GREEN BUILDINGS MARKET FORECAST

Demand for Building Products, Metro Vancouver, 2019–2032

Measuring the Economic Impact
of the BC Energy Step Code

VANCOUVER
ECONOMIC COMMISSION

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About Us

The Vancouver Economic Commission (VEC) serves one of the world's fastest-growing, low-carbon economies, contributing to a metro region representing 60 percent of B.C.'s economy and an annual GDP of $138B.

As the economic development agency for the city's businesses, investors and citizens, VEC works to strengthen Vancouver's economic future by supporting local companies, attracting high-impact investment and promoting international trade. VEC works collaboratively to position Vancouver as a global destination for innovative, creative, diverse and sustainable development.

Today, the green economy employs one in 15 Vancouverites and VEC works to unleash its economic potential by working with industry partners in the green buildings sector to:

- Support manufacturers in the transition to meet future demand
- Enhance B.C.'s industry relationships with key overseas markets
- Create more local IP while gaining access to global innovations
- Conduct and publish original research on the green economy
- Improve affordability and support the development of more efficient local supply chains

Report Author: Juvarya Veltkamp, Vancouver Economic Commission

Our Partners

We gratefully acknowledge the financial support of the Discovery Foundation, as well as BC Housing through the Building Excellence Research & Education Grants Program.

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Cover Image Source: Cascadia Windows and Doors

TABLE OF CONTENTS

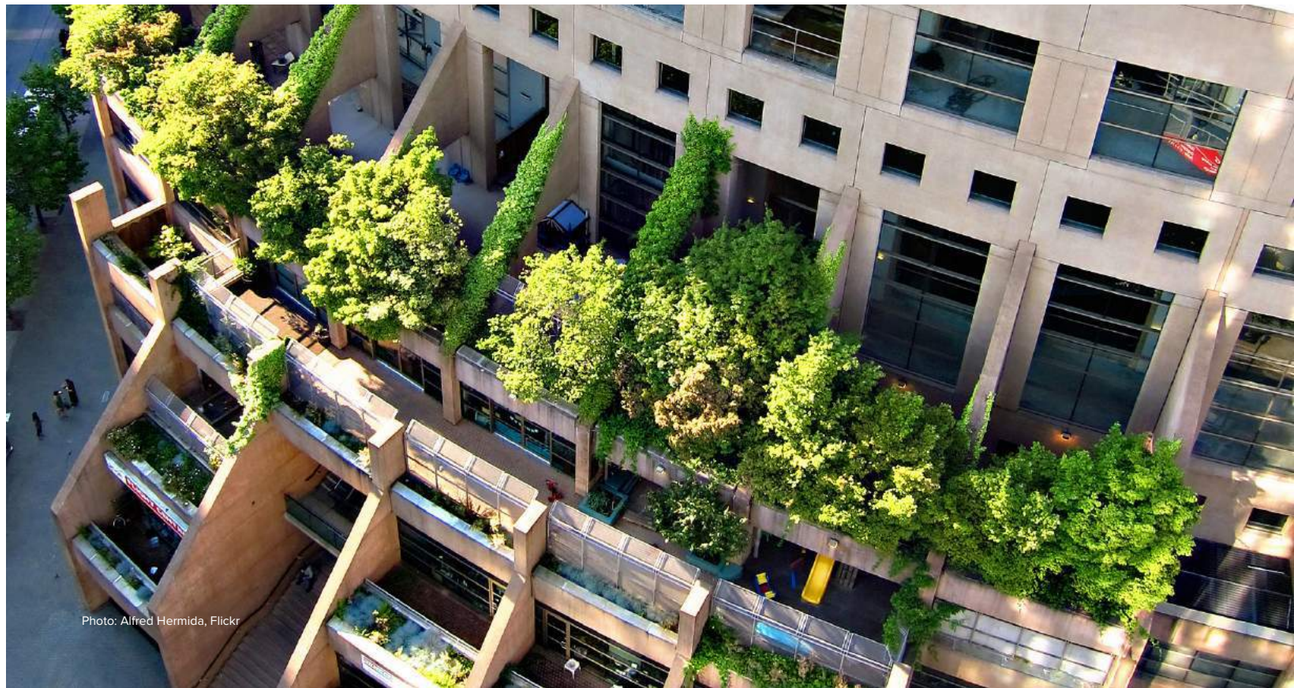


Photo: Alfred Hermida, Flickr

01

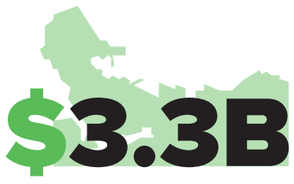
"We've been trying to encourage curtain wall and fenestration manufacturers from Europe making Passive House-certified units to bring their products to Canada, and they are looking for hard data and market information on which way the market is going.

This report provides concrete market data, which can be very useful for them and other manufacturers, architects, municipalities, and developers."

Cillian Collins
Senior Architect, Perkins+Will

ECONOMIC OPPORTUNITIES
and B.C.'s Building Regulations

Vancouver and British Columbia's zero emissions and net-zero energy ready building policies are stimulating a $3.3B market for high-performance building products and technologies in Metro Vancouver



market value for building products in Metro Vancouver 2019-2032
(VEC)

market value for the global green building market by 2022
(IMARC Group)

Vancouver has a long history of pioneering approaches to planning and built forms from the continuous public waterfront to the podium-tower development model that have been emulated worldwide and become globally branded as "Vancouverism." In the 1980s and 90s, British Columbia's "leaky condo crisis" sparked further development of deep local expertise in building envelope and mechanical system performance. The end of the crisis dovetailed with the Kyoto Protocol and a growing emphasis on reducing carbon emissions. Local engineers subsequently turned their attention to the next big topic related to building enclosures: energy efficiency. Vancouver has established expertise in these areas, and continual revisions of local building codes have set iteratively greener building standards. The World Green Building Council has recognized the City of Vancouver as having the "Best Green Building Policy" of any jurisdiction in the world.[1]

Vancouver has a goal to be 100 percent powered by renewable energy by 2050, with all new buildings producing zero emissions before 2030.[2] [3] British Columbia (B.C.) plans to reduce carbon emissions by 40 percent by 2030 (based on 2007 levels), and the BC Energy Step Code charts a path for all new buildings across B.C. to be net-zero energy ready by 2032.[4] [5]

Constructing buildings to meet these high-performance standards is set to drive a $3.3 billion market for building products in Metro Vancouver (2019–2032).[6] Globally, the green building materials market is estimated to be worth over $350 billion by 2022.[7] B.C. currently imports many of the technologies required for high-performance buildings, in particular mechanical equipment such as heat pumps and heat recovery ventilators. Manufacturing the products required in Metro Vancouver from 2019–2032 would support an average of 925 each year; currently, only one-third of these jobs are located in B.C.[8] Installing these products would support an average of 770 local installation jobs.

Photo: Andrew Latreille / Courtesy: Perkins+Will

This report is designed for manufacturers, suppliers, investment partners and other industry professionals to help them understand and prepare for changes in building product demand and performance requirements in Metro Vancouver as a result of the BC Energy Step Code.

The Vancouver Economic Commission (VEC) is working with a wide group of industry partners to advance economic development within B.C.'s green building sector with a focus on the following:

- Supporting local manufacturers with transitioning knowledge, equipment, and marketing to meet current and future demand
- Enhancing B.C.'s industry relationships with key overseas markets
- Creating more local intellectual property (IP) while accessing global innovation
- Improving affordability by creating more resilient and efficient local supply chains while reducing transportation distances, costs, and logistical risks
- Increasing the overall number of manufacturing jobs in B.C.

$12M

annual energy savings (2007–2015) for Vancouverites due to City of Vancouver's successful reduction of carbon emissions from buildings[9]

BEHIND THE MARKET DATA

A Roadmap for Changes in Demand

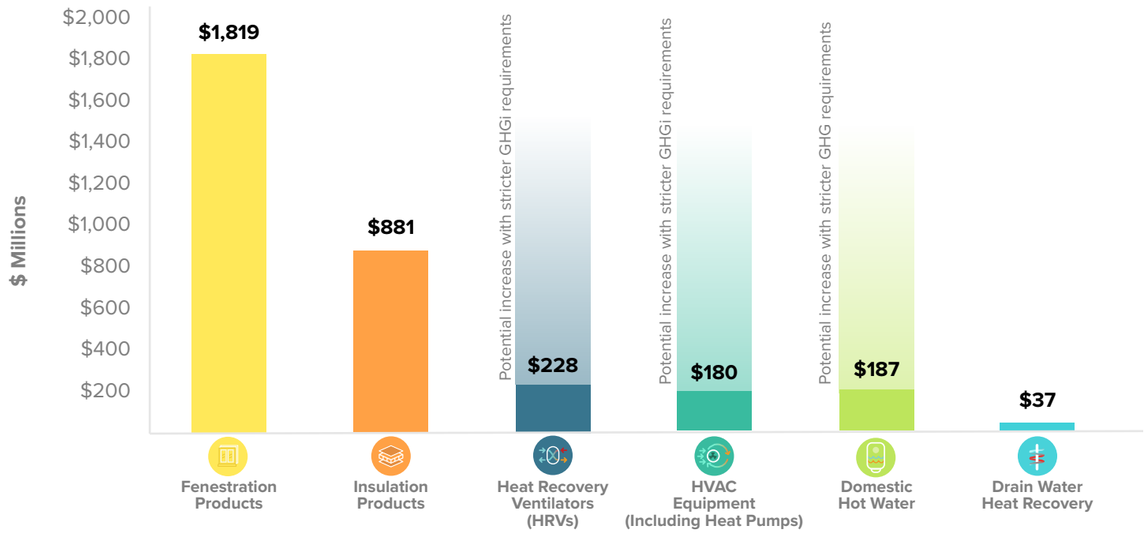
The BC Energy Step Code is an amendment to the BC Building Code that provides consistency and predictability as the market transforms towards net-zero energy ready buildings. The performance requirements for each step were developed over two years through a province-wide, consensus-building process, supported by energy modelling and analysis.[10] This analysis provided insights into the technologies suitable to meet the requirements of each step.

The VEC built on this analysis to develop a 'Market Demand Forecasting Tool' that forecasts the demand for building products and technologies–and the required performance level–as a result of the BC Energy Step Code.

The Market Demand Forecasting Tool was developed in consultation with a wide range of real estate and construction industry experts convened by the VEC over eight months in 2018, with modelling provided by The Delphi Group.[11] All market forecast data in this report is from this tool unless otherwise stated.

Demand for Building Products

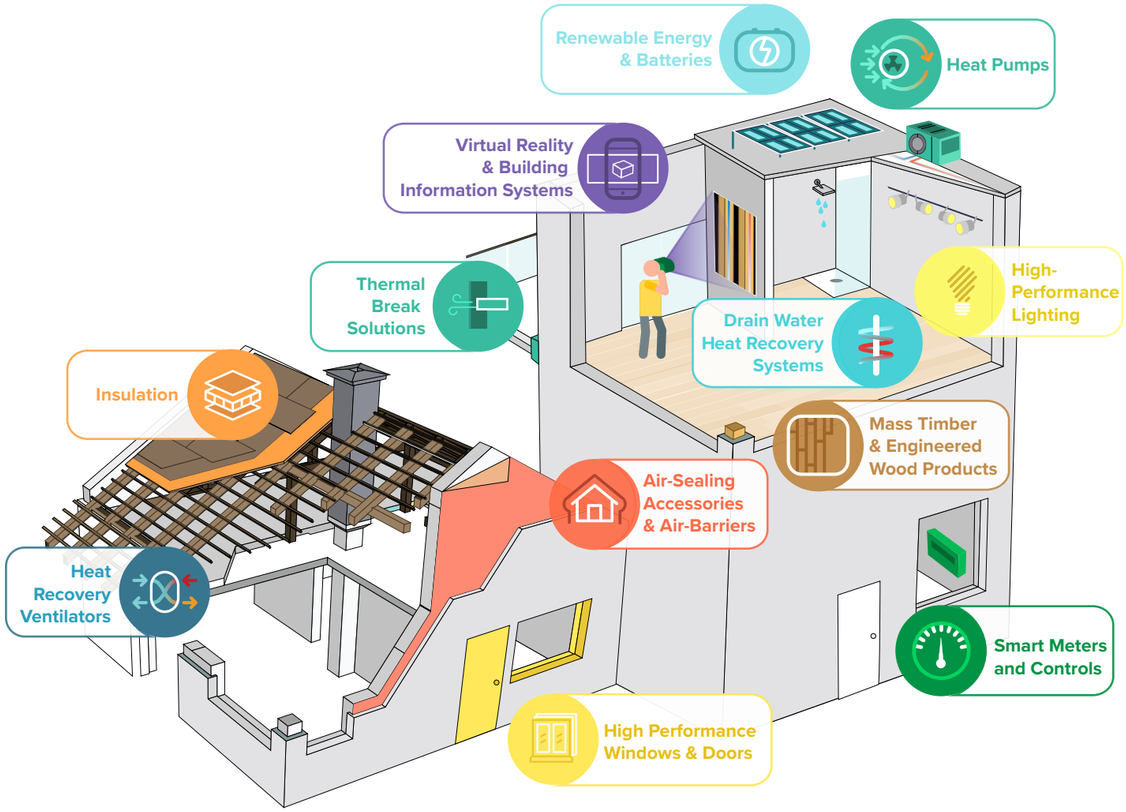
Metro Vancouver, New Construction, 2019–2032 Forecast (cumulative)



Delivering High-Performance Buildings

Requires a Wide Range of Products and Technologies

Adapted from: ENERGY STEPCODE BUILDING BEYOND THE STANDARD



Page 11 **Fenestration Products**

Page 13 **Insulation Products**

Page 15 **Heat Recovery Ventilators (HRVs)**

Page 16 **HVAC Equipment** (Including Heat Pumps)

Page 19 **Domestic Hot Water**

Page 20 **Drain Water Heat Recovery**

Methodology

The Market Demand Forecasting Tool is a responsive, Excel-based tool designed to estimate demand for six categories of building products.

Key variables and inputs to the tool are illustrated in the graphic to the right.

Supply-side insights were developed from 30 key informant interviews with leading subject-matter experts. All research and modelling was conducted by The Delphi Group on behalf of VEC, and is further detailed in the technical policy report the **BC Energy Step Code Supply Chain and Economic Opportunities** December 2018.

An Even Bigger Market Exists

The $3.3 billion figure for the size of the market is just the tip of the iceberg. Due to study limitations, the data does not include all the potential demand for building products in several key areas:

Accelerated Uptake of the BC Energy Step Code

Just five local governments (representing approximately 50 percent of Metro Vancouver's new construction) had announced plans to adopt higher levels of the BC Energy Step Code when the Market Demand Forecasting Tool was developed in 2018.[12] As more municipalities adopt similar standards, this will grow the forecasted demand beyond $3.3 billion. If all of the communities that have indicated interest adopt the standard, this would represent more than two-thirds of all new construction, and would increase forecasted demand by at least 30 percent.[13]

Policy Drivers

City of Vancouver Bylaws

| New Construction

- Zero Emission Building Plan: zero emissions for all new construction by 2030
- Green Buildings Policy for Rezonings: Passive House requirements (or an alternative such as International Living Building Institute's Net Zero Energy Building)

| Retrofits

- Energy efficiency upgrades proportionate to nature and scale of renovation. E.g. home renovation >$5,000 requires energy audit

BC Building Code

| New Construction

- Energy Step Code: net-zero energy ready buildings by 2032

National Energy Code for Buildings

- Commitment to net-zero energy ready model national building code by 2030

Regions Beyond Metro Vancouver

This study quantifies demand from projects built in Metro Vancouver but the BC Energy Step Code will impact new construction across the entire province. Metro Vancouver represents a population of 2.5 million while the population of B.C. has reached 5 million, so demand for building products is almost certainly double the $3.3 billion in Metro Vancouver. If we include demand from projects across the Cascadia megaregion (B.C., Washington, and Oregon) there would be demand from a region with a population of over 16 million. Looking beyond the continent, B.C. is a global gateway for trade with the Asia Pacific, offering North America's closest ports and airports to Asian markets, super post-panamax port capabilities, and tens of billions of dollars invested in road, rail, port and airport infrastructure by the Pacific Gateway Alliance.[14] Globally, the green building market is estimated to be worth $350 billion by 2022.[15]

Other Building Products and Professional Services

This study examines six categories of building products included in the original modelling for the BC Energy Step Code, but there are many other products (e.g. prefabricated wall panels, mass timber products or field-installed mechanical systems) and services (e.g. professional services, construction services) not quantified by the Market Demand Forecasting Tool.

Retrofit Projects

This study captures demand from new construction projects, which make up anywhere from 50–75 percent of all construction activity.[16] Proposed updates to B.C. and Vancouver's retrofit codes will further increase demand from retrofit- and renovation-type projects which could nearly double the forecast demand for most of the products in this study.[17]

Green House Gas Intensity Requirements

Vancouver, Burnaby, the City of North Vancouver, New Westminster, Richmond and Surrey utilize a Low Carbon Energy System (LCES) or Greenhouse Gas Intensity (GHGi) metrics to various degrees. These requirements are expected to drive fuel switching, favouring renewable electricity and renewable natural gas, the former further increasing demand for low carbon products like heat pumps.

The BC Energy Step Code: A High-performance Staircase

The BC Energy Step Code is a "high-performance staircase" that offers a voluntary path for local governments to require a higher level of energy performance than that required in the BC Building Code regulation.[18] The BC Building Code itself will work its way up through the steps and the highest step of the BC Energy Step Code will become the minimum standard for all of B.C. by 2032. The CleanBC climate strategy indicates that Part 9 of the building code (small buildings and single family homes) will reach Step 3 by 2022, while Part 3 of the building code (large and commercial buildings) will reach Step 3 by 2027.

The BC Energy Step Code also means adoption of performance metrics (rather than just design standards), such as Total Energy Use Intensity (TEUI) and the energy demand for space heating, Thermal Energy Demand Intensity (TEDI). These metrics are used in various combinations in standards such as LEED, R2000, the Zero Carbon Building Standard and Passive House.

Energy Standards at a Glance

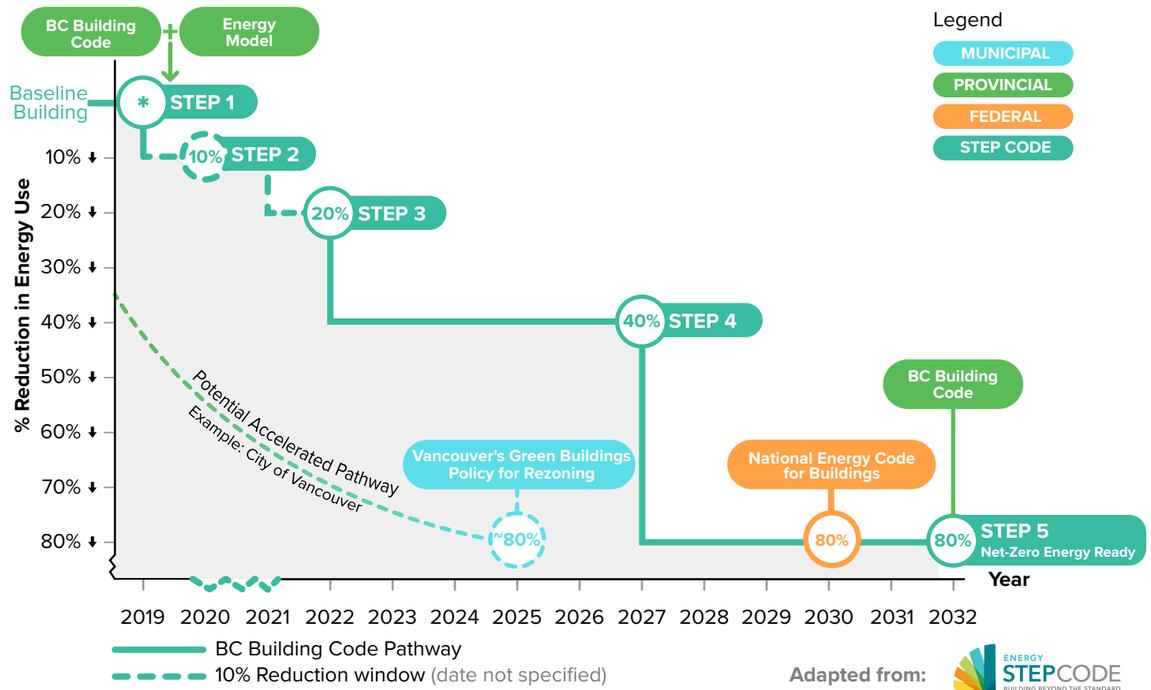
	TEUI kWh/m2/year	**TEDI** kWh/m2/year	**GHGI** KG CO2e/m2/year
Passive House	<120	<15	-
City of Vancouver	<100 - 210*	<15 - 40*	<3 - 8
British Columbia	<100 - 170**	<15 - 70**	-

Average TEUI for office buildings in B.C.: 335 kWh/m2/year and for multi-unit residential buildings (MURBs): 215 kWh/m2/yr.[19]

*depending on type of building
** depending on type of building, climate zone and level of Step Code adopted

BC Energy Step Code High-Performance Staircase

Example for Part 9 (small) Buildings



Adapted from: ENERGY STEPCODE BUILDING BEYOND THE STANDARD

Benefits of Strengthening B.C.'s Green Building Supply Chain

B.C. has strong capabilities and assets in green building engineering, design and construction, along with local access to raw materials including wood and mined metals. However, B.C. imports many of the products required for net-zero energy and zero emissions buildings, in particular mechanical equipment such as heat pumps and heat recovery ventilators.

Incentives
This report highlights some of the incentives available for net zero energy buildings and high-performance building products – check out each product section for details of product-specific incentives.

EfficiencyBC | **efficiencybc.ca**
EfficiencyBC offers homeowners and businesses access to information and incentives to reduce energy use and greenhouse gas emissions in new and existing homes and buildings. Incentives are administered by BC Hydro, FortisBC and BC Housing.

Fortis Commercial New Construction Performance Incentives | **fortisbc.com**
Up to $500,000 for larger, more complex buildings that achieve a higher whole-building energy (TEUI) performance than the minimum B.C. Building Code.

A concerted effort to build on B.C.'s strengths and increase the proportion of high-performance building products manufactured or assembled in the province would allow B.C. to capture economic opportunities from relocalizing the supply chain. These opportunities include:

- The creation of local technology and IP
- Strategic investment into B.C.'s manufacturing infrastructure
- Workforce development
- The proliferation of well-paying, sustainable employment opportunities
- Reducing transportation distances from plant to site
- Improving access/affordability of building products in B.C.

For instance, if B.C. is not manufacturing a particular technology, there is an opportunity to leverage the market data in this report to catalyze local entrepreneurs and manufacturers or attract outside investment to B.C. Global partnerships and joint ventures with local companies offer the international partner access to local and regional markets (e.g. Cascadia, Asia Pacific), as well as an opportunity to customize and tailor their goods to local specifications. Local companies benefit from licensing or creating new, jointly owned IP and accessing global capital and supply chains worldwide.

This mirrors a global trend: uncertainties marked by trade wars, political shifts and volatile commodity markets, coupled with social and environmental concerns and technological advancements, are leading to relocalization of supply chains around the world.

A U.S. subsidiary of Fujitsu partnered with Oregon's Ventacity Systems to integrate Ventacity's smart building controls systems and heat recovery ventilator within Fujitsu's heating and cooling system, providing a more efficient HVAC solution tailored to the Oregon market.

"Cascadia is pleased to be an innovator and manufacturer of products that enable buildings to be more energy conserving than ever before. VEC's report further validates the need for this expertise, and that our industry's supply chain is ready to advance to the highest of the BC Energy Step Code levels."

Michael Bousfield
Technical Director, Cascadia Windows & Doors

B.C.'s Manufacturing Renaissance

30%
increase in B.C.'s manufacturing sales in five years

60,000
industrial jobs in City of Vancouver

With sales of over $50 billion in 2017, B.C.'s manufacturing sector has grown more than 30 percent over the last five years and is a key driver of intellectual property, innovation and high-paying jobs.[20] [21] [22]

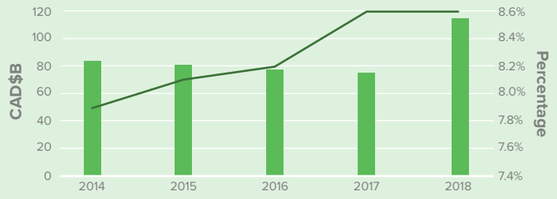
More than 65 percent of industrial businesses in Vancouver plan to expand in the next two years[23]. Globally, startups in sectors such as advanced manufacturing and robotics have seen a nearly fourteen-fold increase in total funding value (2012–2017).[24]

Even the dense, urban city of Vancouver is home to 60,000 industrial jobs in production, distribution and repair (15 percent of all jobs in the city), of which 58 percent pay a living wage.[25] [26] Small and medium-sized industrial enterprises contribute $2.4 billion annually in wages to Vancouver's economy.[27]

Each manufacturing job in B.C. supports an additional 3.5 indirect or "spinoff" jobs (e.g. in transportation, packaging or accounting), and procurements from local businesses recirculate at least 30 percent of revenues within the local economy.[28] [29]

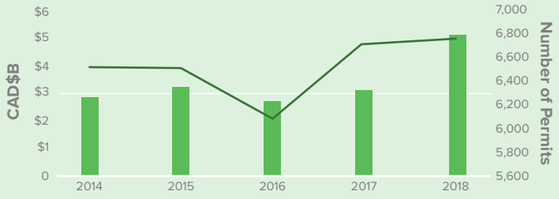
Construction Industry by the Numbers

B.C. Construction Projects
Value and GDP Contribution, 2014–2018



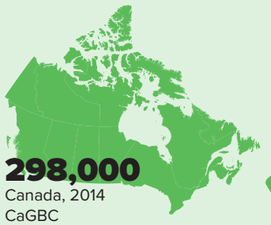
Source: BC Construction Association, B.C. Construction Industry Statistics 2018

City of Vancouver Building Permits
Value and Number of Permits, 2014–2018



Source: City of Vancouver, Issued Building Permits, 2018

Green Buildings Jobs
Number of Jobs

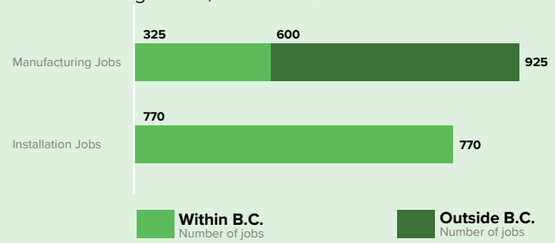


298,000
Canada, 2014
CaGBC

37,000
B.C., 2017
Pembina Institute

7,700
City of Vancouver, 2016
VEC

Jobs Opportunity for Meeting Metro Vancouver Demand
Annual Average Jobs, 2019–2032



Source: VEC, 2018

02

B.C.'s GREEN BUILDING SECTOR

At a Glance

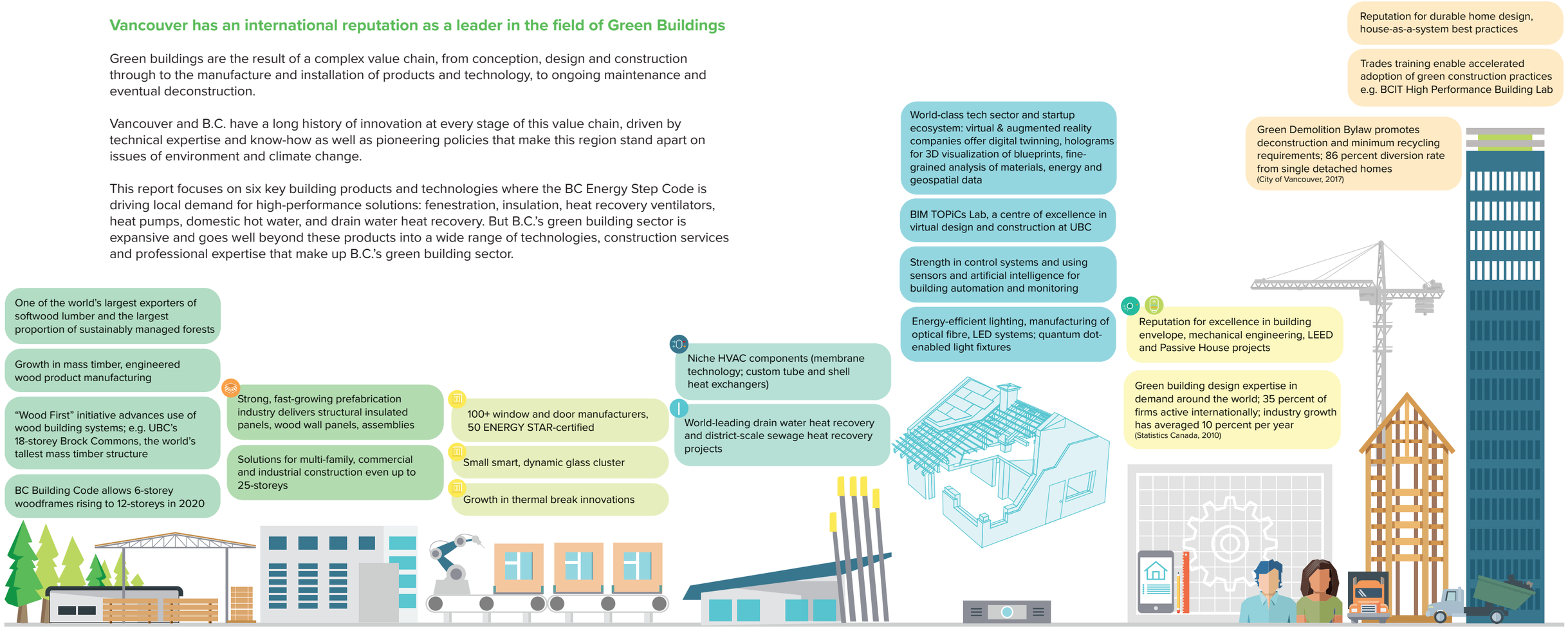
In This Section

Vancouver has an international reputation as a leader in the field of Green Buildings

Green buildings are the result of a complex value chain, from conception, design and construction through to the manufacture and installation of products and technology, to ongoing maintenance and eventual deconstruction.

Vancouver and B.C. have a long history of innovation at every stage of this value chain, driven by technical expertise and know-how as well as pioneering policies that make this region stand apart on issues of environment and climate change.

This report focuses on six key building products and technologies where the BC Energy Step Code is driving local demand for high-performance solutions: fenestration, insulation, heat recovery ventilators, heat pumps, domestic hot water, and drain water heat recovery. But B.C.'s green building sector is expansive and goes well beyond these products into a wide range of technologies, construction services and professional expertise that make up B.C.'s green building sector.



Supportive Ecosystem

Vancouver's Greenest City and Renewable City Action Plans
» Set goals for Vancouver to be the greenest city in the world, and to use 100% renewable energy by 2050

BC's Carbon Tax
» First in North America

International Trade Agreements
» CETA (Canada-EU) » USMCA (Canada-US-Mexico)
» CPTPP (Canada-Asia Pacific including Australia and Japan)

Presence of many non-profit facilitators
» CaGBC
» Light House Sustainable Building Centre
» OPEN Green Building Society
» Passive House Canada
» Zero Emissions Building Centre (ZEBx)

Incentives & Financing Options
» BC Innovative Clean Energy Fund (BC-ICE)
» NRCan Energy Innovation Program
» NRCan Industrial Research Assistance Program (IRAP)
» Scientific Research and Experimental Development (SR&ED) tax credit
» Sustainable Technology Development Canada (SDTC) funds

Progressive building codes drive innovation and demand for high performance buildings
» BC Energy Step Code » Vancouver's Zero Emission Building Bylaw

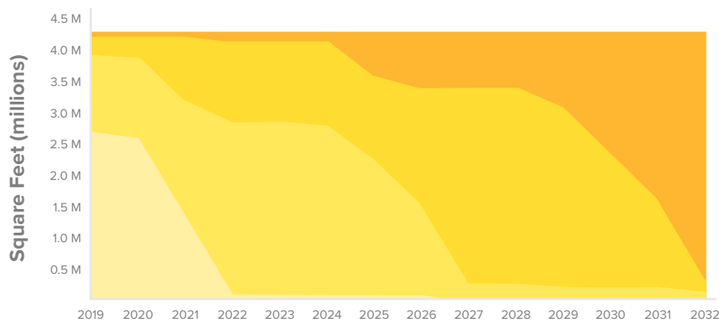
CleanBC
» Province-wide GHG reduction targets with new financing and supportive policy advancing green buildings & low carbon energy


Cascadia Windows and Doors

FENESTRATION

Windows, skylights and doors,
structural glazing and curtain walls

Demand Forecast for Fenestration Products
New Construction, Metro Vancouver, 2019–2032



$1.8B

market value for fenestration products in Metro Vancouver (2019–2032)

Industry Competitiveness

Existing Manufacturing Base
Heavy, fragile products and low barriers to entry encourage strong local and regional supply chains. Today, there are 100+ small and mid-sized manufacturers in B.C.

Certification Barriers
Higher barriers to entry for high-performing products (due to R&D, product testing, certification, technology) mean that large Canadian or international manufacturers dominate high-performing categories[30]

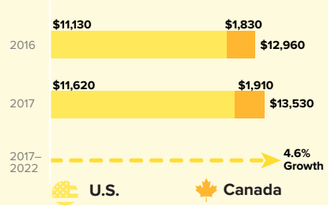
Future Retooling
Retooling to produce triple-glazed fenestration (U-value <1.0 W/m²K) similar in cost to retooling for U-value of 1.2 W/m²K; however, this requires new frame design and costs can be prohibitive for smaller companies[31]

Company Spotlight:
Cascadia Windows and Doors
Manufacturer of high-performance fiberglass windows, employing 90 staff at a 90,000 square foot facility in Langley, B.C.

25%
increase in average annual revenues for last 10 years

5-15 new hires
expected annually through 2023

North American Sales
Windows and Advanced Coverings
US$M



Source: BCC Research

Metro Vancouver Context

75%
of total demand in Metro Vancouver will be for medium performance windows (2019–2032)

Change in Demand Over Time
Fenestration Products

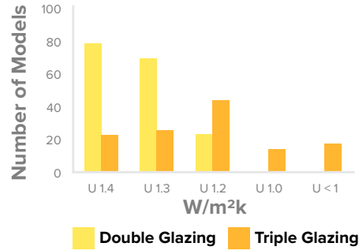
B.C. Capabilities

ENERGY STAR
B.C. fenestration industry has proven responsive to new standards in the past, developing double and even triple-glazed products. Today, there are 50+ ENERGY STAR-certified manufacturers across B.C.

High-Performance Ready
Larger B.C. manufacturers have indicated their capacity to upgrade capabilities and deliver high-performance and even Passive House-certified windows, given clarity on timelines and market demand (**Cascadia Windows**, **Innotech**, **Eurolines**)[32]

Smart Glass
A small cluster is developing smart, self-tinting glass (**Switch Materials** and **View Dynamic Glass**)

Number of Window Models by U-value
Produced by B.C. Manufacturers



Source: Research Local High-Performance Building Supply for New Low-Rise Homes, Arash Shadkam (Greenest City Scholar), Prepared for City of Vancouver Sustainability group, August 2018

Risk Factors

Repetitive Retooling
Demand for different performance levels could co-exist, requiring repetitive retooling and inventory tracking[33]

High-Cost R&D Needs
Smaller B.C. manufacturers may risk being squeezed out if unable to invest in R&D, product testing, certification, technology upgrades. However, the High Performance Window Certification Program provides support for transition – see **Incentives** below.

Market Opportunities

Pan-Canadian Market
Manufacturers may consider alignment with emerging federal standards that could require U-value <1.0 W/m²K across Canada[34]

Market Timing
Manufacturers can time investments into new product development using data from the Market Demand Forecasting Tool, phasing out low-performance by 2022 and low–medium performance before 2027

Slab Style Doors
Doors have a critical role in ensuring envelope performance, yet there are very few high-performance slab-style doors manufactured in North America[35]

Incentives

High Performance Window Certification Program | fen-bc.org
B.C. manufacturers can access up to $80,000 to design, test, certify and manufacture new energy-efficient window products.

Home Renovation Rebate and Efficiency BC Program | efficiencybc.ca
Homeowners can receive $50/high-performance window/door (up to $1000)

QAI Laboratories | qai.org/doors-windows
Fenestration testing and certification

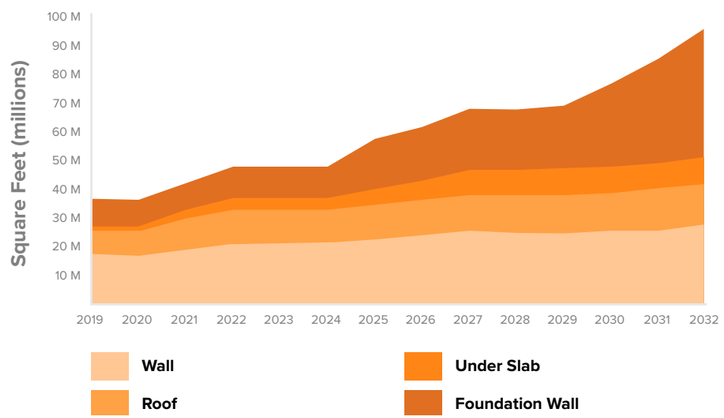
Insulating Glass Manufacturers Association of Canada | igmaonline.org
Certification program

Photo: ROCKWOOL

INSULATION

Wall, roof, slab and foundation

Demand Forecast for Insulation Materials
New Construction, Metro Vancouver, 2019 - 2032



$880M

market value for insulation materials in Metro Vancouver (2019–2032)

B.C. Capabilities

Low-Impact Materials
Small niche producers of high-performance or environmentally benign products such as expanded polystyrene and stone wool, and potential for other cellulose materials such as wood fibre and hemp (most insulation materials come from international manufacturers)

Thermal Break Solutions
Thermal break solutions to overcome heat loss from thermal bridging (e.g. **Cascadia Windows** Cascadia Clip thermal spacer and fiberglass curtain wall vent adaptor address heat loss through building envelope; **Monoglass** spray-on insulation helps with balcony retrofits)

Mass Timber & Cross-Laminated Timber
Capabilities in mass timber and engineered wood products: cross-laminated timber (CLT), dowel-laminated timber (DLT), nail-laminated timber (DLT) and glulam (**Structure Craft**, **Structurlam**, **B.C. Passive House, Seagate Structures**); driven by regulations allowing for expanded wood and tall wood construction

Company Spotlight: ROCKWOOL

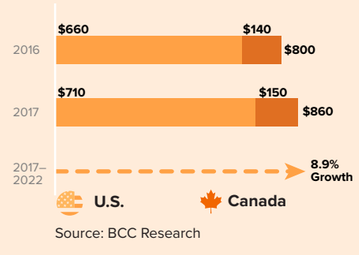
World's largest producer of stone wool, made from natural basalt rock and recycled slag to form high-performance insulation products. Headquartered in Copenhagen, the firm's B.C. operations were established in 1999 in Grand Forks.

$3M
Contribution to local economy

200+
employees

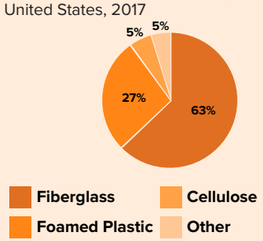
North American Sales

Weather Barriers and Efficient Insulation, US$M



Source: BCC Research

Residential Insulation by Material
United States, 2017



Source: Freedonia Focus Reports

Metro Vancouver Context

50%
increase in foundation wall material demand after 2024

Part 9 (small buildings) driving Metro Vancouver growth[39]

B.C. Capabilities: Prefabrication and Offsite Assembly

B.C. is home to a strong and fast-growing prefabricated building and offsite assembly industry.

Prefabrication offers multiple benefits relevant in the current real estate cycle of high land values and construction costs. Productivity in the construction sector has grown only one percent annually since the 1990s, while manufacturing output has increased three times faster.[36] The controlled environment offered by prefabrication, and the use of lean construction approaches, automation and additive manufacturing, allows improvements in productivity that can cut costs and improve affordability.

Around the world, prefabrication is attracting significant investment. Tech giant Amazon invested in Plant Prefab, betting on smart modular homes with short delivery times. B.C.'s wide-ranging capabilities span from structural insulated panels and wood wall assemblies to technology-driven solutions for multi-family, commercial and industrial buildings up to 25-storeys (**Stack Modular**, **Metric Modular, Horizon North**, **QUBE**).

Market Opportunities

Wood Fibre Insulation
Demand for wood fibre insulation may grow due to drivers such as Passive House projects. Wood fibre insulation is not currently an area of expertise for B.C. lumber companies. This would require a different market mindset and partnerships with established European manufacturers to bring know-how, efficiencies and technology to B.C.[37]

Prefabrication
Expand capacity to deliver prefabricated panelized wall and curtain wall assemblies, and invest in lean construction approaches such as automation, off-site modular and 3D-printing materials

Hemp Products
Legalization of cannabis in Canada could create market for hemp insulation but requires more data and analysis

Deconstruction
Vancouver's Green Demolition Bylaw is diverting wood products from the landfill and driving market for deconstructed materials (e.g. **Unbuilders**, **Octiscapes**, **Green Coast Rubbish**)[38]

Building Envelope Innovations
Increased investment and R&D into thermal break innovation, capacity building and product licensing

Incentives

Home Renovation Rebate and EfficiencyBC Program | efficiencybc.ca
Homeowners can receive up to $5,500 in rebates for installing insulation in their homes

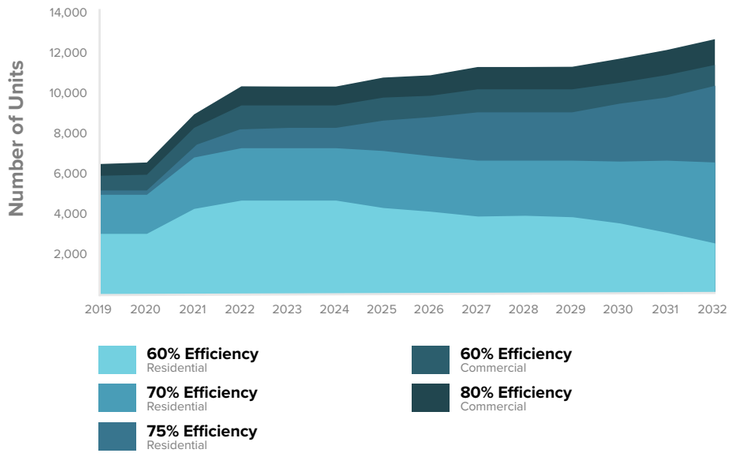
Photo: Core Energy Systems

HEAT RECOVERY VENTILATORS

Heat recovery ventilators and
energy recovery ventilators

Demand Forecast for Heat Recovery Ventilators

New Construction, Metro Vancouver, 2019–2032

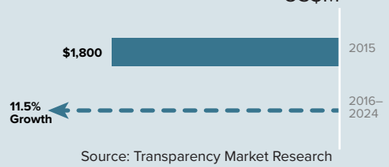


$228M

market value for heat recovery ventilators in Metro Vancouver (2019–2032)

Global Sales

Energy Recovery Ventilators, US$M



Source: Transparency Market Research

Metro Vancouver Context

3x

increase in demand for 75% efficient residential units after 2024

Units Required

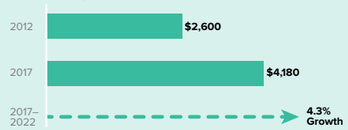
119,600 residential in-suite units (100–200 cfm*)

26,800 large commercial centralized units (>600 cfm)

cfm = cubic feet per minute

North American Sales

Heat Pumps US$M



Source: Freedonia Focus Reports

Metro Vancouver Context

3x

increase in demand for residential units (25 mbh*) in Metro Vancouver after 2024

Units Required

15,510 residential units (25 mbh)

10,200 small commercial units (60 mbh)

560 large commercial units (720 mbh)

mbh = 1,000 BTU/hour
BTU = British Thermal Unit

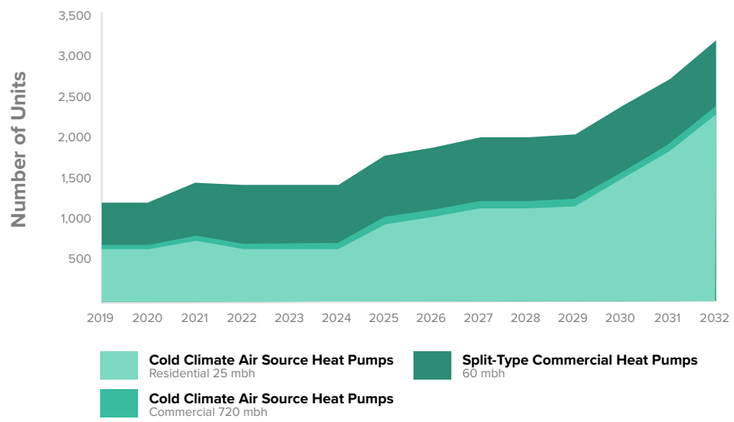
Photo: Lamiot

AIR SOURCE HEAT PUMPS

Air-to-air heat pumps, air-to-water heat pumps,
ductless mini-split heat pumps

Demand Forecast for Air Source Heat Pumps

New Construction, Metro Vancouver, 2019–2032



$121M

market value for air source heat pumps in Metro Vancouver (2019–2032)

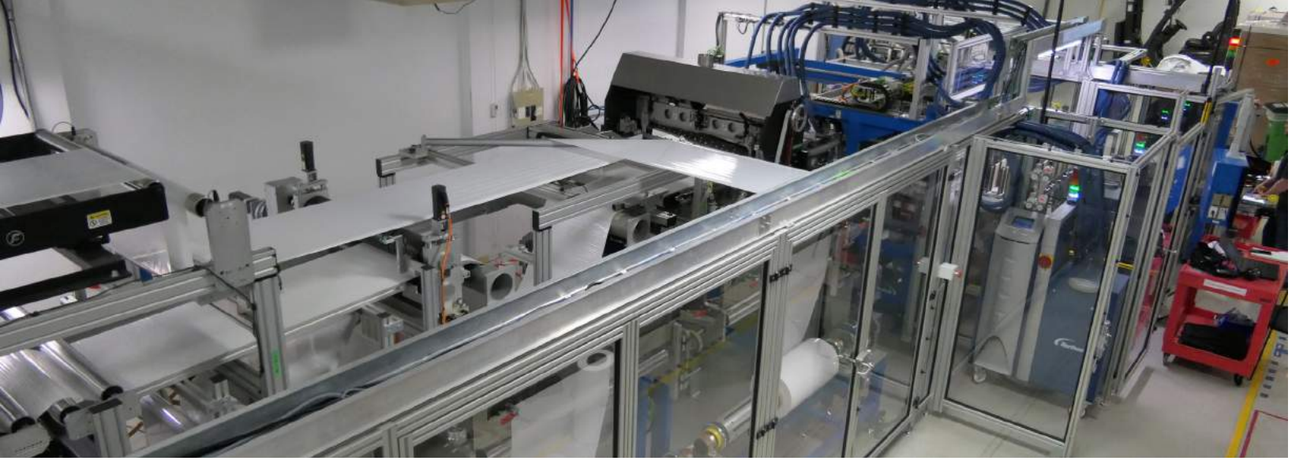


Photo: Core Energy Systems

Industry Competitiveness

High Barriers to Entry

The high capital investment and economies of scale required for manufacturing heating ventilation and air conditioning (HVAC) equipment, means high barriers to entry. This has resulted in the dominance of multinationals based in Asia, Europe and the United States; some limited manufacturing exists in Quebec and Ontario

Established Suppliers

Builders and project developers tend to purchase complete HVAC systems and related components from established national and international manufacturers and suppliers

B.C. Capabilities

Niche Manufacturing

Niche components, including high-performance membranes (**Core Energy Recovery**), custom tube and shell heat exchangers, ducting systems, and vents

Monitoring & Control Systems

Strength in control systems allowing optimal operation and monitoring of HVAC and other energy efficiency or air quality equipment (**Delta Controls, Ecotagious, Rainforest Automation, Sensible Building Science, TZOA**)

Risk Factors

Cold Climate

Performance of air source heat pumps may suffer in below-freezing conditions; cold-climate air source heat pumps (optimized for temperatures as low as -25C°) are being tested and offered in Canada[40]

Few High-Efficiency Models

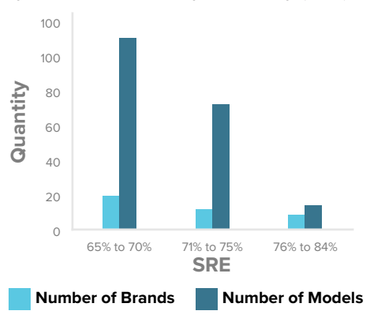
Current shortage of heat recovery ventilators >75 percent efficiency in B.C.[41]

Upfront Capital

Investments in heat recovery ventilators can incur additional upfront construction costs. However, when evaluating an impact on affordability, the total cost of ownership should be considered, as lifetime heating costs for the owner are significantly lower[42]

HRV Models and Brands

By Sensible Recovery Efficiency (SRE)



Source: 'Research Local High-Performance Building Supply for New Low-Rise Homes', Arash Shadkam (Greenest City Scholar), Prepared for City of Vancouver Sustainability group, August, 2018.[45]

Market Opportunities

Phased Availability

Manufacturers and suppliers can time investments into B.C. based on demand (residential heat pumps and 75-percent-efficient residential HRVs needed now; demand doubles after 2024)

Co-Production

Potential for partnerships to encourage product licensing, customization and assembly in B.C. For instance local component and control system companies can offer market access to international partners. The North American market for energy-efficient controls, including thermostats and smart home automation in residential buildings, was $2.5 billion in 2017 with an expected annual growth of 18 percent through 2022[43]

Benign Refrigerants

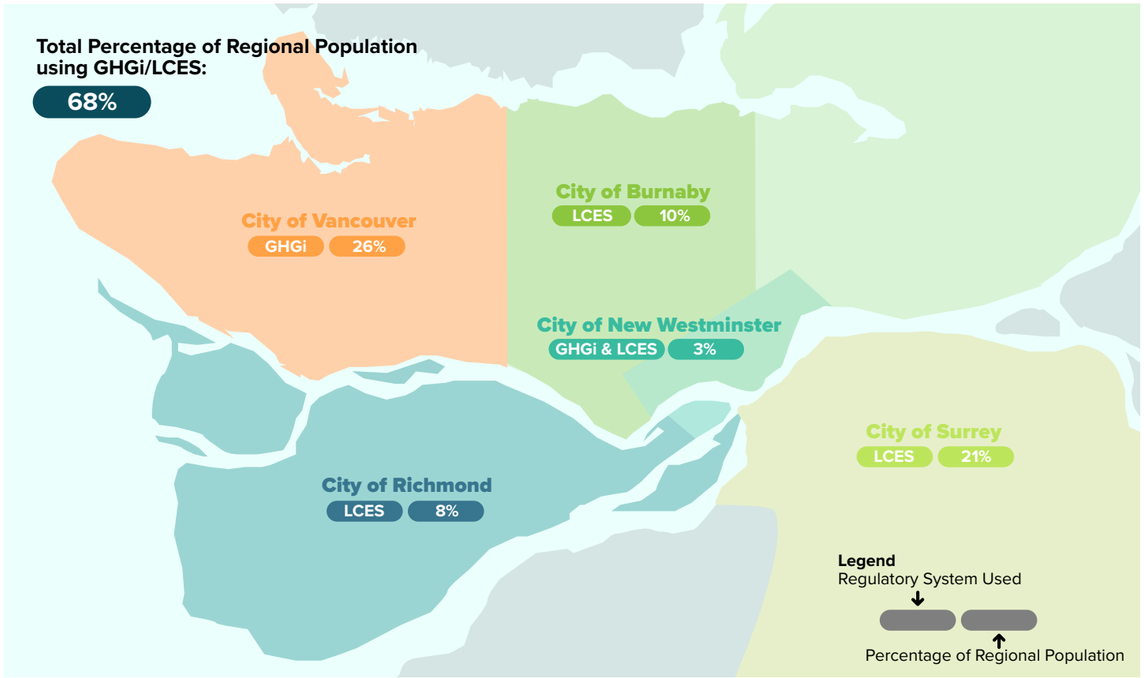
Cold climate heat pumps that work in colder climates, and CO_2 heat pumps that replace refrigerants with greater global warming potential

North American Market

Manufacturers may consider early alignment with wider provincial, federal and U.S. standards driving demand for high-performance HVAC equipment[44]

Expanding Influence of Carbon Reduction Policies

Vancouver, Burnaby, New Westminster, Richmond and Surrey utilize a mixture of Low Carbon Energy System (LCES) and Greenhouse Gas Intensity (GHGi) metrics in addition to TEUI and TEDI standards. These requirements are expected to drive fuel switching, favouring renewable electricity and renewable natural gas, the former further increasing demand for low carbon technologies like heat pumps.



Incentives

Home Renovation Rebate and EfficiencyBC Program | efficiencybc.ca
Homeowners can receive up to $2,000 in rebates for installing central system, mini- or multi-split air source heat pumps in their homes. Select municipalities offer an additional $2,000 when converting from fossil fuels.

FortisBC Air Source Heat Pump Loan Program | fortisbc.com/rebates/home
Homeowners can borrow up to $6,500 at 1.9 percent interest for installing high-efficiency central or variable speed mini- or multi-split air source heat pumps.

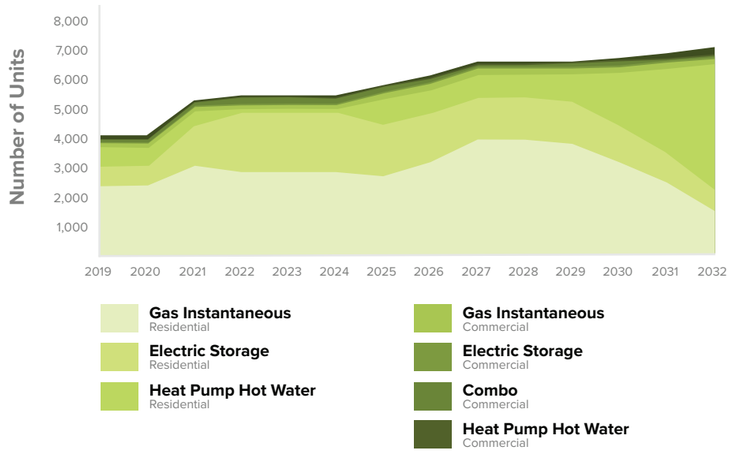
FortisBC Air Source Heat Pump Rebate for Non-Profit Organizations | fortisbc.com/rebates/business
Co-ops, Indigenous housing providers, nonprofits or charities can receive incentives for cold climate, packaged terminal and Variable Refrigerant Flow (VRF) heat pumps.

Photo: Olympic International/Smartforme solutions

DOMESTIC HOT WATER

Instantaneous natural gas, electric storage, hot water heat pumps, boiler combination systems (heating/hot water), condensing boilers

Demand Forecast for Domestic Hot Water Systems
New Construction, Metro Vancouver, 2019–2032

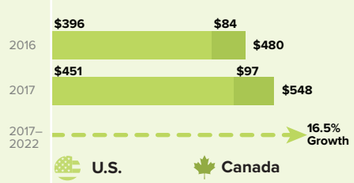


$187M

market value for domestic hot water systems in Metro Vancouver (2019–2032)

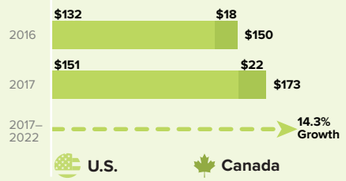
North American Sales

Tankless Water Heaters
US$M



Source: BCC Research

Heat Pump Water Heaters
US$M



Source: BCC Research

Metro Vancouver Context

3x
increase in demand for residential hot water heat pumps in Metro Vancouver after 2029

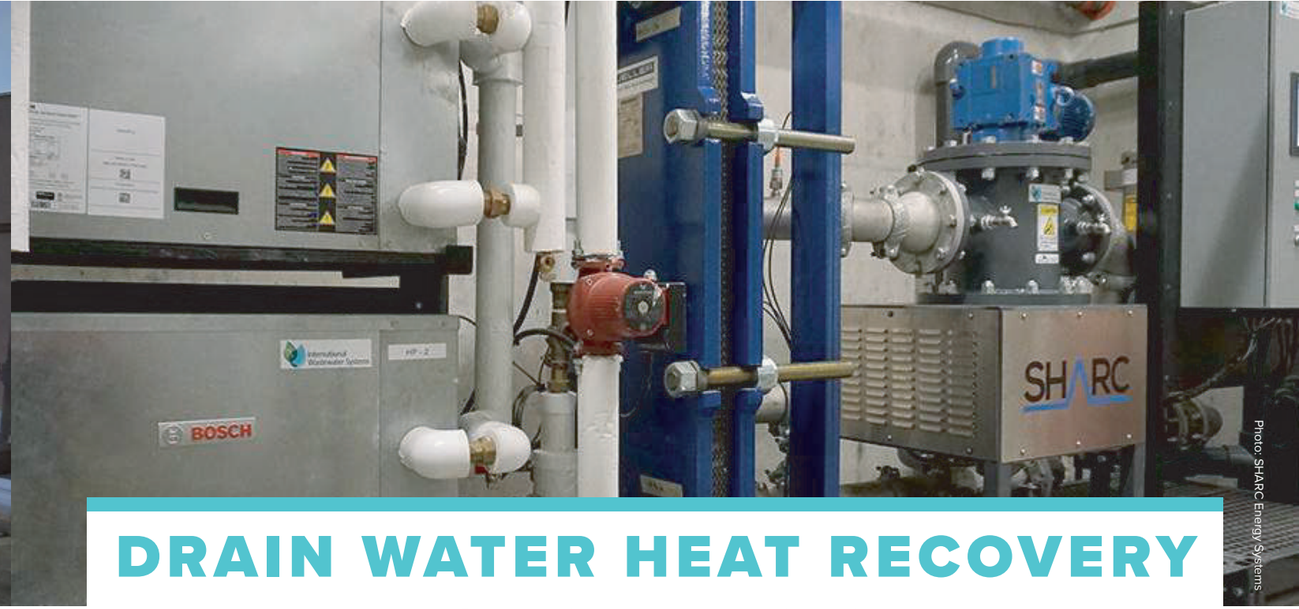


Photo: SHARC Energy Systems

DRAIN WATER HEAT RECOVERY

Copper drain wrap arounds and large scale heat exchangers with or without storage

Global Context

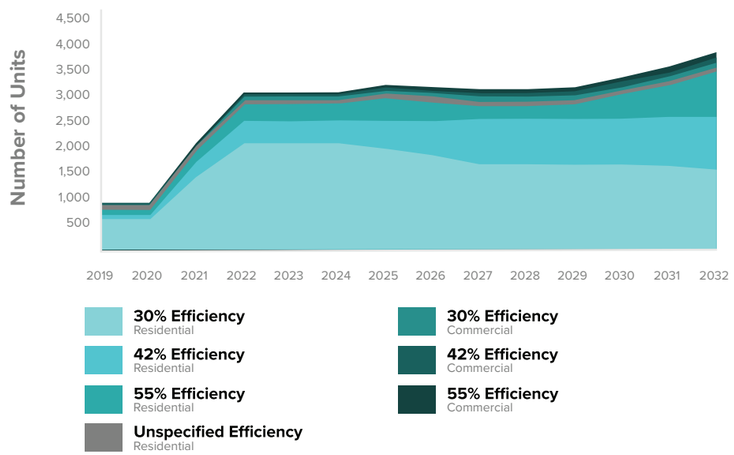
20,000 units
drain water heat recovery units were manufactured and installed globally, almost exclusively in Canada in 2015
Source: California Energy Commission

Metro Vancouver Context

3x
increase in demand for drain water heat recovery products between 2019–2022

Demand by type 2019–2032:
36,300
residential in-suite units
3,100
commercial systems

Demand Forecast for Drain Water Heat Recovery
New Construction, Metro Vancouver, 2019–2032



$37M

market value for drain water heat recovery systems in Metro Vancouver (2019–2032)

Industry Competitiveness

Global Significance
Highly competitive supply chain for domestic hot water systems and market dominated by large, global manufacturers; Canadian water heater manufacturing largely relocated to United States over past ten years due to labour costs, exchange rates

Cold Climate
Five primary manufacturers of drain water heat recovery units all located in Canada (**EcoDrain**, **EcoInnovation Technologies**, **RenewAbility Energy**, **SHARC Energy Systems**, **WaterCycles Energy Recovery**). All report being able to meet growing demand with existing capacities.[46]

B.C. Capabilities

Local Manufacturers
Some manufacturing of hot water tanks (**Advance Metalpres**) and several boiler makers (**IBC Boilers**)

Sewer Heat Recovery
Local manufacturing of drain water heat recovery (**SHARC Energy Systems**, that also specializes in district-scale sewage heat recovery systems)

Market Opportunities

Regulatory Changes
Drain water heat recovery demand growing across North America: required by code or supported by incentives in Ontario, Alberta, Manitoba; increasing in United States also; opportunity to ramp up capacity to meet greater demand, especially given timelines and market projections (burgeoning demand across Metro Vancouver 2019–2022)

Company Spotlight:
Vancouver's Neighbourhood Energy Utility (NEU)

Operating since 2010, this district energy system captures energy from sewage and delivers heat and hot water to 5.3 million square feet of residential, commercial and institutional floor space

5.3 million sq. ft.
floor space served

~45,000 MWh
annual sales of energy

Company Spotlight:
SHARC Energy Systems

Industry-leading DWHR technology manufacturer and installer, with neighbourhood-scale sewage heat recovery systems in operation around the world. A SHARC system is installed at Vancouver's NEU to assist sewer screening in a hermetically-sealed environment, removing odour from sewer heat recovery

x7
increase in revenues in past 5 years

up to 100
employess in next 5 years (currently 12 in Canada)

5,000 sq. ft.
facility in Port Coquitlam

Company Spotlight:
Smartforme solutions

Provides a total heating, cooling and domestic hot water system that reduces carbon emissions on buildings to near zero levels using a combination of technologies

83%
reduction in carbon emissions

Incentives

Home Renovation Rebate and EfficiencyBC Program | efficiencybc.ca
Homeowners can receive up to $1,000 in rebates for installing heat pump water heaters, or up to $3,000 for combination space and water heat pump systems.

Photo: Vancouver's Neighbourhood Energy Utility (NEU)

03

VANCOUVER
ECONOMIC COMMISSION

To learn more about any of our programs, get in touch with VEC's green economy team at **info@vancouvereconomic.com**

VEC SUPPORT
for the Green Building Sector

The Vancouver Economic Commission (VEC) serves one of the world's fastest-growing, low-carbon economies, contributing to a metro region representing 60 percent of B.C.'s economy and an annual GDP of $138B

VEC strives to ensure inclusive, sustainable prosperity for all in our region. As the economic development agency for Vancouver, our approach is data-driven and aligns with the best practices of leading global peer cities, such as New York, Portland and London. VEC has defined, measured and reported on green economy metrics since 2010, and developed targeted programs that aid Vancouver's transformation towards a low-carbon economy by supporting innovative local entrepreneurs, businesses and talent.

Green Building Market Acceleration Platform (MAP)
This report is the foundation for VEC's efforts to advance the green building sector in response to the BC Energy Step Code. We continue to work with a wide group of partners with a focus on the following:

- Supporting manufacturers in transitioning to meet future demand
- Enhancing B.C.'s industry relationships with key overseas markets
- Creating more local IP while gaining access to global innovations
- Conducting and publishing original research on the green economy
- Improving affordability and supporting the development of more efficient local supply chains

Industrial Concierge | vancouvereconomic.com/space-sharing
The Industrial Concierge Service addresses industrial space challenges in Vancouver by activating underused industrial spaces and simplifying the space-sharing process for industrial operators. This service assists industrial businesses with finding industrial space, the permitting and licensing process, and establishing governance structures and financing models – occasionally through space-sharing projects such as the Material Innovation and Learning Lab (MILL).

"The VEC **Industrial Concierge** is an invaluable asset for groups looking to find affordable space in the scarcity of Vancouver's industrial lands. In 2018 the Industrial Concierge was instrumental in helping the MILL Co-op take our next steps, both as an organization and towards finding our ideal location. We wouldn't have gotten this far without them."

Emily McGill
Founding Member, MILL Co-op

The Tech Deployment Network (TDN) | vancouvereconomic.com/gddp
Launching in 2019, the TDN is a member-based demonstration network comprised of major asset owners in Vancouver sharing common visions, values, and goals around sustainability, intelligent facilities, and the customer experience. The program builds on the existing Green and Digital Demonstration Program (GDDP), but expands its impact regionally. TDN communicates the members' challenges through an online portal and allows innovators to submit targeted project proposals through an intake process. VEC scouts, screens, and shortlists projects while promoting the region as a global hub for tech adoption.

"**TDN** is a technology partnership that eliminates traditional bureaucratic obstacles to innovation at the municipal level. The VEC acts as an external advocate, uniquely positioned to remove challenges that would otherwise curtail innovation."

Jason Harmer
CEO, GetWorkers

Thriving Vancouver | thrivingvancouver.com
Thriving Vancouver empowers businesses to introduce sustainable options into their daily operations by connecting the Vancouver business community to curated resources, such as solutions providers, workshops, events and vendors.

Impact 6 Pack | vancouvereconomic.com/impact-6-pack
Over six weeks, participating businesses work with a collaborative and supportive cohort to craft their impact business model and implement impact strategies in their business. The course is comprised of six modules designed to build a strategic impact plan unique to each business. The course concludes with a celebratory wrap party attended by members of Vancouver's growing impact ecosystem, special guests of the course, and previous Impact 6 Pack participants.

Capital Mentorship Program | vancouvereconomic.com/cleantech-capital
The Discovery Foundation Capital Mentorship Program is designed to help early-stage, for-profit entrepreneurs become more strategic in raising the capital critical to accelerating their ventures. The program is a series of impactful events featuring panels, workshops, pitch training, investor–company matching and networking opportunities.

Vancouver Startup City | vancouvereconomic.com/vancouverstartupcity
Vancouver Startup City increases access to funding and deal flow opportunities, investor networking, and startup education. Past programs have included Startup City: Capital and Startup City: Impact – both week-long activations of the Vancouver startup ecosystem.

04 SELECT BUILDING PRODUCT COMPANIES
Across B.C.

Category	Company Name	Product	Location	Website
MECHANICAL SYSTEMS	ABB	Heat exchangers	Burnaby, Kelowna, Surrey	abb.ca
	Advance Metalpres, Inc.	Heat Exchangers	Richmond	metalpres.ca
	All Valley Metals Ltd.	Sheet Metal Contractor	Surrey	avm.webmasterscorp.com
	Allied Engineering	Boiler	North Vancouver	alliedboilers.com
	Axton Mf. Ltd.	Heat exchangers	Delta	axton.ca
	CORE Energy Recovery Solutions	HRV and ERV	Vancouver	core.life
	Ellett Industries	Heat exchangers	Port Coquitlam	ellett.ca
	EM Manufacturing	Heat exchangers	North Vancouver	emmfg.com
	Fujitsu	HVAC	Vancouver, Victoria	fujitsu.com/global
	Gasmaster Industries Inc.	Boiler	Delta	gasmaster.ca
	Haakon Industries Canada Ltd	Air handling units	Richmond	haakon.com
	International Thermal Research	Boilers	Richmond	
	Johnstone Boiler and Tank	Heat exchangers and boilers	Vancouver	jbtvan.com
	Primex Vents	HVAC ducting and vents	Langley	primexvents.com
	SHARC Energy Systems	DWHR Unit	Port Coquitlam	sharcenergy.com
	Smartforme	ERV	North Vancouver	smartforme.ca
	Valor	Fireplace and furnace	North Vancouver	valorfireplaces.com
INSULATION	Beaver Plastics	Insulation	Chilliwack	beaverplastics.com
	CGC Inc.		Surrey	usg.com
	Hal Industries	Protection membranes	Surrey	halind.com
	Mansonville Plastics Group	Sprayfoam insulation	Surrey	mansonvilleplastics.com
	Rockwool International	Insulation	Grand Forks	rockwool.com
MONITORING AND CONTROLS	Delta Controls	Control systems	Surrey	deltacontrols.com
	Reliable Controls	Control systems	Victoria	reliablecontrols.com
	TZOA	Air quality monitoring	Vancouver	tzoa.com
	Sensible Building Science	Energy monitoring	Vancouver	sensiblebuildingscience.com
	Rainforest Automation	Energy monitoring	Burnaby	rainforestautomation.com
	Ecotagious	Energy monitoring	Vancouver	ecotagious.com
LIGHTING	Eaton's Cooper Lighting Business	LED lights	Port Moody	cooperindustries.com
	Green Image Tech	LED Lights	Richmond	greenimagetech.com
	BL Lighting	LED Lights	Vancouver	bllighting.com
	Onstate Technologies	LED Lights	New Westminster	onstatetech.com
	Radiance Energy	EE lighting	Manufacturer	radiance.energy
	Cooledge	LED Lights	Vancouver	cooledgelighting.com
	Nano-lit	Quantum dot lighting	Vancouver	nano-lit.com
FENESTRATION	A-1 Window Manufacturing Ltd.	Windows	Burnaby	a1windows.ca
	Alkan Windows Ltd.	Windows	Surrey	
	AVS Windows Ltd.	Windows & Doors	Surrey	avswindows.com
	Berdick Manufacturing Pacific Ltd.	Windows	Penticton	berdickwindows.com
	Boardwalk Woodworking Ltd.	Windows	Castlegar	boardwalkwoodwork.com
	Bowen Window & Door Ltd.	Windows	Richmond	bowenwindows.com
	Builders Door & Window Supply	Windows & Doors	Burnaby	buildersdoorandwindow.ca
	Canadian Aluminum Windows (2004) Ltd.	Windows	Surrey	canadianwindows.info
	Cascadia Windows Ltd.	Windows	Langley	cascadiawindows.com
	Centra Windows Inc.	Windows	Langley	centrawindows.com
	Century Glass (85) Ltd.	Windows	Kamloops	centuryglass.ca
	Clear Choice Windows & Shower Doors Ltd.	Windows	Abbotsford	clearchoicewindows.ca
	Coastal Windows	Windows	Nanaimo	coastalwindows.ca

Category	Company Name	Product	Location	Website
FENESTRATION	Columbia Manufacturing Co. Ltd.	Windows	Burnaby	columbiaskylights.com
	Csky Windows Ltd.	Windows	Coquitlam	csky.ca
	DYG Windows Ltd.	Windows	Coquitlam	
	Dynamic Windows and Doors Inc.	Windows	Abbostford	dynamicwindows.com
	EuroLine Windows Inc.	Windows	Delta	euroline-windows.com
	Ever-Brite Aluminum Products Ltd.	Windows	North Vancouver	ever-brite-alum-prods-ltd.business.site
	Fenstur	Windows	Duncan	fensturwindows.com
	Glenmore Millwork	Windows	Kelowna	glenmoremillwork.ca
	HighQ Windows Inc.	Windows	Burnaby	highqdev.ca
	Home Fortune Enterprises Ltd.	Windows	Vancouver	homefortune.ca
	IJ Windows and Doors Ltd.	Windows	Kamloops	ijwindowsanddoors.com
	Innotech Windows & Doors Inc.	Windows	Abbotsford	innotech-windows.com
	Jim's Prehung Doors Ltd.	Doors	Richmond	
	MJ Windows Ltd.	Windows	Surrey	mjwindows.ca
	Modern Aluminum and Vinyl Products Ltd.	Windows	Powell River	modern.ca
	Morrison Windows Ltd.	Windows	Surrey	morrisonwindows.ca
	Mountainview Designs Ltd.	Windows	Surrey	woodwindowsanddoors.com
	Oasis Windows Ltd.	Windows	Surrey	oasiswindows.com
	Open Windows Inc.	Windows	Richmond	open-windows.ca
	Prestige Joinery Ltd.	Glazing	Victoria	prestigejoinery.ca
	RetroTeck Window Mfg. Ltd.	Windows	Burnaby	retroteckwindow.ca
	Skyview Windows Inc.	Windows	Surrey	skyviewwindows.ca
	Starline Windows	Windows	Langley	starlinewindows.com
	Stilewood International Door and Window	Doors	Port Coquitlam	stilewood.com
	Sunlight Windows MFG Ltd.	Windows	Richmond	windowdoorvancouver.com
	Super Windows Ltd.	Windows	Port Coquitlam	
	Thermoproof Manufacturing Ltd.	Windows and Doors	Chemainus	thermoproof.ca
	Tundra Windows, Doors and Hardware Inc.	Windows and Doors	Penticton	
	Tyee Manufacturing Inc.	Windows	Abbotsford	tyeewindows.com/products
	Unison	Curtain Wall	North Vancouver	unisonwindows.com
	VanAir Designs	Doors	Vancouver	vanairdesign.com
	Van Isle Windows Ltd.	Windows	Victoria	vanislewindows.com
	Vintage Woodworks	Windows	Victoria	vintagewoodworks.ca
	Vinylco Windows Ltd.	Windows	Surrey	vinylcowindows.com
	Vinyltek Windows	Windows and doors	Delta	vinyltek.com
	West Coast Windows Ltd.	Windows	Delta	westcoastwindows.ca
	Westeck Windows Manufacturing Ltd.	Windows	Chilliwack	westeckwindows.com
	Westview Doors Ltd.	Doors	Delta	westviewdoors.ca
	Windowland Construction Inc. DBA	Windows	Salmon Arm	windowland.bc.ca/about
PREFABRICATION AND ENGINEERED WOOD PRODUCTS	Stack Modular	Prefab/Modular buildings	Vancouver	stackmodular.com
	Metric Modular	Prefab/Modular buildings	Agassiz	metricmodular.com
	QUBE	Prefab/Modular buildings	Vancouver	qubebuildings.com
	StructureCraft	Prefab/Modular buildings Mass timber products	Abbotsford	structurecraft.com
	StructurLam	Mass timber products	Penticton	structurlam.com
	B.C. Passive House	Prefab/Modular buildings Mass timber products	Pemberton	bcpassivehouse.com
	Centura Building	Insulation products	Delta	centurabuilding.com
	Factor Building Panels	Prefab/Modular buildings	Squamish	factorbuildingpanels.ca
	Tiny Healthy Homes	Prefab/Modular buildings	Roberts Creek	bengarratt.com
	Wood Shop Workers Co-op	Reclaimed wood products	Vancouver	woodshop.coop
	Brisco	Engineered wood products Prefab/Modular buildings	Brisco	briscoman.com
	Westcoast Outbuilding	Prefab/Modular buildings	Squamish	outbuildings.ca
	Pacific Homes	Prefab/Modular buildings	Cobble Hill	pacific-homes.com
	Tamlin International Homes	Prefab/Modular buildings	Coquitlam	tamlintimberframehomes.com
	Karoleena Homes	Prefab/Modular buildings	Kamloops	karoleena.com
	SRI Homes	Prefab/Modular buildings	Kelowna	srihomes.com
	Nomad Micro Homes	Prefab/Modular buildings	Vancouver	nomadmicrohomes.com
	Honomobo	Prefab/Modular buildings	Kelowna	honomobo.com
	Chaparral Industries	Prefab/Modular buildings	Kelowna	chaparralbuilt.com
	Freeport Industries	Prefab/Modular buildings	Westbank	freeportindustries.ca
	Moduline Industries	Prefab/Modular buildings	Penticton	moduline.ca
	Footprint Sustainable Housing	Prefab/Modular buildings	Maple Ridge	homesbyfootprint.ca
	Seagate Structures	Mass timber products	Surrey	seagatestructures.com

ENDNOTES

1 World Green Building Council, 2013
2 City of Vancouver. **Renewable City Action Plan**, (2017)
3 City of Vancouver. **Zero Emissions Building Plan**. (2016)
4 Government of British Columbia. **CleanBC**. (2018)
5 Government of British Columbia. **Energy Step Code** (n.d.)
6 Projected demand in Metro Vancouver from new construction activity 2019–2032 (CAD$) for six categories of products and equipment (not including installation): fenestration; insulation; heating, ventilation, air conditioning and cooling equipment including heat pumps; heat recovery ventilators; drain water heat recovery systems; and domestic hot water systems). Source: VEC's Market Demand Forecasting Tool 2018
7 IMARC Group. **Green Building Materials Market: Global Industry Trends, Share, Size, Growth, Opportunity and Forecast 2018-2023**. (2018)
Grand View Research. **"Green Building Materials Market Size Worth $364.6 Billion By 2022**," Research briefing. (March, 2018)
Research and Markets. **Green Building Materials Market Analysis By Product (Structural, Exterior, Interior, Others), By Application (Framing, Insulation, Roofing, Exterior Siding, Interior Finishing, Others) And Segment Forecasts To 2022**. (2015)
8 13,000 person years of employment
9 City of Vancouver. **Statement of Building Permits Issued, Vancouver Data Catalogue**, December 2018
10 This analysis is available in the '**Energy Step Code: Building Beyond the Standard - 2017 Metrics Research**' report, updated in 2018. The process was overseen by an Oversight Committee comprised of BC Housing, BC Hydro, the Province of B.C.'s Building And Safety Standards Brands, the City of Vancouver and Natural Resources Canada and analysis was conducted by Integral Group, Morrison Hershfield and E3 Eco Group
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