

// BRITISH COLUMBIA'S
GREEN ECONOMY

September 2010

SECURING THE WORKFORCE OF TOMORROW



GLOBE
FOUNDATION



The GLOBE Foundation of Canada is a Vancouver-based, not-for-profit organization dedicated to finding practical business-oriented solutions to the world's environmental problems. Formed in 1993, we've helped companies and individuals realize the value of economically viable environmental business opportunities through our conferences and events, research and consulting, project management, communications and awards program.

We're a leader in championing green initiatives and leveraging sustainable ventures into mutually rewarding opportunities for enterprise and the environment. From urban sustainability to climate change, we're helping change the world by degrees.

For more information on the GLOBE Foundation, please visit our website at:

www.globe.ca

For more information,
please contact:

Paul Shorthouse
GLOBE Foundation
World Trade Centre
578 – 999 Canada Place
Vancouver, BC
Canada V6C 3E1
Tel : (604) 695 5001
Fax : (604) 695 5019
Email : paul.shorthouse@globe.ca



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www.gov.bc.ca

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// Preface

This summary report, **British Columbia's Green Economy: Securing the Work Force of Tomorrow**, is the culmination of the second phase of an in-depth analysis undertaken by the GLOBE Foundation of Canada to identify the core components of the green economy in British Columbia, and to gauge the potential economic and work force opportunities and associated challenges in building the province's low-carbon future.

As noted in the Phase One report of this analysis published in February 2010, **British Columbia's Green Economy: Building a Strong Low-Carbon Future**, the concept of a "green economy" has taken root in political and business circles and is beginning to shape economic policies in many jurisdictions. While acknowledging that "green" elements are present in all areas of the economy, the Phase One report focuses on the six key sectors that supply the bulk of the products and services that contribute to greening the economy in BC. The analysis provides a foundation and a framework upon which to measure the economic and employment impacts of such activities in all regions of the province, and forecast potential GDP and employment impacts that could be reasonably expected by 2020.

This Phase Two summary report is based on 11 months of investigation, research, analysis, and consultation conducted by the GLOBE Foundation. The report builds on the earlier research drawing upon the insights of over 350 secondary sources and provides a more in-depth examination of the labour force implications of a lower-carbon economy in British Columbia—including further statistical analyses of industry and labour market trends for all sectors in every region of the province.

In addition, information was gleaned from more than 70 one-on-one interviews with the CEOs and directors of leading green and clean energy companies in the province, as well as with the leaders of major industry associations, government officials, and the presidents, deans, and instructors from many of BC's post-secondary and trades training institutions. The goal here was to garner first-hand insights from those who are leading the transition to a low-carbon future in this province.

An extensive online survey was also initiated to reach out to a much wider audience of business owners and human resource specialists, to verify the conclusions reached, and to identify potential problems in securing the qualified workers and skill sets that will be required in the future.

Finally, one of the most important facets of the Phase Two research program was a series of focus groups held throughout the province where small groups of community and business leaders were gathered together, alongside academic experts, First Nations representatives, and municipal officials, to discuss regional opportunities and challenges affecting the transition to a greener economy. In addition, a special presentation was made at a gathering of First Nations Chiefs from across the province.

Completion of this phase of the analysis would not have been possible without the enthusiastic support provided to the GLOBE Foundation by everyone involved. The level of interest in this subject was found to be extremely high and the willingness to participate fully in the discussions was present province-wide. The GLOBE Foundation is grateful to all who assisted in the efforts and, in particular, to the Labour Market Agreement, an agreement between the Province of BC and the Government of Canada, that helped make this analysis possible.

To access the full findings of the GLOBE Foundation's study, including more detailed information on BC's green economy and labour market, on green education and training in BC, on the green employer survey, on the regional focus groups, and/or the project methodology, contact the Foundation at info@globe.ca or visit www.globe.ca.





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// Highlights

Greening the Economy – The “green economy” is a concept that is gaining ground as business and government leaders around the world seek to profit from the realities of a lower-carbon future. Spurred by green stimulus spending, ambitious emission reduction targets, rising fossil fuel energy and resource prices, and looming climate related impacts, the green components of the economy are growing faster than the economy as a whole.

Gross Domestic Product – BC’s six key “green” sectors contributed \$15.3 billion to the province’s gross domestic product (GDP) in 2008—\$11.1 billion direct and \$4.2 billion indirect, equivalent to 10.2 percent of the province’s total GDP for that year.

Green Employment – The green elements of BC’s economy were responsible for nearly 166,000 direct and indirect full-time equivalent (FTE) jobs in 2008—equal to 7.2 per cent of total provincial employment.

Growth Potential – Growth scenarios for BC’s economy suggest GDP from its green sectors could grow from \$15.3 billion in 2008 to between \$20.1 billion and \$27.4 billion in 2020, representing between 10.8 percent and 14.1 percent of total provincial GDP.

Green Job Demand – Under a low-growth scenario of 1.9 percent CAGR, the demand for green workers by 2020 will reach 147,000 direct FTE green jobs. Under a high-growth scenario of 4.7 percent CAGR, a total of nearly 202,000 direct FTE green jobs could exist in BC by 2020—an increase of nearly 85,000 jobs over 2008.

Green Job Supply – The supply of green workers may be one of the largest constraints to greening BC’s economy. A growth projection for BC’s green labour force of 1.5 percent CAGR will result in approximately 140,000 green workers in BC by 2020—roughly equivalent to 60,000 skilled green workers short of demand. Supply issues could be addressed through increased education and training/retraining programs and by encouraging entrants into the work force to follow green career paths.

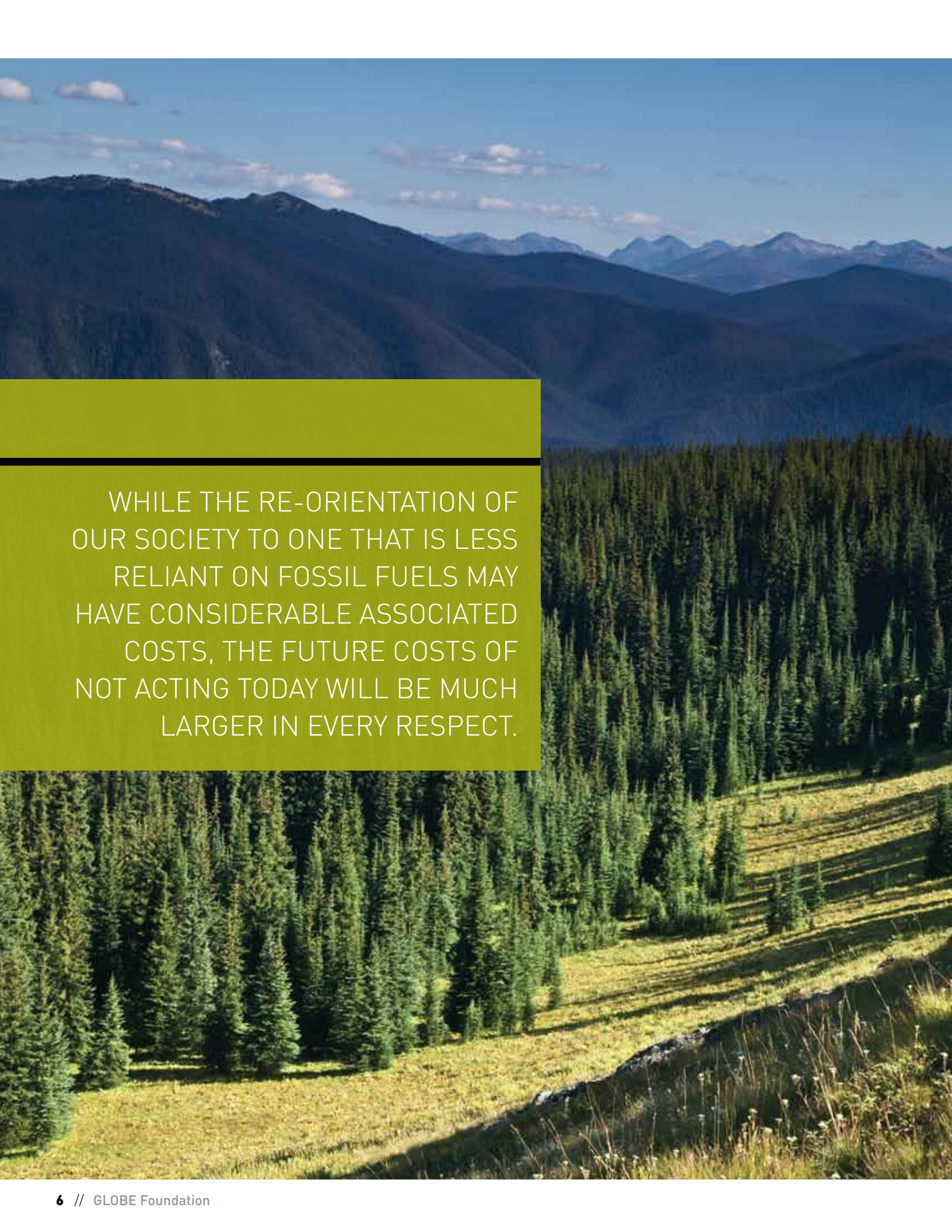
Education & Training – Demand is growing for more training and skill development programs and expanded educational curriculum for engineers, technicians, consultants, and other environment-related professionals. An analysis of the opportunities for re-allocating post-secondary funding toward greener program and curriculum development is warranted.

Skill Shortages – BC is suffering from a shortage of experienced engineers, skilled technologists, and workers certified to install and service complex renewable energy (solar, wind, geothermal, etc.) and water quality management systems. Efforts are needed to increase education and training opportunities in these areas in order to capture the full economic benefits of greening BC’s economy.

First Nations – BC’s First Nations are keen to be active participants in a greener economy. However, a need exists to expand skilled trades and apprenticeship training for rural and Aboriginal populations and to bring learning resources and employment opportunities closer to their communities.

Policy Framework – Achieving the widespread adoption of a green economy involves a re-orientation of our economy and a re-focusing on sustainable development. The policy framework needed to guide this transition must be government-wide in terms of its scope and delivery and must engage all population segments in all regions of the province.

The Future – The transition to a lower-carbon future is not something that BC residents can either choose to do or not to do—as a society, there is no other option. The good news is that BC has all that is needed to make the transition without undue hardship and dislocation, given the right policy framework and clarity of vision. And the sooner BC embraces this shift in full, the stronger its position will be in the global greener economy.



WHILE THE RE-ORIENTATION OF
OUR SOCIETY TO ONE THAT IS LESS
RELIANT ON FOSSIL FUELS MAY
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NOT ACTING TODAY WILL BE MUCH
LARGER IN EVERY RESPECT.

1//Introduction

Greening the economy is a concept that is gaining considerable public interest and political attention around the globe as business and government leaders seek new opportunities in a carbon- and resource-constrained world. Many factors are driving the global shift toward a greener economy, most notably the need to deal with the impacts of climate change, to reduce greenhouse gas (GHG) emissions, to better manage resource shortages, to weather fluctuations in commodity prices, and to create new employment opportunities.

With a global market value of nearly US \$5.2 trillion, the green components of the global economy are growing faster than the economy as a whole. Export opportunities for green products and services to some of the world's fastest developing nations—including China and India—are massive, as these countries look to green their economies and deal with environmental concerns brought on by their rapid industrial growth and growing middle-classes. Spurred by over US \$500 billion in green stimulus spending since 2008, as well as ambitious emission reduction targets, the transition to more sustainable, greener economies is occurring at various speeds around the world.

Nowhere is this economic shift more relevant than in British Columbia, a province that is extraordinarily well-endowed with natural resources and clean, low-cost energy supplies, but which is also highly vulnerable to the shifting tides of international trade and commerce that greatly influence the province's economic and social well-being, as well as the quality of life for its residents.

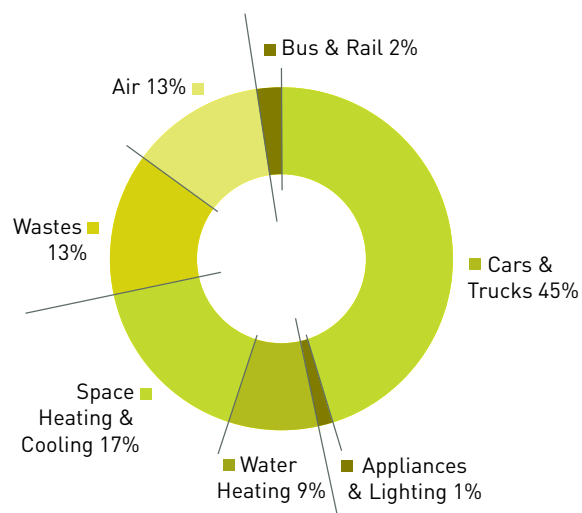
Many of the province's traditional resource-based industries have suffered from fluctuations in commodity prices in recent years and BC's forestry sector is still reeling from the devastating effects of the mountain pine beetle epidemic. To buffer against these business cycle swings and climate related impacts, the province's public and private sectors have been increasing the level of investments in renewable energy, clean technology, and green infrastructure, generating jobs for thousands of BC residents in the process. The province's work force is also in transition and post-secondary institutions and training bodies are busy modifying their programs to usher in new practices and skill sets required for building a more sustainable world.

Despite BC's many environmental and energy related strengths, the challenges associated with lowering BC's per capita GHG footprint are daunting. The province's

residents as a whole are directly responsible for approximately 30 percent of the 67,000 kilotonnes of carbon dioxide equivalent (CO₂e) emissions that were released into the atmosphere in 2007—amounting to nearly five tonnes per person. The province's residents are among the world's highest energy users, with vehicle emissions accounting for nearly half (45 percent) of the total household emissions (see Figure 1.1). The balance of BC's GHG emissions comes from large commercial and industrial operations in the province.

In order to address some of the issues, the BC Government has legislated several initiatives. BC's Climate Action Plan has laid the foundation for the transition to a lower-carbon economy in the province by setting a firm target to reduce GHG emissions by 33 percent from 2007 levels by 2020, and by putting in place policies that encourage the development of BC's clean energy resources. The government has also implemented North America's first comprehensive carbon tax on GHG emissions from fossil fuel combustion, with the intent that these measures would initiate behavioural changes amongst BC residents and businesses.

Figure 1.1: Per household greenhouse gas emissions in BC.
Source: www.livesmartbc.ca/learn/emissions.html



What becomes apparent from the GLOBE Foundation's research is that while BC can be considered relatively "green" by national standards—Corporate Knights magazine awarded BC a "C" in its 2010 Green Provincial Report Card, the highest letter grade for all Canadian Provinces—there is much work to be done in order to increase investments in the greener elements of the economy; to strengthen the domestic market for green products and services; to increase export opportunities; and to build a more resilient, sustainable society for the citizens of this province.

From a business perspective, a "sustainability imperative" has emerged as a new "megatrend" over the last decade, with a fundamental shift in the competitive landscape that creates inescapable threats and game-changing opportunities that will profoundly affect a company's competitiveness and even its survival.¹ According to a recent article in Harvard Business Review magazine, "environmental issues have steadily encroached on businesses' capacity to create value for customers, shareholders, and other stakeholders... and have been magnified by escalating public and governmental concern about climate change, industrial pollution, food safety, and natural resource depletion, among other issues."

There is one overriding message associated with the business case for greening the economy. While the reorientation of our economy to one that is less reliant on fossil fuels may have considerable associated costs, the future costs of not acting today will be much larger in every respect. This message is even more relevant when applied to the need to adapt to climate-related changes that will inevitably impact on the economic foundations of our society.

This reality was brought home clearly in the November 2006 report commissioned by the former British Prime Minister, Tony Blair, and authored by Sir Nicholas Stern, the former Chief Economist of the World Bank. In his review, Stern wrote, "the scientific evidence is overwhelming: climatic change presents very serious global risks ... it demands an urgent global response. Climate change presents a unique challenge for economics; it is the greatest and widest-ranging market failure ever seen."

Nowhere is this fact as painfully clear as in British Columbia. The effects of climate-related impacts have had a devastating effect on one of the province's most important economic sectors—the forestry sector. The primary factor in the spread of the mountain pine beetle infestation is milder winters, hotter, drier summers, and other climatic changes consistent with those scientifically predicted as a result of climate change.

But the impacts of this great forest die-off go far beyond the loss of harvestable timber. Hundreds of communities in BC are located in or near forests and for those residents, the forest sector provides livelihoods, contributes to cultural values, and sustains human health.

In addition, here in BC, significantly reduced winter snowpack conditions have lessened spring runoffs resulting in water shortages in areas critical for drinking water, agricultural production, and hydropower generation. Unseasonably warm summers have become routine and in-turn, have contributed to forest fires on an unprecedented scale. In addition to the effects of climate change, human health has been affected by particulate matter in the air, chemicals in the environment, and by fluctuating commodity prices that make it difficult for individuals and families to support their livelihoods.

Yet for all the interest generated in greening the economy, there exists elements of confusion and misunderstanding about why this transition is needed. Much of this can be attributed to the lack of a clear understanding of what a greener economy in BC means, or of the challenges and opportunities associated with it. For example, while the full impact of BC's carbon tax has yet to unfold, the risk remains that in some quarters it will be seen simply as an increased cost of doing business to be passed on to consumers, rather than as an incentive for changes that would create more green jobs and provide a commercial basis for local suppliers of green goods and services.


This report attempts to clarify some of this uncertainty by providing a definitional framework for BC's green economy, highlighting many of the opportunities for wealth generation and employment, and identifying some of the challenges and possible solutions for realizing these opportunities.

For example, it is anticipated that as the world recovers from the current economic downturn, investment in clean energy and low-carbon technologies and services will increase.

With this investment comes an increased demand for a labour force with the technical skills and knowledge needed to retool key industries to adapt to a more carbon-constrained world. The demand for expertise in energy efficiency, green building design and construction, resource management, and renewable energy is expected to increase significantly.


The key message here is that the transition to a lower-carbon future is not something we can either choose to do or not to do. As a society, there is no other option. The good news is that while environmental and energy issues present some of the world's most pressing challenges, they also present some of the greatest economic and employment opportunities. And British Columbia has all that is needed to make the transition without causing undue hardship and dislocation to its communities and residents.

1. From: David A. Lubin and Daniel C. Esty, "The Sustainability Imperative" (May 2010). Harvard Business Review.



BRITISH COLUMBIA HAS A STRONG FOUNDATION UPON WHICH TO BUILD A LOW-CARBON FUTURE. THE PROVINCE'S CULTURAL, INDUSTRIAL, AND INSTITUTIONAL STRENGTHS THAT CONTRIBUTE TO ITS CURRENT COMPETITIVE ADVANTAGES INCLUDE:

- // Progressive policies and programs to attract investments and to move to a new “greener” economy
- // An environmentally-conscious population that supports a low-impact lifestyle
- // A wide array of socially-conscious environmental networks, organizations, and think-tanks
- // A well-established and widely dispersed low-carbon electricity supply system
- // A large natural resource base, including large reserves of natural gas
- // A full spectrum of available alternative and renewable energy resources and options
- // A host of locally-available clean technology options
- // Strong and growing clusters of green technology and advanced energy companies
- // A widely distributed network of advanced education and skill training institutions
- // A high concentration of research facilities focused on green technology research
- // A hospitable quality of life that attracts a skilled and diverse workforce
- // A strategic location as Canada's Pacific Gateway to the rapidly expanding economies in Asia



The GLOBE Foundation quantified the contribution of the six key green sectors to BC's economy by identifying the relevant industry codes using the North American Industry Classification System (NAICS) and by analyzing the relevant intensity ratios, or percentage of green activity, found within each NAICS code.

A Statistics Canada Input-Output model was then used to generate the macroeconomic GDP and job numbers based on 2008 Canada Revenue Agency data for BC firms.

While every effort has been made to accurately measure the size of the green elements in BC's economy, the GLOBE Foundation recognizes that some green economic and job contributions made by industries outside of the six key sectors identified may not be fully captured due to the limitations of this sector-based framework approach. For this reason, green GDP and job numbers presented in this macroeconomic study are considered to be conservative estimates.

2//Greening BC's Economy

The green economy is defined as a fast-growing economic development model that focuses on the creation of green jobs, the promotion of real, sustainable economic growth, and the prevention of environmental pollution, global warming, resource depletion, and ecological degradation.

Greening BC's economy involves a transition to one that is powered by green technologies and practices in every dimension of society and one that generates green jobs, creates more sustainable businesses, and stimulates low-carbon investments province-wide. It is important not to consider the green economy in BC as separate from the economy as a whole, but rather as a growing trend that is apparent across all industries and all sectors.

The core green components of BC's economy can be quantified using a framework that consists of six key sectors responsible for supplying the bulk of green products and services to other areas of the economy in order to help lower GHG emissions and to reduce human-related impacts on the environment.

These six sectors are:

- 1. Clean and Alternative Energy** (including renewable energy, bioenergy, and fuel cells);
- 2. Energy Management and Efficiency** (including energy storage, transmission infrastructure and smart grid, energy efficient lighting and heating, ventilating, and air conditioning (HVAC), and sustainable transportation);
- 3. Green Building** (including green construction, infrastructure development, community design, and real estate);
- 4. Environmental Protection** (including elements of agriculture and silviculture, remediation, pollution control, and environmental consulting);
- 5. Carbon Finance and Investment** (including carbon management, offset markets, and venture capital); and
- 6. Green Knowledge and Support** (including research and development (R&D), advanced education and training, law, information and communications technology (ICT), non-governmental organizations (NGOs), and the public sector).

In 2008, these sectors generated \$18.4 billion in revenues for BC companies and contributed roughly \$15.3 billion

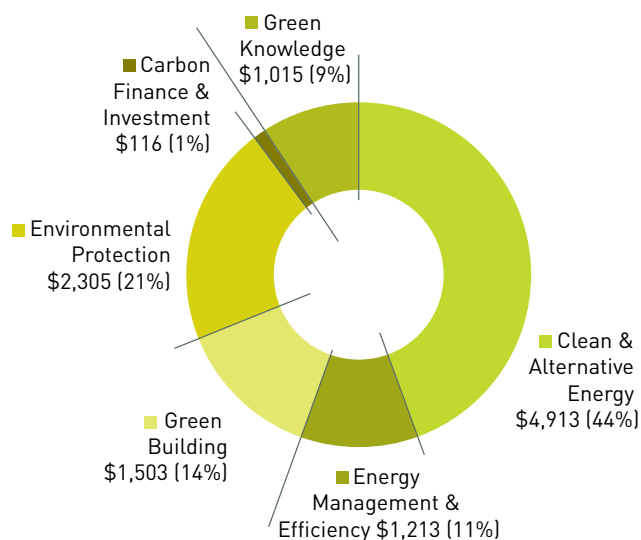


Figure 2.1: Direct GDP contributions by sector to BC's green economy in 2008 (\$ millions)

Source: GLOBE Foundation.

to the provincial GDP (\$11.1 billion direct and \$4.2 billion indirect)—which was equal to 10.2 percent of the province's total GDP for that year (see Figure 2.1). The greatest contribution comes from electric power generation, transmission, and distribution in the Clean and Alternate Energy sector, which can be largely attributed to the province's clean hydro-electricity system. Most of the activity in the green sectors of BC's economy is concentrated in the south-western regions of the province—the areas with the highest populations and access to infrastructure. However, other regions throughout BC are directly responsible for the generation of a large percentage of the wealth from the exploitation of the province's natural resources, including its renewable energy capacity, abundant supplies of lower-carbon natural gas, and its green forestry-related products.

Research suggests that BC's economic future under a low-carbon regime is particularly promising. Based on a combination of data sources, including the BC Major Projects Inventory, BC Statistics, Statistics Canada, Central 1 Credit Union, and Informetrica Ltd., as well as a wide range of domestic, national, and international industry forecasts, the green elements of BC's economy are growing faster than the province's economy as a whole and are expected to continue to do so over the next decade.

THE GREEN ELEMENTS OF BC'S ECONOMY ARE GROWING FASTER THAN THE PROVINCE'S ECONOMY AS A WHOLE AND ARE EXPECTED TO CONTINUE TO DO SO OVER THE NEXT DECADE.

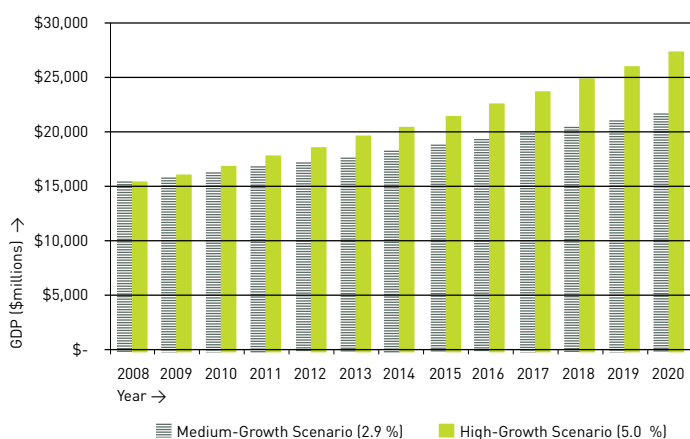


Figure 2.2: Medium- and high-growth scenarios for BC's green economy from 2008 to 2020.

Source: GLOBE Foundation

The compound annual growth rates (CAGR) for each of the industry NAICS codes identified as part of BC's green economy were calculated for the 2008 to 2020 period. Under a medium-growth scenario of 2.9 percent CAGR, the province's green GDP (both direct and indirect) would increase from \$15.3 billion in 2008 to \$21.5 billion in 2020 (see Figure 2.2), equivalent to 10.9 percent of BC's economy as a whole—assuming that BC's economy as a whole grows at its projected rate of 2.4 percent to 2020. Under the high-growth scenario of 5.0 percent CAGR, BC's green GDP (direct and indirect) would grow to \$27.6 billion by 2020, equivalent to 14.1 percent of total provincial GDP.

Growth in BC's green economy will be driven in part by the development of major green and clean energy projects. British Columbia's Major Projects Inventory for December 2009 reveals that there were 62 green and clean energy projects under construction in BC, with a total investment valued at more than \$12 billion (see Figure 2.3). Another \$52 billion in projects are proposed for development in the province, including those related to the 27 new Electricity Purchase Agreements between BC Hydro and various Independent Power Producers (IPPs) from March through August 2010. The North Coast/ Nechako and Northeast Development Regions could potentially see the largest green job creation benefits relative to the size of their current labour force, stemming from investment in these proposed major projects. In addition, BC's Innovative Clean Energy (ICE) Fund is investing \$25 million annually into clean energy projects province-wide.

In terms of trade in green products, BC exported more than \$1.3 billion in green commodities in 2009 (including \$290 million in clean electricity). The province also imported nearly \$2.4 billion in green equipment, machinery, and electricity, some of which was sourced from high-carbon generating facilities (see Figure 2.4). This negative trade balance for green technologies and products has been growing steadily in the province since 1999 and stood at a cumulative balance of more than \$4.4 billion in 2009.

With the exception of some equipment and machinery exports coming from the Energy Management and Efficiency, Green Building, Environmental Protection sectors, BC has historically followed a pattern of trade and commerce that trends toward the export of raw natural resource and energy commodities, and the import of manufactured technologies and products.

British Columbia's weakness in product exports is somewhat compensated for through its stronger export of consulting and environment-based services. Further export diversification of BC's mind and management expertise for addressing environmental issues is seen as a huge opportunity—especially in relation to emerging nations, such as China and India, where environmental concerns are growing and the countries are actively looking to green their economies.

In addition, the analysis behind this report suggests that there are many opportunities for increased export promotion and/or import substitution—i.e., where products and technologies currently imported could be targeted for investment promotion efforts to establish profitable, job-creating manufacturing, or fabrication opportunities here in BC. Areas that have been identified so far include product categories with high strategic importance including potable water and wastewater management technologies, renewable energy technologies, as well as electrical transmission, distribution, and storage systems. Export promotion can also be achieved through the development of

PROJECT TYPE	CONSTRUCTION	STARTED (Q4 2009)	PROPOSED	
	Investment (\$m)	Total GDP (\$m)	Investment (\$m)	Total GDP (\$m)
Environmental Engineering	\$1,275	\$880	\$3,297	\$2,275
LEED Building	\$4,834	\$3,335	\$2,688	\$1,855
Transmission	\$947	\$653	\$2,048	\$1,413
Run-of-River Hydro	\$799	\$551	\$9,034	\$6,233
Other Hydro	\$21	\$14	\$10,704	\$7,386
Wind	\$600	\$414	\$12,990	\$8,963
Bioenergy/Waste to Energy	\$72	\$50	\$1,784	\$1,231
Marine/Wave/Tidal	\$226	\$156	\$40	\$28
Transit/Transportation	\$3,144	\$2,169	\$4,595	\$3,171
Natural Gas	\$200	\$138	\$4,675	\$3,226
Total	\$12,118	\$8,361	\$51,855	\$35,780

Figure 2.3: Major Green and Clean Energy projects currently under construction and proposed for development in BC.

Source: BC Major Projects Inventory, December 2009

Figure 2.4: 2009 revenues for BC trade in green commodities (\$ thousands).

Source: GLOBE Foundation (based on Statistics Canada data)

PRODUCT CATERGORY	EXPORTS	IMPORTS	TRADE BALANCE
Electrical Energy	\$289,443	\$359,129	-\$69,686
Waste Water Management	\$193,992	\$418,233	-\$224,241
Monitoring and Analysis	\$167,182	\$260,921	-\$93,739
Renewable Energy Plant	\$144,509	\$134,340	\$10,169
Renewable Biomass	\$144,509	\$134,340	\$10,169
Heat Energy Management	\$94,821	\$244,901	-\$150,079
Solid Hazardous Waste	\$84,976	\$115,208	-\$30,232
Air Pollution	\$70,081	\$130,009	-\$59,928
Electrical Transmission & Distribution	\$62,516	\$239,126	-\$176,610
Other Recycling Systems	\$25,901	\$9,719	\$16,182
Potable Water Management	\$20,279	\$58,766	-\$38,487
Batteries (includes fuel cells)	\$15,166	\$12,683	\$2,483
Oceanographic and Surveying	\$13,835	\$25,843	-\$12,008
Clean Transportation	\$185	\$240,343	\$240,158
Total All Countries	\$1,327,395	\$2,383,559	-\$1,056,164



Figure 2.5: The Richmond Speed Skating Oval, built for the 2010 Winter Olympic Games, was constructed using cross-laminated timber from BC.

Source: www.structurlam.com

BC MUST BUILD ON ITS ASSETS AND STRENGTHS TO GAIN COMPARATIVE ADVANTAGES THAT WILL POSITION THE PROVINCE EFFECTIVELY FOR THE FUTURE.

international, cooperative Centres of Excellence—an example of such being the new Net Zero Canadian Research and Development Centre to be built as part of the Eco-Business Park in Tianjin Eco-City, designed to showcase Canadian green building technology-based companies in China.

While emerging opportunities are presenting themselves in the six key sectors of the green economy, BC must build on its assets and strengths to gain comparative advantages that will position the province effectively for the future.

In the **Clean and Alternative Energy** sector, BC has relied for decades on its low-carbon hydro power assets for generating electricity for its residents and for export revenues. With a changing climate and potentially reduced water levels, the province has been diversifying its renewable energy base.

British Columbia has recently entered the wind energy industry and is working to deploy both solar PV and solar thermal technologies province-wide. These renewable energy sub-sectors offer meaningful investment and job creation opportunities for the province, despite the reality that BC will likely never be a global force in these areas.

Geothermal has yet to get a foothold in BC, despite having some well-established companies in this area and a strong mining industry in the province. This is due in part to land tenure and permitting issues which need addressing in order to develop this resource opportunity further.

In the areas of wave and tidal energy production, BC has significant natural resource assets and could capitalize on its current R&D strengths in order to potentially gain a significant position in an infantile but growing world marketplace.

Bioenergy-fuelled heating and power solutions also present immediate opportunities for industry and for helping rural and First Nations communities reduce their GHG emissions and become more energy self-sufficient.

British Columbia's world-renowned hydrogen fuel cell industry, which consists of more than 40 companies and 1,100 direct jobs, is gaining new strengths in stationary power—the Hydrogen Assisted Renewable Power (HARP) project in Bella Coola as one example. The sector is also responsible for powering the world's largest fleet of 20 hydrogen buses in Whistler. If the International Energy Agency's prediction that hydrogen fuel cells could be powering 30 percent of the global passenger vehicle stock by 2050 becomes a reality, the province could be well positioned, with a current global market share for fuel cells of 16 percent.

In the **Energy Management and Efficiency** sector, BC has strengths in natural gas engine technologies and related infrastructure—an area that offers considerable potential for developing partnerships to address domestic vehicle and transport fleet emissions, especially in-line with Canada's Pacific Gateway and the province's shipping ports.

British Columbia is also on the front line of the electric vehicle revolution with BC residents switching to hybrid vehicles at double the rate of the Canadian average. The Pembina Institute suggests that in 20 years time, one in every three vehicles on BC's roads could be electric. Many municipalities and public institutions have adopted hybrid and/or electric vehicles into their fleets and companies in the private sector are active in electric drive-train development, as well as battery technologies, chargers, converters, and system controls.

Public transportation initiatives are also important. A recent Memorandum of Understanding (MOU) signed by the provincial government and the TransLink mayors' council suggests that the provincial government is willing to look at reallocating some of its existing revenue to pay for transit and to talk about potential new and innovative revenue sources in order to create a more livable, environmentally sustainable region.

Plans by BC Hydro to install new smart grid infrastructure—which includes replacing all of the public utility's 1.8 million customer meters with "smarter" digital ones—will provide better demand-side management and is expected to promote energy conservation in the province. A number of BC companies are active internationally in the smart grid sub-sector, with proprietary wireless and software-based applications.

In addition, energy-saving lighting (for example, light-emitting diodes or LED) and system controls, as well as efficient heating solutions—including geexchange systems and district energy technologies—present enormous opportunities for reducing energy consumption and GHG emissions within the built environment. A few companies in BC, including Terasen Gas and TerraSource, are actively involved in developing and operating these energy efficient heating projects.

There is room to support BC companies in all areas of the Energy Management and Efficiency sector through increased local procurement of homegrown technologies in order to build a more robust domestic industry and stimulate job growth.

In the **Green Building** sector, new low-energy and resource efficient design practices, more stringent building standards, and advanced construction materials, often employing pine-beetle killed wood—such as cross-laminated timber (see Figure 2.5), concrete products, wooden window frames, and wood-based fibre for insulation—are shaping BC's built environment and creating new jobs. Green retrofitting has become a primary focus for many municipalities, considered the "low-hanging fruit" that can provide immediate reductions in energy consumption and GHG emissions.

BC has become a hub for green building and community design, with more than 1,260 Leadership in Energy and Environmental Design (LEED) Accredited Professionals, 346 projects registered between 2004 and May 2010, and over one-quarter (28 percent) of all LEED certified projects in Canada (see Figure 2.6). BC has the highest number of LEED buildings per capita of any province in Canada. In addition, there are more than 80 companies offering the Built Green Program and over 2,400 homes enrolled in the program in BC. The Industrial Commercial and Institutional (ICI) sector is also actively adopting green building practices and standards, including those offered by LEED and the Building Owners and Managers Association's (BOMA) Building Environmental Standards (BEST) program.

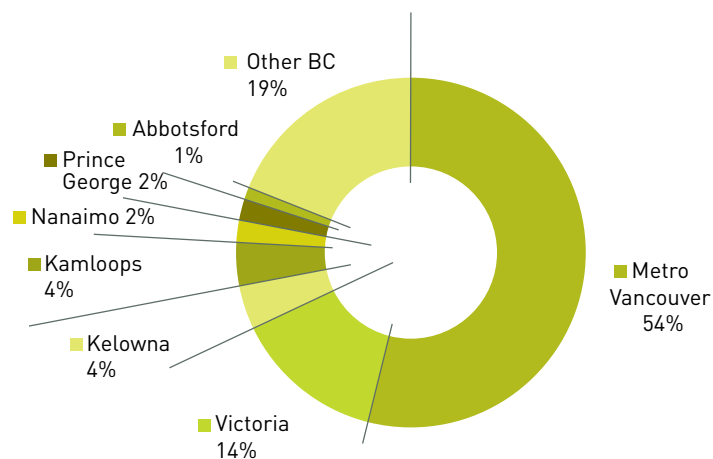


Figure 2.6: LEED registrations by BC community from 2004 to 2010.

Source: Canadian Green Building Council, 2010

Notwithstanding these advantages, challenges remain in terms of the pace of deployment of green building practices and products in the province. The greening of provincial and municipal building codes, which is an ongoing process in BC, is helping to remove some of the barriers to the deployment of these new technologies and practices, so long as it develops in cooperation with industry capabilities. There is also room for improvement of on-site waste management practices across all sub-sectors of the construction industry.

In the **Environmental Protection** sector, British Columbia has a long history of progressive environmental stewardship. Indeed, it is an export commodity of some significance and is an area with positive growth potential. Increasingly rigorous enforcement of regulations for water use, waste management, and pollution control are important for local environmental businesses.

Water metering will become increasingly important in many jurisdictions as the effects of climate change and population growth impact on BC communities. Investing in R&D and supporting the commercialization of urban and rural agriculture practices and technologies will help to close loops in the supply chain, ensure food security, add value to agriculture-based products, and build a more resilient green economy in BC. Establishing a clear value on the province's living forest reserves and sequestered carbon also presents significant opportunities.

The **Carbon Finance and Investment** sector is a relatively under-developed area of the green economy. In part, this is due to lingering uncertainties about the evolving carbon market and the eventual nature of national or regional cap-and-trade regimes both in Canada and the United States. Greater efforts to promote carbon offset project development and aggregation, as well as to educate business leaders, governmental officials, and the public at large on the job creating potential of effective carbon management strategies will be important in accelerating the transition towards a greener economy.

In terms of investment, BC already has one of the most attractive tax regimes in North America which, coupled with Vancouver's designation as an International Finance Centre that includes incentives for clean technology patents and development, can be further promoted to attract favourable foreign business and investment.

British Columbia's strengths in generating venture capital, which have for years been targeted toward the province's mining sector, can now be re-focused on clean technology and green company development.

In addition, an opportunity exists for BC's financial sector to provide insurance products that address climate adaptation risks and could generate additional revenue for the local economy, create jobs, and provide further clarity in terms of the uncertainty BC faces as the climate changes.

Finally, the **Green Knowledge and Support** sector is one of BC's greatest green economy assets. Well-established advanced research facilities integrated with various post-secondary educational institutions throughout the province have enabled BC to develop the largest clean technology cluster in Canada compared with national GDP, with a large number of firms operating at the developmental and pre-commercial stage².

A strong ICT sector in the province, including wireless and database management expertise, has the potential to further reduce GHG emissions by improving processes and developing "smarter" systems.

In addition, committed members within provincial and municipal governments and a wide array of supporting organizations are accelerating the transition to a greener economy in BC through progressive initiatives.

By developing innovative practices, adopting new technologies, and consulting the services offered by firms that are part of the six key sectors, traditional primary resource-based industries—including mining, forestry, agriculture/aquaculture, and oil and gas—are progressively "greening" their operations across the province. The same holds true for secondary and service-based sectors, such as in the manufacturing, wholesale, retail, transportation, warehousing, tourism, hospitality, and food services industries.

British Columbia's mining industry, in particular, plays an important role in the greening of the economy. Metals, including gold, copper, and molybdenum, are used widely in electrical equipment, wiring, environmental machinery, and other clean technology products, such as wind turbine towers. In addition, the demand for clean technologies has spurred interest in rare earth elements and metals, such as lanthanum, neodymium, and beryllium, which are mined in BC through small, low-impact operations. Metal recycling is also an important aspect of BC's mining operations—as evidenced by Teck Resource's electronic waste recycling program at their Trail operations.

The mining industry in BC has been working with environmental scientists, monitors, and consultants for years in order to reduce energy consumption and to ensure the impact of operations is minimized. As a result, metals are extracted in the province under some of the highest environmental standards in the world, creating the potential for showcasing this industry sector as a global model for responsible mining.

The biggest challenge for this industry is the public's perception that the industry is dirty and has a large environmental footprint. However, with the application of new, cleaner technologies and more efficient processes, the industry has evolved into something far more sustainable and remains a critical component of the emerging low-carbon economy in BC.

It is also important to recognize that internal, "grass roots" efforts are being made within many organizations in other areas of BC's economy that fall outside of the six key green sectors. Green teams and committees, sustainability managers, and engaged employees are working to improve environmental performance within their companies and to promote energy and resource efficiency.

Notwithstanding this, efforts to green BC's economy face multiple challenges including a lack of awareness and understanding in some key areas of business, with governments at all levels, and with the public at large. A greater awareness of the opportunities presented by the transition to lower-carbon operations and from the more efficient use of energy and resources needs to be developed. BC's small market size, its relatively low-cost, clean electricity and natural gas supplies, and its poor track record in the early adoption of locally-produced green technologies and services, adds to these challenges. Many of these issues can be addressed through the proper alignment of forward-looking policies—such as a properly structured feed-in-tariff (FIT) program, a coordinated green procurement strategy, and by re-investing carbon tax revenues into green activities—as well as through increased partnerships and incentive programs.

2. Sustainable Technology Development Canada (2010), The 2010 SDTC Cleantech Growth & Go-To-Market Report

SOME OF THE KEY MESSAGES ARISING FROM THE RESEARCH AND CONSULTATION FOR THIS PROJECT INCLUDE:

// BC's low priced energy acts as a barrier to lower-carbon energy development and deployment – The availability of low-cost natural resources in BC, including electricity and natural gas, can act as a disincentive for companies and individuals to change their patterns of consumption or to embrace renewable energy and cleaner, more energy-efficient technologies. Increasing and re-investing revenues from the BC Carbon Tax into lower-carbon initiatives could help stimulate the development of greener industries and the adoption of cleaner technologies.

// Long-term funding and programming is essential for greening the economy – Attention must be given to supporting long-term policies, programs, and funding arrangements for renewable energy and energy efficiency. Programs such as LiveSmart have been irregular and this has created uncertainty in the marketplace with respect to demand and supply capacity. Funding for advanced education and applied research is key for technology R&D, and for greening the labour force.

// Incentives are needed in the early stages to help green the economy – Strong incentives are needed to promote renewable energy development and the decentralization of electricity generation. One of the most often repeated suggestions during research for this project, now provided for under the Clean Energy Act, was for a well-structured feed-in-tariff for renewable energy as a means to build local market demand which in-turn, would create new jobs. Other suggestions included the adoption of policies that require green procurement favouring local content in certain projects, or long-term supply contracts that allow BC-based green companies to strengthen their market presence.

// Streamlining permitting and regulatory processes would speed up project implementation – Permitting and application review processes are very time consuming and need to be streamlined and better coordinated at all levels of government in order to speed up the approvals process. In particular, the environmental review process needs to be streamlined to eliminate unnecessary and costly duplication. Greater attention also has to be paid to First Nations concerns and issues in order to ensure First Nations participate as full partners in the decision making process that will affect their communities and their economic and social well-being.

// Building codes need to be harmonized and made more accommodating to new technologies – There is a need for increased flexibility in building codes to allow for new technologies to be tested and certified for use in retrofits and new green building. Greater harmonization of federal, provincial, and municipal building codes should be considered and measures put in place to reduce risks for utilities or municipalities when adopting new technologies for municipal infrastructure improvements.

// The long-term vision and the opportunities must be clearly communicated to all stakeholders – The vision of what constitutes a green economy differs from one region to the next and there are widely divergent viewpoints with respect to priorities and programs to achieve a lower-carbon future. The government must work harder to convey a clear and consistent long-term vision of what needs to be done in order to green the economy and to highlight the business benefits of why such a transition is important.



IN THE TRANSITION TO A LOWER-CARBON, GREENER ECONOMY, THE LINES BETWEEN ENVIRONMENTAL JOBS AND JOBS IN MORE TRADITIONAL SECTORS BECOME INCREASINGLY BLURRED.

3//BC's Green Labour Market

The United Nations Environment Programme (UNEP) has defined green jobs as those positions in agriculture, manufacturing, research and development, administration, and the service sector that contribute substantially to preserving or restoring environmental quality³. This includes jobs that directly or indirectly help to protect ecosystems and biodiversity; reduce the use of energy, materials, and water consumption; “de-carbonize” the economy; and minimize or avoid waste and pollution.

In-line with the definition above, when an occupation produces an output or lowers the price of a product that offers positive environmental externalities, this may be considered in whole or in part a green job. Two examples would be the net environmental impacts when an engineer remediates an old mining site, or when a solar panel manufacturer increases the supply of photovoltaic (PV) panels, thus reducing their cost to the market.

Most green jobs are not new jobs but rather are based on existing occupations that become in a sense “greener” as they build environmental skills and tasks into their everyday duties. As such, in the transition to a lower-carbon, greener economy, the lines between environmental jobs and occupations in more traditional sectors are becoming increasingly blurred. While job descriptions for strictly environmental careers will continue to exist, traditional occupations, such as engineers, architects, property managers, electricians, construction workers, financial advisors, and ICT specialists, to name but a few, will increasingly incorporate aspects of sustainability and green practices. Employment growth in green jobs will be directly related to increased investment in efforts that improve the environment, reduce pollution, or lower GHG emissions.

It is also important to recognize that a full definition of green jobs must recognize that every job has both “green” and “brown” effects, just as every “green” project has some impact on the environment. For example, while a wind park releases near-zero GHG emissions, its development will have an impact on the surrounding ecosystem—an impact which is important to minimize.

In 2008, the green elements in BC’s economy were responsible for nearly 166,000 full-time equivalent (FTE) jobs—117,000 direct and 49,000 indirect—equal to 7.2 percent of total provincial employment. While the Clean and Alternative Energy sector is the largest in terms of green GDP generation, other sectors of BC’s green economy are more labour intensive and are therefore responsible for more jobs. As illustrated in Figure 3.1, the Environmental Protection sector was responsible for approximately 32,700 direct FTE jobs in 2008, equivalent to more than one-quarter (28 percent) of all green jobs in the province.

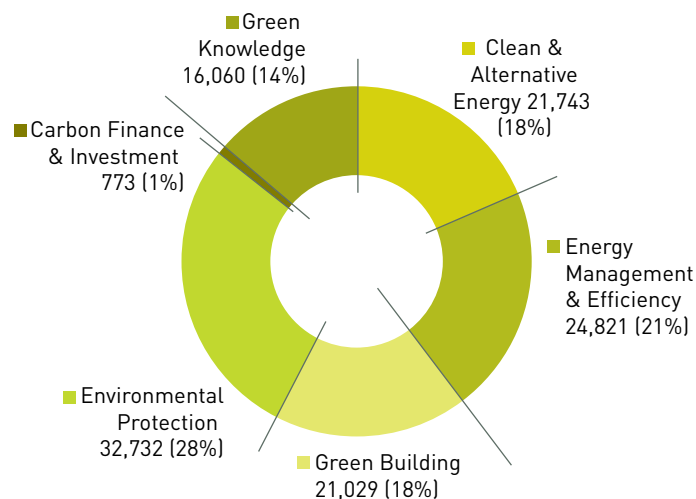


Figure 3.1: Direct full-time equivalent jobs in BC's green economy by sector in 2008.

Source: GLOBE Foundation

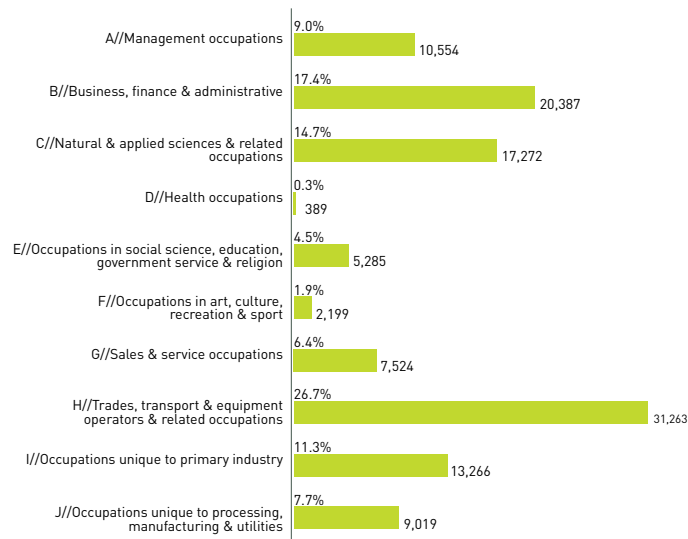


Figure 3.2: Green labour force by occupation and number of direct FTE jobs in 2008

Source: GLOBE Foundation
(based on Statistics Canada 2006 Census).

3. UNEP, ILO, IOE and ITUC (2008), Green Jobs: Toward Decent Work in a Sustainable, Low Carbon World.

OCCUPATION (2 DIGIT NOC-S)	TOTAL DIRECT FTE GREEN JOBS	% OF TOTAL
I0 Occupations unique to agriculture, excluding labourers	13,046	11.1%
C0 Professional occupations in natural & applied sciences	9,620	8.2%
B5 Clerical occupations	8,591	7.3%
H7 Transportation equipment operators & related workers, excluding labourers	7,006	6.0%
C1 Technical occupations related to natural & applied sciences	6,754	5.8%
H1 Construction trades	5,417	4.6%
H4 Mechanics	4,702	4.0%
B0 Professional occupations in business & finance	4,465	3.8%
A3 Other managers, n.e.c.	4,274	3.6%
H8 Trades helpers, construction, and transportation labourers & related occupations	4,165	3.6%
I2 Primary production labourers	3,585	3.1%
A1 Specialist managers	3,449	2.9%
H2 Stationary engineers, power station operators & electrical trades & telecommunications occupations	3,442	2.9%
E0 Lawyers & policy and program officers	3,095	2.6%
J2 Assemblers in manufacturing	3,000	2.6%
B3 Administrative & regulatory occupations	2,926	2.5%
G9 Sales and service occupations, n.e.c.	2,863	2.4%
J1 Machine operators in manufacturing	2,717	2.3%
J3 Labourers in processing, manufacturing & utilities	2,223	1.9%
H6 Heavy equipment & crane operators, including drillers	1,875	1.6%
Other Direct FTE Green Jobs in BC	19,941	17.0%
Total Direct FTE Green Jobs in BC	117,158	100.0%

Figure 3.3: Direct FTE green jobs in BC's green economy by 2-digit occupational code in 2008

Source: GLOBE Foundation (based on Statistics Canada 2006 Census)

The Energy Management and Efficiency sector was the second largest in terms of employment in the province's green economy, responsible for approximately 24,800 direct FTE jobs in 2008—due in part to elements related to public transportation.

All occupational sectors contribute to the green elements of the province's economy, although to varying degrees (see Figure 3.2). Trades, transport, equipment operators, and related occupations were responsible for more than one-quarter (27 percent) of the green occupations in BC in 2008—equal to more than 31,200 direct FTE jobs. Occupations in business, finance, and administration, as well as in natural and applied sciences also ranked high in importance, making up approximately 17 percent and 15 percent of all direct green jobs, respectively.

As illustrated in Figure 3.3 on the following page, green jobs in agriculture (which include farmers and farm managers, aquaculture operators, nursery and greenhouse operators, and landscaping and ground maintenance supervisors) ranked highest in number for BC's green economy—equal to 13,000 direct FTE jobs in 2008 and making up 11 percent of all direct green jobs in the province. Professional occupations in natural and applied sciences (which include scientists and researchers, engineers, forestry professionals, and architects)

were second at 9,600 direct FTE jobs, equivalent to 8 percent of all direct green jobs in BC. Other important occupational categories include transportation equipment operators, technical occupations related to natural and applied sciences, construction trades, mechanics, and professional occupations in business and finance.

BC's green labour force is generally older than the province's labour force as a whole, with 44 percent being between the ages of 45 and 64 at the time of the last Census in 2006 (See Figure 3.4). By comparison, only 35 percent of BC's total labour force was between the ages of 45 and 64.

BC's green labour force is fairly well educated, with 62 percent having some level of post-secondary education or trades training (see Figure 3.5). Of the percentage with post-secondary education, 40 percent have obtained a level of Bachelor's degree or higher. In terms of post-secondary fields of study, approximately one-third (34 percent) have an educational background in architecture, engineering, or related technology. Business, management, and public administration also ranked highly at 16 percent.

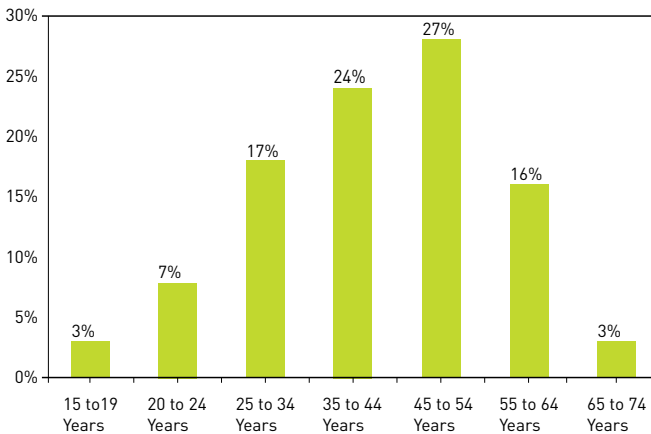


Figure 3.4: BC's green labour force by age groups.

Source: GLOBE Foundation
(based on Statistics Canada 2006 Census)

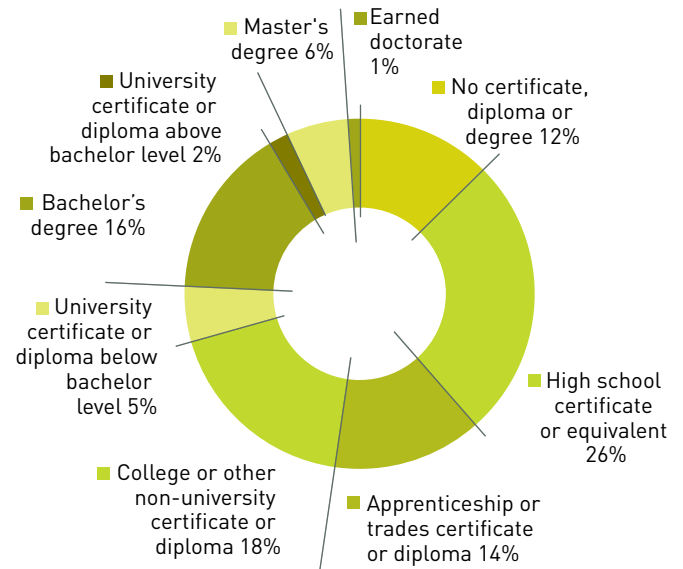


Figure 3.5: BC's green labour force by highest education level achieved.

Source: GLOBE Foundation
(based on Statistics Canada 2006 Census)

A variety of new jobs in BC are already emerging as the economy transitions toward a greener future. These include tidal power electrical engineers, solar thermal technicians, wood pellet machine operators, energy managers, green real estate brokers, waste reduction consultants, greenhouse gas emissions verifiers, carbon trading market analysts, and hydrogen fuel cell researchers, to name a few (for a list of some of the existing and emerging green jobs in BC, see the box at the end of this section).

Green Job Demand

Under a low-demand scenario of 1.9 percent CAGR, based on the BC Labour Market Outlook, 2009-2019, recently released by the provincial government, the demand for green workers in BC by 2020 will be equal to 147,000 direct FTE green jobs—an increase of nearly 30,000 jobs and an overall growth of 25 percent over 2008 green job numbers. Under a high-demand scenario for green workers of 4.7 percent CAGR, based on Informetrica's labour market projections and an analysis of the key green sectors and proposed major projects in BC, a total of nearly 202,000 direct FTE green jobs could exist in BC by 2020—an increase of close to 85,000 jobs and an overall growth of 73 percent over 2008 numbers.

Green Job Supply

In terms of the supply of green workers in BC, the province's green labour force is expected to be highly impacted by attrition, with approximately 22 percent expected to retire over the next six years to 2016. Fortunately for BC's green economy, green workers tend to be relatively mobile in nature and have historically moved to BC from outside the province if attractive employment opportunities exist. In addition, intra-provincial migration is common for BC's green work force. The labour supply scenario, which is again based on the BC Labour Market Outlook report and incorporates migration patterns, projects growth for BC's green labour force at 1.5 percent CAGR, resulting in the supply of approximately 140,000 green workers in BC by 2020.

These numbers suggest that BC's economy could face shortages of more than 60,000 skilled green workers by 2020.

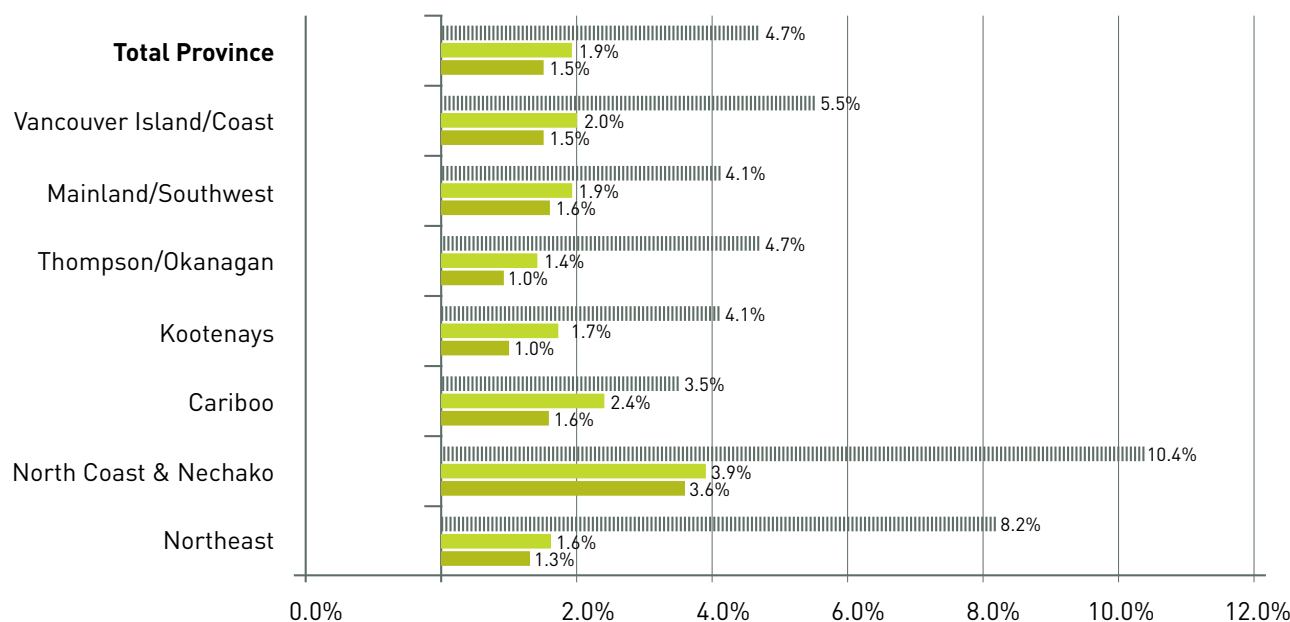


Figure 3.6: BC's green labour supply and demand (low- and high-growth scenarios) by Development Region, 2008 to 2020.
Source: GLOBE Foundation

THESE NUMBERS SUGGEST
THAT BC'S ECONOMY
COULD FACE SHORTAGES
OF MORE THAN
60,000 SKILLED GREEN
WORKERS BY 2020.

Taking into account the labour demand and supply scenarios presented above, it becomes apparent that some Development Regions will be faced with greater pressures for green workers than others—especially in the high-growth demand scenario that is heavily influenced by the proposed major green and clean energy projects (see Figure 3.6).

The Mainland/Southwest region is expected to see the largest shortages in green workers ranging from 3,000 to more than 30,000 direct FTE jobs based on the two growth scenarios. The North Coast/Nechako and Northeast regions may be affected by shortages of more than 3,500 and 5,900 direct FTE jobs respectively—which, as a -percentage of the total labour force available in these locations, may present serious challenges to meeting the demand created by new green and clean energy projects in those regions.

In order to address labour supply issues, increasing productivity must be a priority, as well as increasing the participation rates of under-employed segments of the labour market.

Interestingly, BC's Aboriginal population constitutes the only naturally growing population segment in the province, and many First Nations communities are keen to share in the economic, environmental, and social benefits surrounding the emerging green economy.

Many First Nation green businesses already exist throughout BC in the areas of resource management and environmental consulting, renewable energy systems design and installation, and green building. With new land and marine tenure rights being negotiated between government and First Nations communities throughout BC, green jobs in renewable energy, bioenergy, and environmental protection are expected to grow as the land is transferred back to its original stewards.

It will be essential to build strategies that address education, training, recruitment, and labour market issues for Aboriginal populations in BC related to the green economy. Areas of particular importance will include developing strategies that encourage Aboriginal youth to complete high school and consider continuing education, training, and trades related to green jobs. Funding that supports Aboriginal training and education in their communities is extremely important, as many members have difficulties leaving to attend educational facilities that are often long distances from home.

In addition to labour supply issues, other challenges in developing BC's green work force include:

// A current lack of demand for green trades and occupations brought on by a low market demand for renewable energy technologies and green building concepts. This is due, in part, to the higher costs of green technologies at the present time and a lack of incentives that encourage their adoption.

// A high migration of potential workers from rural regions to urban centers due to a lack of locally-based education and training options and a shortage of financial support for implementing strategies to attract and retain qualified workers.

// A labour force that is poorly aligned with current business cycles due to the extended time required for developing education and training programs, as well as the tendency of institutions to train workers for traditional industries that are no longer presenting the same opportunities that they once did.

// A poor recognition of existing opportunities at the middle- and high-school level resulting in a lack of interest by youth in following green career paths.

With continuing innovation, education, and training/retraining, BC's work force can build on its existing knowledge base to incorporate the emerging skills that will open up doors to new green employment opportunities in all industries, both new and old.

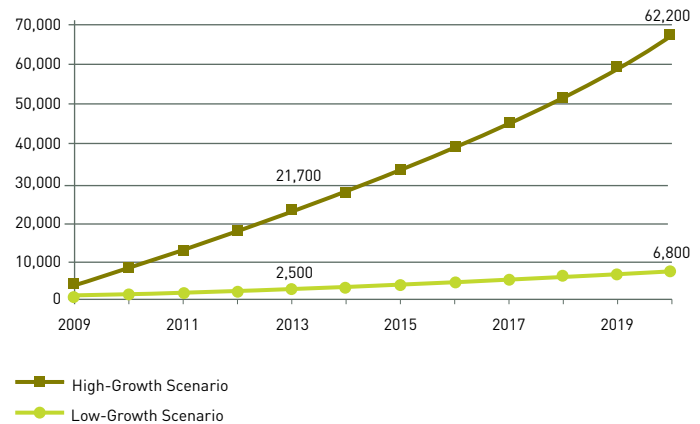


Figure 3.7: BC's projected direct green job shortages under the low- and high-growth labour demand scenarios from 2009 to 2020.
Source: GLOBE Foundation

INCREASING PRODUCTIVITY
MUST BE MADE A PRIORITY,
AS WELL AS INCREASING
THE PARTICIPATION RATES
OF UNDER-EMPLOYED
SEGMENTS OF THE LABOUR
MARKET.



BELOW IS A LIST OF A FEW OF THE MANY EXISTING AND EMERGING WELL-PAID GREEN CAREER OPPORTUNITIES IN BRITISH COLUMBIA:

// Hydrogen Fuel Cell Engineer

Designs, constructs, and maintains hydrogen fuel cell equipment and components

// Solar Hot Water Manufacturing Technician

Manufactures solar hot water heaters, parts and equipment

// Wind Farm Electrical Systems Designer

Design underground and overhead wind farm collector systems and prepare and develop site specifications

// Bioenergy Feedstock Production Labourer

Responsible for gathering wood products and wastes for the production of bioenergy

// Hybrid/Electric Vehicle Mechanic

Repairs hybrid and electric vehicles, powertrains and controls

// Power Electronics Assembler/Tester

Builds and assesses solid-state electronics used for the conversion and manipulation of electric power

// Smart Grid Engineer

Addresses complex problems in the electric power delivery infrastructure related to grid modernization

// Instrumentation and Controls Technician

Responsible for installing and maintaining instruments and controls to monitor power distribution

// Commercial/Industrial Energy Manager

Provides advice to clients on how to reduce energy consumption and increase efficiencies

// Green Real Estate Brokers

Oversees transactions for renting, selling, buying green properties and can arrange loans for prospective buyers

// Green Home Renovator

Specializes in home improvements, construction and repair with expertise in green building standards.

// Landscape Technician

Actively involved in the processes of landscape development, construction, horticulture, maintenance, and associated technologies

// Urban Planner

Develops short- and long-term comprehensive plans and programs for sustainable development, growth, revitalization and utilization of land and physical facilities of cities and metropolitan areas to maximize quality of life for the community and its residents

// Ecological Restoration Planner

Collaborates with biology professionals and field technicians with the implementation of restoration projects

// Horticulturalist

Specializes in the science of plant cultivation, with expertise in the production, and breeding, as well as plant biochemistry and plant physiology

// Renewable Energy Consultant

Assesses industry trends and related implications, monitors product developments and preferences, examines emerging technologies and advises clients on practical solutions

// Waste Reduction Consultant

Specializes in strategy development to reduce, reuse and recycle waste and streamline operations

// GHG Emissions Verifier

Conducts data audits of reported GHG emissions inventories

// Carbon Emissions Trading Specialist

An accountant who specializes in using a market-based approach to promote emission reductions within industries and the global marketplace

// Clean Technology Venture Capital Investment Analyst

Identifies and evaluates investment opportunities and provides guidance regarding investment decisions

For more information on green jobs, see GLOBE's "Reference Guide to Green Jobs in BC", available at www.globeadvisors.ca



4//Green

Education and Training in BC

Education, training, and capacity building are essential components in developing a more diverse, resilient, and sustainable economy. Preparing the provincial labour force for the transition to lower-carbon operations and best practices will require a multi-tiered approach—targeting both new work force entrants, those seeking mid-career access to a greener economy, and those at the mid- or senior-stages of their careers whose decision-making can advance or hinder the shift to a greener economy.

One area where this province shows demonstrated strength is in its existing and evolving academic and skills training bodies. Responsibility for the development, coordination, and delivery of education and training solutions will largely be handled by post-secondary universities, colleges, technical institutes, and tertiary sector educators, as well as relevant unions, sector councils, associations, and supporting organizations in the province.

British Columbia has 25 public post-secondary institutions, dozens of private universities, colleges, and non-degree granting institutions, and a number of industry training organizations, skills councils, and associations that have a role to play in the education and training of BC's green labour force.

Enrolment in environment-related programs is increasing in both colleges and universities compared to all programs. However, the actual number of students entering environmental programs at BC's public post-secondary institutions is small relative to other program areas. According to a recent study by the Environmental Careers Organization (ECO) Canada, the national sector council dedicated to environmental careers, approximately 10.5 percent of all university enrolments and only 2.3 percent of college enrolments in BC were in environment-related programs in 2004/2005. The percentage of students who end up graduating from environment-related programs in BC is slightly higher than enrolment at 11.6 percent for universities and 5.2 percent for colleges.⁴

In 2008, approximately 23,450 students obtained a post-secondary education certificate at some level of green programming identified as important for BC's economy (see Figure 4.1).

4 . ECO Canada (2010). Post-Secondary Graduation Research: Enrolment and Graduation Rates from Environment-Related College and University Programs.

It will be important to encourage as many of these new graduates as possible to enter the occupational fields important for greening BC's economy in order to meet future demand. Increasing the job opportunities for graduates upon completion of these programs by increasing the demand for green products and services will also be important for building capacity in these areas.

PREPARING THE
PROVINCIAL LABOUR FORCE
FOR THE TRANSITION
TO LOWER-CARBON
OPERATIONS AND BEST
PRACTICES WILL REQUIRE A
MULTI-TIERED APPROACH.

CIP CODE	ACADEMIC AND OCCUPATION-SPECIFIC PROGRAMS[1]	2008
1	Agriculture, Agriculture Operations and Related Sciences	744
3	Natural Resources and Conservation	705
4	Architecture and Related Services	118
11	Computer and Information Sciences and Support Services	401
13	Education	2,770
14	Engineering	1,225
15	Engineering Technologies/Technicians	1,372
22	Legal Professions and Studies	326
23	English Language and Literature/Letters	20
26	Biological and Biomedical Sciences	1,512
27	Mathematics and Statistics	287
30	Multidisciplinary/Interdisciplinary Studies	42
31	Parks, Recreation, Leisure and Fitness Studies	149
40	Physical Sciences	612
41	Science Technologies/Technicians	78
44	Public Administration and Social Service Professions	132
45	Social Sciences	1,894
46	Construction Trades	3,163
47	Mechanic and Repair Technologies/Technicians	1,843
48	Precision Production	1,907
49	Transportation and Materials Moving	119
50	Visual and Performing Arts	264
52	Business, Management, Marketing and Related Support Services	3,766
Total for All Programs		23,449

Figure 4.1: Post-secondary certifications awarded in 2008 that are relevant to BC's green economy (by CIP code classification). The table includes the following credential types: Doctorate, Masters, Post-Degree Diploma, Post-Degree Certificate, Bachelors, Associate Degree, Advanced Diploma, Diploma, Certificate, Short Certificate, and Apprenticeship.

Source: Ministry of Advanced Education and Labour Market Development, Central Data Warehouse, October 2009 Submission; BC Headset, Table: Credentials Awarded; BC Stats, Apprenticeship Student Outcomes Survey, Student Outcomes Reporting System.

Public Universities

British Columbia's 11 public universities offer in-depth theoretical and practical education that collectively covers almost every discipline important to greening the economy here in the province.

Traditional programs in environmental protection are evolving to encompass new issues related to natural systems restoration, environmental planning, toxicology, and water treatment. Royal Roads University (RRU) offers Bachelor's and Master's Degrees in Environmental Management, with courses in ecological economics and environmental reporting, as well as a Master's in Environmental Education and Communication. RRU has also partnered with ECO Canada to create the Canadian Centre for Environmental Education (CCEE), which offers a distance-learning, post-graduate Certificate and Master's in Environmental Practice.

The University of Victoria (UVIC) has both a Certificate and a Diploma in Restoration of Natural Systems, and a range of degrees in Earth and Ocean Sciences and Environmental Studies. Simon Fraser University (SFU) has a Master's Degree in Resource and Environmental Management and in Environmental Toxicology. Thompson Rivers University (TRU) offers a Master's Degree program in Environmental Science, as well as a Certificate and a Diploma in Water Treatment Technology that focus on processes, from mechanical systems to water chemistry, in-line with BC-specific legislation. Capilano University has a two-year Associate Arts Degree in Global Stewardship. The University of the Fraser Valley (UFV) offers a Certificate and Diploma in Horticulture Crop Production and Protection, as well as a new Bachelor of Business Administration in Agriculture Management. Kwantlen Polytechnic University has a Diploma in Environmental Protection and has developed a training program that provides practical knowledge, farm skills, apprenticeship, and land leasing opportunities for new farmers through their new farm school in Richmond.

In addition, public institutions are now developing programs in emerging areas important in a greener economy. The University of British Columbia (UBC) has a new Master's Degree in Engineering for Clean Energy which is the first of its kind in Canada and one of only a handful of similar programs offered worldwide. This professional degree program has partnered with BC Hydro Power Smart, which is providing expertise on energy conservation technologies and is actively involved with curriculum development.

Vancouver Island University (VIU) offers a Certificate Program in Renewable Energy Technology, with the ultimate goal of supplying skilled workers to deploy renewable energy technologies—including solar, wind, geo-exchange, biomass, and micro-hydro. VIU also has a Diploma for Technicians in Green Building and Renewable Energy. TRU offers an apprenticeship certification for Domestic/Residential Geothermal Technicians.

In the realm of green building and urban planning, SFU has its Centre for Sustainable Community Development that offers an undergraduate certificate and post-baccalaureate diploma (both also available through distance education), graduate support, and a non-credit professional program. Emily Carr University of Art and Design has certificate and degree programs in Industrial and 3D Design, as well as specific courses on Sustainability and Green Design and on Design for Social Change.

In the area of law, UBC offers a Specialization in Environmental and Natural Resource Law as part of its Bachelor's of Law program. In addition, UVIC is often ranked as Canada's top law school by Canadian Lawyer Magazine, and the school's reputation is particularly strong in the area of environmental law.

Graduate students also play a vital but sometimes overlooked role in BC's knowledge-based economy. Within universities, they are the engine of the research process, generating innovative ideas and technologies while advancing knowledge.

In 2007, the province committed to increasing support for graduate students with a four-year strategy that included adding 2,500 new graduate spaces. The funding for these new spaces was used to expand the government's priority areas of life sciences, technology, clean technology, and natural resources.

UVIC engineering students have a range of options surrounding sustainable energy systems design and electronics, with graduate research areas including alternate energy technologies and systems, computer networks and distributed systems, ocean engineering and ocean energy, and electronics and energy. In addition, the Pacific Institute for Climate Solutions (PICS), a centre of excellence which is hosted by UVIC in partnership with UBC, SFU, and UNBC, has graduate students who are dedicated to research on climate change and related issues.

UBC's Sauder School of Business has its Centre for Sustainability and Social Innovation (ISIS) where MBA students can take on research projects related to carbon management and sustainability, as well as the Institute for Resources, Environment, and Sustainability (IRES) that includes a major interdisciplinary graduate education program with 80 Doctoral and 40 Master's students. In addition, UBC recently agreed to provide grants for 10 graduate students to work on long-term goals contained in the Vancouver 2020 Greenest City Action Team report. These initiatives, along with a proactive agenda to increase campus sustainability, are helping UBC reach its goals of becoming the "most sustainable campus on earth" and a world centre for green research.

EDUCATION, TRAINING,
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ARE ESSENTIAL
COMPONENTS IN
DEVELOPING A MORE
DIVERSE, RESILIENT, AND
SUSTAINABLE ECONOMY.



Public Colleges & Technical Institutes

British Columbia's 11 public colleges and two of its technical institutes offer a wide variety of credentials from certificates to degrees. Their focus is to provide students with applied, hands-on education which is employer-driven and often technology-based. A growing number of these institutions are now preparing students for entry into careers in the low-carbon economy with programs that span an array of disciplines from renewable energy, to environmental resource management, to green building design and construction.

Skilled trades training—including carpentry, plumbing, pipefitting, welding, automotive, and electrical—is mostly handled by BC's colleges and technical institutes, in partnership with industry. Many of these traditional trades are being adjusted to include new green technologies and practices such as hybrid/electric vehicle engine repair and the design, installation, and maintenance of district energy, geoechange, renewable energy, and smart electricity grid systems.

The concept of transforming British Columbia Institute of Technology's (BCIT) campuses into living laboratories of sustainability was formerly adopted by the institute in 2007 and was subsequently adopted by UBC in 2009. In 2010, BCIT expanded the scope and role of its Sustainability Committee and the work to transform BCIT's campuses into living laboratories continues.

Currently, BCIT's School of Construction and the Environment offers a Diploma program in Sustainable Resource Management which provides students with the academic and field and safety training needed to work in technical jobs with resource management firms, environmental consultancies, and government agencies. BCIT's Sustainable Energy Management Certificate program, developed in partnership with BC Hydro and funding support from the Natural Resources Canada – Office of Energy Efficiency, is designed to support employment opportunities in the emerging field of sustainable energy management, with a focus on energy demands of commercial and institutional buildings. The school offers unique professional courses in Brownfield Redevelopment and Green Roofs and Living Walls. In addition, BCIT includes a course on GHG accounting and reporting in its Bachelor of Technology in Environmental Engineering program and is planning to include related courses in its future sustainable business management curricula.

Northern Lights College (NLC), promoted as BC's "Energy College", offers a number of programs including the new 10-month Certification for Wind Turbine Technicians that was developed using international standards with six Canadian schools and the BZEE Education Centre for Renewable Energies in Europe. NLC is also responsible for all Solar Thermal Installer training in the province, with more than 130 students having completed the classroom portion of this program since it began in 2008. The course also prepares certified plumbers to write the Canadian Solar Industries Association (CanSIA) Solar Thermal Certification

exam in order to receive industry certification. The new Geoechange Technician Diploma program offered at NLC will be taught through the school's Workforce Training Department that is working with the Canadian GeoExchange Coalition (CGC) to develop and deliver the curriculum. In addition, NLC's Land Reclamation Diploma program prepares students to effectively repair disturbed land resulting from industrial development and activity. Being delivered in Fort St. John, students often find work in the oil and gas sector, with additional opportunities in mining, forestry, and independent environmental consulting.

In addition to offering trades training, many other colleges have developed unique programs, including:

// Camosun College has a Diploma in Environmental Technology, as well as a Diploma in Electronics and Computer Engineering Technology with a specific focus on Renewable Energy;

// The College of New Caledonia offers a course in hybrid vehicle technology and apprenticeship programs for Power Engineering;

// The College of the Rockies has developed a Certificate in Environmental Studies, a Certificate in Natural Building, an Associate of Science degree in Environmental Sciences, and will be offering a Bachelor of Business Administration in Sustainable Business Practices starting in 2010/2011;

// Douglas College has a Certificate in Environmental Systems, a Residential Landscape Technician Diploma, and an Associate of Arts Degree in Environmental Studies;

// Langara College has Diplomas and Associate Degrees in Environmental Studies and a Diploma in Applied and Urban and Rural Planning;

// Nicola Valley Institute of Technology offers Certificate and Diploma programs for Natural Resource Technicians;

// Northwest Community College has a program in Applied Coastal Ecology, a Certificate in Applied Earth and Environmental Studies, an Associate of Arts/Science Degree in Sustainable Communities, as well as a Timber Frame Craftsman Certificate;

// Okanagan College has Diplomas in Electronic Engineering Technology, Environmental Environmental Studies and Water Quality/Environmental Engineering Technology, a Certificate in Landscape Horticulture, and an apprenticeship for Domestic/Residential Certified Geothermal Technicians;

// Selkirk College has a Diploma program in Integrated Environmental Planning and a Certificate in Renewable Energy (currently on hold).

SECTOR	PROGRAM	ORGANIZATION
Clean & Alternative Energy	Solar Hot Water System Installer	Canadian Solar Industry Association
	Canadian Geothermal Code for Public Reporting	Geothermal Energy Association
Energy Management & Efficiency	Groundwater Drilling & Pump Technician	BC Ground Water Association
	Geothermal Installer	GeoExchange BC/Canadian Geoechange Coalition
	Residential Geothermal System Designer	GeoExchange BC
	Commercial Geothermal System Designer	GeoExchange BC
	e-Energy Training	Building Owners and Managers Association (BOMA)
	Forced Air Guidelines	Thermal Environmental Comfort Association
Green Building	Sustainable Building Advisor Program	Brighter Green
	Built Green	Canadian Home Builders' Association of BC
	LEED Accredited Professional	Canada Green Building Council
	Skilled Trades Employment Program	BC Construction Association
	Green Construction Training Program	Lighthouse Sustainable Building Centre
Environmental Protection	Environmental Professional Certificate	ECO Canada
	Wastewater Treatment and Biosolids Management	British Columbia Water and Waste Association

Private Universities, Colleges & Non-Degree Granting Institutions

Two private universities in BC offer programs that are important for a greener economy. Since opening its doors in Squamish in September 2007, Quest University has amalgamated some of the best historical practices in education with unique and contemporary innovations. Quest teaches its courses on the innovative “block plan” with courses in environmental/ecological economics and policy and the sustainable resource management. Trinity Western University is based out of Langley, BC and offers courses in resource and environmental management, environmental thought, and environmental physiology.

Non-degree granting post-secondary training institutions in BC also play important roles in offering educational programs to students in urban centres and rural communities across the province. The Ministry of Advanced Education and Labour Market Development provided regulatory authority for non-degree granting institutions in 2004 to the Private Career Training Institutions Agency (PCTIA), with a list of these institutions available on their website. This agency is governed by a board made up of seven industry elected representatives and three government appointed public interest representatives and provides highly dynamic and diverse training programs across all sectors, with a growing number of organizations involved in sustainable education and training.

Figure 4.2: A few of the exceptional industry-based programs offered in BC related to greening the economy.

Source: GLOBE Foundation



Challenges in green education and training for BC's economy often relate to a lack of funding, a shortage of experienced and qualified instructors, a rigid institutional framework that does not allow for changes in programming, or a disconnect between industry practices and current curriculum teachings. Many of these issues can be addressed through sufficient and consistent funding that builds capacity ahead of demand, by building flexibility into course programming to accommodate advances in green practices and technologies, and by increased communication and partnerships between institutions, training bodies, and the private sector—such as through co-operative education experiences and the development of industry-driven demonstration and training facilities.

K-12 Education

Elementary and high-school education is an area of particular importance for building a stronger green economy in BC. The Province has mandated that BC's Science 10 curriculum include a module on Sustainable Resources and the BC Science Teachers Association is interested in working with BC science teachers to enable this initiative. In addition, the Ministry of Education (MOE) has recently developed a new "Year of Science" program that will focus its first year here in the province on clean technology. However, there is room for more collaboration between industry, post-secondary institutions, and the K-12 system to educate youth on some of the emerging career opportunities. In addition, incorporating green education into the core K-12 curriculum and prescribed learning outcomes will be essential to securing tomorrow's environmentally-conscious work force.

Trades Training

Trades training is at the forefront of change in the greening of BC's economy. The province's Industry Training Authority and its Industry Training Organizations are actively involved in making adjustments to existing apprenticeship training programs through new modules that are designed to meet changing market demands. New apprenticeships have been developed in recent years, including programs for Wind Turbine Technicians, Building Envelop Technicians, and Certified Geothermal Technicians. Engaging youth in trades will be key to ensuring green jobs in construction and related resource industries can be met with qualified and experienced workers in the future.

Other Green Education and Training

A number of industry-based organizations have developed their own training programs relevant to the green economy to address the immediate needs of industry and fill gaps in skills training by post-secondary institutions and apprenticeship training (see Figure 4.2). This is particularly relevant in the Green Building sector where a number of trades training and accreditation programs exist, but is also important in the areas of clean energy, energy management, and environmental protection. ECO Canada is also actively involved in environmental certification through their Environmental Professional certification and with specific programs for BC's Aboriginal population. In addition, much of the experience for green jobs is gained within firms through in-house corporate training programs.

ABOUT THE REGIONAL FOCUS GROUPS

The GLOBE Foundation hosted a series of regional focus groups throughout the province to help uncover provincial policy issues and labour market challenges related to BC's emerging green economy. A total of nine sessions were held in six of the seven Development Regions during the months of April to June 2010 and were attended by a total of 82 participants. Regional focus groups were held in the following Development Regions: Vancouver Island/Coast, Mainland/ Southwest, Thompson/ Okanagan, Kootenays, Cariboo, and the Northeast.

The 2.5 hour sessions were comprised of key stakeholders from the private, public, industry, NGO, and education/training sectors. Session sizes varied throughout each region, but aimed to have between 8 and 12 participants representing various backgrounds and expertise.

Focus Group Objectives:

- // To uncover provincial policy issues that are acting to hinder the growth of the green economy and the wide-spread adoption of green technologies in each region;
- // To uncover labour market supply/demand issues, needs, and skill gaps for industries as they relate to the emerging green economy in each region; and
- // To prioritize a set of realistic recommendations that could be brought back to the Province of British Columbia in order to assist businesses and public institutions in each area to further the green economy and address some of the described policy and labour market challenges.

FOCUS GROUP HIGHLIGHTS:

- // BC should better communicate its vision of the green economy and be prepared to "pick winners" based on the strengths and realities that the province has to offer.
- // To create strong export markets, BC must first build a strong domestic market. This will require the assistance of municipalities to provide a test-bed for unproven and emerging technologies and to incorporate public procurement strategies for local green products/services.
- // Lifecycle costing and externalities should be incorporated into all government purchasing decisions for green products and services.
- // Local communities and regions should be allowed to explore options for local utility ownership and for distributed power production and supply.
- // Providing municipalities and other local communities with the tools and the funding needed to reduce their GHG emissions would allow them to implement innovations best suited to their specific strengths and needs.
- // Food security is becoming an ever increasingly important issue, and the province should be doing more to promote local production and encouraging the establishment of companies who are able to help "close loops" in the supply chain and add value to their products.
- // Emerging green technology companies need to have access to capital during the pre-commercialization phase of their business cycles, and the re-introduction of a program such as the original "Science Council" would help young companies in their efforts to commercialize their products.
- // Increased support for all education programs in more northern regions of the province are needed in order to retain skilled workers, to build labour force capacity ahead of demand, and to advance local green economies.

Please visit www.globe.ca to download the focus group summaries.





5// Policies for Greening the Economy

The policy framework needed for achieving a greener economy in BC must be government-wide in terms of its scope and delivery, and it must be able to engage all population segments in all regions of the province.

However, while government policies and initiatives play a critical role in the development of a greener, lower-carbon economy, the reality is that governments do not change social values or guarantee environmental integrity. Governments create the policies that, in turn, influence how other players—be they firms, institutions, or individuals—pursue their own goals and missions.

For purposes of this analysis, the GLOBE Foundation examined several dimensions of the policy process that bear significantly on the greening of the provincial economy. The observations put forward in each of these areas are summarized below.

Climate Action & Clean Energy – BC’s Climate Action Plan, the Energy Plan, the Bioenergy Strategy, the Greenhouse Gas Reductions Targets Act, the Carbon Tax, and the Innovative Clean Energy (ICE) Fund are just a few of the public policies and programs that are providing a solid foundation helping to green BC’s economy.

The recently introduced Clean Energy Act provides a wide range of powers and tools to move even further forward in terms of stimulating the expansion of low-carbon energy resources in the Province and which, in-turn, is expected to stimulate new investments that will create jobs and export sales opportunities.

In terms of BC’s proposed new feed-in-tariff (FIT) program, increasing the annual investment budget, the length of tariff applicability, and the maximum project size limit under the program would help further establish the province’s clean energy industry. In addition, reinvesting the carbon tax into businesses to help them reduce GHG emissions and/or to fund clean technologies, green projects, and public transportation initiatives, would also help accelerate the transition to a greener economy in BC.

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Technology Development, Finance & Investment –

Investments in green technology have been shown to contribute to economic and employment growth. The Conference Board of Canada notes that BC can expect more than \$800 million in GDP and 13,000 person-years of employment for every \$1 billion invested in green technologies. One example, BC's Research and Innovation Strategy (including the ICE Fund), has been important for in this regard.

British Columbia could make environmental stewardship (remediation, pollution mitigation, and energy efficiency) the focus of an innovation strategy, particularly because the province has proven skills and talent in this area—one ripe for the development of competitive products and services for export.

In addition, commercialization should be made a priority in policy development. With a limited domestic market, BC companies have difficulty accessing capital and as a result, are slow to reach the critical \$5 million revenue mark, leaving them vulnerable to takeovers or disadvantaged in potentially lucrative markets by better funded competitors.

While governments across Canada have established programs designed to stimulate the development and commercialization of new technologies, it is ultimately the private sector that must be the principal source of investment funding. Policies that encourage private sector outlays on R&D are essential for stimulating innovation and increasing productivity levels. A Green Innovation Investment Fund run by private sector professionals would help in this regard. Enlarging the existing ICE Fund above its current \$25-million annual cap could also help.

Additional policies to accelerate the development and diffusion of clean technologies, including incentives for firms to engage in green activities as well as for funding applied research at universities, colleges, and in Centres of Excellence, will be keys to advancing a greener economy. Expanding the provincial Investment Tax Credit Program so that eligible green companies can earn credits against provincial income taxes is also worth considering.

The Built Environment & Empowering Municipalities

– While reducing GHG emissions is important, the policy framework for greening the built environment has a much wider mandate encompassing urban form, efficient transportation systems, “smart” information networks, building codes and energy efficiency standards, and eco-efficiency networks.

Research carried out as part of this project suggests an overarching issue restricting the early adoption of new technology is the great number of regulatory codes and by-laws that are prescriptive and structural rather than performance-based. This, plus the reluctance of authorities to adopt new technologies that achieve mandated performance goals in unique ways, stifles the development of a domestic market upon which to build commercial viability and export potential.



Measures are required to align regulatory codes and by-laws to reduce municipal, regional, and district barriers to the deployment of distributed renewable energy systems, to focus more performance-based outcomes, and to encourage authorities to accommodate new but proven technologies.

The policy suggestions emerging from the foregoing are that in a small economy such as in BC, additional stimuli and policy signals are needed to overcome risk aversion tendencies of potential buyers and to encourage early stage investors to take the plunge. The provincial government could work to implement programs that encourage the early adoption and commercialization of clean energy and green building technologies by public buyers. In addition, a risk cushion for municipalities could be developed that would encourage the early deployment of new technology-based solutions.

A possible mechanism to address this issue on a continuous basis could be for the Union of British Columbia Municipalities (UBCM) to establish a Green Economy Secretariat to accelerate a review of municipal regulations, zoning and construction standards, and to coordinate green policies and initiatives with both the province and with key industry players.

Labour Supply, Education & Training – BC’s aging population and declining birth rate will result in a smaller resource pool in the traditional labour market. Public policy initiatives that focus on increasing productivity and labour market participation rates of under-represented groups— such as Aboriginal persons, women, youth, and immigrants—are needed.

Programs that work to recognize the foreign qualifications and credentials of immigrants, especially with regard to green occupations that are in short supply, will ease labour market pressures and help to integrate new arrivals into the fabric of BC’s society.

While many jobs in the emerging green economy will be similar in scope and skill requirements to today (e.g. carpenters, plumbers, millwrights, pipefitters, laboratory technicians, construction workers, etc.), new technologies and practices will require additional skills and training programs.

Funding to support programs for workforce development and training at existing and expanded education facilities throughout the province is essential for meeting the needs of a greener economy. In addition, initiatives that encourage collaborative arrangements between employers and educational/training institutions will be particularly useful to help match labour demand with supply.



First Nations – It is only in the last two decades that First Nations' control over self-governance has taken root and First Nations' involvement in resource development on Indian lands has become commonplace. It is now more than evident among the corporate leaders in this province that renewable or conventional energy developments will not take place unless there is full and meaningful consultation and participation by First Nations' interests beforehand.

For their part, a new generation of First Nations' leaders have acquired the negotiating skills and the insights needed to ensure that the new found powers granted from court decisions, and the growing imperative to exploit the vast opportunities for wind, wave, geothermal, biomass, and natural gas resources has given them the leverage power needed to ensure that their constituencies benefit socially and economically. First Nations are interested in becoming full partners in the green economy.

But this reality has not taken root in some areas and better communication and cooperation is necessary. There are far too many instances of negotiations that take place that affect First Nations' lands or waters where the affected First Nations are not involved or even made aware. Trespasses onto First Nations' lands by municipal, corporate, resource developer, and other interests are commonplace, as are instances where toxic wastes are being dumped or left untended. So too, decisions are being made on mining developments which could have significant impacts on the health and well-being of First Nations' communities without adequate consultations with those most vulnerable.

In addition, there are still realities of location and culture that have made it difficult for First Nations' youth to acquire the skills and training that would open up employment opportunities in the growing green economy. The need to bring training opportunities to the often remote communities is key, as opposed to uprooting the ever-growing population of First Nations' youth and requiring them to move to larger, often inhospitable, urban centers.

Realizing the full potential of the green economy means that all players should be involved, and where this involves First Nations' interests, the cost of doing business should include the costs of enabling meaningful educational and employment opportunities for a new generation of First Nations' youth. It also means recognizing that from a business perspective, First Nations' leaders should be at the table.

From a policy perspective, the provincial government should keep in the forefront its oft stated mission to ensure that First Nations' interests are protected as a greener economy is brought forward, and that a clear, unequivocal message is sent to the corporate community that First Nations' interests are not a problem, but part of the solution.

Trade & the Asia Pacific Gateway – Over the next few decades, India and China will put huge demands on the energy resources of the world and are expected to have the largest increase in global oil, coal, and natural gas consumption by 2030. Energy efficient innovations, alternative energy sources, environment-based solutions, and clean technologies will become increasingly important in these developing countries.

British Columbia's Asia Pacific trading partners, with cultural and historic ties to this province, will continue to view BC as a preferred supplier of resource-based commodities and a destination of choice for the export of high-priced finished goods and products. The efficiency of the Asia Pacific Gateway will play an important role in support of this traditional pattern of trade, especially as Asian countries seek new, cleaner energy options.

To better serve the goal of the green economy in BC, the Asia Pacific Gateway could better develop its role as an access corridor for trained labour and educated professional talent; as a facilitator in attracting investment capital from the Asia Pacific; and as the North American base for Asian enterprises seeking a foothold on this continent.

Strategic incentives for anchor investments in manufacturing or assembly would generate new training and career opportunities locally, as well as downstream jobs. Courting Asian investors and major global corporations to establish a presence in this province through trade missions and by establishing partnerships and cooperative Centres of Excellence could help. Such can be done by targeted low-interest loans, manufacturing and tax incentives, guaranteed purchases, and employee training incentives in areas where high demand is likely to persist.

Ontario, for example, has been quite successful in this regard, having secured a \$7-billion commitment from a consortium led by South Korean industrial giant Samsung Group to create 16,000 jobs in the wind and solar energy sectors and to anchor a cluster of companies that will export clean electricity to the burgeoning green-energy market in North America.

Arguments for import substitution versus export promotion tend to favour the latter in terms optimal industrial development. Recent economic history is rife with examples of where import substitution strategies have failed, due largely to the fact that inefficient industries develop when insulated from international competitive forces.

In BC's case, no such protection is being proposed. Rather, a strategic policy focus is being suggested to stimulate entrepreneurship in those areas where local demand is high and export potential exists. Products and technologies allied to BC's existing comparative advantage in natural resources are particularly relevant in this case.

In addition, more effort to promote BC's exportable green services—in areas such as systems integration, clean technology support, pollution mitigation, and energy conservation—would be beneficial.

Public Awareness & Outreach – As has been indicated throughout this report, there exists an imperfect understanding within the general public of the pending climate-related changes that will affect lives in the future. This, in turn, contributes to skepticism about the need for some of the policy and program initiatives that have already been instituted, and sows the seeds of resistance to measures that will be required in the future.

Recognition must be given to the fact that adapting to the realities of a low-carbon future will be a long-haul process and that whole generations will need to be made aware of this fact. It is imperative that creative measures be put in place to raise general awareness and gain acceptance of the need for climate-related adaptation and to market the opportunities presented by the green economy to business, government at all levels, and the public at large.

In Summary – The strategic framework needed to implement these policies will require a mix of enabling instruments, including market-based approaches, regulations, and standards; measures to stimulate private and public R&D; and information-based instruments to influence consumer choices.

The key policy consideration here is the need to ensure that the objective of achieving a greener economy be seen as a government-wide initiative that involves all departments and agencies and that extends through to other levels of government and other public institutions that, in one form or another, will shape the next generation of workers, consumers, and managers.

Admittedly this is a tall order, but history is replete with examples of situations where all encompassing policy frameworks have been put in place to guide decision making across a myriad of government departments and agencies in the service of a government-wide, goal-oriented endeavour. British Columbia has already started down this path, with a number of policy initiatives that are longer-term in focus and for the most part, province-wide—but it will be essential for the trend to continue and for it to encompass and engage all audiences.

ABOUT THE GREEN EMPLOYER SURVEY

An online survey was distributed by the GLOBE Foundation in March 2010, in co-operation with Prophis Research, to 650 companies in BC that operate within the key green sectors in order to identify current business and industry challenges, and to identify issues in the demand and supply of skilled labour. Surveys were targeted to the employers within the firm and a total of 104 questionnaires were completed in full for a response rate of 16 percent.

The surveyed companies represent a wide-cross section of the key sectors of the green economy, with a heavier focus on the Clean and Alternative Energy sector (38 percent of respondents). All Development Regions in the province were represented within the survey responses, with companies being mostly small in size and fairly well-established (three-quarters of the firms employed fewer than 25 full-time staff and approximately two-thirds of the companies have had operations in BC for more than 5 years). In addition, one-third of the companies surveyed had current job vacancies despite the recent recession—an indication that green jobs may be difficult to fill for BC firms.

SURVEY HIGHLIGHTS:

// The employers surveyed showed optimism in terms of growth for their industries with respect to the green economy in BC, with 95 percent identifying moderate to significant opportunities within their industry sectors.

// One-third (33 percent) of employers surveyed had job vacancies in March 2010—which may be an indication that despite the recent recession, green companies are having a difficult time hiring the qualified and experienced workers they need.

// Respondents advocated that more stringent environmental regulations and increased incentives could help create demand for their products and services, and indicated that a lack of government commitment to some programs and to the enforcement of regulations has stagnated growth in certain green industries.

// Survey respondents consistently identified experienced professional engineers, skilled technicians and technologists, environmental consultants and analysts, and financiers/business development officers as the most important and hardest to staff occupations for their organizations.

// The green employers surveyed indicated concern over projected difficulties in hiring for key occupations over the next decade, and advocated for improvements to training and education in order to address skill shortages and suggested possible means to facilitate hiring—including additional government policies and programs such as tax credits and grants for employee training, attraction, and retention.

// A shortage of experienced and qualified staff was identified as the primary reasons for some of the hiring challenges. Other key issues included a lack of perceived career advancement opportunities with employees, inadequate salary and benefit offerings available, and an inability of firms to offer permanent employment.

// Respondents stressed the need for more relevant programs to be developed. Increased efforts to promote collaboration and partnerships between post-secondary institutions and the private sector were repeatedly highlighted. Providing students with more practical work experience alongside their studies (through co-operative education and internship experiences, for example) is considered very important by organizations.

// The most common message was the need for program curriculums to include a focus on renewable energy in order to equip future employees with the skills needed for BC's changing energy landscape.

// Feedback on current training programs revealed an emphasis on the importance of developing multiple skill sets, such as combining entrepreneurial and business skills with technical training. Several respondents indicated the need to integrate management and business skills with traditional trades training to help improve opportunities within their industry sectors.

Please visit www.globe.ca to download the full green employer survey findings.

6//Conclusions

The future holds many challenges for BC, but this province has the resources, the knowledge, the policy tools, and the demonstrated will to not only weather these challenges, but to turn them into meaningful job creating opportunities.

However, achieving the transition to a greener economy won't happen on its own. It will require long-term visioning and clear policy signals that will provide the business community and civil society institutions with the confidence needed to make the necessary investments in infrastructure and new industrial plant and equipment.

That process must begin with a clear understanding of BC's existing assets, as well as its competitive advantages and disadvantages, including the diversity of the province's economic regions, its varied climate, and the scattered distribution of its population.

The research conducted in support of this report indicates that even today, BC is suffering from a shortage of experienced engineers, skilled technologists, and workers certified to install and service complex renewable energy (solar, wind, geothermal, etc.) and water quality management systems. The CEOs of some of BC's most progressive and forward-looking companies predict that these shortages will become more pronounced over the next decade.

There is a growing demand within the business community for more training and skill development and expanded post-secondary educational programs for engineers, technicians, consultants, and other environment-related professionals—a demand that is far from being satisfied in the near-term.

BC needs to continue building on its suite of smart, green policies and programs that encourage investment, that support company growth and retention, and that build export opportunities in the green economy. Continued efforts are required to attract the innovators and entrepreneurs, to train the skilled workers, and to source the capital needed to build a sustainable green economy that will lead to economic prosperity in the province for both present and future generations.

WHAT IS CLEARLY EVIDENT FROM THE ANALYSIS UNDERTAKEN BY THE GLOBE FOUNDATION IS THAT BC HAS A SOLID FOUNDATION UPON WHICH TO BUILD A LOWER-CARBON FUTURE.

The research carried out by the GLOBE Foundation has provided the basis for the following general conclusions:

1// Because the vision of what constitutes a greener economy in BC is not well understood, increased public awareness and education for businesses, governments, and local residents surrounding the benefits and need for transitioning to a greener economy is considered essential in promoting the wider acceptance and adoption of new technologies and practices.

2// Providing local governments with the tools and resources needed to implement sustainable development practices, combined with greater coordination between provincial and municipal policies and programs, will help to speed up BC's transition to a greener economy.

3// It is imperative that public sector pension funds, BC-based banking and financial institutions, and other pools of investment capital be given a clear signal by the provincial government that investing in home-grown technologies and businesses is deemed a matter of high priority.

4// All levels of government and major public service institutions, such as hospitals, educational institutions, public service agencies, and energy utilities, should work to coordinate their purchasing decisions to stimulate the development of commercially-viable green businesses within the province that in-turn, will create more green jobs. To the extent that there are increased risks or increased costs associated with green purchasing policies, the provincial government should be prepared to shoulder this burden as part of the down payment for a more prosperous and greener future.

5// A suite of low-carbon or green resource-based industry goals must be identified and the instruments to achieve these goals should be put in place to enable local suppliers of green technologies, lower-carbon products, or sustainable services to gain a viable commercial foothold, create more jobs, and strengthen their capacities to compete in the larger global marketplace.

6// Investing in R&D and promoting the commercialization of clean and green technologies will help close loops in local supply chains and will build a more resilient domestic economy that in turn will create jobs in BC and develop the products and service which can then be exported to the rest of the world.

7// BC is projected to experience serious shortages in green workers over the next decade due in part to high attrition levels and constraints on skilled labour supply. Action is needed to increase productivity levels within the labour force; to attract and retain existing workers and new graduates for the province's green industry sectors; to train and up-skill workers from traditional industries; and to increase the participation rates amongst under-employed segments of BC's population.

8// There is a large, untapped labour pool available for skills training and higher education opportunities amongst BC's First Nations. An urgent need exists to expand skilled trades and apprenticeship training for rural and aboriginal communities and to bring learning resources and employment opportunities closer to these communities.

9// BC is well endowed with academic and skills training institutions which will serve as important focal points for the transition to a greener economy. Not only do these institutions supply the human resources that will be in such high demand in the future, but they can also serve as testing and training grounds for some of the low-carbon technologies and products that in time will become commonplace in the larger society. An analysis of opportunities for reallocating post-secondary funding toward greener program and curriculum development, as well as toward applied research and demonstration projects, is warranted.

10// Incorporating the environment, sustainability, and the growing importance and attractiveness of green occupations into the formal K-12 curriculum is seen as essential to building future labour force capacity and creating change. The design of in-school programs and online information tools that include resource materials for elementary and high school students, teachers, and parents would help in this regard.

What is clearly evident from the analysis undertaken by the GLOBE Foundation is that BC has a solid foundation upon which to build a lower-carbon future. That being said, so long as the green economy in the province is considered as separate from the province's economy as a whole, there is work yet to be done. As such, efforts to usher in a greener economy, if pursued effectively, will lead to opportunities that will generate sustainable wealth and lasting employment for BC's residents for generations to come.



TO ACCESS THE FULL FINDINGS OF THE GLOBE FOUNDATION'S STUDY, INCLUDING MORE DETAILED INFORMATION ON BC'S GREEN ECONOMY AND LABOUR MARKET, ON GREEN EDUCATION AND TRAINING IN BC, ON THE GREEN EMPLOYER SURVEY, ON THE REGIONAL FOCUS GROUPS, AND/OR THE PROJECT METHODOLOGY, PLEASE CONTACT THE FOUNDATION AT **INFO@GLOBE.CA** OR VISIT **WWW.GLOBE.CA**.

6//Links to More Information

National Resources:

Canada's Job Bank - Service Canada
Human Resources and Skills Development Canada
Labour Market Information (Service Canada)
National Research Council
Working in Canada

Provincial Resources:

BC Work Futures
Career Planning and Labour Market Information
Industry Training and Apprenticeships in BC
Industry Training Authority
What's Key – Opportunities, Careers, Education
WorkBC

Green Job Websites:

CanadianEnvironmental.com
ECO.ca
GreenCareersGuide.com
GoodWorkCanada.ca
Jobs.CleanEdge.com
WorkCabin.ca

Industry Training Organizations:

Automotive Training Standards Organization
Construction Industry Training Organization
Horticulture Education BC
Propel – Tourism, Hospitality, Foodservices Training
Residential Construction Industry Training Organization
Resource Training Organization
Transportation Career Development Association

Sector Councils:

Aboriginal Human Resources Development Council of Canada
BioTalent Canada
Canadian Agricultural Human Resource Council
Canadian Apprenticeships Forum
Canadian Automotive Repair and Service Council
Canadian Council of Technicians and Technologists
Canadian Supply Chain Sector Council
Canadian Tourism Human Resource Council
Canadian Trucking Human Resources Council
Construction Sector Council
Council for Automotive Human Resources
Electricity Sector Council
Environmental Careers Organization (ECO) Canada
Forest Products Sector Council
Human Resource Council for the Voluntary/Non-Profit Sector
Information and Communications Technology Council
Installation, Maintenance and Repair Sector Council
Mining Industry Human Resource Council
Motor Carrier Passenger Council of Canada
National Seafood Sector Council
Wood Manufacturing Council

Associations & Supporting Organizations:

Asia-Pacific Gateway Skills Table

Association of BC Forest Professionals

Association of Canadian Community Colleges

Association of Professional Engineers and Geoscientists of BC

Association for Technology Professionals in BC

BC Biodiesel Association

BC Bioenergy Network

Business Council of BC

BC Chamber of Commerce

BC Community Forest Association

BC Construction Association

BC Environment Industry Association

BC Ground Water Association

BC Innovation Council

BC Sustainable Energy Association

BC Technology Industry Association

BC Water and Waste Association

Building Owners and Managers Association of BC

Canada Green Building Council

Canadian Bioenergy Association

Canadian Energy Efficiency Alliance

Canadian GeoExchange Coalition

Canadian Geothermal Energy Association

Canadian Home Builders Association of BC

Canadian Hydrogen and Fuel Cell Association

Canadian Hydropower Association

Canadian Solar Industries Association

Canadian Renewable Fuels Association

Canadian Wind Energy Association

Cascadia Region Green Building Council

Clean Energy BC (formerly IPPBC)

Community Energy Association

Council of Forest Industries

Economic Development Association of BC

Engineers Canada

Forest Products Association of Canada

Forest Stewardship Council of Canada

Fraser Basin Council

Genome Canada

GeoExchange BC

Kootenay Association for Science and Technology

Kootenay Rockies Innovation Council

LifeSciences BC

Light House Sustainable Building Centre

Mining Association of BC

National Brownfield Association

North Columbia Environmental Society

Northern Bioenergy Partnership

Ocean Renewable Energy Group

Okanagan Environment Industry Alliance

Okanagan Science and Technology Council

Peace Energy Cooperative

Recycling Council of BC

SolarBC

Thermal Environmental Comfort Association

Union for British Columbia Municipalities

Urban Development Institute – Pacific Region

Vancouver Economic Development Commission

Vancouver Renewable Energy Cooperative

Victoria Advanced Technology Council (VIATec)

Water Supply Association of BC

Wood Pellet Association of Canada



www.globe.ca

For more information,
please contact:

GLOBE Foundation
World Trade Centre
578 – 999 Canada Place
Vancouver, BC
Canada V6C 3E1
Tel : (604) 695 5001
Fax : (604) 695 5019
Email : info@globe.ca



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