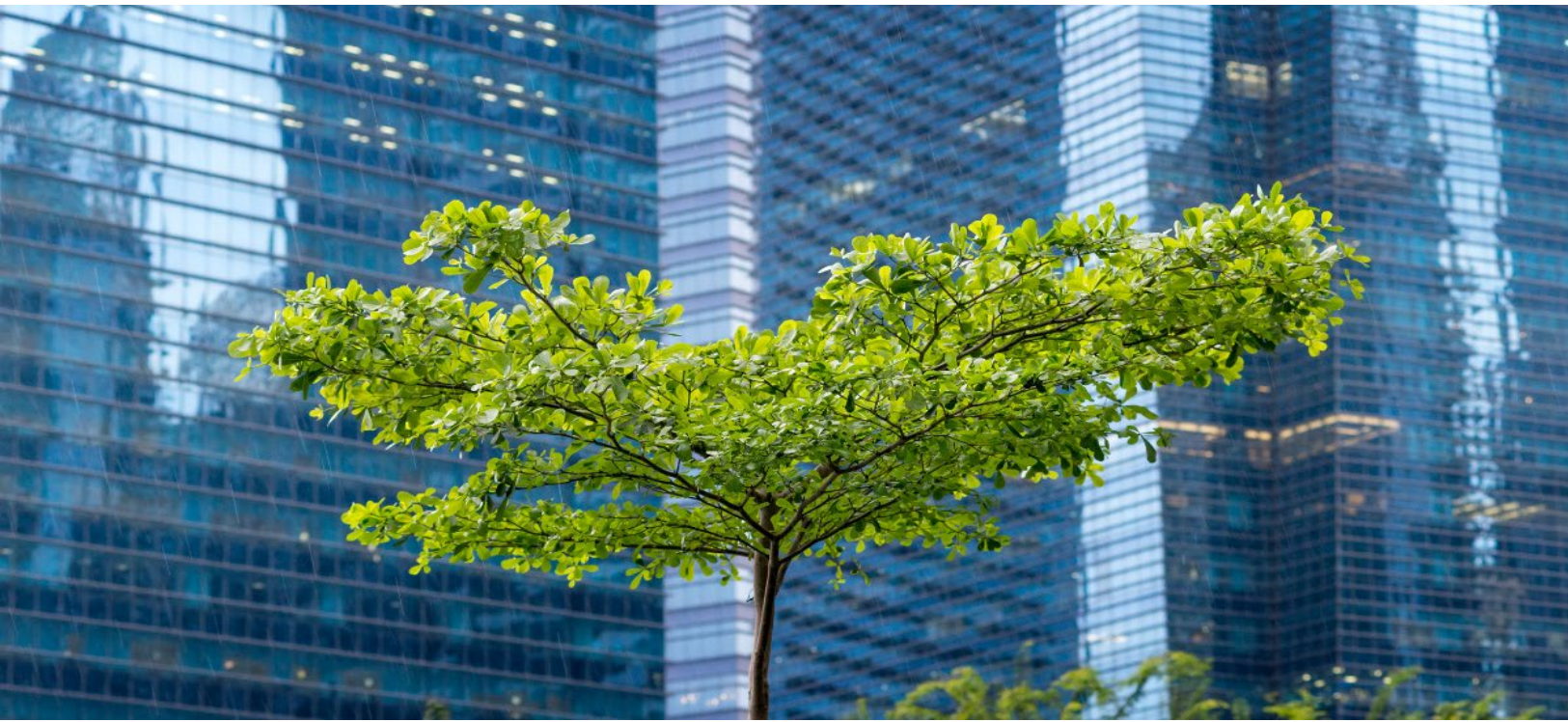




Recommendations for Municipalities **Focus: Urban Tree Cover**



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CELA Publication No 1485
ISBN # 978-1-77842-006-1

1. BACKGROUND

URBANIZATION ALTERS LOCAL CLIMATE. Urbanization has a strong influence on local climate and can result in the generation of an urban heat island (UHI). The creation of impervious urban surfaces decreases water absorption into land, increases solar radiation absorption, and alters near-surface air temperature and wind speeds.¹ A positive correlation between UHI strength and city size has been established; as building density increases so does the UHI effect (Figure 1).²

URBAN HEAT ISLANDS IMPACT HUMAN HEALTH. A UHI can amplify heatwaves which are already increasing in length, frequency, and intensity due to global warming. It is well established that heatwaves have deadly effects on human health. During the summer of 2018 in Quebec, the hottest summer on record in 146 years, 86 heat-related deaths were recorded.³ In British Columbia, between June 25 and July 1, 2021, 619 heat-related deaths were recorded.⁴ In fact, the majority of decedents in the Quebec heatwave lived in a UHI.⁵ For further information, please see CELA's recommendation on Extreme Heat. Additionally, UHIs exacerbate air pollution. Air quality models establish that as ambient temperature increases, air pollution worsens.⁶

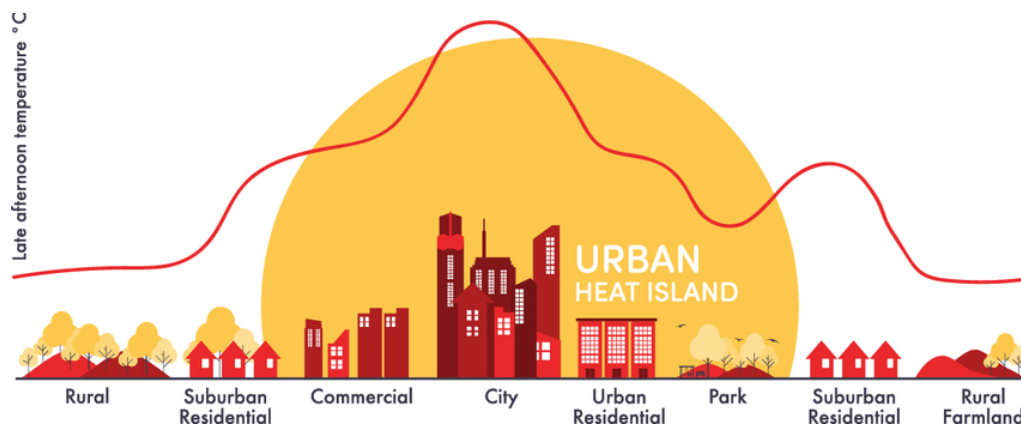


Figure 1. Positive correlation between temperature and building density. Source: World Meteorological Organization: <https://community.wmo.int/activity-areas/urban/urban-heat-island>.

2. URBAN TREES AND UHI

URBAN TREES DAMPEN THE UHI EFFECT. Planting urban trees is both a climate adaptation strategy and a climate mitigation strategy. The Toronto 2018 Tree Canopy Study found that street trees provide \$1.277 million dollars per year in ecosystem services such as energy saving, carbon sequestration, pollution removal, and decreased runoff.⁷

¹ Loughner, CP, Allen, DJ, Zhang, DL, Pickering, KE, Dickerson, RR, & Landry, L. (2012). Roles of urban tree canopy and buildings in urban heat island effects: Parameterization and preliminary results. *Journal of Applied Meteorology and Climatology*, 51 (10), 1775-1793.

² Loughner et al, Roles of urban tree canopy and buildings in urban heat island effects: Parameterization and preliminary results.

³ Annick Poitras, "Extreme Heat Waves in Quebec", online: <https://climatedata.ca/case-study/extreme-heat-waves-in-quebec/>.

⁴ Government of British Columbia, "Extreme Heat and Human Mortality: A Review of Heat-Related Deaths in B.C. in Summer 2021" (June 7, 2022), online: https://www2.gov.bc.ca/assets/gov/birth-adoption-death-marriage-and-divorce/deaths/coroners-service/death-review-panel/extreme_heat_death_review_panel_report.pdf.

⁵ Center-Sud-de-l'Île-de-Montréal Integrated University Health and Social Services Center, "Heat Wave: July 2018 – Montreal Preliminary Assessment", online: https://santemontreal.qc.ca/fileadmin/fichiers/actualites/2018/07_juillet/BilanCanicule2018VF.pdf

⁶ Loughner et al, Roles of urban tree canopy and buildings in urban heat island effects: Parameterization and preliminary results.

⁷ City of Toronto, "2018 Tree Canopy Study".

- A. Urban trees are an adaptation tool to combat rising temperatures as they decrease near-surface temperatures through shading and evaporative cooling.⁸ Urban trees further mitigate against climate change by reducing greenhouse gas emissions from power plants created to cool building interiors.⁹ A study by the Lawrence Berkeley National Laboratory for the Toronto Atmospheric Fund established a 20% reduction in peak power use through the implementation of UHI mitigation strategies, 51% of which could be accounted for by planting urban trees.¹⁰
- B. Urban trees can improve air quality by increasing the removal rate of pollution from the atmosphere.¹¹ Gaseous air pollutants including carbon monoxide, particular matter, and nitrogen dioxide can be taken up by the tree's leaf stomata.¹² Of course, trees also reduce atmospheric carbon dioxide levels through photosynthesis.
- C. Urban trees also provide shade, which is an effective barrier against harmful exposure to ultraviolet radiation that can cause skin cancer. This is especially important as the ozone layer over southern Canada has thinned by about 7% since 1980.¹³ As the ozone layer continues to thin, ultraviolet radiation becomes stronger and the need for urban trees as shade providers is magnified.

3. UHI AND VULNERABLE PEOPLE

URBAN TREE COVER DECLINES WITH SOCIOECONOMIC CLASS. The scientific literature establishes that urban green infrastructure is more prevalent in neighbourhoods with a higher socioeconomic class, and scarcer in poorer, more multicultural neighborhoods.¹⁴ A study examining the spatial relationship between median household income and fractional tree cover discovered a measurable inequality in access to the urban canopy in Toronto.¹⁵ Moreover, it has been found that green spaces in lower-income neighbourhoods are more often under-maintained, of lower quality, less numerous, and smaller as compared to higher-income neighborhoods.¹⁶ However, it is important to be mindful of the correlation between increasing urban tree cover and corresponding gentrification and rent increases.¹⁷ Urban greening can prompt 'environmental-gentrification'. Environmental gentrification occurs when the development of a new greenspace increases property values as the location becomes more attractive for new residents and investors.¹⁸ Efforts must be taken to ensure that

⁸ Loughner et al, Roles of urban tree canopy and buildings in urban heat island effects: Parameterization and preliminary results.

⁹ Loughner et al, Roles of urban tree canopy and buildings in urban heat island effects: Parameterization and preliminary results.

¹⁰ Toronto Cancer Prevention Coalition, "Shade Guidelines" (July, 2010), online: https://www.toronto.ca/wp-content/uploads/2019/08/8ecf-AODA_Shade_Guidelines_2010_Final_Report-002.pdf

¹¹ Loughner et al, Roles of urban tree canopy and buildings in urban heat island effects: Parameterization and preliminary results.

¹² Nowak, D. J., Crane, D. E., & Stevens, J. C. (2006). Air pollution removal by urban trees and shrubs in the United States. *Urban forestry & urban greening*, 4(3-4), 115-123.

¹³ Government of Canada, "Depletion of the ozone layer: cause, status and recovery" (May 25, 2010), online: <https://www.canada.ca/en/environment-climate-change/services/air-pollution/issues/ozone-layer/depletion-impacts/causes-status-recovery.html>.

¹⁴ Landry, F., Dupras, J., & Messier, C. (2020). Convergence of urban forest and socio-economic indicators of resilience: A study of environmental inequality in four major cities in eastern Canada. *Landscape and Urban Planning*, 202, 103856.

¹⁵ Greene, C. S., Robinson, P. J., & Millward, A. A. (2018). Canopy of advantage: Who benefits most from city trees?. *Journal of Environmental Management*, 208, 24-35.

¹⁶ Anguelovski, I., Connolly, J. J., Garcia-Lamarca, M., Cole, H., & Pearsall, H. (2019). New scholarly pathways on green gentrification: What does the urban 'green turn' mean and where is it going? *Progress in human geography*, 43(6), 1064-1086.

¹⁷ Schwarz, K., Fragkias, M., Boone, C.G., Zhou, W., McHale, M., Grove, J.M., ... & Cadenasso, M.L. (2015). Trees grow on money: urban tree canopy cover and environmental justice. *PLoS one*, 10 (4), e0122051.

¹⁸ Rupperecht, C. D., & Byrne, J. A. (2017). Informal urban green space as anti-gentrification strategy? In *Just green enough* (pp. 209-226). Routledge.

greening does not result in the displacement of marginalized and vulnerable communities. These actions may include increased oversight on rent control.¹⁹

4. CELA RECOMMENDATIONS

GOAL: Canadian Geographic states that the ideal tree canopy cover for cities sits at 30-40%.²⁰ The City of Toronto has committed to increasing its tree canopy cover to 40% by 2050 and has more than doubled its budget from \$31.1 million in 2008 to \$68.7 million in 2018 for a 10-year investment of \$605.6 million.²¹ The City of Vancouver has committed to increasing tree canopy cover to 30% by 2050. To reach the target of 30-40% tree cover, all municipalities must implement the following:

1. **All municipalities must implement a Tree Equity Approach.** The City of Toronto is implementing a Tree Equity Approach, which combines land cover classification data, demographic data, and socioeconomic data to identify opportunities for tree cover expansion at the neighbourhood scale. Toronto is the first municipality in Canada to utilize this equity approach. The City of Toronto provided each neighborhood with a ‘tree equity score’, a metric that helps cities assess how well it is providing equitable tree cover to all residents. A lower score indicates a greater priority for closing the tree canopy gap in that neighbourhood. A higher score indicates that the neighbourhood has acceptable tree equity. The City was able to identify ten neighborhoods with low tree equity scores and will prioritize canopy growth in these areas. Vancouver also identified areas lacking urban forests and will similarly prioritize tree planting in these communities as part of its Urban Forest Strategy.
2. **Strengthen tree protection.** The City of Toronto’s Tree By-Laws regulate the injury, destruction, or removal of trees on the City’s property and private property. Increasing fees will dissuade potential owners and developers from contravening these by-laws.
3. **Draft and publish a Public Tree Management Guidebook** to advise staff in tree planting, maintenance, inspection, protection, and other operational tasks. As part of its Urban Forest Strategy, the City of Vancouver will create this guidebook to aid in managing public trees.
4. **Control invasive species that degrade trees and forest ecosystems.** High Spongy Moth populations can cause damage to tree health and result in the death of oak and some evergreen trees. The City of Toronto has identified aerial spraying to be very effective in lowering Spongy Moth populations over large areas. In fact, aerial spraying is not detrimental to human health and its active ingredient, BTK, is not toxic to bees and other insects, birds, fish or mammals.²² Further, it does not impact other moth and butterfly species, like monarchs, as their caterpillars appear later in the season.²³ The City of Ottawa controls Emerald Ash Borers (EAB) by injecting trees with TreeAzin, an insecticide that is effective at controlling EAB populations.

¹⁹ Homeless Hub, “The Impacts of Green Gentrification on Homelessness; Urban Greening and Displacement in Parc-Extension Neighborhood of Montreal” (November 16, 2021), online: <https://www.homelesshub.ca/blog/impacts-green-gentrification-homelessness-urban-greening-and-displacement-parc-extension>.

²⁰ Mary Starr, “The importance of urban tree canopy” (October 11, 2013), online: <https://canadiangeographic.ca/articles/the-importance-of-urban-tree-canopy/#:~:text=The%20ideal%20tree%20canopy%20for,30%20and%2040%20per%20cent.>

²¹ <https://www.toronto.ca/news/new-tree-canopy-study-shows-increase-in-toronto-s-tree-population/>.

²² Middlesex Centre, “Spongy Moth Aerial Spraying Program 2022” (April 1, 2022), online at: <https://www.middlesexcentre.on.ca/articles/spongy-moth-aerial-spraying-program-2022>.

²³ Middlesex Centre, “Spongy Moth Aerial Spraying Program 2022” (April 1, 2022).

5. **Work with residents to plant urban trees.** Trees Winnipeg works with local citizens to expand the urban tree canopy through volunteering and tree planting events.