



PHOTO COURTESY OF ROSEMONT

Measures to reduce the urban heat island effect in Rosemont–La Petite-Patrie

Regulatory measures can be useful in building resilience to climate change.



Rosemont–La Petite-Patrie (population 137 000) is a centrally located, densely built borough of the City of Montréal. The urban heat island (UHI) effect – a phenomenon where the ambient temperature in an urban area is hotter than that of surrounding areas – is pronounced in many parts of the borough.

UHIs occur where there is minimal vegetation cover and a high percentage of dark surfaces such as tar roofs and asphalt roads or parking lots. The dark surfaces absorb the sun’s rays and radiate heat out, thereby increasing the ambient air temperature. UHIs can be very localized – the air temperature can be significantly different from one street to the next, depending on the amount of vegetation and asphalt and building design, orientation and placement. In summer, parts of central Montréal have been recorded up to 12°C hotter than the surrounding countryside (Oke 1982).

Prolonged exposure to extreme heat without significant cooling intervals can pose a critical risk to human health and well-being. Young children, people with chronic illnesses, the marginally housed or homeless and socially isolated seniors are particularly at risk. Montréal’s experience in the summer of 2010 was a stark reminder of the threat. The city experienced five consecutive days where the maximum daily temperature exceeded 33°C. During this period, the coroner reported 106 excess deaths that were probably or possibly linked with the extreme heat

(Roy, et al. 2011). Many of the victims had pre-existing medical conditions such as mental illness and cardiovascular disease. The coroner noted the death toll would have been much higher were it not for Montréal’s heat alert and response system (Roy, et al. 2011).

GENERAL MEASURES TO REDUCE THE UHI EFFECT

Expand vegetation cover by planting trees, shrubs and climbing plants, creating new open spaces, and installing vegetative (green) roofs.

Increase surface reflectivity of buildings and paving materials by installing reflective roofs, using light-coloured paving materials for roads, sidewalks, parking lots and driveways, and implementing climate-sensitive urban design and planning.

Reduce waste heat* by retrofitting buildings and utilities for higher energy efficiency, installing energy-efficient appliances, and passing anti-idling bylaws.

*Note: This applies particularly to large waste heat sources such as factories, office towers or large commercial buildings.

Climate change is expected to increase the annual number of extreme heat days in Montréal. It is projected that the number of extreme heat days (i.e. where the maximum temperature exceeds 30°C) in Montréal could rise from the annual average of 9 days today up to 27 days by 2070 (Casati & Yagouti 2010). This increase places acute stress on the health of vulnerable populations, particularly those living in an area characterised by a UHI.

In April 2011, the Rosemont–La Petite-Patrie borough council revised their comprehensive zoning bylaw¹ to include the following four regulatory measures aimed at tackling UHIs:

- When replacing an existing roof or constructing a new building, the owner must install a green (vegetative) roof, a white roof, a highly reflective roof or some combination of the three. Reflective roofing material must be manufacturer-certified to meet a solar reflectivity index rating of at least 78.
- For all new parking lots of 10 or more spaces, at least 15 percent of the area must be open ground landscaped with plants, bushes and trees.
- The paving material in all new parking, loading and storage areas must meet a minimum solar reflectivity index rating of 29.
- When a new building is built, at least 20 percent of the building site must remain open ground and be landscaped with plants, bushes and trees. Note this provision does not apply to commercial arteries.

The four measures apply to all renovations and new construction on both public and private property throughout the borough. While climate change was not a driving factor for taking action, the measures help to build resilience to climate change.

Rosemont's new zoning bylaw requires the property owner or authorized agent to obtain a permit before constructing a new roof or replacing an existing one. Among other requirements, the permit applicant must provide a



GREEN ALLEYWAYS

The City of Montréal has approximately 500 kilometres of alleyways. Many are paved with asphalt and have little vegetation, contributing to the urban heat island effect. Ruelle Verte (or green alleyways) are citizen-led projects where residents, with the support and approval of the local borough, transform the alleyways by removing asphalt (where possible) and planting trees, bushes, climbing plants and flowers. The projects help to reduce the UHI locally. The Plateau Mont-Royal, a Montréal borough that abuts Rosemont, has created more than 50 of these green alleyways since 2005. The Rosemont borough council initiated its own Ruelle Verte program in 2010 – so far 25 alleyways have been converted and more are anticipated.

description of the work being undertaken and proof, in the form of a signed letter from the contractor, of the solar reflectivity index rating of the roofing material being used. While this new permit system has increased the administrative workload for borough staff responsible for permits, it provides a useful point of intervention that did not previously exist.

The new bylaw and permit system presents an opportunity to educate the public and developers about the impacts of UHIs on human health and energy consumption and effectively enforce the new regulatory measure. More than 300 permits for reflective roofs were issued within the first year that the bylaw was in effect.

Rosemont is one of the first communities in Canada to mandate reflective roofs. While the zoning bylaw does set out a minimum solar reflectivity index rating, it is not overly prescriptive and provides for a wide range of solutions. For example, it is still possible to install a traditional tar and gravel roof, but using a lighter-colour gravel than usual.

¹ A zoning bylaw is a regulatory tool that municipalities across Canada regularly employ to control land uses.

As with any new building-related regulation, there will be a transition period as roofing and paving contractors adjust to new planning regulations and to using different materials.

The Rosemont borough council is also leading by example. It has installed reflective roofs on four buildings that are owned by the municipality and six others are planned. In addition, the borough has supported other measures and programs aimed at reducing UHIs, including a green alleyways project (see inset box) and the planting of a larger proportion of trees in neighbourhoods that are most sensitive to UHIs.

Although it is too early to measure the effect of Rosemont's new zoning regulation on reducing of the UHI locally, the number of roof permits granted to date is a good indicator of the impact of the new zoning bylaw. It demonstrates that regulations, along with a suite of other policies, programs and tools, can be used effectively to build resilience to a changing climate.

TACKLING UHIS IN THE MONTRÉAL REGION

Many other jurisdictions and organizations in the Montréal region are implementing innovative UHI reduction measures. For example, the Montréal borough of Verdun, in partnership with Nature-Action Québec, has launched a three-year project designed to reduce the UHI effect in the borough's Wellington-De l'Église neighbourhood by increasing the vegetation cover. The Urban Ecology Centre, a non-profit organization, and the Office municipal d'habitation de Montréal, an affordable housing association, have created a joint project aimed at reducing the UHI effect and improving the quality of living environments for social housing on the island of Montréal. Both of these projects have received funding through the Government of Québec's Green Fund, which has supported more than 35 UHI mitigation projects across Québec.

REFERENCES

Casati, B. and Yagouti, A. (2010). Analysis of extreme temperature indices in nine Canadian communities using the Canadian Regional Climate Model projections for public health planning. Internal Report. Scenario Group, Consortium Ouranos. Montréal, Que.

Giguère, M. (2009). *Mesures de lutte aux îlots de chaleur urbains : revue de littérature*. Québec. Institut national de santé publique Québec. Québec, Que. www.inspq.qc.ca/pdf/publications/988_MesuresIlotsChaleur.pdf

Oke, T. R. (1982). The energetic basis of the urban heat island. *Quarterly Journal of the Royal Meteorological Society*, 108(455), 1–24.

Richardson, G., Otero, J., Lebedeva, J., and Chan, C.F. (2009). Developing Climate Change Adaptation Strategies: A Risk Assessment and Planning Tool for Urban Heat Islands in Montréal. *Canadian Journal of Urban Research*. 18(1): 72-93

Rosemont–La Petite-Patrie (2011a) *Lutte contre les îlots de chaleur*. Ville de Montréal. http://ville.montreal.qc.ca/portal/page?_pageid=7357,82287591&_dad=portal&_schema=PORTAL

Rosemont–La Petite-Patrie (2011b) *Toitures*. Ville de Montréal. http://ville.montreal.qc.ca/portal/page?_pageid=7357,82733669&_dad=portal&_schema=PORTAL

Roy et al. (2011). *Canicule 2010 à Montréal : rapport du directeur de santé publique*. Agence de la santé et des services sociaux de Montréal. Montréal, Que. http://publications.santemontreal.qc.ca/uploads/tx_asssspublications/978-2-89673-036-0.pdf

For information regarding reproduction rights, contact Natural Resources Canada at copyright.droitdauteur@nrcan-rncan.gc.ca.

Aussi disponible en français sous le titre : Mesures visant la réduction des îlots de chaleurs urbains dans Rosemont–La Petite-Patrie

Cat. No. M174-9/2013E-PDF (Online)
ISBN 978-1-100-22921-8

© Her Majesty the Queen in Right of Canada, as represented by the Minister of Natural Resources Canada, 2014

This case study is one in an ongoing series prepared by the Climate Change Impacts and Adaptation Division, Natural Resources Canada. The series illustrates a range of climate change impacts and adaptation responses from communities across Canada.

Watch for updates at adaptation.nrcan.gc.ca