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Room to Grow: Comparing Urban Density in Canada and Abroad

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Summary

As Canada's most successful metropolitan areas continue to grow, they face pressures to grow outward—through the construction of new communities at the urban fringe—and upward—by accommodating more residents in existing urban areas, leading to higher populations densities. This bulletin compares population densities across 30 cities located in high-income countries.

To ensure comparability between the cities analyzed, the study includes only fully urbanized municipalities or municipalities with rural land area and population removed from the density equation.

Of the 30 cities analyzed, Canada's largest have low population densities relative to international counterparts. The coastal tourist hubs of San Francisco and Barcelona are 1.31 and 2.89 times as dense as Vancouver, Canada's densest major city. Chicago, New York, and London are 1.03, 2.45, and 2.48 times as dense as Canada's financial and media centre, Toronto. Paris is 4.29 times as dense as Montreal, and even the Toronto suburb of Mississauga is 1.17 times as dense as Calgary, Canada's third most populous municipality.

Moreover, higher population densities need not come at the expense of living standards. Preliminary comparisons between population density in the cities included in this essay and Mercer's 2017 Quality of Living Ranking indicate that cities of comparable density vary significantly in Mercer's ranking.

A better understanding of how cities differ in population density and how higher density might (or might not) affect living standards encourages citizens and policymakers to rethink their perceptions of urban living.

Comparing Urban Density in Canada and Abroad

Introduction

Though it covers a vast geographical area, Canada is one of the world's most urban countries: more than 80 percent of Canadians live in cities and towns (Statistics Canada, 2011). Canada's most successful metropolitan areas continue to attract new workers and families, and as a consequence, they must adapt physically as well. Namely, they face pressures to grow outward—through the construction of new communities at the urban fringe—and upward—by accommodating more residents in existing urban areas. When the outward growth of cities comes up against restrictions such as mountains, water bodies, or protected rural lands, growing cities must pursue the latter growth strategy, which results in higher population densities.

This bulletin compares population densities of some of Canada's largest cities with densities in cities in other high-income nations. In doing so, a clearer picture emerges of Canada's main metropolitan areas and their ability to accommodate more urban residents through greater density.

The bulletin's first section defines density and explains the selection of fully urbanized municipalities for comparison. The second section compares urban density in 30 major cities from high-income countries, underscoring the relatively low density found in Canada's largest municipalities. The third section discusses the lack of a relationship between population density and a measure of the quality of living. It finds that not only are Canada's largest cities not very dense relative to international peers, but more density need not come at the expense of living standards. A brief conclusion ends the bulletin.

What is urban density and why is it important?

Though there are many ways to measure population density, all are "expressed as a ratio in which the numerator is a quantity of human activity—residents, jobs, or built form—and the denominator represents a given land base" (Taylor and Van Nostrand, 2008). Common examples include dwelling units per square kilometre/mile, residents per kilometre/mile, and floor area ratio (FAR).[1]

The simplest, most common measure of population density is the division of a jurisdiction's population by its land area. For example, the 2016 population in the city of Vancouver, British Columbia, was 631,486 people in a total land area of 114.97 square kilometres (Statistics Canada, 2016). As such, Vancouver's 2016 population density was 5,493 inhabitants per square kilometre.

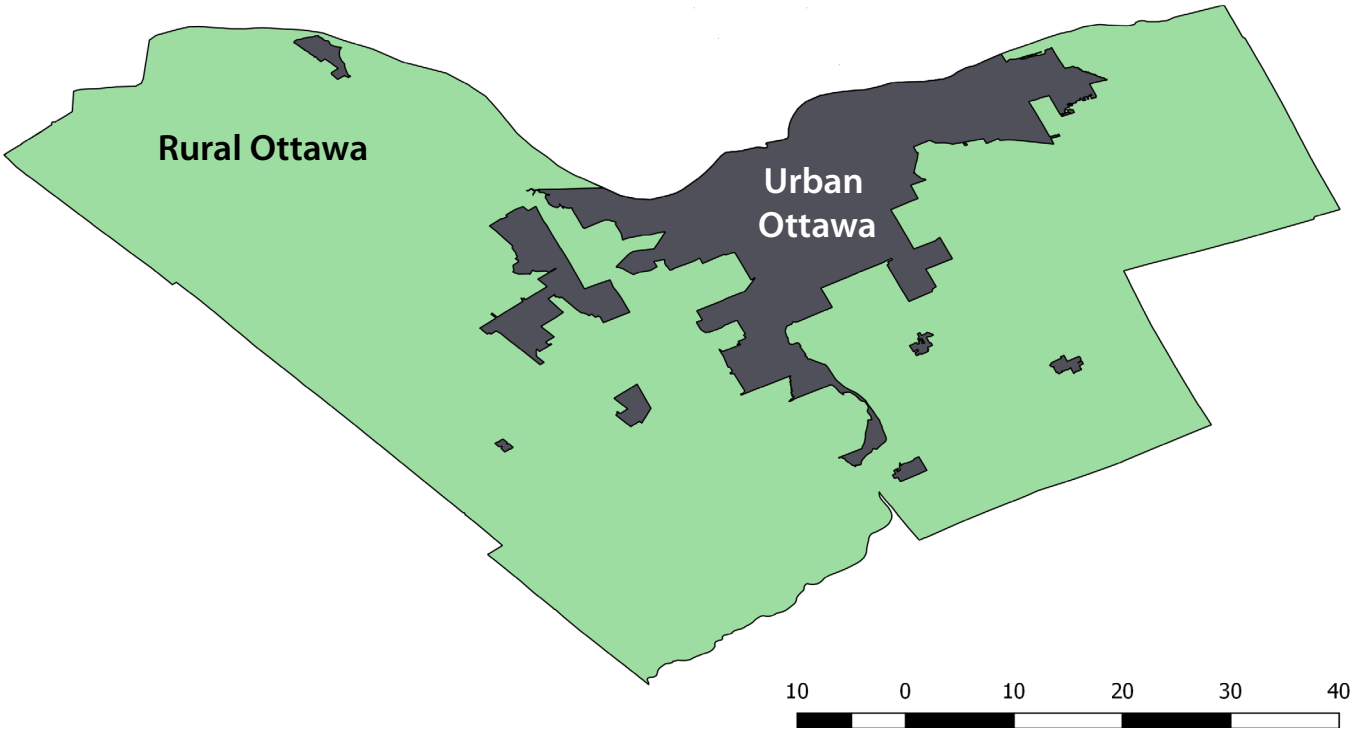
This approach accurately captures Vancouver's ability to accommodate residents within its urban and political boundaries. However, not all municipalities are fully urbanized.[2] As political jurisdictions, municipalities often include sparsely populated rural areas such as farm fields or mountains within their boundaries.

For example, 80 percent of land within the city limits of Ottawa, Ontario (see Map 1) was considered rural in 2010, while 90 percent of the

[1] For more on different measures of density, see Taylor and Van Nostrand (2008).

[2] "Fully urbanized" means municipalities whose geography consists entirely of urban uses. These include residential, commercial, industrial and institutional uses, as well as municipal or metropolitan parks. Farmland, forests, deserts, or mountains not within local or metropolitan parks are considered rural.

Map 1: City of Ottawa, by Urban and Rural Uses



Note: The "Urban" portion of the map represents Ottawa's "population centres," which Statistics Canada defines as areas "with a population of at least 1,000 and a density of 400 or more people per square kilometre" (Statistics Canada, 2011c).

Sources: Statistics Canada 2011a, 2011b; author's calculations.

city's population lived in the urbanized core (City of Ottawa, 2010). Indeed, Ottawa's population per square kilometre including the rural area was only 335 during the 2016 census (Statistics Canada, 2016). After adjusting for the presence of farmland, the Ottawa-Gatineau population centre (the contiguous inhabited portion of Ottawa and neighbouring Gatineau) increases to 1,900 inhabitants per square kilometre—a 568 percent increase. Clearly, the simple division of Ottawa's total population by total land area would not produce a result immediately comparable to that for Vancouver.

The analysis that follows addresses this issue in two ways. First, where rural lands are captured in geographical subdivisions designated by statistical authorities (such as census dissemination areas), these lands and their populations are removed from city-level density estimates. The result is that land area and population estimates used in this study only represent urbanized areas, allowing for more direct comparison.

Second, cities where the first step is not possible (due to incongruity between rural lands and subdivision boundaries) are excluded from the analysis. As such, this study only includes fully

urbanized municipalities (such as Vancouver), or municipalities whose rural lands and populations are easily removed from city-wide estimates (such as Toronto, where all rural lands are contained within a single census dissemination area).[3] For more on this process, see Appendix 1.

The type of cross-city comparison this approach allows is important, especially in the context of urban growth pressures. As newcomers continue to be drawn by the enhanced economic, cultural, and leisure opportunities afforded by large urban agglomerations,[4] the success of cities is determined in part by their ability to comfortably accommodate more residents within limited geographic areas.

Population density across cities in Canada and other high-income countries

This section compares 30 cities by population density. As mentioned earlier (and in Appendix 1), the cities selected include fully urbanized municipalities from 11 countries. They were selected first based on their location in high-income countries, and second based on population.[5]

Excluding cities not situated in countries from the World Bank's 2017 "high-income" categorization allows for comparisons within a common level of living standards. For example, the densest urban area in the world is Dhaka, Bangladesh (Demographia, 2017). That this region accommodates more residents per square kilometre than urban areas in wealthier countries is not necessarily a helpful metric when large disparities exist in other areas, such as income, education, public safety, or access to amenities, services, and infrastructure.

Table 1 contains information for these high-income cities including population, land area (in square kilometres), and population density (inhabitants per square kilometre).

The cities in Table 1 vary greatly in land area and population. For example, New York City and Charlotte, North Carolina, share a similar geographic area, yet New York has ten times the number of inhabitants per square kilometre. Similarly, Athens and Vancouver are close in population, but Athens' geographic footprint is one third that of Vancouver's, making it three times as dense.

More meaningful comparisons, however, are between qualitatively similar cities. For instance, Toronto and Chicago are both located along the shore of a Great Lake, were permanently settled at similar times in history,[6] are

[3] For metropolitan cities—cities encompassing several lower-tier municipal jurisdictions within a metropolitan administration (such as London or Tokyo)—this study uses cores defined by statistical agencies (Inner London, and Tokyo's core "special wards").

[4] Much has been written on the reasons for, and benefits of agglomeration, starting with Alfred Marshall (1890). For more recent work in this field, see Rosenthal and Strange (2004), Duranton and Puga (2004), Glaeser (2011), and Angel and Blei (2016).

[5] From United Nations and national statistical agency population estimates.

[6] The town of York—Toronto's predecessor—was founded in 1793 (City of Toronto, 2017), and Fort Dearborn—Chicago's predecessor—was founded in 1803 (Andreas, 1884).

Table 1: Cities in High Income Countries, by Population Density

City	Urban population	Population year	Urban land area (km^2)	Land area year	Population density (inhabitants per km^2)
Hong Kong*	7,330,000	2016	285	2016	25,719
Paris	2,220,445	2014	105	2014	21,067
Athens	664,046	2011	39	2011	17,036
Barcelona	1,608,746	2016	101	2016	15,873
Tokyo**	9,272,565	2015	627	2015	14,796
Osaka	2,691,742	2015	225	2015	11,952
Singapore*	5,825,000	2016	518	2016	11,245
London**	3,529,300	2016	319	2016	11,054
New York City	8,537,673	2016	781	2016	10,935
Naples	970,185	2017	119	2011	8,151
San Francisco	870,887	2016	121	2016	7,171
Turin	886,837	2017	130	2011	6,821
Vancouver	631,486	2016	115	2016	5,493
Boston	673,184	2016	125	2016	5,376
Amsterdam***	841,884	2017	171	2017	4,916
Montreal***	1,700,480	2016	346	2016	4,916
Chicago	2,704,958	2016	589	2016	4,594
Philadelphia	1,567,872	2016	348	2016	4,512
Toronto***	2,730,744	2016	613	2016	4,457
Washington	681,170	2016	158	2016	4,301
Seattle	704,352	2016	217	2016	3,244
Baltimore	614,664	2016	210	2016	2,932
Mississauga	721,599	2016	292	2016	2,468
Calgary****	1,237,656	2016	586	2016	2,112
Detroit	672,795	2016	359	2016	1,872
Portland	639,863	2016	346	2016	1,851
Dallas	1,317,929	2016	883	2016	1,493
Houston	2,303,482	2016	1651	2016	1,395
Austin	947,890	2016	810	2016	1,170
Charlotte	842,051	2016	791	2016	1,065

Notes:

*Hong Kong and Singapore urban land area and population data were sourced from Demographia (2017), as both of their administrative territories include rural forested or mountainous terrain.

**Tokyo and London are metropolitan authorities, not single-tiered municipalities. As such, the 23 core special wards (*tokubetsu-ku*) of Tokyo, and the 14 local governments (13 boroughs and the City of London Corporation) that make up Inner London were selected for this study. Both of these areas were defined by national statistical agencies.

***For Amsterdam, Montreal and Toronto, statistical agancies permitted for the removal of rural geographical subdivisions. In Amsterdam, urban land area and population data exclude the rural districts (*wijken*) of Lutkemeer/Ookmeer and Waterland, both of which consist almost entirely of farmland. Montreal and Toronto estimates were produced by removing five dissemination areas not included in the Montreal and Toronto population centres by Statistics Canada (see Appendix 1 for more detail).

****Calgary urban land area and population data represent the Calgary Population Centre, as defined by Statistics Canada, and not the City of Calgary's municipal boundaries, which include farmland.

Sources: See "Data Source for Table 1" at the end of the reference list in this publication.

important financial[7] and logistical[8] hubs, and have a similar number of inhabitants. Yet, Chicago, whose population has actually decreased since the mid-twentieth century,[9] is 3.1 percent denser than Toronto.

Other important English-speaking financial and cultural centres include New York City and London. Both are well more than twice as dense, on average, as Toronto. In fact, when disaggregated into its constituent boroughs,[10] parts of New York are significantly denser than Toronto. For example, Brooklyn has roughly as many residents as Toronto or Chicago, yet the borough's land area is well under one third that of either city.[11]

Vancouver shares North America's West Coast with San Francisco. Both are geographically constrained[12] port cities with important tourism and lifestyle sectors,[13] and they occupy a similar land area. Yet San Francisco has 140,000 more residents than Vancouver, making it more than 30 percent denser. Barcelona, also an important coastal tourist[14] hub covering just over 100 square kilometres, is far denser than both San Francisco and Vancouver, at almost 16,000 inhabitants per square kilometre.

Within Canada, the former City of Toronto (the City of Toronto prior to its amalgamation with surrounding municipalities in 1998) occupied a land area similar to Vancouver (97.15 square kilometres to Vancouver's 114.97). When last included in the Canadian census in 2001, this portion of Toronto was over 26 percent denser than the City of Vancouver was in 2016 (Statistics Canada, 2001; 2016). It is clear that, despite its geographical limitations, Vancouver has more than sufficient space to accommodate a growing population and housing supply.

Montreal, Canada's largest francophone city, is less than one quarter as dense as Paris, France. While occupying under a third of Montreal's land area, Paris accommodates half a mil-

[7] In Toronto and Chicago, the finance and insurance services sectors (from the North American Industry Classification System) represent 8 and 6 percent of their respective labour forces, well above the Canadian and American national averages (US Census Bureau, 2016; Statistics Canada, 2011b). These two cities are also home to important futures (Chicago Mercantile Exchange) and stock (TMX Group) exchanges.

[8] Toronto's international airport (YYZ) is Canada's busiest, and Chicago's (ORD) is America's second busiest by total aircraft movements (Airports Council International–North America, 2016).

[9] The City of Chicago had over 900,000 fewer residents in 2016 than in the 1950 US Census (US Census Bureau, 1950; 2016a).

[10] The City of New York is divided into five county-level administrative divisions, called boroughs. These Include Manhattan (New York County), the Bronx (Bronx County), Brooklyn (Kings County), Queens (Queens County), and Staten Island (Richmond County). With the exception of Staten Island, all five boroughs are denser than any large city in Canada (US Census Bureau, 2016a; 2016b).

[11] See Appendix 2 for a summary of population densities in sub-municipal divisions.

[12] Both Vancouver and San Francisco are peninsulas and are near hilly or mountainous terrain.

[13] In Vancouver and San Francisco, the arts, entertainment and recreation, and accommodation and food services sectors (from the North American Industry Classification System) represent 13 and 12 percent of their respective labour forces, well above the Canadian and American national averages (US Census Bureau, 2016a; Statistics Canada, 2011b).

[14] Barcelona welcomed 8.2 million overnight visitors in 2016, making it the twelfth most visited city in the world (Hedrick-Wong and Choong, 2016).

lion more inhabitants and remains one of the world's most desirable cities.[15]

Calgary, Canada's third most populous municipality anchoring the country's fourth most populous metropolitan area, is qualitatively similar to the energy industry hub of Houston. The workforces of both cities include between 4 and 5 times their respective national average shares of workers in the energy sector.[16] However, Houston is far larger, geographically, than Calgary, and far less dense. In land area, Chicago is the city most similar to Calgary and accommodates more than twice as many inhabitants. Even Mississauga, Toronto's largest suburb, which—like Calgary—grew around the automobile[17] during the second half of the twentieth century, is almost 17 percent denser.

The data in table 1 and the comparison of qualitatively similar cities reveal that Canadian cities have relatively low population densities. Indeed, the densities of the five Canadian cities (from its four largest metropolitan areas) included in table 1 all fall in the bottom two thirds of the 30 cities featured. Even Vancouver, Canada's densest large municipality, is thirteenth. And despite the relatively low densities of many US cities, America's densest urban areas far outstrip Canada's.

Population density and the quality of living

Because Canada's major cities have relatively low population densities, as highlighted above, it is clear that the country's most desirable urban areas have the physical capacity to comfortably accommodate far more housing units and residents than they now have. Moreover, the inclusion of cities in table 1 that are drawn solely from other high-income nations suggests that higher population densities need not come at the expense of living standards. Building on these preliminary observations, this section further challenges perceived trade-offs between population density and urban living standards.

A first step in comparing density with living standards is to select a measure of urban quality of life. Admittedly, no single measure can fully capture the relative success of a given city. What constitutes "livability"[18] is inherently subjective, as are the many factors that people weigh in deciding whether and where to relocate. Most measures of livability, therefore, focus on specific metrics of interest to well-defined groups.

The index selected for this analysis is Mercer's annual Quality of Living Ranking. This measure incorporates data on 39 criteria including infrastructure (specifically, transportation, electricity, telecommunications, mail delivery, and water), public safety, political stability, and health considerations from more than 450 cities across 170 countries. These data come from government statistical agencies and from ques-

[15] Paris welcomed 18.03 million overnight visitors in 2016, making it the third most visited city in the world (Hedrick-Wong and Choong, 2016).

[16] In Calgary and Houston, the share of workers in the mining, quarrying, and oil and gas extraction sectors (from the North American Industry Classification System) are 4.28 and 4.67 times those in their respective countries (US Census Bureau, 2016; Statistics Canada, 2011b).

[17] Both experienced the bulk of their growth during the post-WWII period, implying low-density, car-oriented development patterns.

[18] According to American Association of Retired Persons, "A livable community is one that is safe and secure, has affordable and appropriate housing and transportation options, and supportive community features and services" (AARP, 2017).

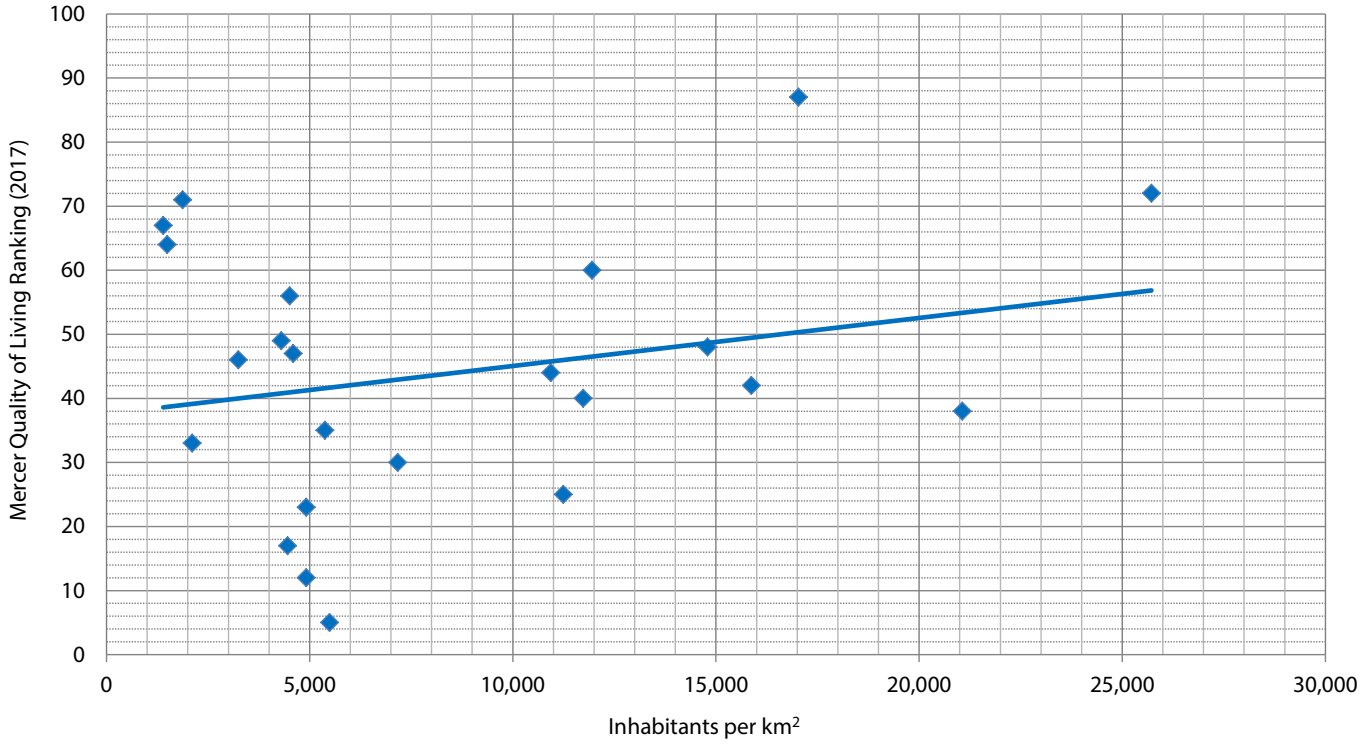
tionnaires issued to multi-national companies and expatriated professionals, as the aim of the ranking is to inform firms and workers seeking to expand or relocate in different cities around the world (Mercer, 2017b).

The Mercer Quality of Living Ranking has featured in numerous studies including Giffinger et al. (2007), Yigitcanlar (2010), and Morais et al. (2013), and remains an important, if imperfect, point of reference for international comparison.

Figure 1 includes a preliminary comparison of population densities from table 1 and Mercer's 2017 Quality of Living Ranking, where available.

Of note in Figure 1 is the difficulty in establishing a meaningful relationship between density and Mercer's Quality of Living Ranking. Cities of similar density differ greatly in Mercer's ranking. For example, Barcelona and Athens (both between 15,000 and 17,000 inhabitants per square kilometre) are 45 ranks apart on quality

Figure 1: Population Density and the Mercer Quality of Living Ranking



Notes:
i) The correlation coefficient rendered by an OLS regression is 0.0007 (meaning that, on average, for every additional 1,335 inhabitants per square kilometre, a city moves up a number on Mercer's ranking), with a p-value of 0.263.
ii) Cities that feature in Table 1 but not in Figure 1 were not included in Mercer's 2017 Quality of Living Ranking.

Sources: Mercer, 2017; and calculations by author.

of living. Similarly, Amsterdam and Philadelphia (both between 4,500 and 5,000 inhabitants per square kilometre) are 44 ranks apart. Indeed, there is a 55-rank spread among the eight cities featured with between 4,000 and 6,000 inhabitants per square kilometre. Divergences in the Mercer ranking are likely explained by factors other than population density.

Statistically, the limited sample of cities shows a very small, positive correlation coefficient of 0.0007, meaning that—on average—for every additional 1,335 inhabitants per square kilometre, a city moves up a number on Mercer's ranking (which means, qualitatively, that it moves down a rank). However, this correlation is not statistically significant (with a p-value of 0.263), reinforcing the notion that there is virtually no relationship between population density and this measure of living standards. Beyond this preliminary test, the relatively small sample of cities hinders the application of detailed statistical analysis.

Conclusion

As Canada's most desirable cities continue to grow, they face pressure not only to expand their physical footprints, but also the number of inhabitants they accommodate within existing neighbourhoods. When compared to fully urbanized municipalities in other high-income countries, Canada's largest cities are typically not as dense.

The coastal cities of San Francisco and Barcelona manage to balance high incomes with higher densities than Vancouver, at 1.31 and 2.89 times Vancouver's population density, respectively. The financial hubs of Chicago, New York, and London are 1.03, 2.45, and 2.48 times as dense as Canada's financial and media centre, Toronto. Paris is 4.29 times as dense as Montreal, and even the Toronto suburb of Mississauga is 1.17 times as dense as Calgary, Canada's third most populous municipality.

Moreover, higher densities need not come at the expense of living standards. Preliminary comparisons between cities in table 1 and Mercer's 2017 Quality of Living Ranking indicate that cities of comparable density can rank very differently in Mercer's ranking, raising important questions for future research.

As urbanization persists in Canada and abroad, it is important to understand the different ways in which cities grow. In particular, a better understanding of how cities vary in population density and how higher density might (or might not) affect living standards encourages citizens and policymakers to rethink their perceptions of urban living.

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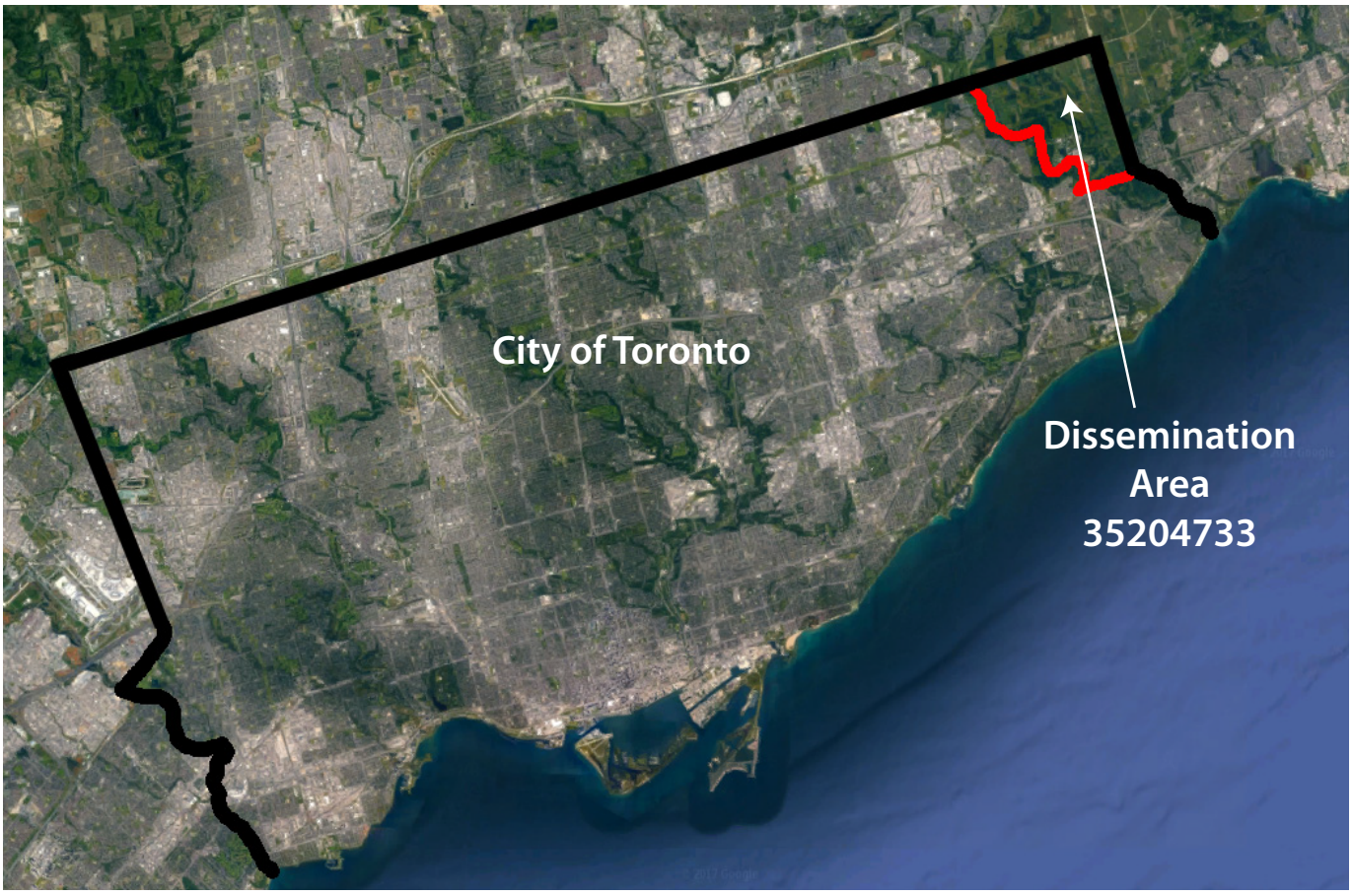
Appendices

Appendix 1: Developing a comparable sample of cities

This study took four steps to produce a broadly comparable sample of cities. First, the researcher selected cities from countries in the World Bank's "High-Income" categorization for 2017 (World Bank, 2017). Second, cities in these countries were ranked based on population (from largest to smallest) using a dataset from the United Nations Statistics Division (United Nations Statistics Division, 2017). Third, the author examined satellite imagery and land-use maps of the most populous cities to determine whether they were fully urbanized within their jurisdictional limits. Fully urbanized cities in table 1 were included; those remaining were subjected to a fourth step, in which it was determined whether statistical agencies allowed for the easy removal of rural lands and their populations from these jurisdictions.

Map A.1: Removing Rural Uses from Density Estimates in the City of Toronto



Note: The black outline in this map indicates the Toronto city limits. The red line indicates Dissemination Area 35204733, which is almost entirely congruous with the rural lands contained within the City of Toronto.

Statistics Canada, 2016.

For example, Map A.1 shows a satellite image of the city of Toronto. The green area in the city's northeast corner consists primarily of rural uses (farm fields). Indeed, this area's population density was 47 inhabitants per square kilometre in 2016, well below Statistics Canada's urban threshold of 400 per square kilometre (Statistics Canada, 2016).

Because this area is almost perfectly congruous with Dissemination Area 35204733 from the 2016 census, it was straightforward to remove its land area (17.48 square kilometres) and population (827 inhabitants) from city-wide density estimates. All cities in which similarly simple operations were possible were also included in table 1, with a hard limit of 30 cities in total—cities with fewer than 600,000 inhabitants were excluded.

Appendix 2: Population Densities in Sub-municipal Divisions

Municipality	Sub-municipal division	Sub-municipal division population	Population year	Sub-municipal division land area (km^2)	Land area year	Population density (inhabitants per km^2)
New York City	Manhattan (New York County)	1,643,734	2016	59	2016	28,012
	Brooklyn (Kings County)	2,629,150	2016	181	2016	14,541
	The Bronx (Bronx County)	1,455,720	2016	109	2016	13,366
	Queens (Queens County)	2,333,054	2016	282	2016	8,282
	Staten Island (Richmond County)	476,015	2016	151	2016	3,159
Toronto	Toronto (pre-1998 amalgamation boundaries)	676,352	2001	97	2001	6,962

Sources: Statistics Canada (2001); United States Census Bureau (2016a); United States Census Bureau (2016b).

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References

American Association of Retired Persons (AARP) (2017). Chapter 9: Livable Communities, *The Policy Book: AARP Public Policies 2017-2018*. AARP. <http://policybook.aarp.org/the-policy-book/chapter-9/s073-1.3570128>, as of December 4, 2017.

Airports Council International–North America (2016). *Airport Traffic Reports*. Web page. ACI. <http://www.aci-na.org/content/airport-traffic-reports>, as of December 4, 2017.

Andreas, Alfred Theodore (1884). *History of Chicago*. Arno Press.

Angel, Shlomo, and Alejandro M. Blei (2016). The Productivity of American Cities: How Densification, Relocation, and Greater Mobility Sustain the Productive Advantage of Larger US Metropolitan Labor Markets. *Cities* 51: 36–51.

City of Ottawa (2010). *Diversity Snapshot: Rural Residents*. City of Ottawa. <http://documents.ottawa.ca/sites/documents.ottawa.ca/files/documents/rural_2010_en.pdf>, as of December 4, 2017.

City of Toronto (2017). *Former City of Toronto Records*. Toronto Archives. <https://www1.toronto.ca/wps/portal/contentonly?vgnextoid=238e757ae6b31410VgnVCM10000071d60f89RCRD>, as of December 4, 2017.

Demographia (2017). *Demographia World Urban Areas (Built Up Urban Areas or World Agglomerations), 13th Annual Edition*. Demographia (April). <http://www.demographia.com/db-worldua.pdf>, as of December 4, 2017.

Duranton, Gilles, and Diego Puga (2004). Micro-Foundations of Urban Agglomeration Economies. *Handbook of Regional and Urban Economics* 4: 2063–2117.

Giffinger, Rudolf, Christian Fertner, Hans Kramar, and Evert Meijers (2007). *Smart Cities: Ranking of European Medium-Sized Cities*. Centre of Regional Science, Vienna University of Technology. <http://www.smart-cities.eu/download/smart_cities_final_report.pdf>, as of December 4, 2017.

Glaeser, Edward L. (2011). *Triumph of the City: How Our Greatest Invention Makes Us Richer, Smarter, Greener, Healthier, and Happier*. Penguin.

Gwartney, James, Robert Lawson, and Joshua Hall (2016). *Economic Freedom of the World: 2016 Annual Report*. Fraser Institute. <https://www.fraserinstitute.org/sites/default/files/economic-freedom-of-the-world-2016.pdf>, as of December 4, 2017.

Hedrick-Wong, Yuwa, and Desmond Choong (2016). *Global Destination Cities Index*. Mastercard. <https://newsroom.mastercard.com/wp-content/uploads/2016/09/FINAL-Global-Destination-Cities-Index-Report.pdf>, as of December 4, 2017.

Marshall, Alfred (1890). *Principles of Economics*. MacMillan. <https://archive.org/stream/principlesecono00marsgoog#page/n8/mode/2up>, as of December 13, 2017.

Mercer (2017a). *Quality of Living Rankings*. Web table. Mercer. <https://mobilityexchange.mercer.com/Portals/0/Content/Rankings/rankings/qol2017e784512/index.html>, as of December 4, 2017.

Mercer International (2017b). *Quality of Living Methodology*. Mercer International.

Morais, Paulo, Vera L. Miguéis, and Ana S. Camanho (2013). Quality of Life Experienced by Human Capital: An Assessment of European Cities. *Social Indicators Research* 110, 1: 187–206.

Rosenthal, Stuart S., and William C. Strange (2004). Evidence on the Nature and Sources of Agglomeration Economies. *Handbook of Regional and Urban Economics* 4: 2119–2171.

Statistics Canada (2001). Community Highlights for Toronto. Web page. *2001 Census*. Statistics Canada. <http://www12.statcan.gc.ca/english/profil01/CP01/Details/Page.cfm?Lang=E&Geo1=CSD&Code1=3520004&Geo2=PR&Code2=35&Data=Count&SearchText=toronto&SearchType=Begins&SearchPR=01&B1=All&Custom=>, as of December 4, 2017.

Statistics Canada (2011). Population, Urban and Rural, by Province and Territory (Canada). *2011 Census*. <http://www.statcan.gc.ca/tables-tableaux/

sum-som/l01/cst01/demo62a-eng.htm>, as of December 4, 2017.

Statistics Canada (2011b). National Household Survey (NHS) Profile: Census Subdivisions. *2011 National Household Survey*. Catalogue no. 99-004-XWE. Government of Canada.

Statistics Canada (2011c). *From Urban Areas to Population Centres*. Government of Canada. <http://www.statcan.gc.ca/eng/subjects/standard/sgc/notice/sgc-06>, as of December 4, 2017.

Statistics Canada (2016). Census Profile: Census Subdivisions. *2016 Census*. Catalogue no. 98-316-X2016001. Government of Canada.

Taylor, Zack, and John Van Nostrand (2008). *Shaping the Toronto Region, Past, Present, and Future: An Exploration of the Potential Effectiveness of Changes to Planning Policies Governing Greenfield Development in the Greater Golden Horseshoe*. Neptis Foundation. <http://www.neptis.org/sites/default/files/toronto_metropolitan_region_shaping_the_toronto_region/shaping_report_web_20080902_0.pdf>, as of December 4, 2017.

United States Census Bureau (2016a). *Community Facts*. American FactFinder, U.S. Census Bureau. <https://factfinder.census.gov/faces/nav/jsf/pages/community_facts.xhtml>, as of December 4, 2017.

United States Census Bureau (2016b). *2016 U.S. Gazetteer Files*. U.S. Census Bureau. <https://www.census.gov/geo/maps-data/data/gazetteer2016.html>, as of December 4, 2017.

United States Census Bureau (1950). *1950 Census of Population*. U.S. Census Bureau. Link from https://www.census.gov/prod/www/decennial.html, as of December 4, 2017.

United Nations, Department of Economic and Social Affairs (2014). *World Urbanization Prospects, 2014 Revision*. United Nations. <https://esa.un.org/unpd/wup/Publications/Files/WUP2014-Report.pdf>, as of December 4, 2017.

United Nations, Statistics Division (2017). *City Population by Sex, City and City Type*. UNdata. <http://data.un.org/Data.aspx?d=POP&f=tableCode%3A240>, as of December 4, 2017.

World Bank (2017). *World Bank Country and Lending Groups*. World Bank. <https://datahelpdesk.worldbank.org/knowledgebase/articles/906519#High_income>, as of December 4, 2017.

Yigitcanlar, Tan (2010). Making Space and Place for the Knowledge Economy: Knowledge-based Development of Australian Cities. *European Planning Studies* 18, 11: 1769–1786.

Data Sources for Table 1

Hong Kong

Demographia (2017). *Demographia World Urban Areas (Built Up Urban Areas or World Agglomerations), 13th Annual Edition*. Demographia (April). <http://www.demographia.com/db-worldua.pdf>, as of December 4, 2017.

France

Institut national de la statistique et des études économiques (2017). *Comparateur de territoire - Commune de Paris* (75056). <https://www.insee.fr/fr/statistiques/1405599?geo=COM-75056>, as of December 13, 2017. The area and population data come from the "état civil en géographie," as of January 1, 2017. The data are from 2014.

Greece

Hellenic Statistical Authority (2011). Administrative division 2011. *Register of Municipalities, Communes and Settlements/2011*. <http://www.statistics.gr/en/statistics/-/publication/SKA01/2011>, as of December 13, 2017. Data are from the last Census, in 2011.

Catalonia

Institut d'Estadística de Catalunya (2016). *Barcelona (080193)—Barcelonès. The municipality in figures*. <http://www.idescat.cat/emex/?lang=en&id=080193>, as of December 13, 2017.

Comparing Urban Density in Canada and Abroad

Japan

Statistics Bureau of Japan (2016). *Preliminary Counts of the Population and Households. 2015 Population Census.* <http://www.e-stat.go.jp/SG1/estat/ListE.do?bid=000001068779&cycode=0>, as of December 13, 2017. Data from the last Census, in 2015.

United Kingdom

Office for National Statistics (2016). *Resident Population. ONS Population Estimates - local authority based by five year age band.* <https://www.nomisweb.co.uk/reports/lmp/la/1967128593/report.aspx#tabrespop>, as of December 13, 2017.

Office for National Statistics (2017). *Standard Area Measurements (2016) for Administrative Areas in the United Kingdom.* <https://ons.maps.arcgis.com/home/item.html?id=a79de233ad254a6d9f76298e666abb2b>, as of December 13, 2017.

Singapore

Demographia (2017). *Demographia World Urban Areas (Built Up Urban Areas or World Agglomerations), 13th Annual Edition.* Demographia (April). <http://www.demographia.com/db-worldua.pdf>, as of December 4, 2017.

United States

U.S. Census Bureau (2016). *Annual Estimates of the Resident Population for Incorporated Places of 50,000 or More, Ranked by July, 2016 Population: April 1, 2010 to July 2016. City and Town Population Totals: 2010-2016.* <https://www.census.gov/data/tables/2016/demo/popest/total-cities-and-towns.html>, as of December 13, 2017.

U.S. Census Bureau (2016). *National Places Gazetteer Files. 2016 U.S. Gazetteer Files.* <https://www.census.gov/geo/maps-data/data/gazetteer2016.html>, as of December 13, 2017.

Italy

Istituto Nazionale di Statistica (2017). *Popolazione residente - bilancio.* <http://dati.istat.it/Index.aspx?DataSetCode=DCIS_POPORESBIL1&Lang=#>, as of December 13, 2017.

Istituto Nazionale di Statistica (2011). La superficie dei Comuni, delle Province e delle Regioni italiane al 9 ottobre 2011. *Superfici delle unità amministrative a fini statistici.* <http://www.istat.it/it/archivio/82599>, as of December 13, 2017.

Canada

Statistics Canada (2016). Census Profile: Census Subdivisions. *2016 Census.* Catalogue no. 98-316-X2016001. Government of Canada.

Amsterdam

Gemeente Amsterdam (2017). Kerncijfers wijken en stadsdelen, 1 januari 2017. *Feiten en cijfers.* <https://www.ois.amsterdam.nl/feiten-en-cijfers/>, as of December 13, 2017.

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