



Executive Summary

Introduction

AdvantageBC¹ is a non-profit organization that promotes British Columbia (“**BC**” or the “**Province**”) as an attractive location for international businesses. AdvantageBC recognizes that as a result of the global push for a reduction in greenhouse gas emissions, there will be a significant clean economy that develops in coming years. British Columbia is uniquely situated to benefit from this global growth. The Province has built a successful brand as a clean economy, and could leverage its growing strength in clean technology to stay ahead of the curve and take advantage of expected growth.ⁱ In addition, the Province has established itself as a contender in sustainable finance in recent years, as Vancouver has been recognized globally by the Global Green Finance Index as having a quality and depth of green finance offerings that rank it 17th in the world.ⁱⁱ

AdvantageBC hired KPMG to perform an economic study to investigate the potential of clean technology (“**Cleantech**”)² and sustainable finance (“**Sustainable Finance**”)³ sectors (collectively, the “**Sectors**”) in British Columbia. The study had four main objectives:

- 1 Develop an understanding of the current magnitude and trajectory of the Sectors globally;
- 2 Develop a current economic profile of the Sectors in BC;
- 3 Develop an understanding of the size and growth rate of Cleantech or the broader technology (“**Tech**”) sectors in other jurisdictions where robust innovation clusters (“**Clusters**”)⁴ have developed; and
- 4 Estimate the potential economic opportunity available to BC that could result from the development of robust Cleantech and Sustainable Finance Clusters.

¹ All references to AdvantageBC reflect the business name associated with the International Financial Centre British Columbia Society.

² For the purposes of this report, the Cleantech sector consists of firms that are involved in the process or provision of services and products that reduce negative environmental impacts through significant energy efficiency improvements, the sustainable use of resources, or environmental protection activities. This definition of the Cleantech sector excludes early mainstream adopters of clean technologies; business that generate power for sale; and those that manufacture, service, implement, integrate, or consult solely with respect to technologies or systems developed by other companies.

³ This report is leveraging the definition of sustainable finance put forth by the Interim Report by the Expert Panel on Sustainable Finance. For purposes of this report, the definition of the Sustainable Finance sector includes: the capital flows, risk management activities, and financial processes that assimilate environment and social factors as a means of promoting sustainable economic growth and the long-term stability of the financial system. In particular, the report will focus on the following components of Sustainable Finance: Green Bonds and investments in infrastructure that promote sustainability.

⁴ References to Clusters refer to “a geographically proximate group of interconnected companies and associated institutions in a particular field. As detailed in further in this report, researchers have found the presence of Clusters to have a positive impact on the region’s economy.”



Approach⁵

KPMG’s analysis was carried out in the following four stages:

- 1 An assessment was made of the current state of the Sectors globally. This established a baseline knowledge of current performance of the Sectors and their expected future growth.
- 2 An assessment was made of the current state of the Sectors in BC. This was done by leveraging the recently published BC Cleantech Status Report by KPMG in collaboration with the BC Cleantech CEO Alliance, and through secondary literature reviews.
- 3 A review of prominent Cleantech and Tech Clusters in North America was performed. Data was collected on the Clusters to serve as a benchmark for the growth potential available to the Province if Clusters were to form surrounding Cleantech. Simultaneously, a review was performed of secondary literature to understand the economic potential available in the Sustainable Finance sector.
- 4 Using the benchmarked growth rates, the economic opportunity for the Sectors was estimated using Statistics Canada’s Input/Output multipliers.

Key Findings

Economic Profile of the Sectors Globally

Globally the Cleantech and Sustainable Finance sectors have realized significant growth in recent years, after a brief period where investment in Cleantech slowed in the late 2000s. The key findings of the current state of the global Sectors are summarized in the table below:

Economic Profile	
Cleantech	Sustainable Finance
Exports	Increasing Demand
<ul style="list-style-type: none"> – As the costs of inputs and products in the Cleantech space have decreased in recent years, demand in the sector has increased. – Export activity is forecast to reach \$2.5 trillion by 2022; this follows compound annual growth of exports between 2008 and 2015 of approximately 4 percent. 	<ul style="list-style-type: none"> – It is estimated that an additional investment of close to \$300-\$500 billion per year is required to achieve the goals outlined in the Paris Agreement⁶. In particular, much of this investment will be related to building new environmentally friendly infrastructure or retrofitting old infrastructure. Financing required for this activity will be significant.
Investment	Green Bonds
<ul style="list-style-type: none"> – US investment has returned to Cleantech investment levels achieved prior to the 2008 Financial Crisis. China and Europe, large players 	<ul style="list-style-type: none"> – In 2019, there was US \$257.7 billion in green bond issuances, which was annual market growth of 51 percent.

⁵ KPMG conducted desktop research and relied on information and data presented by publicly available sources. In preparing this report, KPMG relied on information and material provided by other parties. KPMG has not audited nor independently verified any of the third-party information. None of KPMG, member firms of KPMG nor any of their respective directors, officers, partners, employees, agents or representatives make any representations or warranties as to the accuracy, reasonableness or completeness of this information, nor shall any of them have any liability for any representations, expressed or implied contained herein, or for any omissions from the report or from any other written or oral communications transmitted in connection with this report. KPMG will not assume any responsibility or liability for losses incurred by AdvantageBC or other parties as a result of the circulation, publication, reproduction or use of this report.

⁶ The Paris Agreement was an agreement reached by parties of the United Nations Framework Convention on Climate Change, the aim of which was to combat climate change and to accelerate and intensify the actions and investments needed for a sustainable low carbon future.



in Cleantech, have been investing billions of dollars in the Sector.

- Patents for innovation in clean technologies are outpacing technology patents in almost all other sectors, indicating that the appetite for innovation in the Sector is growing.ⁱⁱⁱ

- Investment in green bonds, and other related instruments, will likely increase as taxonomies are being produced globally, and locally in Canada, that help to define the Sustainable Finance sector, making it a more easily accessible investment for interested parties.

In general, there is a consistent indication that global activity in both Cleantech and Sustainable Finance is expected to see sustained growth in coming years as the world transitions to a cleaner economy.

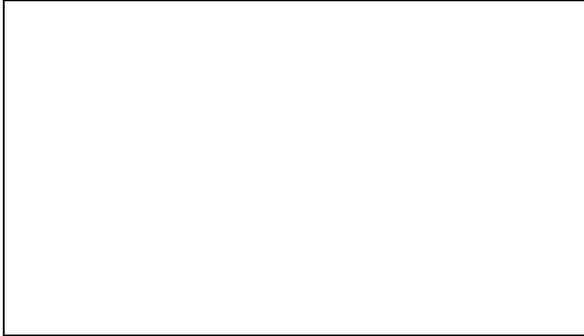
Economic Profile of the Sectors in BC

Both the Cleantech and Sustainable Finance Sectors have a growing presence within the BC economy. Importantly, British Columbia already has a nascent cluster of companies producing Cleantech goods and services. In addition, Sustainable Finance activity has become more prevalent in recent years.

The key findings of the current state of the BC Sectors are summarized in the table below:

Economic Profile	
Cleantech	Sustainable Finance
Revenue	Global Recognition
<ul style="list-style-type: none"> – Revenue growth has remained steady; forecasts estimated a 25 percent increase in expected industry revenues for 2018⁷, and growth of greater than 45 percent between 2018 and 2019 – 2019 revenue is estimated to reach \$3.5 billion 	<ul style="list-style-type: none"> – Vancouver has been recognized globally by the Global Green Finance Index as having a quality and depth of green finance offerings that rank it 17th in the world.^{iv}
Jobs	Green Bonds
<ul style="list-style-type: none"> – Compound annual job growth between 2016 and 2018 was 25 percent; this is significantly stronger than the average compound annual growth rate in BC during the same time period (2.5 percent) – It is estimated that in 2019, Cleantech jobs were estimated to reach 12,419, this translates to a jobs concentration that is 2,500 jobs per million people in the population – BC’s Cleantech Sector employs highly skilled labour earning an average salary of \$82,000 	<ul style="list-style-type: none"> – There appears to be increasing appetite for green bond issuance in the Province. There have been a handful of green bonds issued over the years, including the City of Vancouver and TransLink, with most recent issuances being oversubscribed.
Investment	Sustainable Infrastructure
<ul style="list-style-type: none"> – Between 2016 and 2018, it is estimated that approximately \$1.9 billion in total equity was raised by the Cleantech sector.^v This is nearly twice the amount that was raised between 2014 and 2016. 	<ul style="list-style-type: none"> – It is estimated that Canadian investors could earn between \$23 billion and \$90 billion for choosing to invest in sustainable infrastructure alone.^{vi} – Canada is actively supporting sustainable infrastructure investment through the

⁷ Data reported in the 2019 BC Cleantech Status Update was reported as estimates for 2018



Canadian Infrastructure Bank, which has dedicated two of their four priorities to Sustainable Finance related targets: Green Financing and Public Transit.

- The opportunity available in infrastructure investment is particularly significant for the Province, as one of the top infrastructure investors in the world, British Columbia Investment Management Corporation, is domiciled in British Columbia.



As fundamental changes to business-as-usual are made in order to achieve climate commitments, demand within the clean economy will increase. This will be accompanied by increased demand for Cleantech goods and services, and the need for financing to support the transition to a cleaner economy. The Province is uniquely positioned to benefit from the business and economic growth that will accompany this demand given the current foundation provided by the Sectors. Encouraging the development of the Province into a Cluster for Cleantech and Sustainable Finance may allow for access to significant economic opportunities that simultaneously meet the Province's climate objectives.

Review of Prominent Clusters

Research has demonstrated that Clusters act to accelerate growth within a sector or industry. Clusters emerge when a network of companies or groups cohabit the same geographic location, and thereby collaborate and compete in a way that generates innovation at a growth rate that they wouldn't have achieved in isolation.^{vii} Both academic and applied research has suggested that firms and regions benefit from "clustering." Some of the important economic influences associated with clustering include the following:

- Research highlights that Clusters create robust networks of people and institutions. Research and other case studies have shown that strong Clusters are able to foster innovation through knowledge transfer, and can strengthen entrepreneurship and start-up survival, resulting in positive spillover and economic benefits.^{viii}
- Clusters create a nucleus of talent, allowing an environment where labour understands they have the flexibility to access a multitude of opportunities.
- It has been found that industries that are located in relatively strong Clusters experience much higher growth rates in employment, than those industries located in regions that have weaker Cluster specialization.^{ix}
- Growth rate of wages and firm establishment are also positively impacted by the existence of a strong Cluster.^x

If BC encourages the development of Clusters in Cleantech and Sustainable Finance, it could help to increase the Sectors' share of the Canadian market and allow them to become more competitive on a global scale.

Part of the research performed to understand the potential impact of Clusters on a sector was to review prominent Clusters in North America. These jurisdictions are referenced frequently in literature as regions with a strong Cluster, where the economic performance of the relevant sector exceeds national growth. The compound annual growth rate for each of the comparable jurisdictions was assessed and estimated using publicly available data. This led to a range of Cluster growth rates between 2.8 percent and 8.9 percent with a median of 4.6 percent. This range supports research that highlights the relationship that strong Clusters can support sustained job growth. This information was also used as the basis for estimating the economic opportunity available in the Provincial market, conditional on the development of a strong Cluster.



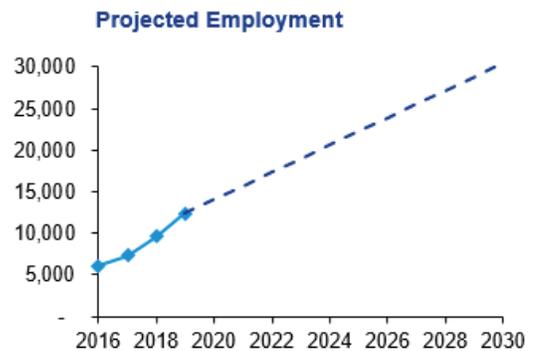
Opportunity in the Cleantech and Sustainable Finance Sectors

Cleantech Sector

As BC already has a nascent Cleantech Cluster, it has a strong foundation to develop into a robust Cluster which will reveal potential growth. Using the growth rates of comparable jurisdictions with prominent Clusters, described above, the median growth rate was then applied to BC's jobs data in order to model out what the growth path could look like for the Cleantech sector in 2030, conditional on the establishment of a robust Cleantech Cluster.

It was estimated that the Cleantech sector in BC has the opportunity to support between 29,000 and 32,000 jobs. This would more than double the current number of jobs in Cleantech in BC and increase the provincial ratio of Cleantech jobs per million people to nearly 5,000.

It was estimated that the Sector would contribute between \$3.4 billion and \$3.6 billion in GDP and \$5.8 billion and \$6.3 billion in output, as measured in 2019 dollars. This would mean that the direct contribution of the Cleantech sector to BC's GDP could almost double, increasing from 0.45 percent in 2019 to approximately 0.9 percent by 2030.⁸



The direct economic impact within the Province is summarized in the table that follows:

Direct Economic Impact: Within Province ⁹		
Output	GDP	Jobs
\$5.8 billion - \$6.3 billion	\$3.4 billion - \$3.6 billion	29,000-32,000

Sustainable Finance Sector

In line with the expanding clean economy, investors within the Province are already showing interest in Sustainable Finance. As the transition to a cleaner economy accelerates, funds will be required to support its evolution. BC will benefit from encouraging the development of a Cluster of Sustainable Finance investors to take advantage of the global growth in the Sector.

As a result of data limitations, the approach for estimating the potential opportunity in BC's Sustainable Finance sector differed from the approach used to estimate the Cleantech sector. A literature review was performed, and a report published by Corporate Knights¹⁰ was identified which provided an estimate of the opportunity available in the Canadian market. The majority of this opportunity is predicted to arise from sustainable infrastructure investment. This could place BC in a position to assert itself in the Sustainable

⁸ BC GDP was extrapolated to 2030 using the Expenditure Based Estimate of GDP and the CAGR between 2007 and 2018. Values were then converted to 2019 dollars using CPI. 2030 CPI was forecasted using CPI CAGR between 2007 and 2018

⁹ The economic impact was estimated using within province multipliers. This therefore summarizes a subset of the total national impact that Sector would have on the Canadian economy

¹⁰ Corporate Knights is a media, research, and financial information products company based in Toronto, Canada, focused on promoting an economic system where prices fully incorporate social, economic, and ecological costs and benefits, and market participants are clearly aware of the consequences of their actions.



Finance market, as one of the largest infrastructure investors in the world, British Columbia Investment Management Corporation, resides in the Province.

To estimate the opportunity in the Sustainable Finance market that could be realized within BC, it was assumed that the Province could capture the same proportion of the Sustainable Finance Sector that it currently has of the Canadian Finance sector.

Under this assumption, it was estimated that the Sustainable Finance sector in BC has the opportunity to support between 11,000 and 20,000 jobs. This would lead to between \$2.4 billion and \$4.5 billion in GDP and \$4.2 billion and \$7.7 billion in output as measured in 2019 dollars. This would mean that the direct contribution of BC's Sustainable Finance sector to BC's GDP could be between 0.6 percent and 1.2 percent.¹¹

The direct economic impact within the Province is summarized in the table that follows:

Direct Economic Impact: Within Province¹²		
Output	GDP	Jobs
\$4.2 billion - \$7.7 billion	\$2.4 billion - \$4.5 billion	11,000-20,000

Encouraging the development of a Sustainable Finance and Cleantech Cluster could introduce substantial economic opportunity to the Province. Leveraging its existing strengths in the clean economy and its brand as a sustainable province, BC may be able to assert itself as a larger contributor to the Cleantech and Sustainable Finance sectors moving forward.

¹¹ BC GDP was extrapolated to 2030 using the \$2012 Expenditure Based Estimate of GDP and the CAGR between 2007 and 2018. Values were adjusted to 2019 dollars using the forecasted CPI for 2030 based upon the CAGR between 2007 and 2018.

¹² The economic impact was estimated using within province multipliers. This therefore summarizes a subset of the total national impact that Sector would have on the Canadian economy