Victoria`s Suburban Sprawl as a Barrier to Sustainable Development

GPHY 501: Special Studies in Geography

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Executive Summary

Canada is a nation where over two-thirds of the population lives in some form of suburb (Gordon & Janzen 2013). It is important to monitor the locations of population growth within our nation as it has profound effects on our economic effectiveness, environmental sustainability, and our overall public health. The purpose of this study is to estimate Victoria's 2016 suburban population using housing density and journey-to-work transportation data to classify the Census Metropolitan Area (CMA) into *exurban*, *auto suburb*, *transit suburb*, or *active core*. Using Transportation Method 9 (Gordon 2018), it was found that 74.9% of Victoria's population lived in suburban settings in 2016, with 65.3% situated in auto suburbs at the time of the 2016 census. Victoria had Canada's highest active transportation average at 16.9%, with the second highest being Kingston at 9.5%. The population living in Victoria's active cores was 21%, a 4% increase from 2011 with only 17% active core.

Introduction

In 2011, Statistics Canada estimated the 'urban' population to be 81% based on the Stats Canada definition of 'Urban' and 'Rural' (Statistics Canada 2015). However, these classifications fail to incorporate the spectrum of '*sub*urban' development, and thus paints a false picture of Canadian urbanization. In 2013, Gordon & Janzen classified Canada as a suburban nation, with 66% of all Canadians living in some form of suburb in 2006. This is an important distinction to make, as suburban development has important impacts on social, environmental, and economic growth. The urbanization of suburban areas is a key issue in contemporary urbanism, in particular in North America where suburban, car-oriented development was prevalent in the last 60 years (Taranu,A. 2018). While urban areas are becoming more and more expensive, the urban lifestyle is becoming more and more popular, so suburban towns and developers are increasingly catering those looking for a more walkable, dense community.

This report has used the Transportation Method 9 (TM9) to classify the Census Tracts (CTs) of the Victoria CMA into four distinct categories: *active core*, *transit suburb*, *auto suburb*, and *exurban*. Dr. Gordon's research team determined this to be the best algorithm to define Canadian cities after testing the method over all Canadian CMAs with consistent results. *Active core* and *transits suburbs* represent the more 'sustainable' neighbourhoods, having high active transportation (walking and biking) averages. *Auto suburbs* and *exurban* areas represent the auto-dependant 'unsustainable' neighbourhoods or areas of 'urban sprawl'. Anomalies were checked by overlaying the

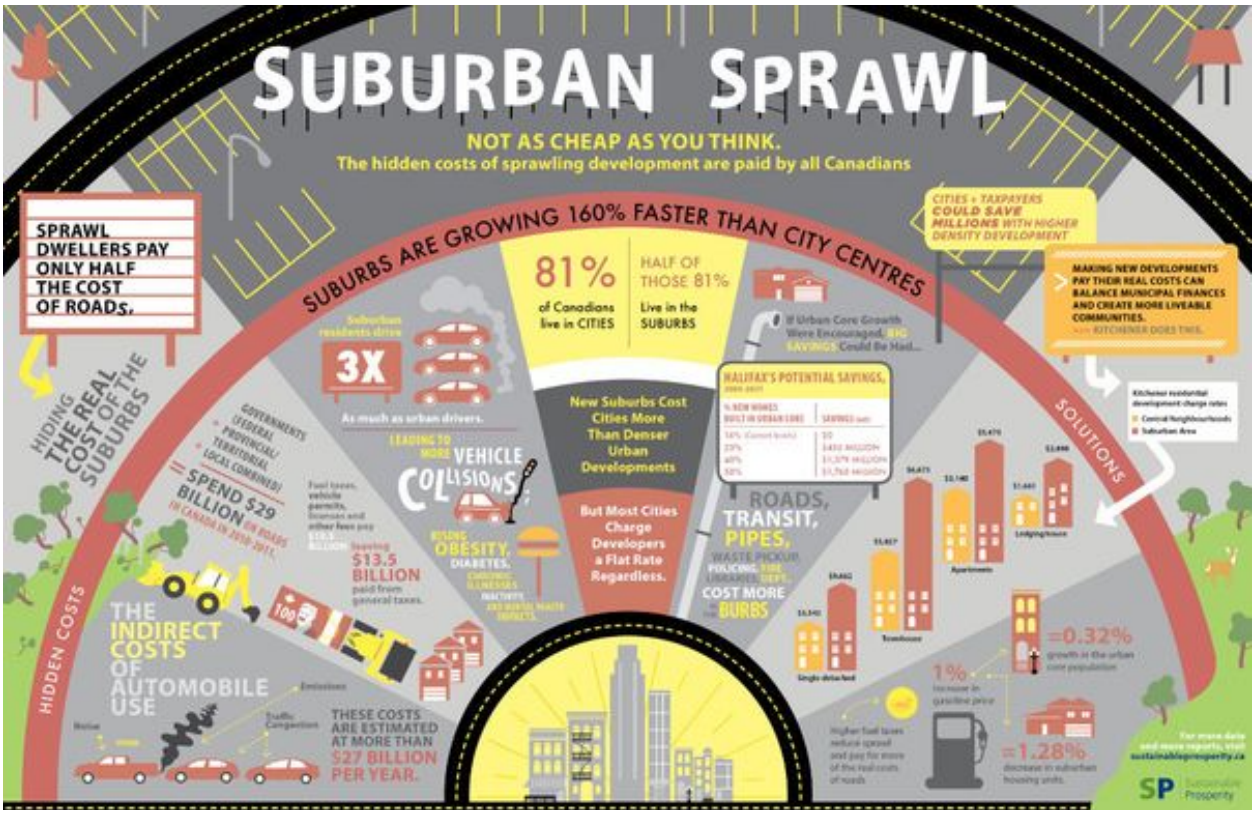
maps in Google Earth and manually examining the CTs (CTs) that appeared to be inconsistent with the classification criteria.

Why should we care?

Despite the recent condominium booms and intensification trends of downtown cores, Victorian planners should still be worried about suburban sprawl as the greatest threat to sustainable development. The increase of dwelling units in 'sustainable' neighbourhoods looks great initially but does less to balance the numbers in terms of population count. On average, a dwelling unit in Victoria's *active core* houses 1.8 residents, while a dwelling unit in an *auto suburb* contains 2.4 persons (table 6). Sprawling suburban areas are witness to higher rates of automobile use and vehicle ownership (Ewing et al. 2002). In such areas, people own more cars, drive longer hours, and commute less by public transit. Extensive automobile use leads to more air pollution and greenhouse gas emissions compared to commuting by transit, walking, or cycling. With more people commuting longer distances and living consumer lives in their single-detected homes, these suburban settings demand more transit cost, infrastructure, and loss of greenfield.

The migration of residents to the automobile-dependent suburbs has also taken a toll on human health and vitality. A study from Universities of Oxford and Hong Kong show evidence that suburban lifestyles are correlated with higher obesity rates and that walkability is no longer just an ideal (Florida 2014). Obesity is less common in densely-built areas because of amenities within easy walking distance, providing more incentive to walk to them, while densely-built environments can also de-incentivize driving because of their congestion and limited parking. The study also suggests that "a highly compact dense residential environment might act as a proxy for enhanced community social capital and support," (Sarkar et. Al 2017) thus reducing crime, improving health, spurring creativity, and encourage more civic engagement in our communities.

Furthermore, the lack of walkability has also been found to be significantly and negatively correlated with neighbourhood foreclosures, as found when examining a cities Walk Score (Gilderbloom et al 2015). There are substantial costs associated with urban sprawl, which are, ultimately, paid for by the taxpayer.



Thompson 2013: The Hidden Cost of Suburban Sprawl

Greenfield development and servicing infrastructure investments burden the city with costs that are far below the cost-benefit of the inner city (Thompson 2013). A report on suburban sprawl estimates that infrastructure of low-density development costs $1.50 per every real-estate tax dollar, meaning that large cities such as Halifax and Calgary could save upwards of $700 million and $11 Billion respectively by densifying development already in the urban core (Diamond & Thompson 2013).

Literature Review

Defining the core

The definition of *active core* has used active transportation data because of the high correlation of walkers and bikers present in an inner city. The original construction of a city had the commercial node of the city surrounded by the lower-income housing. City residents were migrating into the suburbs as the result of higher incomes, rising city crime, and industrial pollution. Higher income families were willing to pay higher transportation costs (i.e. time) for the country lifestyle. With the rise of New Urbanism, gentrification of Canadian cities has introduced desirable inner-city apartments; forcing low-income families out of the city and attracting highly educated and skilled workers (Gordon & Vipond, 2005). A study done by Peter Saunders (2017) shows that core cities are attracting educated Millennials that desire pedestrian friendly, mix-use neighbourhoods. The incoming generation's living habits are more aligned with that of city-living, valuing social time over longer commutes to suburban estates, and desiring to congregate where they work, live, and play.

Defining the suburbs

Defining the suburbs is a difficult task and has many plausible answers (Forsyth 2012). Over the years, definitions have been made based upon dwelling age, individual assessment, commuting status, income, and home ownership. Arthur Nelson describes American suburbs as "low densities spread across vast landscapes, they are dominated by one land use: the single-detached home on a large lot, dependent on the automobile, and so inefficiently developed as to rob America of economic vitality" (Grant et al 2013). Anthony Hommik notes that there also appear to be at least two types of suburbs: inner and outer (Hommik n/d). Since urban growth is a fluid process, it can therefore be reasoned that some current inner suburbs will likely be enveloped by the inner city in the future. It might then be assumed that these inner suburbs are more densely populated and therefore better served by public transit. Consequently, rates of transit usage would be higher than in outer suburbs where the automobile is likely to be more dominant. As summarized by Jackson (1985), suburban residents "commute elsewhere to work, [whereas] city residents work nearby". Based on the literature above, this study will classify suburban CTs based on auto-dominance and limited active transportation and public transit use.

Defining rural

Defining rural areas appears to be a lot simpler, as there is often a clear visual line between the uniform suburban town houses and the farmhouses that require a ten-minute walk just to see your neighbour's driveway. In general, rural areas are defined by location and density. Statistics Canada loosely defines rural as "sparsely populated lands lying outside urban areas" and more specifically where the "population is located outside centres of more than 1000 people and with densities less than 400 people per square kilometre" (Statistics Canada 1999, 226). Drawing on the findings on Chris Vandyk's (2009) Masters research in this project, Victoria's CTs with a population density <150 / km^2 will be classified as Exurban.

Victoria's Growth strategies

The purpose of the Official Community Plan (OCP) Annual Review 2016 was to provide an annual snapshot of progress towards achieving the OCP, which Council approved in July 2012. The review focused primarily on land management and development and was used to identify emerging trends and issues that may impact the OCP. The key findings of this review included the "highest amount of housing unit creation since the OCP was adopted" and a "greater vibrancy through increased number of activities in public spaces", encouraging a strong downtown core and a network of vibrant walkable villages. The three main Targets relatable to this paper observed in the OCP were:

- 90% of all housing units are within 400 metres of either the Urban Core, a Town Centre or an Urban Village by 2041
- The Urban Core accommodates a minimum of 10,000 additional residents from 2011 to 2041
- At least 70% of journey to work trips by Victoria residents take place by walking, cycling and public transit by 2041

  - OCP Annual Review 2016

The Capitol Regional District (CRD) Growth Strategy (2018) furthers the goals of the OCP and aims to keep urban settlement compact by establishing a mix-use downtown core and focusing on densification in the Urban Containment Policy Area[1] (Map 3b). The Urban Containment Policy Area aligns with many sustainable growth

[1] Urban Containment Policy Area: Includes residential, general employment, commercial and industrial lands, as well as other associated land uses. The Urban Containment Policy Area is intended to accommodate 95% of the region's new dwelling units. Within the Urban

initiatives, hoping to establish a strong mix of uses around Victoria's downtown, increasing the proportion of apartments, and focusing employment and population growth in complete communities. The plan is designed to locate a minimum of 95% of the regions' new dwelling units to 2038 with the Urban Containment Policy Area. The measurement of urban and suburban growth is paramount to coordinated and consistent decision making that focuses on how people, land use, transportation, infrastructure and technology can mitigate and adapt to change (2018 CRD Regional Growth Strategy).

Past research

This research report was inspired by Gordon et. al's (August 2018) *Still Suburban? Growth in Canadian Suburbs 2006-2016.* They begin by demonstrating that Canada is a suburban Nation, with two thirds of residents living in suburban areas. By mapping population growth for the 2006 – 2016 period, they determined that only 15% of Canadian growth was in sustainable *active cores* and *transit suburbs*, and that 67.5% of Canada's population lived in some form of suburb in 2016 (figure 1). The findings of this paper show the auto-dependence of Canadian residents, and insignificance of the inner-city condos booms as compared to the population growth in *auto suburbs* and *exurban* sectors.

Canadian Metropolitan Neighbourhood Population Distribution for 2006 and 2016

	Population in 2006[1,2]		Population in 2016		Population Growth 2006-2016		Share of Population Growth 2006-2016
Active Core	3,107,305	14%	3,372,730	14%	265,425	9%	8%
Transit Suburb	2,707,917	13%	2,923,161	12%	215,244	8%	7%
Auto Suburb	14,100,386	66%	16,523,569	67%	2,423,183	17%	75%
Exurban	1,572,913	7%	1,887,269	8%	314,356	20%	10%
TOTAL CMA[3,4]	**21,506,282**	**100%**	**24,724,257**	**100%**	**3,217,975**	**15%**	**100%**

Data source : Statistics Canada, 2016 and 2006 Census Tract data

[1] *This chart utilizes classifications from the 2016 Census and moves the population data backward*

[2] *Data for 2006 is sourced from the 2016 Census 'T9' classifcation exercise and are estimations due to census tract splits*

[3] *Lethbridge and Belleville are new CMAs for the 2016 Census but have been omitted from this chart for comparison to previous work*

[4] *While all total population figures represent true totals, they are not always a true sum of the Active Core, Transit Suburb, Auto Suburb, and Exurban figures due to 'unclassified' census tracts in several CMAs*

Figure 1: CMA classification for all of Canada, Gordon et al (2018)

Containment Policy Area, planned growth and major new transportation infrastructure investments will be encouraged to align with the settlement concept shown on Map 3(b). Municipalities will determine the precise land use, intensification, density, servicing and connectivity requirements through local planning and regulatory processes. The settlement concept is comprised of three components: Nodes, Sub-Regional Nodes, and Metropolitan Core.

This report takes a more in-depth look at the Victoria CMA growth trends in the 2006-2016 period, using the same methods used on all Canadian CMAs by Gordon et al (2018). This report will also compare Victoria's results to other mid-sized Canadian cities and Vancouver, both covered in *Still Suburban? Growth in Canadian Suburbs 2006-2016.*

Methods

This report will use two primary research methods: Census tract (CT) classification and document analysis.

Data Sources

Statistics Canada

- 2016 census tract shape file

P-Census

- 2006 CT population counts and dwelling counts (occupied and total) from Statistics Canada

CHASS

- 2016 census data from Statistics Canada; 2016 population, 2016 dwelling unit counts, 2016 occupied dwelling units, and 2016 journey to work data.

This report compared the 2006 and 2016 CT data by examining the changes in population and dwelling unit counts. 2006 Census data was extracted from P-Census and 2016 data was downloaded from the Statistics Canada 2016 long-form census. The CT shape files were also obtained from Statistics Canada and edited in ArcMap to remove all water features and grouped into the CMAs. CTs that were split from old CTs in 2016 were given estimated 2006 data by using Allen and Taylor's (2018) calculation method based on day-symmetric and built-form weights. This report then applied the Transportation Method 9 (T9), modified from the Transportation Method 8 (T8) established by the Canadian Suburbs research program (Gordon & Janzen, 2013), to classify each of Victoria's CTs as outlined below:

- *Exurban* areas are defined as areas with gross population density less than 150 people per square kilometre.
- *Auto Suburbs* are defined as CTs with a gross population density greater than 150 people per square kilometre, transit use less than 150% of the metro average, and active transit less than 150% of the metro average.

- *Transit Suburbs* are defined as CTs with transit use greater than 150% of the metro average for journey to work, active transit less than 150% of the metro average, and transit use at greater than 50% of the national average and 150% of the metro average.
- *Active Cores* are defined as CTs with active transit greater than 150% of the metro average for the journey to work and greater than 50% of the national average.

(Gordon & Janzen, 2013).

Using the updated T9 method, the floors for each of the classifications were calculated using the CMA data[2]. *Exurban* was classified first to be any CT with a population density less than 150 people per km^2. The floor for *active core* was calculated to be 150% of the average CMA active transportation. If the corresponding number was higher than 50% of the national CMA average, the CMA floor would be used. If not, the national CMA floor would be used (figure 2). Any CT over the active transportation floor would be classified as '*active core'*. This floor normalizes the data and allows for national comparisons. It also prevents anomalous classifications where local CMA development and behaviour established abnormally low thresholds.

	Exurban	Active Transportation		Public Transit	
	Density	CMA data	National Average	CMA data	National Average
Average Share		16.91%	6.89%	10.89%	16.25%
Exurban threshold	<150 ppl / km^2				
Active Core Floor (higher value used)		**25.37%**	10.34%		
Transit Suburb Floor (higher value used)				**16.34%**	8.13%

*National Average Floor must be at least 50% higher than the national average for active cores, and must exceed 50% of national average for transit suburb (see Notes 2 & 3 in Gordon & Janzen [2013])

Figure 2: calculations for Victoria CMA active and public transit floors

Compared to most other Canadian CMAs, Victoria has achieved more sustainable results. With a 10.3% walking average, and a 6.6% biking average, it has gained bragging rights as the CMA with the highest proportion of active transportation in the journey to work (figure 3).

[2] The T8 method first calculated the percent of active transit / public transit for each CT, and then averaged all the results for the whole CMA * 1.5 to determine the CMA floors. In theory, this should make little difference to the results as all CTs are defined as being between 5000 and 8000 people and thus equal weighting would present little different. In practice however, the CTs may range from 5 to 10,000 residents. In this case, using equal weighting for all the CTs produces an inaccurate average. The average of the total CMA active transpiration use divided by total number of commuters and the total average public transit use to calculate the floors for the *active core* and *transit suburbs*.

Walking and Biking Across Canada

2016 Rank (of 33)	CMA	Walking (%)		Cycling (%)		Active Transportation total (%)	
		2006	2016	2006	2016	2006	2016
1	Victoria	10.4	10.3	5.6	6.6	16.0	16.9
2	Kingston	9.6	7.6	2.4	1.9	12.0	9.5
3	Halifax	10.1	8.2	1.0	1.3	11.1	9.5
4	Vancouver	6.3	6.7	1.7	2.3	8.0	9.1
5	Ottawa-Gatineau	6.8	6.3	2.1	2.4	8.9	8.7
9	Montréal	5.7	5.2	1.6	2.0	7.3	7.2
National CMA average		**5.7**	**5.3**	**1.4**	**1.6**	7.1	6.9
11	Toronto	4.8	5.2	1.0	1.4	5.8	6.7
14	Winnipeg	6.0	4.6	1.7	1.7	7.7	6.2
15	Calgary	5.4	4.7	1.3	1.5	6.7	6.2
27	Edmonton	5.1	3.7	1.1	1.0	6.2	4.7

Figure 3: Walking and biking in The Journey to work across Canada
Source: Statistics Canada

Using the Victoria CMA data, the Victoria *active core* floor was calculated as *((CMA total commuters using active transit) / (Total CMA commuters)) *1.5*

Active core floor T9 = 28 885/ 170 830 = 16.9% x 1.5 = 25.37%

Since 25.37% is over the national floor of 10.34% [3], the Victoria CMA active floor is used to classify the Victoria CMA (figure 1).

A similar method was used to classify the *transit suburbs*, using instead the average public transit use data to calculate the floor.

Transit suburb floor T9 = 18 610 / (170 830) = 10.89% * 1.5 = 16.34%

[3] 6.89% * 1.5 = 10.34%

All remaining CTs not meeting the standard for *exurban*, *active core*, or *transit suburb* are classified as '*auto suburb*' (using the method outlined by Gordon & Janzen, 2013). Any CTs without journey to work data or determined by visual analysis to be significantly unpopulated are changed to '*unclassified*'. This may include industrial yards, First Nation reserves, and parks.

Mapping

Once classified, the Excel worksheets were imported into ArcMap and the data was joined with the corresponding CT, using the FID number as the unique identifier. Using Google Earth and Google Maps to verify the results, Geographic Information System (GIS) mapping techniques were used to create final classification maps available to overlay on satellite imagery and compare with previous research results. Any anomalies found on the transportation map where CT classification seemed to differ from the overall pattern were checked by overlaying the map layers in Google Earth. These anomalies are discussed in the Anomalies and Limitations section below.

Anomalies and Limitations

CT 180.05 is situated in the North of the CMA, along Patricia Bay and is, oddly, an *active core* surrounded by *auto suburbs*. The 29 HA plot was home to a mere 94 people in 2016, and so it is unclear as to how it become its own CT. Because of the 10 people (66.7%) using active transport, the classification still stands but is an illogical placement.

122.00 and 121.01 are both *transit suburbs* surrounded by *auto suburbs* in the area of Gordon Head. This anomaly can be explained by the adjacency to both the University of Victoria and Camosun College, and the higher rate of student commuters in the area.

150.03 is an IRI and despite visual evidence of population, no census data is available as of 2016 and has therefore been classified as '*unclassified*'.

Outlying communities

The classification method used in this study is based upon local levels of active transportation and public transit. Since the Victoria region scores highly on both counts, the suburban municipalities must reach a higher threshold for *active core* and *transit suburb* than many other mid-sized cities. Because of this, outlying towns in the Victoria CMA such as Sidney, Colwood, and Sooke all appear to be *auto suburban* with no *active core*, despite being well over the national active floor of 10.34%.

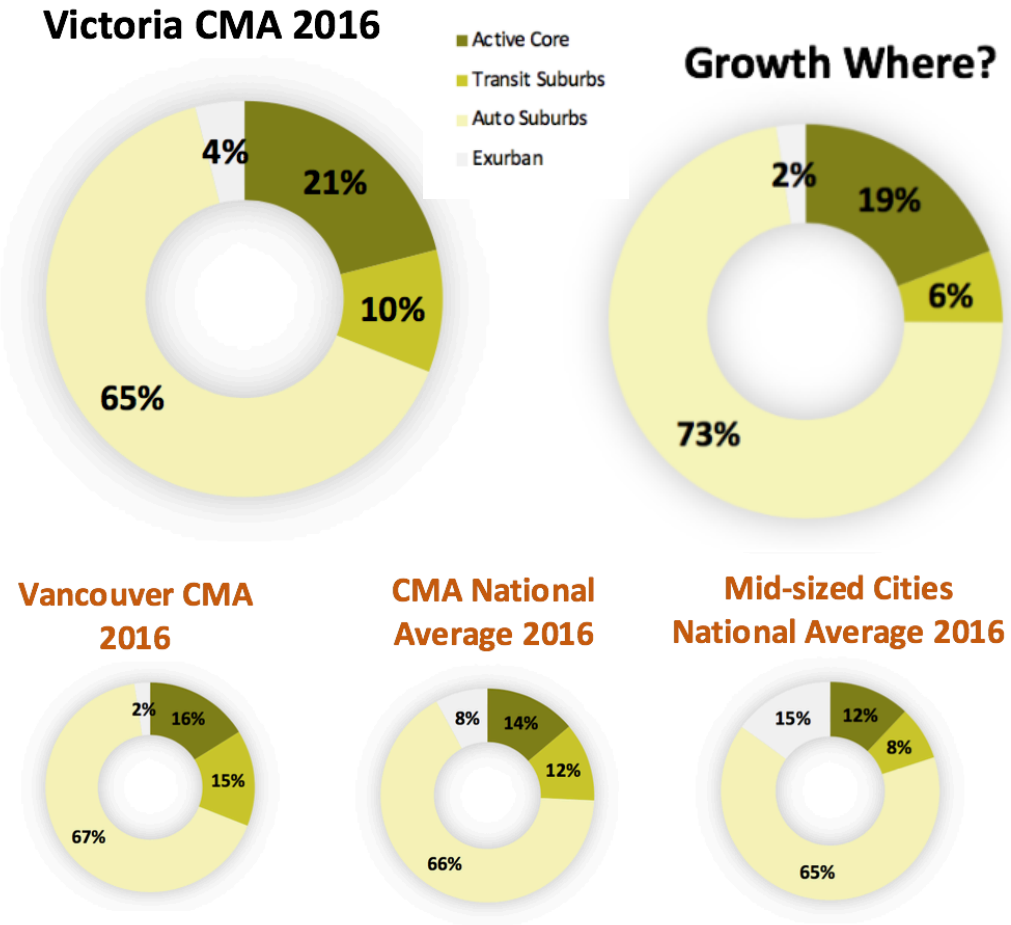
We might expect that the downtown core of Sidney, CT 170.00, to be an *active core*, yet it is classified as an *auto suburb*. This is in part due to the size of the CT, as it spans a great portion of Sidney's residential sector surrounding the downtown. However, the core of Sidney has sparse mix use development, and minimal public transit, and an abundance of public parking, thus promoting use of personal vehicle travel. So perhaps the *auto suburb* classification should not be surprising.

Downtown Sidney, 4th Street & Sidney Ave., Google Earth street view 2018

Similarly, Sooke (CT 156.06) has little to no mixed development and a very auto-dependent centre. Moreover, the CT covers the whole of the Sooke area, (except for CT 165.05 in the South-West) that forces the classification to *auto suburb.* The 285 active transport persons and 470 public transit users are likely all congregated near the downtown sector but get outnumbered by the 3965 drivers of the CT's suburbs. Additionally, CT 156.06 stretches over to the West corner of East Sooke, providing a plot of *auto suburban* classification in an area with hardly any residents.

Main intersection in Sooke, Sooke Road & Otter Point Road, Google Earth street view, 2018

Analysis



Graph 1: classification distributions for Canadian cities using data retrieved from Gordon et al 2018

Using the 2016 classification, the Victoria CMA was 21% *active core* and 65% *auto suburb*. 19% (7,222) of Victoria's growth over the 10-year period occurred in *active cores*, while 73% (27,274) occurred in *auto suburbs*. In comparison to other mid-sized Canadian cities, Victoria has almost double the population (21% to 12%) living in *active cores* and 11% less than the average *exurban* area (15%). This is unusual for mid-sized cities, as the exurban population surrounding them is not exposed to the longer and slower commute found in larger metropolitan areas, and thus often have more exurban residents. When looking at other Canadian mid-sized cities, the exurban sprawl is often in the form of farmland surrounding the cities suburbs. Victoria's geographical location, surrounded by a mountain range and the Juan De Fuca Strait, provides a physical barrier to restrict exurban areas from spreading as much as they do on the mainland.

Classification

Map 1 shows the Victoria CMA classified using the T9 method. The Census Tracts classified as *active core* are highly clustered around Victoria's downtown sector (map 2). This aligns very well with the Metropolitan centre in the 2018 CRD settlement concept classifications (map 3B) as well as the visually identifiable areas as seen on Google Earth Street view.

Using the Transportation Method 9 developed by the research team, there are two main ways to analyze the growth data, each of which will be further discussed. The CT classification changes over the years depending on the census data, and therefore the data can be examined by freezing the classifications as they were at 2006 or looking at them as they are most recently in 2016. A third option would be to examine the changes with 2006 data classified as it was in 2006 and 2016 data classified as it was in 2016. However, this method provides challenges as it provides no common ground for comparison due to the difference in CT classification, and therefor the growth numbers will be highly affected by classification changes.

2006 classification looking forwards

	Moving Forward -->		2016 CTDataMaker data using 2006 T9 classifications				
Victoria	**2006 Population**	**2006 Population (%)**	**2016 Population**	**2016 Population (%)**	**Population Growth 2006-2016**	**% Population Growth 2006-2016**	**% of Total Population Growth 2006-2016**
Active Core	70,775	21.4%	76,855	20.9%	6,080	8.6%	16.2%
Transit Suburb	29,579	9.0%	32,010	8.7%	2,431	8.2%	6.5%
Auto Suburb	216,273	65.5%	244,565	66.5%	28,292	13.1%	75.2%
Exurban	13,508	4.1%	14,340	3.9%	832	6.2%	2.2%
Total	**330,135**		**367,770**		**37,635**	**11.4%**	

Table 2: 2006 Classifications used in both 2006 and 2016

By retrieving 2006 journey to work census data and classifying it using T9, we can examine the growth patterns according to the development as it progressed over the years. As seen above (table 2), 16.2% of Victoria's growth was in the pre-existing *active cores*, but a 75.2% increase in the unsustainable *auto suburbs*. In this case however, the distribution of total population living in active cores actually decreased by 0.5% and increased by 1% in *auto suburbs*.

2016 classification looking backwards (map 2)

	2016 CTDataMaker using new 2016 Classifications		<-- Moving Backward				
Victoria	**2006 Population**	**2006 Population (%)**	**2016 Population**	**2016 Population (%)**	**Population Growth 2006-2016**	**% Population Growth 2006-2016**	**% of Total Population Growth 2006-2016**
Active Core	70,147	21.2%	77,369	21.0%	7,222	10.3%	19.2%
Transit Suburb	33,215	10.1%	35,451	9.6%	2,236	6.7%	5.9%
Auto Suburb	213,004	64.5%	240,278	65.3%	27,274	12.8%	72.5%
Exurban	13,769	4.2%	14,672	4.0%	903	6.6%	2.4%
Total	**330,134**		**367,770**		**37,636**	**11.4%**	

Table 3: 2016 Classification in both 2006 and 2016

By using the population values in 2016 classification, the story shows an even higher growth in *active core* areas, due to more CTs in 2016 being classified as *active cores*. This analysis shows that over the last 10 years, the population grew by 8.6% in the CTs that were *active core* in 2006 (table 2), for an overall 10.3% growth rate in the *active core* CTs identified in the 2016 classification including the 2016 classifications (table 3). This shows a successful densification and use of active transportation in more sectors, and the continued improvement of mix-use areas. An impressive 25.1% of Victoria's overall growth was in the sustainable *active cores* and *transit suburbs*, as compared to the national CMA average (15%). A total of 30.6% of the population lives in these sustainable CTs, which is over the CMA average of 26% and mid-sized city[4] average of 20% (graph 1). Victoria has out-done larger cities such as Toronto (27%) and is almost on par with Vancouver and Montreal at 31% (Gordon et al 2018).

Population Change (map 4)

The 2018 CRD growth strategy has predicted the greatest growth areas from 2011 to 2038 to be Saanich, Colwood, Langford and Sooke (Appendix, table 1: *Population, dwelling unit and employment projections*), aligning with the 2006-2016 results that show the largest growth areas (table 4).

[4] For this purpose, mid-sized cities include all Canadian CMAs that are not Toronto, Montreal, Vancouver, Calgary, Ottawa, Edmonton, Quebec Winnipeg or Hamilton.

Neighbourhood	GEOUID 2016	2016 Population	2011 Population	2006 Population	Population change 06-16	Population change % 06-16	Population Density per sqKm
Happy Valley	9350154.02	7,720	5,353	3,701	4,019	**108.6%**	565.8
Bear Mountain	9350151.03	10,030	8,791	6,245	3,785	**60.6%**	600.1
Langford Lake	9350151.02	9,363	7,803	6,336	3,027	**47.8%**	1465.3
Sooke	9350156.06	10,393	8,903	7,372	3,021	**41.0%**	424.3
Downtown	9350010.00	9,207	7,971	7,001	2,206	**31.5%**	4961.5
Mill Hill	9350151.04	8,229	7,281	6,177	2,052	**33.2%**	2529.4
Colwood & Braemar Height	9350154.01	9,277	8,647	7,478	1,799	**24.1%**	1049.2
Victoria West	9350011.00	7,669	6,806	6,023	1,646	**27.3%**	4758.3
Thetis Lake & View Royal	9350150.02	6,563	5,794	5,178	1,385	**26.7%**	526
Burnside	9350012.00	5,968	5,277	4,673	1,295	**27.7%**	3532

Neighbourhood	GEOUID 2016	Total Dwelling Units 2016	Total DU 2006	Total DU change	Total DU change %	Occupied DU 2016	Occupied DU 2006	Occupied DU change	Occupied DU change %	Classification
Happy Valley	9350154.02	3041	1,475	1,566	**106.2%**	2916	1,381	1,535	111.2%	Auto Suburb
Bear Mountain	9350151.03	4243	2,486	1,757	**70.7%**	3897	2,337	1,560	66.8%	Auto Suburb
Langford Lake	9350151.02	4129	2,675	1,454	**54.4%**	3964	2,573	1,391	54.1%	Auto Suburb
Sooke	9350156.06	4306	2,979	1,327	**44.5%**	4045	2,825	1,220	43.2%	Auto Suburb
Downtown	9350010.00	6523	4,546	1,977	**43.5%**	5570	4,169	1,401	33.6%	Active Core
Mill Hill	9350151.04	3494	2,489	1,005	**40.4%**	3402	2,363	1,039	44.0%	Auto Suburb
Colwood & Braemar Height	9350154.01	3823	2,840	983	**34.6%**	3622	2,716	906	33.4%	Auto Suburb
Victoria West	9350011.00	4484	3,455	1,029	**29.8%**	4162	3,163	999	31.6%	Active Core
Thetis Lake & View Royal	9350150.02	2505	1,934	571	**29.5%**	2428	1,834	594	32.4%	Auto Suburb
Burnside	9350012.00	3195	2,726	469	**17.2%**	3049	2,584	465	18.0%	Active Core

Table 4: Top 10 Growth Census Tracts

However, most of these areas highlighted as large growth areas are classified as *auto suburbs*, presenting a concern for increase in suburban sprawl. As shown in *Map 4: Victoria Population Change, 2006 - 2016* there are a few high growth CTs in the downtown area, but the majority are large CTs in the suburban and outlying communities. The greatest auto-suburban population growth areas are: Happy Valley (doubled from 3,701 to 7,720), Bear Mountain, Langford Lake, and Sooke inner city. The downtown core, Victoria West, and Burnside *active core* areas all have population growth over 1000.

Neighbourhood	GEOUID 2016	2016 Population	2011 Population	2006 Population	Population change 06-16	Population change % 06-16	Population Density per sqKm
Oak Bay	9350101.00	3,178	3,185	3,251	-73	**-2.2%**	3039.7
Oak Bay S	9350100.00	3,908	3,902	3,981	-73	**-1.8%**	1559.3
Metchosin	9350155.04	4,708	4,803	4,779	-71	**-1.5%**	66.2
Hillside- Quadra	9350013.01	4,539	4,459	4,601	-62	**-1.3%**	5859.8
Harris Green & Fernwood	9350008.00	3,486	3,316	3,540	-54	**-1.5%**	7015.5
Cheanuh Marina	9350155.03	129	324	148	-19	**-13.0%**	49

Neighbourhood	GEOUID 2016	Total Dwelling Units 2016	Total DU 2006	Total DU change	Total DU change %	Occupied DU 2016	Occupied DU 2006	Occupied DU change	Occupied DU change %	Classification
Oak Bay	9350101.00	1835	1,833	2	**0.1%**	1728	1,718	10	0.6%	Auto Suburb
Oak Bay S	9350100.00	1725	1,698	27	**1.6%**	1626	1,631	-5	-0.3%	Auto Suburb
Metchosin	9350155.04	1932	1,815	117	**6.5%**	1818	1,717	101	5.9%	Exurban
Hillside- Quadra	9350013.01	2337	2,412	-75	**-3.1%**	2204	2,296	-92	-4.0%	Active Core
Harris Green & Fernwood	9350008.00	2099	2,112	-13	**-0.6%**	2003	1,970	33	1.7%	Active Core
Cheanuh Marina	9350155.03	54	56	-2	**-4.0%**	43	53	-10	-19.2%	Exurban

Table 5: Tracts with population decline

The census tracts with population decline (table 5) did not surpass a loss of 100. The two *active cores* also had a small dwelling unit decline, while the population loss in the other census tracts may be either maturing neighbourhoods with children leaving or family homes being converted to student housing[5].

Dwelling units

If we look at the change in dwelling units, a slightly different story will be told (table 6). It can be seen that there is a higher growth rate in *active core* dwelling units than with the population. Similarly, there is lower growth in the *auto suburbs* dwelling units. This can be understood when one considers the average number of persons living in a downtown apartment versus a suburban townhouse.

Victoria	2006 Total Dwelling Units	2006 Total Dwelling Units (%)	2016 Total Dwelling Units	2016 Total Dwelling Units (%)	Total Dwelling Unit Growth 2006-2016	% Total Dwelling Unit Growth 2006-2016	% of Total Dwelling Unit Growth 2006-2016
Active Core	40,982	26.6%	45,212	26.2%	4,230	10.3%	22.8%
Transit Suburb	16,097	10.5%	16,945	9.8%	848	5.3%	4.6%
Auto Suburb	90,978	59.1%	103,828	60.2%	12,850	14.1%	69.3%
Exurban	5,953	3.9%	6,574	3.8%	621	10.4%	3.3%
Total	**154,010**		**172,559**		**18,549**	**12.0%**	

Table 6: 2016 classification used in both 2006 and 2016, Dwelling unit counts

By calculating population / occupied dwelling units, we can determine the average persons per dwelling unit in each type of classification (table 7).

Classification	Average number of persons per household
Active Core	1.8
Transit Suburb	2.2
Auto Suburb	2.4
Exurban	2.5

Table 7: persons per household ratio 2016

Since there is a higher average population per unit in *auto suburbs* and *exurban* areas, it can be realized that new units in these communities will have a higher demand for human services such as schools and health care. For every downtown apartment suite, 1.3 times the numbers will be moving into a new townhouse. Map 5 outlines the higher

[5] In the 2016 long form census, a dwelling unit completely occupied with students is listed as 'unoccupied'. During the research project, this caused some data discrepancies in university towns such as Kingston, where a neighborhood on paper seemed to undergo mass decline, when in fact it was being overrun by the student population.

population associated with the dwelling units in the suburban regions. The dwelling unit map shows the highest concentration clustered around the City of Victoria, whereas the population map shows the greater spread of higher numbers throughout the CMA. Thus when planning for human sustainability, it is best to focus on population numbers and not dwelling units.

City of Victoria versus Victoria suburbs

When comparing the results of this report to the goals of the CRD Regional Growth Strategy (2018) and the Official Community Plan Annual Review (2016), there is questionable success. The Urban Containment Area outlined by the CRD (map 3A) contains not only the *active cores* and *transit suburbs*, but also the majority of the *auto suburbs*. The goals of achieving 95% of new dwelling units within the Urban Containment Policy Area by 2038 is well on track with and 96.7% of growth in *active cores*, *transit suburbs* and *auto suburbs* in 2016 (table 6). However, when looking at the City's OCP, the municipal boundaries only include the inner core of the CMA. By breaking down our results into 'City of Victoria' and 'Victoria suburbs', we can compare the growth patterns. By comparing with the municipal OCP boundaries, the City of Victoria was determined to be CTs 001.00 to 014.02.

Victoria City	2006 Population	2006 Population (%)	2016 Population	2016 Population (%)	Population Growth 2006-2016	% Population Growth 2006-2016	% of Total Population Growth 2006-2016
Active Core	70,038	89.7%	77,275	90.1%	7,237	10.3%	93.6%
Transit Suburb	4,462	5.7%	4,610	5.4%	148	3.3%	1.9%
Auto Suburb	3,557	4.6%	3,907	4.6%	350	9.8%	4.5%
Exurban	0	0.0%		0.0%	0	0.0%	0.0%
Total	**78,057**		**85,792**		**7,735**	**9.9%**	

Table 8: 2016 T9 classification, population growth in Victoria City

Victoria Suburbs	2006 Population	2006 Population (%)	2016 Population	2016 Population (%)	Population Growth 2006-2016	% Population Growth 2006-2016	% of Total Population Growth 2006-2016
Active Core	109	0.0%	94	0.0%	-15	-13.6%	0.0%
Transit Suburb	28,753	11.4%	30,841	10.9%	2,088	7.3%	7.0%
Auto Suburb	209,447	83.1%	236,371	83.8%	26,924	12.9%	90.0%
Exurban	13,769	5.5%	14,672	5.2%	903	6.6%	3.0%
Total	**252,077**		**281,978**		**29,901**	**11.9%**	

Table 9: 2016 T9 classification, population growth in Victoria suburbs

The growth within the city was 7,734 new residents, 95.5% of which was sustainable (table 8) in *active cores* and *transit suburbs*. In the suburbs however, only 7.0% of the 29,901 population growth was sustainable (table 9) in comparison to Vancouver's suburbs at 16.7% sustainable growth (table 10).

City of Vancouver	2006 Population		2016 Population		2006-2016 Population Growth		Share of Population Growth
Active Core	269,015	46.6%	310,311	49.0%	41,296	15.4%	73.9%
Transit Suburb	181,113	31.4%	193,382	30.5%	12,269	6.8%	22.0%
Auto Suburb	127,119	22.0%	129,445	20.4%	2,326	1.8%	4.2%
Exurban	-	-	-	-	-	-	-
Total	**577,247**		**633,138**		**55,891**	**9.7%**	

Vancouver Suburbs	2006 Population		2016 Population		2006-2016 Population Growth		Share of Population Growth
Active Core	66,913	4.4%	86,765	4.7%	19,852	29.7%	6.7%
Transit Suburb	140,539	9.2%	169,923	9.3%	29,384	20.9%	10.0%
Auto Suburb	1,279,416	83.3%	1,514,074	82.7%	234,658	18.3%	79.6%
Exurban	47,757	3.1%	58,658	3.2%	10,901	22.8%	3.7%
Total	**1,535,553**		**1,830,293**		**294,740**	**19.2%**	

Table 10: Vancouver population growth inner city and suburbs, 2016 T9 classification, Gordon et al 2018

Similarly, the dwelling unit growth in the city was 97.6% sustainable (table 11), but only 5.4% sustainable in the suburbs (table 12).

Victoria City	2006 Total Dwelling Units	2006 Total Dwelling Units (%)	2016 Total Dwelling Units	2016 Total Dwelling Units (%)	Total Dwelling Unit Growth 2006-2016	% Total Dwelling Unit Growth 2006-2016	% of Total Dwelling Unit Growth 2006-2016
Active Core	40,936	91.4%	45,172	91.8%	4,236	10.3%	95.6%
Transit Subu	2,080	4.6%	2,168	4.4%	88	4.2%	2.0%
Auto Suburb	1,767	3.9%	1,872	3.8%	105	5.9%	2.4%
Exurban	0	0.0%	0	0.0%	0	0.0%	0.0%
Total	**44,783**		**49,212**		**4,429**	**9.9%**	

Table 11: 2016 T9 classification, dwelling unit growth in Victoria City

Victoria Suburbs	2006 Total Dwelling Units	2006 Total Dwelling Units (%)	2016 Total Dwelling Units	2016 Total Dwelling Units (%)	Total Dwelling Unit Growth 2006-2016	% Total Dwelling Unit Growth 2006-2016	% of Total Dwelling Unit Growth 2006-2016
Active Core	46	0.0%	40	0.0%	-6	-13.1%	0.0%
Transit Suburb	14,017	12.8%	14,777	12.0%	760	5.4%	5.4%
Auto Suburb	89,211	81.7%	101,956	82.7%	12,745	14.3%	90.3%
Exurban	5,953	5.5%	6,574	5.3%	621	10.4%	4.4%
Total	**109,227**		**123,347**		**14,120**	**12.9%**	

Table 12: 2016 T9 classification, dwelling unit growth in Victoria suburbs

The OCP Annual Review outlining that at least 70% of journey to work trips by Victoria residents take place by walking, cycling and public transit by 2041. The 2016 Victoria City public transit use was 14.3% and active transit use was 34.4%, totalling 48.7% (table 13). So, the City of Victoria is only 22% under the its ambitious 2041 goal.

	Total communters	Active transportation users	Active transit %	Public Transit users	Public transit %
Victoria City	42,965	14,800	34.4%	6,145	14.3%
Victoria Suburbs	127,895	14,085	11.0%	12,470	9.8%
total	170,860	28,885	16.9%	18,615	10.9%

Table 13: Active transit and public transit use, city and suburbs, 2016

Conclusion

Although the City of Victoria is growing in the sustainable a*ctive cores* and *transit suburbs*, if the metropolitan area is to reach its sustainability objectives it must also focus on building more sustainable suburban regions. The CRD can be happy that it is meeting its goal of having 95% of new dwelling units within the Urban Containment Policy Area, but unfortunately 74.6% of the total dwelling unit growth (table 6) is in unsustainable *auto suburbs* and *exurban* areas. The suburban areas outside of the City of Victoria account for 76% of total dwelling unit growth[6] from 2006-2016, containing 3.3 times the population as the city (table 8 & 9). Within the suburban area, only 5.4% of dwelling unit growth (table 12) is in the sustainable *transit suburbs.* Sidney and Sooke are examples of suburban towns that must be developed in a less auto-dependant manner if the region's sustainability objectives are to be met during future periods of suburban growth. If the current trends of continue, the Victoria CMA will become less sustainable and more suburban.

[6] Dwelling unit growth in Victoria suburbs (table 12)/ Total dwelling unit growth (table 6) = 14120 / 18549 = 76%

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Appendix

Map 3b: Settlement concept- detail

Map 1: Victoria T9 classification, 2016

Map 2: Victoria population distribution and T9 classification

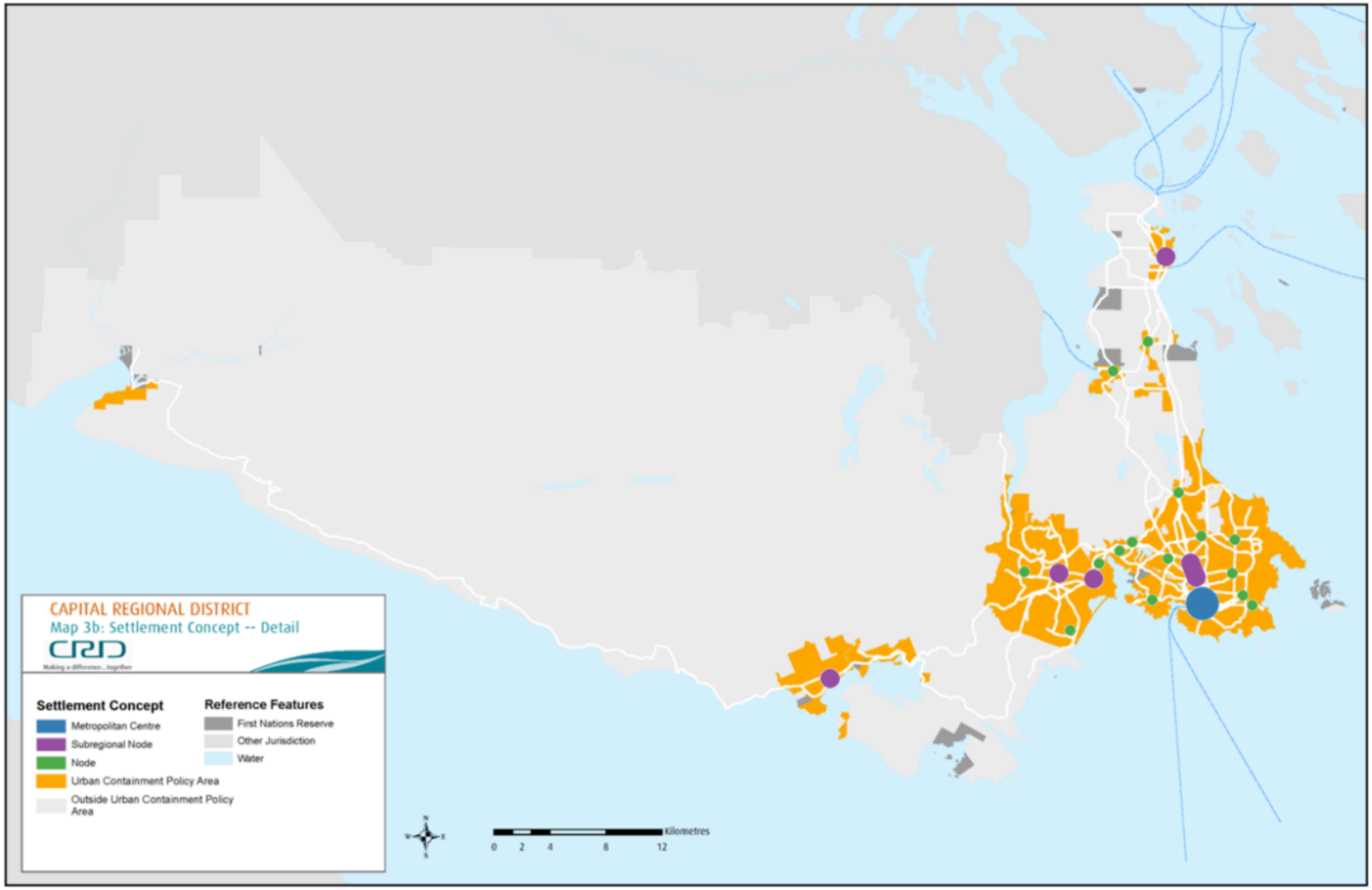
Map 4: Population change in Victoria CMA 2006 – 2016

Table 1: Population, dwelling unit, and employment projections

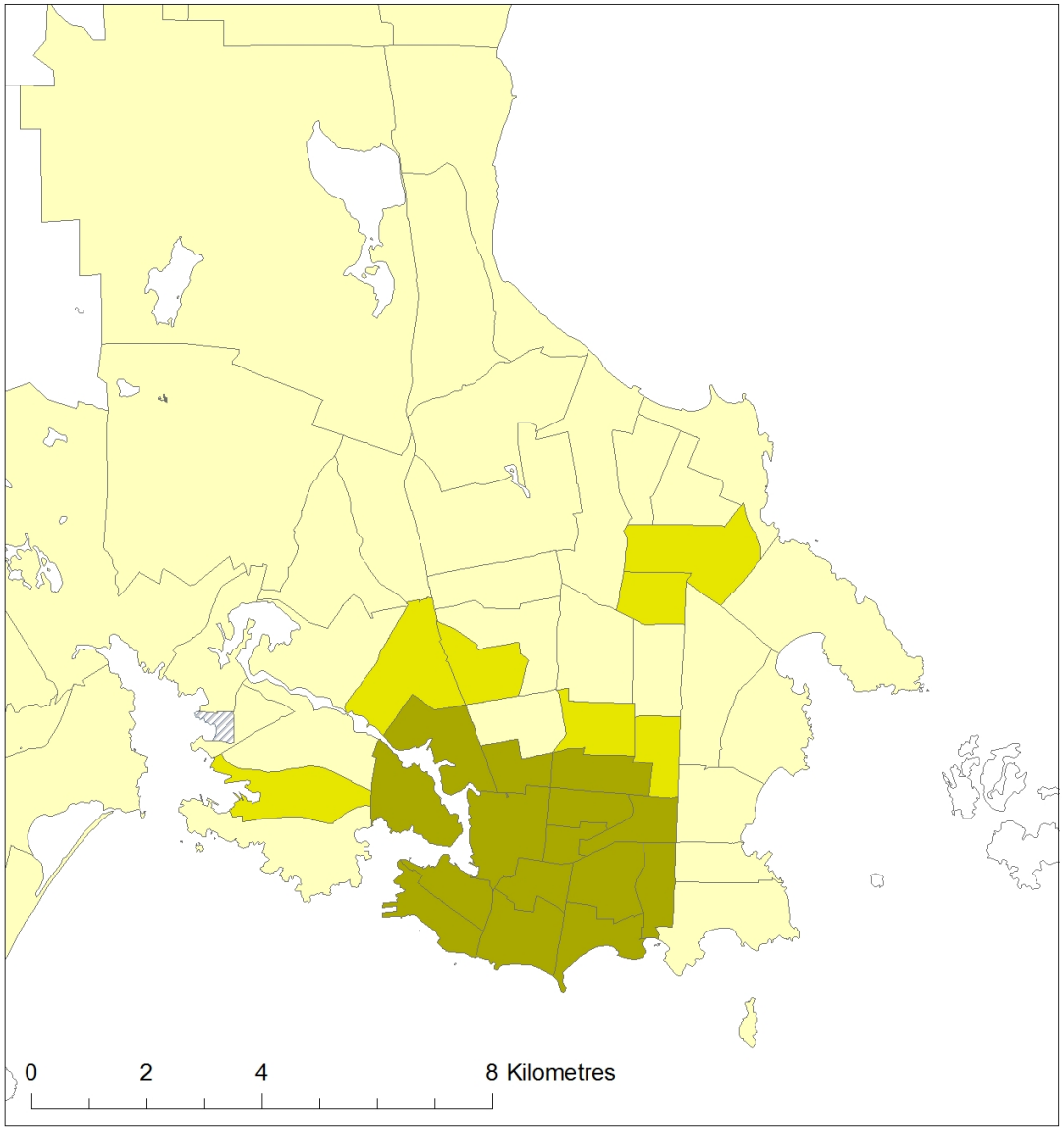
Map 5: Victoria Population and dwelling unit count 2016

Appendix

MAP 3(B): SETTLEMENT CONCEPT – DETAIL



Map 3b: Settlement Concept plan, 2018 CRD Regional Growth Strategy



Victoria

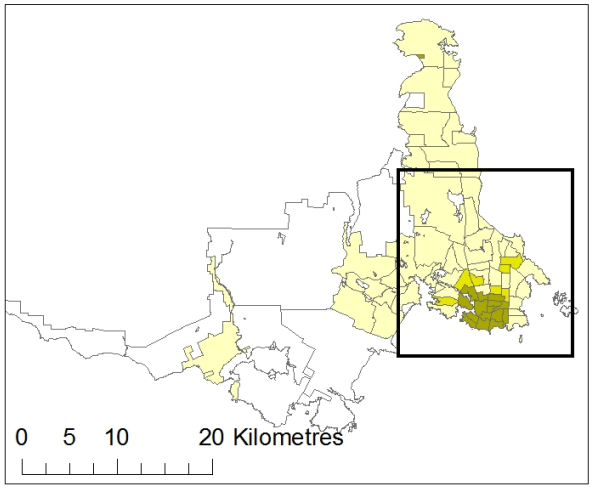
Transportation T9 Method

Legend

- Active Core
- Transit Suburb
- Auto Suburb
- Exurban
- Unclassified

Active Core:	21%
Transit Suburb:	10%
Auto Suburb:	65%
Exurban:	4%

Census Tracts and Population Data: 2016 Census
Census Tract Classification: 2016



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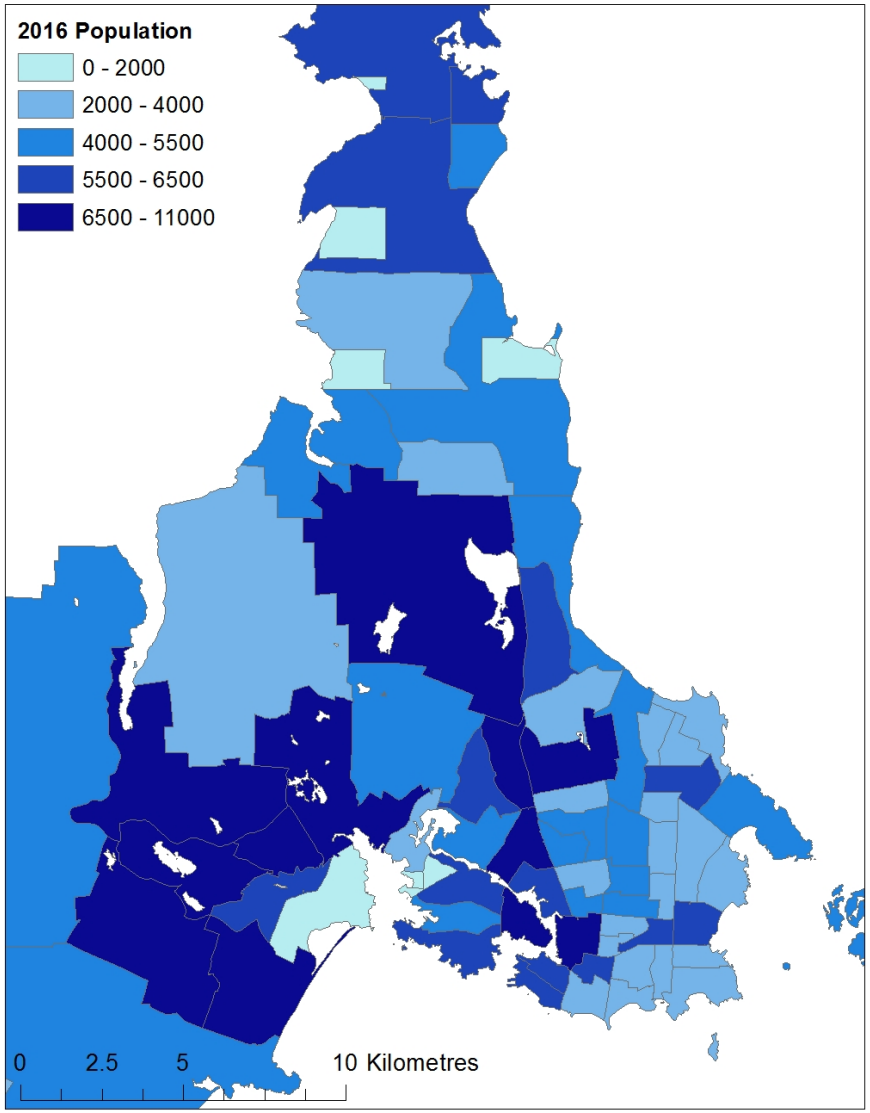
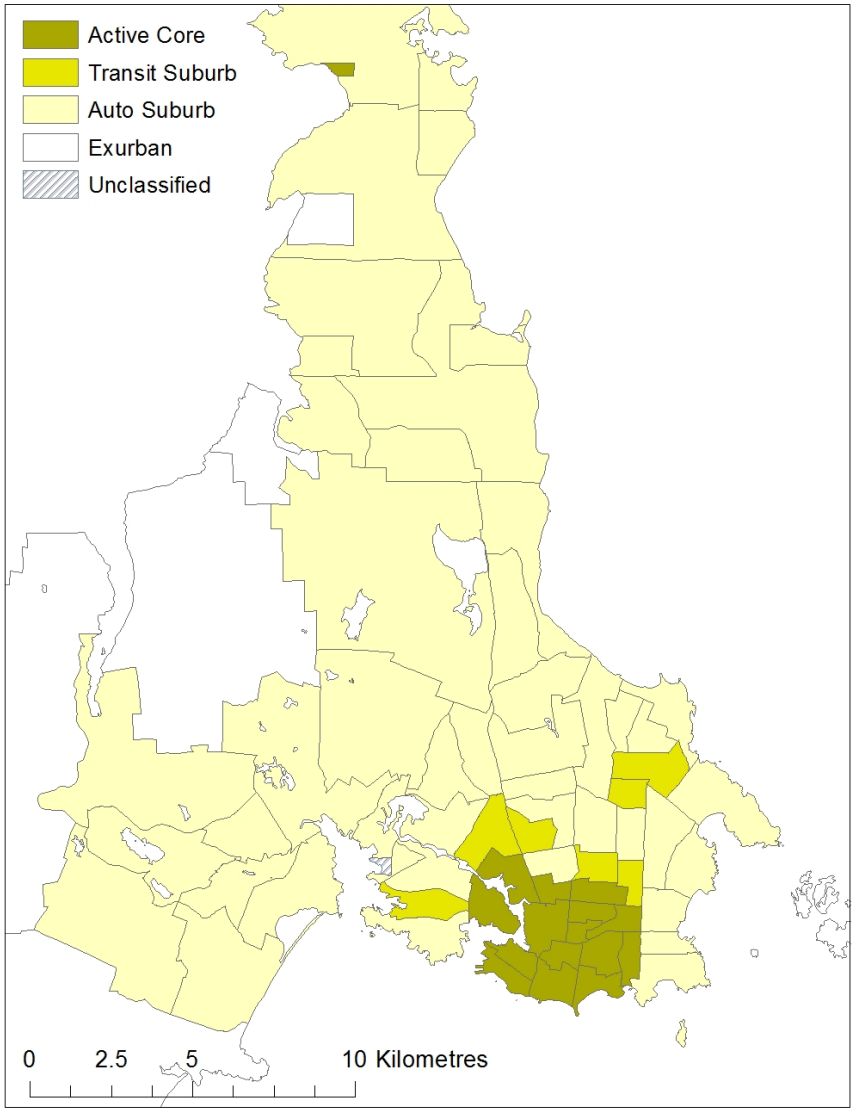
Map 1: Victoria 2016 T9 classification

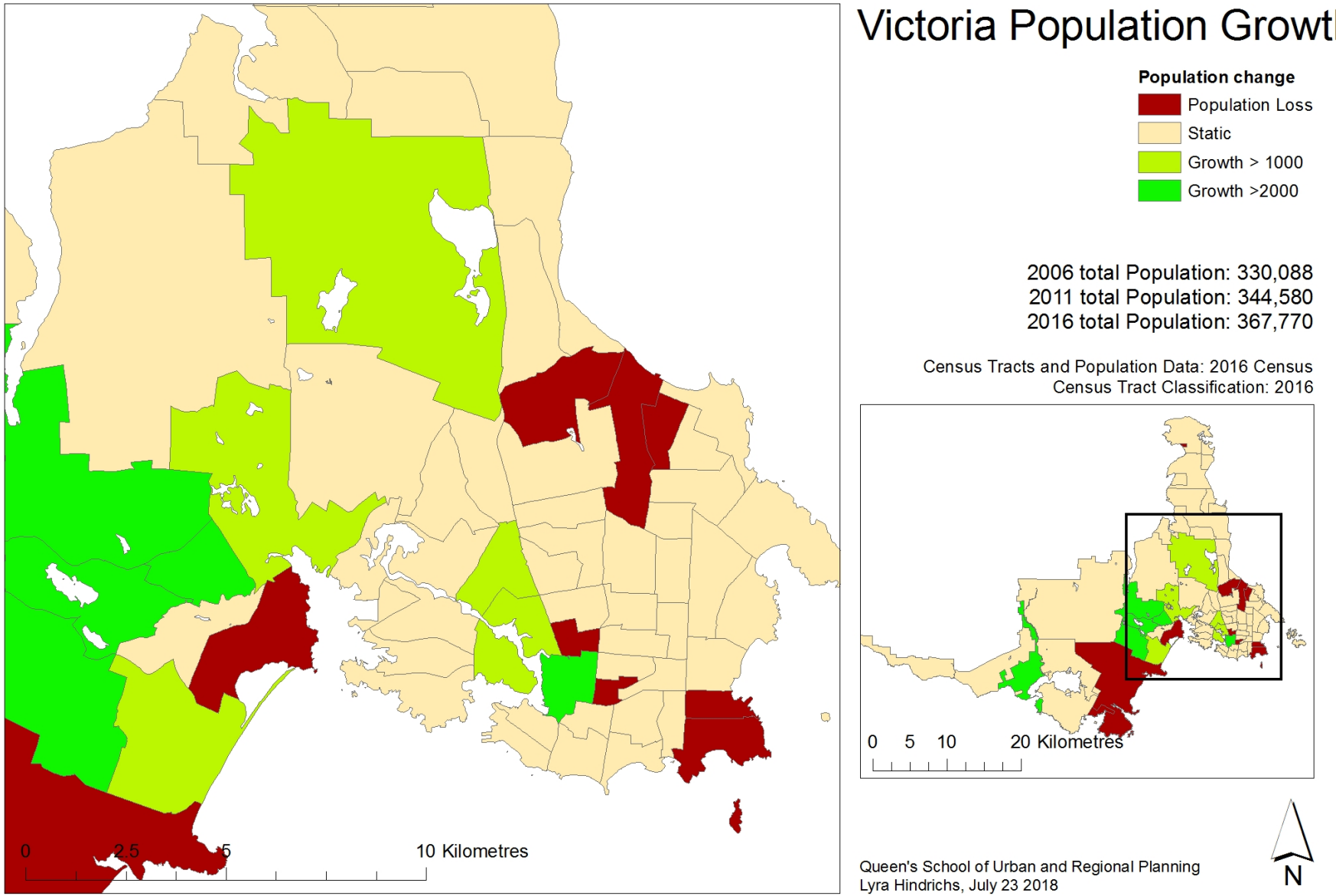
Victoria 2016 population and classification





Map 2: Victoria 2016 population distribution and T9 classification

Census Tracts and Population Data: Statistics Canada 2016 Census
Census Tract Classification: 2016
Created by: Lyra Hindrichs, Queen's University
July 23 2018



Map 4: Population change in Victoria CMA 2006-2016

TABLE 1: POPULATION, DWELLING UNIT AND EMPLOYMENT PROJECTIONS

	2011			2038			Population Change	
	Population	Dwellings	Employment	Population	Dwellings	Employment	Total	Percentage
Core								
Esquimalt	16,600	8,300	11,100	18,300	9,500	12,200	1,700	10.2%
Oak Bay	18,200	8,000	7,300	15,300	8,400	7,200	-2,900	-15.9%
Saanich	112,100	46,600	42,300	128,600	56,300	55,500	16,500	14.7%
Victoria	82,400	44,400	76,400	99,500	56,500	84,100	17,100	20.8%
View Royal	9,600	4,100	4,800	15,000	6,700	5,900	5,400	56.3%
Total	*238,900*	*111,400*	*141,900*	*276,700*	*137,400*	*164,900*	*37,800*	*15.8%*
Saanich Peninsula								
Central Saanich	16,100	6,500	8,900	21,600	8,300	10,700	5,500	34.2%
North Saanich	11,100	4,400	5,300	13,800	6,000	6,600	2,700	24.3%
Sidney	11,200	5,200	6,100	11,900	6,600	7,600	700	6.3%
Total	*38,400*	*16,100*	*20,300*	*47,300*	*20,900*	*24,900*	*8,900*	*23.2%*
West Shore								
Colwood	16,600	6,100	4,000	31,100	12,200	6,800	14,500	87.3%
Highlands	2,100	800	400	2,600	1,000	2,300	500	23.8%
Juan de Fuca EA	4,400	1,900	800	6,200	2,700	1,100	1,800	40.9%
Langford	29,900	11,600	12,200	48,000	19,200	22,700	18,100	60.5%
Metchosin	4,900	1,800	1,400	5,200	2,200	6,500	300	6.1%
Sooke	11,700	4,500	2,700	24,700	9,300	3,300	13,000	111.1%
Total	*69,600*	*26,700*	*21,500*	*117,800*	*46,600*	*42,700*	*48,200*	*69.3%*
Totals	**346,900**	**154,200**	**183,700**	**441,800**	**204,900**	**232,500**	**94,900**	**27.4%**

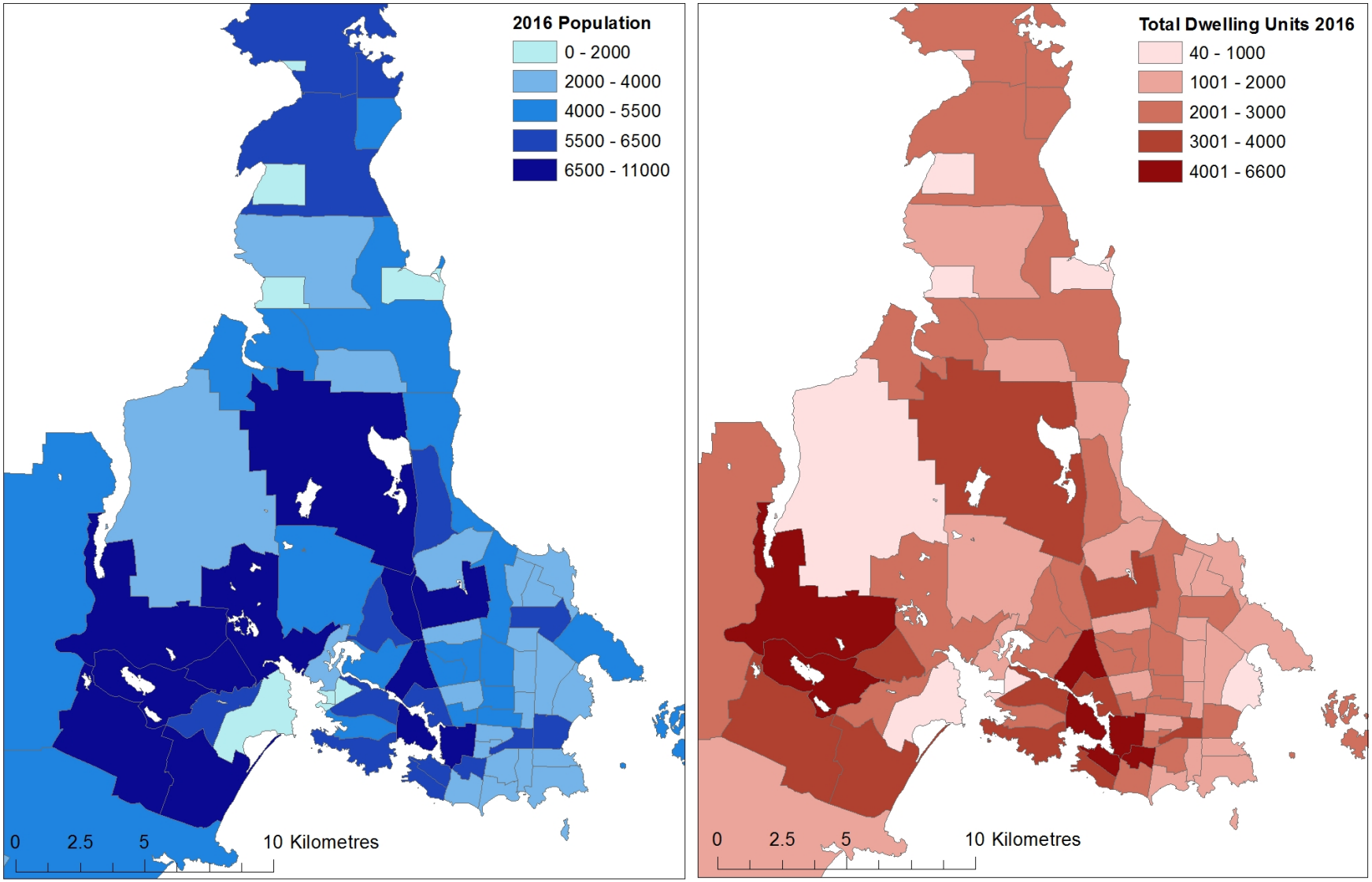
Source: Urban Futures, 2014

Please note that First Nations populations are not included in Table 1, as First Nations Reserves are outside the GMPA.

Please note that projections were prepared using 2011 Census data. Implementation Measure I-6 identifies the need to update the projections using the most recent census data at the time of the first update to the 2018 Regional Growth Strategy.

Table 1: Population, dwelling unit, and employment trends, 2018 CRD Growth Strategy

Victoria Population and Dwelling Units, 2016



Map 5: 2016 population and dwelling unit distribution

Census Tracts and Population Data: Statistics Canada 2016 Census
Census Tract Classification: 2016
Created by: Lyra Hindrichs, Queen's University
July 23 2018