specific maps. The following GIS and tabular data can be used to determine areas impacted by high heat:

- Thermal satellite imagery
- Aerial imagery
- Demographic data
- Land uses
- Water features
- Census tracts
- Parcel fabric with assessment information
- Landmarks (used for shelters and cooling stations)
- Emergency services
- Healthcare facilities
- Social service locations
- Government buildings
- Sports and recreation facilities
- Arts and culture facilities
- Places of worship

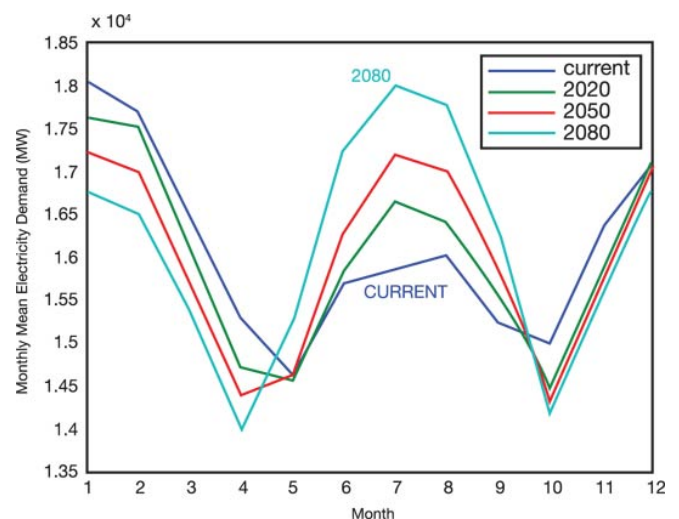


2009 Landsat Satellite Thermal Image and 2007 Orthoimage in the City of Brampton

(Source: Clean Air Partnership and Region of Peel, 2011)

Some possible uses of GIS for UHI analysis could include:

- Showing hotspots in Peel with an average surface temperature above 40 degrees Celsius.
- Showing where elderly populations correspond to hotspots in highly urbanized areas.
- Determining where healthcare facilities are located in relation to hotspots in the area municipalities.
- Locating census tracts with a high proportion of rental units (lower incidence of air conditioning)
- Overlaying a temporal series of thermal imagery to see how hot spots have changed over time.



Projected Electricity Demand in Ontario

(Source: Liu, A. (2003) Presentation at Institute for Environmental Studies seminar series. University of Toronto, Toronto, Ontario.)

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Climate Change

With over half of the population of the world now living in cities, it has become a pressing concern to understand the intricacies of the built environment and how this impacts the atmosphere and human well-being. Care must be taken to understand the complex interaction between large urban structures, building materials, cityscapes and climate change. This is a multi-disciplinary initiative which will require all government departments at every level to come together to further understand these issues and take precautionary and remedial action.

The Region of Peel, in collaboration with the Cities of Brampton, Mississauga, the Town of Caledon, Credit Valley Conservation and the Toronto and Region Conservation Authority, have developed a climate change strategy to adapt to and mitigate against the impacts of rising urban temperatures and climate change. Strategies such as curbside planting and the installation of green and light coloured roofs are captured in the background reports of the Strategy, and will be implemented within Peel Region.

CLIMATE CHANGE



For more information on how the Region and its partners are taking action to reduce greenhouse gas emissions, please visit www.peelregion.ca/climatechange

URBAN HEAT ISLANDS AND CLIMATE CHANGE

Hot Weather

NUMBER OF HEAT AND EXTREME HEAT ALERTS WITHIN THE REGION OF PEEL

2007	2008	2009	2010	2011
<u>Mississauga</u>	<u>Mississauga</u>	<u>Mississauga</u>	<u>Mississauga</u>	<u>Mississauga</u>
Heat Alerts – 8 Extreme – 3	Heat Alerts – 2 Extreme – 0	Heat Alerts – 1 Extreme – 0	Heat Alerts – 7 Extreme – 8	Heat Alerts – 4 Extreme – 3
<u>Brampton/Caledon</u>	<u>Brampton/Caledon</u>	<u>Brampton/Caledon</u>	<u>Brampton/Caledon</u>	<u>Brampton/Caledon</u>
Heat Alerts – 11 Extreme – 4	Heat Alerts – 1 Extreme – 1	Heat Alerts – 0 Extreme – 0	Heat Alerts – 10 Extreme – 3	Heat Alerts – 2 Extreme – 4

(Source: Health Services Emergency Management, Region of Peel)

For more information on Hot Weather in Peel, please visit www.peelregion.ca/health/heat

CLEAN AIR PEEL



For further information on Clean Air Peel Initiatives, please visit www.peelregion.ca/health/cleanairpeel/initiatives/energy.htm