MARKET INTELLIGENCE REPORT 2019

Robust Non-Residential Leads Strong Construction Growth

December, 2018

Global Development & Infrastructure Consultants

BTY.COM

bty

DIRECTORS' MESSAGE

In 2018, BTY celebrated *40 years of success* in serving property and infrastructure clients worldwide. The company is marking further significant milestones in time for the new year.

Long-time executive leader Joe Rekab is transitioning to a new senior advisory role in the practice, as Chairman of the Board. Toby Mallinder is taking the helm as the new Managing Director of the firm, and Gord Smith is taking on the role of Operations Director. All three have played key leadership roles in BTY's expansion across Canada, the United States, Europe, MENA and Central Asia.

Like the markets the firm is rooted in, BTY has seen enormous change since 1978. The issues in the firm's early years were the building blocks of cities: housing, transportation, schools, hospitals, energy, and water and wastewater facilities. Environmental concerns had not yet come so perilously close to the tipping point that we are rapidly approaching.

Acceleration in the pace of urbanization has only led to the complication and intensification of issues. Building a better world for tomorrow is now more about how we integrate the building blocks with new technologies and methods to create smart cities of the future *(see article on page 44)*.

How do we align transit with housing to improve affordability? How do we build resilient infrastructure to mitigate the growing impacts of climate change on physical security as well as economic performance? *(see article on page 46)*. And how do we accommodate even denser urbanization to come in ways that ensure that our cities thrive as sustainable communities?

The traditional homebuilding model is simply not efficient enough to deliver at the scale, speed and cost required to meet the affordability challenge. Construction has lagged behind in embracing new technologies and methods to improve productivity and lower costs. Whether it's called modular, prefab or off-site fabrication, we see this form of construction as now having the sophistication and scale to play a major role in solving the affordability challenge *(see article on page 40)*.

Another shift is thinking about what we build. Healthy cities offer options for both home ownership and rentals to meet the needs of different income levels. Models such as Build-to-Rent – rental homes built at scale for the primary purpose of being rented long-term – can help solve part of the affordability challenge in concert with changes to integrate policy, planning, and funding.

BTY has long been collaborating with other industry leaders-lenders, builders, architects and planners – to develop innovative approaches to the pressing issues of the day through organizations such as Urbanarium in Vancouver. We are also contributing to projects that are pioneering smart city infrastructure in Toronto.

The challenges are complex and the learning curve is steep. We anticipate that the changes in the industry over the next 40 years will be even more transformative than those enabled by the successive waves of computer, Internet and wireless technologies over the past four decades. We are also confident that we will be here to provide people to count on and knowledge to build with for property and infrastructure clients worldwide.

Joe Rekab
Chairman

Toby Mallinder
Managing Director

Gord Smith
Operations Director

CANADA'S CONSTRUCTION OUTLOOK

OVERVIEW

Canada's fundamentals remain positive despite continuing uncertainties over trade and tariffs and volatility in oil prices that weaken business investment, and a cooling residential sector due in part to a tighter lending environment and rising interest rates.

Projected housing starts:

204,500 to 213,100 (2018)
193,700 to 204,000 (2019)

1.8%
GDP growth for 2019

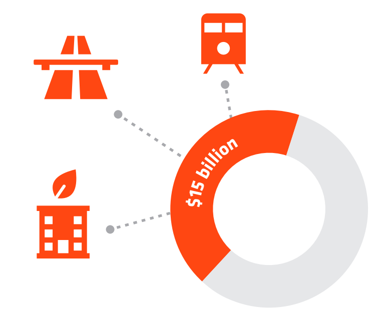
$585 billion
in actual and planned resource investment

300,000+
new immigrants a year 2017 to 2020

Strong population growth continues to support construction demand for new homes, schools, hospitals, and transportation, transit, and water and wastewater infrastructure. In 2017, 360,000 immigrants accounted for 75% of Canada's total population increase. The United States' current stance on immigration will work in Canada's favour, enabling companies to attract top talent, especially in the tech sector.

The federal government's housing strategy will create 100,000 new units and repair 300,000 existing units over the coming decade. This will help accommodate the influx in concert with multiple provincial and municipal housing initiatives to improve affordability for both home buyers and renters.

The long-awaited flow of investment funds from the Investing in Canada program and the newly established Canada Infrastructure Bank (CIB) started in August 2018 with a $1.28 billion, 15-year loan towards the $6.3 billion light-rail project in Montreal, led by Caisse de dépôt et placement du Québec.



*Of CIB's initial $35 billion in public funding, **$15 billion** is earmarked for public transit, trade and transportation corridors, and green infrastructure projects.*

The current federal government has allocated more than $80 billion in infrastructure spending over the coming decade.

Relatively weak investment in the oil and gas industry over the past two years has shown signs of strengthening with the return of mega-projects such as the $40-billion LNG Canada natural gas pipeline in British Columbia. Several other major LNG plants are close to final investment decisions, on both the west and east coasts. Overall, there are 418 projects currently under construction or planned in the resource sector, representing $585 billion in actual and potential capital investment. Energy projects account for 87% of the total value of major projects in that inventory, with minerals and metals projects at 12%, and forest projects at 1%.

Office vacancy rates dropping to 10% or lower in five cities across the country – Vancouver, Winnipeg, Toronto, Ottawa and Montreal – should help to sustain healthy investment in new construction. Demand for office space and data centres is especially strong in Canada's rapidly growing tech sector, as is e-commerce driven demand for warehouse and fulfillment facilities.

Total Canadian industry was at 85% of capacity in Q2 2018 – the highest level in 12 years, indicating a stronger likelihood for an expansion of facilities. As of Q2, industrial construction activity in 2018 was on track to reach a two-year high of nearly 20 million square feet.

Against this backdrop, the Bank of Canada raised its benchmark interest rate in October 2018 to 1.75%, the fifth increase in a year. It is expected that rates will continue to rise in 2019. A higher rate would help dampen inflation, which would also serve to restrain overall construction escalation. The Bank expects the economy to grow by 1.5% to 2.1% in 2018 and 1.4% to 2.2% in 2019. Major private sector forecasters differ only slightly, projecting increases of 2.1% in 2018 and 1.8% in 2019.

2019 OUTLOOK
BY PROVINCE

ONTARIO
A strong overall economic performance drives healthy activity across all sectors. Housing starts can expect a slight dip, but will remain well above historic averages.

BRITISH COLUMBIA
Mega-projects in energy and transportation support continued strength in overall construction as the economy and residential sectors slow after years of robust expansion.

ALBERTA
Oil price volatility and challenges in getting oil to market will curtail growth in 2019. Construction activity will be strongest in the industrial sector and infrastructure.

SASKATCHEWAN
Investment in energy and infrastructure projects and moderate growth in residential, industrial and commercial sectors is expected for the province. Saskatoon and Regina will lead growth in 2019.

MANITOBA
Large new industrial projects and investment in energy projects will help balance moderation on the residential and commercial sectors. Office, hotel and retail projects will strengthen activity in Winnipeg.

QUEBEC
A surge of office and condo investment, strong demand for industry and warehousing, and sustained infrastructure spending will buoy construction levels as housing starts decline slightly.

ATLANTIC PROVINCES
Newfoundland and Labrador will lead all provinces in growth in 2019 with a big boost from increased oil production, followed by Prince Edward Island close behind.

CANADIAN ESCALATION FORECAST

Ontario	6% to 8%
British Columbia	6% to 8%
Alberta	1% to 2%
Saskatchewan	1% to 2%
Manitoba	2% to 3%
Quebec	3% to 5%
Atlantic Provinces	0% to 1%

Upward Pressure Coming From
- Continued high immigration
- Increased spending on infrastructure
- Rising interest rates
- Weaker Canadian dollar
- Carbon tax

Downward Pressure Coming From
- Cooling in many residential markets
- Forecast for slowing growth in 2019
- Low oil prices

Escalation expected to be highest in Vancouver, Toronto and Montreal

2019 FORECAST
HOUSING STARTS

1. **BRITISH COLUMBIA** 38,500
2. **ALBERTA** 29,000
3. **SASKATCHEWAN** 3,800
4. **MANITOBA** 6,800
5. **ONTARIO** 73,000
6. **QUEBEC** 43,000
7. **NEWFOUNDLAND** 1,000
8. **PRINCE EDWARD ISLAND** 725
9. **NOVA SCOTIA** 3,800
10. **NEW BRUNSWICK** 2,350

regional snapshot

ONTARIO

Healthy economy supports construction across sectors

Increased business investment, major infrastructure projects and busy commercial and industrial sectors will help offset a slight dip in residential construction in the province. Housing starts are projected to decline from 77,500 in 2018 to 73,000 in 2019 – but totals are still expected to sit well above the long-term average of 64,700 units from 1991 to 2017. The $1.25-billion Port Lands project in Toronto is the largest development opportunity in the province and will be home to thousands of affordable housing units.

The USMCA trade pact will help keep Ontario's manufacturing exports flowing freely over the border to meet sturdy demand from the United States. Despite the impending closure of the Oshawa GM Plant in 2020 and a slower growth forecast for the U.S., the provincial economy is projected to experience only slight moderation, from 2.1% growth in 2018 to 1.9% in 2019.

Steady, if slower, population growth will help sustain housing demand even with tighter rules for mortgages, new restrictions on government insurance for low-ratio mortgages, and new taxes aimed at curtailing speculative investing. Population growth is projected to remain strong at 1.5% in 2018 and 1.4% in 2019.

An array of major transportation projects – underway and upcoming – include four billion dollar-plus LRT projects: Eglinton Crosstown, Ottawa, Hamilton and Hurontario, plus GO Transit's Regional Express Rail, and the $5.7-billion Gordie Howe International Bridge.

Toronto alone has launched construction projects valued at $720 million to renew the city's aging infrastructure with $360 million allocated to roads, expressways, and bridges and $299 million to sewers and watermains.

ICI construction is also showing an upward trajectory, with demand for warehousing and fulfillment centres driven by e-commerce leading the way. Toronto's downtown vacancy rate – the lowest in North America for two years running – is also generating a wave of new development across downtown Toronto led by a 46-storey tower at 160 Front Street West and the 48-storey Union Centre.

The mining sector will see road construction into the chromite-rich Ring of Fire and the first phase of expansion for the $760 million Cooper Cliff nickel mine as well as work on the $700-million Onaping Depth venture.

HOUSING STARTS BY CENSUS METROPOLITAN AREAS

1. LONDON 3,150
2. BRANTFORD 640
3. GUELPH 850
4. KITCHENER-CAMBRIDGE-WATERLOO 4,050
5. HAMILTON 2,900
6. ST. CATHARINES-NIAGARA 1,600
7. TORONTO 32,700
8. BARRIE 1,550
9. OSHAWA 2,500
10. PETERBOROUGH 430
11. KINGSTON 680
12. OTTAWA 7,700
13. WINDSOR 1,150

FORECAST HOUSING STARTS

77,500 IN 2018 vs 73,000 IN 2019

ONTARIO OUTLOOK

Projected GDP Growth

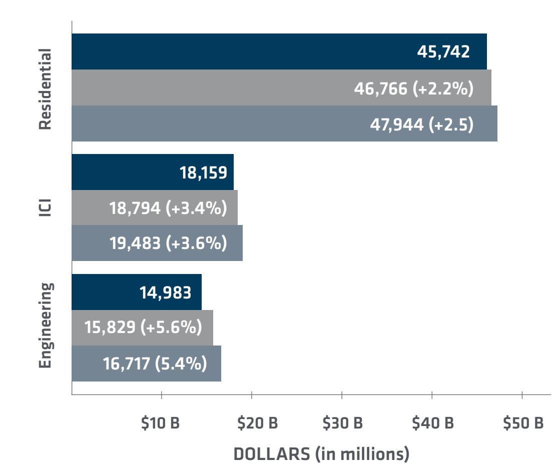
2.0% IN 2018 vs 1.9% IN 2019

Escalation Rate 2019

6% to 8%

Preliminary Put-in-Place Construction Investment Projections for 2018 – 2020

(Constant 2007 Canadian Dollars $ Millions)



(Sources: Central 1, Conference Board of Canada, Scotiabank, Royal Bank, BMO, Statistics Canada, PIP Spring 2017 (CanaData))

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BRITISH COLUMBIA

FORECAST HOUSING STARTS

42,100 IN 2018 vs **38,500** IN 2019

BC OUTLOOK

Projected GDP Growth

2.5% IN 2018 vs **2.0%** IN 2019

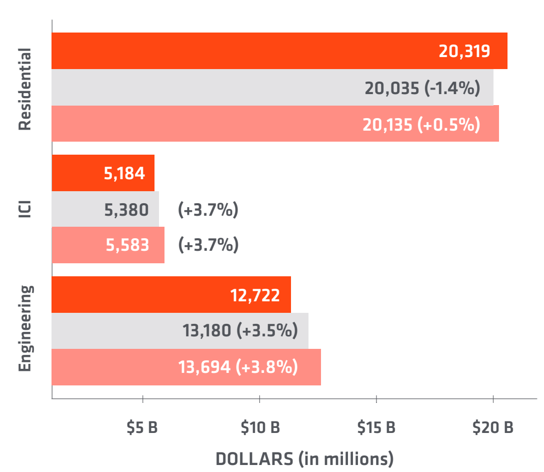
Escalation Rate 2019

6% to 8%

Preliminary Put-in-Place Construction Investment Projections for 2018 – 2020

(Constant 2007 Canadian Dollars $ Millions)

- = 2018
- = 2019
- = 2020



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Mega projects offset residential pullback

Several multibillion-dollar mega projects in the energy and transportation sectors will sustain continued strength in overall construction as the provincial economy and residential sector take a breather after many years of robust expansion. GDP growth is forecast to slip from 2.5% in 2018 to 2.0% in 2019.

The LNG Canada pipeline and plant in Kitimat, Site C Dam, the Broadway transit extension in Vancouver, and the Pattullo Bridge replacement lead the pack, with more potential LNG projects in the pipeline. Other major projects include the redevelopment of Royal Columbian Hospital, the new St. Paul's Hospital, Oakridge Centre Expansion, the North Shore Waste Water Treatment Plant in Metro Vancouver, and the Royal Inland Hospital in Kamloops.

While the projects will help to offset a residential pullback, they will also put even more stress on an already tight labour market. Tightening of mortgage lending policies and provincial housing measures have slowed demand, and anticipated interest rate hikes and high construction costs are expected to further dampen new residential construction. Housing starts are forecast to drop from 42,100 in 2018 to 38,500 in 2019.

Even with residential cooling, the economy will remain healthy, supported by steady population growth averaging 1.3% a year, continued business investment, strong exports, and a booming tech sector, which now accounts for 7% of provincial GDP compared to 3% for forestry.

Tech expansion is driving demand for new office space in Vancouver, which had North America's second lowest vacancy rate in Q2 2018. Amazon's expansion in BC is emblematic of the surge in the sector.

Amazon will be the anchor tenant – with 3,000 employees – in the redeveloped Canada Post building, which will also deliver the single largest infusion of new retail space within the downtown area in 18 years. That's in addition to a new suburban fulfillment centre, Amazon's third in Metro Vancouver.

Other downtown office projects set to break ground in 2019 and 2020 include a new 36-storey tower, the Stack, which will be Vancouver's tallest office building, the 33-storey Vancouver Centre II, and 400 West Georgia, a 24-storey tower.

regional snapshot

ALBERTA

Infrastructure and industrial lead construction

Oil price volatility and challenges in getting oil to market will see Alberta's growth curtailed in 2019. GDP growth is forecast to drop from 2.4% in 2018 to 1.5% in 2019 before rebounding to 2.7% in 2020, when Enbridge's Line 3 replacement is expected to be fully operational.

There is moderate growth in jobs added to the economy but the employment rate still has not reached pre-recessionary levels.

The province remains a top destination for immigrants and is set to again become a magnet for Canadians moving from other provinces, which supports the strong population growth of 1.8% in its two main urban centres, Calgary and Edmonton.

The growth in jobs and population should help reduce high housing inventories while keeping price increases and new construction stable. Housing starts are forecast to remain at stable levels, with 2018 finishing at 28,900 and 2019 projected to 29,000.

The industrial sector is experiencing solid growth, with Calgary showing particular strength in last-mile warehousing and fulfillment facilities. Strong leasing demand is driving industrial construction in Edmonton.

While government capital spending has been scaled back, the province's most recent budget continues to project a large deficit of $8.8 billion in 2018-19, little changed from the $9.1 billion reported in 2017-18. Major social and transportation infrastructure projects such as the Calgary Cancer Centre, Stoney Trail South, and Green Line LRT will help maintain activity levels in the city's construction sector. Construction will continue into 2019 on the Telus Sky Tower, the West Village Towers, and the Royal Condos.

Edmonton's revitalization of the city's downtown core continues with construction of the MacEwan Centre for the Arts, the ICE District, and work on the new Valley Line LRT.

FORECAST HOUSING STARTS

28,900 IN 2018 vs **29,000** IN 2019

ALBERTA OUTLOOK

Projected GDP Growth

2.4% IN 2018 vs **1.5%** IN 2019

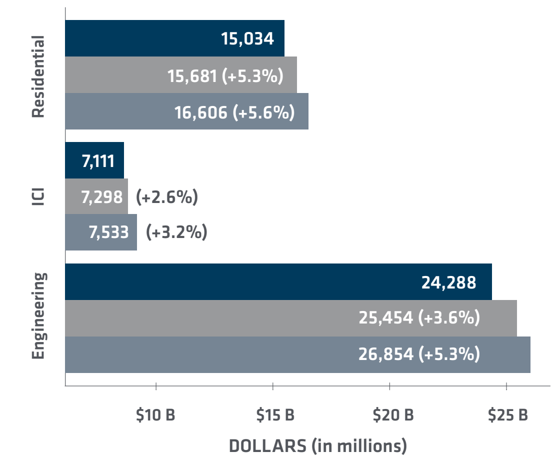
Escalation Rate 2019

1% to 2%

Preliminary Put-in-Place Construction Investment Projections for 2018 – 2020

(Constant 2007 Canadian Dollars $ Millions)

= 2018
= 2019
= 2020



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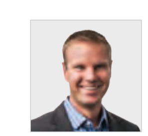

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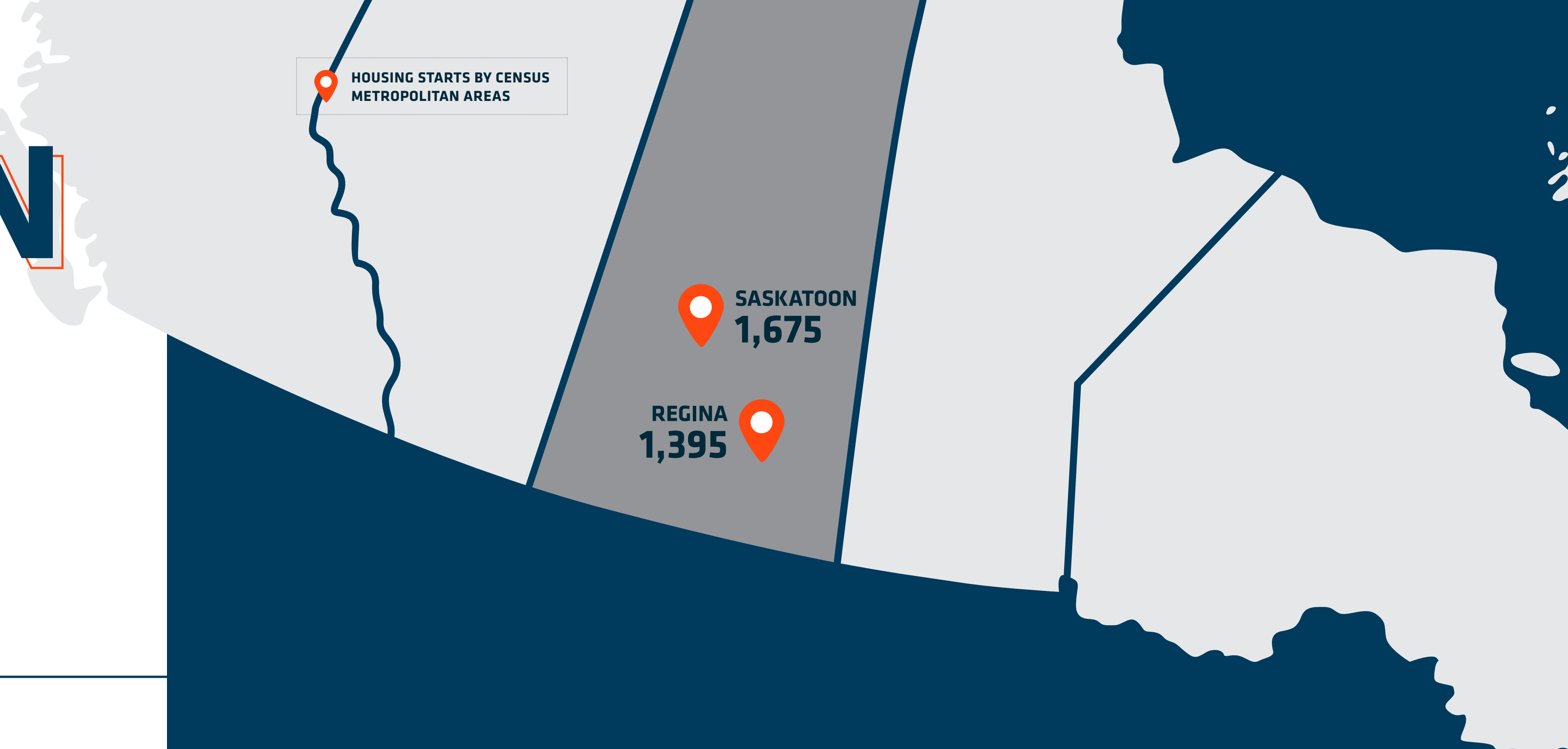
SASKATCHEWAN



FORECAST HOUSING STARTS

3,400 IN 2018 vs **3,800** IN 2019

SASKATCHEWAN OUTLOOK

Projected GDP Growth

1.4% IN 2018 vs **2.0%** IN 2019

Escalation Rate 2019

1% to 2%

Preliminary Put-in-Place Construction Investment Projections for 2018 – 2020

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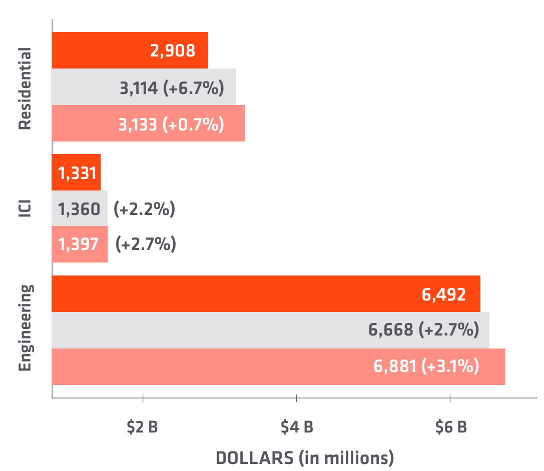

(Sources: Conference Board of Canada, Scotiabank, Royal Bank, BMO, Statistics Canada, PIP Spring 2017 (CanaData))

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Energy and infrastructure investment boosts construction

Saskatchewan will see growth moderate in 2018, with GDP growth dipping slightly to 1.4% before rebounding to 2.0% in 2019.

Significant investment in energy and infrastructure will help keep construction levels healthy. The province is grappling with softer than expected demand for its leading mineral products, uranium and potash, sub-par agricultural output, and a lower rate of in-migration and population growth.

Among the leading energy projects are the $5.3-billion Line 3 pipeline replacement program and two new steam-assisted heavy oil extraction plants in western Saskatchewan valued at $700 million. Husky currently has four plants under construction. The $2.8 billion Muskowekwan potash mine reserve project is going ahead while investment in other potash projects is stalled due to oversupply on global markets.

Work on the Regina Bypass, the $1.9-billion ring road around the capital, and the $680-million Chinook Power Station will continue into 2019. A new cannabis plant near Regina will also help keep non-residential building on an even footing, as will multiple school projects, and large-scale, big box projects such as Acre 21 and Aurora in Regina and Meadows Market in Saskatoon.

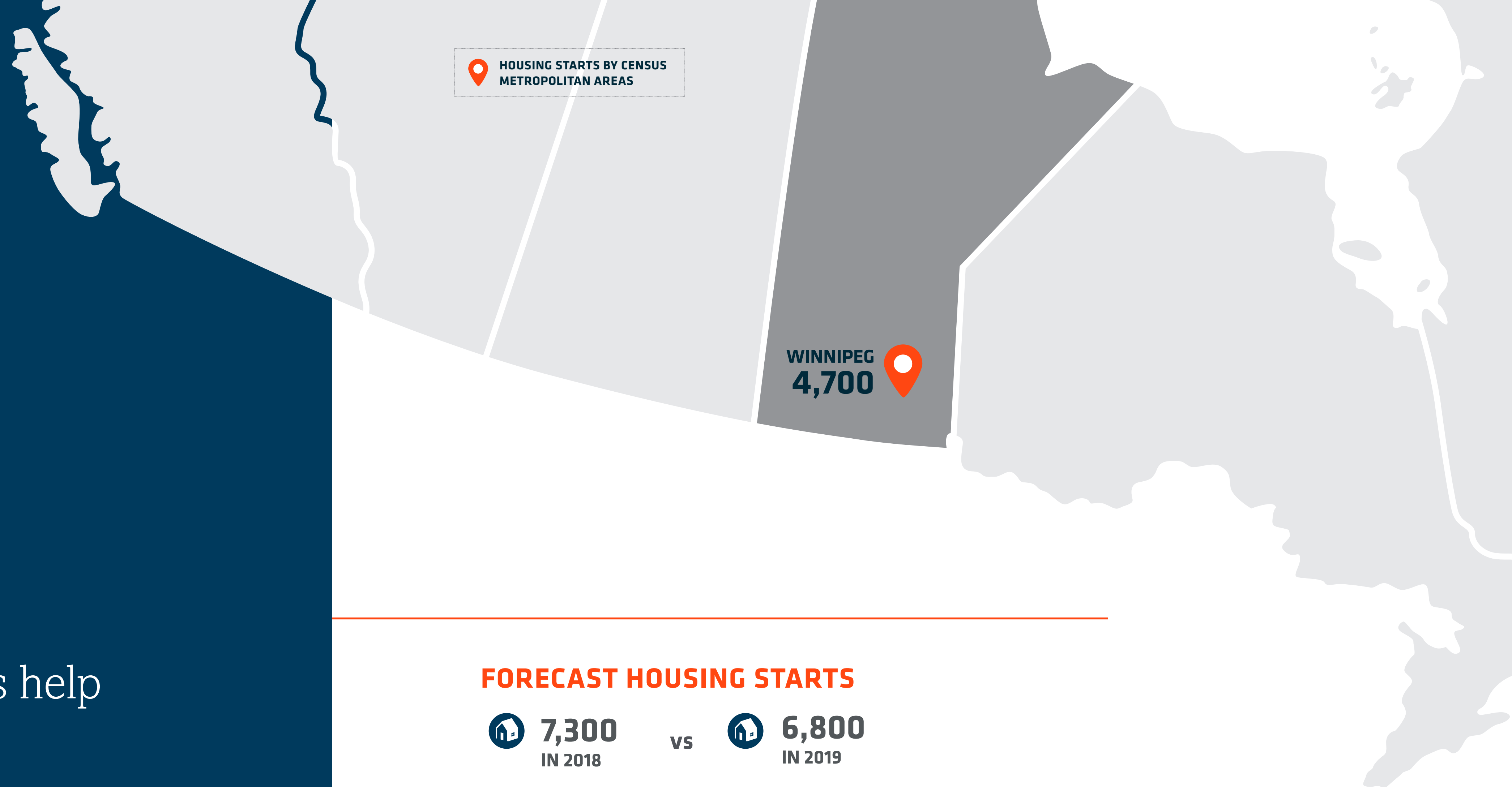
That city is one of the province's bright spots with a growth forecast of 2.3% in 2019. A proposed $120 million bus rapid transit system that would cross the city is intended to support the development of mixed-use "transit villages" along the new corridors. Construction of the system could commence in 2019 and be completed within three years.

The province and the federal government signed an agreement in fall 2018 for $900 million to be invested in buses, parks, recreation facilities, internet access and other infrastructure projects over the next 10 years. That investment will help to offset a planned reduction in provincial infrastructure investment.

With low job growth and weaker in-migration, housing starts are expected to remain at 2018 level or increase slightly. Several multi-generational care facilities are helping to sustain activity in the housing sector.

regional snapshot

MANITOBA



Large non-residential projects help offset housing dip

The strong performance of Manitoba's residential building sector, supported by robust population growth, will moderate in 2019. Housing starts are forecast to dip from 7,300 to 6,800, due in part to tighter mortgage rules and higher interest rates. A number of multi-phase residential apartment projects and seniors care homes will help stabilize activity in that sector.

But significant business investment in the form of new industrial as well as infrastructure projects will help offset the decline in housing starts and the winding down of mega projects in the energy sector. Overall, the province is forecast to maintain GDP growth of 1.8% in both 2018 and 2019.

The world's largest pea processing plant, valued at $400 million, will be built near Portage La Prairie to help feed growing global demand for plant-based protein. That city will also see a $480 million expansion of the Simplot potato processing plant. Manitoba produces one-fifth of Canada's potato crop.

Activity levels will also get a boost from the construction of Manitoba's portion of the Line 3 Pipeline Replacement project, one of the country's biggest infrastructure projects. In June 2018 the province and federal government signed an agreement that will see $1.1 billion in funds flow to Manitoba for infrastructure development over the next 10 years.

The federal government will cover 40% of costs for eligible transit projects, 50% for projects in rural and northern communities, 60% for projects in communities with populations under 5,000, and 70% for projects in Indigenous communities.

A long awaited upgrade to Winnipeg sewage treatment is also expected to get underway over the next two years. Valued at $795 million, it is the most expensive capital-construction job in the city's history.

Winnipeg will be a bright spot, with continuing construction of True North Square, a $400 million, four-tower downtown project with office and retail space as well as a hotel, and another major downtown project 300 Main, a 40-storey Class A office tower.

FORECAST HOUSING STARTS

7,300 IN 2018 vs **6,800** IN 2019

MANITOBA OUTLOOK

Projected GDP Growth

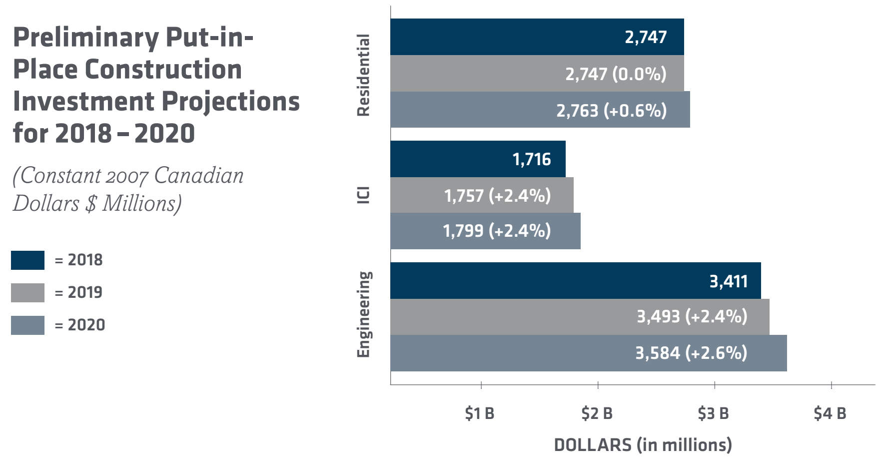
1.8% IN 2018 vs **1.8%** IN 2019

Escalation Rate 2019

2% to 3%

Preliminary Put-in-Place Construction Investment Projections for 2018 – 2020

(Constant 2007 Canadian Dollars $ Millions)



(Sources: Conference Board of Canada, Scotiabank, Royal Bank, BMO, Statistics Canada, PIP Spring 2017 (CanaData))

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QUEBEC

FORECAST HOUSING STARTS

46,000 IN 2018 vs **42,500** IN 2019

QUEBEC OUTLOOK

Projected GDP Growth

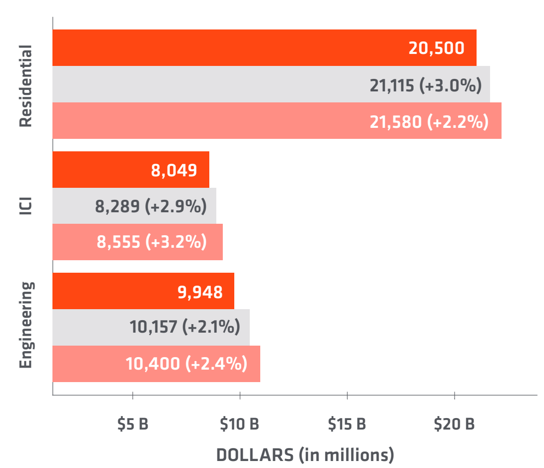
2.5% IN 2018 vs **2.0%** IN 2019

Escalation Rate 2019

3% to 5%

Preliminary Put-in-Place Construction Investment Projections for 2018 – 2020

(Constant 2007 Canadian Dollars $ Millions)



(Sources: Conference Board of Canada, Scotiabank, Royal Bank, BMO, Statistics Canada, PIP Spring 2017 (CanaData), La Commission de la Construction du Québec)

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Strength in every sector supports high construction levels

A robust economy over the past two years, a rising tide of office and condo investment, and sustained infrastructure spending are creating a bright outlook for Quebec's construction industry for the next two years even as GDP growth is forecast to slow from 2.5% in 2018 to 2.0% in 2019. Overall construction activity in the province will come in at 9% higher this year, compared to 2017. For 2019, the estimated construction work hours are expected to decline by 3% but with many newly announced projects, the outlook remains positive.

With relatively low condo prices compared to Vancouver and Toronto, Montreal has seen a strong influx of foreign investment in mixed-use and office complex development. Two new office towers, each over 50-stories, will be the city's tallest. One will be mixed-use with eight-stories of office and retail, and the balance condo residences; the other is the National Bank of Canada's new $500-million headquarters.

Overall, however, the province is forecast to post a slight decline in residential building after a strong showing in 2018. Housing starts are expected to dip from 46,000 in 2018 to 42,500 in 2019 as tighter lending conditions and an anticipated increase in interest rates temper demand.

Major regional transportation projects include the $4.2-billion Champlain Bridge, the $6.3-billion REM integrated rail network, a $2.5-billion upgrade to Pierre Elliott Trudeau International Airport, and the long-awaited $3.9-billion extension of the Metro system's Blue Line, which is slated to begin in 2020.

Major social infrastructure spending includes $1.5 billion for a new hospital in the Montreal suburb of Vaudreuil, $400 million to repair deficient school buildings, $400 million for new classrooms and expanded schools, and $274 million to build 3,000 more social housing units province-wide.

The ICI sector has shown record work levels in 2018, with a 10% increase over 2017. Demand for industrial space in both Montreal and Quebec City is strong as there has been a dearth of suitable modern space for expansion. Large custom-built distribution centres in ring suburbs of Montreal are springing up, while older industrial space in the city centre is being converted for commercial and office space for the tech industry.

Construction in the natural resources sector has declined in both the number of projects and value over the past three years, but still represents a significant portion of activity, with 56 energy, mining or forestry projects valued at $38 billion planned or under construction.

regional snapshot

ATLANTIC PROVINCES

Construction levels moderate with residential pullback

New Brunswick

Higher in-migration and population growth are expected to drive an increase in housing starts to 2,600 in 2018 but will dip slightly to 2,350 in 2019. The provincial economy, supported by stable resource exports and increased investment in business centres by financial services and airline companies, will achieve modest growth in GDP, from 0.6% in 2018 to 0.7% in 2019. Infrastructure spending is expected to increase in the next two years following a $673 million federal-provincial agreement signed in mid-2018.

Nova Scotia

The completion of the Maritime Link project and shut down of gas field production will hold back GDP growth, forecast at 0.8% for both 2018 and 2019. Ongoing multi-year, multi-billion-dollar shipbuilding contracts and the proposed $10-billion Goldboro natural gas (LNG) project should support a stronger performance in the long-term. Continued strong population growth is buoying homebuilding, with starts forecast at 4,600 in 2018 before dropping back to 3,800 in 2019 as rising borrowing costs take hold.

Prince Edward Island

PEI is one of Atlantic Canada's bright lights with forecast GDP growth of growth of 1.4% in 2018 and 2.7 % in 2019. Solid, immigration-driven population growth supports stronger housing, with starts expected to rise to 800 in 2018 before settling back to 725 in 2019. A projected budget surplus will see the government increase its spending on infrastructure, transportation and energy.

Newfoundland and Labrador

New oil production from the Hebron platform and resumption of operations at Hibernia are expected to lift Newfoundland and Labrador from -1.0% GDP growth in 2018 to 5.2% in 2019. That will help catapult the province to the head of the pack – and augur well for increased construction in 2020.

FORECAST HOUSING STARTS (2018 vs 2019)

New Brunswick	2,600	vs	2,350
Nova Scotia	4,600	vs	3,800
Prince Edward Island	800	vs	725
Newfoundland and Labrador	1,500	vs	1,000

ATLANTIC CANADA OUTLOOK

Projected GDP Growth (2018 vs 2019)

New Brunswick	0.6%	vs	0.7%
Nova Scotia	0.8%	vs	0.8%
Prince Edward Island	1.4%	vs	2.7%
Newfoundland and Labrador	-1.0%	vs	5.2%

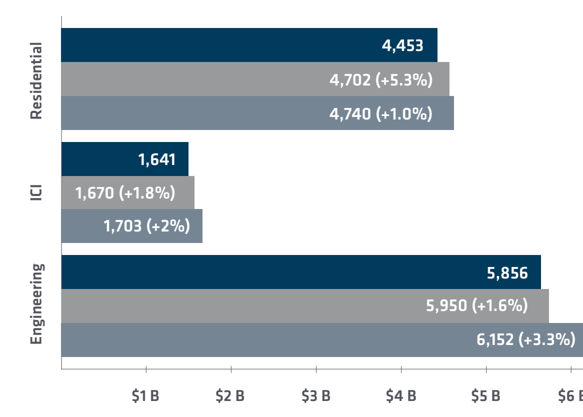
Escalation Rate 2019

0% to 1%

Preliminary Put-In-Place Construction Investment Projections for 2018 – 2020

(Constant 2007 Canadian Dollars $ Millions)

■ = 2018
■ = 2019
■ = 2020



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CANADIAN COST DATA PARAMETERS COMPARISON

BTY has been publishing the annual Market Intelligence Report and a comparison of Cost Data Parameters since 2003. The Cost Data includes unit rates for selected project categories, based on in-house data surveyed on a provincial level, and tendered data where available. The comparison provides actual data for 2018 and forecast data for 2019, using escalation levels generated by BTY.

PROJECT CATEGORY	BRITISH COLUMBIA				ALBERTA			
	ACTUAL 2018		FORECAST 2019		ACTUAL 2018		FORECAST 2019	
	$/m²	$/ft²	$/m²	$/ft²	$/m²	$/ft²	$/m²	$/ft²
HEALTH CARE								
Residential Care	2,690 - 3,010	250 - 280	2,820 - 3,160	262 - 294	2,630 - 3,160	244 - 294	2,670 - 3,210	248 - 298
Ambulatory Care	5,330 - 5,530	495 - 514	5,600 - 5,810	520 - 540	4,710 - 5,140	438 - 478	4,780 - 5,220	444 - 485
Acute Care	6,590 - 7,450	612 - 692	6,920 - 7,820	643 - 727	6,060 - 7,080	563 - 658	6,150 - 7,190	571 - 668
LABORATORIES								
Research Laboratories	6,720 - 7,450	624 - 692	7,060 - 7,820	656 - 727	6,310 - 7,000	586 - 650	6,400 - 7,110	595 - 661
Teaching Laboratories	5,230 - 5,790	486 - 538	5,490 - 6,080	510 - 565	5,150 - 6,000	478 - 557	5,230 - 6,090	486 - 566
Animal Research	8,340 - 9,270	775 - 861	8,760 - 9,730	814 - 904	7,500 - 8,220	697 - 764	7,610 - 8,340	707 - 775
HIGH-RISE RESIDENTIAL								
Rental Units	2,480 - 2,960	230 - 275	2,650 - 3,170	246 - 295	2,760 - 3,070	256 - 285	2,790 - 3,100	259 - 288
Market Units Mid End Specifications	2,940 - 3,390	273 - 315	3,150 - 3,630	293 - 337	2,500 - 3,160	232 - 294	2,530 - 3,190	235 - 296
Market Units High End Specifications	3,170 - 4,110	295 - 382	3,390 - 4,400	315 - 409	2,870 - 3,730	267 - 347	2,900 - 3,770	269 - 350
LOW- & MID-RISE RESIDENTIAL								
Rental Units	1,740 - 2,030	162 - 189	1,860 - 2,170	173 - 202	1,410 - 1,850	131 - 172	1,430 - 1,880	133 - 175
Market Units Mid End Specifications	2,090 - 3,370	194 - 313	2,240 - 3,610	208 - 335	1,690 - 2,260	157 - 210	1,720 - 2,290	160 - 213
Market Units High End Specifications	3,010 - 3,770	280 - 350	3,220 - 4,030	299 - 374	2,130 - 2,950	198 - 274	2,160 - 2,990	201 - 278
TOWNHOUSES (WOOD FRAME)								
Rental Units	1,410 - 1,770	131 - 164	1,510 - 1,890	140 - 176	1,140 - 1,530	106 - 142	1,160 - 1,550	108 - 144
Market Units Mid End Specifications	1,540 - 2,020	143 - 188	1,650 - 2,160	153 - 201	1,480 - 1,640	137 - 152	1,500 - 1,660	139 - 154
Market Units High End Specifications	1,820 - 2,520	169 - 234	1,950 - 2,700	181 - 251	1,710 - 2,300	159 - 214	1,740 - 2,330	162 - 216
SHOPPING CENTRES								
Strip Plaza	1,120 - 2,740	104 - 255	1,180 - 2,880	110 - 268	1,520 - 2,040	141 - 190	1,540 - 2,060	143 - 191
Enclosed Mall	2,610 - 3,730	242 - 347	2,740 - 3,920	255 - 364	2,400 - 3,130	223 - 291	2,420 - 3,160	225 - 294
Anchor/Department Store	2,290 - 2,770	213 - 257	2,400 - 2,910	223 - 270	2,240 - 2,890	208 - 268	2,260 - 2,920	210 - 271
Supermarket	1,780 - 2,360	165 - 219	1,870 - 2,480	174 - 230	1,770 - 2,220	164 - 206	1,790 - 2,240	166 - 208
Discount Store	1,380 - 2,000	128 - 186	1,450 - 2,100	135 - 195	1,720 - 2,220	160 - 206	1,740 - 2,240	162 - 208
OFFICE								
Under 5 Storeys	2,120 - 2,550	197 - 237	2,280 - 2,740	212 - 255	1,920 - 2,720	178 - 253	1,940 - 2,750	180 - 255
5–10 Storeys	2,300 - 2,970	214 - 276	2,470 - 3,190	229 - 296	2,230 - 2,850	207 - 265	2,250 - 2,880	209 - 268
10–20 Storeys	2,520 - 3,210	234 - 298	2,710 - 3,450	252 - 321	2,310 - 2,980	215 - 277	2,330 - 3,010	216 - 280
20–30 Storeys	2,890 - 4,000	268 - 372	3,110 - 4,300	289 - 399	2,610 - 3,710	242 - 345	2,640 - 3,750	245 - 348
EDUCATIONAL								
Elementary Schools	2,200 - 2,980	204 - 277	2,310 - 3,130	215 - 291	2,190 - 2,880	203 - 268	2,220 - 2,920	206 - 271
Secondary Schools	2,450 - 3,340	228 - 310	2,570 - 3,510	239 - 326	2,310 - 2,990	215 - 278	2,340 - 3,030	217 - 281
Higher Education	2,940 - 4,350	273 - 404	3,090 - 4,570	287 - 425	2,720 - 3,810	253 - 354	2,760 - 3,870	256 - 360
LIGHT INDUSTRIAL								
Warehouse	1,040 - 1,400	97 - 130	1,100 - 1,480	102 - 137	1,080 - 1,520	100 - 141	1,090 - 1,540	101 - 143
HOTELS								
Low Rise	2,080 - 2,930	193 - 272	2,180 - 3,080	203 - 286	2,060 - 2,490	191 - 231	2,090 - 2,520	194 - 234
ROADS - PAVING	$/Lane km		$/Lane km		$/Lane km		$/Lane km	
Paved Highway - Linear Roadworks	1,027,300 - 1,296,200		1,068,400 - 1,348,000		964,000 - 1,203,700		978,500 - 1,221,800	
ROAD OVERPASS BRIDGE STRUCTURE	$/m²		$/m²		$/m²		$/m²	
Highway Overpass Structures	4,200 - 5,700		4,400 - 6,000		3,800 - 5,900		3,900 - 6,000	

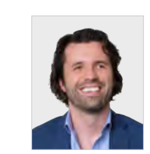
PROJECT CATEGORY	SASKATCHEWAN				ONTARIO				QUEBEC			
	ACTUAL 2018		FORECAST 2019		ACTUAL 2018		FORECAST 2019		ACTUAL 2018		FORECAST 2019	
	$/m²	$/ft²	$/m²	$/ft²	$/m²	$/ft²	$/m²	$/ft²	$/m²	$/ft²	$/m²	$/ft²
HEALTH CARE												
Residential Care	2,850 - 3,140	265 - 292	2,910 - 3,200	270 - 297	2,570 - 2,930	239 - 272	2,760 - 3,150	256 - 293	2,810 - 3,200	261 - 297	2,920 - 3,330	271 - 309
Ambulatory Care	5,150 - 5,820	478 - 541	5,250 - 5,940	488 - 552	4,730 - 5,330	439 - 495	5,080 - 5,730	472 - 532	5,170 - 5,750	480 - 534	5,380 - 5,980	500 - 556
Acute Care	5,960 - 6,920	554 - 643	6,080 - 7,060	565 - 656	6,170 - 6,630	573 - 616	6,630 - 7,130	616 - 662	5,630 - 7,190	523 - 668	5,860 - 7,480	544 - 695
LABORATORIES												
Research Laboratories	6,850 - 7,760	636 - 721	6,990 - 7,920	649 - 736	6,410 - 7,230	596 - 672	6,860 - 7,740	637 - 719	6,850 - 7,860	636 - 730	7,120 - 8,170	661 - 759
Teaching Laboratories	5,580 - 6,060	518 - 563	5,690 - 6,180	529 - 574	5,420 - 6,220	504 - 578	5,800 - 6,660	539 - 619	5,680 - 6,760	528 - 628	5,910 - 7,030	549 - 653
Animal Research	8,890 - 9,130	826 - 848	9,070 - 9,310	843 - 865	6,390 - 8,350	594 - 776	6,840 - 8,930	635 - 830	6,960 - 9,110	647 - 846	7,240 - 9,470	673 - 880
HIGH-RISE RESIDENTIAL												
Rental Units	2,230 - 2,750	207 - 255	2,260 - 2,790	210 - 259	2,290 - 2,960	213 - 275	2,460 - 3,180	229 - 295	1,980 - 2,540	184 - 236	2,060 - 2,640	191 - 245
Market Units Mid End Specifications	2,570 - 3,220	239 - 299	2,610 - 3,270	242 - 304	2,650 - 3,410	246 - 317	2,850 - 3,670	265 - 341	2,430 - 3,090	226 - 287	2,530 - 3,210	235 - 298
Market Units High End Specifications	2,950 - 3,760	274 - 349	2,990 - 3,820	278 - 355	3,170 - 4,100	295 - 381	3,410 - 4,410	317 - 410	2,980 - 4,410	277 - 410	3,100 - 4,590	288 - 426
LOW- & MID-RISE RESIDENTIAL												
Rental Units	1,350 - 1,750	125 - 163	1,360 - 1,770	126 - 164	1,300 - 1,540	121 - 143	1,400 - 1,660	130 - 154	1,320 - 1,560	123 - 145	1,370 - 1,620	127 - 151
Market Units Mid End Specifications	1,560 - 2,160	145 - 201	1,580 - 2,180	147 - 203	1,540 - 1,800	143 - 167	1,660 - 1,940	154 - 180	1,440 - 1,820	134 - 169	1,500 - 1,890	139 - 176
Market Units High End Specifications	2,290 - 2,650	213 - 246	2,310 - 2,680	215 - 249	1,900 - 2,260	177 - 210	2,040 - 2,430	190 - 226	1,880 - 2,320	175 - 216	1,960 - 2,410	182 - 224
TOWNHOUSES (WOOD FRAME)												
Rental Units	1,110 - 1,310	103 - 122	1,120 - 1,320	104 - 123	1,250 - 1,470	116 - 137	1,340 - 1,580	124 - 147	1,100 - 1,490	102 - 138	1,140 - 1,550	106 - 144
Market Units Mid End Specifications	1,210 - 1,620	112 - 151	1,220 - 1,640	113 - 152	1,370 - 1,600	127 - 149	1,470 - 1,720	137 - 160	1,440 - 1,770	134 - 164	1,500 - 1,840	139 - 171
Market Units High End Specifications	1,620 - 2,220	151 - 206	1,640 - 2,240	152 - 208	1,600 - 1,950	149 - 181	1,720 - 2,100	160 - 195	1,660 - 2,320	154 - 216	1,730 - 2,410	161 - 224
SHOPPING CENTRES												
Strip Plaza	1,310 - 2,320	122 - 216	1,320 - 2,340	123 - 217	1,390 - 1,740	129 - 162	1,490 - 1,860	138 - 173	1,020 - 1,690	95 - 157	1,060 - 1,760	98 - 164
Enclosed Mall	2,410 - 3,080	224 - 286	2,430 - 3,110	226 - 289	1,740 - 2,070	162 - 192	1,860 - 2,210	173 - 205	2,360 - 3,260	219 - 303	2,450 - 3,390	228 - 315
Anchor/Department Store	2,320 - 2,930	216 - 272	2,340 - 2,960	217 - 275	2,100 - 2,480	195 - 230	2,250 - 2,650	209 - 246	2,020 - 2,690	188 - 250	2,100 - 2,800	195 - 260
Supermarket	1,310 - 2,220	122 - 206	1,320 - 2,240	123 - 208	1,550 - 1,990	144 - 185	1,660 - 2,130	154 - 198	1,340 - 1,850	124 - 172	1,390 - 1,920	129 - 178
Discount Store	1,310 - 1,820	122 - 169	1,320 - 1,840	123 - 171	1,260 - 1,490	117 - 138	1,350 - 1,590	125 - 148	1,290 - 1,690	120 - 157	1,340 - 1,760	124 - 164
OFFICE												
Under 5 Storeys	2,210 - 3,690	205 - 343	2,230 - 3,730	207 - 347	1,740 - 2,070	162 - 192	1,870 - 2,230	174 - 207	1,620 - 1,960	151 - 182	1,680 - 2,040	156 - 190
5–10 Storeys	2,370 - 3,550	220 - 330	2,390 - 3,590	222 - 334	1,860 - 2,300	173 - 214	2,000 - 2,470	186 - 229	1,960 - 2,470	182 - 229	2,040 - 2,570	190 - 239
10–20 Storeys	2,440 - 3,050	227 - 283	2,460 - 3,080	229 - 286	2,090 - 2,550	194 - 237	2,250 - 2,740	209 - 255	2,020 - 2,720	188 - 253	2,100 - 2,830	195 - 263
20–30 Storeys	2,820 - 3,460	262 - 321	2,850 - 3,490	265 - 324	2,350 - 2,930	218 - 272	2,530 - 3,150	235 - 293	2,560 - 3,290	238 - 306	2,660 - 3,420	247 - 318
EDUCATIONAL												
Elementary Schools	2,350 - 2,960	218 - 275	2,400 - 3,020	223 - 281	1,750 - 2,080	163 - 193	1,870 - 2,230	174 - 207	1,800 - 2,140	167 - 199	1,870 - 2,230	174 - 207
Secondary Schools	2,450 - 3,260	228 - 303	2,500 - 3,330	232 - 309	1,860 - 2,300	173 - 214	1,990 - 2,460	185 - 229	1,910 - 2,420	177 - 225	1,990 - 2,520	185 - 234
Higher Education	2,750 - 3,770	255 - 350	2,810 - 3,850	261 - 358	2,130 - 2,590	198 - 241	2,280 - 2,770	212 - 257	2,810 - 4,490	261 - 417	2,920 - 4,670	271 - 434
LIGHT INDUSTRIAL												
Warehouse	1,310 - 2,220	122 - 206	1,320 - 2,240	123 - 208	1,060 - 1,290	98 - 120	1,130 - 1,370	105 - 127	900 - 1,240	84 - 115	940 - 1,290	87 - 120
HOTELS												
Low Rise	1,890 - 2,580	176 - 240	1,910 - 2,610	177 - 242	1,810 - 2,370	168 - 220	1,940 - 2,540	180 - 236	1,910 - 2,580	177 - 240	1,990 - 2,680	185 - 249
ROADS - PAVING	$/Lane km		$/Lane km		$/Lane km		$/Lane km		$/Lane km		$/Lane km	
Paved Highway - Linear Roadworks	1,212,600 - 1,370,700		1,236,900 - 1,398,100		907,500 - 1,107,200		971,000 - 1,184,700		1,312,300 - 1,472,900		1,358,200 - 1,524,500	
ROAD OVERPASS BRIDGE STRUCTURE	$/m²		$/m²		$/m²		$/m²		$/m²		$/m²	
Highway Overpass Structures	4,700 - 6,600		4,800 - 6,800		4,000 - 6,200		4,300 - 6,700		5,000 - 7,200		5,200 - 7,500	

Note: *The unit rates reflect hard construction costs, including general requirements and fees, and exclude site works and tenant improvements. Variances in unit rates and escalation will occur due to the remoteness of some regions and prevailing local market conditions. Construction costs can also be affected by a multitude of factors that may not be limited to market conditions.*

BTY strongly recommends that readers seek the advice of a Professional Quantity Surveyor (PQS) prior to establishing a budget for their specific projects.

U.S. CONSTRUCTION OUTLOOK

REGION EXPERTS:



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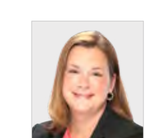

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USA

Non-residential to lead growth in U.S. construction spending

Infrastructure to rise, residential to decline

Non-residential construction spending in the U.S. is forecast to grow by 4.7% in 2018 and moderate slightly to 4.0% in 2019. Overall construction starts are expected at $808 billion for 2019, inching slightly ahead of 2018's $807 billion.

The anticipated moderation comes against a backdrop of an expected slowing of the country's economic growth, rising interest rates and increased materials costs. The U.S. GDP growth is forecast to rise to 3.1% in 2018 and moderate to 2.5% in 2019.

The leading non-residential sectors and projected growth rates for spending in 2019 include:

- Public Safety – 5.9%
- Education – 5.2%
- Industrial – 4.9%
- Healthcare – 4.4%
- Office – 4.0%

Infrastructure showing continued strength

Public works construction will increase 4%, with growth across most of the project types. A federal appropriations bill is providing greater funding for transportation projects that will carry over into 2019. Among the transportation sub-sectors that are seeing some of the healthiest growth are airports. Multiple airport expansions and redevelopments are using the Public Private Partnership (P3) model, with spending on pre-launch and in-progress P3 projects valued at $51.7 billion.

Among those using the P3 Model under construction are the $4-billion LaGuardia Airport CTB Project and the $3.9-billion LaGuardia Terminal C & D project. The $1-billion Consolidated Rent-A-Car facility at Los Angeles International Airport achieved financial completion in 2018.

Residential to drop slightly

Single family is expected to see a 3% decline in housing starts to 815,000, with multi-family projected to have an 8% drop in units to 465,000. The moderations are due partly to increases in mortgage rates, reduced affordability, and tax reform that reduced tax advantages for home ownership.

Concern over rising interest rates and materials costs

Rising materials costs, such as import tariffs on steel and aluminum products, price increases in diesel fuel, lumber, gypsum products and plastic construction products could slow growth in 2019. By mid-2018, year-over-year increases in materials costs for construction had risen by 10%.

Labour availability to remain an issue

With the U.S. unemployment rate expected to remain below 4% into 2019, persistent labour shortages are expected to continue. The construction industry workforce is estimated to be close to one-third immigrant labour, and largely Hispanic. The ongoing immigration issues at play in the U.S. could further reduce the number of workers available.

Sources: FMI Construction Outlook, American Institute of Architects (AIA) Construction Consensus Forecast, 2019 Dodge Construction Outlook, ConstructConnect

INTERNATIONAL MARKETS IN FOCUS

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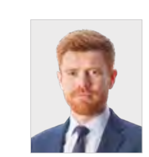

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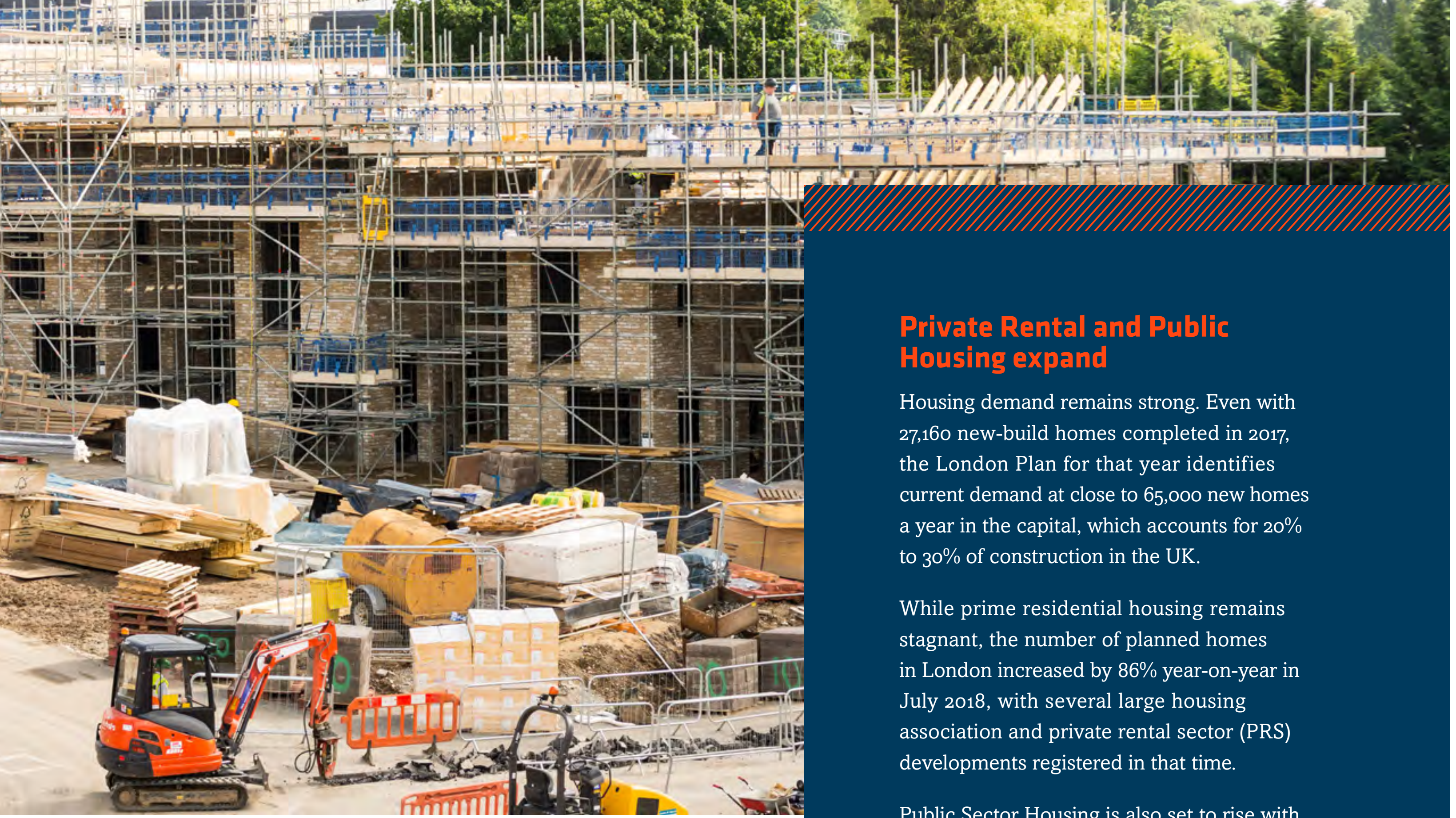


UNITED KINGDOM

Housing and infrastructure drive UK construction

In the shadow of uncertainty over Brexit, the UK construction industry is expected to dip slightly in 2018 by 0.6% before rebounding to 2.3% growth in 2019 and 1.9% in 2020.

Home building and infrastructure will lead growth as many commercial and retail developers are taking a wait-and-see attitude before committing to delivering new projects. Other impacts of Brexit uncertainty include a decline of 15% to 20% in the value of GBP against the Euro, which drives up the cost of imported material items, and a potential reduction in the labour pool.

The infrastructure sector–forecast to rise by 5% in 2018 and 2% in 2019–remains the growth engine for the industry. Output is forecast to hit a historic high of £23.6 billion by 2020, driven by large projects such as HS2 and Hinkley Point C, two new nuclear power stations.

Private Rental and Public Housing expand

Housing demand remains strong. Even with 27,160 new-build homes completed in 2017, the London Plan for that year identifies current demand at close to 65,000 new homes a year in the capital, which accounts for 20% to 30% of construction in the UK.

While prime residential housing remains stagnant, the number of planned homes in London increased by 86% year-on-year in July 2018, with several large housing association and private rental sector (PRS) developments registered in that time.

Public Sector Housing is also set to rise with the removal of borrowing caps set in 2012 on Council Housing Revenue Accounts. The removal is expected to enable Councils to build another 10,000 homes a year.

Build-to-Rent sector thriving

The challenges of low availability of land, high land prices and high property prices in London is helping the Build-to-Rent (BtR) sector thrive there and across the country. The total number of BtR homes completed, under construction and in planning across the UK rose by 30% between Q1 2017 and Q1 2018. The number of completed BtR homes jumped by 45% in the same period, increasing from 14,371 to 20,863. Industry estimates project that the sector, which is now attracting institutional investment, could provide a further 15,000 homes each year.

BTY's experience in BtR schemes, in combination with expertise in Employers' Agent services in the UK, makes our offering unique. BTY's RICS professionals provide owners, developers and architects project solutions from early concept design and business case development to finalisation of design and construction project controls.

Sources: RICS, Office for National Statistics, Inside Housing, Reuters

IRELAND

Strong economy fuels rapid growth in construction

GDP growth is forecast at 8.9% in 2018 and 4.5% in 2019–roughly double the projected average growth rate for the EU–with a critical underlying assumption being that the same customs and trading conditions will continue during a Brexit transition next year.

This strong performance will support healthy growth across sectors. Total construction output is expected to top €20 billion, an increase of two-thirds over three years, but still far from the overheated late stages of the pre-2007 Irish construction market crash. By comparison, output in 2006 was estimated at €35.5 billion.

Housing targets double current output

A chronic lack of housing in Irish cities, particularly acute in Dublin, is worsening affordability nationwide. Housing completions are forecast at 18,000 in 2018, which is only about half the estimated demand for new housing stock required simply to meet natural demand. The shortage is also driving up rental prices and homelessness.

Several large-scale housing initiatives, including nearly 1,000 units of social housing being procured through PPPs, are in the pipeline. South Dublin County Council is planning for 975 new homes, and Dublin City Council is preparing to spend up to €1 billion on social housing. Privately led, internationally financed apartment and Build-to-Rent sector developments are also expanding.

The government's Project Ireland 2040 program has set long-term targets to boost housing stock to meet estimated population growth of one million by 2040. Plans call for adding between 25,000 and 35,000 homes each year, roughly double the current number. By 2027, there will be 112,000 new social homes. State-owned land will be used to support the program. BTY is providing Lenders' Technical and Lifecycle advisory services on Government's Social Housing PPP Bundle Two–which will provide 465 social housing units to the market in 2020.

Infrastructure investment increases

The need for infrastructure development in transportation, water, wastewater, and telecommunications is also driving increased investment through the Ireland 2040 and the National Development plans. Among the major transportation projects are:

- A second runway and new control tower for Dublin Airport as well as upgrades and expansions in regional airports.
- A new Atlantic Road Corridor connecting Cork, Limerick, Galway and Sligo, including the M20 Cork-Limerick motorway, and €7.3 billion for regional roads.
- The Metro Link to connect Swords and Dublin Airport to the city centre by rail has been extended south to upgrade the Luas Green Line.

Price inflation and labour shortage

While wider inflation is expected to remain relatively low at 1.0% in 2018 and 1.3% in 2019, the already high rate of construction price inflation could hobble the government's ability to follow through on housing and infrastructure plans. Another threat is the acute shortage of labour and skills that extends in trades and construction related professional services as Ireland edges closer to full employment. The availability of labour from the EU's large labour pool could help take the pressure off as it did in the pre-2008 building boom.

Sources: Government of Ireland, Economic and Social Research Institute, Irish Times, PWC Global Economic Outlook, Bank of Ireland

CENTRAL ASIA, MIDDLE EAST AND NORTH AFRICA

Transportation and energy infrastructure drive growth

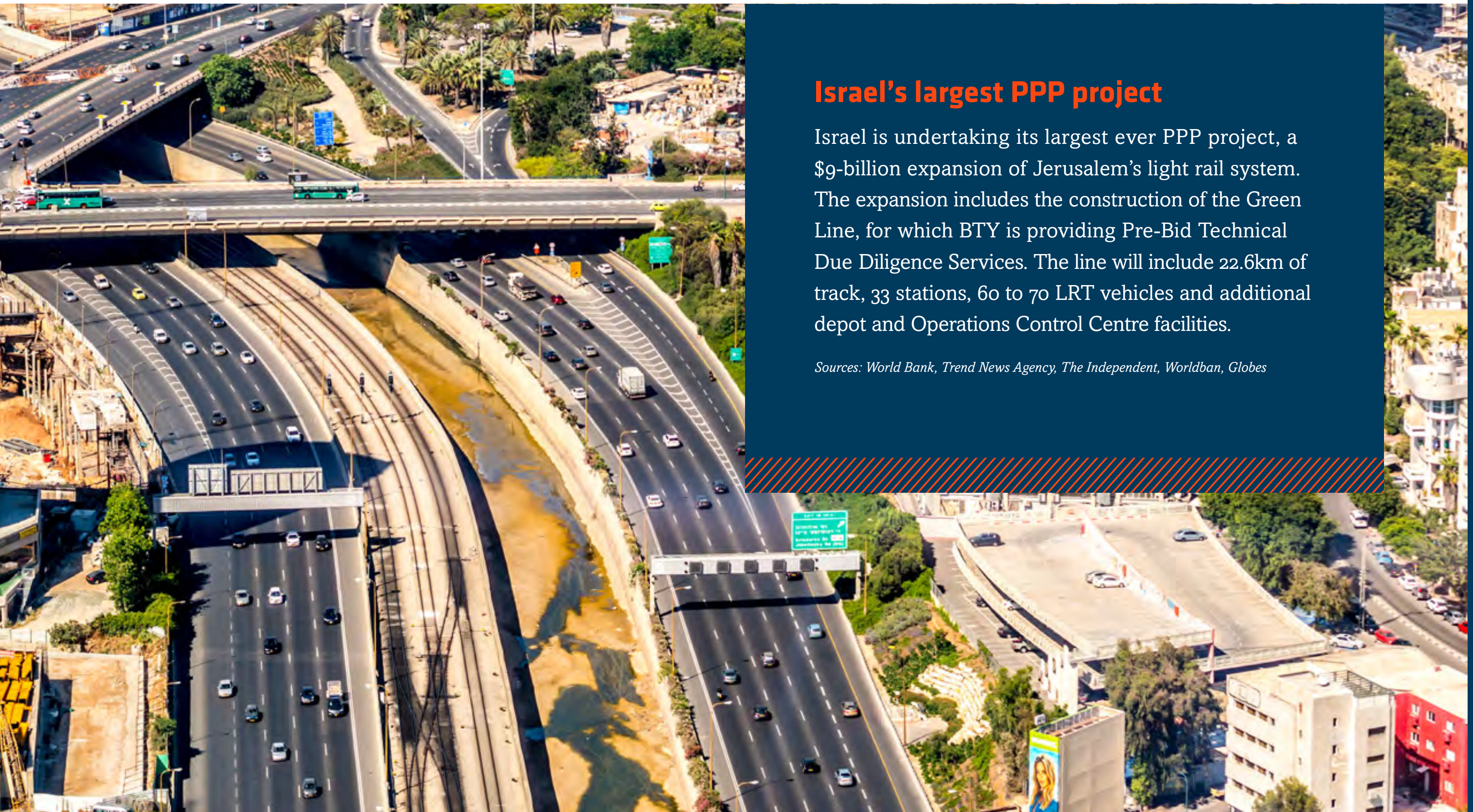
Investment increasing in projects across Central Asia

The steady expansion of China's Belt and Road Initiative (BRI) across Central Asia has seen a marked increase in investment by international financing institutions in both transportation and energy projects in resource-rich CIS countries such as Kazakhstan across Central Asia.

The $1-trillion BRI aims to build trade and infrastructure networks connecting economies along the ancient Silk Route, allowing goods to be delivered from China's Pacific coast to Europe. The trade corridor's overland route through Kazakhstan – an alternative to shipping goods by sea – allows delivery time to be reduced from 40 to 60 days to 13 to 14 days.

One of the largest projects in Kazakhstan's own ambitious highway, railway and airport expansion and upgrade programs is the Big Almaty Ring Road project, a six-lane ring road that includes 21 bridges and 19 viaducts. It's the first PPP project in the country, and BTY is providing Environmental and Safety Advisory services on the project.

Improved transportation infrastructure would support the accelerated development of the country's energy and resource sectors. Kazakhstan, the world's 9th largest country, is estimated to have the 11th largest proven reserves of both petroleum and natural gas, the second largest uranium, chromium, lead, and zinc reserves, the third largest manganese reserves, and the fifth largest copper reserves. It also ranks in the top ten for coal, iron, and gold.



Israel's largest PPP project

Israel is undertaking its largest ever PPP project, a $9-billion expansion of Jerusalem's light rail system. The expansion includes the construction of the Green Line, for which BTY is providing Pre-Bid Technical Due Diligence Services. The line will include 22.6km of track, 33 stations, 60 to 70 LRT vehicles and additional depot and Operations Control Centre facilities.

Sources: World Bank, Trend News Agency, The Independent, Worldban, Globes

Turkey continues PPP expansion

Turkey, which also has a strategic position along the BRI, remains a strong performer in PPP infrastructure development with multiple healthcare and road projects completed. A robust energy pipeline has multiple offshore wind, solar, and geothermal projects, while proposed transportation projects include 8,000 km of motorways and rail upgrades.

Over the past five years, BTY has served as Lenders' Technical, Environmental and Social Advisors – and continues to serve as Construction and Operations Term Monitor – on five of the country's most notable Healthcare PPP projects. We have also added transportation PPP projects in the region with our involvement in refinancing services for the 3rd Bosporus Bridge, and expanded an offering to include social, labour, environmental impact and safety advisory services.

As Turkey faces challenging economic headwinds with financing, it is expected that only the highest priority projects will move forward in 2019. Economic growth is forecast to slow to 4.5% in 2018 and to 4.0% in 2019. At the same time, there is forward movement expected in refinancing and secondary market deals as the PPP healthcare and transportation sectors mature and new financing venues such as the Project Bonds market are launched.

MAJOR TRENDS SHAPING CONSTRUCTION

bty

CREATING
AFFORDABLE
RENTAL HOUSING AT SCALE

A shortfall of affordable rental housing is a pressing global issue that is playing out locally in major urban centres.

Housing stock has not expanded fast enough to keep up with increasing demand–and the costs of home ownership have often risen far more quickly than incomes. As more middle-income earners are priced out of the home buying market, rents have soared and vacancy rates have plummeted.

The concerns have reached crisis levels in some of the world 's most prosperous cities, where the forces of growing urbanization, slowly modernizing regulatory apparatus and increasing pace of technological innovation in construction are compounding the pressure to deploy scalable solutions locally.

Typically, a home is deemed affordable when buyers spend 2.5 to 3 times gross annual household income on a house. Another rule of thumb for affordability–including renting–is spending no more than 30% of annual household income on housing.

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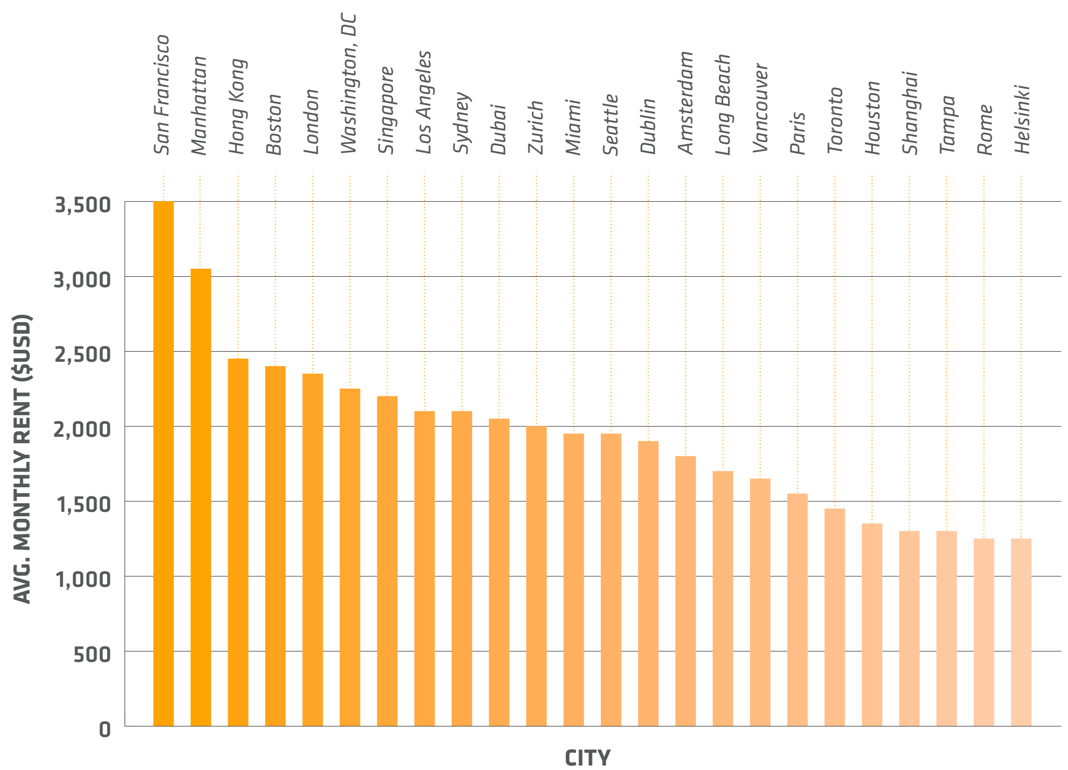
The affordability challenge is global

An estimated 22% of renters in Vancouver spend 50% or more of their salaries on housing. In the Greater Toronto Area (GTA), it's 23%,[1] with 47% of Toronto renters spending more than 30% of their income on housing.[2] The Royal Institution of Chartered Surveyors (RICS) predicts that London (UK) rents are likely to rise by 3% a year for the next five years, outstripping increases in house prices.[3] In Dublin, renters are now spending as much as 55% of their take-home pay on rent.[4]



Strategies for developing affordable rental housing

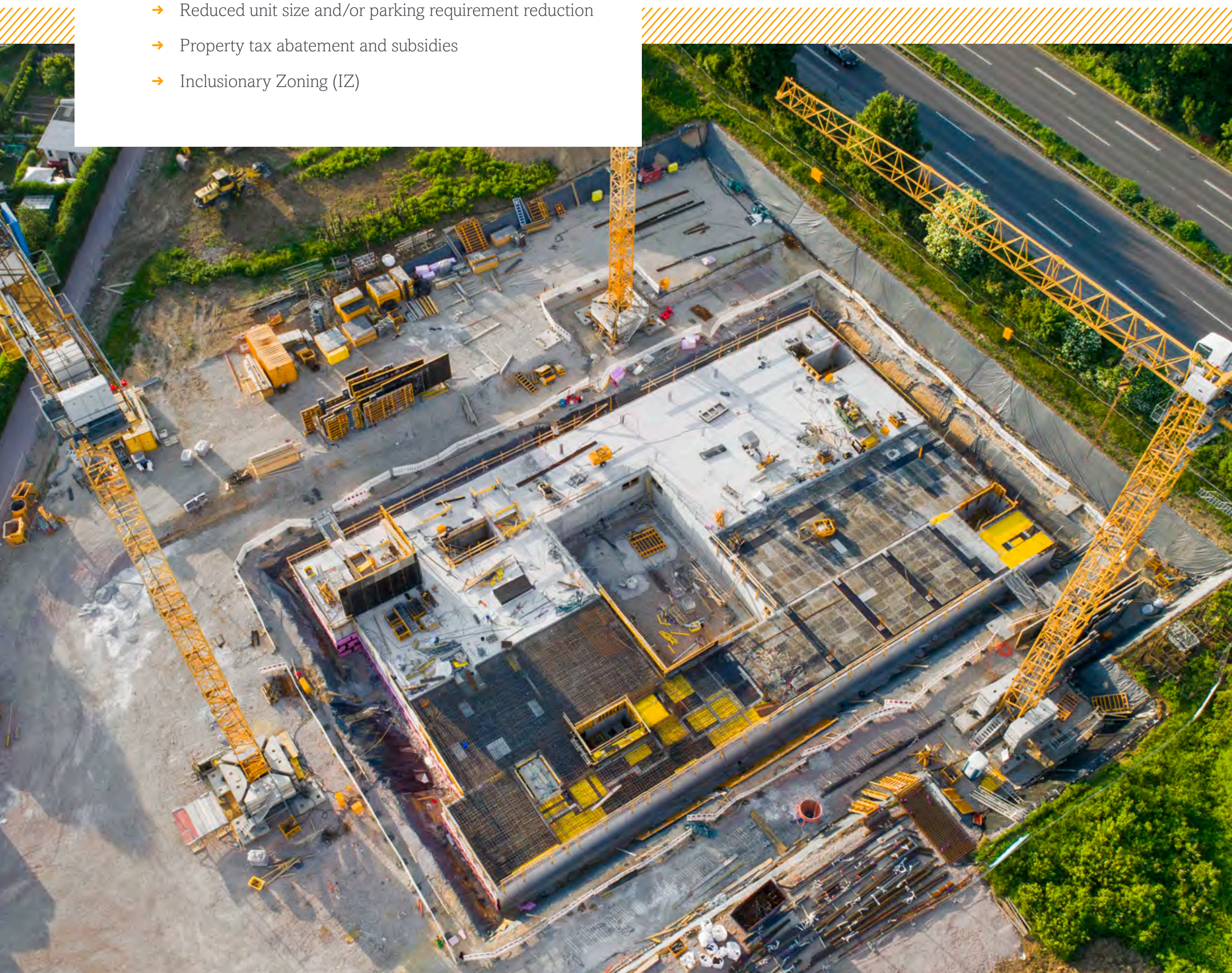
Typically, successful affordable rental projects require a combination of measures and a high level of public and private sector collaboration to overcome the fragmentation and achieve project objectives. The following measures have proven to be among the most effective:

- Giving or leasing surplus municipal/provincial/federal land
- Transit Corridor Zoning
- Zoning for rental only
- Low-cost loans and funding opportunities
- Exemption/Waiver of Development Cost Contributions
- Expedited processing
- Density Bonusing
- Alternate Development Standards
- Reduced unit size and/or parking requirement reduction
- Property tax abatement and subsidies
- Inclusionary Zoning (IZ)

Building affordable rental at scale

The UK is meeting the leap in demand for affordable rental at scale with a new development type, Build-to-Rent (BtR). In BtR schemes, national and local governments work together with developers to accelerate development on large, phased sites. BtR rental homes – managed professionally and with amenities – are maintained as rentals for the long-term, and generate low-to moderate returns, but steady long-term income. More than 47,000 BtR homes have been built or are under construction.

As BtR construction and project finance experts, BTY is leveraging our experience in this scheme with insights from leading developers, funders and contractors to help the industry understand and implement BtR.



Responsive land-use planning is key

Based on research conducted by the Centre for Urban Research and Land Development (CUR) at Ryerson University, the single largest cause of sluggish, supply responsiveness to rising prices is the land-use planning system. The shortage exists in supply of serviced sites for housing for both rental and ownership.

Making more land available for the development of affordable rental housing is a necessary first step to creating new supply. But it needs to be supported by integrated policy, programs, planning and processes to expedite such development at a scale that meets the urgent – and still growing – demand.

Demand for affordable rentals far outpaces supply

For the first time in decades, demand for rental housing in Canada is outpacing growth in ownership, which fell from 68% to 67%, the first drop since 1971.[5] An estimated 32% of new households in Canada are rental households, and some 43% of Canadian renters now face affordability issues.

The need to develop new affordable rental housing on a massive scale is clear. The path to delivering is not. One of the single most important factors in the economics of developing housing, whether for ownership or rent, is the cost of land. It has been estimated that 80% of the increase in home prices across 14 advanced countries since the Second World War has been due to the increasing prices of land, with construction costs holding flat.[6]

Reducing construction costs

Another key element in building affordable rental housing is reducing construction costs by improving efficiencies and productivity with innovative methods and technologies.

- Value engineering, improved procurement, scheduling and processes can reduce construction costs by up to 30%, according to McKinsey.[7]
- Modular construction for accelerated, large-scale development using factory manufactured products has made tremendous gains in quality and efficiency that can reduce delivery time from 40% to 50%.[8]
- Implementing technologies including BIM, LEAN Planning, 3D Printing, SMART Technology, and AI.

1 *CTV News, Vancouver, "1-in-5 B.C. renters spending more than half of income on housing", May 8, 2018*
2 *CBC News, "New rental report shows "Toronto is in the midst of a housing crisis," says councillor", February 9, 2018*
3 *On The Market, "Rental market: What will happen in 2018?", August 31, 2018*
4 *The Irish Times, "Is the housing market getting more unfair?", Novermber 7, 2017*
5 The Globe and Mail, "Canada's rental growth outstrips home ownership", May 8, 2018
6 *C.D. Howe Institute, Commentary No. 513, "Through the Roof: The High Cost of Barriers to Building New Housing in Canadian Municipalities", May, 2018*
7 McKinsey Global Institute, "A blueprint for addressing the global affordable housing challenge", October, 2014
8 Ibid.

SMART CITIES

START WITH SMART INFRASTRUCTURE

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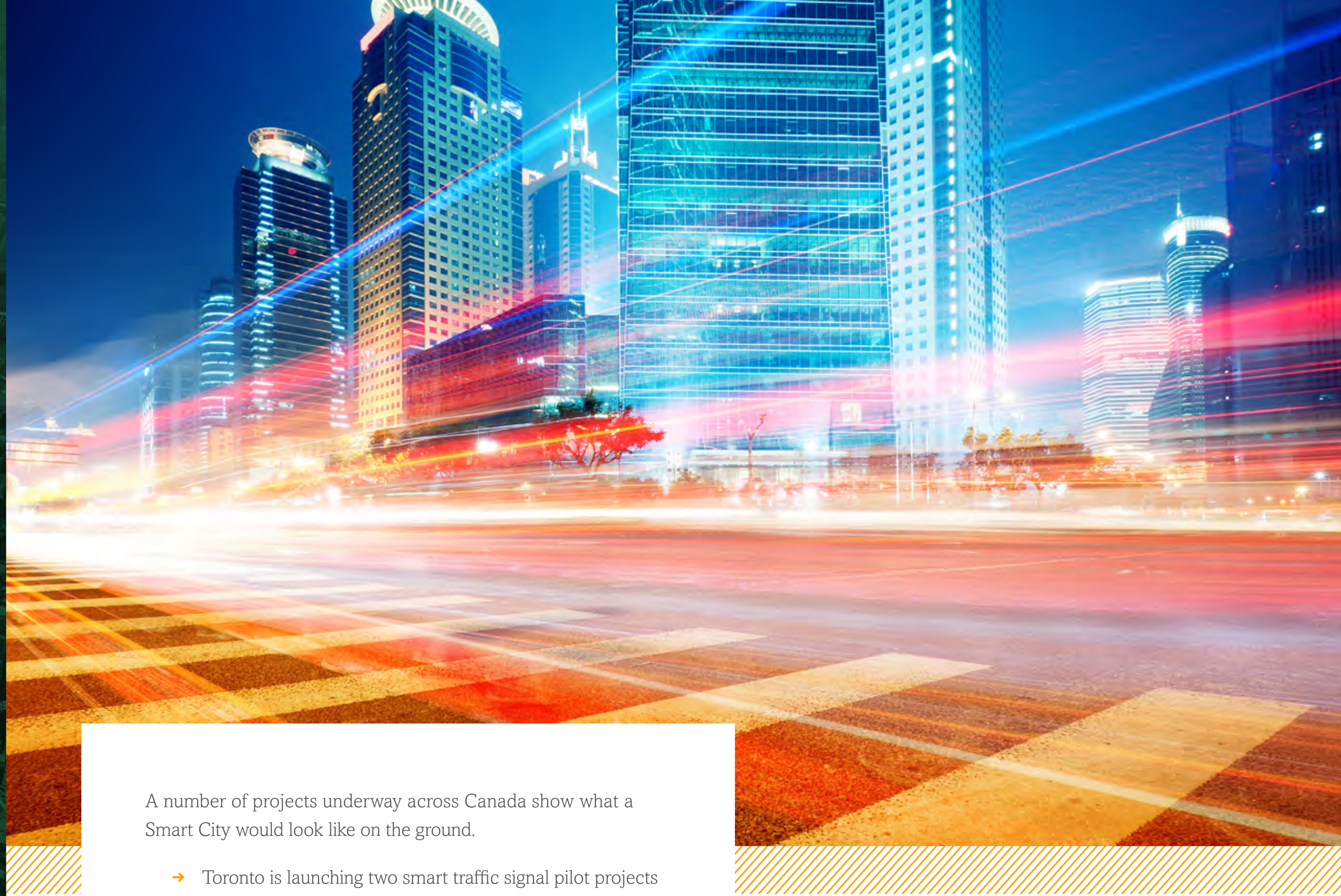
3 D's – Data, Digital and (User) Design Guide Development

Smart Cities integrate multiple information and communication technologies to monitor and manage urban assets and services from roads, transit, and water and wastewater management to "smart" parking meters, streetlights, and even trash receptacles. The goal is to build in the capability to respond intelligently to changes in the urban environment, including user demands and other infrastructure, to improve performance on a number of fronts:

- Moving people and goods more efficiently
- Reducing energy use and greenhouse gas emissions
- Monitoring air quality and noise pollution
- Supporting the development of affordable housing

The global market for building the infrastructure for smart cities is predicted to have a value of up to $1.6 trillion by 2020.[9] To date much of the focus has been on developing and deploying hardware-sensor based physical infrastructure – but the fuel that makes a smart city run is data. And data flow depends on a robust digital integration broadband and telecommunications, sensors, social media, data collection and integration, automation, analytics and visualization to provide real-time situational analysis.



A number of projects underway across Canada show what a Smart City would look like on the ground.

- Toronto is launching two smart traffic signal pilot projects that feature smart systems with new signals that can adjust traffic signals independently to respond to real-time traffic patterns at any time of the day – and communicate and synchronize with other smart signals in the vicinity to alleviate congestion.[10]
- Vancouver and Surrey are proposing Canada's first two collision-free multi-modal transportation corridors that promise to reduce transportation safety risk, greenhouse gas emissions and improve traffic efficiency. The projects feature autonomous shuttles, smart mobility infrastructure and advanced data and analytics.[11]
- Sidewalk Labs has proposed a Toronto development, with 20% of land dedicated to affordable housing, that includes autonomous vehicles, a thermal grid that does not use fossil fuels, low-cost modular buildings with flexible uses and robotic delivery, and waste-management systems.[12]
- Eve Park, a proposed component of West 5, a sustainable community in London (ON) that integrates four housing types (condos, townhouse, rental apartments, and retirement living), as well as office and retail, with solar panels, a solar powered parkade with electric charging stations, and high-performance road surfaces that melt snow and ice faster and reduce the use and impact of salt.

Data and power issues

While the smart technologies promise greater efficiency, there remain questions about use, ownership, control, protection of, and access to the data, much of it gathered in public spaces, involved in enabling a smart city. Another challenge is power. The installation and operation of millions of sensors that can retrieve and relay useful, potentially life-saving data, would require enormous energy that is beyond current capacity to deliver. The rise of electric vehicles is another important element. Handling the extra demand generated by tens of thousands of EVs and plug-in hybrids will be one of the key challenges for energy management in a smart city.[14]

9 Bank of America Merrill Lynch -"21st Century Cities: Global Smart Cities Primer Picks", May 2017
10 Canadian Consulting Engineer, "Toronto pilots new real-time smart traffic signal technology", November 24, 2017
11 Government of Canada, "Smart Cities Challenge: Spotlight on Finalists", June, 2018
12 CityMetric, "What Toronto's Quayside project has taught us about smart cities and data", July 13, 2018
13 West 5 Development, London, Ontario, Sifton Properties
14 Power Technology, "Smart cities: redefining urban energy", February 8, 2018

DEVELOPING
CLIMATE-RESILIENT
INFRASTRUCTURE

Building cities that can survive, adapt and grow through climate change impacts

Natural disasters have caused losses of life estimated at more than 2.5 million people and economic losses of nearly $4 trillion over the past three decades. An estimated 75% of these losses are attributable to extreme weather events, including hurricanes, typhoons, floods, and wildfires.[15]

Those global losses have risen from $50 billion a year in the 1980s to $200 billion in the last decade. 2017 was the worst year on record, with 710 noteworthy natural catastrophes – significantly more than the average of 605 – that caused a record $330 billion in global losses.[16] The impact tracks the progression of global warming, with 17 of the 18 warmest years on record occurring since the year 2001.[17]

As population growth and urbanization increasingly concentrate risk in cities, and the incidence and severity of extreme weather events linked to climate change grows, developing resilient infrastructure becomes critically important to saving lives and protecting property and economic capacity.

It is estimated that the next 20 years will see more infrastructure developed than has been built over the last 2,000 years.[18] The threat posed by extreme weather events can be an unprecedented opportunity to build resilient infrastructure that enables cities to prepare for, and adapt to changing conditions – and withstand and recover rapidly from disruptions.

While it is challenging to predict when and where natural disasters will occur, predictive software can now provide more accurate information on the probability of natural events occurring within given return periods.

Managing risk from climate change can cover a broad range. The following examples of planning for resilience focus on water and sanitation, and transportation – areas significantly affected by flooding – and fire prevention and suppression.

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Resilience in water and sanitation

A major issue in storms and flooding is the transfer of pathogens and bacteria into water systems. Updating and upgrading infrastructure to facilitate safe removal of stormwater is critical – as are measures to increase water storage capacity and repair ageing drinking water systems.

Redundancy, a key element in resilience, in the sanitation sector is strongly related to the adoption of modular, decentralized wastewater treatment technologies. New wastewater technologies include drop-in small footprint and energy-efficient secondary treatment replacement reactors for conventional wastewater plants.

While existing installations serve 50,000 to 1 million people, multiple small reactors could be placed within the footprint of existing plants or deployed as part of a distributed system with network redundancy to re-route waste flows from city quadrants that have been disrupted by an extreme weather event, such as sudden heavy rains.[19]

Low Impact Development to reduce flood risk

Urbanization and suburbanization disrupt natural watershed function, preventing efficient rainfall retention that result in much higher run-off volumes. Low-impact development (LID) can mitigate storm water runoff, reduce flood risk and pollution loads.

Ontario's Credit Valley Conservation Authority has tracked the results of LID practices for water quantity and quality results for six years, achieving up to an 80% reduction in runoff volumes, an 80% decrease in suspended solids and phosphorus loadings, and heavy metal loading reductions from 50% to 90% as well as a cooling effect on water filtered by LID systems of more than 5°C.[20]

Reducing the incidence and impact of wildfires

While the costs of preventing wildfires are difficult to measure, they are estimated to be between 11% to 51% of actual fire costs. They include the cost of labour to suppress the fires as well as value of homes, buildings, evacuation, losses of jobs and tourism, land devaluation and cost of relief provided.

There are a number of measures than can make fire prevention and suppression more efficient and less costly. These include controlled burns that lessen the impact when fires occur, and vegetation strips of fire-resistant plants that reduce a fire's ability to spread. Measures to improve fire suppression include stockpiling equipment in high-risk areas, reservoir maintenance, and building and maintaining roads that enable fire engine access

Building codes that are adaptive to fire risks include preventative measures such as a moisture barrier that serves as a fire suppressant. Homes with their own pumping system and metal roofs significantly increases the probability that they would survive a fire.

Building resilient transportation

Roads, bridges, railways and runways are heavily exposed to climate impacts including rising temperatures, more frequent and intense rainfall, and flooding. Urban densification reduces the amount of transportation infrastructure exposed to climate impacts and allows re-deployment of resources to strengthen existing infrastructure. Complete communities where residents can easily access goods and services by foot or bicycle improve urban climate resilience.[21]

Iowa's Department of Transportation (DOT), Iowa State University and the University of Iowa Flood Center used historical rainfall data to forecast peak discharge flows from two local basins that had recently experienced severe flooding events that have affected primary highways and the interstate. Using climate forecasting and streamflow modelling, researchers estimated future flooding in the region and compared it to the transportation assets inventory. An analysis enabled the DOT to identify at-risk roads, bridges and other infrastructure and to include design elements that help to reduce their vulnerability to future flooding.[22]

15 *The World Bank, Understanding Poverty, "Disaster Risk Management", September 25, 2018*
16 *Munich RE, "Natural catastrophe review: Series of hurricanes makes 2017 year of highest insured losses ever", January 4, 2018*
17 *Prairie Climate Centre, "2017 ranked second-hottest year on record", January 22, 2018*
18 *The World Bank, Sustainable Cities, "Engineering our way out of disasters - the promise of resilient infrastructure", 10/12/2017*
19 *Prairie Climate Centre, "Eight Ways Cities are Building Climate Resilience", April 10, 2017*
20 *Ibid.*
21 *Prairie Climate Centre, "Building a Climate-Resilient City: Transportation infrastructure", 2017*
22 *Ibid.*

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