

[HTTPS://WWW.THEGLOBEANDMAIL.COM/CANADA/ARTICLE-CITIES-HEATWAVES-CLIMATE-CHANGE/](https://www.theglobeandmail.com/canada/article-cities-heatwaves-climate-change/)

IN DEPTH

# In Canada's biggest cities, vulnerability to rising temperatures may depend on your neighbourhood

What can Canada's cities do to make summers bearable in the hottest neighbourhoods – and will they do it soon enough?

MATTHEW MCCLEARN

KATHRYN BLAZE BAUMENVIRONMENT REPORTER

VANCOUVER, TORONTO

PUBLISHED 16 HOURS AGOUPDATED 10 HOURS AGO



Without air conditioning or adequate ventilation, the Hazelwood single-room-occupancy hotel, located in Vancouver's Downtown Eastside, was not designed for 21st-century heat. JESSE WINTER/THE GLOBE AND MAIL

63 COMMENTS

SHARE

BOOKMARK

LISTEN TO ARTICLE

During a pleasantly cool September afternoon, it is uncomfortably hot in the Carl Rooms in Vancouver's Downtown Eastside. Light streams into a small, empty, south-facing room that's awaiting a new tenant. Its windows swing out only a few inches and a mechanism automatically closes the door: Forget trying to cool things off with a cross-breeze. There's no air conditioning system. And won't be any time soon.

The 43-unit Carl Rooms is in most respects a typical single room occupancy hotel, or SRO. There are dozens throughout the Downtown Eastside, some built more than a century ago. They weren't designed for 21st-century heat.



Janice Abbott, chief executive of Atira Property Management, stands in Oppenheimer Park, one of the only green spaces in the Downtown Eastside neighbourhood, which was kept closed to the public for much of the deadly heatwave in June, 2021. JESSE WINTER/THE GLOBE AND MAIL

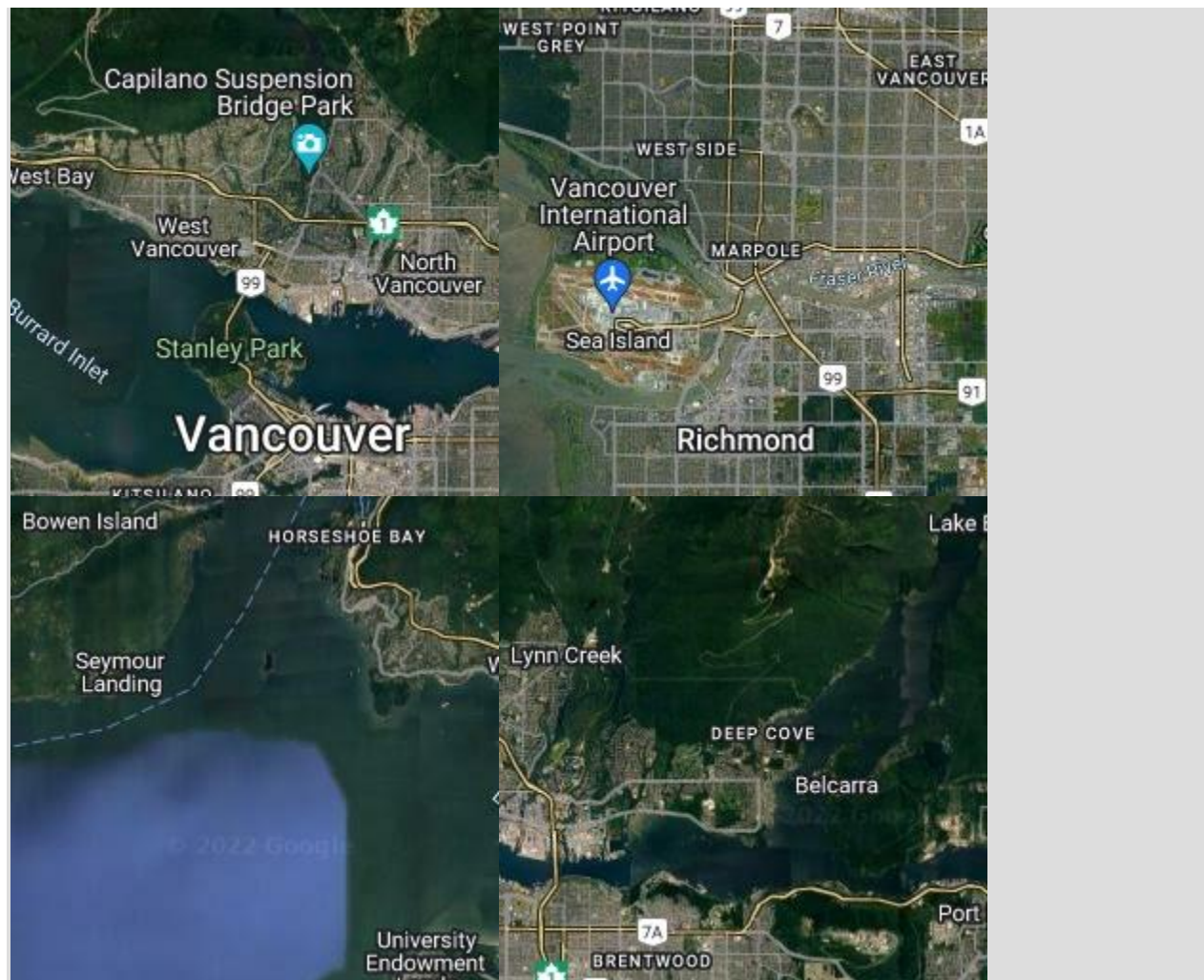
“When it’s 20 degrees out here, it’s too hot for most people in those buildings,” said Janice Abbott, chief executive of Atira Property Management, a non-profit that manages roughly 30 SROs, including the Carl Rooms. “So never mind when it’s 35 or 38.”

Such temperatures were once unthinkable in this temperate city, but no longer. The mercury went above 40 C during a deadly, record-smashing Pacific Northwest heat wave in June, 2021, that killed 619 people in B.C. alone. Projections suggest Vancouver will experience many more scorching summer days as Earth’s climate continues warming.

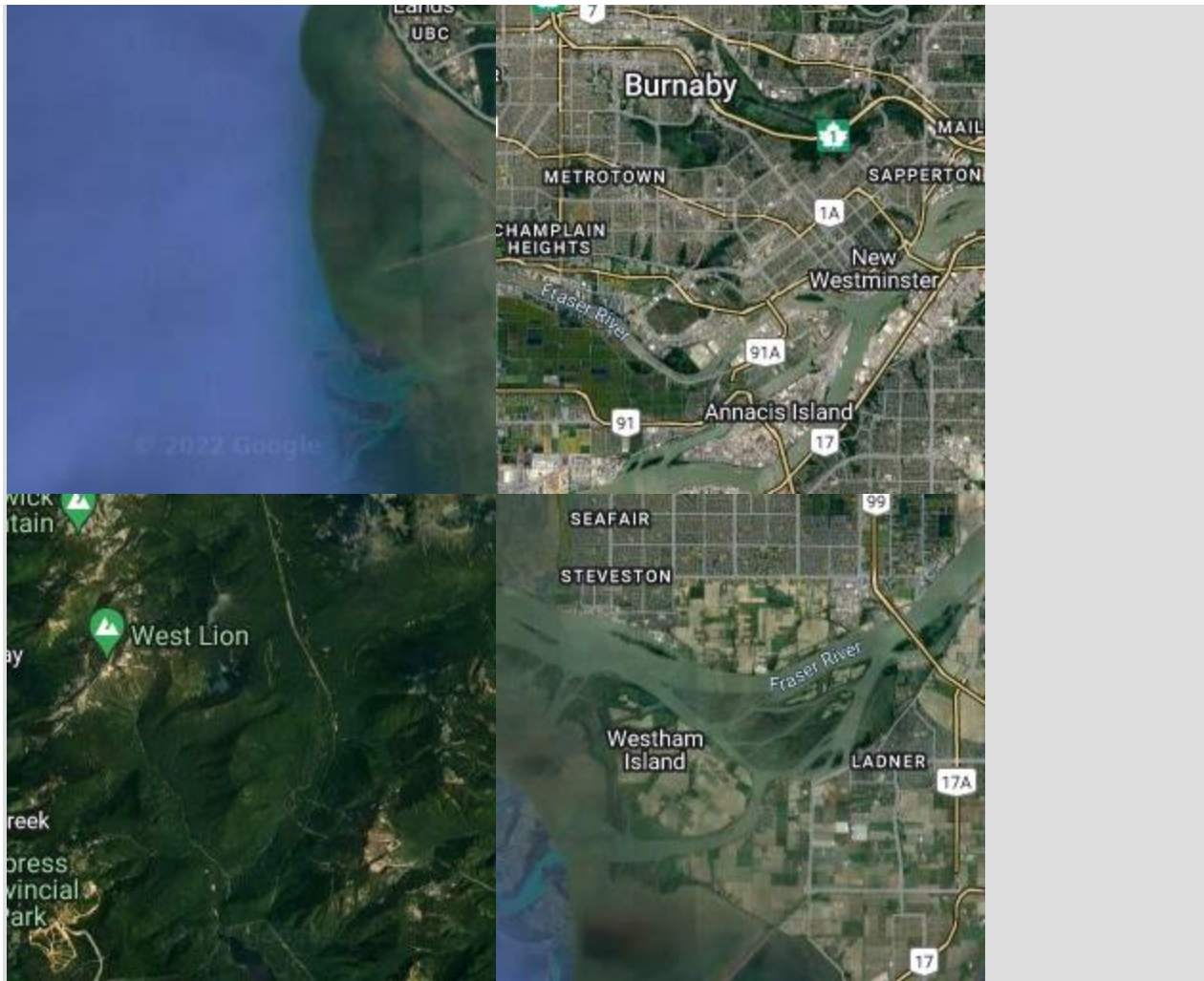
That's bad news for the whole city, but particularly for the Downtown Eastside. It's already among the city's hottest neighbourhoods, according to a review of satellite-derived land surface temperature data by The Globe and Mail. Yet just blocks away sits Strathcona, one of Vancouver's oldest residential neighbourhoods. It features million-dollar houses and narrower streets, lined with mature trees and cooler temperatures.

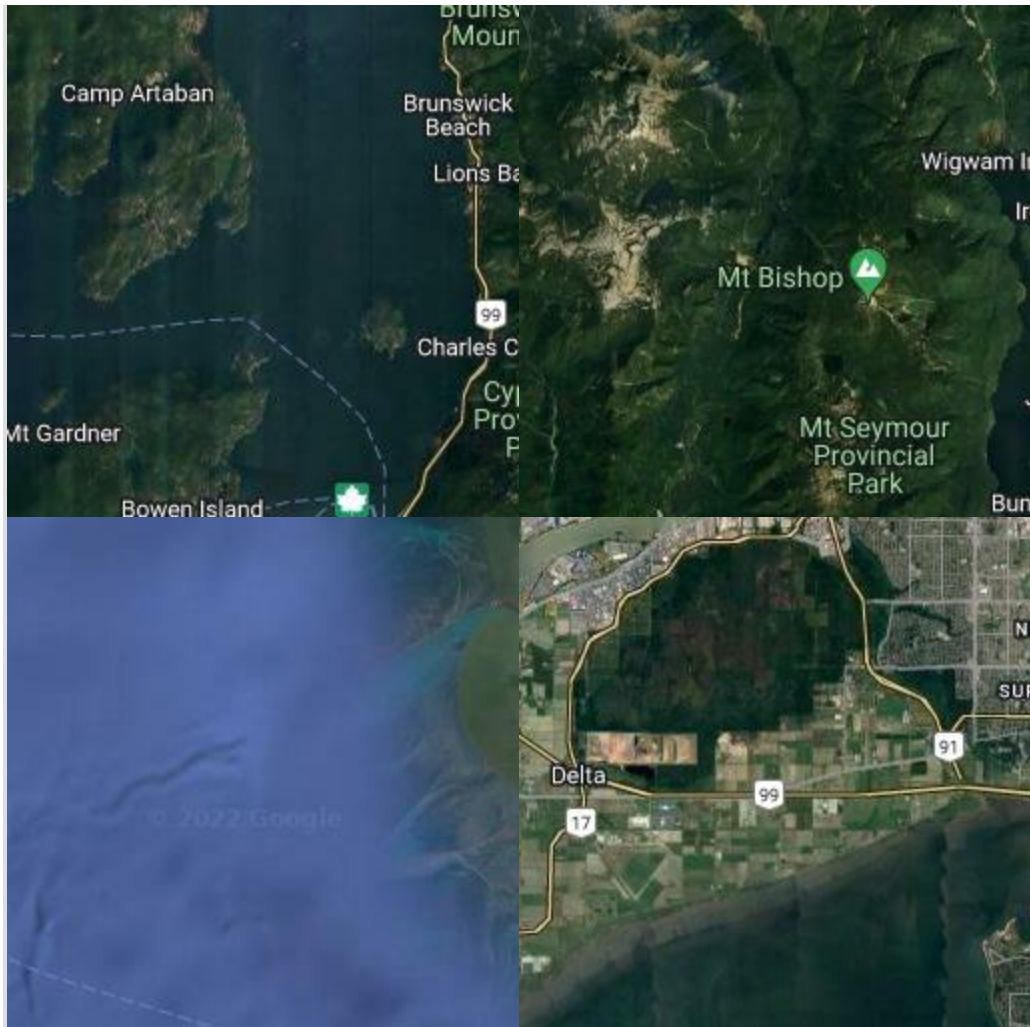
"It's like two different worlds," Ms. Abbott observed.

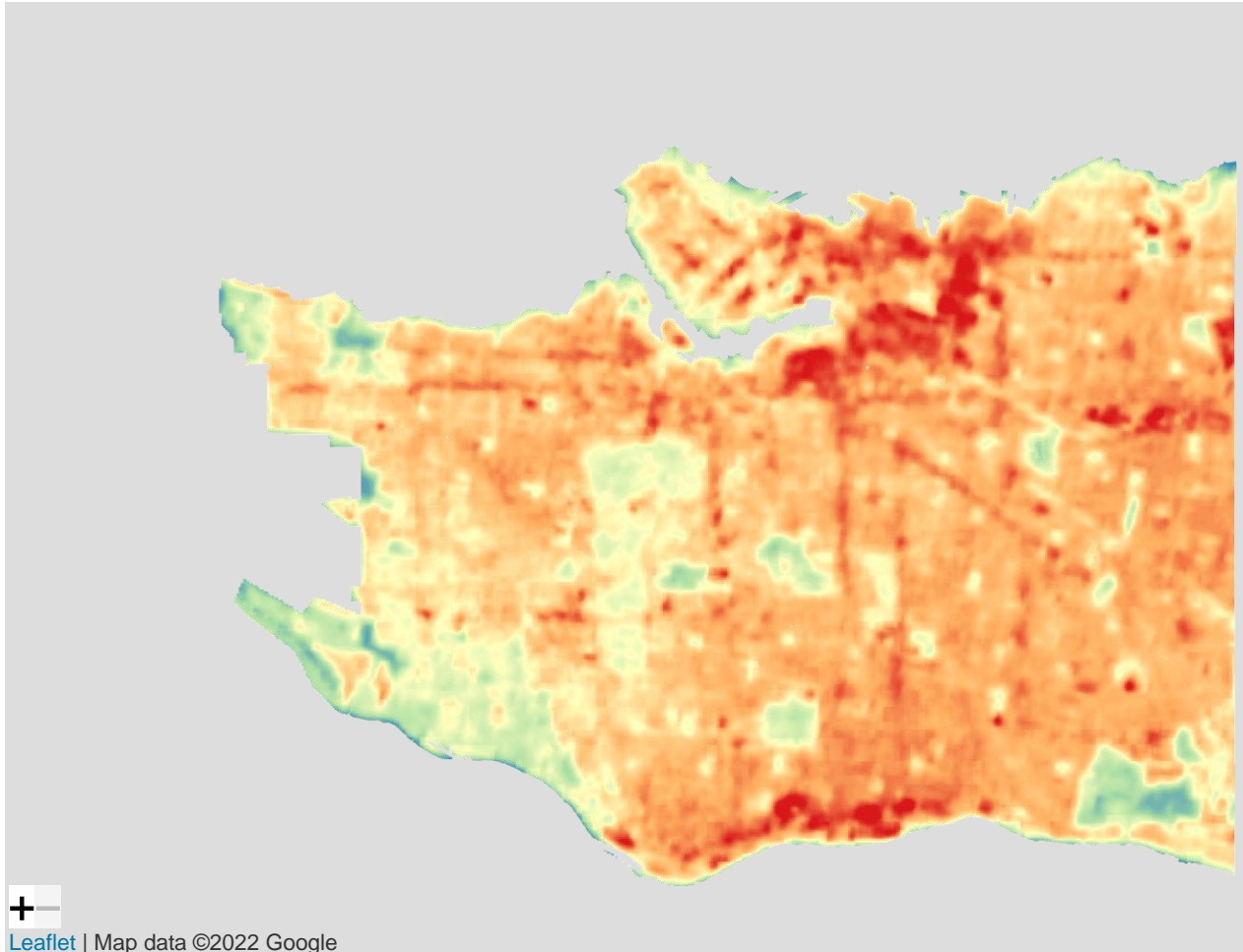
Land surface temperature data reveal many such divisions within Canada's largest cities. They also suggest that how we plan and build often fails to give due consideration to heat. Through our municipal codes, architecture, zoning laws and construction materials, we continue propagating heat-absorbing cityscapes that will be with us for decades, even centuries. Those choices help determine which neighbourhoods are destined to become uninhabitable, as opposed to merely more uncomfortable.











Heat layer

OFF

ON

Vancouver land surface temperatures  
June 30, 2015

Cooler

Hotter

### Civilization's fireplaces

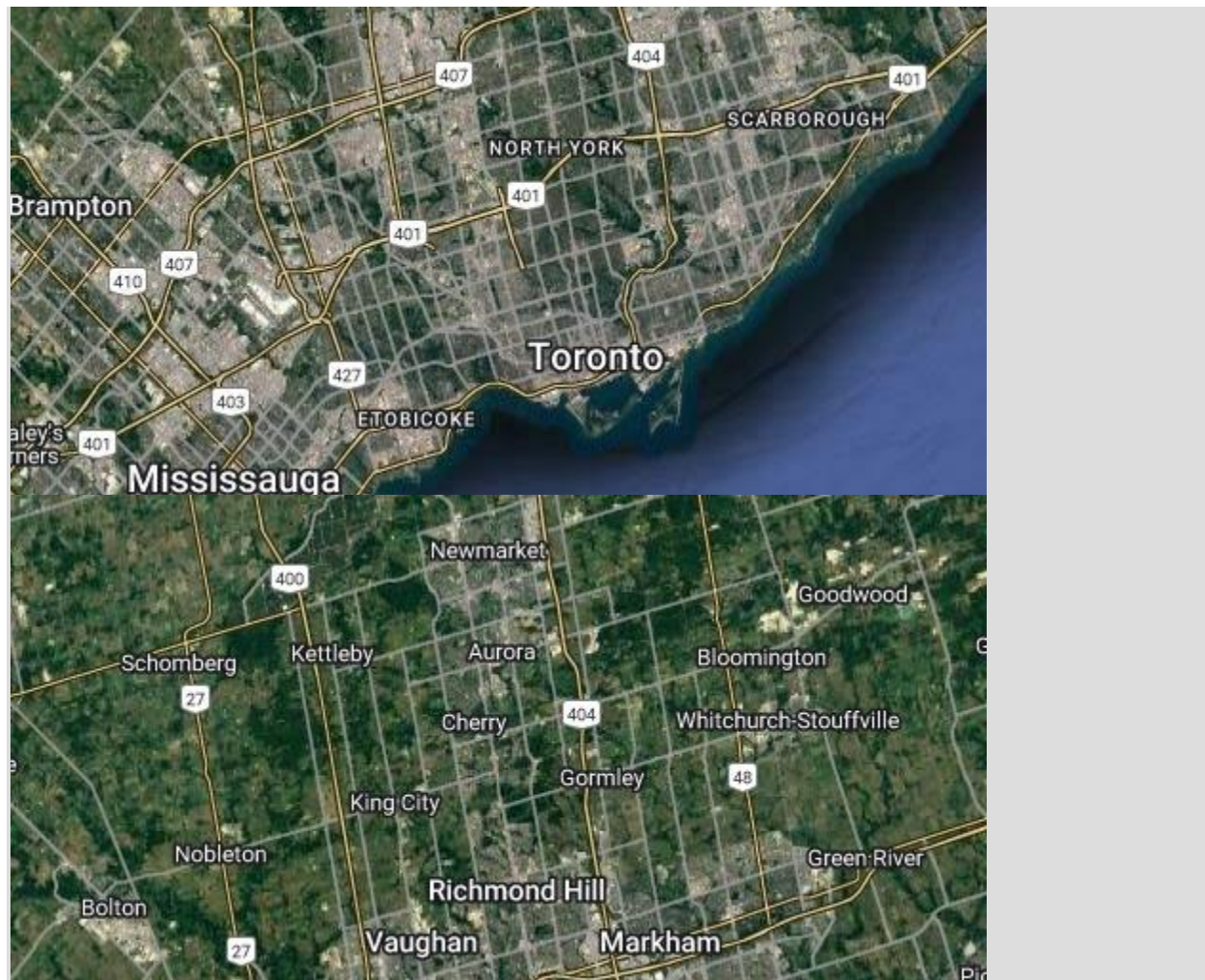
The 19th-century American minister and abolitionist Theodore Parker called cities “the fireplaces of civilization, whence light and heat radiated out into the dark.” Land surface temperature data reveal that this is literally true: Cities are hotter than surrounding suburban and rural landscapes owing to a well-understood phenomenon known as the urban heat island effect. Some researchers have found the difference is as much as six degrees.

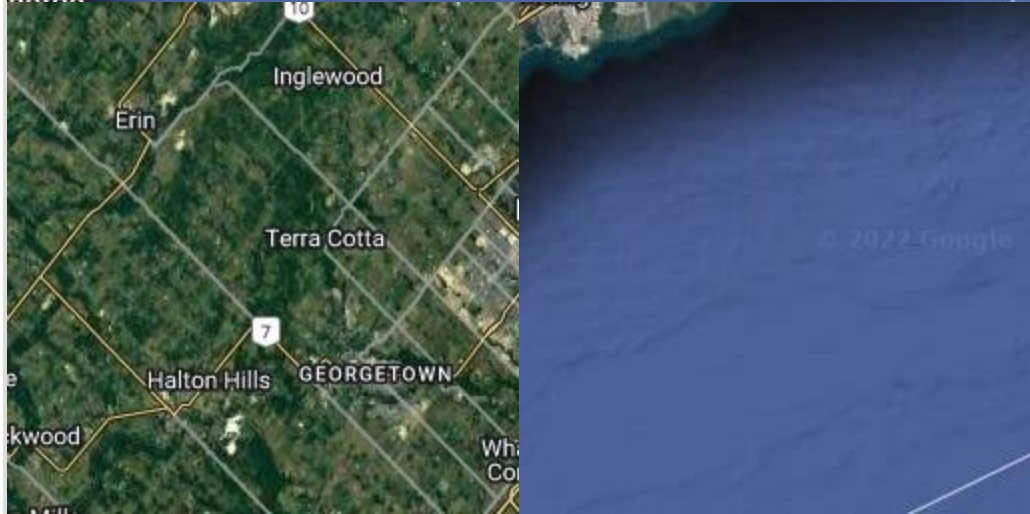


Concrete, asphalt and other heat-absorbing materials obviously bear much of the blame. Cities typically also have fewer trees, resulting in less shade and evaporative cooling. More densely populated neighbourhoods typically have more of the former, less of the latter.

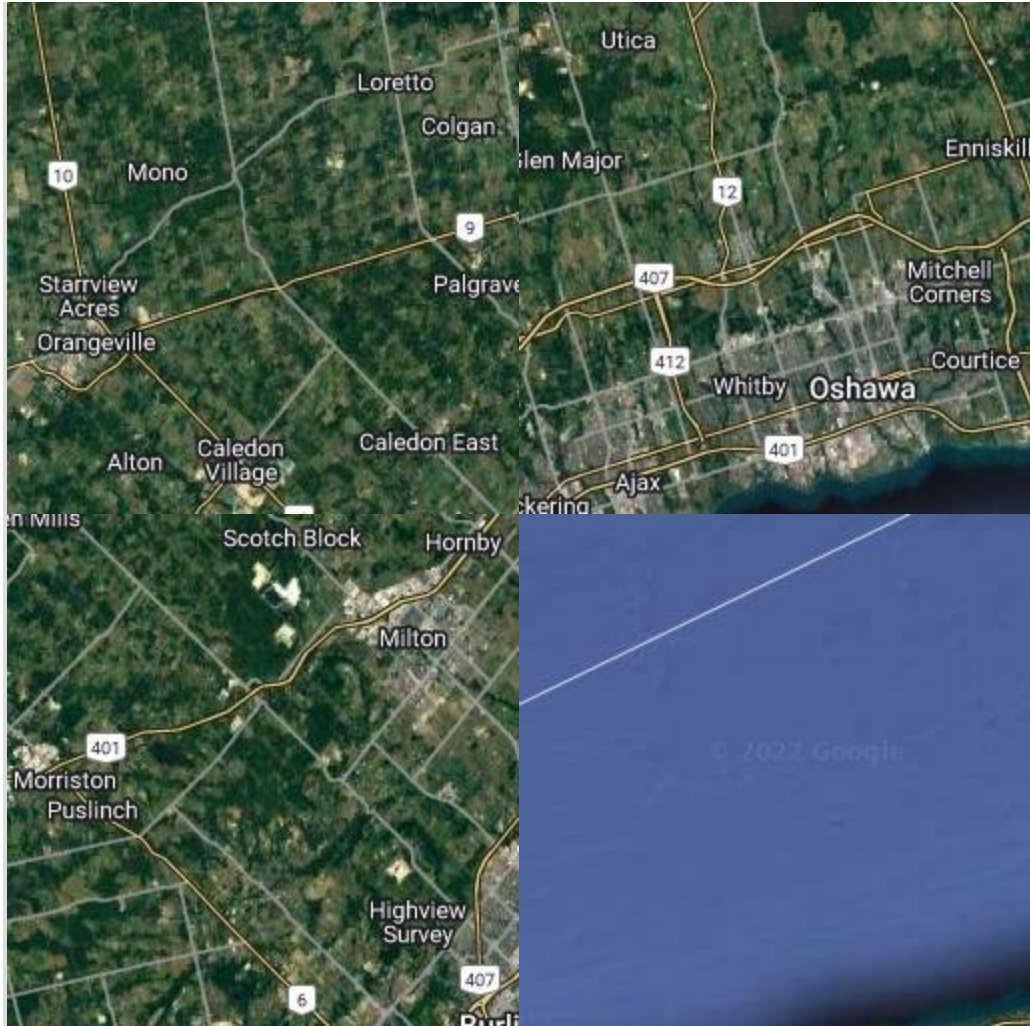
To identify some of Canada's hottest neighbourhoods, The Globe turned to Vivek Shandas, a professor at Portland State University's urban planning department. He and his colleagues have studied land surface temperature data for 108 U.S. cities, exploring the relationship between heat and "redlining," a now-illegal practice that involved denying home loans or insurance to neighbourhoods inhabited by Blacks and other minorities on explicitly racist grounds. The first-of-its kind analysis linked historical federal housing policy to the disproportionate exposure to heat in vulnerable communities.

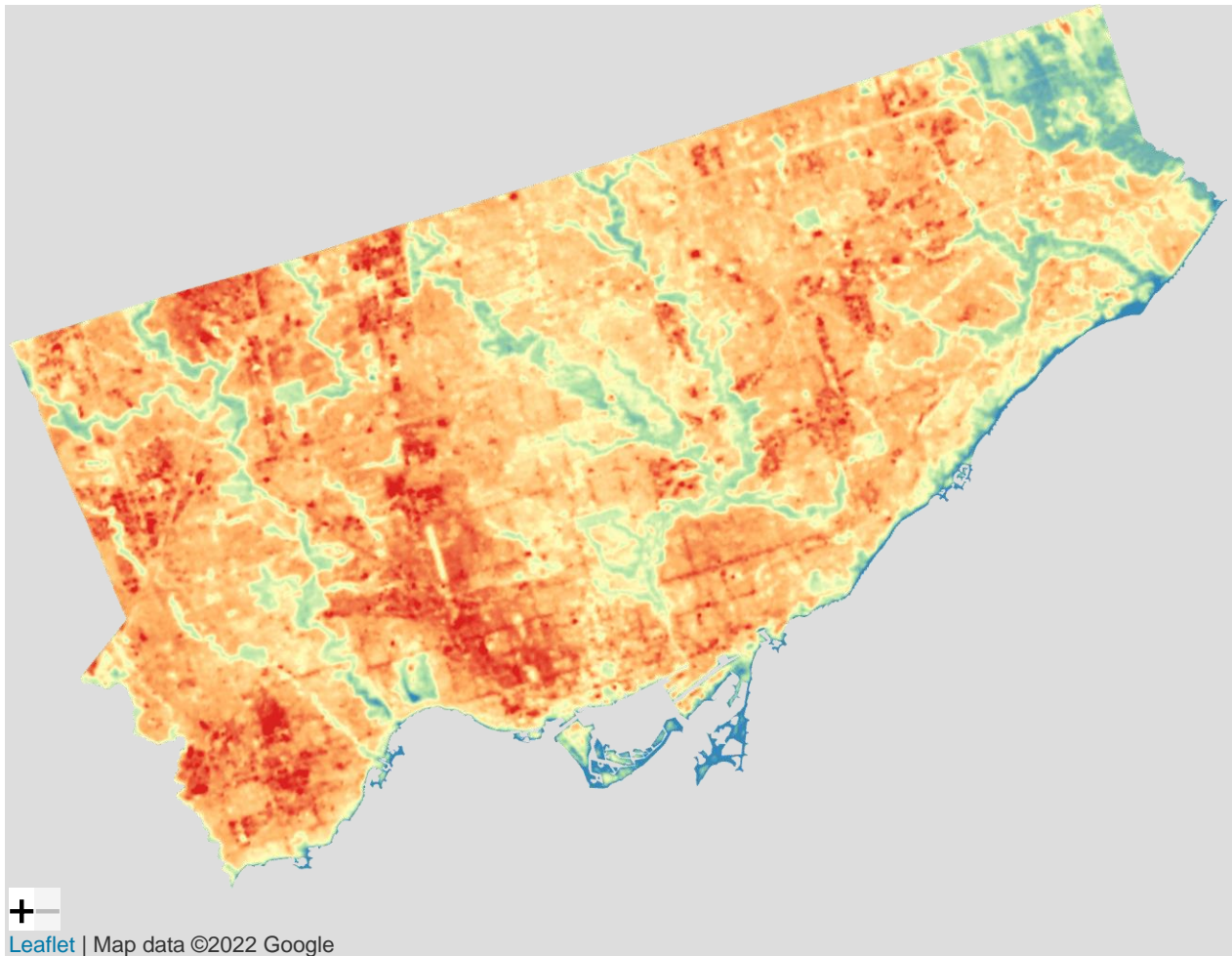
STORY CONTINUES BELOW ADVERTISEMENT











Heat layer

OFF

ON

Toronto land surface temperatures

July 2, 2020

Cooler

Hotter

“I cut my teeth on satellite imagery, and that’s where I got an appreciation for the vast differences in urban landscape,” Prof. Shandas said. “We’re putting materials out into the world, regulations and codes, that don’t take into account the variability of temperatures – let alone the extremes that we’re beginning to see.”

Prof. Shandas provided The Globe with land surface temperature data for Vancouver and Montreal. Camilo Perez Arrau, a Montreal-based geographer who has studied urban heat in several large Canadian cities, provided imagery for Toronto. Using geographical information system software known as ArcGIS Pro, The Globe cross-referenced these

data with satellite imagery, as well as with 2016 census data, to explore patterns in the distribution of heat. We confirmed our observations with local experts.

Strolling through the Downtown Eastside, one notices that buildings almost entirely cover many lots, leaving little room for trees and grass. Many street trees along the main thoroughfare – six-lane East Hastings Street – are young and spindly. Some appear dead, or nearly so. Nearby industrial areas – dominated by rail yards, warehouses and parking lots – have virtually no greenery to begin with.

These conditions were more than a century in the making. Local historian Lani Russwurm said many of the SROs were built after 1910. “Between 1910 and about 1913, there was a real boom,” he explained. “So they built these basically to give accommodation to the itinerant workers like the loggers who spent half the year in the bush.” Many hotels were built cheek-by-jowl, sharing “light wells” between them that allow minimal sunlight, but little wind.



On East Hastings Street in Vancouver, buildings almost entirely cover many lots, leaving little room for trees and grass. The Patricia Hotel, far right, is now run as supportive housing with 195 units. RAFAL GERSZAK/THE GLOBE AND MAIL

Some of the old hotels have been demolished, but dozens remain, including the Savoy and the Hazelwood. Over time, SROs became what one local organization calls the last stop before homelessness. Like redlined neighbourhoods in U.S. cities, the Downtown Eastside received little investment for generations.



“This is a class issue,” said Vancouver city councillor Jean Swanson. “If you’re poor, you can’t afford air conditioning. If you’re really poor, you can’t afford a fan. If you’re really, really poor, you don’t have a house and need shade.”

#### STORY CONTINUES BELOW ADVERTISEMENT

Not all neighbourhoods are hot for identical reasons. Other blistering Vancouver neighbourhoods include Sunset and adjacent Marpole. Both feature tightly packed residential lots predominantly occupied by buildings with asphalt roofing, driveways and walkways, and little room for planting. But the main culprit is found along the Fraser River.

“Right along the river, because that’s so built up and industrial, there’s almost no vegetation,” said Michael Brauer, a professor at the University of British Columbia’s School of Population and Public Health who co-authored a study on heat sensitivity across B.C.’s Lower Mainland.

In the heart of Vancouver lies the wealthy enclave of Shaughnessy, where luxury homes sit on large, meticulously landscaped lots. It boasts the densest tree canopy of any Vancouver neighbourhood; unsurprisingly, it’s among the coolest. Neighbourhoods closest to the Pacific Ocean, including West Point Grey, Dunbar-Southlands and Kerrisdale, are cooler still.

Toronto’s ravines, lined with trees, small rivers and streams, stand out as oases in land surface temperature imagery. Rouge National Urban Park helps this part of the Greater Toronto Area enjoy some of the lowest temperatures in the GTA.

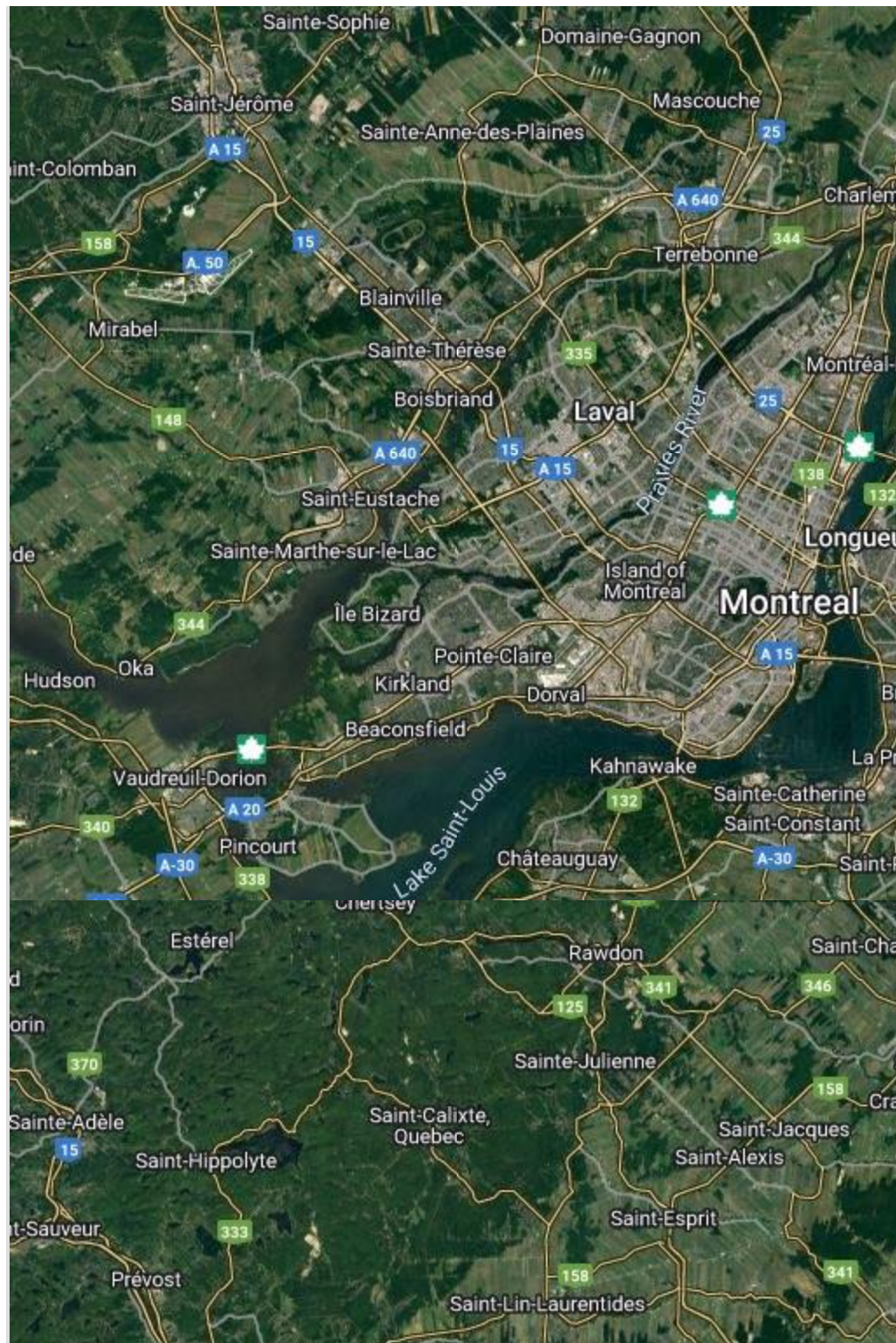


Toronto's ravines, lined with trees, small rivers and streams, stand out as oases in land surface temperature imagery. CHRISTOPHER KATSAROV/THE GLOBE AND MAIL

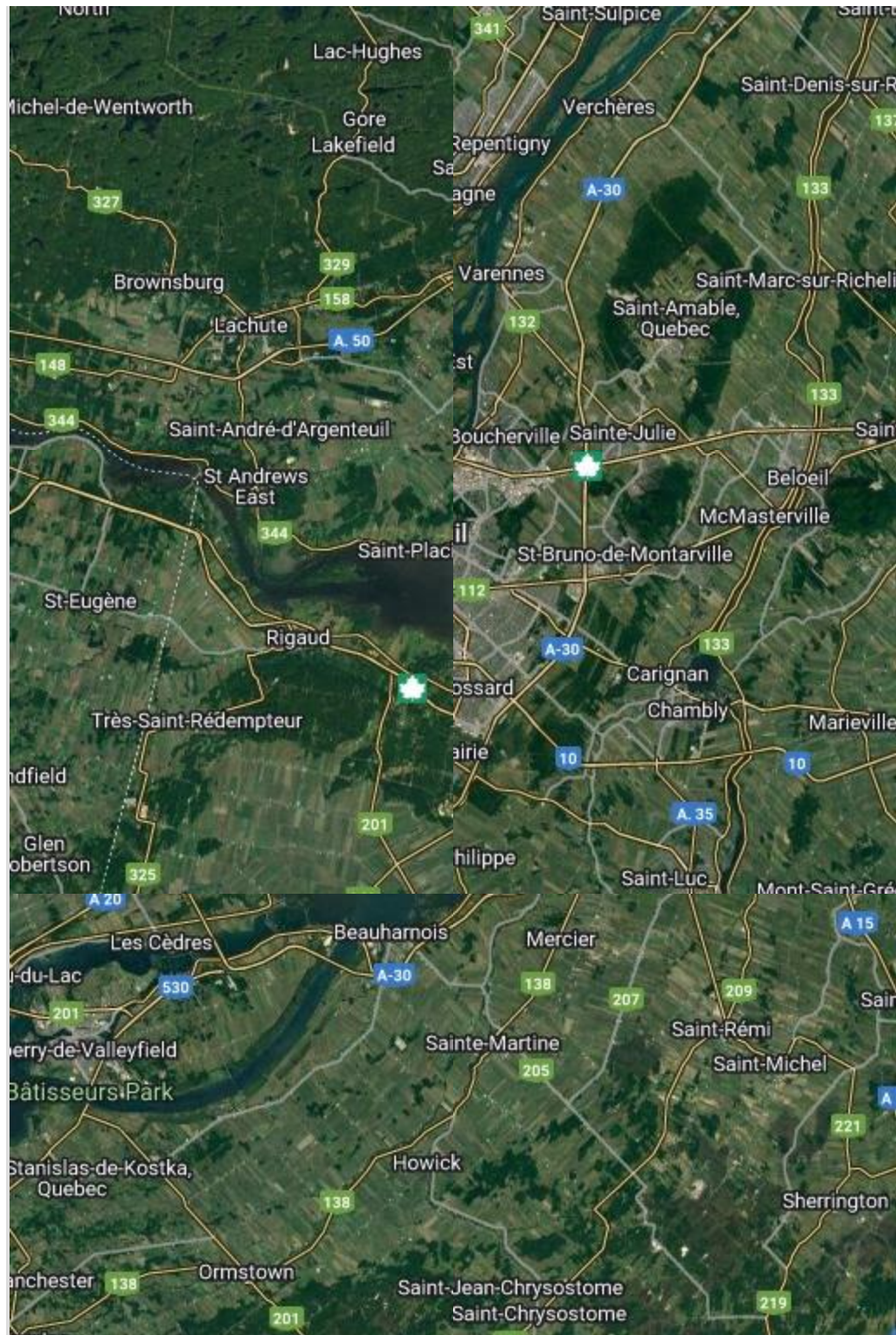
The Davenport ward in Toronto, a residential neighbourhood tightly packed with single detached homes, is strikingly oppressive: four degrees warmer than the coolest neighbourhoods on the date of our imagery. Here, relief belongs only to the dead: Prospect Cemetery, a narrow strip of land stretching two kilometres from north to south, is the only obvious refuge.

In Montreal, temperatures in neighbourhoods along the St. Lawrence River are notably lower. L'Île-Bizard–Sainte-Geneviève, which features the smallest population of any Montreal borough, is dominated by golf courses and parks and surrounded by the Lac des Deux Montagnes. Ditto for nearby Senneville, an affluent enclave on the western tip of the Island of Montreal. Mount Royal Park, near the heart of Montreal, offers a rare respite in an otherwise sweltering downtown.

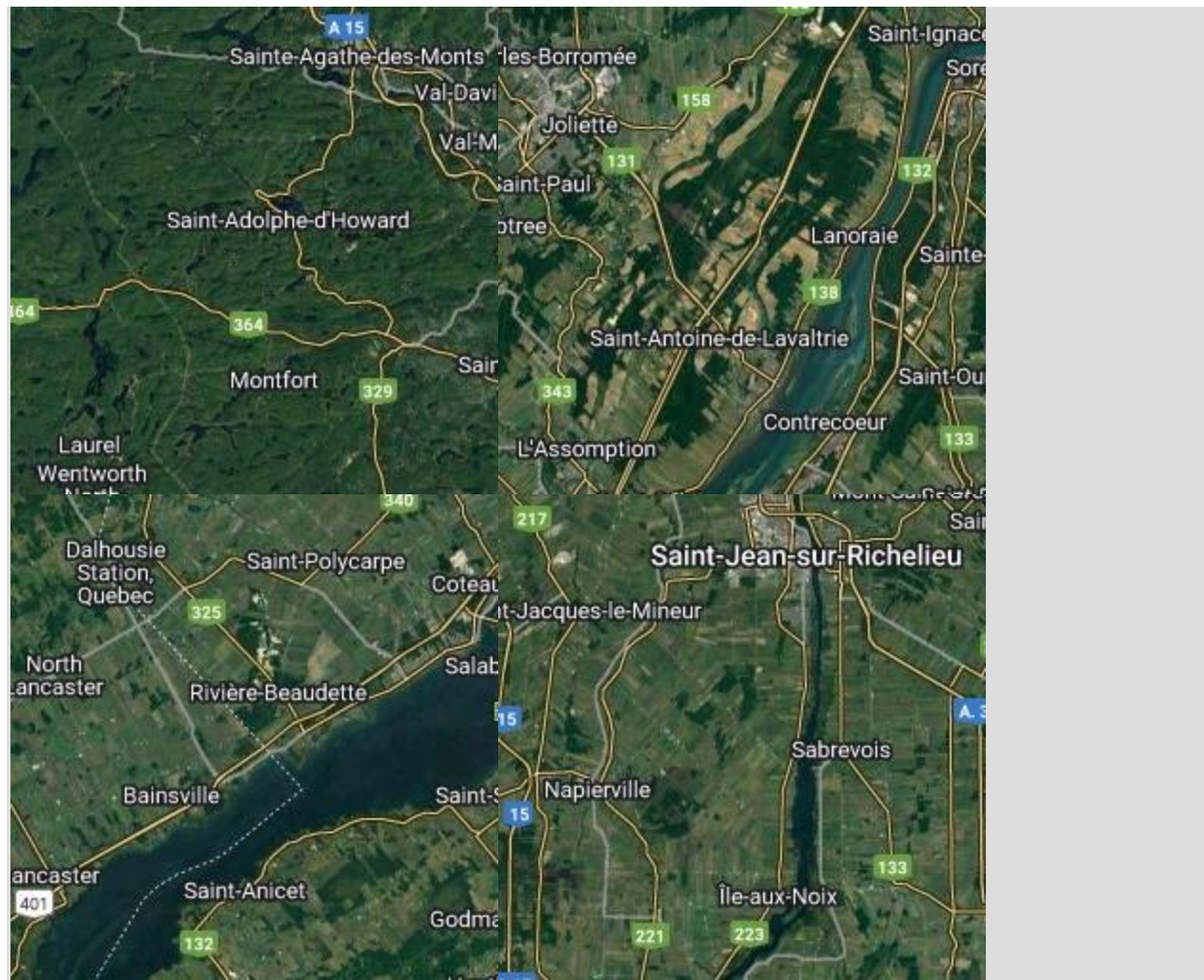
STORY CONTINUES BELOW ADVERTISEMENT

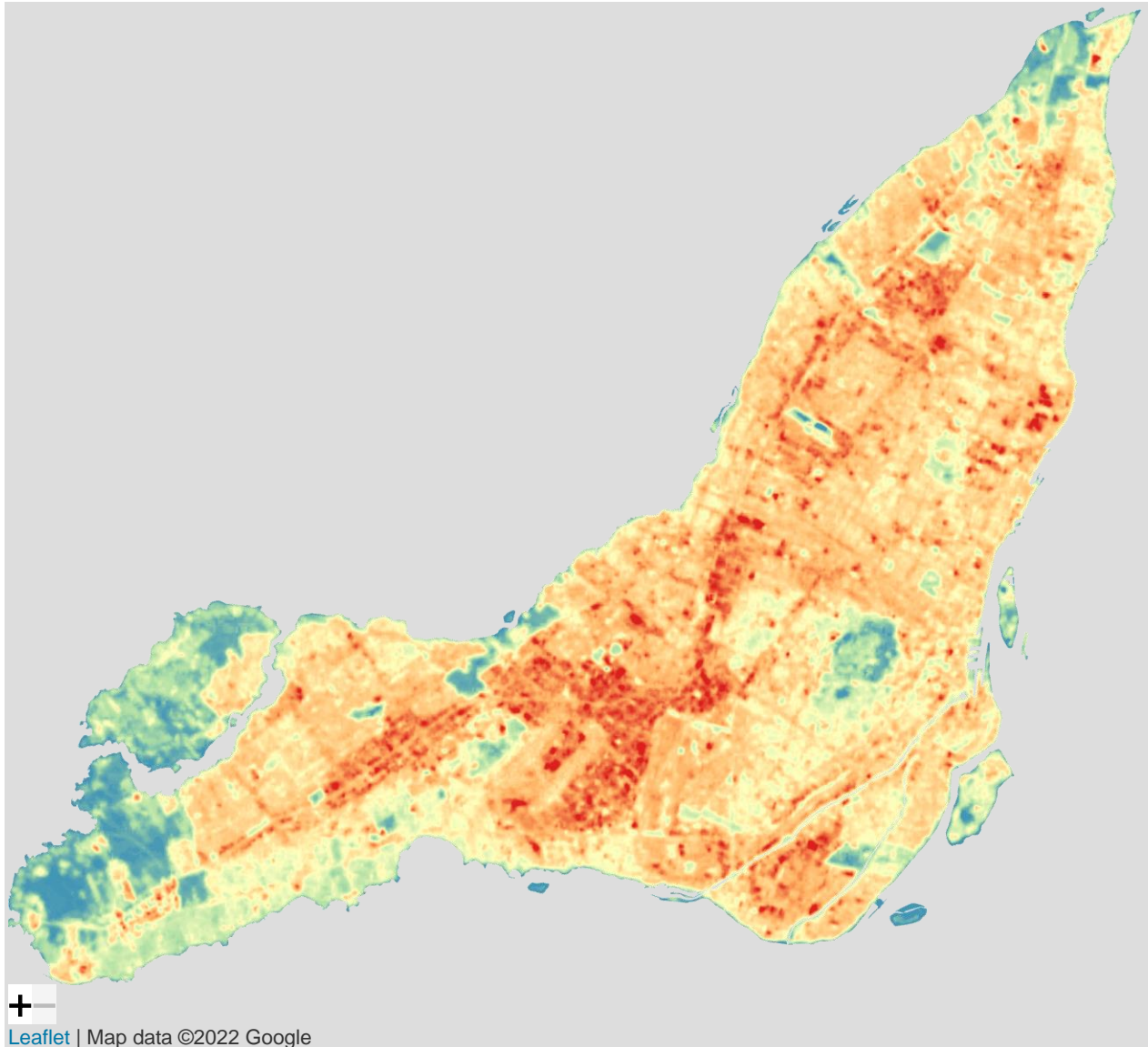












Leaflet | Map data ©2022 Google

Heat layer

OFF

ON

Montreal land surface temperatures  
August 10, 2021

Cooler

Hotter

Industrialized boroughs in the island's interior represent the opposite extreme: Saint-Laurent borough's sprawling blocks of industrial and commercial properties – particularly those near Pierre Elliott Trudeau International Airport – stand out.



David Kaiser, a physician responsible for environmental health at Montreal Public Health, pointed to striking contrasts between cooler, higher-income residential boroughs around the mountain (Outremont, Mont-Royal, Westmount) and hotter, lower-income neighbours, divided by nothing more than abstract administrative boundaries.

“There’s no natural law that says people in a richer neighbourhood should have more trees, or be less exposed to heat than in a poorer neighbourhood,” he said. “But it’s so evident when you look at something like surface temperature data.”



Research published in the journal *Nature Climate Change* warns that the probability of extreme climate events, like last summer’s Pacific Northwest heat wave, will increase dramatically by mid-century. DARRYL DYCK/THE CANADIAN PRESS

### A cold nation in the deep fryer

According to calculations based on historical records, last summer’s Pacific Northwest heat wave was a one-in-1,000-year event. It might seem unwise to entertain sweeping changes in response to such an unlikely occurrence. But virtually every credible climate forecaster suggests the historical record can no longer be trusted. Research published in the journal *Nature Climate Change*, for instance, warned that the probability of such extreme events will increase dramatically by mid-century.

According to the *Climate Atlas of Canada*, an initiative of the University of Winnipeg’s Prairie Climate Centre, Canadian cities will endure four times as many days above 30

degrees each year between 2051 and 2080 than they do currently. (Those projections don't include urban heat island effects, so they're probably understated.) In a report released last year, the Intergovernmental Panel on Climate Change said extreme high temperatures across North America are virtually certain to increase.

Municipal governments accept this. Between 1971 and 2000, Toronto experienced a heat wave (defined as three consecutive days above 32) about once every two years; a 2012 municipal study forecasts five heat waves annually as soon as the 2040s.

By mid-century, city officials expect 66 days with maximum temperatures above 30. Vancouver's models predict an average of 43 summer days above 25 in the 2050s, compared with just 18 today.

Some cities, Toronto among them, have mapped heat vulnerability. But Portland State University's Prof. Shandas said that's the easy part. "Maps arrive, and then it's like, 'Oh, brother!' – it's hard to go to the next step," he said. "Because this means we have to rethink how we are centring places that are going to be 10 degrees hotter in our planning decisions. We've never done that before."

Actually, we've barely begun to think about it as a key issue. The federal Public Safety department, for example, is expected early next year to publish a first-ever national risk profile assessing the threat posed by certain natural disasters and our ability to respond. It will focus on flooding, wildfires and earthquakes. It will also include some information on extreme heat events, but more detailed assessment of extreme heat will have to wait for subsequent reports.

Canadian researchers also seem to be well behind international peers when it comes to assembling an attractive menu of locally appropriate solutions.



First responders and police assist a woman who lost consciousness due to the extreme heatwave that saw temperatures reach 43 degrees and above in Montreal in July, 2018. DARIO AYALA/THE GLOBE AND MAIL

Luna Khirfan, a professor in the University of Waterloo's School of Planning, specializes in climate change adaptation. She conducted a broad literature review of urban heat adaptation as part of her work for the Intergovernmental Panel on Climate Change. She was impressed by Italian studies that included detailed cross-sections of streetscapes, examining the impact of diverse factors such as building heights and street widths on urban heat at different times of the day.

"In Europe, they're looking at the cladding of buildings, what materials, what colours, the type of glass used," she said. "I couldn't find anything parallel to that in Canada."

STORY CONTINUES BELOW ADVERTISEMENT

### It's not easy getting greener

West 63rd Avenue boasts some of the lushest tree canopy to be found anywhere in Vancouver's Marpole neighbourhood. But one needn't venture far before the foliage thins out. Strolling through the area on a rainy morning late last summer, arborist Joe McLeod saw numerous opportunities to help prepare for searing summers.

He pointed out purple plum trees. The species gained popularity in the 1990s as officials tried to diversify the canopy. But there's a problem: It's small and provides little shade.



Mr. McLeod also noted with displeasure a lengthy stretch of sidewalk with adjacent grass occupied by a single tree stump – one of about 3,000 stumps in the city’s database.

“We need to grind that stump and replace it with another tree,” he said.



ALIA YOUSSEF/THE GLOBE AND MAIL



The affluent enclave of Strathcona (top), with its substantial tree coverage, is notably cooler than the neighbouring low-income Downtown East Side area (bottom). JESSE WINTER/THE GLOBE AND MAIL

One worries about such things when you're supervisor of Vancouver's urban forestry unit. Mr. McLeod's employer, the park board, plans to achieve 30-per-cent urban canopy cover by mid-century, from an estimated 23 per cent today. The plan prioritizes neighbourhoods with below-average canopy, including Marpole and the Downtown Eastside.

In other words, Mr. McLeod has work to do. Purple plums and other small street trees should be nervous.

"Even though maybe those trees are healthy enough to justify keeping, it probably makes more sense of improving the livability of the city to remove them," Mr. McLeod said. "Within maybe five years, a species like maple, oak or ash would be much larger."

Vancouver is a peninsula hemmed in on three sides by water, and by Burnaby to the east. Intensification remains the order of the day: Developers buy up rows of residential parcels to build townhouses, row houses and towers, often at the expense of privately owned trees. Intensifying canopy, then, seems oddly appropriate.

The more built-up a neighbourhood is, though, the harder it is to find space to do that. Underground utilities, such as buried natural-gas lines and water pipes, must be worked around, as must overhead obstructions such as the electrical wires used by city buses.



Marpole's residential streets are lined with grassy areas several feet wide with natural soils: Planting a tree here can cost \$1,500. Downtown, and in other more densely populated areas, sidewalks must be torn up and new soils added, which can increase costs tenfold.

Such challenges are hardly insurmountable, though, which helps explain why canopy expansion nearly always figures prominently in municipal cooling strategies. Toronto's urban forestry division plants 120,000 trees and shrubs each year, with a goal of reaching 40-per-cent canopy cover. It's considering using new tree species such as hybrid elms, which it believes are more resilient to climate change.

Another option involves replacing tar and asphalt roofing with plant covering, which cools buildings passively. In 2010, Toronto became the first jurisdiction in North America to set requirements for construction of "green" roofs. Meanwhile, Dr. Kaiser said Montreal's Rosemont-La-Petite-Patrie borough modified bylaws several years ago to require white roofs (which reflect more sunlight) on new builds and renovations.

STORY CONTINUES BELOW ADVERTISEMENT



During last summer's heat dome event, BC Hydro warned that inhabitants of "glass castles" could expect soaring electricity bills because of the inefficient, portable air conditioners many condo-owners use. DARRYL DYCK/THE CANADIAN PRESS



“What’s important is that it’s a bylaw,” he said. Asphalt and tar roofs last something like 15 or 20 years, he explained, and the neighbourhood has many flat roofs. So over time, that simple rule change should greatly improve heat resilience.

Often, however, adaptation strategies come with trade-offs. As noted in commentary on heat governance published in the peer-reviewed journal *Nature*, urban greening increases water consumption. Lighter pavement coatings, the authors write, may be effective in reducing land-surface temperatures, but the reflected heat can actually cause the mean radiant temperature above the paving to rise at midday, relative to untreated asphalt.

Even as cities weigh such trade-offs, the fallout from yesterday’s choices is becoming obvious.

A few years ago, a study by Toronto’s Medical Officer of Health counted nearly 1,200 older apartment towers higher than eight storeys, nearly all of which lack central air conditioning. Roughly half a million people – a sixth of the city’s population – live in them. During heat waves, many apartments become almost uninhabitable.

The Medical Officer had asked whether the city should compel landlords to keep indoor temperatures below 26. The report’s answer: It’s simply not feasible. Older towers often lack duct work. They haven’t enough insulation. There’s no window shading. Retrofits could cost millions of dollars. The simplest workaround – installing window air conditioners – would strain the city’s electrical transmission infrastructure.

The people who designed and built Vancouver’s SROs, and maybe also Toronto’s 1980s apartment buildings, can perhaps be excused for failing to foresee 21st-century heat. But it would be a mistake to assume their successors are doing better.

In the midst of last summer’s heat dome event, BC Hydro warned that many inhabitants of “glass castles” – the very symbol of residential modernity – could expect soaring electricity bills because of the inefficient, portable air conditioners so many of them had purchased. “Condos made of glass are poor insulators that allow cool air to easily escape and reflect hot air into the building, making it difficult to keep temperatures stable inside,” its bulletin noted.

Toronto hasn’t given up on rectifying past mistakes; it still wants to encourage retrofits. In a statement, officials said a program called the High-Rise Retrofit Improvement Support Program had already committed \$10.1-million in financing to 16 buildings. This summer, the city plans to launch a new retrofit program called Taking Action on Tower Renewal, which will provide additional grants and financing for another five to 10 buildings.

That’s a small fraction of the city’s towers. It’s also a start.

This article is part of No Safe Place, a year-long Globe project on climate adaptation in Canada. Last year's catastrophic and deadly heat dome, fires and floods in British Columbia revealed a hard truth about how ill-equipped Canadians are to respond to the devastating effects of climate change. No Safe Place focuses on issues and solutions related to adapting societies and economies to a hotter climate. Coverage includes digital interactives, data-driven investigations and engaging features. <https://tgam.ca/NoSafePlace>

—

Our Morning Update and Evening Update newsletters are written by Globe editors, giving you a concise summary of the day's most important headlines. Sign up today.

We have a weekly Western Canada newsletter written by our B.C. and Alberta bureau chiefs, providing a comprehensive package of the news you need to know about the region and its place in the issues facing Canada. Sign up today.