Housing Production in Canada Has Fallen Far Short of the Needs of Our Growing Population

Will Dunning Inc.

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Introduction and Summary

This report is an extension of a research report that I published on January 26[1]. In that report, I calculated that during the 15 years up to June 30, 2021, Canada[2] produced about 300,000 dwellings less than was required by our growing population and to replace dwellings that were lost through demolition. (The calculations are summarized in numbered lines 1 to 5 in the Summary table on Page 3). The shortfall averaged about 20,000 units per year during 2006 to 2021.

Table 1 (on page 10) shows the estimates for 36 Census Metropolitan Areas across Canada.

Most of the shortfalls have accrued recently: during the past five years (up to June 30, 2021) the total production shortfall was about 175,000 (35,000 per year, or about 15% less than the required amount).

This updated research report makes new calculations, and finds a larger shortfall.

A different (but tentative) calculation can now be made, using new data from the 2021 Census that became available on April 27. As is shown in the table on Page 3:

- From 2006 to 2021, the inventory of occupied housing (for the 10 provinces, excluding the Territories) increased by 2,533,935 units (line 6).
- This is 429,539 (line 7) less than the requirement that I have calculated for the same period (2,963,474 units, from line 1).
- A caveat is that it is possible that the numbers of households have been affected by changes in the completeness of the Census data ("net under-coverage"). Therefore, I am viewing this estimate as preliminary and not further exploring that analysis. (There is a brief description of "under-coverage" in the Appendix – the last paragraph in the section for "Looking Backward".)

The next step in the analysis considers that the total housing supply shortfall in Canada might be larger than these calculated figures, due to shortages that existed at the beginning of the analysis period (as of 2006). In the section "International Comparisons", estimates are developed of the total shortfall that existed in 2021. As is shown in line 8 of the table on Page 3, it is a larger number, in the area of 500,000 dwelling units.

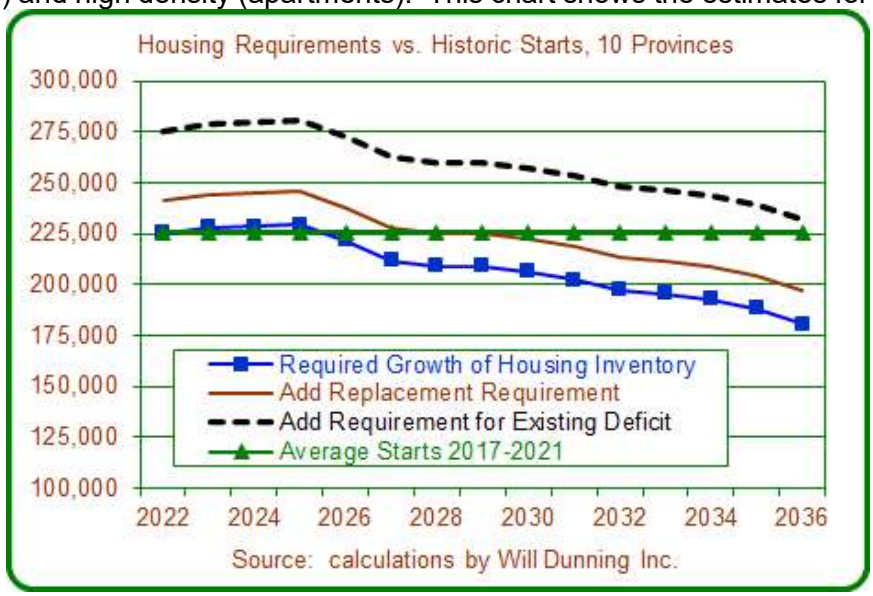
The figures for each of the CMAs are shown in Table 2 (on Page 16). Out of the 36 CMAs, 19 are calculated to have surpluses as of 2021, and 17 have calculated deficits. For the locations that have calculated deficits, the combined total shortfall as of 2021 is close to 700,000 dwelling units. Table 2 might imply that for areas with surpluses, actual production could be reduced, to work-off those surpluses. I interpret this differently: in those communities, local circumstances (including low housing costs) have supported above-average rates of household formation. To allow continuation of housing choices and to support continued moderate housing costs, actual housing production in those communities should be at least equal to the amounts that result from the projections of household growth plus the replacement requirements (the sums of the numbers in the first and second columns of Table 4, on Page 21).

[1] The second item on this page: https://www.wdunning.com/recent-reports

[2] The analysis in this report is for the 10 provinces, excluding the three territories, due to incomplete data for the territories.

The detailed discussion in the "International Comparisons" section shows that many of the largest deficits are in "move-to" communities that previously were lower-cost but are now receiving increased migration by people who might otherwise live elsewhere, especially in Toronto and Vancouver. This is causing those move-to communities to become highly-pressurized.

The section "Looking Forward" contains calculations of how much new housing supply might be required during the coming 15 years (2021 to 2036). The projections are summarized in the Table on the next page, starting in line 9. They begin by projecting growth in numbers of households (and therefore how much the housing inventory needs to grow). Then, in lines 10 to 12 adjustments are made for additional construction that is needed to replace demolished dwellings and then to address the existing shortages. In lines 13 and 14, annual requirements are compared to the actual average starts for the prior five years. The concluding estimates in line 15 indicate that there is an extremely large shortfall for low density housing (single-detached and semi-detached homes), while supplies appear to be adequate (and even more than adequate) for medium density (town homes) and high density (apartments). This chart shows the estimates for the three stages of the calculations, in contrast with recent production (average housing starts during 2017 to 2021). Recent starts have been close to the projections of required growth. But, when adjustments are made to replace dwellings lost to demolition, a deficit emerges. And, when a further adjustment is made to address existing shortages (over a 15-year period), the deficit becomes very large.



The bottom line in this analysis is that there is a need for a quite substantial rise in housing production in Canada: for the 15 years from 2021 to 2036, annual production needs to be about 258,000 units per year (shown in the third last row of the table). As is shown in the last row, this is about 32,000 units per year higher compared to the production that has occurred during the past five years (which was already quite high in historic terms). As is briefly discussed in the section "Factors Inhibiting Housing Supply" (starting on Page 24), there are many issues that are impeding housing construction in Canada.

Moreover:

- As is shown in the chart above, the annual requirements are projected to decline over time (due to an expectation of slower population growth and because of the movement of the population into older age groups). In the near term, the calculated requirement exceeds 275,000 housing starts per year, and the supply deficit is about 50,000 units per year during the five years up to 2026.
- The estimates of the total requirements are based on eliminating the existing shortages over a 15-year period. Even if this is achieved, Canadian housing markets are likely to remain highly pressurized for quite some time. Reducing that adjustment period to 10 years would add another 16,600 units to the annual requirements, to about 293,000 units

per year during 2021 to 2026. In this alternative scenario, the supply deficit would be 66,800 units per year during 2021 to 2026.

Summary of Housing Requirements versus Housing Supply				
	Low Density	*Medium Density*	*High Density*	*Total*
Calculated Requirements for 2006 to 2021				
1. Total Growth Required	1,876,843	178,315	908,316	2,963,474
2. Replacement Requirement	163,643	13,607	66,845	244,095
3. Total Requirement	2,040,486	191,922	975,162	3,207,569
4. Total Supply (Housing Completions)	1,378,803	316,215	1,194,641	2,889,659
5. Production Surplus/Deficit	-661,683	124,293	219,479	-317,910
Growth According to Census Data for 2006 and 2021				
6. Change in Number of Occupied Units	1,319,705	282,845	931,385	2,533,935
7. Surplus/Shortfall vs Estimated Growth Required	-557,138	104,530	23,069	-429,539
8. Total Shortfall, as of 2021, Based on International Comparison				-498,831
Projected Requirements for 2021 to 2036				
9. Total Growth Required	1,973,459	221,442	931,215	3,126,116
10. Replacement Requirement (1)	163,643	13,607	66,845	244,095
11. Pre-Existing Deficit (1)	334,419	27,807	136,605	498,831
12. Total Requirement	2,471,521	262,856	1,134,665	3,869,042
13. Adjusted Requirement Per Year, 2021-36	164,768	17,524	75,644	257,936
14. Average Production 2017-2021	79,739	25,761	120,558	226,058
15. Required Increase in Annual Production	85,029	-8,237	-44,914	31,878
Source: calculations by Will Dunning Inc. Note: (1) allocations by housing type are based on existing shares of the housing inventory as of 2006.				

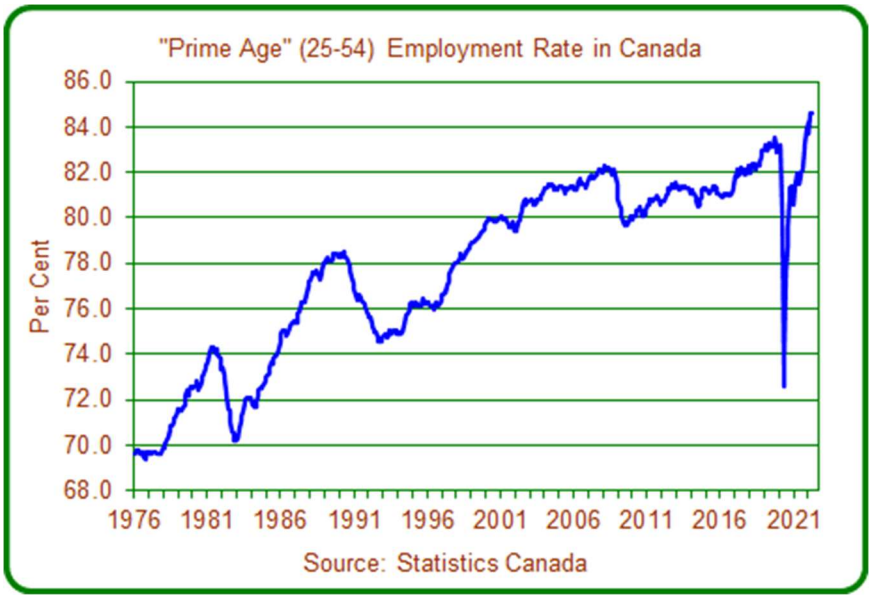
The details of the estimates (for the past and the future) show that the mix of dwelling types supplied is quite different than might be desired by Canadians, with extremely large shortfalls for low density housing (single-detached and semi-detached), as is shown in the first column of the table above. On the other hand, as is shown in the second and third columns, supplies of medium density housing (town homes) have been larger than the estimated requirements, and supplies of high density (apartments) have been much larger than the estimated requirements. Many Canadians have "substituted" away from low density into medium and high density housing. To a degree, that reflects changes in consumer preferences. But, it is also likely that for many people, the substitution has been out of necessity, rather than a preference.

Housing shortages have resulted in dire consequences across Canada, in both the home ownership and rental sectors. The Canadian housing market needs to do a much better job, not just in providing total supply, but also in providing housing in forms that are friendly to Canadian families.

The consequences of supply shortages will, of course, vary over time, because events can have more than one cause. For a while, the major factors in Canadian housing markets have pushed in the same direction – upwards. We are now entering a period when there will be mixed effects, pushes in different directions, and the outlook is currently even more uncertain than usual.

- Recently, economic conditions have been extremely favourable, and have created the potential for household formation rates to increase.

- The economic indicator that I watch most closely is the "employment-to-population ratio" for the "prime working age" (25 to 54 years old). As can be seen in the chart on the next page, this has recently been the best ever seen in Canada.



- Interest rates were, until recently, exceptionally low.
- Wages have grown more rapidly than the cost of living. During 2006 to 2021, the average weekly wage in Canada rose by 51% while overall prices rose by 30%. In "real terms" (adjusted for inflation), the average weekly wage increased by 1.0% per year (16.5% in total during the 15 years). That "real growth" was even stronger during 2016 to 2021 (1.2% per year). However, during the past year, wage growth (3.9%, as of March) has not kept up with inflation (6.7%). That said, the average weekly wage in Canada (adjusted for inflation) is still a bit higher than it was at the start of 2020.
- Population growth has accelerated.

- In recent times, this combination has been conducive to increased desires to form new households, which has raised housing demand, quite possibly to larger amounts than is indicated by the projections that have been created here. But, insufficient housing opportunities have existed across the country. Elevated potential demand, in the face of inadequate supply, has resulted in intense competition and contributed to extreme price growth (especially during the past year and a half).

Recent sharp rises in interest rates, notably for 5-year fixed-rate mortgages and also for variable rates, will have some dampening consequences for the economy, and will quite likely reduce the potential for household formation. This might create an appearance of reduced pressures in housing markets. This chart shows my opinion-estimates (I update it each week) of typical rates advertised by major lenders. In my view, a neutral mortgage rate is

now in the range of 2.5% to 2.75%. Variable rates are now close to the neutral level, but fixed rates (now exceeding 4%) are far above it.

As I write this (in early May), emerging data is showing early effects of higher interest rates, with sharp reductions in home sales across the country. While transactions are being reduced, actual demand (requirements) for housing remains far in excess of the supply.

The consequences of inadequate housing supply will continue to be felt to varying degrees for quite some time.

In May last year, in my Twitter, I compared Canadian housing markets to a game of Musical Chairs. The game will continue, although the intensity of the play will vary.
https://twitter.com/LooseCannonEcon/status/1395810375434752008

Recently, I've been thinking about the importance of distinguishing between "transactions" versus "demand". Too much of the discussion, and indeed the federal government's (and some provincial governments') policy choices have been about transactions – how many sales occur (and at what prices). But what really matters is how much housing is required, and if there is enough housing actually available.

I have also referred to the arcade game Whack-A-Mole. Government policies have ignored demand and supply, and focused on the sales transactions, attempting to suppress home buying (chiefly via the mortgage stress tests, which use an unreasonably high interest rate and which ignore the income growth that will happen during the initial term of the mortgage). Those policies do nothing to solve the supply problem. In fact, they make it worse: by reducing pre-construction sales of new homes and condominiums, those policies have impaired housing supplies, and will continue to do so.

While the policies may succeed in reducing sales, they don't actually alter the demand for housing (the requirements that result from population growth). That demand finds other ways to express itself, and then, when the markets have become re-pressurized, there has been policy escalation (this is what I mean by Whack-A-Mole). Here are three examples of how demand asserts itself:

- If fewer people can buy homes, more of them will rent, adding to pressures in the rental sector.
- Higher rents mean that more properties will be purchased by investors, reducing supplies available for owner-occupancy. (I am not arguing that investment buying should be discouraged – because I believe that what matters most is the total supply of housing, and that the tenure forms of housing is irrelevant overall. But, discouraging investment buyers will impair the total supply of housing, by reducing new construction.)
- Some home buyers will migrate to alternative, less-regulated lenders. Many of these people will end up paying higher interest rates than they would otherwise and there is uncertainty about what will happen when it's time to renew the mortgages: this adds to risks for them, and therefore for the economy and the financial system. This defeats the intention of the federal government's mortgage policies, which are about risk reduction.

The simultaneous existence of Musical Chairs and Whack-A-Mole has done a lot of harm to Canadians.

In the on-going discussions, there are two concepts of housing supply, and this has muddied the waters: the two concepts are the number of listings in the resale market versus, secondly, the amount of housing that exists. The supply of listings varies over time, and that has

consequences for price movements (this is explored in the section "Housing Market Impacts", starting on Page 22). But, it's the other concept of supply (the total inventory on-the-ground) that has mattered in the long-term. That reality has meant that most of the time there isn't enough resale inventory and therefore most of the time we see rapid growth of housing prices (and rents) in Canada. There have been some periods when elevated supplies of resale listings resulted in soft pricing. During the coming months, there is quite likely going to be more supply available in resale markets, which would affect pricing. I see a possibility, but not a certainty, that current levels of interest rates will lead to substantial housing price reductions across Canada in the coming months. Some people will argue that it has been proven that supply isn't the issue (I see on Twitter that this has already started.) I will disagree with those arguments: in the long run, the inventory problem will remain the substantive issue.

Recently, the federal government and some of the provinces have announced initiatives to promote new housing construction. At this time, these are aspirational goals, not achieved results. Meanwhile, the most important federal policies are the mortgage regulations that make it harder to buy and are therefore suppressing supply.

One more thought (and a large caveat): these estimates of current housing requirements and housing shortages for local areas are based on the populations that actually live in the areas. In some areas, there are unmeasurable additional shortages related to people who would prefer to live there, but are unable to, due to lack of housing opportunities and high costs. This also affects the projections of future population growth and housing requirements.

Therefore, in some places (especially those with the highest housing costs) the "true" shortages are even larger than I have calculated here.

On the other hand, there are some places (the "move-to" cities) that we might consider as having "imported shortages", as the pressures that they are experiencing are the consequence of population flows away from higher-cost cities. Where those imported shortages exist, solutions ultimately depend on fixing the supply issues for Canada as a whole.

Details on the estimates (for Census Metropolitan Areas) are provided within this report. An Appendix provides some notes on the methodologies and major assumptions.

The author of this report has been analyzing Canadian housing markets since 1982. Until 1997, I worked in various positions in housing market analysis for the federal government's housing agency (Canada Mortgage and Housing Corporation), and since then as a consultant. This includes 21 years as the sole employee of my own company. My clients have covered a wide range of interests, including industry associations, governments, the private sector (in construction and finance), and non-governmental organizations.

This is "unsponsored research".

Other reports on Canadian housing markets can be found on my website, including monthly *Housing Market Digest* reports and some occasional reports: https://www.wdunning.com/

Individualized reports (considerably shorter - usually about 5 or 6 pages) for communities across Canada (including provinces, CMAs, and other areas) can be provided on request, for modest fees.

Looking Backward

This section discusses the estimates of housing requirements versus housing production for Canada (the sum of 10 provinces, excluding the Territories) and 36 major urban areas in Canada, for 2006 to 2021. It contrasts annual housing requirements for years ending June 30 (calculated by this author) with annual supply (measured by housing completions as reported by Canada Mortgage and Housing Corporation) for the same periods.

Broadly speaking, three different periods can be seen. During the first 10 years (up to 2016) total production was relatively close to the total requirements (however, as is discussed later, there was a pronounced shortage of low-density housing). Then, there were four years with extreme shortfalls (up to 2020). Finally, in the last year, there was a large surplus (as Covid-19 sharply disrupted movements into Canada, resulting in much slower population growth and reduced housing requirements).

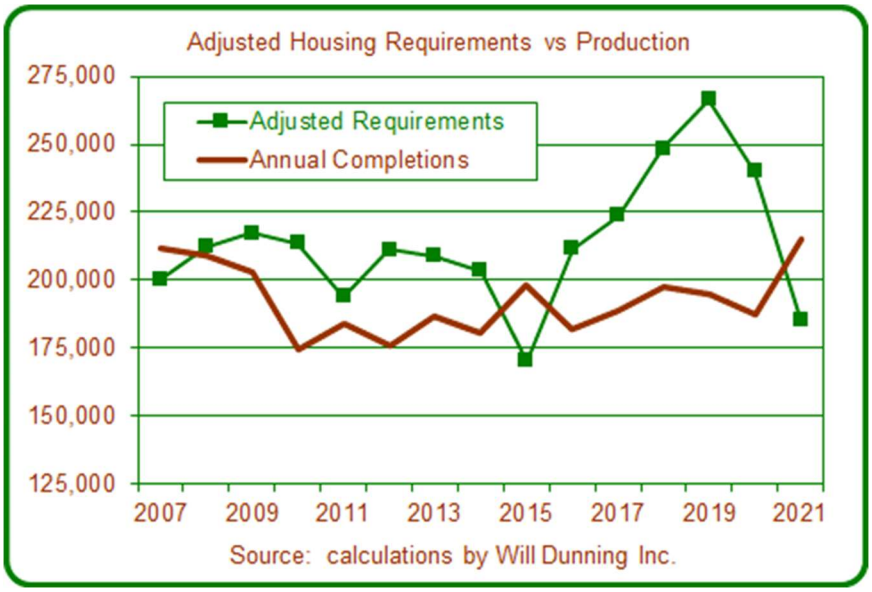
For the 15 years covered in this analysis:

- The total growth requirement is estimated at 2.96 million units (the data is for the 10 provinces, excluding the territories).
- Total housing completions were 2.89 million.
- For the total period, housing completions were only slightly below the estimated growth requirements (by a total of about 73,000 dwelling units, or about 4,900 per year).
- Compared to the total housing inventory (12.4 million occupied dwelling units as of 2006), this estimated total shortfall is quite small. However, as is discussed below, the distribution of the shortfall matters. In addition, as is discussed in the section on “Principal Residences”, the actual shortfall is larger than is indicated by these estimates.

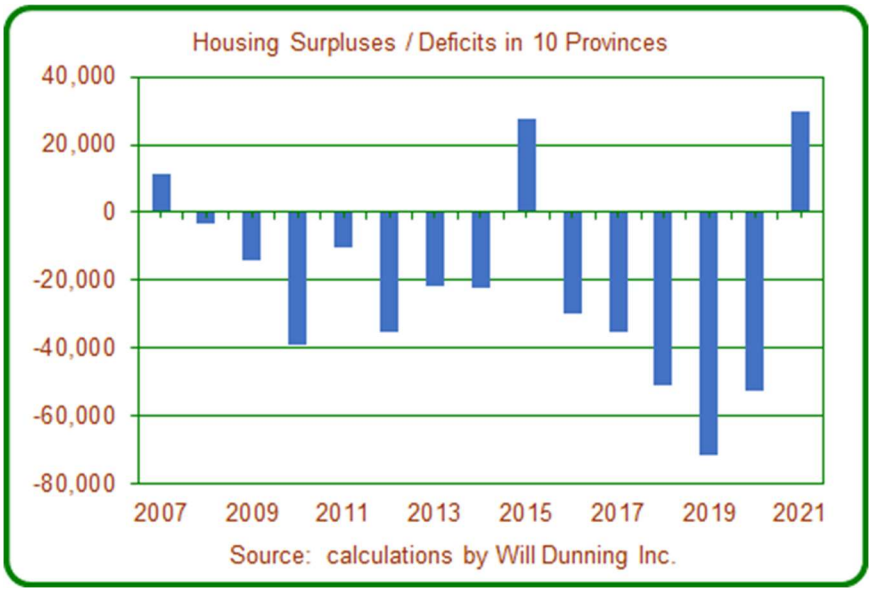
There is an additional requirement, to replace dwellings lost due to demolition, and this results in substantial increases in the estimates of shortages.

Each year, some housing is lost due to demolitions, and therefore there is an additional housing requirement to replace the lost housing. Limited data is available on housing demolitions within Canada. Statistics Canada now publishes some data, which starts in 2018. In the following analysis, it is assumed that each year demolitions are equal to the average for 2018 to 2021 (16,273 units per year).

This chart updates the one shown on the previous page: the annual requirements are adjusted upwards for the need to replace about 16,000 dwelling units per year. For the 15 years, this adds about 244,000 dwelling units to the requirements. This brings the total requirement to about 3.21 million (213,838 per year), versus total supply of about 2.89 million (193,212 per year). This results in a total supply deficit of about 318,000 units (21,194 per year).

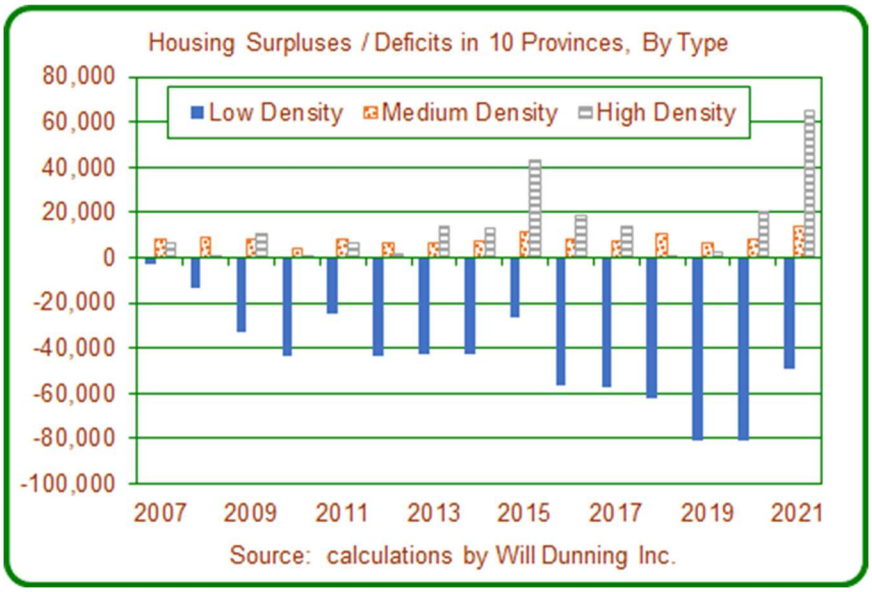


This chart shows the calculated surpluses and deficits for each of the 15 years. These estimates indicate that there were surpluses in 3 out of 15 years (housing completions exceeded the required amounts). But, there were deficits in 12 of the 15 years. In 9 of the years, the deficits exceeded 20,000 units, meaning that supply was 10% (or more) below the required amounts.



Most of the deficits were accrued during the final years: for the entire period covered in this analysis, population growth in Canada averaged 1.1% per year. Notably, the growth rate was 1.4% in both 2018 and 2019. Growth slowed sharply during the pandemic, to an estimate of just 0.4% in the year up to April 1, 2021. Recent estimates indicate that population growth is rebounding – in the year ending January 1, 2022, the growth rate is 1.2%. By mid-2022, the growth rate is likely to be back to the pre-Covid level (in the area 1.4%). This implies that there is quite likely to be another shortfall for 2022, and beyond.

The next chart looks at the details of the shortfalls for 2006 to 2021: the annual surpluses and shortfalls for the three dwelling types (low density, medium density, and high density). The estimates show:



- For low density housing there were deficits in all of the 15 years, totaling about 659,000 dwelling units (close to 44,000 per year). Compared to the total inventory (8.3 million occupied low-density units as of 2006), this total shortfall is quite large.
- For medium density, there were estimated surpluses in every one of the 15 years, for a combined total surplus of 123,000 units, or about 9,200 per year. This is very large compared to the inventory (691,000 dwelling units in 2006).
- For high density, there were also surpluses in every year, for a total of 217,000 units (about 14,500 per year). This is a substantial surplus compared to the inventory (3.4 million dwellings in 2006).

More details are provided below, in Table 1, which summarizes the results for the 15-year period for each of 36 Census Metropolitan Areas in Canada, a combined "rest of" area, and for the summation of the 10 provinces.

Looking at the last column of the data, for the 36 Census Metropolitan Areas, 7 had overall surpluses and 29 had overall deficits during the 15 years. The "rest of" area is calculated to have a small overall surplus (a total of just 22,000 during the 15 years). The "rest of" area no doubt includes many communities with shortages, as well as many with surpluses.

The first three columns look at the results by type of dwelling.

- For low density homes (single-detached and semi-detached homes), most of the CMAs (33 out of 36) plus the "rest of" area had deficits, while 3 CMAs had calculated surpluses. For the 36 CMAs in combination, the accumulated shortfall of low density homes was more than 600,000, and the "rest of" areas added a further shortfall of about 50,000 low density units.
- On the other hand, there were surpluses for medium density (town homes) in most (34 out of 36) CMAs and the "rest of" areas. The total surplus for town homes was about 96,000 units in the CMAs and close to 27,000 in the "rest of" areas.
- Similarly, for high density (apartments), there were estimated surpluses in most of the CMAs (22 out of 36) and in the "rest of" area. The total surplus across the 36 CMAs was about 173,000 units, and 45,000 in the "rest of" areas.
- It is interesting to combine the results for low density and medium density housing, since "substituting" from a single-detached or semi-detached home to a town home may be a relatively easy choice for many of us. Those calculation show that there were combined surpluses in just 3 of 36 CMAs. There were deficits in 33 of the 36 CMAs plus the "rest of" area. Across the 10 provinces, the combined deficit for low plus medium density housing was about 535,000 units, or more than 35,000 per year.

Table 1 Summary of Estimated Surpluses and Shortfalls, by Location, During 15 Years (2006/07 to 2020/21)				
Location	*Low Density*	*Medium Density*	*High Density*	*Total*
St. John's, Newfoundland and Labrador	311	-753	1,428	987
Halifax, Nova Scotia	-12,761	531	3,688	-8,542
Moncton, New Brunswick	-3,384	332	1,798	-1,254
Saint John, New Brunswick	-1,442	60	335	-1,047
Saguenay, Quebec	1,646	139	1,135	2,920
Québec, Quebec	-4,939	1,615	19,090	15,766
Sherbrooke, Quebec	-891	880	1,078	1,067
Trois-Rivières, Quebec	-822	104	1,900	1,182
Montréal, Quebec	-68,785	7,605	55,980	-5,200
Ottawa - Gatineau, Quebec part	-4,981	966	6,478	2,463
Ottawa - Gatineau, Ontario part	-21,666	8,752	-10,924	-23,838
Kingston, Ontario	-2,146	770	-178	-1,554
Belleville, Ontario	-605	668	-1,420	-1,357
Peterborough, Ontario	-1,616	667	-809	-1,758
Oshawa, Ontario	-12,487	2,639	-3,572	-13,420
Toronto, Ontario	-153,942	24,880	39,874	-89,189
Hamilton, Ontario	-16,341	7,243	-6,146	-15,245
St. Catharines - Niagara, Ontario	-6,487	4,041	-3,630	-6,075
Kitchener/Cambridge/Waterloo, Ontario	-19,219	2,369	4,183	-12,667
Brantford, Ontario	-3,027	1,281	-1,338	-3,084
Guelph, Ontario	-5,717	1,655	1,075	-2,986
London, Ontario	-6,858	1,146	-905	-6,617
Windsor, Ontario	-2,641	1,214	-3,087	-4,514
Barrie, Ontario	-7,426	1,210	261	-5,954
Greater Sudbury, Ontario	-882	278	-903	-1,506
Thunder Bay, Ontario	463	107	-209	361
Winnipeg, Manitoba	-16,586	2,116	455	-14,016
Regina, Saskatchewan	-9,824	1,518	2,222	-6,084
Saskatoon, Saskatchewan	-13,078	1,657	-2,048	-13,468
Lethbridge, Alberta	-2,537	559	-774	-2,753
Calgary, Alberta	-46,718	4,114	11,744	-30,860
Edmonton, Alberta	-22,672	2,128	1,487	-19,057
Kelowna, British Columbia	-11,698	1,239	5,668	-4,792
Abbotsford - Mission, British Columbia	-9,603	379	676	-8,548
Vancouver, British Columbia	-104,064	12,821	43,772	-47,471
Victoria, British Columbia	-15,737	-438	4,178	-11,997
Subtotal (36 CMAs)	-609,157	96,487	172,564	-340,106
Other Areas	-49,496	26,825	44,866	22,196
Canada (10 Provinces)	-658,652	123,312	217,430	-317,910
Source: calculations by Will Dunning Inc, using data from Statistics Canada and Canada Mortgage and Housing Corporation.				

International Comparisons

The estimates of housing requirements that were developed previously are based on the household formation rates that were actually seen as of 2006. However, it is possible that in some places, as of 2006, actual household formation rates were lower than they should have been, as the result of existing housing shortages. Therefore, it is quite possible that housing deficits already existed as of 2006, and the total supply deficits are now larger than those calculations indicate.

In May 2021, the Economics group of Scotiabank published a very creative take on the supply situation: "Estimating the Structural Housing Shortage in Canada: Are We 100 Thousand or Nearly 2 Million Units Short?"[3]

That research report used an international comparison. Based on the average number of dwellings per 1,000 people for six countries (Canada plus France, Germany, Japan, the United Kingdom and the United States), the report calculated that Canada would need an additional 1.8 million dwellings to reach the average figure of dwellings per 1,000 people. In the data included in the report (in its Chart 2) it can be seen that the rate for Canada is quite similar to the US and UK, but is much lower than for France, Germany and Japan.

That report is creative and very useful, and I've been thinking about it. In two ways, I have tried to build on that original idea:

- Looking at a larger number of countries.
- Considering whether there are any factors that might influence the variations across countries.

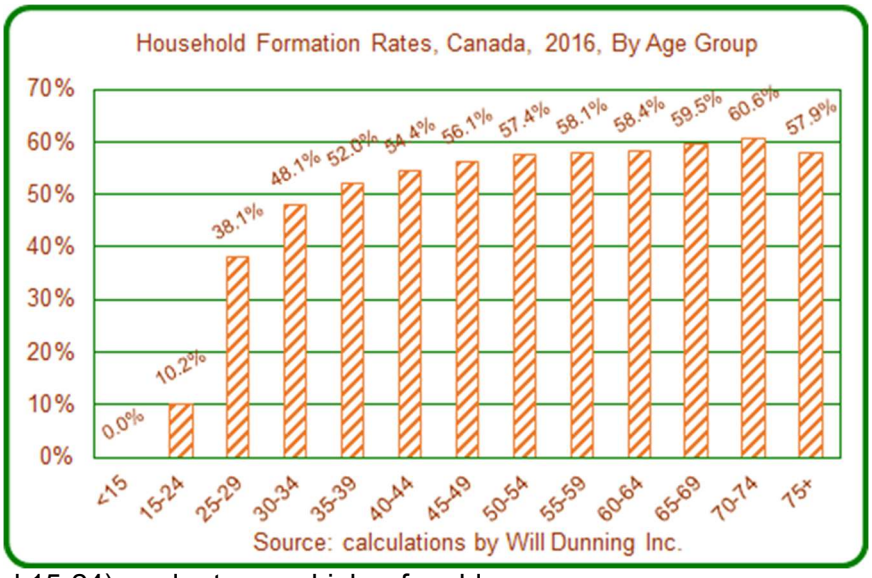
This section explores these two issues, and then draws conclusions about the magnitude of the housing deficit in Canada and across communities.

The first step in this research was to change the data concept: instead of looking at numbers of dwellings per 1,000 people, I looked at average numbers of people per dwelling (or per household).

This research starts with a theory about a factor that might help explain variations in household sizes across countries: age structures of populations.

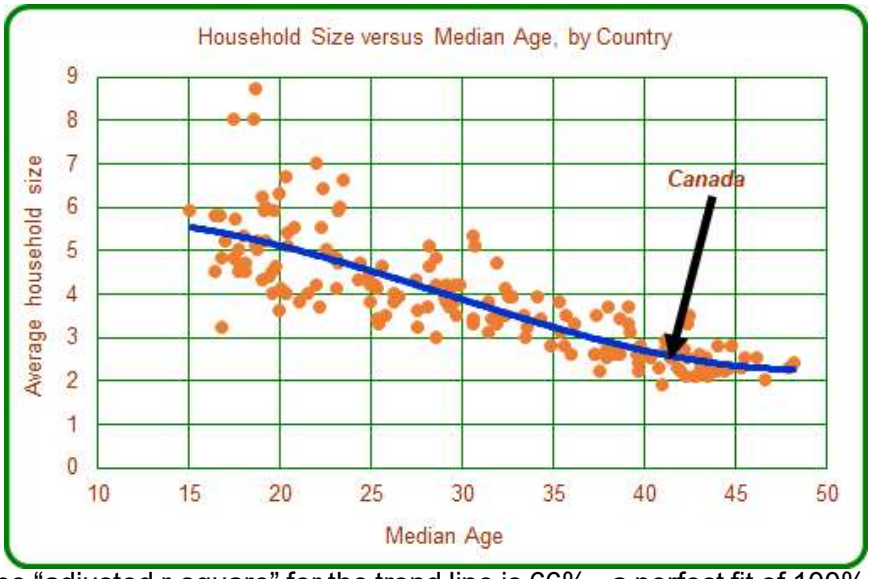
[3] Available here: https://www.scotiabank.com/ca/en/about/economics/economics-publications/post.other-publications.housing.housing-note.housing-note--may-12-2021-.html

- Household formation rates vary across age groups, as is shown in this chart. For the youngest age group (under the age of 15), the household formation rate is 0% (none of the people in this age bracket are defined as "household maintainers"). There is a low formation rate in the youngest adult age group (10.2% for people aged 15-24), and rates are higher for older age groups.



- The important implication of this is that the number of dwellings required will be influenced by the ages of the population in the area. For areas (countries, provinces, regions, cities, etc.) that have young populations, we should expect that there will be more people per dwelling, and conversely in older locales, household sizes should be smaller.

The next step was to construct an international dataset, that contains data on median ages and average household sizes. This chart combines data from two separate sources.[4] In this dataset, there are 169 countries for which both data elements were available. This data indicates that there is indeed a relationship between ages and household sizes. While there are quite a few outriders, overall, there is a good statistical relationship (the "adjusted r-square" for the trend line is 66% - a perfect fit of 100% would mean that every datapoint is exactly on the trend line. In my experience, the 66% fit for this type of data is reasonably strong).



For Canada, in this dataset the median age is 41.4 years and the average household size is 2.5 persons, 2.8% lower than is "predicted" by the trend line (2.57 persons). On this basis, a tentative

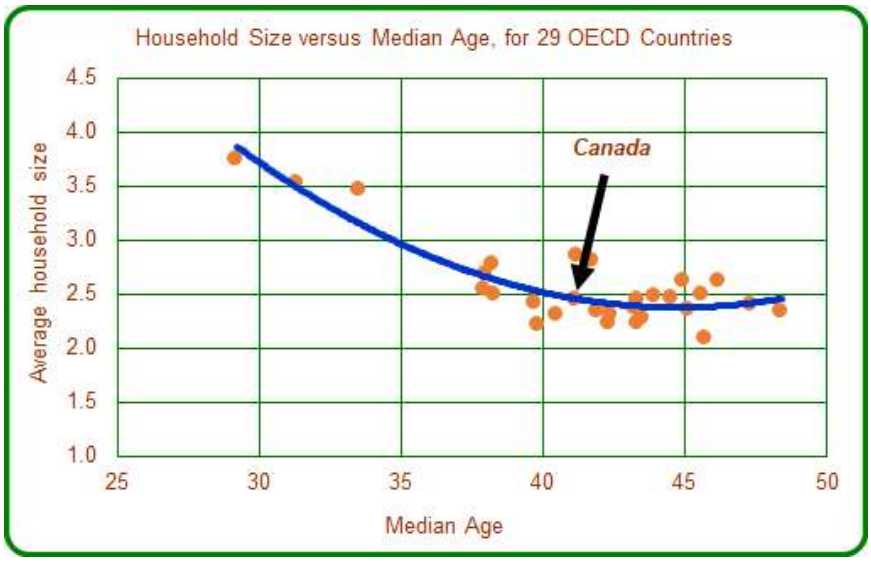
[4] The data on median ages by country is from the United Nations https://ourworldindata.org/grapher/median-age?tab=table and the data on average household sizes is from https://www.prb.org/international/indicator/hh-size-av/map/country/.

conclusion would be that the housing inventory in Canada is actually slightly larger than it ought to be.

However, this analysis of data from 169 countries includes quite a few that are very different than Canada, certainly in economic conditions and perhaps socially or culturally. This analysis does not include those additional factors, and in consequence it might not provide a good representation of what should be expected in Canada.

For this reason, I assembled a different data set, for a smaller group of countries that can more reasonably be considered Canada's peers: the members of the Organisation for Economic Co-operation and Development ("OECD"). In this data set, I used UN data on median ages (previously cited) and on average household sizes.[5]

There are 38 members in the OECD. This chart shows the data for 29 countries for which both of the data elements were available. This data shows a relationship of the expected type (countries with older populations tend to have smaller household sizes), and the "fit" of the trend line is very good (the adjusted r-square is 77%).



In this data, the average household size for Canada (2.45 persons) is almost exactly equal to the rate "predicted" by the trend line (2.44 persons). This might imply that Canada's housing supply is adequate.

But, looking at the data, there is a pattern: the countries that are above the trend line (having household sizes larger than "predicted") tend to have relatively low incomes: the two largest differences are in Slovakia and Poland. Countries below the trend line (smaller household sizes than expected) tend to have high incomes: the two largest differences are in Germany and Norway.

Income levels can reasonably be expected to affect household formation rates: rich countries will have higher formation rates and therefore lower household sizes.

Canada is a high-income country, and therefore, our average household size should be below the trend line (among the 27 countries that are used in the following analysis, Canada has the fifth highest income).

[5] Obtained from here: https://www.un.org/development/desa/pd/sites/www.un.org.development.desa.pd/files/undesa_pd_2019_household_size_and_composition_dataset.xlsx This dataset is dated 2019. It shows varying effective dates for the estimates. Data was used where the effective date is 2011 or later. The notes to the UN data indicate that a consistent definition of household size was used, which is consistent with the definition used in Canada (the number of persons in private households divided by the number of private households).

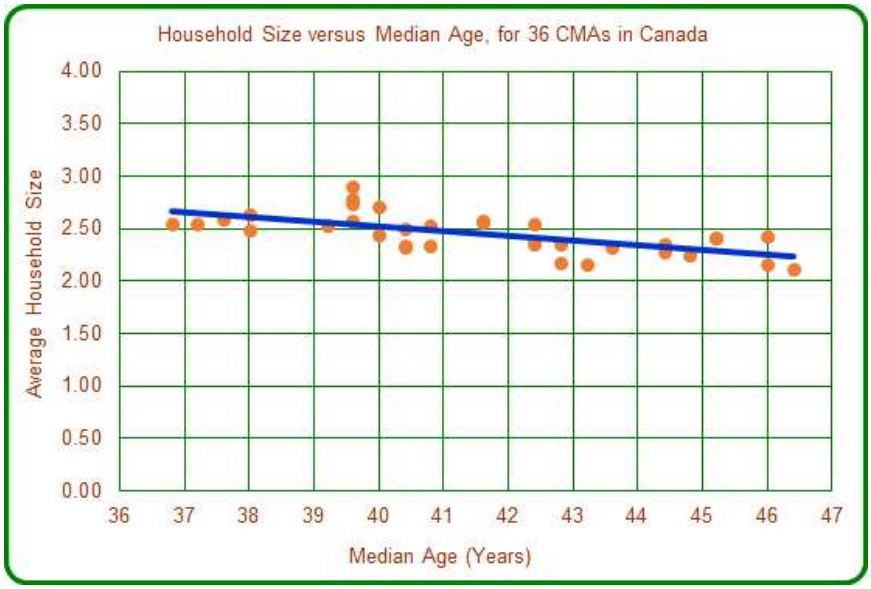
So, data was obtained from the OECD on incomes[6] and a further statistical analysis looked simultaneously at the impacts of ages and incomes on household sizes. This analysis found that ages and incomes have the expected effects. For income, each additional $1,000 is estimated to reduce average household size by about 0.01 person[7] (this has a bigger impact than you might expect, as can be seen in the next calculation,).

Applying the results from this international data and analysis to Canada, our expected average household size is 2.37, but in 2021 the actual size was larger (2.45). Applying this to data from the 2021 Census, the preliminary implication is that our housing inventory is too low by 517,500 dwelling units. The next steps in the analysis develop a more definitive estimate.

Applying the international model within Canada required that I develop proxy estimates of incomes that would match the OECD estimates.[8] The estimates were combined with data from the 2021 Census on median ages and average household sizes.

Applying the model to the 10 provinces and summing the results, there are 499,000 fewer households than we should expect (shown in the second last row of Table 2, on Page 16).

The analysis then looks at the Canadian CMAs. The chart to the right illustrates the data on average household sizes versus median ages for each of the 36 CMAs, from the 2021 Census. This data shows a relationship (albeit not a strong one, as the r-square is 45%).



It appears that some of the outriders are related to local economic considerations, which include housing costs and incomes.

Applying the analysis model to the 36 CMAs yields estimates that are summarized in Table 2.

Out of 36 CMAs, 17 have calculated deficits and 19 have calculated surpluses. As is shown in the fourth last row (the Subtotal), for the 36 CMAs the combined deficit is about 262,600. There is a remainder (a deficit of about 232,200) that is attributable to areas within the 10 provinces that are outside of CMAs.

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[6] Obtained here: https://stats.oecd.org/sdmx-json/data/DP_LIVE/.AVWAGE.TOT.USD.A/OECD?contentType=csv&detail=code&separator=comma&csv-lang=en&startPeriod=2017. The data used shows estimated wages in 2020, expressed in US dollars. A brief description of the data is in the Appendix. The dataset with all required elements includes 27 OECD countries.

[7] This estimate is quite significant statistically, with a t-statistic of 4.1. The analysis model that includes income is statistically stronger (adjusted r-square of 79%) than a model that excludes income (adjusted r-square of 65%).

[8] These estimates combine data from Statistics Canada Table 11-10-0238-01 and Profiles from the 2016 Census ("Average total income in 2015 among recipients"), layered onto the OECD estimate for Canada.

The largest deficits (in terms of numbers of dwelling units) are in the highest-cost centres, especially Toronto and Vancouver (which we might have expected), as well as in their nearby CMAs.

On the other hand, the surpluses are within the Atlantic provinces, Quebec, Manitoba, and Saskatchewan, plus (in Ontario) Kingston, London, and Thunder Bay, (in Alberta) Lethbridge and Edmonton, and Victoria (more on this one in a moment).

Expressed in percentage terms, the largest deficits are in the "move-to" CMAs that are close to Toronto and Vancouver: lack of housing opportunities and extreme housing costs have forced demand outwards, resulting in intense pressures in those surrounding communities, which is now making them considerably more expensive. The largest calculated deficits (ordering this list starting from the largest percentage deficits) are in Abbotsford-Mission, Oshawa, Toronto, Barrie, Hamilton, Windsor, Vancouver, and then Ottawa.

The last row in Table 2 shows an adjusted total that excludes the CMAs with calculated surpluses. This shows that in the CMAs where deficits exist, plus the overall deficit for "other areas", the total deficit is in the range of 680,000.

The result for Victoria (a small calculated surplus) is initialing surprising. This may be a situation in which community history has resulted in a small average household size, which outweighs the consequences of current housing costs. Plus, in the Looking Backward section, the calculations indicate that there has been a large degree of under-production in Victoria (a 12,000 units shortfall during 2006 to 2021).

Another surprise is that across the provinces, the "rest of areas" (towns and cities outside of the CMAs plus rural areas) collectively have a quite large calculated deficit. However, recent housing market data is consistent with housing shortages: many non-CMA areas have very low rental vacancy rates and are experiencing rapid housing price growth.

- According to CMHC's 2021 rental market survey, for CMAs the average vacancy rate was 3.1%. For Census Agglomerations (urban areas with populations from 10,000 to 100,000), the average vacancy rate was lower, at 2.6%.
- For Census Agglomerations for which CMHC published vacancy rate data, 34% had very low vacancy rates (1% or lower); for CMAs, there was a smaller share with very low vacancies, at 21%.
- As a way to compare house price growth for "other" areas to CMAs, I used data from the Canadian Real Estate Association, to calculate rates of growth for average prices for 2019 to 2021, for each area that CREA reported. For reporting areas that are not part of a CMA, more than one-half (61%) had price growth that exceeded the average for their province.
- For those non-CMA areas, the simple (unweighted) average rate of price growth for 2019 to 2021 was 38%, quite similar to the rate of 37% for all of Canada. For the areas that are part of a CMA, the (unweighted) average is similar, at 39%.

Table 2 Calculations of Housing Surpluses and Shortfalls, as of 2021, By Location				
Location	*Median Age*	*Average Household Size (1)*	*Predicted Size*	*Housing Surplus/ Deficit*
St. John's, Newfoundland and Labrador	42.4	2.32	2.39	2,452
Halifax, Nova Scotia	40.4	2.29	2.46	13,507
Moncton, New Brunswick	42.4	2.30	2.37	2,126
Saint John, New Brunswick	44.4	2.30	2.31	206
Saguenay, Quebec	46	2.11	2.27	5,365
Québec, Quebec	43.2	2.11	2.26	26,194
Sherbrooke, Quebec	42.8	2.10	2.37	11,736
Trois-Rivières, Quebec	46.4	2.03	2.29	8,627
Montréal, Quebec	40.8	2.29	2.40	81,997
Ottawa - Gatineau, Quebec part	40.4	2.30	2.40	6,134
Ottawa - Gatineau, Ontario part	40.4	2.46	2.35	-21,454
Kingston, Ontario	42.8	2.29	2.32	1,055
Belleville, Ontario	45.2	2.36	2.33	-698
Peterborough, Ontario	45.2	2.36	2.31	-1,285
Oshawa, Ontario	39.6	2.76	2.46	-18,502
Toronto, Ontario	39.6	2.72	2.44	-259,161
Hamilton, Ontario	41.6	2.52	2.35	-21,116
St. Catharines - Niagara, Ontario	46	2.37	2.30	-5,562
Kitchener/Cambridge/Waterloo, Ontario	38	2.59	2.58	-1,471
Brantford, Ontario	41.6	2.53	2.42	-2,595
Guelph, Ontario	39.6	2.55	2.45	-2,653
London, Ontario	40	2.41	2.48	6,087
Windsor, Ontario	42.4	2.51	2.36	-10,074
Barrie, Ontario	40	2.68	2.46	-6,894
Greater Sudbury, Ontario	43.6	2.28	2.28	-101
Thunder Bay, Ontario	44.4	2.23	2.29	1,417
Winnipeg, Manitoba	39.2	2.48	2.49	902
Regina, Saskatchewan	38	2.44	2.55	4,196
Saskatoon, Saskatchewan	36.8	2.49	2.64	7,059
Lethbridge, Alberta	37.2	2.48	2.71	4,219
Calgary, Alberta	38	2.60	2.48	-26,617
Edmonton, Alberta	37.6	2.55	2.55	685
Kelowna, British Columbia	44.4	2.32	2.23	-3,655
Abbotsford - Mission, British Columbia	39.6	2.84	2.51	-8,973
Vancouver, British Columbia	40.8	2.50	2.37	-56,620
Victoria, British Columbia	44.8	2.20	2.21	858
Subtotal (36 Census Metropolitan Areas)				-262,609
Other Areas				-236,222
Canada (10 Provinces)				-498,831
Excluding CMAs with calculated surpluses				-683,652
Source: calculations by Will Dunning Inc. using data from Statistics Canada. Note: (1) Census data was published with only 1 decimal place. Those figures have been recalculated by Will Dunning Inc.				

For the 19 CMAs that have calculated housing surpluses I am not concluding that they have too much housing. While the analysis includes incomes, there are other factors that will affect household formation. Some time ago, I did an analysis of household formation rates across the country (using data from 2011 Census), relative to some local economic factors. That analysis showed that household formation is indeed affected by local economic factors (employment-to-population ratios, incomes, and housing costs), especially for the youngest age groups, with less effect on older adults. I didn't publish that research. When the required data from the 2021 Census is available in September, I might update the analysis.

For now, the 2021 Census data on household sizes is hinting that there are variations in local household sizes that are related to housing costs, in addition to ages of local populations.

The point is that these 19 CMAs with calculated surpluses have economic conditions that are conducive to household formation – notably, they have relatively low average home prices and/or rents, and therefore, it is reasonable for them to have higher household formation rates (conversely, they have low average household sizes).

Looking Forward

In this section, projections are made of population growth for 2021 to 2036, and then those projections are used to estimate how much new housing supply will be required. The methodology employed and key assumptions are briefly discussed in the Appendix. In brief:

- Populations for each area are projected using a "cohort-survival" demographic model, which takes account of births, deaths, and migration (movements of people to and from other places).
- Housing requirements are calculated by applying household formation rates and dwelling type choice rates (those rates are from the 2016 Census).
- Calculations are made for each year from 2021 to 2036. The two tables below show the averages for the 15-year period.

Table 3 summarizes the first set of conclusions - the expected growth in households that result from population growth (in the first four columns). The fifth column shows average annual starts for 2017 to 2021. The final column contrasts the estimated growth requirements versus recent construction numbers, to give a preliminary indication of the adequacy of supply. Positive numbers indicate that recent starts have exceeded the household growth that is expected for the coming 15 years. Negative numbers indicate that increases are required for housing starts.

At the stage of analysis illustrated in Table 3, the calculations indicate that at the national level, recent production has been greater than the household growth that is expected for the 15 years, by more than 17,000 units per year.

However:

- Most of that excess supply is in the "other" areas. For the 36 Census Metropolitan Areas, recent starts levels have been quite close to the total projection for household growth.
- Across the 36 CMAs, 11 have calculated surpluses and 25 have calculated shortages.
- Recent starts exceed the requirements in Quebec.
- Across most of the CMAs in other provinces, recent starts are lower than the required growth amounts.
- Moreover, household growth is projected to be reduced over time, as was illustrated in the chart on Page 2. Therefore, in the near term, there will be more situations of shortages.

However, in Table 4, further calculations are made, to take account of additional requirements that result from the need to replace demolished dwellings and to reduce accumulated deficits of supply. Those calculations show much larger future shortfalls.

Table 3
Projections of Household Growth, by Location,
Per Year, During 15 Years (2021/22 to 2035/36

Location	Growth Required				Average Starts 2017-21	Calculated Production Surplus/Deficit
	Low Density	Medium Density	High Density	Total		
St. John's	322	37	76	435	567	132
Halifax	3,207	189	1,589	4,984	3,162	-1,822
Moncton	1,025	45	347	1,418	1,261	-156
Saint John	276	25	113	414	402	-12
Saguenay	-21	1	93	73	487	413
Québec	1,304	45	1,228	2,577	6,860	4,283
Sherbrooke	723	40	631	1,393	1,826	433
Trois-Rivières	433	20	331	785	773	-11
Montréal	10,191	627	8,906	19,724	26,897	7,173
Ottawa-Gatineau, Que.	1,073	72	655	1,800	2,673	873
Ottawa-Gatineau, Ont.	5,808	1,806	3,372	10,986	8,590	-2,397
Kingston	749	93	360	1,201	1,054	-147
Belleville	609	61	218	889	619	-269
Peterborough	513	75	172	761	498	-263
Oshawa	3,245	549	830	4,624	2,720	-1,905
Toronto	24,145	3,534	13,990	41,669	38,158	-3,510
Hamilton	2,673	674	1,296	4,643	3,466	-1,177
St. Cath.-Niagara	1,867	207	537	2,611	2,389	-222
Kitch./Camb./Waterloo	3,934	763	1,612	6,310	4,356	-1,953
Brantford	978	135	237	1,349	850	-500
Guelph	905	174	325	1,404	880	-523
London	3,262	634	1,637	5,532	3,983	-1,549
Windsor	1,155	111	407	1,672	1,299	-373
Barrie	1,479	214	407	2,100	1,390	-710
Greater Sudbury	422	19	172	613	248	-365
Thunder Bay	142	2	83	226	194	-32
Winnipeg	3,420	164	1,541	5,126	5,341	215
Regina	1,175	97	451	1,723	1,070	-654
Saskatoon	2,100	190	771	3,061	1,883	-1,178
Lethbridge	753	44	119	916	621	-295
Calgary	7,694	930	2,474	11,098	11,733	635
Edmonton	7,580	846	2,737	11,162	11,250	88
Kelowna	1,979	200	762	2,941	2,683	-257
Abbotsford-Mission	1,096	147	441	1,684	1,327	-357
Vancouver	9,663	1,758	6,830	18,251	25,227	6,975
Victoria	2,050	250	1,210	3,510	3,930	420
Subtotal (36 CMAs)	107,930	14,777	56,960	179,666	180,667	1,001
Other Areas	23,634	-14	5,121	28,741	45,391	16,650
Canada (10 Provinces)	131,564	14,763	62,081	208,408	226,058	17,650

Source: calculations by Will Dunning Inc. using data from Statistics Canada and CMHC.

The next step makes two adjustments:

- Adding replacement requirements that result from demolitions. Annual totals are assumed to be equal to the averages seen during 2018 to 2021 (16,273 for the total of the 10 provinces).
- Adding requirements to (gradually) eliminate the accumulated deficits that have been estimated for 2021. The total amount is assumed to be the figure of 498,831 (33,255 per year) that was developed previously.

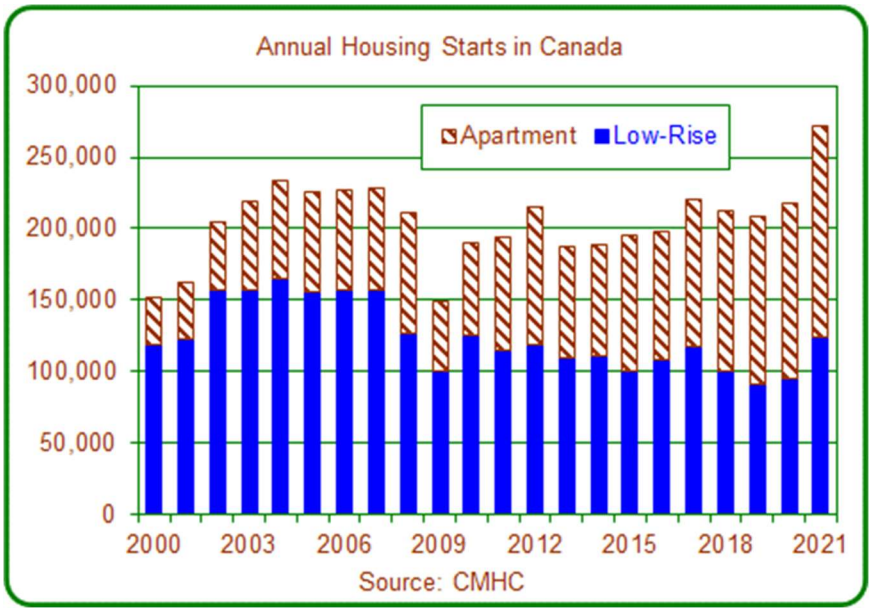
In this analysis, the total adjusted requirements (about 258,000 units per year) is about 32,000 higher than recent starts (as is shown in the last row of Table 4, on the next page). For the sum of the 10 provinces, recent starts have been 12% lower than the amounts required during 2021 to 2036.

Most of the CMAs (27 of 36) need to see increases in starts. Once again, most of the CMAs that seemingly have adequate starts are located within Quebec.

One surprise within these estimates is that Vancouver appears to have adequate supply (average starts are almost the same as the calculated total requirements). However, it is more likely that extreme conditions in Vancouver have constrained population growth in the past, which is impairing the projections of future population growth and housing requirements: if Vancouver was more affordable, it would have more population growth and its housing requirements would be considerably larger than is estimated here. Similarly, for Toronto the true deficit may be even larger than indicated.

Total starts for Canada in 2021 were unusually high (271,198 units).

- This is higher than the averaged requirement for the 15 years (257,936, as is shown in the last row of Table 4.
- It is only slightly below the estimated requirement for this year (274,880 units). But, 2021 was an unusual year. Starts peaked during the first quarter and have subsequently slowed. For the first quarter of this year, the annualized rate was about 236,000.



- With sharp rises in mortgage interest rates during the past few months, pre-construction sales of new homes will very likely slow, which would result in a subsequent slowing for starts.

If the period to reverse the existing shortages was set at 10 years rather than the 15 years used here, the annual requirements would be about 16,600 per year larger (291,508 for this year, and an average of 292,859 for the first five years). This would be 66,800 units per year higher than the average starts seen during 2017 to 2021.

Table 4
Adjusted Housing Requirements, by Location,
Per Year, During 15 Years (2021/22 to 2035/36

Location	Total Required Growth	Replacement Req'ment	Reduce Prior Shortages (15-year period)	Adjusted Total Req'ment	Average Starts 2017-21	Calculated Surplus/ Deficit
St. John's	435	37	-163	309	567	258
Halifax	4,984	117	-900	4,200	3,162	-1,038
Moncton	1,418	16	-142	1,292	1,261	-30
Saint John	414	80	-14	480	402	-78
Saguenay	73	50	-358	-235	487	722
Québec	2,577	272	-1,746	1,102	6,860	5,758
Sherbrooke	1,393	67	-782	678	1,826	1,148
Trois-Rivières	785	71	-575	281	773	492
Montréal	19,724	1,402	-5,466	15,660	26,897	11,237
Ottawa-Gatineau, Que.	1,800	158	-409	1,548	2,673	1,124
Ottawa-Gatineau, Ont.	10,986	440	1,430	12,856	8,590	-4,266
Kingston	1,201	64	-70	1,194	1,054	-140
Belleville	889	25	47	960	619	-341
Peterborough	761	43	86	889	498	-391
Oshawa	4,624	62	1,233	5,920	2,720	-3,200
Toronto	41,669	2,020	17,277	60,966	38,158	-22,807
Hamilton	4,643	202	1,408	6,253	3,466	-2,787
St. Cath.-Niagara	2,611	161	371	3,143	2,389	-754
Kitch./Camb./Waterloo	6,310	227	98	6,634	4,356	-2,278
Brantford	1,349	29	173	1,551	850	-702
Guelph	1,404	30	177	1,610	880	-730
London	5,532	108	-406	5,234	3,983	-1,251
Windsor	1,672	127	672	2,471	1,299	-1,171
Barrie	2,100	68	460	2,628	1,390	-1,238
Greater Sudbury	613	58	7	678	248	-430
Thunder Bay	226	34	-94	165	194	29
Winnipeg	5,126	294	-60	5,360	5,341	-19
Regina	1,723	73	-280	1,517	1,070	-447
Saskatoon	3,061	116	-471	2,705	1,883	-823
Lethbridge	916	4	-281	639	621	-18
Calgary	11,098	524	1,774	13,396	11,733	-1,663
Edmonton	11,162	564	-46	11,681	11,250	-430
Kelowna	2,941	147	244	3,331	2,683	-648
Abbotsford-Mission	1,684	146	598	2,428	1,327	-1,100
Vancouver	18,251	3,249	3,775	25,275	25,227	-49
Victoria	3,510	246	-57	3,699	3,930	231
Subtotal (36 CMAs)	179,666	11,325	17,507	208,498	180,667	-27,831
Other Areas	28,741	4,949	15,748	49,438	45,391	-4,047
Canada (10 Provinces)	208,408	16,273	33,255	257,936	226,058	-31,878

Source: calculations by Will Dunning Inc. using data from Statistics Canada and CMHC.

Housing Market Impacts

The housing market repeatedly demonstrates one of the most basic concepts in economics – that prices are determined by the relationship between demand and supply.

I have constructed many charts similar to this one, for all of Canada, the provinces, and communities across the country. In these charts, the relationship between demand and supply is shown by the sales-to-new-listings ratio ("SNLR"). In this chart, it is very clear that movements in the average house price during one-year periods are very closely related to the average of the SNLR over the same periods. During the time covered in this chart, the SNLR for Canada averaged 58.7% and the average selling price increased by an average of 6.9% per year. Statistical analysis tells me that the threshold for a "balanced market" in Canada is an SNLR of 52% (this is the SNLR at which prices are expected to rise by 2% per year). The estimated thresholds vary across the country, as is shown in Table 5. In every province, the average SNLR since 2006 has exceeded the calculated threshold and the average price has grown rapidly.

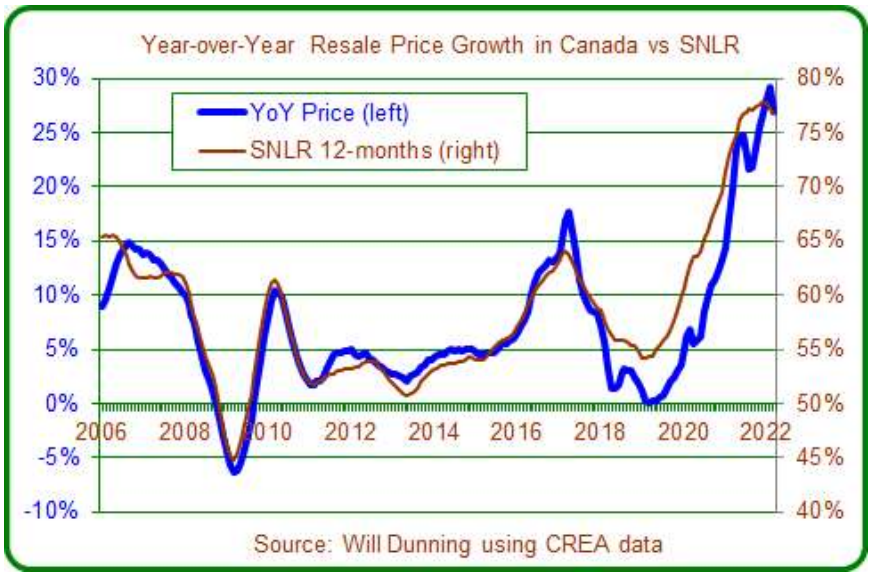


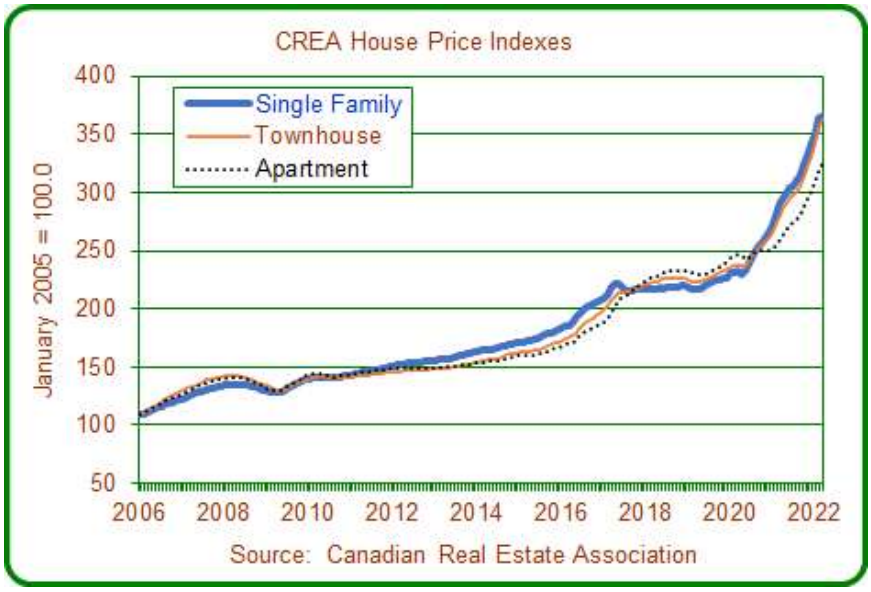
Table 5
Balanced Market SNLRs, by Province

	Estimated Threshold	*Average SNLR 2006 to March 2022*	*Annualized Change in Average Price*
Canada	52%	58.7%	6.9%
Newfoundland and Labrador	45%	49.2%	4.2%
Prince Edward Island	39%	56.6%	6.6%
Nova Scotia	48%	59.2%	6.2%
New Brunswick	47%	54.9%	5.6%
Quebec	44%	58.0%	6.4%
Ontario	54%	61.3%	8.4%
Manitoba	51%	68.1%	6.0%
Saskatchewan	49%	52.2%	5.5%
Alberta	51%	56.4%	4.3%
British Columbia	47%	57.9%	6.6%
Source: calculations by Will Dunning.			

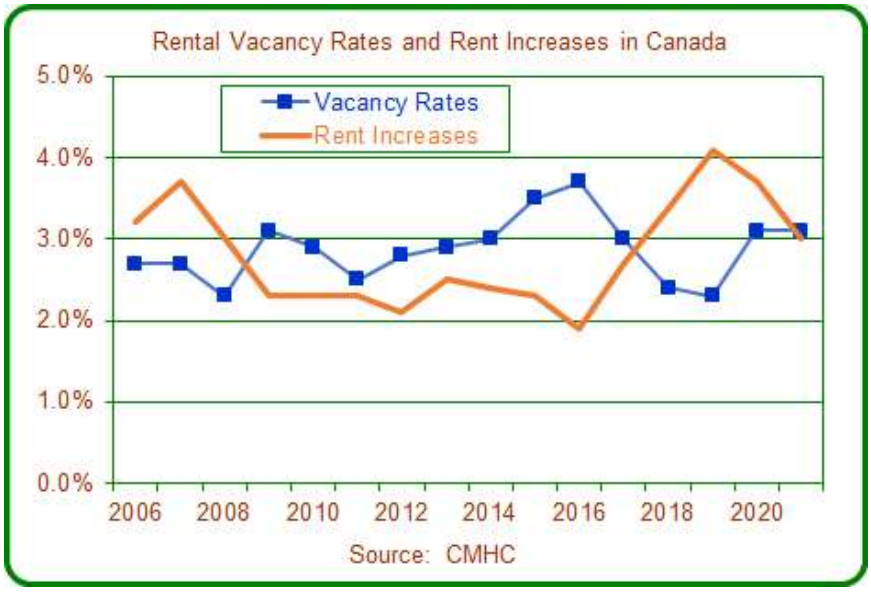
Some commentary suggests that a balanced market range can be defined by a SNLR from 40% to 60%. That is too wide: at a 40% SNLR, the expected price change for Canada is a 6.4% price

drop; at 60%, the expected change is a rise of 8.1%. If you want to use a range, I suggest the point estimate plus or minus three percentage points: for Canada, a SNLR from 49% to 55% results in expected price change from 0% to 4%. The ranges will vary across the provinces (and cities) of Canada.

During the pandemic, consumers have become more interested in changing their housing situations). The employment situation has bolstered demand. Interest rates have been extremely low. Shortages have worsened. That combination has resulted in extreme price growth: during the past two years (up to March 2022), CREA's House Price Index has increased by 51%. Price rises are largest for single family homes (57% during the past two years). But, even though there have been larger amounts of supply for medium density (townhouses) and high density (apartments), the overall shortages of housing have resulted in pressures in those market segments as well: during the past two years townhouse prices are estimated to have increased by 53% and for apartments the increase is estimated at 31%.



Housing shortages have also affected the rental sector. Data from CMHC shows falling vacancy rates during 2017 to 2019 (in each year, the data are as of October). Reduced employment during the pandemic period caused the vacancy rate to rise for October 2020 and be unchanged in 2021. Rent growth has increased: for the four years to 2021, CMHC data shows that rents have increased by an average of 3.5% per year. And, these are increases for occupied units (meaning that increases have been constrained by rent regulations and by landlords' tenant-retention decisions). For available (vacant) units, rents are often considerably higher and it appears that increases have been much more rapid.



If Canada had produced enough new housing to accommodate our growing population, Canadian housing markets would be much less heated than they are.

"Principal Residences"

Strictly-speaking, the estimated housing requirements are for "principal residences" (dwellings permanently occupied as the main residence, by a home owner, renter, or as band housing). Other dwellings (including second residences, such as vacation properties) and short-term rentals are not principal residences and shouldn't be counted against the requirements. Therefore, some of the new housing created is not principal residences.

Consequently, the "true" production shortfalls for low-density dwellings are larger than estimated, to some degree. And, the surpluses for medium and high-density housing are over-estimated to some degree. I'm not expressing an opinion here on how large the resulting errors might be. The message, tentatively expressed, is that the total shortfall of housing production in Canada has very likely been larger than is estimated here, to some unknown degree.

Other Housing Flows

In this analysis, adjustments have been made for demolitions. Other events affect the total supply of housing, including abandonments (especially in small towns and rural areas), altering numbers of units within structures (such as adding or removing a basement apartment), conversions (converting commercial buildings to residential use or on the other hand converting homes to business uses), changes in principal residence status (switching between permanent occupancy versus short-term rentals, which often won't count as principal residences). In theory, the estimates of surpluses or shortages should be adjusted for these events, but unfortunately, we don't have data that is complete and reliable. This research assumes that these other processes don't materially alter the outcomes. New Census data is consistent with this assumption. For the 2016 to 2021 Census period, the change in households (180,912 per year) was 16,414 per year lower than housing completions for the period (197,326 per year). This difference is very close to the assumption that has been made here for losses due to demolitions (16,273 per year).

Factors Inhibiting Housing Supply

This report is not intended to explain the reasons for the production shortfalls, to measure the effects of the causes, or to argue for solutions for enhancing supply. That said, here is a quick list of factors that I think are involved. I have no doubt that I've missed some.

- Naturally-occurring physical constraints.
- Land-use plans that limit uses of land that has development potential.
- Delayed approvals.
- Delayed installation of infrastructure.
- Costs imposed by governments on new construction (from a large list of fees and charges), which have increased very rapidly over time. Builders have to delay, so that attainable prices can catch-up to their increased costs.
- Decisions by land owners about whether to take actions – to sell or develop their lands. (This issue gets very little attention, but I think it ought to be investigated.)
- Mortgage regulations that suppress home buying: these reduce sales of new housing, which impairs future supplies.
- Labour supply: commentary from several communities suggest that housing construction is being constrained by shortages of skilled trades. A related concern is that in places

where large increases in construction are needed, the local cost of living makes it difficult to attract labour.

- Looking forward, given the need to increase housing starts by a large amount, supplies of building materials and equipment could emerge as challenges.

The factor of government-imposed costs is rarely mentioned in the on-going discussions about housing supply in Canada. I have come to believe that this is a major factor for our existing housing shortages. Half a century ago, growth-related infrastructure investment was funded largely through lending by governments (including bonds issues by CMHC). The borrowings were repaid out of municipalities' tax revenues. I think careful consideration should be given to revolutionizing how infrastructure is funded, by reviving a model from the ancient past.

Higher prices should provide incentive for builders to offer more supply, causing supply to respond to requirements. Will the environment be conducive to that expansion?

What will be the mix of that future housing supply? The recent data is not encouraging on that score. As is shown in the table below, total housing starts surged in 2021 (the total of 271,198 units was significantly higher than the average of 203,857 per year during the prior 10 years). Most of the increase was for apartments (to 147,212 units, versus a requirement that might be in the area of 75,000 to 80,000). Low density starts (singles plus semis) totaled just 95,392, while the requirement is likely to be in the area of 165,000 (as was shown in the summary table on page 3). Once again, town house starts (28,594) were above the requirement (perhaps 17,500). The total supply of ground-oriented housing (singles, semis, and towns) was less than 125,000 starts in 2021. This was, once again, well below the combined requirement, which exceeds 180,000 units, for growth plus the additional large increment to reduce existing deficits.

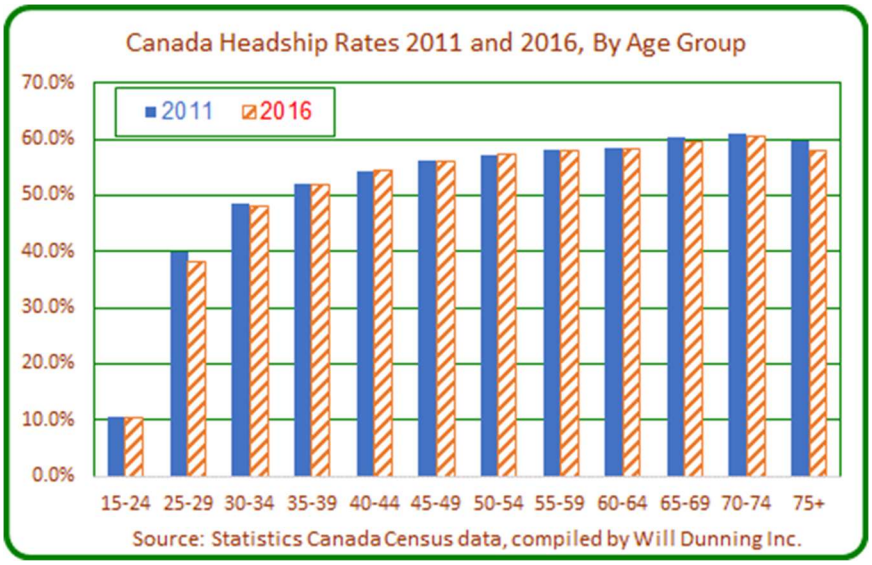
Table 6
Annual Housing Starts in Canada

Year	*Single-detached*	*Semi-detached*	*Row*	*Apartment and other*	*Total*
2000	92,184	11,530	15,247	32,692	151,653
2001	96,026	11,883	15,166	39,658	162,733
2002	125,374	13,584	18,482	47,594	205,034
2003	123,227	13,644	20,343	61,212	218,426
2004	129,171	14,297	22,067	67,896	233,431
2005	120,463	13,477	22,134	69,407	225,481
2006	121,313	14,358	20,963	70,761	227,395
2007	118,917	14,432	23,281	71,713	228,343
2008	93,202	12,651	20,868	84,335	211,056
2009	75,659	11,114	13,908	48,400	149,081
2010	92,554	13,006	19,857	64,513	189,930
2011	82,392	12,570	19,447	79,541	193,950
2012	83,657	14,285	20,976	95,909	214,827
2013	76,893	12,544	19,993	78,493	187,923
2014	75,515	13,407	21,448	78,959	189,329
2015	68,125	11,047	21,611	94,752	195,535
2016	74,089	10,830	22,653	90,344	197,916
2017	76,843	12,291	28,046	102,583	219,763
2018	65,940	10,992	23,510	112,401	212,843
2019	55,869	10,018	25,147	117,651	208,685
2020	59,954	11,397	23,506	122,945	217,802
2021	82,116	13,276	28,594	147,212	271,198

Source: Canada Mortgage and Housing Corporation, via Statistics Canada

Falling Household Formation Rates

If housing supply doesn't keep up with the requirements, some people who want to form new households are unable to do so, meaning that the calculated household formation rates will fall.



Inadequate supply is materially affecting the ability of Canadians to organize and live their lives the way they want. During 2011 to 2016, household formation rates fell for young adults (especially for the 25 to 29 age bracket, but also for 30 to 34 year olds), due in part to the housing market pressures that existed during that period. Housing data from the 2021 Census is expected to be released in September.

At this juncture, it seems quite likely that there were further drops in household formation rates during 2016 to 2021, signaling that housing shortages are making it increasingly difficult for Canadians to get on with their lives.

In the Introduction, I discussed that the employment situation should be encouraging increased household formation rates, but that a lack of supply is preventing that potential from turning into actuality.

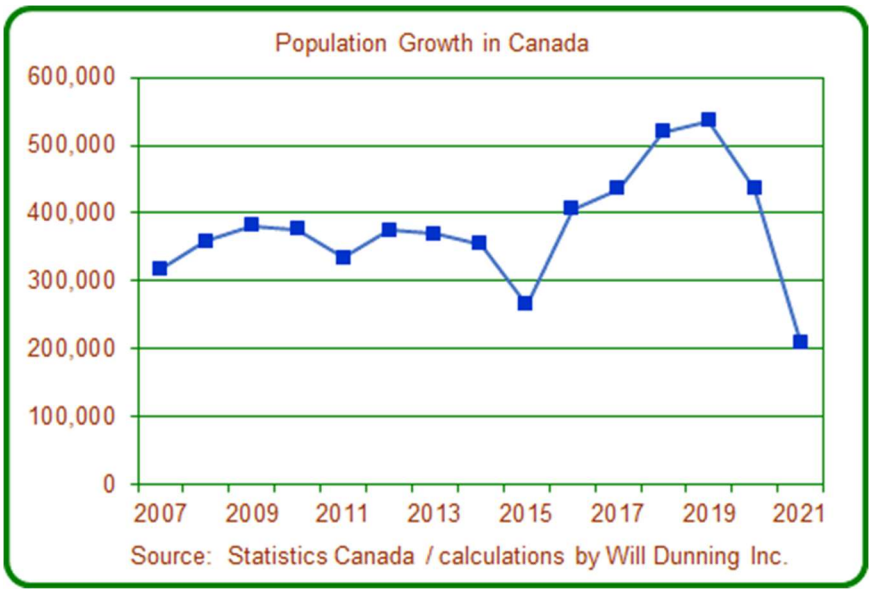
Changing Consumer Choices, Including "Substitution"

To varying extents, people today will make different choices compared to other people in earlier times. Housing production has shifted away from low density forms towards medium density, and especially to high density. In part, that reflects changing preferences: reduced child-bearing, as an example, will cause more people to want to live in apartments rather than in larger homes. Also, desires to be closer to work have supported movement to apartments. In some cases, substitution occurs due to economic necessity (especially the shift to town homes, away from single-detached and semi-detached homes). It is similarly possible that there has been some substitution from low and medium densities to apartments, due to economic pressures rather than to preferences: the increasing share of apartments, for some of the newer occupants, meant giving up on a first choice, to make the best of a very challenging situation.

Current events in housing markets across the country show that many consumers are re-assessing their preferences and revising their choices, which is causing them to compete aggressively in under-supplied segments of local housing markets.

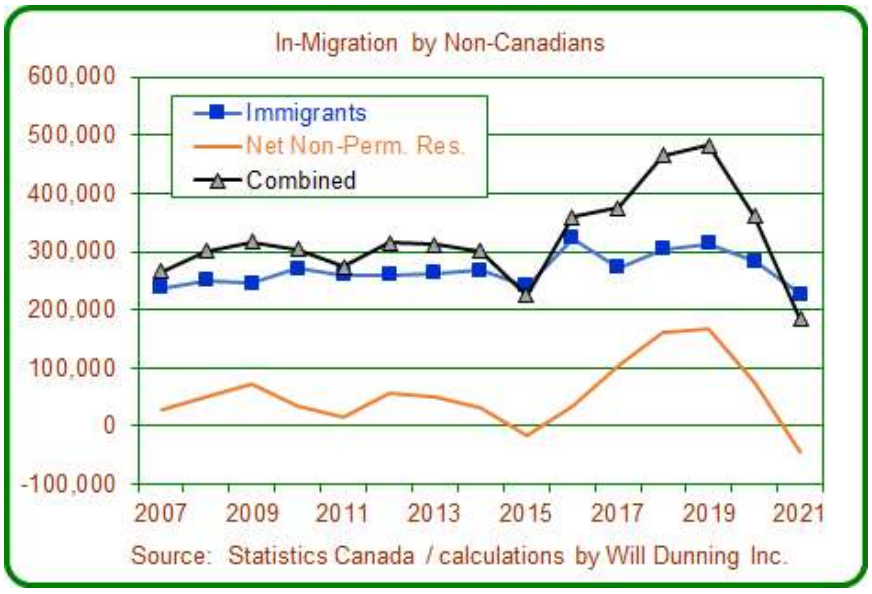
The Key Driver of Population Growth (and Housing Requirements)

Among first-world countries, Canada has relatively rapid population growth. Our rate of growth became even faster after 2016. As was noted earlier, our population grew by 1.4% in both 2018 and 2019. There was a pronounced dip in 2021 (about 209,000, or 0.4% for the year up to July 1st). The quarterly data is now showing a resurgence: during the first four quarters of 2021 (up to January 1, 2022), the population grew by an estimated 457,888, or 1.2%).



There are several components to population growth. At the national level, the three major components are “natural growth” (births minus deaths), movements by Canadians across the border, and movements by non-Canadians across the border. Sub-nationally, movements within Canada (between provinces, as well as within provinces) make further contributions to growth of local populations.

The third major component of population growth (movements by non-Canadians across the border) has the most variation and has the biggest impact on the growth rate for the population of Canada. In the data, this consists of two components: immigrants and the change in the number of non-permanent residents who are residing in Canada (this includes people on work and educational permits as well as refugees). This chart shows the annual data for those two components and the combined result. The elevated rates of population growth during 2016 to 2020 are due to this, and the dip in population growth for 2021 is due to the sharp drop-off for international migration. The recent rebound for population growth is likewise the result of a resurgence of migration into Canada.



The federal government has set a target for 431,635 immigrants this year (and higher amounts subsequently). This can be expected to result in a sustained rapid rates of population growth,

exceeding 450,000 per year during the next five years (although slowing gradually, as is as shown in a chart on the last page).

In order to meets our housing needs, Canada will need to produce housing at rates that are far above historical levels, on a sustained basis.

We need at least five years of housing starts in the area of 300,000 dwelling units per year.

Appendix – Notes on Methodologies

Looking Backward

The analysis starts with population and housing data from the 2006 Census of Canada, by age group. Calculations are made to profile housing choices by age group. The analysis then assumes that for each age group, those choices will be unchanged over time, to create a "what if" scenario.

Steps in the calculations are:

- Firstly, household formation rates are calculated for each age group, for each location. These are applied to Statistics Canada's annual population estimates by age group, to calculate how many households might exist in each of the years.
- Secondly, for each age group, what percentages of households live in each of the three types of dwelling? Applying these shares from 2006 to the future estimates of households produces estimates of how many dwellings of each type will be needed in each year.
- Then, the growth in the required numbers of dwellings indicates how many new dwellings need to be added in each year (again, by type of dwelling).
- Allowances are made for replacement of demolished dwellings: demolition data from Statistics Canada is available only since the start of 2018. Annual losses are assumed to be equal to the averages in that dataset.
- The estimated requirements are compared to actual housing production, using data from Canada Mortgage and Housing Corporation on housing completions.

These steps are completed for 36 major urban areas in Canada (Census Metropolitan Areas, or "CMAs"). For each province, the same calculations are made for the combined "rest of" area.

The estimates for the individual areas (36 Census Metropolitan Areas plus the "rest of" areas) are summed to generate national totals. Because CMHC does not provide the construction data for the Territories, they are excluded from the calculations of national requirements and production.

Since the estimates of population are as of July 1st each year, the housing completions data is for the same July-to-June periods (eg. the year labelled as 2007 covers the period July 1, 2006 to June 30, 2007. The final period is July 1, 2020 to June 30, 2021).

In 2006, there were about 12.4 million occupied dwellings in the 10 provinces, including just under 8.5 million within the 36 CMAs and just over 3.9 million in the "rest of" areas.

A Note on the Population Data

Earlier this year, data from the Census was released, showing populations as of May 2021. This Census data shows growth of 5.2% (1.03% per year) for Canada for 2016-2021, which is slower than the 5.9% (1.16% per year) in the annual data (also from Statistics Canada) that was used in this analysis. Varying differences are seen in the data for lower levels of geography.

The accuracy of the Census data is affected by "under-coverage" (people who are missed) and "over-coverage" (people who are counted more than once, or who may have deceased). After each Census, Statistics Canada does research to estimate the "net under-coverage". Then it generates detailed estimates of actual populations – that process, following the 2016 Census, was used to produce the annual data that has been used in this study. Based on past experience it might be another two years until the "post-Censal" revisions are available for the 2016-2021 estimates. The upshot is that at this time, we don't know which of the population datasets (the Census or the annual estimates) was more accurate.

International Comparisons

For the statistical analyses, the trend lines are 3rd order polynomials for the 169 countries and 2nd order polynomials for the countries of the OECD.

In the analysis of the OECD countries, two models are considered: the "simple" model is based on the age (and its square). The economic model adds data on "average wages" in US dollars, for 2020, obtained from here: https://data.oecd.org/earnwage/average-wages.htm.

The OECD describes its wage data as follows:

> Average wages are obtained by dividing the national-accounts-based total wage bill by the average number of employees in the total economy, which is then multiplied by the ratio of the average usual weekly hours per full-time employee to the average usually weekly hours for all employees. This indicator is measured in USD constant prices using 2016 base year and Purchasing Power Parities (PPPs) for private consumption of the same year.

OECD indicates that the data is to be cited as: OECD (2022), Average wages (indicator). doi: 10.1787/cc3e1387-en (Accessed on 03 May 2022)

Data on households and median ages was obtained from the UN website. Population estimates are as of 2020, and may include projections rather than actual data. Household size data has various effective dates, ranging from 2011 to 2018.

Table A-1 *Data for OECD Countries*					
Country	*Median Age*	*Average Household Size*	*Average Wage*	*Predicted Size*	*% Error*
Countries Included in the Analysis Model					
Australia	37.9	2.55	$55,206	2.56	-0.4%
Austria	43.5	2.27	$53,132	2.29	-0.9%
Belgium	41.9	2.34	$54,327	2.34	0.2%
Canada	41.1	2.45	$55,342	2.37	3.5%
Czechia	43.2	2.37	$29,885	2.52	-6.1%
Estonia	42.4	2.30	$30,720	2.54	-9.7%
France	42.3	2.22	$45,581	2.41	-7.6%
Germany	45.7	2.09	$53,745	2.23	-6.0%
Greece	45.6	2.50	$27,207	2.48	0.6%
Hungary	43.3	2.44	$25,409	2.56	-4.7%
Ireland	38.2	2.77	$49,474	2.59	6.9%
Italy	47.3	2.40	$37,769	2.36	1.9%
Japan	48.4	2.33	$38,515	2.34	-0.6%
Latvia	43.9	2.48	$29,876	2.50	-0.9%
Lithuania	45.1	2.35	$31,811	2.45	-4.0%
Luxembourg	39.7	2.41	$65,854	2.34	3.1%
Mexico	29.2	3.74	$16,230	3.78	-1.0%
Netherlands	43.3	2.23	$58,828	2.24	-0.7%
New Zealand	38	2.67	$45,269	2.64	1.1%
Norway	39.8	2.22	$55,780	2.43	-8.9%
Poland	41.7	2.81	$32,527	2.56	9.9%
Portugal	46.2	2.62	$28,410	2.46	6.3%
Slovakia	41.2	2.85	$23,619	2.67	6.9%
Slovenia	44.5	2.47	$41,445	2.37	4.1%
Spain	44.9	2.62	$37,922	2.39	9.2%
United Kingdom	40.5	2.31	$47,147	2.48	-6.8%
United States	38.3	2.49	$69,392	2.39	4.1%
Other OECD Countries (incomplete data)					
Chile	35.4				
Colombia	32.2	3.53			
Costa Rica	33.6	3.46			
Denmark	42.3				
Finland	42.8				
Iceland	37.3				
Israel	30.6				
South Korea	43.4				
Sweden	41				
Switzerland	43.1				
Turkey					
Source: Data from the United Nations and OECD; calculations by Will Dunning Inc.					

Looking Forward

"Cohort survival" methodologies are widely used in projecting population and housing requirements. My model includes the following process, for each of the 36 CMAs and 10 provinces:

- The projections start with the populations by single year of age and sex, as of 2021 (the most recent Statistics Canada estimates, from Table 17-10-0135-01).
- Additions and subtractions are made for the components of migration. Historical base data is from Statistics Canada Table 17-10-0136-01. For each area, assumptions for the components are developed as follows:
    - Immigration (immigrants plus change in non-permanent residents) is based on the area's share of the national total for 2016/17 to 2020/21, applied to the assumption that the national total will be 431,635 in 2022, 447,005 in 2023, and 451,000 in 2024 and the same in subsequent years.
    - Net emigration (the sum of the components of emigration) is based on the ratio of emigration to the area's population at the start of each year, averaged for the five years starting in 2016 to 2020.
    - Net interprovincial and net intraprovincial migration are similarly based on the historic ratios of migration to the population at the start of each year.
    - For each of the components, age/sex distributions of migrants are based on shares within the area for 2016/17 to 2020/21.
- The population is aged one year at a time, using Statistics Canada data on survival rates (provincial data for 2017 to 2019), from Table 13-10-0114-01.
- Births are added, by applying Statistics Canada provincial fertility rates for the most recent year (2020), from Table 13-10-0418-01. Note: fertility rates have fallen quite sharply over time, and especially during the past five years. This creates considerable uncertainty about future numbers of births. However, the estimates for projected households will not be affected by these births, since no one who is born during the projection period will have reached the age of 15 before the end of the period.
- Projections of numbers of households, and the distributions across three housing types, are calculated using the same methodology as in the Looking Backward section, although using household formation rates and housing type choice rates for 2016.

This chart illustrates that the rate of population growth is projected to slow during the 15-year projection period. This contributes to a slowdown for expected household formation (which was illustrated by the blue line in the chart on Page 2).