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 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 eight years have been green buildings, cleantech and materials management.

vancouvereconomic.com | @VanEconomic | 1.866.632.9668

WHAT’S INSIDE

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VEC LEAD AND REPORT AUTHOR

Juvarya Veltkamp, Manager, Green Economy Initiatives, of the Vancouver Economic Commission with support from the Delphi Group and the Mustel Group.

Published June 2018
In Vancouver, a vibrant green economy employs one in fifteen Vancouverites.

Vancouver’s reputation as a clean and green leader drives a brand valued at $31.5 B

Three ingredients: policy, innovation, demand

From the founding of Greenpeace to the concept of the ecological footprint and the advent of the 100-mile diet, Vancouver has long been a source for disruptive innovation in response to climate change. Over the decades, Vancouver has pioneered policies that have made the city stand apart on issues of environment, social cohesion and economic inclusion. Vancouverites chose livability over car-centric urban planning approaches in the 1960s, and today, it is one of the only North American centres without an inner-city freeway. The city’s building code is the greenest of any jurisdiction in the world. And recent citywide plans put Vancouver on a path to be 100 percent powered by renewable energy, produce zero waste, make the majority of trips by foot, bike or transit and be a place where everyone has a home.

Vancouver’s most enviable innovations have found a supportive policy environment, but they have also been championed by progressive thinkers with some of the world’s most entrepreneurial minds. Recognized as one of the world’s top startup ecosystems, Vancouver is home to numerous game-changing technologies including General Fusion (world leader in commercial fusion energy) and Carbon Engineering (carbon capture and synthesis of hydrogen and fuel). Vancouverites up from one in 20 just four years ago, while 30 percent of businesses deliver products or services that help to restore or preserve the environment. Vancouver’s reputation as a clean and green leader drives a brand valued at $31.5 billion, and the economy grew faster than any other city in Canada from 2010 to 2017. All this while carbon emissions declined by 11 percent, resulting in the carbon intensity of our GDP (tonnes GHG per dollar of GDP) decreasing by 40 percent.

In Vancouver, a vibrant green economy employs one in fifteen Vancouverites.

The Green Economy presents a big opportunity

The transformation goes far beyond policy. Cities, global companies, financial institutions and investors already recognize that climate change is not only an environmental problem but a business one. Addressing climate change means avoiding risks but also means new opportunities for growth. Larry Fink, the largest investor in the world, directly asked S&P 500 companies to incorporate environmental, social and governance strategies into their investment process if they want his support. The Financial Stability Board’s climate change task force, which includes Michael Bloomberg and Mark Carney, recommended that all financial institutions assess and disclose climate risk; the market value of companies agreeing reached $7.1 trillion.

All of this looks promising for Canada’s cleantech sector which ranks fourth in the world. Two Canadian cleantech clusters that share a strong presence in Vancouver are driving this global ranking. The Canadian green buildings sector created $25.45 billion in GDP and 297,890 jobs in 2014.1 and the hydrogen and fuel cell sector generated $220 million in revenue and 1,795 jobs in 2015.2 In addition, the Province of British Columbia’s (B.C.) carbon tax and a requirement for all public operations to be carbon neutral have led to major investments in building upgrades and the creation of a robust carbon offsets market.

Canada’s cleantech sector ranks fourth in the world.

There is a lot to celebrate in 2018

Climate change policy has seen tremendous successes – as well as serious adversity in the past year.

When the U.S. departed the U.N. Paris Agreement, states, cities and corporations decided to double down on science-based targets to cut back carbon emissions. In the face of increased intensity of destructive hurricanes and wildfires, 1,200 climate laws have been adopted across the globe compared to just 60 two decades ago.3 China represented the largest automobile market in 2017, buying more than 24 million vehicles, but they have also become the largest producer of plug-in electric vehicles in the world and have plans to ban gas powered cars altogether. And despite waning faith in governments’ ability to bring about needed carbon reductions, more than 40 national and 25 regional governments have put a price on carbon, representing about 15 percent of global greenhouse gas emissions.4

Vancouver Community-wide Plans & Strategies

Supportive policy driving innovation

Greenest City Action Plan 2020
Through a set of measurable and attainable targets, Vancouver is on the path to becoming the greenest city in the world.

Zero Waste 2040
The plan includes forward-thinking policies and actions to help Vancouver become a zero waste community.

Transportation 2040
Guides transportation and land use decisions, and public investments for the years ahead.

Renewable Energy Strategy 2050
Delineates 100% of the energy used in Vancouver from renewable sources and reduce greenhouse gas emissions before 2050.

Additional Community-wide Plans

Healthy City
Digital City
Resilient City
There is a long road ahead

Although we are celebrating 2018, there is still a lot more work to be done.

With more than a million people expected to call Vancouver home in the next two decades, the region needs a growth strategy that will provide good jobs, efficient urban infrastructure and a resilient economy. In particular, we need to develop responsive, smart and distributed infrastructure; implement aggressive social and environmental policies; and make wise investments in capital projects, people, and places that will improve the diversity, equity, and sustainability of our economy over the long run.

Energy infrastructure

B.C. recently greenlit the Site C Dam, a renewable energy mega-project, expanding the province’s reliance on large-scale hydro projects to power a growing population. This project will have a heavy impact on ecosystems and will suffer from large power losses associated with transmission over long distances.

Looking into this centralized system could preclude more efficient and resilient solutions such as distributed and district-scale generation that provide flexible, modular and more responsive systems, located closer to areas of high energy demand.

The government of Canada has bought Kinder Morgan’s Trans Mountain bitumen pipeline for $4.5 billion to ensure that 890,000 barrels of Alberta bitumen per day can be pumped to Canada’s west coast and ultimately shipped to global markets. In light of the rapid global shift away from fossil fuels and toward renewable resources and the circular economy, this pipeline would create just 50 permanent jobs and has the potential to quickly become a ‘stranded asset’—a risky investment considering even the World Bank has declared it a risky economic activity—than more than the Province of Alberta depends on fossil fuels.

Energy infrastructure is critical for a smart energy or transportation system that provide flexible, modular and efficient and resilient solutions such as distributed and district-scale generation that provide flexible, modular and more responsive systems, located closer to areas of high energy demand. In the meantime, critical pieces of infrastructure and policy required for a smart energy or transportation system are still missing in B.C. Unlike most jurisdictions in the world, B.C. has been removing rather than installing smart meters after a roll out program plagued first by health and privacy concerns, then by faulty or substandard meters. Smart meters are one of the early deployment of locally developed green technology.

Come join us

We know that solving these challenges is possible with collaboration. At the Vancouver Economic Commission, we develop relationships with investors to help attract the right kind of patent capital; we help local cleantech companies access global markets to realize their full export potential; and we have been leveraging our own city assets and infrastructure to stimulate the early deployment of locally developed green technology.

In this report we share with you data about our green economy while highlighting the movers and shakers that are bringing about transformation. We welcome you to learn about the Vancouver advantage, and what makes us a unique ecosystem for green business and a green economy. We thank those of you already playing a role in Vancouver’s acceleration towards a greener, resilient future and we welcome the rest of you to come work with us in the near future.

Real estate affordability

B.C.’s economy is more dependent on real estate and construction than any other province in the country. Real estate and construction make up nearly 35 percent of B.C.’s GDP, with a major share of those losses associated with transmission over long distances.

Looking into this centralized system could preclude more efficient and resilient solutions such as distributed and district-scale generation that provide flexible, modular and more responsive systems, located closer to areas of high energy demand.

The last few years have seen huge leaps in clean transportation. Vancouver is hailed as ‘ride sharing capital of the world’ and the city operates the largest municipal electric vehicle fleet in Canada. Connected, smart cars have the ability to reduce energy consumption through efficient driving and improved performance, and projections suggest that full autonomous vehicles will be on the roads by 2025. Yet B.C. has not allowed autonomous vehicles to be tested on the roads, and ride-hailing services like Uber and Lyft are not yet available locally. While the legal and social implications of these technologies are wide-ranging and complex, we cannot afford to ignore them. Resources need to be dedicated to developing effective, thoughtful policies that both enable innovation and protect the safety and security of citizens.

Transportation

BY THE NUMBERS...

Vancouver’s Green Economy

<table>
<thead>
<tr>
<th>Category</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Green Ecosystem</td>
<td>Page 5</td>
</tr>
<tr>
<td>25,000</td>
<td>— number of green jobs in Vancouver in 2016</td>
</tr>
<tr>
<td>30%</td>
<td>— percentage of Vancouver businesses delivering products/services that restore/preserve the environment</td>
</tr>
<tr>
<td>30%</td>
<td>— reduction in carbon intensity of GDP in Vancouver since 2010</td>
</tr>
<tr>
<td>Green Buildings</td>
<td>Page 9</td>
</tr>
<tr>
<td>$23.45 B</td>
<td>— amount of GDP from Canada’s green building sector in 2014</td>
</tr>
<tr>
<td>43%</td>
<td>— reduction in carbon intensity of Vancouver buildings since 2010</td>
</tr>
<tr>
<td>Cleantech</td>
<td>Page 13</td>
</tr>
<tr>
<td>4</td>
<td>— rank for placement of Canada’s cleantech sector in the world</td>
</tr>
<tr>
<td>$1.3 B</td>
<td>— revenues for Canada’s renewable energy technology sector in 2015</td>
</tr>
<tr>
<td>Green Mobility</td>
<td>Page 17</td>
</tr>
<tr>
<td>33%</td>
<td>— percentage of B.C. residents wanting their next car to be an electric vehicle</td>
</tr>
<tr>
<td>1</td>
<td>— rank for size of Vancouver’s municipal electric vehicle fleet in Canada</td>
</tr>
<tr>
<td>$20,000</td>
<td>— cost of Electra Meccanica’s SOLO, a single-seat Battery Electric Vehicle</td>
</tr>
<tr>
<td>Materials Management</td>
<td>Page 21</td>
</tr>
<tr>
<td>10%</td>
<td>— percentage of Vancouver businesses diverting waste streams beyond those regulated</td>
</tr>
<tr>
<td>33%</td>
<td>— percentage of Vancouver businesses with a goal to be zero waste</td>
</tr>
<tr>
<td>Local Food</td>
<td>Page 25</td>
</tr>
<tr>
<td>8.5%</td>
<td>— percentage of B.C. residents that are vegetarian</td>
</tr>
<tr>
<td>4%</td>
<td>— percentage of B.C. residents that are vegan</td>
</tr>
<tr>
<td>25</td>
<td>— number of breweries in Vancouver</td>
</tr>
<tr>
<td>13</td>
<td>— number of urban farms in Vancouver</td>
</tr>
</tbody>
</table>
WHY GREEN COMPANIES CHOOSE VANCOUVER

Entrepreneurial spirit, game changing innovation, and world leading policies: all have built Vancouver’s global reputation for clean and green leadership

Thirty percent of Vancouver businesses deliver products or services that help to restore or preserve the environment, and one in fifteen Vancouverites works in the green economy. The city has a goal to be 100 percent renewable energy powered before 2050, and the province became a carbon neutral government in 2010. Combined with targeted investments and a strong investment climate, this foundation has helped build Vancouver’s $31.5 billion global brand for clean and green leadership while increasing GDP 26 percent since 2007, and reducing carbon emissions by 11 percent.

Green jobs have grown 35 percent since 2010, nearly six percent on average per year. The fastest-growing sectors have consistently been local food (35 percent between 2010 and 2016, or 5.8 percent on average per year); green buildings (53 percent since 2010 or 8.8 percent average per year); and materials management (111 percent since 2010 or 18.5 percent average per year).

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.

Research Centres
1. BCIT: Centre for Energy System Applications; School of Construction and the Environment; Green Roof Research Facility; and Building Science Centre of Excellence
2. SFU Burnaby: Centre for Sustainable Community Development; and School of Resource and Environmental Management
3. SFU Surrey: Sustainable Energy Engineering Program
4. UBC: Centre for Interactive Research on Sustainability; Institute for Resources, Environment and Sustainability; and Clean Energy Research Centre
5. UVic: Institute for Integrated Energy Systems; and Pacific Regional Institute for Marine Energy Discovery
6. Kwantlen Polytechnic University: Institute for Sustainable Food Systems
7. UNBC: Wood Innovation and Design Centre
8. CityStudio Vancouver
9. Capilano University: School of Global Stewardship

Key Organizations
1. Vancouver Economic Commission (VEC)
2. City of Vancouver (CoV)
3. Innovate BC (formerly B.C. Innovation Council)
4. BC Technology Industry Association (BC Tech)
5. Discovery Foundation Tech Education Program
6. Foresight Cleantech Accelerator Centre
7. Launch Academy
8. SFU Radius Social Innovation Lab and Venture Incubator; Venture Labs; and Coast Capital Savings Venture Prize
9. Spring Activator
10. UBC: Lean Launchpad Accelerator
11. VANTEC Angel Network and National Angel Capital Organization Academy

Legend
- Vancouver Economic Commission (VEC)
- City of Vancouver (CoV)
- Innovate BC (formerly B.C. Innovation Council)
- BC Technology Industry Association (BC Tech)
- Discovery Foundation Tech Education Program
- Foresight Cleantech Accelerator Centre
- Launch Academy
- SFU Radius Social Innovation Lab and Venture Incubator; Venture Labs; and Coast Capital Savings Venture Prize
- Spring Activator
- UBC: Lean Launchpad Accelerator
- VANTEC Angel Network and National Angel Capital Organization Academy

Vancouver’s Green Ecosystem

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

2nd 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

Vancouver’s Brand Value: $31.5 B
Built on Green Leadership
Brand Finance, 2015

3rd Greenest City in the World
Economist Intelligence Unit/Siemens

4th Most Innovative Cleantech Sector
Global Cleantech Innovation index, 2017

Green & Local Food Jobs in Vancouver
Vancouver Economic Commission, 2016

Number of Jobs in 2010 Number of Jobs in 2016
\[
\begin{array}{lcc}
\text{Local Food} & 7,604 & 7,689 \\
\text{Green Buildings} & 7,689 & 2,544 \\
\text{Cleantech} & 2,544 & 2,780 \\
\text{Green Mobility} & 1,944 & 1,944 \\
\text{Sustainability Services} & 1,944 & 664 \\
\text{Environmental Engineering} & 664 & \\
\text{Materials Management} & 664 & \\
\end{array}
\]


WHAT IS A GREEN JOB?

**GREEN JOB (noun)** A job with a focus on activities that restore or preserve environmental quality; reduce energy, materials and water consumption; decarbonize the economy; and minimize or altogether avoid the generation of all forms of waste and pollution.

(United Nations)

For many, a green job may be synonymous with highly specialized science and engineering jobs and the invention of new technologies that will stop climate change and pollution. While these types of occupations are certainly crucial to creating a green economy, green jobs are much more varied than that. Green jobs are as diverse as Vancouver’s economy itself: people working on designing, building or even deconstructing green buildings; clean technology researchers and sales professionals; recyclers and processors for all manner of valuable materials; and educators and policy makers working in the field of sustainability.

Even our banks, mining companies, accounting firms and hair salons employ people that work to make them more innovative and environmentally responsible.

**Industry Characteristics vs. Occupational Characteristics**

VEC measures Vancouver’s green jobs numbers by evaluating the size and health of seven green economic sectors: green buildings; cleantech; green mobility; materials management; sustainability services; environmental engineering; and local food.

This means the nature of the business drives VEC’s green jobs figures, rather than the nature of the occupation. For example, green building jobs include specialized occupations such as energy modellers and installers of renewable energy technologies. However, jobs included in the green building sector also include the activities of builders, tradespeople, drafters and architects when they are working on a high-performance or green construction project.

What these roles have in common is that they work towards preserving environmental quality; reducing resource use, decarbonizing the economy, and help to eliminate waste and pollution.

**Green jobs are as diverse as Vancouver’s economy itself**

**New Jobs vs. Transitional Jobs**

Green jobs encompass both new and transitional jobs. Some jobs are new, created when a sector grows because it is selling more green goods and services. Other jobs are existing ones that have transitioned to greener practices. With more and more industries greening their operations (eco-fashion, sustainable tourism, sustainable film production), the green economy becomes embedded in more sectors.

An average of 40 percent of the growth in green jobs each year can be attributed to new jobs in the green economy, while 60 percent of the growth stems from transitional job growth.

**How to find a Green Job**

With the broad nature of occupations available in green sectors, there is a green job for virtually every type of background. There are specialized green jobs boards (some are listed to the right), as well as specific post-secondary education programs (listed, by sector, in other sections of this report). If in doubt, make your current job a green job by becoming a green leader at your workplace.

- **City Studio Vancouver**
  - www.citystudiovancouver.com
  - A collaboration where city staff, students, faculty and community work together to design experimental projects that make Vancouver more sustainable
- **Eco Canada Wage Subsidy**
  - www.eco.ca/wage-subsidy-program
  - Employment program for science, technology, engineering, mathematics (STEM) or natural resources environmental jobs
- **MITACS**
  - www.mitacs.ca
  - A variety of research and training programs
- **UBC Greenest City Scholars**
  - www.sustain.ubc.ca/get-involved/students/greenest-city-scholars
  - A collaboration where city staff and UBC graduate students work on sustainability projects
- **United Nations Canada Green Corps**
  - www.unac.org/unac-projects/canada-green-corps
  - Youth employment program focused on climate action

**Low-barrier Jobs**

Many social enterprises focus on green industries like materials sorting, buildings deconstruction or weatherization, and create jobs for those with barriers to employment. The Binners’ Project, for example, creates low-barrier jobs and generated more than 7,700 hours in economic activity and $109,200 in earned income for 340+ binners (2017).

**Green social enterprises providing low-barrier green jobs:**

- **United We Can** bottle and can recycling, alley clean-up
- **EMBERS** green renovations
- **Common Thread** converts old banners into shopping bags and other products

**What is my job a GREEN JOB?**

I produce a green product or service
My company produces a green product or service (but I’m the accountant)
My company produces some green products or services (not all, but 40% or more of product or service must be green)
I incorporate greener practices in my job or decision making

**PARially**

**Green & Local Food Job Growth in Vancouver: New vs. Transitional**

Vancouver Economic Commission, 2016

40% New Jobs
60% Transitional Jobs

**JOB BOARDS**

- **ACRE Sustainability Recruitment**
  - www.acre.com
- **Allen + York Sustainability Recruitment**
  - www.allen-york.com
- **B.C. Environmental Industry Association**
  - www.bcea.com (click Opportunities)
- **B.C. Technology Jobs**
  - www.bctechnology.com/jobs
- **Canadian Environmental Network**
  - wwwjobs.eken.ca
- **Charity Village**
  - www.charityvillage.com
- **Connecting Environmental Professionals**
  - www.bpcevancouver.org
- **Coro Strandberg’s job postings**
  - www.corostrandberg.com
- **Eco-Canada**
  - www.eco.ca
- **GoodWork**
  - www.goodwork.ca
- **GreenBiz Jobs**
  - www.jobs.greenbiz.com
- **The Green Recruitment Company**
  - www.greenrecruitmentcompany.com
- **The Idealist**
  - www.idealist.org
- **Net Impact**
  - www.netimpact.org/jobs
- **Renewable Energy Jobs**
  - www.renewableenergyjobs.com
- **U.S. Green Building Council Career Centre**
  - www.careercenter.usgbc.org/home/index.cfm
- **Work Cabin**
  - www.workcabin.ca
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 95 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.

Fibres 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 responsive 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 retrofit with Monoglass spray-on insulation products. Schöck provides structural thermal break solutions for balconies, canopies, slab edges and more.

**Heat Pumps & Heat Recovery**

C apturing 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. TZO A uses artificial intelligence to automate heating, ventilation, and air conditioning services (HVAC). Core Energy Recovery Solutions carries products with Passive House certification.

At the neighbourhood scale, Vancouver’s Neighbourhood Energy Utility (NEU) has been capturing energy from sewage since 2010 and delivering heat and hot water to 5.2 million square feet of residential, 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$850 million 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 Prahran product is designed as a heat recovery solution for small buildings.

### Prefabracation & 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 stories.

**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.

![VEC Program Spotlight](Image)

**Vancouver Job Growth: Green Buildings**

- **7,689** TOTAL GREEN JOBS IN 2016
- **53%** INCREASE SINCE 2010

- **$44 M** ESTIMATED ANNUAL ENERGY COST SAVINGS for citizens

- **2,980,547** SQUARE FEET of LEED® CERTIFIED PROJECTS in B.C.

- **5,200,000** SQUARE FEET OF RESIDENTIAL, COMMERCIAL & INSTITUTIONAL FLOOR SPACE receives heat & hot water from Vancouver’s Neighbourhood Energy Utility

- **By 2030** all new buildings must be ZERO EMISSIONS

- **50%** DECREASE IN CARBON INTENSITY of new buildings in Vancouver (City of Vancouver, 2010-2016)
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.

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®.

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 national building code by 2030.

The average TEUI for office buildings in B.C. is 335 kWh/m²/year and for multi-unit residential buildings (MURBs) is 215 kWh/m²/year. 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.

Technologies for Zero Emissions Buildings

- Triple-glazed/dynamic/tinted windows
- High 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

Further Reading

- Monoglass Incorporated: www.monoglass.com
  Spray-applied fibreglass insulation with high R-values and thermal performance

- Nano-Lit: www.nanolit.com
  Quantum dot technology-enabled, tunable lighting products that reduce energy use, adjust in real-time, and improve well-being

- QUBE: www.qubebuildings.com
  Digital technology to transform construction decision making and stackable interlocking high-rise building solutions

- Schckb: www.schchb-na.com
  Structural thermal break solutions for new balconies, canopies, slab edges, concrete pavers and steel beams

- Seagate Structures: www.seagatestructures.ca
  Mass timber construction specialists

- SHARC: www.sharcenergy.com
  Sewage heat recovery from wastewater for heating, cooling, and hot water for buildings and neighbourhoods

- Stack Modular: www.stackmodule.com
  Structural steel modular buildings with a 25-storey high-rise prototype

- Stambol Studios: www.stambol.com
  Immersive experiences through virtual and augmented reality for architecture and real estate

- Structurium: www.structurium.com
  Wood science experts producing the finest cross laminated and mass timber products

- Switch Materials: www.switchmaterials.com
  Switchable photometric-electrochromic technology for automotive glass, architectural glass and eyewear

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

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

WHO TO WATCH

- Cascadia Windows and Doors: 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
  High performance, hygienic air-to-air heat exchangers suitable for healthcare and Passive House HVAC systems

- GeoSim: www.geosimcities.com
  Visualizing cities in 3D with high spatial precision, unmatched visual fidelity, and interactive navigation

- LNO Studios: www.lngstudios.com
  Immersive experiences leveraging 3D renderings, floorplans and animations, VR/AR and drone technology

- Metric Modular: 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
  Spray-applied fibreglass insulation with high R-values and thermal performance

- Nano-Lit: www.nanolit.com
  Quantum dot technology-enabled, tunable lighting products that reduce energy use, adjust in real-time, and improve well-being

- QUBE: www.qubebuildings.com
  Digital technology to transform construction decision making and stackable interlocking high-rise building solutions

- Schckb: www.schchb-na.com
  Structural thermal break solutions for new balconies, canopies, slab edges, concrete pavers and steel beams

- Seagate Structures: www.seagatestructures.ca
  Mass timber construction specialists

- SHARC: www.sharcenergy.com
  Sewage heat recovery from wastewater for heating, cooling, and hot water for buildings and neighbourhoods

- Stack Modular: www.stackmodule.com
  Structural steel modular buildings with a 25-storey high-rise prototype

- Stambol Studios: www.stambol.com
  Immersive experiences through virtual and augmented reality for architecture and real estate

- Structurium: www.structurium.com
  Wood science experts producing the finest cross laminated and mass timber products

- Switch Materials: www.switchmaterials.com
  Switchable photometric-electrochromic technology for automotive glass, architectural glass and eyewear

- SZOA: www.szoa.com
  Artificial intelligence and sensors to automate HVAC maintenance and air quality analysis

- uForis VR: 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
  Privacy glass and smart glass for windows and televisions

- View Dynamic Glass: 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.

Vancouver is home to many game-changing cleantech 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 $33.5 billion brand valuation.

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

Vancouver’s attractive corporate tax regime, targeted incentives and positive policy context (Greenest City Action Plan, Vancouver’s cleantech sector emerged in the late 1980s through a combination of entrepreneurial vision and early-stage government funding. Early innovations spawned numerous ventures and created a generation of progressive-thinking engineers and technicians focused on addressing age-old industries.

Trends
Wastewater
Taking 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. MXL 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 Ionotor offers highly durable ion-exchange membranes.

BOE 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

2,544
TOTAL GREEN JOBS IN 2016
7% INCREASE
SINCE 2010

VEC Program Spotlight
Green and Digital Demonstration Program (GDDP) has allowed numerous cleantech companies to pilot their innovative or sustainable solutions on city-owned assets. Soon, this program will be expanded to the regional level.

Municipal demonstrations and early adoption
Reference sales and demonstrations – especially large institutions that have global green brands – are indispensable assets to help cleantech startups build credibility and access new markets. The Green and Digital Demonstration Program (GDDP) has provided a dedicated pathway for cleantech companies to do just that, by enabling demonstrations on assets and infrastructure owned by the City of Vancouver.

For example, GDDP participant Portable Electric brought their emissions-free, mobile power generation station to Vancouver’s Canada 150 celebrations to replace polluting diesel generators. 21st Century Fox also commissioned the VOLTSlick power station for the filming of FX’s Legion. At the federal level, the Build In Canada Innovation Program (BCIP) also offers an opportunity – along with up to $500,000 – to lend a major reference sale while testing an innovation in real-life settings.

Changing face of cleantech investment
Pitchbook data suggests that venture investments may have peaked. Yet strategic investors are filling the gap, with large corporates delivering more patent capital to cleantech companies. Teck Resources invested in desalination technology from Saltworks to remove contaminants from tailings, reduce runoff and eliminate wastewater at their mining sites. Teck also partnered with Zincmx Energy Solutions, the developer of a zinc-air fuel cell for energy storage at remote sites. IKEA’s GreenTech Investments became a shareholder in Terramera Inc., which delivers plant-based pesticides for use in agriculture and in targeting bed bugs or dust mites in consumer products.

Distributed, decarbonized and digitized grid
Independent producers already provide 14 percent of BC Hydro’s energy supply. At the building scale, solar PVs and heat pumps mean energy consumers are now “prosumers,” contributing to a multi-directional energy system. This multiplication of Distributed Energy Resources (DERs) requires new solutions to manage the complexity of sources, distribution lines and end users.

PowerTech Labs helps utilities adapt to this complexity. Ecotagious helps homeowners monitor energy use of major appliances; and Cirr offers software to optimize renewable assets. Legend Power Systems addresses the issue of “overvoltage,” matching voltage supplied with demand so that equipment can be operated at a controlled voltage at lower cost.

Tantalus Systems offers Advanced Metering Infrastructure (AMI) sensors and communications networks that allow two-way communications between a utility and its customers. Awesense’s software helps clients affordably and remotely monitor anomalies and losses on their grid – even with no AMI in place. CoreInix Communications uses broadband over power lines technology to transmit data about the grid over the power wiring itself, eliminating the need for additional communications infrastructure such as radio towers. Enbala Power Networks leverages machine learning to network together tens or even thousands of individual DERs to create ‘virtual power plants’, and then optimize the system for cost as well as carbon.

Doing away with power lines and sensors altogether, ELIX Wireless has a magnetic coupling technology that allows wireless charging for automobiles. It produces no heat, works in the rain, and can even push aside debris.
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 81.0 billion tonnes of carbon directly from the air\(^2\).

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 B.C. 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
- 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
- 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
- Clean Energy for Rural and Remote Communities
- Natural Resources Canada

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

### Accelerators & Incubators

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

### 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

### WHO TO WATCH

- **Acuva** | www.acuvatech.com
  - UV-LED system cleans water of pathogens instantly for use in RVs, boats and homes

- **Aiwassense** | www.aiwassense.com
  - AI smart grid analytics grid modernization platform for electric distribution utilities

- **Axine Water Technologies** | www.axinewater.com
  - Treats toxic industrial wastewater from pharmaceuticals, electronics and chemical markets

- **BQE Water** | www.bqewater.com
  - Treats mining wastewater and hydrometallurgical waste streams

- **Carbon Engineering** | www.carbonengineering.com
  - Captures carbon directly from the air which is then used in the synthesis of clean transportation fuels to displace crude oil

- **Clir Renewables** | www.clir.eco
  - Software enables wind & solar renewable energy asset optimization

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

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

- **Ionionr** | www.ionionr.com
  - Durable ion-exchange membrane that will not deteriorate over time due to complete alkaline stability and strength

- **MineSense Technologies** | www.minesense.com
  - Industrial IoT provides real-time, sensor-based data and sorting solutions for large-scale mines

- **Ostara Nutrient Recovery Technologies** | www.ostara.com
  - Nutrient management solutions to recover phosphorus and nitrogen from wastewater, producing an eco-friendly fertilizer

- **Portable Electric** | 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
  - 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.semiocs.com
  - Pest management system integrates pheromone dispensers with camera-enabled pest traps, all connected wirelessly across fields

- **Tantalus Systems** | www.tantalus.com
  - Smart grid communications and solutions for advanced metering, demand response, distributed automation and grid optimization

- **Terramera** | www.terramera.com
  - Safe, effective and high-performance plant-based alternatives to conventional chemical pesticides and fertilizers for pest control and consumer products
GREEN MOBILITY
The birthplace of fuel cell innovation, Vancouver cultivates cutting edge green transportation solutions for high livability

Green mobility is a multifaceted sector encompassing solutions from transportation planning and public transit to vehicle sharing and internet-enabled route-planning platforms; it includes the design, manufacture and maintenance of clean energy vehicles, and the entire ecosystem of connected car technology.

Vancouver chose liveability over car-centric urban planning approaches in the 1960s, instead developing a top-ranked transit system that includes the longest, fully automated light metro in the world. Today, Vancouver is one of the only North American centres without an inner-city freeway, and half of all trips originating in the city are made by walking, cycling or transit. The city’s biking network spans 311 km, and Vancouver operates the largest municipal electric vehicle fleet in Canada.

Smart, connected and clean vehicles are seeing increased demand, and are supported by policy and incentives such as the Clean Energy Vehicle incentive program and local bylaws that require new buildings to provide charging infrastructure.

Canadian geophysicist Geoffrey Ballard’s early breakthroughs in the 1980s led to global recognition of B.C. as the “birthplace for fuel cell innovation,” and Canadian fuel cell companies continue to play a leading role in today’s global industry.

Trends
Smart logistics and planning
The transportation network now extends beyond physical roads and transit lines and into a virtual world built on sensors, data and analytics. Routific offers a route optimization software for delivery vehicles while Freightera finds efficient shipping options and includes a Green Freight Marketplace featuring carriers with emissions reduction programs. Cowlines provides individuals with the most efficient options for getting from point A to point B and thanks to multimodal routing helps reduce your carbon footprint, while UrbanLogix analyzes municipal data to provide insights that can reduce traffic collisions or identify other links between traffic patterns and social phenomena.

Clean aviation & marine travel
Canada became the first country in the world in 2005 to develop a voluntary agreement to address carbon emissions from aviation, and then to conduct the world’s first civil jet flight powered by 100 percent biofuel in 2012. A consortium led by Vancouver-based NORAM Engineering and the University of British Columbia is working to make aviation biofuel from forest residue, which could meet up to 10 percent of B.C.’s annual jet fuel demand.

Meanwhile, maritime electric propulsion is already here. Corvus Energy supplied its lithium-ion solution to an all-electric ferry owned by Norwegian ferry operator Fjord and Plan B Energy Storage, started by Corvus’ founders, also provides solutions for marine, grid and heavy industry.

Pathways to electric vehicles
By 2025, every sixth car sold will be electric.12 Along with the goal of being 100 percent renewable by 2050, Vancouver is signatory to a “fossil fuel free streets” declaration that commits major areas of the city to be zero emissions by 2030.

In passenger and light duty vehicles, the market already delivers a range of plug-in hybrid electric vehicles (PHEVs) and battery electric vehicles (BEVs). Alongside global brands, boutique manufacturers offer niche vehicles, like Electra Meccanica’s Solo, a single-seat BEV available for under $20,000 targeted at commuters.

The market for lithium-ion batteries for vehicles is expected to reach $30 billion in 202413, and demand for batteries means increased appetite for materials and components. Global Lithium Graphite’s graphite mine is located close to Tesla’s Gigafactory, hoping to supply graphite for the factory’s planned $100 billion lithium-ion pack a year. First Cobalt, Giga Metals and MDX Minerals aim to responsibly mine nickel and cobalt from clean sources in Canada. While Nano One Materials creates nanomaterial cathode materials to improve battery life span and energy density, Vanadium Corp is betting on vanadium redox flow batteries, and they are recovering vanadium from waste. Retrieve Technologies recycles batteries from PHEVs and BEVs, while American Manganese has a recycling process that captures 100 percent of cathode materials.

The third pathway to EVs is fuel cell electric vehicles (FCEVs) — a born-in-B.C. innovation with strong foothold in heavy-duty applications, like buses, trains and rail. Ballard modules are powering the world’s first fuel-cell-powered electric tram in China, as well as over 600 buses and trucks around the world. Loop Energy builds fuel cell “range extenders” for trucks and buses at a 50 percent lower cost than traditional fuel cells. The Mercedes-Benz Fuel Cells manufacturing facility is the first automated automotive facility dedicated to fuel stacks and sub-assemblies as well as the advancement of fuel stack production technology.

Hydrogen for FCEVs can be produced using a number of different technologies. It is most economically extracted from natural gas, but while switching from combustion of fossil fuel to hydrogen offers significant carbon savings, deriving hydrogen from a fossil fuel is not ideal. Processes such as electrolysis, on the other hand, allow for very low carbon intensity fuels.

Hydrogen Technology and Energy Corporation is developing a network of six retail hydrogen fueling stations in Vancouver and Victoria, B.C. along with an electrolysis production facility. They will be opening the first retail hydrogen dispenser in Canada in June 2018. Hydrogen In Motion has a portable hydrogen storage solution, and delivers tanks of hydrogen directly to consumers, while Hydra Energy provides hydrogen as a service and can retrofit entire heavy-duty vehicle fleets to run on a switchable, dual-fuel hydrogen and diesel system.

Vancouver Job Growth: Green Mobility

2,780 TOtAl grEEn jObS in 2016
22% iNCREAsE sInCE 2010

3,000+ vEHICLES
Largest combined fleet of CAR SHARING vehicles in N. America (Vanity, 2018)

1,000 pUBLIC CHARGING STATIONS
in B.C. (250+ in Vancouver) (Plug’n B.C., 2018)

50% of all trips starting in Vancouver are made by WALKING, CYCLING OR TRANSIT (City of Vancouver, 2010)

200 CLEAN ENERGY VEHICLE (CEv) companies with 3,850 jobs in B.C. (AMP, BC Ministry of Finance, 2016)

18,800 green JOBS and 22% INCREASE in B.C. (250+ in Vancouver) (Vancity, 2018)

94% of Bike Lanes expect their next vehicle purchase to be electric (BC Hydro, 2018)

311 KM of Bike Lanes
(City of Vancouver, 2018)

79.6 KM SkyTrain has the longest FULLY AUTOMATED LIGHT METRO in the world (Translink, 2018)

1,000+ VEHICLES
Largest combined fleet of CAR SHARING vehicles in N. America (Vanity, 2018)

CAnADIAN fUEL CELL INDUSTRY
$220 Million revenue and 1,785 jobs
31% of Canadian facilities are located in B.C. (Canadian Hydrogen and Fuel Cell Association, 2016)

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Deep Dive: The Connected Car
Since 1996, onboard computers have been integral to car design, controlling basic features like heated seats, climate control and digital displays. Today, these computers optimize internal functions, transmit engine performance data, and enable “infotainment” applications like GPS navigation, traffic updates and smartphone integration. MoJo’s platform – with its open ecosystem of apps and backend by Amazon’s Alexa Fund – turns vehicles into “smart” devices that can analyze driver behaviour, automate insurance renewal, schedule preventative maintenance and more. Connected cars can reduce energy consumption through efficient driving and improved performance.

Many driver assistance systems use the computer, along with onboard sensors and cameras, to warn about drifting outside lanes or getting too close to other traffic. Going further, Movee Innovations offers advanced sensor technologies – integrated with GPS, roadside traffic infrastructure and artificial intelligence – to provide all the connected infrastructure required for autonomous transportation.

Connected cars and bikes also enable more convenient vehicle-sharing options – and a way out of expensive car ownership. Vancouver has the largest shared vehicle fleet of any city in North America (about 3,000 vehicles from car2go, Evo, Modo and Zipcar).13 As a result, the equivalent of 8,200 cars have been kept or taken off Vancouver roads.14 Offering two-wheeled transportation, Mobo manages 1,500 shared bikes for locals and visitors, while VeloMetro has engaged UBC for a pilot program for their fully enclosed, electric-assisted single passenger vehicle – the Veemo. The Veemo fleet, requiring no driver’s license yet with plenty of space for bags and heavy books, helps students and staff move easily around the large campus.

B.C. Clean Energy Vehicle Incentives*

**Based on MSRP, effective Oct 1, 2016.**

<table>
<thead>
<tr>
<th>Type of Vehicle</th>
<th>Incentive</th>
</tr>
</thead>
<tbody>
<tr>
<td>PHEVs, BEVs and FCEVs &gt; 15kWh</td>
<td>$6,000 (+up to $1,000 for FCEVs)</td>
</tr>
<tr>
<td>PHEVs 4kWh &lt; 15kWh</td>
<td>$2,500</td>
</tr>
<tr>
<td>BEVs (specialty vehicles e.g. motorbikes, buses, fleets)</td>
<td>$2,000 - $85,000</td>
</tr>
<tr>
<td>Scrap a gasoline vehicle</td>
<td>$4,000</td>
</tr>
</tbody>
</table>

*B.C. residents only, vehicles with a MSRP of over $77,000 are not eligible.

Further Reading

**Clean Energy Vehicle Economic Opportunities Assessment**

**Stuck in Neutral: Tracking the Energy Revolution 2017**
Clean Energy Canada 2017

**Canadian Hydrogen and Fuel Cell Sector Profile**
CHFCA 2016

WHO TO WATCH

**American Manganese** | www.americannanomanganeseinc.com
Critical metal company with focus on recycling Lithium-ion EV batteries and able to capture 100 percent of cathode materials

**Ballard** | www.ballard.com
Fuel cell technology for heavy-duty applications such as buses, trucks and rail

**Corvus** | www.corvusenergy.com
Purpose-engineered energy storage solutions for marine, oil and gas, and port applications

**Cowlines** | www.cowlines.com
An advanced trip planning app that helps get you there faster while reducing your carbon footprint

**Electra Meccanica** | www.electrameccanica.com
Designs and manufactures SOLO: a single passenger, three-wheeled battery electric vehicle

**Freightera** | www.freightera.com
Online marketplace that assists companies in finding the greenest and most efficient shipping options

**Hydra Energy** | www.hydra-energy.ca
Refits fleets and builds onsite fueling infrastructure to deliver hydrogen-in-a-service at a fixed price

**Hydrogen in Motion** | www.hydrogeninmotion.com
Develops cost effective low pressure high density solid state hydrogen fuel tanks and delivers them for fuel cell applications

**Hydrogen Technology and Energy Corp** | www.htec.ca
Builds and operates hydrogen vehicle fueling station networks and low carbon intensity hydrogen supply facilities

**Loop Energy** | www.loopenergy.com
Builds fuel cell “range extenders” for trucks and buses at a 30 percent lower cost than traditional fuel cells

**Moovee Innovations** | www.mooveeinnovations.com
Uses sensor technologies and artificial intelligence to provide the connected infrastructure required for autonomous transportation

**Mojio** | www.moj.io
Provides secure, hardware-agnostic digital platform for car monitoring and tracking

**Nano One Materials** | www.nanoone.ca
Builds nanostructured cathode materials to improve battery lifespan and energy density

**Plan B Energy Storage** | www.pbes.com
Provides energy storage solutions for marine, grid and heavy industrial applications

**Retrieve Technologies** | www.retrievech.com
Lithium-ion battery recycling facility that recovers scrap components with a patent to regenerate materials for batteries

**Routific** | www.routific.com
Route optimization platform that saves delivery fleets up to 40 percent in fuel consumption

**UrbanLogiq** | www.urbanlogiq.com
Analyzes diverse municipal data sets to assist governments in understanding community needs

**Vanadium Corp** | www.vanadiumcorp.com
Recovers vanadium from a variety of sources via innovative new processes

**VeloMetro** | www.velometro.com
An electric-assisted, enclosed single passenger bike for sustainable urban transport and sharing service “Veemo”
MATERIALS MANAGEMENT
Digitization, data and design are leading Vancouver’s waste management models towards a more circular economy.

Materials management has evolved from waste management and recycling to a system focused on extracting the most value from limited resources. Today, the sector intersects with nearly every stage in the product lifecycle, from product design and material choice to manufacturing and delivery. It includes waste reduction and repair, resource sharing, deconstruction, upcycling, and even mineral and metal recovery.

In Vancouver, materials management is driven by a powerful combination of policy, innovation and consumer awareness. Vancouver aims to send zero waste to landfill or incinerator by 2040. Its goals are supported by the province, which is a leader in extended producer responsibility and has more programs than any other jurisdiction in North America. These programs have spurred investment in regional recycling infrastructure, while Vancouver’s green demolition bylaw has catalyzed an active deconstruction and remanufacturing sector. This growth in the resource recovery sector has also stimulated a wide range of social enterprises.

B.C. boasts extensive research and educational capacity in design, material science, and sustainable forestry, enabling new businesses that are designing or leveraging waste materials to deliver new products. City residents that value greener products and remanufacturing sector. This growth in the resource recovery sector has also stimulated a wide range of social enterprises.

Policy driving deconstruction
Vancouver’s Green Demolition Bylaw requires older homes to be deconstructed rather than demolished, diverting more than 75 percent of materials from the landfill. This policy has created a surge in deconstruction activity and is now feeding new markets for reclaimed construction materials. Unbuilders, Ocircles, and Green Coast Rubbish are rapidly expanding, offering deconstruction for interiors, landscapes, and entire buildings.

This supply of high-quality reclaimed materials is also fueling growth in upcycling construction enterprises, such as Tiny Healthy Homes, who build tiny homes from reclaimed materials, and the Wood Shop Worker’s Co-op, who design custom furnishings and interiors using reclaimed wood.

Innovative design leveraging discarded materials
A new generation of Vancouver designers are creating beautiful and functional products from waste. ShopValue collects disposable chopsticks to create home decor items and custom furniture; FabCycle collects textile scraps from clothing manufacturers to create punching bags; DeBrand upcycles proprietary and branded materials most recently processing end-of-life yoga mats to create surfacing for horse tracks. Other cradle-to-cradle designers include Red Flag Design, who create high-quality bags and display elements from decommissioned sails, and OR Green Building Products, who use recovered limestone, plastic bags and bottles to create synthetic roofing products.

Data and digitization transforming supply chains
FoodMesh’s online B2B marketplace reduces food waste by matching surplus food with a verified network of businesses and charities. Quupe’s online sharing platform allows consumers to rent common goods from neighbours to reduce waste and costs.

Kabuni’s artificial intelligence and blockchain technology enables designers to manufacture industrial-scale products using additive 3D printing processes, limiting waste affiliated with traditional manufacturing. Venze helps businesses digitize supply chains, improve transparency and access product information to make better decisions about waste reduction.

RecycleSmart, one of Canada’s top 15 fastest growing companies, has IoT-enabled smart bins that use solar power to compact trash, cameras to identify when a bin is full, and signals to indicate when the bins need to be replaced.

VEC Program Spotlight
VEC’s Industry Innovation Labs believe that collaboration can transform an entire industry. Today’s challenges require entire industries to rethink their value chains to stay relevant in the world. A two-year Apparel Textiles’ Innovation Lab, brought together industry leaders to reimagine the way they work. The lab spawned two new ventures, one industry association, and a strong foundation for further collaboration.

B.C. is a North American leader
with 22 industry-led extended producer responsibility programs that have led to:
- a net job creation of 2,400 jobs
- carbon reductions of 173,000 tonnes of CO2
- a 45% diversion rate

Vancouver: A Zero Waste hub
The City of Vancouver revealed its plan for achieving Zero Waste by 2040.

27% REDUCTION IN WASTE
to landfill or incinerator from city of Vancouver, 2008 - 2016
City of Vancouver

450,000 tonnes of organic waste
turned into compost
(Metro Vancouver, 2017)

185,477 tonnes of materials collected
= 179,711 tonnes were recycled
= 6,890 tonnes turned into alternative fuel
(Recycle BC, 2016)

PAPER + PACKAGING

$109,200 GENERATED INCOME for employees of
The Binner’s Project; a social enterprise that creates low-barrier jobs
(The Binner’s Project, 2017)

$7,300,000,000 IN REVENUES
generated from the collection of waste, recyclables and organics, as well as the operation of landfills, transfer facilities, and recycling & organic processing facilities
(Metro Vancouver, 2017)

10,000 TONNES OF MATERIALS DIVERTED
directly from single-family homes that are now reconstructed, rather than demolished, a 86% diversion rate
(City of Vancouver, 2017)

35.4% of businesses DIVERT THEIR WASTE STEAMS BEYOND THOSE REGULATED
(Vancouver, 2018)

111% INCREASE in business revenue and 1,717 new jobs
between 2008 and 2015
(VEC Survey, 2018)

B.C. SOCIAL VENTURES - some focused on waste reduction and creating jobs for those with barriers to employment - earn more than $500 M annually and PROVIDE 13,000 PAID JOBS
(Vancity, 2016)

83% of British Columbians report buying second-hand goods, contributing to a $1.05 B industry
(Vancouver, 2021)

3.6 MBritons report buying second-hand goods, contributing to a $6.5 B industry
(Recycle BC, 2016)

Trends
New approaches to organics
When the city and region banned food scraps from disposal in 2015, traditional large-scale composting facilities were left scrambling to meet demand. Policy had suddenly allowed new technology and decentralized methods to process organic waste at smaller scales and on site at client facilities.

Recycling Alternative helps organizations bring Green Good Composters on site and turn organic waste into soil amendments for gardens and green roofs. This composter even separates plastics from the mix. Anaconda Systems processes organic waste within the city limits – with no foul odour or runoff.

Enterra Feed Corporation harnesses black soldier fly larvae to turn pre-consumer waste food into protein and fat used in animal feed and organic fertilizers. The City of Vancouver revealed its plan for a circular economy goals.

Plastics leadership – locally and globally
Vancouver has historically played a leading role in ocean protection. The Ocean Wise sustainable seafood movement. It also recently launched #6PlasticWise, a pledge and monthly challenge for hotels and restaurants. Fairmont Waterfront Vancouver, Days Inn Vancouver, Executive Hotel Le Soleil Vancouver, Chambar Restaurant and Pinnacle Hotel were the first to commit to eliminating straws and single-use plastic water bottles.

Plastic Bank is part of this legacy of ocean protection, as well as poverty reduction with its platform that enables the exchange of waste plastic found along shorelines for money, items, and even blockchain-secured digital tokens. The plastic is recycled and sold to corporations as Social Plastic, which is helping businesses meet circular economy goals.

VEC’s Industry Innovation Labs believe that collaboration can transform an entire industry. Today’s challenges require entire industries to rethink their value chains to stay relevant in the world. A two-year Apparel Textiles’ Innovation Lab, brought together industry leaders to reimagine the way they work. The lab spawned two new ventures, one industry association, and a strong foundation for further collaboration.
A circular economy requires moving away from nonrenewable resources like fossil fuels. Although fossil fuel energy sources can be replaced with renewable sources, the infrastructure, supply and accessibility of substitutes still need to be scaled up. In Vancouver, many innovators are working to replace fossil fuel-based materials with bio-based materials. As an alternative to synthetic plastic (made of petroleum and natural gas) Good Natured Bioplastics produces one of North America’s widest assortments of plant-derived consumer products and packaging.

In their sub-brand line “Conscious,” H&M strives to displace synthetic textiles such as nylon, polyester, acrylic and spandex (made from natural gas or oil and the largest contributors of microplastics into the environment) instead H&M sources biosynthetics from suppliers that adhere to global standards of environmental and social compliance. Design houses such as Nicole Bridger and Dish Denim incorporate biosynthetics for high performance features, such as increased breathability, moisture wicking, and natural antibacterial properties. Wholesaler KenDor specializes in environmentally and socially responsible textiles, including biosynthetics such as Tencel, Lyocell, and Modal.

Nova Borubber aims to replace nonrenewable or synthetic rubber (derived from crude oil) with a natural rubber found in Russian dandelions. While a significant portion of the world’s rubber is derived from natural rubber, Russian dandelions have been planted in the U.S., Canada, and France. While a significant portion of the world’s rubber is derived from natural rubber, Russian dandelions have been planted in the U.S., Canada, and France.

Further Reading

Towards the Circular Economy: Textiles Sector in Vancouver, Canada
Vancouver Economic Commission 2015

Setting to a Circular Economy: A Primer for Canadian Policymakers
Smart Prosperity Institute 2018

City of Vancouver Zero Waste 2040
City of Vancouver 2018

WHO TO WATCH

Anaconda Systems | www.anacondasystems.ca
Organic waste management without odour or runoff

Biocube | www.biocubeco.com
Transportable biodiesel refinery that produces commercial quantities of high quality biodiesel from waste and renewable feedstocks

ChopValue | www.chopvalue.ca
Product engineering and design firm that creates innovative material with recycled chopsticks as a resource

Debrand | www.debrand.ca
Secure products recycling for diverse materials from textiles to medical devices

Enterra Feed | www.enterrafeed.com
Manufacturers and markets sustainable insect-based feed ingredients and fertilizers

Fab Cycle | www.fabcycle.ca
Collects and recycles textile waste, including scraps, offcuts and end of rolls

FoodMesh | www.foodmesh.ca
528 marketplace that matches surplus food to a verified network of businesses and charities

Good Natured Products | www.goodnatured.ca
North America’s widest assortment of consumer products and packaging options derived from plants

Helfu | www.helfufood.com
Protein, micronutrient powder and a coconut oil-like butter from insects

Kabuni | www.kabuni.com
Biodegradable form for 3D printing at industrial scale that protects, prints, and pays

Nova Borubber | www.novaborubber.net
Safe and renewable borubber, biolatex and linul from rubber plant in North America to solve latex allergy and satisfy rubber demand

Quupe | www.quupe.com
Online sharing platform allows consumers to rent common goods from neighbours

Plastic Bank | www.plasticbank.org
Engages the exchange of plastic for money, items or blockchain secured digital tokens

Recycle Smart | www.recycle-smart.ca
Cost-effective recycling programs with bin sensor technology for homes and businesses and commercial properties

Red Flag Design | www.redflagdesign.ca
Design company focused on material innovation producing high-quality duffel bags & display elements from decommissioned sails

Recycling Alternative | www.recyclingalternative.com
Local leader in innovative approaches to recycling, community partnerships and inclusive employment

Ronin8 | www.ronin8.ca
Separates metals from nonmetals to unlock maximum value of each stream with no burning or emissions

Venzee | www.venzee.com
Replaces spreadsheets with AI-powered data transformation for the retail industry

West Coast Reduction | www.wcr.com
Modern rendering facilities with safe, environmentally friendly recycling solutions for the agriculture industry
The local food sector includes jobs in food production, processing, trade and service, as well as a small number of jobs in food-related advocacy and policy.

Since the 100-mile diet was conceived in B.C. in 2005, consumer demand for local food products has skyrocketed. Vancouver is experiencing a boom in everything from urban farms to craft breweries and artisanal manufacturing, and from food trucks to farmers markets. Decades of policy change has driven greater regional food security in the region.

One of the most critical players in the local food ecosystem is the Vancouver Farmers Market, which has experienced consistent, double-digit growth sales since 2004, with sales volumes of $8.5 million in 2016. Changes in procurement policy by institutions like UBC, SFU and the Vancouver Parks Board have likewise accelerated demand, with the latter now buying at least 44 percent of all food from local sources.

Agriculture is an application of clean technology to the agricultural sector and Vancouver’s agritech sector has spawned multiple award-winning companies whose innovative solutions are recognized globally.

**Trends**

**Green Agritech**

Sensors is a leader in on-site sensors and predictive analytics for agricultural crops, allowing farmers to monitor the health of their fields from a cell phone. *Ecoaction*’s Crop Sense software also sends updates about pests and diseases by monitoring plant physiology, chemical composition and photosynthesis. *Terramera*’s non-toxic pesticide uses only natural plant defences to dramatically reduce harmful runoff from fields, while *gUAVises* uses drones to deter pest birds in B.C.'s blueberry farms. *Boost Environmental Systems* helps farmers break down organic material while producing greater volumes of biogas (green energy) and a high-quality fertilizer.

**Smart logistics and shared services**

Locavore culture and slow food are mainstays of Vancouver’s local food scene, that has a seemingly insatiable demand for small-batch products. Businesses range from microbreweries and distilleries to artisanal manufacturers of ice cream, cheese, juice and fermented foods. These companies are supported by a robust food incubation network, including shared kitchens like *Commissary Connect*. Meanwhile, services like *West Coast Canning* help microbreweries with mobile canning and packaging, while *Direct Tap* provides legs and distribution services, allowing small batch beers to make it to a wider market.

The B.C. Food Connection website matches small scale manufacturers with commercial kitchens and co-packing facilities.

**Vancouver Job Growth: Local Food**

7,604 TOTAL GREEN JOBS in 2016

35% INCREASE SINCE 2010

150+ CRAFT BREWINRES in B.C. 25 of which are in Vancouver and represent 300 LOCAL JOBS (BCSA, 2016)

$9.5 M IN SALES at Vancouver Farmers Markets, a five-fold increase since 2004 (Vancouver Farmers Markets, 2016)

**Urban Farming**

The continued success of the local farmers markets indicates that shoppers are keener than ever to pay urban and local farmers directly – that is, to keep the money within the local economy. This trend is also driven by consumers’ increased awareness of the carbon emissions associated with the growth, preparation and delivery of food. Limitations of space in Vancouver have led to some creative implementation of urban farming and gardens – a trend that took inspiration from the guerilla gardening movement.

**Sole Food**

Transforms vacant urban land into street farms that grow high-quality fruits and vegetables that supply local restaurants and markets. *Sky Harvest* grows microgreens and specialty greens on an organic-certified farm and delivers its products by bicycle to its local customers. *Victory Gardens* consults with urban residents on how to build and maximise the productivity of their container and patio top gardens.

**Strong food incubation ecosystem**

Vancouver hosted Canada’s inaugural *Slow Money* conference in 2014, leading to a groundswell of new forms of investment in the local food ecosystem. *Feeding Growth* is an initiative led by the UBC Farm in partnership with *Vancity*.

**Demand for traceability along the supply chain**

Vancouverites are also driven by the ethics, quality and transparency of food supply chains: people seek out brands that are transparent about their ethical and environmental policies and practices.

Sustainable kitchens like *Forage* source their ingredients from local wild food harvesters and small farms, and strive for zero-waste kitchens by advocating for the return of “nose-to-tail cooking” in which all parts of an animal are fully used.

**B.C. FOOD PROCESSING**

According to the B.C. Agrifood & Seafood Sector 2016 snapshot, B.C.’s food processing sector generated $14.6 B in sales, $4.5 B in GDP and $3.9 B in exports (BC Ministry of Agriculture, 2016).
Deep Dive: Alt Meat & Dairy

Consumer concern for animal welfare and the environmental and health impacts of meat consumption is high in Vancouver. Globally, the average person eats twice as much meat than is recommended, leading to an increase in obesity and type-2 diabetes. Meanwhile, the livestock industry contributes to 15 percent of global carbon emissions. Today, B.C. has Canada’s highest concentration of vegetarians and vegans. This has spurred substantial local food science and innovation, as well as a dramatic increase in the local availability, diversity and quality of meat and dairy alternatives.

These include the development of cheese and dairy alternatives made by Daiya Foods – purchased by启动仪式 Pharmaceutical for $405 million – and Vega, which produces plant-based nutritional products and recently sold to WhiteWave Foods for $705 million. In addition to these trailblazers, other companies specializing in plant, nut and even insect-based products have proliferated in Vancouver. These include Gardein, makers of ‘meatless meats’; Sunrise Soya, one of North America’s largest tofu manufacturers and also one of the first to go GMO-free; and Coast Protein, which has brought cricket protein products to the mass market.

Other local artisanal manufacturers found a ready, willing market of Vancouver buyers for their plant-based, small-batch dairy and protein replacements. Among them are Tempea, local makers of unpasteurized tempeh; Nuez, makers of nut-based milk; Umaluma, serving plant-based gelato; and SPREAD’EM Kitchen, who provide cultured cashew-based products as an alternative to cream cheese spreads.

Financing

Investment Agriculture Foundation of B.C. | www.iafbc.ca

- Canada-BC Agri-Innovation Program: funding for industry, academia, value-added food processors and retailers for late-stage research; pilots and demonstrations; commercialization and adoption of innovative technologies
- Agri-Food Future Fund: funding for agri-tourism, environmental management, Aboriginal agriculture, food and beverage processing, agroforestry and emerging sectors
- Agriculture and Agri-Food Adaptation program: funding for projects that allow sector to seize opportunities, respond to emerging issues, and pilot new solutions to remain competitive
- Agri-Food Environment Initiative: funding for wide range of environmental issues such as soil, air and water quality, wildlife and habitat, water conservation, re-use of by-products, use of pesticides
- Food and Beverage Processing Initiative: funding for wide range of projects that enhance industry competitiveness, build reputation of health and lifestyle-oriented products, or enhance industry networks
- Agricultural Area Planning Program: fund up to 50 percent of the cash costs of an agriculture area plan project, up to a maximum of $45,000

Other funding programs

Bioenterprise B.C. | www.bioenterprise.ca
Maintains a global network of investors including venture capital firms, angels, family offices, corporate venture arms, and financial institutions

FarmFolk CityFolk | www.farmfolkcitifolk.ca
FarmFolk City-Folk, Island Chef’s Collaborative and VanCity’s Micro Loan Program zero interest microloans of $1,000 to $20,000 for farmers, fishers, ranchers, harvesters and processors

The Kathi Fund | www.thekathi.fund
Annual Award $1,000 cash award plus $10,000 in creative services and mentorship for female entrepreneur

Knives and Forks Investment Coop | www.knivesandforks.ca
Provides mentorship and small loans

VanCity | www.vancity.com
Small Growers Fund: up to $75,000 for farming operation or business closely connected to farming and local food

Further Reading

Unlock the Potential of Agri-Technology | BioEnterprise 2017

Vancouver Urban Farming Census 2014 - 2016
Vancouver Urban Farming Society 2017

Tackling Climate Change Through Livestock | Food & Agriculture Organization of the U.N. 2013

WHO TO WATCH

Boost Environmental Systems | www.boost-enviro.ca
Enhances energy and nutrient recovery from wastewater as a source of extra revenue

Coast Protein | www.coastprotein.com
Brings cricket protein products to the mass market

Commissary Kitchen | www.commissaryconnect.com
Food incubator that has spawned more food restaurants and distilleries

Direct Tap | www.directtap.com
Provides logistics and delivery solution for local craft breweries and distilleries

Ecoation | www.ecoation.com
Pinpoints crop stress and extends the growers presence

Enterra | www.enterrafeed.com
Provides renewable animal feed from black soldier flies

FoodX | www.food-x.com
Serves as a sustainable warehouse and delivery platform for third-party groceries

Foodee | www.food.ee
Provides corporate lunches delivered by bicycle

Forage | www.forgevancouver.com
Sources ingredients from local, wild food harvesters and small farms for their sustainable, waste-averse restaurant

Gardein | www.gardein.com
Produces ‘meatless meats’ as a healthy protein option while championing sustainable diets

gUAVas | www.guavas.info
Unmanned Aerial Vehicle (UAV) system to disperse nuisance birds from crops

Meatme.ca | www.meatme.ca
Connects consumers to small scale local farmers who raise their animals free range on natural pastures

Semiocios | www.semiocios.com
Uses big data and predictive analytics to assist farmers to remotely monitor the health of their fields

Sky Harvest | www.skyharvest.ca
Grows organic microgreens and specialty greens on their urban farm and delivers by bicycle

Sole Food Street Farms | wwwSOLEFOODFarms.com
Transforms vacant urban land into street farms

SPUD (Sustainable Produce Urban Delivery) | www.spud.ca
Provides urban residents with fresh local produce through an online shopping and delivery service

Sunrise Soya | www.sunrise-soya.com
One of North America’s largest tofu manufacturers and also one of the first to go GMO-free

Victory Gardens | www.victorygardensvancouver.ca
Provides consultation to urban residents on how to build and maximise the productivity of container and patio-top gardens

West Coast Canning | www.westcoastcanning.com
Provides mobile canning and packaging services to small-batch food manufacturers and processors

Sustainable Agriculture and Food Systems at KPU: Farm Business Planning

University of British Columbia: Master of Food and Resource Economics; Centre for Sustainable Food Systems at UBC Farm

University of the Fraser Valley: Agriculture Technology diploma Bachelor of Agricultural Science, Horticulture major; Bachelor of Business Administration for Agriculture Management; Wide variety of certificates including Livestock Production, Miller Technician, Horticulture Crop Production and Protection, Berry Production, Field Vegetable Production and Integrated Pest Management

Vancouver Island University: Bachelor of Science in Fisheries and Aquaculture

Vancouver Urban Farming Society: Various events and workshops

Education & Training

Kwantlen Polytechnic University: Bachelor of Applied Science, Sustainable Agriculture and Food Systems; Institute for Sustainable Food Systems at KPU: Farm Business Planning

Vancouver: A Sustainable Business Ecosystem

Vancouver businesses leverage a strong ecosystem of sustainability-related services and resources to achieve deep green operations.

From its roots as a resource town, Vancouver has built out capabilities in environmental engineering, environmental assessments and site remediation that it has exported all over the world. Since then, spurred by a strong community focus on carbon, Vancouver has become an epicentre for contemporary services like carbon accounting, zero waste consulting and sustainability reporting.

Along with supportive regulations and a strong investment climate, this sustainable business ecosystem has provided the foundation for a business sector in Vancouver that excels in delivering green products and services while integrating deep green practices into its operations.

Entire industries in Vancouver differentiate themselves as world leaders based on their clean and green innovations. The Vancouver International Film Festival (VIFF) hosts an annual Sustainable Production Forum (SPF) advancing a global reputation for green excellence both on and off screen. Tourism Vancouver promotes a city that is “Spectacular, by Nature” and one committed to sustainable travel. The Sustainable Apparel Coalition will host its annual meeting in Vancouver in 2018.

As they reap the rewards of a triple bottom line approach, Vancouver businesses are confirmation that the green economy is a big opportunity.

Collaboration for industry transformation

Today industries need to rethink their value chains in order to stay relevant in a world with transformational technology, limited resources and a new energy paradigm. The Leverage Lab convenes stakeholders across a focal industry to collaboratively reimagine the way they work. The Apparel Textiles Leverage Lab (2016-17) spawned two new ventures, one new industry association, and a strong foundation for further collaboration.

Microbreweries in the booming craft beer sector have formed collaborations to manage redistribution of spent grain to farmers for feed and soil amendment. DirectTap and sister company FreshTap provide shared logistics solutions for breweries, wineries, and cideries and enable restaurants to serve wine on tap, removing the need for individual wine bottles.

Keep It Green Recycling and Green Spark Group support film and television production with solutions like the Sustainable LootBox to securely store and redistribute set materials for reuse, while Creative BC’s Reel Green program delivers carbon literacy training to film industry professionals.

Reporting and transparency

Measuring and communicating what a business is doing to achieve specific sustainability goals enhances accountability and trust. Increasingly, procurement processes will use environmental and social indicators to evaluate bids, and third-party certifications allow comparisons across businesses and industries.

A certification can more readily communicate complex sustainability efforts to end users, and most are industry specific. Ecolabel Index helps users evaluate the wide variety of third party certifications now available, and select those that are rigorous and respected. The Climate Smart Business program uses software, peer networks and consulting expertise to empower small and mid-sized businesses to measure, track and ultimately reduce carbon, energy, water, waste – and costs. Climate Smart’s carbon mapping tool, the ‘Business Energy and Emissions Profile’, helps communities identify opportunities for new energy infrastructure (e.g., electric vehicle charging stations) and programming (e.g., sector-specific climate action workshops). B Corp certification indicates rigorous standards in social and governance practices in addition to environmental goals, while Loco BC’s Community Impact Assessment evaluates local economic impact.

Beyond certification, networks such as Buy Social Canada match buyers and suppliers that are driven by social values, while Blockchain For Climate puts climate initiatives on the blockchain to verify offset projects and democratize carbon markets. Embedding sustainability into the very articles of incorporation, Community Contribution Companies can limit dividends to shareholders and distribute profits to community or non-profit entities, and B.C. may soon allow Benefit. Corporation status which codifies responsibilities of social purpose, accountability and transparency.

Financing a Green Economy

VanCity’s enviroFund invests five percent of profits into innovations addressing environmental issues. Investment firm Changequity will buy a carbon intensive company and transform it into a green business, as they did with Novex Couriers and Westcoast Sightseeing. Active Impact Investments and Renewal Funds invest in early-stage, mission-driven companies to catalyze social and environmental change. Even non-accredited investors can get involved by joining a Community Investment Co-op like Knives and Forks.

Businesses walking the talk

The Soap Dispensary, Kitchen Staples store and Nada Grocery offer bulk products to customers in purchase in their own containers. Lunapads makes their reusable menstrual products with minimal waste from sustainable fabrics and zero waste pattern making. Adelheid’s custom suits and wiivv’s custom insoles use fitting algorithms and 3D printing to change the way we produce fashion, creating far less waste and speculative production.

Product as a Service

Begun as a Vancouver Tool Library project, The Thingers is a community-sourced and community-managed lending library operated in a modified shipping container, while quipse enables item lending between platform users. Frogbox (leasing sturdy plastic moving boxes) started in Vancouver in 2008 and is now operating in 21 locations in North America. Other lending services include Flaut Fashion Library (dresses), Lanyard Library (lanyards), and UmbraCity (umbrellas).

A global hub

The biennial GLOBE Forum and Expo launched in Vancouver in 1990 and is the largest international conference and expo for sustainable business leadership in North America. In 2006, 12,000 people from 100 countries attended UN-Habitat’s World Urban Forum II. TED’s annual conference has been held in Vancouver since 2014. Sustainable Brands flagship event is in Vancouver in 2018, as is the Sustainable Apparel Coalition’s AGM and public forum.
VEC SUPPORT FOR VANCOUVER’S GREEN ECONOMY

Join us in growing the world’s fastest-growing low carbon economy. Here is a selection of VEC’s programs in the Green Economy space:

**Capital Mentorship Program**

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

"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

**Thriving Vancouver**

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.

"Thrive is an important initiative that will help businesses make the shift to sustainable operations and reduce their environmental impact. It’s great to see VEC taking the lead on this important issue."

Ian McAvoy
President, ClimateSmart Business

**Green & Digital Demonstration Program (GDDP)**

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 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.

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

Jason Harmer
CEO, Fast Workers

**Vancouver Startup City**

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 battling 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 MacKerr
CEO, Thomson Power

Endnotes

5. B.C. Hydro, 2018
6. University of Dalhousie poll, 2018
7. Economic Impacts of the BC Property Development Industry in 2015, Urban Development Institute, February 2016
11. UBES Global Autos Survey, November 2017
17. ‘Tracking climate change through livestock: A global assessment of emissions and mitigation opportunities’, Food and Agriculture Organization of the United Nations, 2013

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