

Fraser Valley Regional District Clean Economy in the Fraser Valley: Resource Guide

November 2019



Credit: BC Transit



Credit: Cheryl Uphill



Credit: Cheryl Uphill



Preface

The following report is a companion to the *Clean Economy Study* as prepared by the **Delphi Group** for the Fraser Valley Regional District. Referencing this study directly, this document serves as a resource guide that outlines the existing clean economy sectors in the region, the opportunities for their future growth, and the economic trends and government policies that can be leveraged in their development. In doing so, it serves as a reference for businesses, governments, First Nations, and other stakeholders in the region looking to further their role in advancing the clean economy in the Fraser Valley. This document is a summary and should be read in conjunction with the final report and its appendices.

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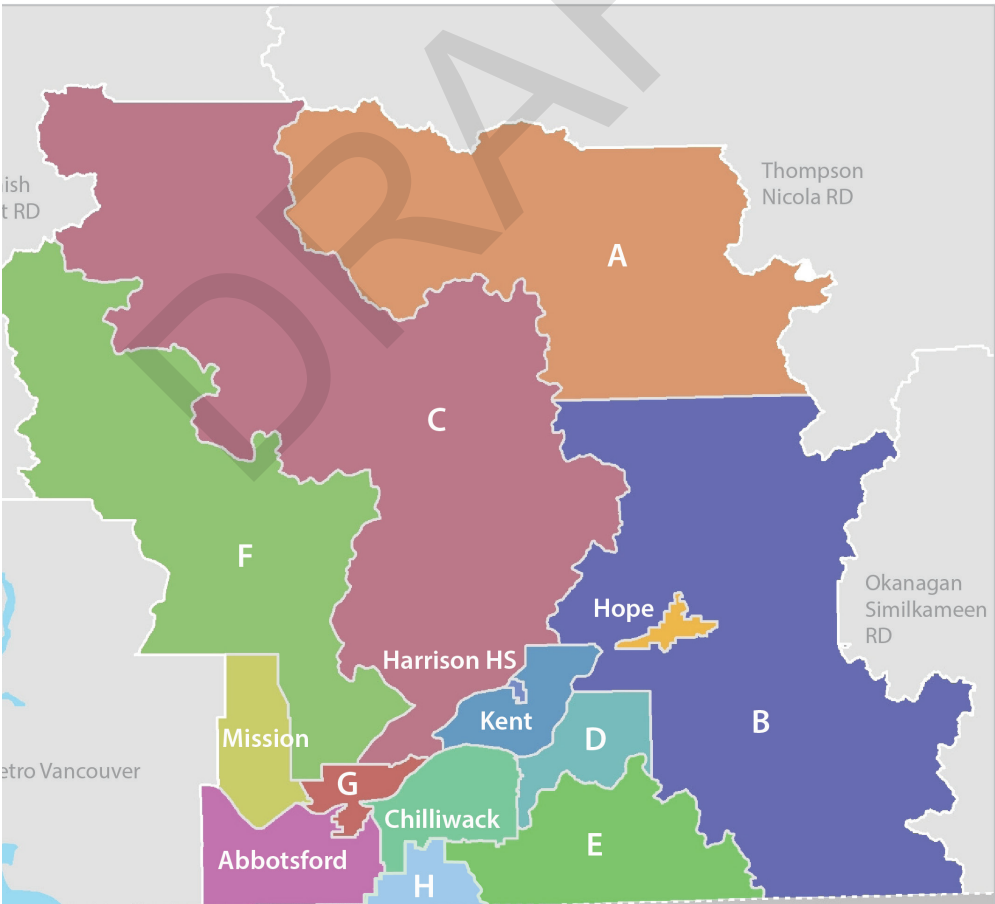


Figure 1: Fraser Valley Regional District Municipalities and Electoral Areas

DISCLAIMER

The information, concepts, and recommendations expressed in this document are based on information available at the time of the preparation of this document. Action or abstinence from acting based on the opinions and information contained in this document are the sole risk of the reader and Delphi and the Fraser Valley Regional District shall have no liability for any damages or losses arising from use of the information and opinions in this document. All information is provided “as is” without any warranty or condition of any kind. The document may contain inaccuracies, omissions, or typographical errors.

Introduction

Defining the Clean Economy

The Fraser Valley Regional District Clean Economy Study defines the clean economy as:

“An economy that aims to reduce environmental risks and ecological scarcities, and that aims for sustainable development without degrading the environment.”

The study provides an understanding of how to support the growth of the clean economy sectors in the Fraser Valley in line with traditional industrial economy strengths across the region, identify federal and provincial policies that can be leveraged for growing the clean economy, and identify the necessary types of supporting hard and soft infrastructure that support sustainable growth.

Federal Policy

Under its commitment to the Paris Agreement, Canada's long-term goal is to reduce greenhouse gas (GHG) emissions by 80% from 2005 levels by 2050. While much effort has been put into individual actions and projects to reduce GHG emissions, a low carbon economy will ultimately be necessary to achieve the significant and sustained GHG emission reductions required to reach these goals.

Provincial Policy

The BC government's CleanBC Climate Plan is an economic and environmental strategy for meeting the province's GHG reduction targets and includes the following key aspects:

- Directing a portion of BC's carbon tax paid by industry into incentives for cleaner operations
- Helping communities achieve 95% organic waste diversion for agricultural, industrial, and municipal waste
- Making industrial natural gas consumption cleaner by putting in place a minimum requirement of 15% to come from renewable gas
- Expanding job training, research, and commercialization for electric and other zero-emission vehicles
- Developing training programs for Energy Step Code and Certified Retrofit Professionals

The Province has shown a commitment to CleanBC in its 2019 budget. \$902 million over the next three years is designated for CleanBC programming with \$354 million in operating funding, \$299 million for new programs, \$26 million in capital investments, and \$223 million to increase the climate action tax credit.

The FVRD Clean Economy Study responds directly to the CleanBC initiative by laying out the direction for the region's incorporation of CleanBC objectives within its economy and growth.

Regional Policy

The FVRD adopted its first Regional Growth Strategy (RGS) in 2004 and is updating the plan to reflect changes in legislation, growth, and demographics. The updated draft RGS will be structured under the following pillars:

1. Collaboration
2. Economic Strength and Resiliency
3. Living Well
4. Community Building
5. Ecosystem health
6. Transportation and Mobility
7. Infrastructure and Services
8. Energy and Climate Change

Based on the opportunities identified through this study, the eight pillars align well with the clean economy and position the FVRD for success as it moves forward with finalizing and implementing the RGS.

The FVRD is a signatory to the BC Climate Action Charter, which commits local governments to becoming carbon neutral in their corporate operations, measuring their community-wide GHG emissions, and building compact, complete, and more energy efficient rural and urban communities. The draft RGS includes GHG reduction targets of 20% per capita by 2020 and 50% per capita by 2050, relative to 2007 levels.

The FVRD's Solid Waste Management Plan (SWMP) provides a strong foundation for growing the clean economy in the region. Renewable energy initiatives supported in this report will focus on wind, solar, geothermal, hydro, anaerobic digestion, and other non-incineration technologies.

The full *Fraser Valley Regional District Clean Economy Study* can be found at: www.fvrd.ca



UFV Trades and Technology Centre
Credit: Cheryl Uphill

Broad Clean Economy Overview

The clean economy in the FVRD is defined by the following five sectors:



This broad range of sectors fits advantageously into the Fraser Valley's existing diverse economy and workforce. The development of the clean economy creates demand for careers in management, professional services, engineering, science, project management, information and communications technologies (ICT), construction, trades, and manufacturing. This demand creates both an opportunity to target education and training towards the clean economy, as well as strengthen the region's labour market more broadly.

The clean economy already exists within the Fraser Valley, with each of the five sectors identified already responsible for jobs and economic output, as per Figures 1 and 2. The region holds a comparative advantage in the clean economy, and in two sectors in particular, as compared to the national level (Figure 4).

These sectors are synergistic. Together, they benefit from the region's existing strengths in research, design, engineering and technical services, construction and manufacturing, and natural asset management. As these sectors continue to expand, they will create opportunities to further build each other up and work towards an integrated economic ecosystem.

This report outlines numerous policy drivers and resources for each sector. These can be broken down into three types:

- Project Funding** – financial resources provided to businesses and research institutions to advance product development.
- Information & Education** – professional expertise and government resources providing support in business development and identifying market opportunities.
- Auxiliary Policies** – government initiatives establishing a framework supportive of clean economy growth, such as clean fuel regulations.

Collectively, these programs support the growth of businesses in the clean economy and facilitate the adoption of environmentally-friendly products and processes overall.

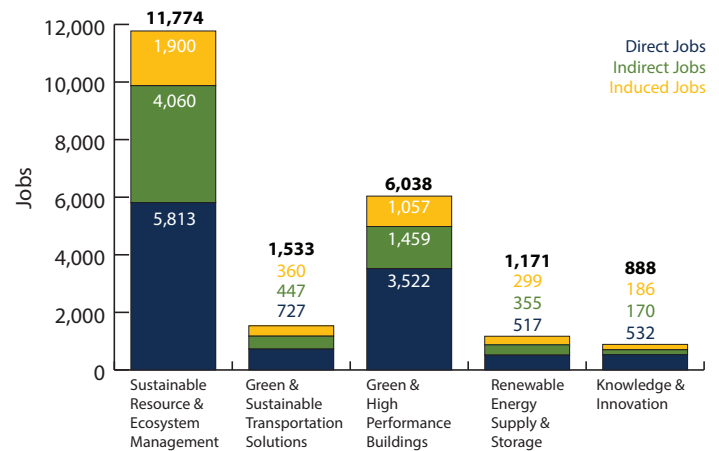


Figure 2 - Clean Economy Jobs in the Fraser Valley (2016)

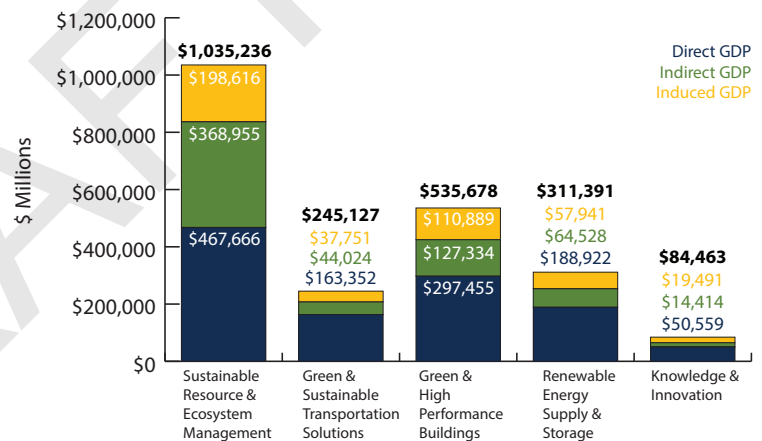


Figure 3 - Clean Economy GDP in the Fraser Valley (2016)

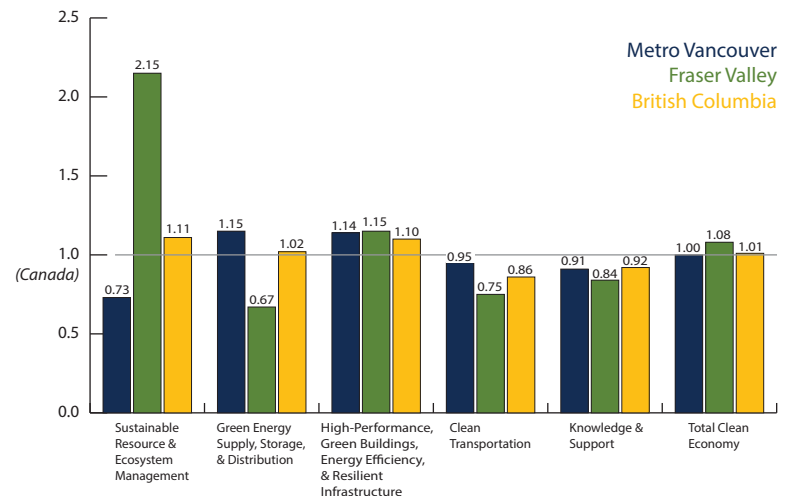


Figure 4 - Clean Economy Comparative Advantage

Sustainable Resource & Ecosystem Management

Overview

This sector is defined as managing agricultural, industrial, and technological processes in a way that conserves resources and allows for their most efficient use while strengthening natural ecosystems. It is focused on the region's sustainability practices across agriculture, waste management and recycling, the **circular economy**, and the restoration of air, water and land ecosystems.

The Fraser Valley's comparative advantage in the clean economy is firmly rooted in this sector, in particular as it relates to agriculture, due to its existing infrastructure, business experience, and well-established workforce. The region also has a strong relevant industrial base, with Abbotsford and Chilliwack hosting infrastructure for food processing, and Mission for steel fabrication, plastics, and wood products.

The sector contributes to the clean economy by reducing waste and simultaneously developing economic efficiencies and opportunities out of its reuse.

Existing Strengths

The region has an established agriculture sector which includes farming, greenhouse growing, food processing, and waste-to-energy operations. Agriculture can drive advancement in the sustainable use of resources and in the local clean economy more broadly.

The Fraser Valley has comparatively affordable industrial land, a burgeoning information and communications technology (ICT) sector, a robust existing workforce, and a network of university and research centres. This provides the region with the ideal conditions for expanding emerging technology opportunities and innovations in sustainable agriculture and manufacturing.

Barriers

Limitations hindering the development of the sector include a lack of industrial land and water/sewage infrastructure to expand manufacturing operations and a lack of skilled high-tech workers to operate complex machinery and software used for both manufacturing and agriculture operations. There is also a lack of awareness in the agriculture community on the evolving business case and opportunities related to agriculture clean technology, such as renewable natural gas (RNG) production and **precision agriculture**.



Key stakeholders

- Local government
- Business leaders from existing waste-to-resource companies
- Research & development leaders
- Universities
- First Nations
- Local technology accelerators
- Economic development leaders

Opportunities

The region's agricultural operations have the potential to increase value-added food processing. This can make the Fraser Valley a hub of locally-sourced, sustainably harvested and processed food.

Local agriculture also presents opportunities for waste-to-resource projects, such as with the production of RNG, bioplastics, organic fertilizers, and compost from agricultural or food waste. This can be supported by the creation of a platform for local farmers and other businesses to connect waste streams with resource gaps across different operations.

The provincial CleanBC initiative has a goal of 15% of natural gas consumption in BC to come from RNG. With the current mix being approximately 0.5%, this provides significant potential for growth within the sector. Provincial regulations have given FortisBC an expanded purchasing price cap of \$30/gigajoule for RNG, which allows the utility to consider projects that were not previously economically viable for farmers and other biogas producers, thereby further growing the potential of the biogas market in the region. Renewable energy initiatives will focus on wind, solar, geothermal, hydro-electric, anaerobic digestion, and other non-incineration technologies.

The region's agricultural base creates the potential for hosting innovation of its own in line with industry trends in areas such as precision agriculture and crop management. For example, a centralized agricultural database open to farmers, government, industry, and universities alike can create more precise land management strategies to inform decision-making.

Partnering with First Nations communities on all these opportunities is an opportunity in itself, as their valuable skillsets and traditional ecological knowledge can act as a launch pad for sustainable agriculture and other resource development projects across all communities in the region.

What is the circular economy?

An economic system maximizing the use of resources by taking the waste from one process and using it as a resource for another. This creates a loop where different materials and by-products continue to be reused, rather than discarded.

What is precision agriculture?

A farming management concept based on analyzing field and crop indicators to maximize returns on resources used. Through the use of GPS, it is possible to locate a precise position in a field, assess its variables, and distribute inputs accordingly.

Trends

Precision Agriculture and Data-Driven Crop Farm Management

Several large-scale programs supporting agricultural innovation are currently in place. For example, in Manitoba, the Enterprise Machine Intelligence and Learning Initiative (EMILI) supercluster accelerates agribusiness through AI and R&D, and the Protein Industries Canada supercluster focuses on plant-based protein development. Bell MTS gave a \$500,000 grant to the University of Manitoba for focused development on **Internet of Things (IoT)** for agriculture solutions.

Bioproducts

The global bioplastics sector is poised for significant growth as plastic pollution policies come into effect. Canadian initiatives that are part of the global movement to mitigate plastics pollution include the Ocean Plastics Charter and the Canadian Council of Ministers of the Environment (CCME) Strategy for Zero Plastic Waste.

Blockchain

Tracking and storage of information on transactions is being integrated into agricultural production, with applications including food safety and traceability, accurate and timely food recalls, product labeling assurance, and real-time commodity market information for farmers and distributors.

Next-Generation Food Manufacturing

New food manufacturing techniques using 3D printing technology represent opportunities for highly personalized nutrition, on-demand food production, and food supply chain customization.

Mechanization

The continued mechanization of agriculture presents a number of opportunities. For example, advances in AI, sensors, and robotics are facilitating the use of on-farm robot harvesting, while technical and mechanical innovation in agricultural storage is key for reducing spoilage, infestation, and other post-harvest crop loss. Data collection, automation, and sensors boost productivity, create efficiencies, and address labour/skills shortages while creating opportunities to train the existing workforce on high-tech systems.

Waste as a Resource

Relevant policy drivers for using waste as a resource include the Environmental Management Act, Organic Matter Recycling Regulation, and Waste Discharge Regulation. Industry drivers include China's import ban on contaminated recycling, new technologies that capture CO² to cultivate value-added biomass, and opportunities in the remanufacturing sector. Canada's National Industrial Symbiosis Program facilitates using waste as a resource by establishing partnerships to redirect waste from one sector into feedstock for others.

Designing Waste out of Products

Extended producer responsibility (EPR) is a policy in which a producer's responsibility for a product is extended to the post-consumer stage. In 2009, the Canadian Council of Ministers of the Environment created a Canada-wide Action Plan for EPR and a Canada-wide Strategy for Sustainable Packaging. Industry is itself driving innovative approaches to eliminating waste products through Cradle-to-Cradle principles for biological and technical cycles and the emergence of new markets for recycled materials.

Advanced Materials

The emergence of 3D printing, nanoparticles, production automation, and advanced chemistry are driving the use of advanced materials and innovation with recycled products.

Product-as-a-Service

The success of the SaaS (Software as a Service) business model has paved the way for PaaS (Product as a Service). This shifts the consumption model from "buy-own-use-discard" to "plan-lease-repair-replace."

What is the Internet of Things (IoT)?

The extension of internet connectivity into every day objects. Examples include smart home systems including lighting fixtures, thermostats, and other home appliances that can be controlled or monitored by mobile devices.



Robotic Milking Chilliwack

Policy Drivers & Resources

Low Carbon Leadership Fund

Provided to make buildings more energy efficient, help industries reduce emissions, and help forestry and agriculture sectors increase stored carbon in forests and soils.

Clean-Tech Innovation Strategy for the Forest Sector

Forest Product Innovation is the Ministry of Forests, Lands, Natural Resource Operations and Rural Development's (FLNR) partner in delivering a clean-tech innovation program. FLNR invests approximately \$3.5 million annually which is leveraged with investment from Natural Resources Canada and in some cases industry to a total of \$5-6 million annually to support R&D projects in the forest sector, including clean tech projects.

Clean Growth Program for Industry

Directs a portion of BC's carbon tax paid by industry into incentives that encourage them to transition to clean operations and reduce emissions. It is designed for regulated large industrial operations such as pulp and paper mills, natural gas operations and refineries, and large mines.

Innovative Clean Energy Fund (ICE Fund)

Supports pre-commercial clean energy projects and technologies that will mitigate or avoid provincial GHG emissions, including prototype development, field testing, and commercial-scale demonstration projects in BC.

Agritech Innovation Challenge

A total of \$150,000 in funding is available to winners of the BC Agritech Innovation Challenge. In addition to seed funding, winners will receive mentorship support, Market-Validation Training (MVT) through the Agriculture Venture Acceleration Program, and other opportunities, to produce and demonstrate a proof-of-concept.

Canada-BC Agri-Innovation Program (CAP)

Designed to accelerate progress along the innovation continuum (research, pilot, and commercialization) to enhance the competitiveness, sustainability, productivity, and resilience of the sector by investing in projects that may include:

- Investments in applied science for major sector commodities.
- Improved support for minor sector commodities and emerging/transformational areas including agri-tech
- Efforts in clean growth, environment, and climate change
- Accelerating the growth of the sector, particularly in the agrifood and value-added food processing sectors
- Strengthening knowledge transfer and adoption

For more information, see: <https://iafbc.ca/agri-innovation/>

\$25.8 million in funding is available over five years.

Canada-BC Agri-Innovation Program

Allows industry, academia, value-added food processors, retailers, and others to access funding for projects involving late-stage research, pilots and demonstrations, as well as the commercialization and adoption of innovative products, technologies, and practices for the agriculture, food, or agri-products sector. Priority for funding will be given to activities identified to advance innovation and competitiveness in BC's agriculture, food, or agri-products sectors, and include:

- Advancement in plant, animal, and food science
- Energy and waste management
- New product development and commercialization
- Improvements in soil, water, and air quality
- Climate change adaptation

\$14 million in funding is available over five years.

Agricultural Clean Technology Program

The Agricultural Clean Technology (ACT) Program is a \$25 million, three-year investment (2018-2021) which aims to support the research, development, and adoption of clean technologies through investments in and promotion of precision agriculture and agri-based bioproducts.

BC Ministry Guidelines and Resources for Farm Mechanization

An online resource on the mechanization of energy, equipment, feed and grain handling, and pesticide application on farms.



Green & Sustainable Transportation

Overview

This sector is defined as mitigating environmental impacts in transportation infrastructure and behaviour.

It includes a variety of objectives, including:

- Promoting multi-modal transportation such as walking, public transit, and cycling
- Adopting electric vehicles (EVs) and other renewable energy sources in transportation such as biofuels, hydrogen, and RNG
- Implementing smart transportation systems and technologies
- Integrating land-use planning that maximizes the use of existing transportation infrastructure and increases the potential for the further development of sustainable transportation options
- Preserving rights-of-way for possible future transportation expansion

The sector contributes to the clean economy by creating economic opportunities in the development of new technologies while reducing the environmental impact of transportation and improving access to jobs at the same time.

Existing Strengths

The potential of the Fraser Valley in this sector relates primarily to its strategic location. Locally, the region is home to two commercial airports which have the potential to serve as hubs for R&D on technologies that reduce the carbon footprint of aviation. It is also home to several transit hubs, and is well connected by rail. Additionally, the region is close to the US border and large population centres within the Cascadia Innovation Corridor, and has a growing digital and information and communications technology (ICT) base of its own.



Barriers

While the Fraser Valley has potential in the development of transportation-based technologies, its existing transportation infrastructure has several limitations, including a lack of transportation options or routes to bypass the main Highway 1 corridor, and the corridor's primarily car and commercial vehicle traffic oriented design. In general, relatively low population density inhibits improvements to connectivity between and within municipalities and other population centres with regards to transit, cycling, and pedestrian routes. There is also an insufficient number of electric vehicle (EV) charging stations.

Key stakeholders

- Local governments
- Transit authorities
- Research & development leaders
- Universities
- Abbotsford International Airport
- Local technology accelerators
- Private businesses
- First Nations

Opportunities

Development of the region's information and ICT infrastructure can support smart mobility solutions and more efficient goods movement both within and through the region. Smart mobility solutions can also be paired with **reverse logistics** and new residential and industrial development to integrate and create efficiencies between transportation and land-use.

The region can also explore the potential for biofuel, hybrid and hydrogen-based aviation research and deployment at Abbotsford International Airport. Additional R&D in the vehicle electrification, logistics, and renewable fuel fields can also create economic opportunities while working towards improvements in sustainability. This also ties into the region's Sustainable Resource & Ecosystem management sector as biofuels produced from agricultural waste and products can be explored as an energy source for transportation.

Making use of these technologies within the Fraser Valley's own transportation network can create similar effects. Through further investment in expanding transit service and electrifying transit fleets; updating infrastructure and smart city applications to enhance walking, transit, and cycling; establishing car, bicycle, and scooter sharing services; expanding electric vehicle infrastructure; and implementing transit software platforms that allow users to easily interact with payment and schedules, the Fraser Valley can improve the regional transportation system while showing leadership in promoting sustainable transportation and building a clean economy.

What is reverse logistics?

The process of moving goods from their final destination backwards through the supply chain for reuse, recycling, or proper disposal. For example, goods or by-products could be moved from a customer back to the manufacturer that would then reuse them in their production operations.

Trends

Electrifying Transportation

CleanBC is driving the electrification of the transportation sector. This is consistent with the trend toward more affordable EV options, as battery costs have decreased as much as 65% in the past five years.

Autonomous Vehicles

80% of top original equipment manufacturers have announced road-ready autonomous technology by 2025.

Smart Mobility

Shared mobility has significant growth opportunity, representing less than 1% of current passenger miles. In 2017, the market saw US\$32 billion invested in ridesharing start-ups alone, and connected cars are emerging as key components of an intelligent transportation network.

Intelligent mobility is becoming more prevalent in Smart Cities, by enabling users to make informed transportation choices based on real-time situation data, and by coordinating and optimizing the movement of freight and people across multiple modes through intelligent transportation systems.

Land Use & Logistics Hubs

Logistics hubs are appearing more frequently due to the significant increase in e-retailing resulting in the need for local distribution points, and apps and other mobile technologies have enabled a proliferation of last-mile solutions. Other important trends in logistics include driverless trucks, the use of blockchain to ensure accuracy and capacity monitoring and drone delivery.

Renewable Fuels

Biofuels comprised 2.8% of renewable fuels for transport as of 2015 and global ethanol production increased 2.5% in 2017. Several international initiatives are working to support this growth. The Biofuture Platform is a 20-country effort aimed at advancing low-carbon fuels and bioeconomy solutions, while Mission Innovation recently announced a Sustainable Biofuels Innovation Challenge to develop ways to produce affordable, advanced biofuels for transportation and industrial applications.

Investment in hydrogen derived from water via electrolysis is growing; if current global projects come online in the next two years, cumulative capacity will rise from 55MW in 2017 to over 150MW in 2020.

Policy Drivers & Resources

Investing in Canada Infrastructure Program

The Canadian government will invest \$3.917 billion in BC infrastructure over 10 years in four key areas:

- Community, culture, and recreation infrastructure
- Rural and northern communities infrastructure
- Green infrastructure
- Public transit

Federal Clean Fuel Standard

The federal government is aiming to enact clean fuel regulations in 2023.

CEV (Clean-Energy Vehicle) Advanced Research & Commercialization

Supports the development of BC companies in the CEV sector and encourages international investment. The program is expected to issue two funding calls of \$675,000 over the next three fiscal years.

BC Renewable & Low Carbon Fuel Requirements Regulation

Fuel suppliers must have a minimum renewable fuel content of 5% for gasoline and 4% for diesel on a provincial annual average basis. They must progressively decrease the average carbon intensity of their fuels to achieve a 10% reduction in 2020 relative to 2010.

BC Clean Vehicle Program

The CEV program has committed more than \$71 million to incentivize the sales of battery electric and hydrogen fuel cell vehicles and investment in charging and hydrogen fueling infrastructure.

BC ZEV (Zero-Emission Vehicle) Legislation

Recently-passed legislation that sets targets of 10% ZEV sales by 2025, 30% by 2030, and 100% by 2040. It is supported by strategies including expanding the size of the province's EV direct-current fast-charger (DCFC) network and increasing the provincial incentive program.

BC Transit Low Carbon Fleet Program

BC Transit will start buying only electric heavy duty buses in 2023, targeting creating a fully electric provincial fleet in all vehicle classifications by 2040. Renewable and low carbon fuels (RNG and CNG) will bridge the transition.



Credit: BC Transit

Green & High Performance Buildings

Overview

The Green & High Performance Buildings sector is defined as supporting the evolution of building materials and energy systems to reduce their environmental impact. It includes products, services, and building materials related to healthy, energy-efficient, and zero emission building design, construction, renovation, and operations such as:

- Building envelope products including pre-fabricated walls and building components, windows and doors, and insulation
- Mechanical systems such as heating, ventilation, and air conditioning (HVAC), and hot water
- Lighting and control systems
- Other construction products such as engineered wood

The sector contributes to the clean economy by creating business and job opportunities and building material manufacturing and construction, as well as in new heating, ventilation and electrical work, while reducing the environmental impact of buildings.

Existing Strengths

The Fraser Valley is well-positioned to be active in this sector through its strengths in local manufacturing and presence of developers experienced in sustainable building construction methods. The region is already home to many manufacturing companies that implement green building principles and technologies and produce modular, pre-fabricated, and wood construction products. This is important to be able to adapt to increasingly higher energy-efficiency standards in the BC building code and the BC Energy Step Code as it is implemented.

Existing builders and developers in the region represent a key source of expertise that can be applied to the development of green building infrastructure. Additionally, the University of the Fraser Valley's (UFV) research and trades training provides modern programs for further developing knowledge and skills in the sector by building talent in areas such as architectural drafting and design, carpentry, welding, electrical, electronics, automation, and robotics.

Barriers

Some gaps in local capability can create challenges to the development of the sector. For example, a lack of knowledge and incentives for home heating companies leads to outdated practices and lower energy-efficiency of buildings.

Opportunities

The high population growth forecasted for the Fraser Valley and the Lower Mainland as a whole creates an opportunity for the development of the green building construction and renovation industry regionally as housing demand stays strong. Furthermore, the continued advancement of the BC Building Code will create demand for a variety of higher-performing products already manufactured and supplied in the region. Incorporating higher steps of the BC Energy Step Code in municipal buildings can showcase the benefits of its envelope first approach.

The region's advantageous access to transportation corridors, large nearby markets, and comparatively affordable land can be attractive to suppliers well-suited for small-scale industrial lands where they can connect easily to local construction sites.

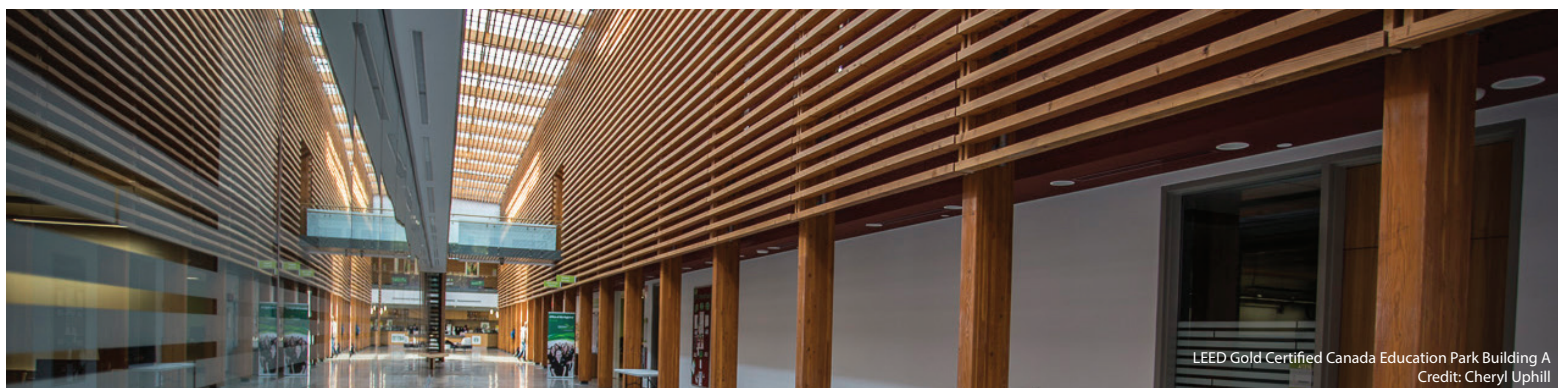
A growing Green & High-Performance Buildings sector can also integrate into the Sustainable Resource & Ecosystem Management sector by having construction companies collaborate with local waste management companies to find pathways for recycling and waste-to-resource streams from manufacturing operations and construction sites across the region.

Construction operations in the Fraser Valley also have the opportunity to integrate with the Knowledge & Innovation sector and apply tools such as 3D printing, smart and life-cycle optimizing equipment, semi-automatic equipment, and enhanced contract and employee management software. Similarly, building architects and construction firms in the region can incorporate advanced building controls and technologies that are increasingly being built into residential and commercial construction to optimize the use of energy and efficiency of lighting, HVAC, security, and sprinkler systems.

More generally, the region has an opportunity to build capacity in energy advisors and train its trade base in best practices.

Key stakeholders

- Building developers
- Local governments
- Product manufacturers
- Universities
- Economic development agencies
- First Nations



LEED Gold Certified Canada Education Park Building A
Credit: Cheryl Uphill

Trends

Envelope First Approach

Policies that are driving high performance envelopes include the BC Energy Step Code, the LEED rating system, and NRCan's High Performance Buildings Program. As a result of these trends, forecast demand for high-performing windows, doors, insulation, air sealing products, and heat recovery ventilation shows promise for sustained business to 2030 and beyond.

Growth of Prefabrication & Modular Construction

Permanent modular construction accounted for 3.18% of the value of new commercial construction in North America in 2016. The modular construction market is valued at US\$106 billion in 2017 and is expected to reach US\$157 billion by 2023. This growth is supported by several initiatives. The Canadian Construction Association created the Lean Construction Institute which encourages off-site/prefab/modular construction, and CanmetENERGY, a research agency of NRCan, is fostering relevant innovation in housing and construction through a series of government incentives and programs. In a recent report by KPMG research, off-site/modular construction was indicated to save up to 7% of total project costs.

Advanced Building Controls & Technologies

Buildings are often constructed with key systems (lighting, HVAC, water, security, fire) already in place, often with stand-alone controls. Systems Integration and Automation services harmonize and standardize controls, and the market is expected to reach \$981 million by 2025, up from \$90 million in 2016. Other key trends in building automation include Building2Grid platforms, IoT energy management, AI for asset management, and standardizing cybersecurity. Additional emerging trends include the ability to order products from inside a building information model, the integration of 3D laser scans and drone footage to provide 100% accurate base layers, and 3D printing of model sub-components for rapid prototyping or for sharing with manufacturing partners. Digital applications are also now being used in construction itself, such as virtual reality (VR)/augmented reality (AR), wearables, drones, cloud computing, and robotics.

Next-Generation Materials & Wood Construction

Structural material currently accounts for 77% of the global advanced market and is forecast to be valued at US\$1.37 trillion by 2024. Locally, BC's Wood First Initiative is supporting the growth of value-added wood products and innovation in the built environment. More broadly, novel construction materials are being developed for nearly every building component, including self-healing concrete, strand rod (carbon fibre) in place of steel cables used for seismic upgrades, hollow bricks with air circulation for in-wall heating and cooling, and GHG-absorbing cement.

Policy Drivers & Resources

Low Carbon Leadership Fund

See Sustainable Resource & Ecosystem Management Policy Drivers & Resources (p. 7)

Green Municipal Fund

The Green Municipal Fund is a \$625 million program that provides funding and knowledge services to support sustainable community development through the Federation of Canadian Municipalities. The funding focus areas are:

- Sustainable neighbourhood and brownfield action plans
- Energy efficiency and recovery
- Transportation and fuel efficiency
- Water quality and conservation
- Waste management and diversion

Funding can be used for:

- Plans
- Feasibility studies
- Pilot projects
- Capital projects

BC Energy Step Code

This performance-based pathway provides local governments and builders with a flexible approach to accelerating net-zero energy ready new construction in BC by 2032. The code will require better building envelopes, higher-performing windows, high-efficiency mechanical systems that reduce energy consumption through heating and cooling.

BC Retrofit Initiative

The Province is investing \$1.1 billion over the next decade to make social housing more energy efficient, less polluting, safer, and cost efficient. The \$400 million retrofit component of the initiative will focus on increasing the use of cleaner energy in 51,000 units of publicly funded and owned social housing.



Renewable Energy Supply & Storage

Overview

This sector is defined as the management of renewable energy and its production, storage, and distribution, and other related technologies. It includes using alternative energy sources such as wind, solar, geothermal, hydro, non-combustible biomass, waste heat to power, and **anaerobic digestion**. It also involves the exploration of energy supply and storage methods such as **district energy**, battery technology, and **smart grid**.

The sector contributes to the clean economy by creating job and growth opportunities in energy research and infrastructure maintenance while reducing the environmental impacts of both energy production and consumption.

Existing Strengths

The Fraser Valley has an opportunity to leverage broader trends in smart grid development, energy storage, and demand for renewable fuels through its existing energy infrastructure. This includes the region's existing electric power generation facilities and its geothermal energy capacity.

Most significantly, the abundance of agricultural and forestry by-products in the region provides it with a strong comparative advantage in the growing field of biogas production.

Hydrogen fuel cells are another source of renewable power that represent an opportunity for the region. Research is currently underway at UFV to optimize the production of hydrogen fuel and improve its economic viability.

Barriers

The primary barrier to the sector's development in the region is a lack of awareness of the opportunities in biogas and RNG. Providing assistance in matching biomass waste and energy production operations can unlock substantial potential in the sector.

Opportunities

To address the gap in renewable energy literacy among farmers and other potential biogas producers there is an opportunity for enhanced coordination between FortisBC, consultants, and training institutions to help potential biogas producers better understand the project development process, available technology, and best sources of information.

The electrification of vehicles, heating and cooling of buildings, and industrial operations creates a demand and opportunity for the development of more small-scale and distributed renewable energy generation, smart grid, and energy storage solutions. For example, micro grids can be applied to the region's remote communities, boosting resiliency and developing projects on land that was otherwise inaccessible to electricity infrastructure. These changes create the associated opportunity to increase grid reliability and resilience in the face of climate change and extreme weather events. Relatedly, there is potential for the development of district energy and geo-exchange systems in the region, which can provide further investment and GHG reduction opportunities.

There is also a strong opportunity within the sector to foster collaboration and new partnerships with the region's First Nations communities. For example, it may be possible to develop increased renewable energy capacity, such as solar generation and energy storage facilities, within local First Nations communities. These opportunities can be advanced through a community partnership model that includes training institutions, technology providers, utility providers, and other First Nations with renewable project experience.

Key stakeholders

- Utility providers
- First Nations
- Local and senior governments
- Agriculture operations and farmers
- Universities



Ruskin Power Station, Mission BC

What is anaerobic digestion?

A collection of processes by which microorganisms break down biodegradable material, which can be used to produce fuels.

What is district energy?

An energy distribution system in which heating or cooling is generated in a centralized location and then distributed to nearby buildings, rather than having each building produce its own through boilers or other means.

What is smart grid?

An electrical grid which incorporates measures such as smart meters and appliances and an interconnected producer-and-consumer network to more efficiently regulate power distribution.

Trends

Explosive Growth in Renewable Technologies & Electrification

Clean energy technology is seeing consistent annual increases accounting for 70% of net additions in 2017, up from 63% in 2016. Furthermore, energy companies traditionally focused on oil and gas are making unprecedented investments in renewables as industry looks to decarbonize through electrification.

Distributed Energy Systems & Grid Infrastructure

Utility and grid operators are seeing new business models emerging, and disruptive energy technologies are expected to reach key milestones in the next decade. Much of this is enabled by energy storage and a shift to smart grid technologies that allow better demand and supply of energy. Smart grid technology specifically is receiving significant investment and has the potential to reduce the projected 2050 demand by up to 24% in parts of the world. The global distributed generation market is expected to grow annually by 15.5% reaching USD\$483 billion by 2024.

Energy Storage Revolution

The costs of batteries have declined as much as 65% in the past five years, and the global battery market is expected to hit US\$250 billion by 2040.

Digitization of Energy

Digitization can have significant impacts on energy grids and enables technical cascades like blockchain and distributed generation. It is forecast to hit US\$45 billion by 2025. The International Energy Agency (IEA) claims digitization is fundamental for transforming electrical utility sectors. Digitization of power and water utilities can yield operational efficiency gains of 10% (vs 1-2%).



FVRD Rooftop Solar Array
Credit: Hawkins Media

Policy Drivers & Resources

Mission Innovation

Mission Innovation will see over 20 countries double the amount of public funds invested in clean energy R&D investment over the next five years. The investments are intended to be innovation-focused, seeking to develop transformational clean energy technologies that can be scaled to varying economic and energy market conditions globally. For Canada, the commitment means doubling its 2014-2015 funding of \$387 million for clean energy and clean technology research and development to \$775 million by 2020.

Clean Energy Innovation Program (NRCan)

Accelerated clean technology research and development (R&D), with priority areas being:

- Renewable, smart grid, and storage systems
- Reducing diesel use by industrial operators in northern and remote communities
- Methane and VOC emission reduction
- Reducing greenhouse gas emissions in the building sector
- Carbon capture, use, and storage
- Improving industrial efficiency

Low Carbon Economy Fund

Supports the Pan-Canadian Framework for Climate Change and Clean Growth by leveraging investments in projects that will generate clean growth, reduce greenhouse gas emissions, and help meet or exceed Canada's Paris Agreement commitments. The fund is split into two parts:

- *The Low Carbon Economy Leadership Fund* – provides \$4.1 billion to provinces and territories that have adopted the Framework.
- *The Low Carbon Economy Challenge* – has over \$500 million available to fund projects that reduce emissions and generate clean growth in support of the Framework.

Green Municipal Fund

See *Green & High-Performance Buildings Policy Drivers & Resources* (p. 11)

CleanBC Communities Fund

As part of the federal-provincial Investing in Canada Infrastructure Program, this fund supports cost-sharing of infrastructure projects focusing on the management of renewable energy, access to clean-energy transportation, improved energy efficiency of buildings, and the generation of clean energy.

Clean Growth Program for Industry

See *Sustainable Resource & Ecosystem Management Policy Drivers & Resources* (p. 7)

Innovative Clean Energy Fund

See *Sustainable Resource & Ecosystem Management Policy Drivers & Resources* (p. 7)

Canada-BC Agri-Innovation Program

See *Sustainable Resource & Ecosystem Management Policy Drivers & Resources* (p. 7)

Knowledge & Innovation

Overview

The Knowledge & Innovation sector is defined as including information and service-based industries, such as education, finance, information and communications technology (ICT), and data science. However, this sector is often integrated with goods-producing industries – including those described in the other sectors of the clean economy – through research and development (R&D), technological advancements, and the collection and analysis of data to optimize agricultural and industrial operations.

It contributes to the clean economy by creating jobs and best practices in sustainable resource management, green transportation, green buildings, and renewable energy.

Existing Strengths

The region is home to an existing collection of R&D institutions, tech accelerators, centres of excellence, and professional innovation networks that, along with UFV, are generally focused on agriculture, manufacturing and digital innovation.

The region's food production supply chain is one of the assets where digital innovation can be applied. For example, the UFV Food and Agriculture Institute is part of a collaboration working on building an integrated food hub network in the region using a platform that enables open-source farm management software and diversified farming systems.

UFV is also host to the Trades and Technology Centre, where faculty are building skills and knowledge across robotics, automation, 3D printing, and architectural drafting using industry-standard technology in virtual reality. UFV is also currently developing the Digital Hub, which will deliver technologically advanced learning for students and industry and provide access to flexible power grids, digital communication platforms, audio-visual equipment and industry-standard digital tools.

Barriers

There are several barriers to the development of the sector in the Fraser Valley. These are primarily a lack of workforce capacity to provide highly skilled technical workers for advanced manufacturing jobs and the ICT sector, and a lack of high-speed internet in certain communities, business parks, and rural areas.

Opportunities

The food production supply chain is one of the assets from which the Knowledge & Innovation sector can grow. For example, biotechnology development can provide the potential to create innovation within agricultural inputs and products. There is an opportunity to create a cluster along the value chain of agriculture foods, biotechnology, land, and ICT to form a strategic hub for logistics and distribution, and leverage the region's proximity to the Cascadia Innovation Corridor.

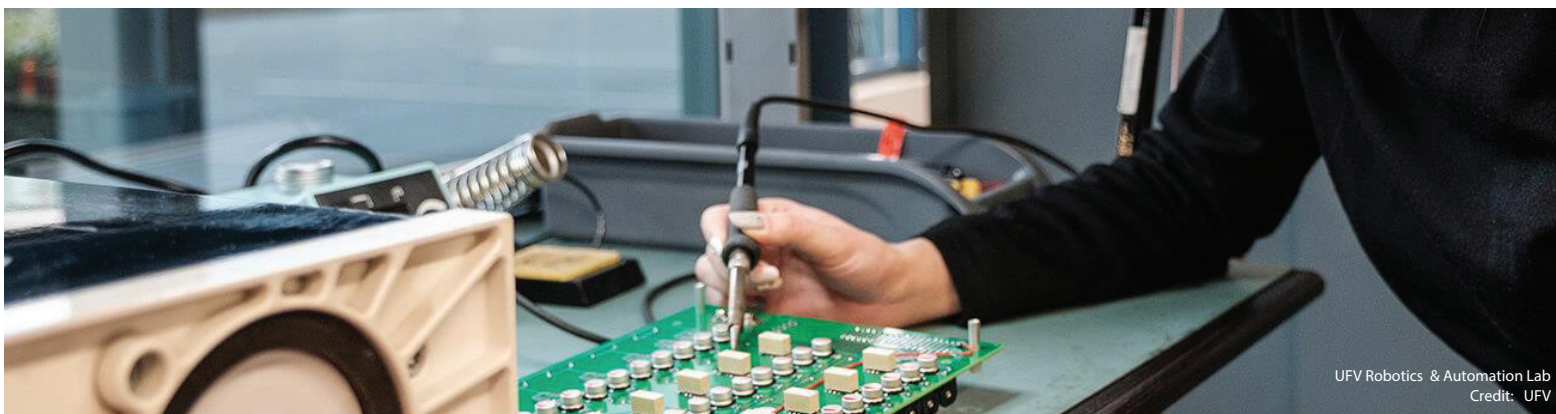
Given the Fraser Valley's land constraints, there is an opportunity for the region to focus on its knowledge-based economy as it can be less space-intensive and allows for business and industry to be built up vertically rather than spread out horizontally. The knowledge-based economy can also increase efficiency and productivity across key sectors such as manufacturing, agriculture, and food processing through the further application of technologies such as automation, instrumentation, blockchain, the internet of things, and cloud technology.

In order to take advantage of these opportunities, the development of the region's knowledge-based workforce is essential. This can be accomplished by expressing clear priorities to UFV for the specific skillsets in demand to help mobilize funds and develop relevant programs in line with local clean economy business strengths and industries. Additionally, a forum can be created with UFV, XLRator (Fraser Valley tech incubator), local municipalities, and/or regional economic development agencies to strategize around high-tech skilled workers and which skills need targeted training and development.

Serving as an example of the potential for such collaboration, interest has already been garnered around creating training partnerships with local companies to advance skillsets in technology and practices used to manufacture engineered wood products. It is important to leverage and attract local expertise to educate and implement new technologies, policies, and projects, and there are opportunities for government in linking new policies and incentives to local experts and suppliers.

Key stakeholders

- Local tech accelerators
- Research & development leaders
- Universities
- First Nations



UFV Robotics & Automation Lab
Credit: UFV

Trends

Artificial Intelligence

2017 saw US\$15.2 billion invested in AI start-ups, a 141% increase over 2016. 62% of organizations in the smart workspaces field expect to have AI-powered virtual assistants in the next two years. Over 40% of enterprises will seek to combine AI with robotic process automation (RPA) representing a market valued at US\$1.17 billion in 2019 and US\$2.9 billion by 2021. The market for AI for AVs is expected to reach US\$10.7 billion by 2024, and the cognitive computing market is anticipated to reach US\$49.9 billion by 2025.

Immersive Experiences

The global market for virtual reality (VR) is projected to be US\$33 billion by 2022, representing a growth of 55% annually. VR applications in the manufacturing sector are anticipated to increase by 98.9% from 2017 to 2021. Combined with augmented reality (AR), the VR/AR market is forecast to reach US\$94.4 billion by 2023, with the AR share growing at 73%. AR for mobile devices is expected to drive growth faster than the VR market, with AR glasses and headsets set to ship 22.8 million units by 2020.

Digital Platforms

Emerging blockchain uses include smart contracts, IoT integration, and content streaming load easing. World Economic Forum outcomes suggested 10% of global GDP will be stored on blockchain by 2027. The FinTech-Blockchain market is expected to grow to US\$8.3 billion by 2024, from US\$207 million in 2017.

The IoT is expected to see business investment reach US\$832 billion by 2020, and consumer spending reach US\$236 billion by 2020, resulting in a cumulative total of US\$6 trillion spent on IoT by 2020.

The cloud computing market is projected to reach \$206 billion in 2019, a 17% increase over US\$175 billion in 2018. Its fastest growing field is Infrastructure as a Service, expected to reach US\$39.5 billion by 2019.

The big data market was estimated at US\$23.5 billion in 2015 and forecasted at US\$118.5 billion by 2022.

Biotechnology & Advanced Materials

The biotechnology market size was valued at over US\$330 billion in 2015 and is expected to double to US\$775 billion by 2024. Key growth areas are anticipated to be DNA sequencing, recombinant technology, fermentation, tissue engineering, and nanobiotechnology.

The advanced materials market is anticipated to reach US\$102 billion by 2024. Advanced materials include ceramics, glasses, polymers, composites, and metals and alloys. Applications include medical devices, automotive, aerospace, electrical/electronics, industrial, and power. The nano-materials market is expected to reach US\$55 billion by 2022, a 20% annual growth from \$14.7 billion in 2015. Nano-materials have applications in paints and coatings, adhesives and sealants, electronics, consumer goods, and personal care products.

Additive Manufacturing (AM)

The AM market is anticipated to reach US\$205 billion by 2020, with the highest growth expected in tooling components and metal castings.

Desktop 3D printers sold approximately 278,000 units in 2015, and by the end of 2018, a total of 529,000 units are expected to sell. Sales for specialized 3D printers for metal additive manufacturing increased from 983 units in 2016 to 1,768 units in 2017. 4D printing is still an emerging technology that allows the components to transform into another shape when exposed to heat, humidity, or any other environmental stimuli. This market is expected to grow by US\$162 million per year to 2022, with the main applications in aerospace and defence, healthcare, automotive, construction, clothing and utilities.

Policy Drivers & Resources

Innovation, Science, and Economic Development Portfolio

17 federal departments and agencies working to build a knowledge-based economy and leverage resources and exploit synergies in:

- *Innovation through science and technology* – helping firms and non-profits more rapidly turn ideas into new products and services
- *Trade and investment* – encouraging more firms in more sectors to export to more markets, and helping Canadian firms attract a larger share of foreign direct investment
- *Growth of small and medium-sized enterprises* – providing access to capital, information, and services
- *Economic growth of Canadian communities* – fostering new approaches to community economic development based on community strengths and information infrastructure

Clean Tech Working Group Strategy

The Pan-Canadian Climate Change and Clean Growth Framework Working Group on Clean Technology, Innovation and Jobs released their final report in September 2016. The report focused on four areas:

- Building and strengthening early-stage clean technology innovation and research, development, and demonstration
- Accelerating clean technology commercialization and growing Canada's commercial capacity in clean technology
- Fostering greater clean technology adoption within Canada
- Strengthening and sustaining collaboration in support of clean technology and clean growth and creating metrics for success

BC Tech Fund

A \$100 million fund investing in tech companies across multiple sectors, including ICT, digital media, clean tech, and life science/healthcare.

British Columbia's Venture Capital program

Provides a 30% credit to BC resident investors who invest in eligible BC companies or managed funds. Businesses must be substantially engaged in the manufacture and processing, or research and development for commercial exploitation, of technologies that do one of the following:

- Increase energy efficiency and conservation
- Reduce greenhouse gas emissions
- Reduce the environmental impact of energy production, generation, storage, transmission, delivery, provision, or conversion

BC Provincial Nominee Program Tech Pilot

As part of the overall Provincial Nominee Program (PNP), the BC PNP Tech Pilot works to ensure that the tech sector can attract and retain top talent. Eligible occupations under the program include engineers, technicians, programmers, and other relevant roles.

BC Cleantech Scale-up Program

BC is investing more than \$711,000 over the next three years in the Alacrity Foundation of BC's Cleantech Scale-Up Program. The program guides growing companies in generating international business opportunities and promotes investment in clean tech companies. BC's support matches federal funding from Western Economic Diversification Canada, along with contributions from Export Development Canada and Alacrity.

Venture Acceleration Program (Innovate BC)

The Venture Acceleration Program (VAP) is a paid structured growth program designed to guide, coach, and grow early-stage tech entrepreneurs and ventures. It helps entrepreneurs define a business model based on a set methodology and set of best practices for growing tech companies.

Foresight Clean Tech Accelerator (Part of the BC Acceleration Network)

Foresight fosters the growth of small and medium size businesses by providing an ecosystem of mentorship, like-minded entrepreneurs, and industry specific guidance. To get companies to commercialization, Foresight has a program with the Business Development Bank of Canada that provides \$250,000 in financing to promising early stage companies provided it is matched by at least the same in private investment.

New Ventures Competition (Innovate BC)

Promotes the growth of early-stage tech companies by providing mentorship, business seminars, networking events, and recognition. It attracts entrepreneurs from a wide range of tech industries including cleantech, ICT, software, bioenergy, agritech, and life sciences.

Ignite Program (Innovate BC)

Ignite provides funding to accelerate the commercialization of new technologies and innovations in the natural resources and applied sciences sectors in BC. The program provides awards of up to \$300,000 to consortia that are conducting research projects that address a significant demonstrated problem faced by industry and will commercialize a proposed innovation within a 3-year timeframe.

Clean-Tech Innovation Strategy for the Forest Sector

See Sustainable Resource & Ecosystem Management Policy Drivers & Resources (p. 7).

BC Scientific Research & Experimental Tax Credit Program (SR&ED)

Designed to encourage research and development in British Columbia that will lead to new, improved, or technologically advanced products or processes. This tax credit complements the federal SR&ED tax credit.

BC Knowledge Development Fund (KDF)

The KDF contributes to fund equipment and facilities in post-secondary institutions for BC scientists and their students to conduct research. Recent revision of the KDF criteria will contribute to advancing BC's knowledge regarding its environment, including reducing greenhouse gases, protecting the environment, and creating innovative clean technologies.

Rural Dividend Fund

The BC Rural Dividend Fund is providing \$25 million a year to assist rural communities with a population of 25,000 or less to reinvigorate and diversify their local economies. It is focused on supporting worthy projects that help rural communities navigate changes impacting their economies, such as attracting and retaining youth, using innovation to drive economic growth, and developing new and effective partnerships to support shared prosperity. Since 2016/2017, the program has provided over \$2.7 million toward 22 cleantech projects across the province.



LEED Gold Certified Canada Education Park Building A
Credit: Cheryl Uphill

Summary

This resource guide provides an overview of the Fraser Valley's existing strengths, gaps, and opportunities as they relate to the clean economy, assesses existing industry trends, and identifies supportive federal and provincial policies to lay the foundation for sustainable growth.

The clean economy is a broad field describing the development of industries that reduce the region's environmental impact while promoting local growth. There is significant overlap between the five sectors identified as the growth or products of one can contribute to the growth of the others. Additionally, the region's existing strong agricultural and manufacturing base serves as the foundation for the development of all these sectors and, in fact, contributes to its comparative advantage within the clean economy overall. While the development of clean economy industries can be complex, this resource guide provides a reference for stakeholders and decision-makers as they work to develop their own relevant strategies to grow the clean economy in the Fraser Valley.



Policy Drivers and Resources Links

Agricultural Clean Technology Program

<https://www.agr.gc.ca/eng/programs-and-services/agricultural-clean-technology-program/>

Agritech Innovation Challenge

<https://innovatebc.ca/what-we-offer/innovation-marketplace/agritech-challenge/>

BC Clean Vehicle Program

<https://www2.gov.bc.ca/gov/content/industry/electricity-alternative-energy/transportation-energies/clean-transportation-policies-programs/clean-energy-vehicle-program>

BC Cleantech Scale-up Program

<https://www.alacritycanada.com/programs/cleantech-scale-up/>

BC Energy Step Code

<https://energystepcode.ca/>

BC Knowledge Development Fund (KDF)

<https://www2.gov.bc.ca/gov/content/governments/about-the-bc-government/technology-innovation/bckdf>

BC Ministry Guidelines and Resources for Farm Mechanization

<https://www2.gov.bc.ca/gov/content/industry/agriculture-seafood/business-market-development/structures-mechanization/farm-mechanization>

BC Provincial Nominee Program Tech Pilot

<https://www.welcomebc.ca/Immigrate-to-B-C/B-C-Provincial-Nominee-Program/BC-PNP-Tech-Pilot>

BC Retrofit Initiative

<https://news.gov.bc.ca/releases/2018PREM0084-002249>

BC Scientific Research & Experimental Tax Credit Program (SR&ED)

<https://www2.gov.bc.ca/gov/content/taxes/income-taxes/corporate/credits/scientific-research-development>

BC Tech Fund

<http://www.kcpl.ca/bc-tech-fund/>

BC Transit Low Carbon Fleet Program

<https://www.bctransit.com/low-carbon-fleet-program>

BC ZEV (Zero-Emission Vehicle) Legislation

<https://news.gov.bc.ca/releases/2019EMPR0018-001077>

British Columbia's capital program

<https://www2.gov.bc.ca/gov/content/employment-business/investment-capital/venture-capital-programs/budget-descriptions>

Canada-BC Agri-Innovation Program

<https://iafbc.ca/agri-innovation/>

CAP Innovation Program

<http://www.agr.gc.ca/eng/about-us/key-departmental-initiatives/canadian-agricultural-partnership/>

CEV (Clean-Energy Vehicle) Advanced Research & Commercialization

<https://arcbc.ca/>

Clean Energy Innovation Program (NRCan)

<https://www.nrcan.gc.ca/science-and-data/funding-partnerships/funding-opportunities/funding-grants-and-incentives/energy-innovation-program/18876>

Clean Growth Program for Industry

<https://engage.gov.bc.ca/app/uploads/sites/391/2018/07/MoE-IntentionsPaper-Industry.pdf>

Clean Tech Working Group Strategy

<https://www.canada.ca/content/dam/eccc/migration/cc/content/6/4/7/64778dd5-e2d9-4930-be59-d6db7db5cbc0/working-20group-20on-20clean-20technology-20innovation-20and-20jobs-20final-20report-20engl....pdf>

CleanBC Communities Fund

<https://www2.gov.bc.ca/gov/content/transportation/funding-engagement-permits/funding-grants/investing-in-canada-infrastructure-program/green-infrastructure/cleanbc-communities-fund>

Clean-Tech Innovation Strategy for the Forest Sector

https://www2.gov.bc.ca/assets/gov/farming-natural-resources-and-industry/forestry/competitive-forest-industry/bc_innovation_strategy_2017-01-18.pdf

Federal Clean Fuel Standard

<https://www.canada.ca/en/environment-climate-change/services/managing-pollution/energy-production/fuel-regulations/clean-fuel-standard.html>

Foresight Clean Tech Accelerator (Part of the BC Acceleration Network)

<https://foresightcac.com>

Green Municipal Fund

<https://fcm.ca/en/programs/green-municipal-fund>

Ignite Program (Innovate BC)

<https://innovatebc.ca/what-we-offer/get-funding/ignite/>

Innovation, Science, and Economic Development Portfolio

https://www.ic.gc.ca/eic/site/icgc.nsf/eng/h_00022.html

Innovative Clean Energy Fund (ICE Fund)

<https://www2.gov.bc.ca/gov/content/industry/electricity-alternative-energy/innovative-clean-energy-solutions/innovative-clean-energy-ice-fund>

Investing in Canada Infrastructure Program

<https://www2.gov.bc.ca/gov/content/transportation/funding-engagement-permits/funding-grants/investing-in-canada-infrastructure-program>

Low Carbon Economy Fund

<https://www.canada.ca/en/environment-climate-change/services/climate-change/low-carbon-economy-fund.html>

Low Carbon Leadership Fund

https://www.canada.ca/en/environment-climate-change/news/2017/12/low_carbon_economyleadershipfund.html

Mission Innovation

<http://mission-innovation.net/our-members/canada/>

New Ventures Competition (Innovate BC)

<https://www.newventuresbc.com/>

Renewable & Low Carbon Fuel Requirements Regulation

<https://www2.gov.bc.ca/gov/content/industry/electricity-alternative-energy/transportation-energies/renewable-low-carbon-fuels>

Rural Dividend Fund

<https://www2.gov.bc.ca/gov/content/employment-business/economic-development/support-organizations-community-partners/rural-economic-development/rural-dividend>

Venture Acceleration Program (Innovate BC)

<https://innovatebc.ca/what-we-offer/connect-with-experts/venture-acceleration-program/>

DRAFT

Fraser Valley Regional District
Clean Economy Study: Resource Guide
November 2019

The full *Fraser Valley Regional District Clean Economy Study* can be found at:
www.fvrd.ca