

# STATE OF VANCOUVER'S GREEN ECONOMY 2018

## PREVIEW

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Green Buildings | 04  
Cleantech | 08

# 02

**Why Green Companies  
Choose Vancouver**



**VANCOUVER**  
ECONOMIC COMMISSION



# WELCOME TO VANCOUVER

Welcome to this preview of Vancouver Economic Commission's (VEC) forthcoming State of Vancouver's Green Economy 2018 Report, exclusively launched at North America's leading sustainability conference.

It is appropriate to launch this at GLOBE Forum 2018, whose organizers have led the charge on the business of the environment since 1993. We are proud to have played a similar role in our own field of economic development, proving that cities can decarbonize their economies while making them more diverse, prosperous and equitable.

We started our journey in 2010, when a new Mayor and Council tasked us with the economic and job-related goals of the 'Greenest City Action Plan' - a strategy to make Vancouver the greenest city in the world by 2020. We were tasked with doubling the number of green jobs (and defining what a green job meant, on a city level, for the first time), and doubling the number of businesses engaged in greening their operations.

Since then, we tracked and reported on our progress in 2010, 2013 and 2016. More importantly, we built a robust 'green team' of economic developers working to turn these ambitious yet attainable goals into reality. This meant building relationships with major investors to help attract the right kind of patient capital; helping local cleantech companies access global markets to realize their full export potential; and using our own city assets and infrastructure to stimulate the early adoption of locally developed green technology through our Green and Digital Demonstration Program (GDDP).

This preview updates you on our preliminary numbers (with more details to come in the full report later this year). It also provides an overview of the Vancouver advantage and what makes Vancouver unique for green business; and an in-depth profile of two of our leading sectors in the green economy.

To visitors, welcome; we hope you – like so many others before you – are inspired to come back to be a part of our green economic success story. To those of you who live, work and play in our smart, thriving city, and especially to those who contributed to this report, thank you for your role in Vancouver's acceleration towards a greener, resilient future. We look forward to working with all of you in the near future. Moreover, we appreciate you taking the time to browse this preview and invite you to keep an eye out for the full report later this year.

## WHAT'S INSIDE

- 01 | Why Green Companies Choose Vancouver
- 02 | Sector Profile: **Green Buildings**
- 03 | Sector Profile: **Cleantech**
- 04 | VEC Programs



**VANCOUVER**  
ECONOMIC COMMISSION

### WHAT WE DO

**The Vancouver Economic Commission works to position Vancouver as a global leader for innovative, creative and sustainable business**

The Vancouver Economic Commission (VEC) engages directly with entrepreneurs, investors, SMEs, global enterprises and a wide range of community stakeholders - including elected officials, departments of all levels of government, industry associations and educational institutions. By staying connected, informed and agile, we're able to recognize trends and constraints in Vancouver's nation-leading green economy.

Vancouver consistently ranks among the greenest cities in the world, driven largely by its innovative policies, environmental ethos, and entrepreneurial culture. Top growth sectors in the green economy over the past seven years have been green buildings, materials and cleantech.

[vancouvereconomic.com](http://vancouvereconomic.com) | [@VanEconomic](https://twitter.com/VanEconomic) | 1.866.632.9668

# WHY GREEN COMPANIES CHOOSE VANCOUVER

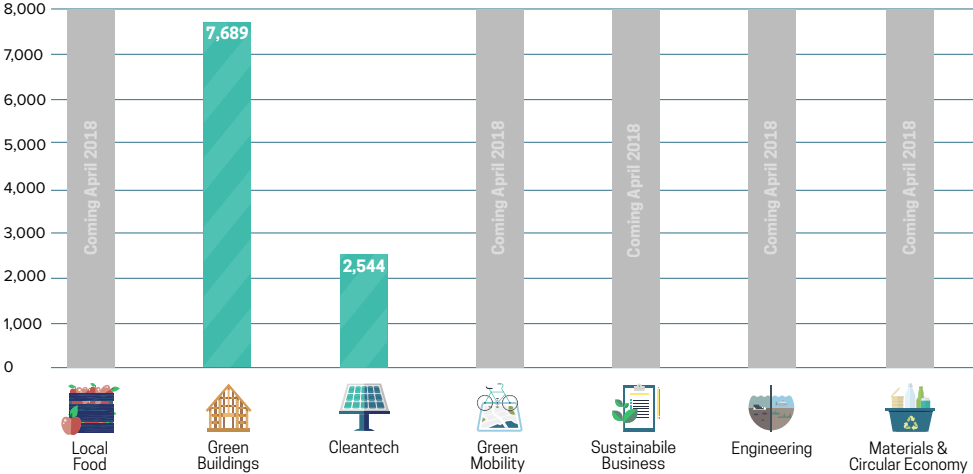
Vancouver has a global reputation – valued at \$31.5 B – as a leading clean and green economy.

With supportive government policy, targeted incentives and a strong investment climate, Vancouver has increased green and local food jobs by over 50 percent since 2010 (see chart). **Today, one in 15 Vancouverites works in the green economy.**

Vancouver is proof that green business pays dividends: carbon emissions per dollar of GDP have decreased 30 percent since 2007; and the Economist ranks the city the 3<sup>rd</sup> greenest in the world.

### Green & Local Food Jobs in Vancouver

Vancouver Economic Commission, 2016



The VEC surveys local businesses every three years (2010, 2013, 2016). Additional data came from the Statistics Canada Labour Force Survey. Our methodology can be found at [www.vancouvereconomic.com/greenjobs2014](http://www.vancouvereconomic.com/greenjobs2014).

This preview highlights data from two of our top green economy sectors: green buildings and cleantech. The full **State of Vancouver's Green Economy 2018** report will feature job growth numbers and detailed insights into all seven sectors.

Of note is that green job growth includes both new and transitional jobs. New jobs come from market expansion and growth, while transitional jobs are existing jobs in traditional sectors that have become green due to changed norms and practices (e.g. construction changes due to greener building codes). On average, 40 percent of growth in green jobs each year may be attributed to new jobs, while 60 percent of growth is due to transitional jobs. Green buildings and cleantech were two of the top sectors for growth.

**Vancouver's Brand Value: \$31.5 B**  
Built on Green Leadership  
Brand Finance, 2015

**3<sup>rd</sup> Greenest City in the World**  
The Economist

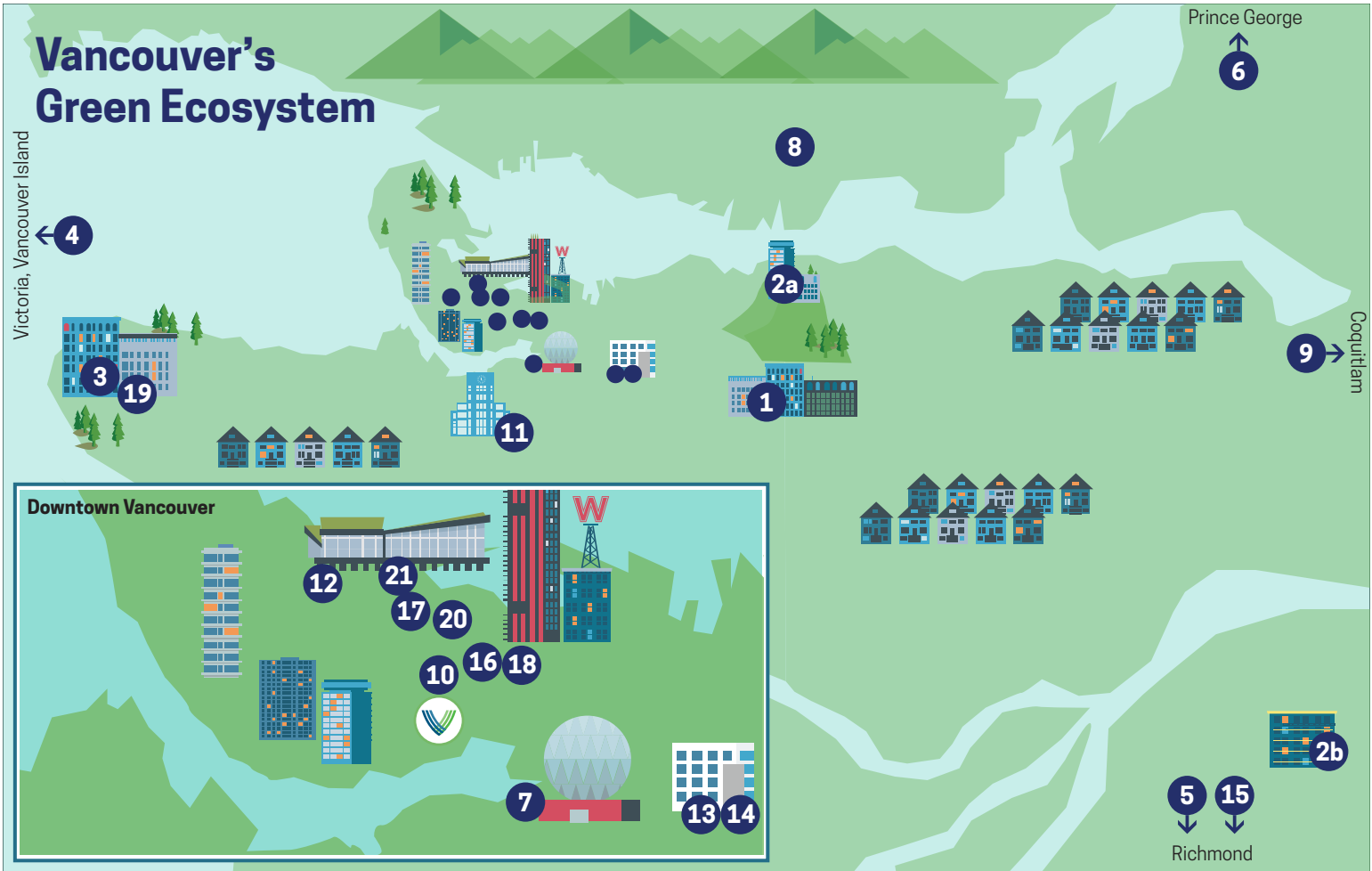
**4<sup>th</sup> Most Innovative Cleantech Sector**  
KPMG, 2017

**Best Green Building Code in the World**  
World Green Building Council, 2013

**2<sup>nd</sup> Most Tax Competitive City in the World**  
KPMG, 2016

**Part of the Pacific Tech Time Zone**  
Seattle, Silicon Valley, San Diego

**Canada is the Most Educated Country in the World**  
OECD, 2018



### Legend

<h4>Research Centres</h4> <ul style="list-style-type: none"> <li>1 BCIT: Centre for Energy System Applications; School of Construction and the Environment; Green Roof Research Facility; and Building Science Centre of Excellence</li> <li>2a SFU Burnaby: Centre for Sustainable Community Development; and School of Resource and Environmental Management</li> <li>2b SFU Surrey: Energy Systems and Environmental Engineering Programs</li> <li>3 UBC: Centre for Interactive Research on Sustainability; Institute for Resources, Environment and Sustainability; and Clean Energy Research Centre</li> <li>4 UVic: Institute for Integrated Energy Systems; and Pacific Regional Institute for Marine Energy Discovery</li> <li>5 Kwantlen Polytechnic University: Institute for Sustainable Food Systems</li> <li>6 UNBC: Wood Innovation and Design Centre</li> <li>7 CityStudio Vancouver</li> <li>8 Capilano University: School of Global Stewardship</li> <li>9 Douglas College: Building Energy and Resource Management Program</li> </ul>	<h4>Key Organizations</h4> <ul style="list-style-type: none"> <li>10 Vancouver Economic Commission (VEC)</li> <li>11 City of Vancouver (CoV)</li> <li>12 Innovate BC (formerly B.C. Innovation Council)</li> <li>13 BC Technology Industry Association (BC Tech)</li> <li>14 Discovery Foundation Tech Education Program</li> <li>15 Foresight Cleantech Accelerator Centre</li> <li>16 Launch Academy</li> <li>17 SFU Radius Social Innovation Lab and Venture Incubator; Venture Labs; and Coast Capital Savings Venture Prize</li> <li>18 Spring Activator</li> <li>19 UBC: Lean Launchpad Accelerator</li> <li>20 VANTEC Angel Network and National Angel Capital Organization Academy</li> <li>21 Wavefront</li> </ul>
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# GREEN BUILDINGS

Vancouver's plan for zero emissions green buildings is driving demand for new techniques and technologies

Green buildings are the result of a complex value chain, from conception, design and construction through to the installation of technology and ongoing maintenance. Vancouver benefits from a long history of innovation at every stage. This has resulted in pioneering planning paradigms 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".

The discovery of a fault in the construction of condos in the 1980s and 1990s, known as the "leaky condo crisis", sparked the development of deep local expertise in building envelope performance. As remedial work on the water infiltration problem tapered off, engineers turned their attention to the next big topic related to building enclosures - energy conservation - and construction of some of the world's most high-performing buildings began.

The end of the crisis dovetailed with a growing emphasis on reducing carbon emissions, and local building codes were revised to include green building standards. By 2013, the World Green Building Council recognized the City of Vancouver as having the "Best Green Building Policy" of any jurisdiction in the world. Today, the City's policies include a Zero Emissions Buildings plan and Passive House-style standards.

## Trends

### Windows

In response to a lack of local manufacturers of high performance fenestration, **Cascadia Windows and Doors** was born. They are currently the only manufacturer of fibreglass (and Passive House-certified) windows and doors on the west coast of North America, delivering 85 percent better performance than aluminum alternatives.

**The Fenestration Association of B.C.** offers \$25,000-40,000 for testing and certifying new window products to either ENERGY STAR or Passive House standards.

Films or tints can be applied permanently to windows to decrease glare and heat gain, but they compromise natural light and obstruct views. Companies like **View Glass**, **Vario** and **Switch Materials** deliver dynamic, self-tinting glass that can be sensor controlled or respond to occupant location, lighting level or even local weather.

### Thermal Breaks

Cascadia's award-winning thermal spacer, called the **Clip**, addresses heat loss through cladding and provides 100 percent more energy efficiency than traditional systems.

Thermal bridges from cast-in-place concrete slabs - balconies, for example - can be retrofitted with **Monoglass** spray-on insulation products. **Schöck** provides structural thermal break solutions for balconies, canopies, slab edges and more.



### VEC Program Spotlight

**Green Buildings Research:** VEC conducts research and data generation to better understand market dynamics across Vancouver's green economy. Currently, VEC is researching the market transformation potential of various green building and zero emissions building codes in B.C.

### Heat Pumps & Heat Recovery

Capturing waste thermal energy is essential to achieve zero emissions buildings.

In new Vancouver homes, heat recovery ventilators (HRVs) have been required since 2008, capturing heat from ventilated stale air to preheat cold air as it enters the building. The regulation led to 3,500 HRVs installed in the first five years. Separating ventilation from heating and cooling through Dedicated Outdoor Air Systems (DOAS) is one of the best options to reduce energy use and improve indoor air quality. **TZOA** uses artificial intelligence to automate heating, ventilation, and air conditioning services (HVAC). **Core Energy Recovery Solutions** carries products with Passive House certification.

commercial and institutional floor space. **SHARC's** (formerly International Wastewater Systems) neighbourhood scale sewage heat recovery systems are in operation around the world. In Scotland, the SHARC system intercepts wastewater from a town sewer line and transfers it to Borders College, Galashiels, where it provides 95 percent of campus heat. In Washington D.C., D.C. Water's new US\$60 M headquarters will use the SHARC system for sewage heat recovery to provide all heating and cooling needs for the 150,000 sf building. SHARC's new Piranha product is designed as a heat recovery solution for small buildings.

### Con-tech

Vancouver excels in both construction and technology, offering ample opportunity for collaboration at the edges of these disciplines.

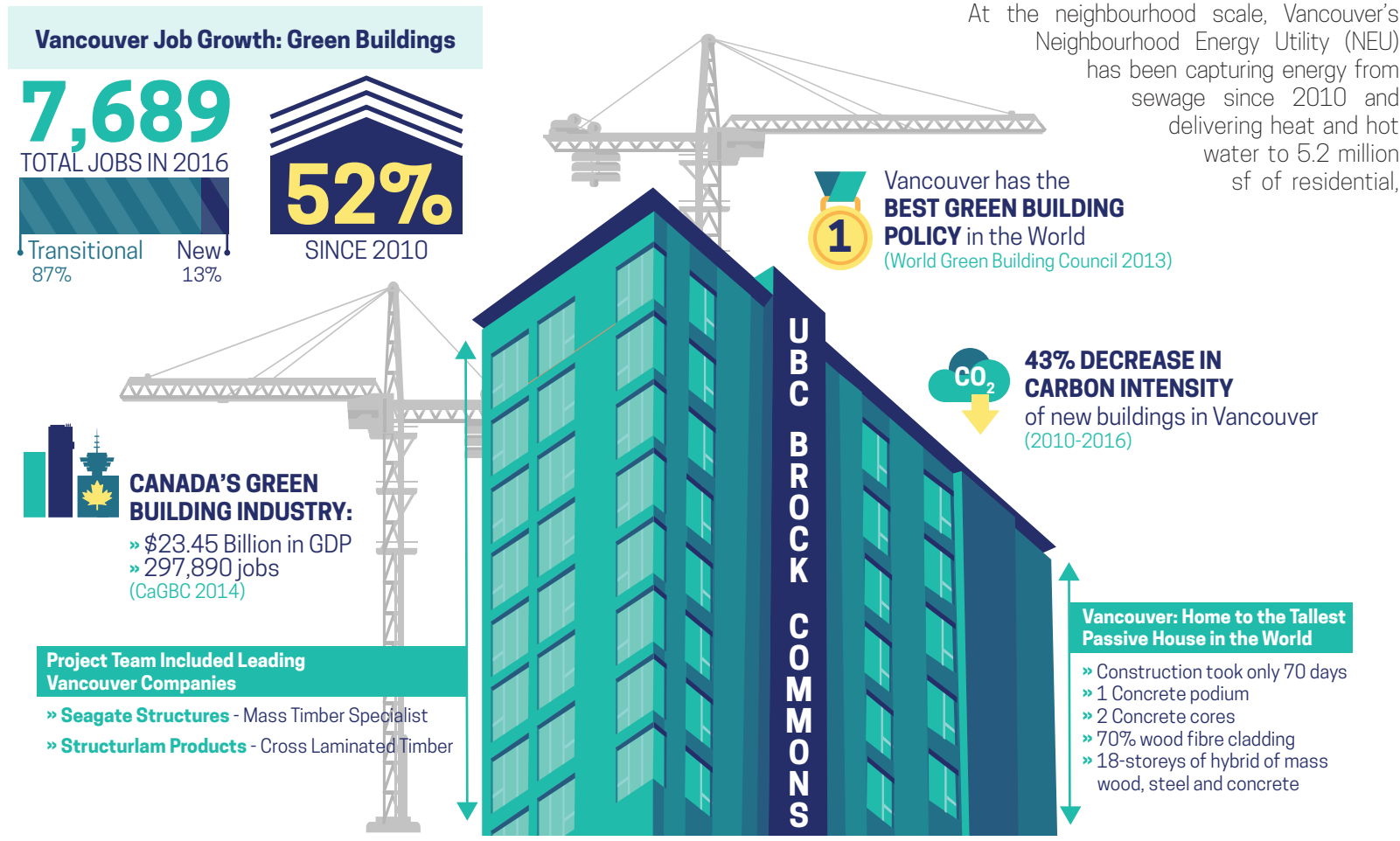
**Summit AEC** offer Building Information Modelling (BIM), software that creates a digital prototype of a building, allowing analysis of materials ordering or site timelines before construction even begins. Virtual Reality/Augmented Reality (VR/AR) experts such as **LNG Studios**, **Stambol Studios** and **uForis VR** are utilizing holograms and immersive experiences to assist in the multidimensional visualization of design blueprints and generation of realistic 3D previews of finished products.

**GEOSim's** 3D city-modelling platform allows users to fly or walk around an entire city, enabling analysis of geospatial and sensor data, identifying traffic patterns, building energy use and more. Combined with drone technologies on site, these solutions allow for an integrated design process, precise construction planning and detailed coordination of on-site activities.

**Nano-Lit's** lighting system uses quantum dots (nanoparticles) to deliver light fixtures suitable for retrofits that shift light temperature from 2400K to 7000K and allow colour purity, efficiency and lowered costs.

### Prefabrication & Lean Construction

While prefabricated homes are not yet cost competitive against custom-built homes, automation, off-site modular construction and 3D printing of materials does cut construction time considerably. **Stack Modular**, **Shelter Modular**, **Metric Modular** and **QUBE** cut construction times in half with options for multifamily, commercial and industrial buildings, and provide prototypes for high-rise construction up to 25 storeys.



**\$44 M** ESTIMATED ANNUAL ENERGY COST SAVINGS for citizens (2007-2015)

**2,980,547** Square Feet of LEED® CERTIFIED PROJECTS in B.C. (CaGBC)

**BY 2030** All new buildings must be ZERO EMISSIONS (City of Vancouver)

**GREEN JOBS**  
 » designers » engineers » manufacturers  
 » contractors » tradespeople & installers  
 » building inspectors » energy modellers  
 » maintenance technicians

**5,200,000** SQUARE FEET OF RESIDENTIAL, COMMERCIAL & INSTITUTIONAL FLOOR SPACE receives heat & hot water from Vancouver's Neighbourhood Energy Utility (City of Vancouver)

## Deep Dive: Zero Emissions Buildings

The City of Vancouver aims to be 100 percent renewable by 2050, and the City's Zero Emissions Buildings Plan requires all new buildings to have zero operational carbon emissions by 2030. Retrofits must also include energy efficiency improvements.

The Province of B.C. has committed to net-zero energy ready buildings by 2032, and developed its Energy Step Code approach to help municipalities meet this goal. The Federal Government committed to achieving a net-zero energy ready model national building code by 2030.

All of these regulations mark a shift towards passive approaches, such as orientation, massing and solar shading, and strict energy conservation. This 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.

	TEUI kWh/m <sup>2</sup> /year	TEDI kWh/m <sup>2</sup> /year	GHGI kg CO <sub>2</sub> e/m <sup>2</sup> /year
Passive House	<120	<15	-
City of Vancouver	<100-210*	<15-40*	<3-8
B.C.	<100-170**	<15-70**	-

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

The average TEUI for office buildings in B.C. is 335 kWh/m<sup>2</sup>/year and for multi-unit residential buildings (MURBs) is 215 kWh/m<sup>2</sup>/yr.<sup>1</sup> While Vancouver is well equipped with building envelope expertise and high-performance building systems to bridge this gap in TEUI, the TEDI and additional Greenhouse Gas Intensity (GHGI) targets set the bar higher. The GHGI requirements could drive fuel switching, favouring renewable hydroelectricity over natural gas and perhaps drive demand for renewable natural gas.

## Policy & Programs

### Vancouver Bylaws

#### New Construction

- The **Zero Emissions Buildings Plan** requires all new buildings to have no carbon emissions by 2030
- The **Green Buildings Policy for Rezonings** requires buildings to meet Passive House requirements (or an alternative such as International Living Building Institute's Net Zero Energy Building)

#### Retrofits

- Retrofits trigger energy efficiency upgrades proportionate to the nature and scale of the renovation. E.g. home renovation >\$5,000 requires an energy audit

### B.C. Provincial Building Code

#### New Construction

- Net-zero energy ready buildings by 2032
- Energy Step Code (ESC) inspired by Passive House

## Technologies for Zero Emissions Buildings

- Triple-glazed/dynamic/tinted windows
- Heat recovery ventilation
- Air-sealing accessories and air-barriers
- Thermal break solutions
- All manner of heat pumps
- High-efficiency HVAC systems
- Metering and smart controls
- Building modeling software
- Battery technology
- Virtual and augmented reality applications

## Education & Training

**Architectural Institute of B.C. / Engineers & Geoscientists B.C.:** professional development courses for designers and engineers

**B.C. Housing/Greater Vancouver Home Builders Association:** courses to help understand the B.C. Energy Step Code

**B.C. Institute of Technology's (BCIT's) School of Construction and the Environment:** variety of courses covering green building construction practices

**Canada Green Building Council:** broad range of programs including LEED® credentials, zero carbon buildings, energy benchmarking and green trades

**Emily Carr Centre for Design Innovation and Entrepreneurship (CDIE) at the Wood Innovation and Design Centre (WIDC):** training in wood construction and design solutions

**Passive House Canada:** variety of courses covering Passive House design and construction practices

**University of British Columbia:** Master of Engineering Leadership in High Performance Buildings

**University of Northern British Columbia:** Master of Engineering in Integrated Wood Design



**UBC's Brock Commons Tallwood Student House**—the world's tallest contemporary wooden building at 18 storeys (54 metres/approx 177 feet)—showcases the advantages of building with wood.

## Further Reading



### Zero Emissions Building Plan

City of Vancouver  
2016



### Construction Innovation Project: Building B.C.'s Vision

British Columbia  
Construction Association  
2015



### Imagining Construction's Digital Future

McKinsey & Company  
2016

Check out [www.vancouvereconomic.com/greenbuildings](http://www.vancouvereconomic.com/greenbuildings) for more!

# WHO TO WATCH

★ **Cascadia Windows and Doors** | [www.cascadiawindows.com](http://www.cascadiawindows.com)  
North American industry leader in energy-efficient fibreglass windows, doors, and cladding support systems

**Core Energy Recovery Solutions** | [www.core.life/en](http://www.core.life/en)  
High performance, hygienic air-to-air heat exchangers suitable for healthcare and Passive House HVAC systems

**GeoSim** | [www.geosimcities.com](http://www.geosimcities.com)  
Visualizing cities in 3D with high spatial precision, unmatched visual fidelity, and interactive navigation

**LNG Studios** | [www.lngstudios.com](http://www.lngstudios.com)  
Immersive experiences leveraging 3D renderings, floorplans and animations, VR/AR and drone technology

**Metric Modular** | [www.metricmodular.com](http://www.metricmodular.com)  
Permanent modular commercial projects, including Canada's first modular multi-unit Passive House building

## ★ Members of Canada Green Building Council

**Monoglass Incorporated** | [www.monoglass.com](http://www.monoglass.com)  
Spray-applied fibreglass insulation with high R-values and thermal performance

**Nano-Lit** | [www.nano-lit.com](http://www.nano-lit.com)  
Quantum dot technology-enabled, tunable lighting products that reduce energy use, adjust in real-time, and improve well-being

**QUBE** | [www.qubebuildings.com](http://www.qubebuildings.com)  
Digital technology to transform construction decision making and stackable interlocking high-rise building solutions

**Schöck** | [www.schock-na.com](http://www.schock-na.com)  
Structural thermal break solutions for new balconies, canopies, slab edges, concrete parapets and steel beams

**Seagate Structures** | [www.seagatestructures.ca](http://www.seagatestructures.ca)  
Mass timber construction specialists

**SHARC** | [www.sharcenergy.com](http://www.sharcenergy.com)  
Sewage heat recovery from wastewater for heating, cooling, and hot water for buildings and neighbourhoods

**Stack Modular** | [www.stackmodular.com](http://www.stackmodular.com)  
Structural steel modular buildings with a 25-storey high-rise prototype

**Stambol Studios** | [www.stambol.com](http://www.stambol.com)  
Immersive experiences through virtual and augmented reality for architecture and real estate

**Structurlam** | [www.structurlam.com](http://www.structurlam.com)  
Wood science experts producing the finest cross laminated and mass timber products

**Switch Materials** | [www.switchmaterials.com](http://www.switchmaterials.com)  
Switchable photochromic-electrochromic technology for automotive glass, architectural glass and eyewear

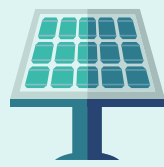
**TZOA** | [www.tzoa.com](http://www.tzoa.com)  
Artificial intelligence and sensors to automate HVAC maintenance and air quality analysis

**uForis VR** | [www.uforis.com](http://www.uforis.com)  
Using VR/AR applications, such as physically-based rendering and panoramic videos, that immerse users in a real world location

**Vario** | [www.varioglass.ca](http://www.varioglass.ca)  
Privacy glass and smart glass for windows and televisions

★ **View Dynamic Glass** | [www.viewglass.com](http://www.viewglass.com)  
Intelligent windows that take in data from sensors, occupant location and even time of day, to maximize natural light and views while reducing heat and glare





# CLEANTECH

Public sector early adoption and corporate strategic investments drive cleantech growth

Cleantech includes companies that develop technologies for clean energy production, management and storage; water treatment and management; material efficiency and circular economy; advanced materials development; green agritech; clean transportation; and green buildings (see Green Buildings on page 4).

Vancouver is home to many game-changing clean technologies, from **General Fusion** (the development of viable fusion energy) to **Carbon Engineering** (the development of clean fuel out of thin air). The innovation and leadership in this area has significantly contributed to Vancouver's global reputation and \$31.5 B brand valuation.

Vancouver's cleantech sector emerged in the late 1980s through a combination of entrepreneurial vision and early-stage government and venture funding. Early innovations spawned numerous ventures and created a generation of progressive-thinking engineers and technicians focused on upending age-old industries.

Vancouver's attractive corporate tax regime, targeted incentives and positive policy context (Greenest City Action Plan, Renewable City Action Plan and B.C.'s carbon tax) help to attract new companies and talent to a growing ecosystem.

## Trends

### Wastewater

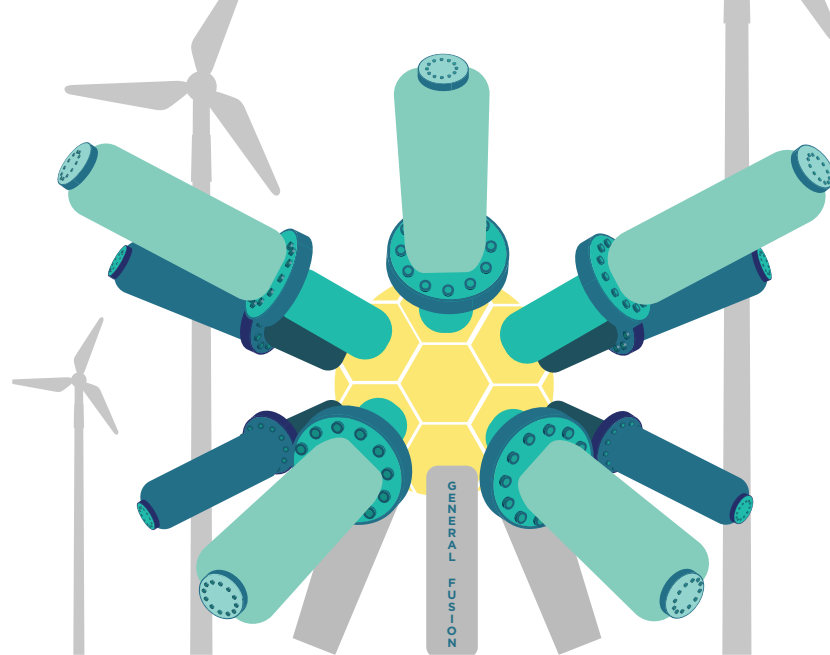
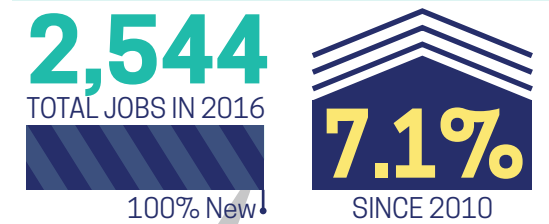
Tailing ponds are inarguably one of the most visual culprits of environmental degradation, and several Vancouver-based innovations are working to turn this sludge into clean water – capturing innocuous solid residue, and extracting nutrients and valuable metals from the fluid.

**Saltworks Technologies'** industrial desalination technology, which essentially reduces wastewater to salt, has attracted customers from mining company **Teck Resources** to NASA, which is piloting Saltworks' technology for future use on the International Space Station. **MGX Minerals** is also pioneering the extraction of lithium – valued for its use in electric vehicles – from oilfield wastewater.

Others are meeting the increasing demand for clean water, including **Acuva's** UV-LED systems that eliminate pathogens instantly from drinking water. **Axine Water Technologies** offers a solution for toxic wastewater from pharmaceutical and chemical markets, and **lonomr** offers highly durable ion-exchange membranes.

**BQE Water** has solutions to remove and recover a range of metals, sulphate, cyanide and more recently, selenium, while **Ostara Nutrient Recovery Technologies** – backed by Robert F. Kennedy Jr. – captures nutrients from wastewater in the form of an eco-friendly, phosphorus-based fertilizer.

### Vancouver Job Growth: Cleantech



**CANADA'S  
CLEANTECH SECTOR  
RANKS 4<sup>TH</sup> IN THE WORLD**  
(Global Cleantech Innovation Index, 2017)

**\$1.3 B** in revenues  
**CANADA RENEWABLE  
ENERGY TECHNOLOGIES**  
(Statistics Canada, 2015)

Company	Raise (\$CAD)
<b>Mojio</b> Kensington Capital   Nov 2017	\$30 M
<b>Jetti Resources</b> DNS Capital & Kleiner Perkins Caufield & Byers   Aug 2017	\$22.8 M
<b>Enbala Power Networks</b> ABB Technology Ventures   Aug 2017	\$22.1 M
<b>MineSense Technologies</b> Aurus Capital & Caterpillar Ventures   Feb 2017	\$19 M
<b>General Fusion</b> Business Development Bank of Canada   Sep 2017	\$15.9 M
<b>Inventys</b> Husky Energy   Jul 2017	\$10 M
<b>Acuva</b> Undisclosed   Dec2017	\$2.6 M
<b>Elix Wireless</b> Chongqing Zongshen Power   Sept 2016	\$6.55 M
<b>DarkVision</b> Evok Innovations & BDC Capital   Sept 2016	\$8 M
<b>Axine Water Technologies</b> Asahi Kasei Corporate Venture Capital   Aug 2016	\$8 M
<b>Carbon Engineering</b> Undisclosed   Nov 2016	\$5.1 M
<b>Illusense</b> Sustainable Development Technologies Canada   Sept 2016	\$1.6 M



**98%**  
of Vancouver's  
**ELECTRICITY  
IS RENEWABLE**

**100%**  
**RENEWABLE ENERGY GOAL**  
by 2050  
(City of Vancouver)



**47%**  
**OF B.C. FIRST NATIONS** are  
involved in renewable energy  
projects  
(First Nations BC Clean  
Energy Working Group, 2017)



**35%**  
**INCREASE IN B.C. CLEANTECH**  
companies, totalling 270+  
(KPMG, 2011 - 2017)



**\$84 K**  
**AVERAGE SALARY**  
in Cleantech (24%↑)  
(KPMG, 2011 - 2017)

**\$6 B**  
**EQUITY RAISED** by B.C.  
Cleantech Companies (25%↑)  
(KPMG, 2011 - 2017)

## Deep Dive: Negative Emissions Technologies

Nearly all of the Intergovernmental Panel on Climate Change (IPCC) models for curbing global warming to less than two degrees Celsius assume that we will remove 810 billion tonnes of carbon directly from the air.

However, solutions such as carbon sinks – forests or wood buildings used to store carbon – require a lot of land. Carbon capture and sequestration projects, which aim to capture industrial emissions at their source and store them deep underground, are few and far between too.

**Carbon Engineering** has a novel approach. Their game changing technology – backed by investors like Bill Gates and Murray Edwards – is based on the direct air capture of carbon (up to a million tonnes annually per facility). This is then used to create clean transportation fuels. The energy requirement is significant, but Carbon Engineering's pilot plant in BC uses renewable hydroelectric power.

Focusing on capture and sequestration, **Inventys** is developing an adsorbent process that is cheaper, non-toxic, and more efficient than amine solutions, with a plant capacity of 30 tonnes of carbon per day.

The **Carbon Capture and Conversion Institute** helps to accelerate commercially viable technologies to reduce carbon emissions. Along with partner **BC Research**, the institute assists clients to scale and pilot carbon capture solutions.

## Policy & Programs

### Federal

- **Build In Canada Innovation Program (BICP)**  
Public Works and Government Services Canada
- **Green Municipal Fund**  
Federation of Canadian Municipalities
- **Going Global Innovation**  
Trade Commissioner Service
- **Business Innovation Access Program**  
National Research Council Industrial Research Assistance Program (NRC-IRAP)
- **Accelerate Internships**  
MITACS Canada National Research Organization
- **Collaborative Research and Development (CRD) Grants**  
Natural Sciences and Engineering Research Council of Canada (NSERC)
- **SD Tech Fund**  
Sustainable Development Technologies Canada (SDTC)
- **Tax incentives from Scientific Research and Experimental Development (SR&ED) Program**  
Canada Revenue Agency (CRA)
- **Western Innovation (WINN) Initiative**  
Western Economic Diversification Canada
- **Cleantech loans** from Business Development Bank of Canada (BDC) and Export Development Canada (EDC)
- **Electric Vehicle and Alternative Fuel Infrastructure Deployment Initiative; Emerging Renewable Power Program; and Clean Energy for Rural and Remote Communities** Natural Resources Canada

### Provincial

- **Innovative Clean Energy (ICE) Fund**  
Province of British Columbia

## Accelerators & Incubators

Program	Mentorship	Competition	Financing
<b>BC Tech</b> Hypergrowth, Executive-in-Residence programs	✓		
<b>China Canada Cleantech Innovation Centre</b>	✓		✓
<b>Creative Destruction Lab</b>	✓		
<b>Colliers-TechStars</b> PropTech Accelerator	✓		✓
<b>Discovery Foundation</b> Tech Education Program	✓		
<b>Expa Labs</b>	✓		✓
<b>Foresight</b> Cleantech Accelerator Centre	✓		
<b>The Founder Institute</b>	✓		
<b>Futurpreneur</b> Growth Accelerator	✓		✓
<b>Highline BETA</b>	✓		✓
<b>Hollyhock Social Venture Institute</b>	✓		✓
<b>Innovate BC's</b> Venture Acceleration program, New Ventures Competition	✓	✓	
<b>Launch Academy</b>	✓		✓
<b>Ready to Rocket</b>		✓	
<b>Simon Fraser University</b> Radius Social Innovation Lab/Incubator, Venture Labs, Coast Capital Savings Prize	✓	✓	
<b>Spring Activator</b>	✓		
<b>University of British Columbia</b> Lean Launchpad Accelerator	✓		✓
<b>VANTEC Angel Network</b> and <b>National Angel Capital Organization</b> Academy	✓		✓
<b>Vancouver Economic Commission</b> Capital Mentorship and Investment Showcase	✓	✓	
<b>Wavefront</b>	✓		

## Further Reading



### Activate an Efficient & Sustainable Future

Schneider Electric  
2017



### Nanogrids, Microgrids, and Big Data: The Future of the Power Grid

IEEE Spectrum  
2017



### British Columbia Cleantech 2016 Status Report

KPMG  
2017

Check out [www.vancouvereconomic.com/cleantech](http://www.vancouvereconomic.com/cleantech) for more!

## WHO TO WATCH

### ★ Acuva | [www.acuvatech.com](http://www.acuvatech.com)

UV-LED system clears water of pathogens instantly for use in RVs, boats and homes

### 🏆 Awesense | [www.awesense.com](http://www.awesense.com)

AI smart grid analytics grid modernization platform for electric distribution utilities

### 🏆★ Axine Water Technologies | [www.axinewater.com](http://www.axinewater.com)

Treats toxic industrial wastewater from pharmaceuticals, electronics and chemical markets

### BQE Water | [www.bqewater.com](http://www.bqewater.com)

Treats mining wastewater and hydrometallurgical waste streams

### ★ Carbon Engineering | [www.carbonengineering.com](http://www.carbonengineering.com)

Captures carbon directly from the air which is then used in the synthesis of clean transportation fuels to displace crude oil



### Members of the Global Cleantech 100 2018 List

#### Clir Renewables | [www.clir.eco](http://www.clir.eco)

Software enables wind & solar renewable energy asset optimization

#### ★ Ecotagious | [www.ecotagious.com](http://www.ecotagious.com)

Software as a Service (SaaS) engagement platform that generates energy insights using smart meter and Internet of Things (IoT) data

#### 🏆 Enbala Power Networks | [www.enbala.com](http://www.enbala.com)

Real-time energy-balancing platform for controlling and dispatching multiple energy resources

#### ★ General Fusion | [www.generalfusion.com](http://www.generalfusion.com)

World leader in commercial fusion energy, developing the world's first commercially viable fusion power plant to deliver clean, safe, abundant and on-demand energy

#### ★ Inventys | [www.inventysinc.com](http://www.inventysinc.com)

Post-combustion carbon capture uses adsorbent structures that are cheaper, non-toxic and more efficient than amine solutions



### Members of B.C. Cleantech CEO's Alliance

#### Ionomr | [www.ionomr.com](http://www.ionomr.com)

Durable ion-exchange membrane that will not deteriorate over time due to complete alkaline stability and strength

#### 🏆★ MineSense Technologies | [www.minesense.com](http://www.minesense.com)

Industrial IoT provides real-time, sensor-based ore data and sorting solutions for large-scale mines

#### Ostara Nutrient Recovery Technologies | [www.ostara.com](http://www.ostara.com)

Nutrient management solutions to recover phosphorus and nitrogen from wastewater, producing an eco-friendly fertilizer

#### Portable Electric | [www.portable-electric.com](http://www.portable-electric.com)

Clean, mobile power stations using plug-and-play modular lithium ion battery packs. For festivals, film sets, job sites, emergencies and more

#### 🏆★ Saltworks Technologies | [www.saltworkstech.com](http://www.saltworkstech.com)

Desalination systems that produce freshwater from highly contaminated industrial wastewater. Projects include a plant for NASA with intended future use on the International Space Station

#### 🏆★ Semios Technologies | [www.semios.com](http://www.semios.com)

Pest management system integrates pheromone dispensers with camera-enabled pest traps, all connected wirelessly across fields

#### Tantalus Systems | [www.tantalus.com](http://www.tantalus.com)

Smart grid communications and solutions for advanced metering, demand response, distributed automation and grid optimization

#### 🏆★ Terramera | [www.terramera.com](http://www.terramera.com)

Safe, effective and high-performance plant-based alternatives to conventional chemical pesticides and fertilizers for pest control and consumer products

Join us in the world's fastest-growing low carbon economy. Here is a selection of VEC's green economy programs:

**Capital Mentorship Program** | [www.vancouvereconomic.com/cleantech-capital](http://www.vancouvereconomic.com/cleantech-capital)

The Capital Mentorship Program delivers entrepreneur training, investor education and collaboration to increase investment activity in Vancouver's startup ecosystem. The first series of this program focused on raising seed and series A capital rounds.

“I was impressed with the quality of the founders I met and the depth of the technology being developed in Vancouver. What I saw helps reinforce our firm's thesis that the next wave of great software startups will come from the Cascadia region.”

**Frank Chang**, Co-Founder & Managing Partner Flying Fish Partners

**Green & Digital Demonstration Program (GDDP)** | [www.vancouvereconomic.com/gddp](http://www.vancouvereconomic.com/gddp)

GDDP participants gain access to City of Vancouver assets for product testing and showcase opportunities. The GDDP enables successful applicants to refine solutions, attract investment and increase marketplace exposure while leveraging the City's \$31.5B green and innovative brand.

“GDDP 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 obstacles that would otherwise curtail innovation.”

**Jason Harmer**, CEO Get Workers

**Thriving Vancouver** | [www.thrivingvancouver.com](http://www.thrivingvancouver.com)

Thriving Vancouver connects the Vancouver business community to curated resources such as solutions providers, workshops, events and vendors, with the aim of empowering businesses to introduce sustainable options into their daily operations.

“VEC is a leading voice on how to grow the green economy here and abroad. They take innovation seriously and set a compelling tone for our future, helping businesses like ours grow with impact.”

**Elizabeth Sheehan**, President ClimateSmart Business

**Vancouver Startup City** | [www.vancouvereconomic.com/startupcity2017](http://www.vancouvereconomic.com/startupcity2017)

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.

“VEC provided Thomson Power counsel, encouragement and a sense of belief that Canadian technology companies belong in Canada and the ecosystem being built in Vancouver can support all of us bringing game changing innovative products to market. VEC has provided us with a voice, locally, provincially, federally and internationally.”

**Ian McAvoy**, CEO Thomson Power

**End Notes**

1 | B.C. Building Performance Study, Light House Sustainable Building Centre and B.C. Building Owners and Manager Association February 2014

2 | BC Clean Energy Projects: Investment, Job Creation and Community Contributions, Clean Energy Association of BC, April 2016





**VANCOUVER**  
ECONOMIC COMMISSION

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