INDUSTRY STRATEGY

BRITISH COLUMBIA'S WORKFORCE READINESS FOR A CLEAN ECONOMY FUTURE

April 2020

DELPHI GROUP

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DISCLAIMER

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PURPOSE & PROJECT GOALS

PURPOSE

In December 2018, the Province of British Columbia (the Province) released CleanBC[1], a plan to reduce greenhouse gas emissions (GHGs) and provide economic opportunities across British Columbia. CleanBC sets a pathway to a more prosperous, balanced, and sustainable future; it outlines actions to reduce GHGs and provides a blueprint to build a thriving clean economy.

This Industry Strategy for Workforce Readiness for the Clean Economy (the Industry Strategy) has been developed by industry, for industry, to:

1. **Identify the specific labour and workforce opportunities that will emerge through the implementation of CleanBC;**
2. **Better understand the workforce challenges and opportunities for the emerging clean economy; and**
3. **Recommend actions across a range of stakeholder groups that, if implemented, will help individuals and businesses thrive in the clean economy.**

The Industry Strategy is the culmination of a multi-phase Clean Economy Workforce Readiness Project (the Project). It draws on information from several sources, including previous clean economy and sector-specific studies, existing workforce development and capacity building efforts in B.C., and comprehensive consultation. Guided by a Steering Committee[2] established to oversee the work, the project team undertook the three phases of activity outlined in **Table 1**.

Table 1: Phases of The Clean Economy Workforce Readiness Project

PHASE 1	**STAKEHOLDER ENGAGEMENT**
Purpose:	Engage a project Steering Committee and undertake broader stakeholder and public consultation, including community workshops.
Deliverable:	Engagement summaries
PHASE 2	**RESEARCH & ANALYSIS**
Purpose:	Conduct labour market information research, including statistical analysis, key informant interviews, industry surveys, and sector-specific focus groups. Analyse data on workforce demand and supply opportunities, challenges, and skills gaps in B.C.'s clean economy in line with CleanBC.
Deliverable:	Clean Economy Sector Labour Market Information Summary Report (the LMI Report)
PHASE 3	**STRATEGY DEVELOPMENT**
Purpose:	Draft the Industry Strategy to: • Summarize the findings • Identify key recommendations and actions to advance the clean economy workforce in B.C. • Inform development of the B.C. Government's CleanBC Jobs Readiness Plan
Deliverable:	Industry Strategy on Workforce Readiness for the Clean Economy

1 See: https://cleanbc.gov.bc.ca

2 Steering Committee membership is found in Appendix A.

PROJECT GOALS

Guided by the Steering Committee, three project goals were established at the outset to ensure the work would meet the needs of industry, as outlined in **Figure 1**.

Figure 1: Clean Economy Workforce Readiness Project Goals

PROJECT GOALS

SUPPORT

British Columbians to get the skills they need to take advantage of the opportunities presented by a low-carbon economy

AGGREGATE

and update relevant clean economy sector labour market information (LMI) and profile the workforce and education/training needs

ENSURE

B.C.'s clean economy is globally competitive and able to respond to emerging opportunities through training, retraining and ongoing professional development programs

ACKNOWLEDGMENTS

The development of the Industry Strategy is a product of collaboration, with input from industry, post-secondary institutions, labour and non-profit training providers, Indigenous communities, and many businesses and individuals across British Columbia. The Project was funded through the Canada-B.C. Labour Market Development Agreement's Sector Labour Market Partnerships program, which is administered by the B.C. Ministry of Advanced Education, Skills, and Training (AEST). With additional in-kind support from B.C. Climate Action Secretariat and a host of other organizations, the Delphi Group was able to undertake extensive LMI research and strategy development, engaging more than 500 stakeholders.

The Delphi Group would like to thank the organizations and individuals who participated in the research and development of the Industry Strategy and its recommendations, including the Project Steering Committee, the five sector sub-committees, regional and Indigenous workshop participants, key informant interviewees, participants in the public consultation through EngageBC, and respondents to the industry survey. These organizations provided valuable insights, information, data, and feedback on the work (see Appendix A for a list of organizations consulted).

In addition, special thanks go to:

- **Elevate Consulting for support in refining this Industry Strategy and strategic model;**
- **Indigenuity Consulting Group for leading the engagement process to gather the wisdom and insights from the Indigenous community consultations across B.C.;**
- **Scale Collaborative for the Gender-based Analysis Plus (GBA+) assessment; and**
- **Simon Fraser University's Morris J. Wosk Centre for Dialogue for analyzing the input from the EngageBC portal and facilitating six regional workshops, the outputs of which informed project deliverables.**

EXECUTIVE SUMMARY

B.C.'S CLEAN ECONOMY OPPORTUNITY

For the purposes of this Project, the clean (or low-carbon) economy is defined as an economic state that results from the decarbonization of all industries through meaningful actions taken to address the impacts from climate change, in the pursuit of creating more resilient communities.

The clean economy is a subset of the broader green economy which, in addition to a focus on reducing greenhouse gas (GHG) emissions, seeks to decouple economic growth from natural resource consumption and minimize negative impacts on ecosystems. The green economy also encompasses broader social issues such as advancing lasting reconciliation and self determination for Indigenous Peoples, reducing poverty and hunger, and advancing gender equality.

B.C.'s clean economy includes five core sectors which are responsible for supplying technologies, products, and services that have measurable environmental benefits for reducing GHG emissions, improving energy and process efficiency, and enhancing society's resilience in the face of climate change. These sectors include many sub-sectors and industries, which collectively represent areas of potential employment growth in British Columbia. The core sectors are:

1. **Clean Power Supply and Storage**
2. **Green Building and Resilient Infrastructure**
3. **Clean Transportation**
4. **Materials Management and Waste-to-Resource**
5. **Industrial Energy and Process Efficiency**

ALIGNMENT TO CleanBC & SCOPE

British Columbia has been a leader on climate action since the release of its 2008 Climate Action Plan. The combination of policies from this Plan, coupled with strong economic growth in the decade that followed, set the stage for the December 2018 release of CleanBC.

CleanBC aims to reduce climate pollution while creating more jobs and economic opportunities for people, businesses, and communities. It is focused on actions to reduce GHG emissions by 40% by 2030, 60% by 2040, and 80% by 2050, based on 2007 levels. Existing CleanBC actions are designed to achieve 75% of GHG emission reductions toward the 2030 target through policies and incentives in the areas of clean power, buildings, transportation, industry, and waste.

The modelling that underpins some of this Industry Strategy addresses the labour and workforce implications of CleanBC's initial policies and incentives published in December 2018, which represent the actions required to achieving 75% of the GHG emissions reduction target of 40% by 2030 from 2007 levels.

However, this Industry Strategy as a whole takes a broader view. The project team approached development of the Industry Strategy using systems thinking. Rather than limit the Workforce Readiness Model and recommended actions to the needs identified in modelling the initial CleanBC initiatives announced in 2018, all aspects of a thriving workforce were considered – from a diverse workforce, to modern, progressive employers, to a supportive regulatory framework, to the need to remain flexible and adaptive to emerging trends and the global context as B.C.'s clean economy matures.

SUMMARY OF LMI FINDINGS

Research to support the Project included statistical and economic modelling (LMI research), an industry survey of employers and training providers, focus group discussions, regional workshops, and interviews with a wide range of businesses and organizations across the province. Several key themes and issues were highlighted through these research activities, some of which apply to specific regions while others to the province as a whole.

Initial economic and employment modelling undertaken as part of the LMI research suggests that, across the five core sectors, the CleanBC policies and targets will create an average of 3,700 temporary construction jobs per year (between 2020 and 2030), as well as approximately 3,240 ongoing jobs in operations by 2030.

The *Green Building and Resilient Infrastructure* sector is projected to see most of the temporary construction jobs (55%), while the *Clean Transportation* and *Materials Management* and *Waste-to Resource* sectors are projected to see two-thirds (67%) of the total operational jobs created.

CleanBC will also have significant implications for job transformation within existing industries and occupations. Initial employment modelling suggests that clean economy-related jobs in B.C. will grow from approximately 105,070 jobs in 2018 to more than 222,800 jobs in 2030. This shift in employment reflects the 'greening' of traditional industries, resulting in approximately 117,730 more workers active in BC's clean economy by 2030. The greatest impact in terms of job transformation is expected within the *Green Building and Infrastructure* sector, due largely to the policy goal for all new construction in B.C. to be net zero energy ready by 2032, which has ripple effects across the broad building value chain.

The results of the LMI research suggest that the risks for job displacement are relatively low in the near-term to 2030. Impacts will be felt most greatly in the building sector with shifts away from natural gas equipment to electrically-heated buildings, as well as in the transportation sector with a shift from traditional combustion engine vehicles to electric vehicles. These impacts are expected to be incremental and may be mitigated through training and reskilling efforts.

The supply of workers to fill clean economy job demand is a potentially limiting factor for the growth of B.C.'s clean economy. Supply-side factors include current population forecasts, labour force participation rates, attrition rates, migration and immigration flows, and trends in the number of students graduating from training institutions across B.C.

Challenges and issues were identified specific to each core sector; however, the research identified four overarching challenges that are common across sectors:

- **Lack of Flexible and Responsive Programming** - Education and training programs need to be flexible and responsive to emerging industry trends and technology shifts. Without this flexibility, there is a risk that skill gaps will form or widen as graduates or trainees are not sufficiently equipped with the skillsets and knowledge that align with employers' needs.
- **Lack of Lifelong Learning and Demand for Training** - Many occupations in the clean economy do not have effective incentives for continuous learning, which may impact safety, quality assurance, and accountability. The concept of lifelong learning and continuing professional development (CPD) is not yet a common practice for many trades. More value will be put on a worker's ability to adapt and develop new capabilities as industries shift.
- **Recruitment and Retention Challenges** - Many employers in B.C. struggle to recruit and retain employees. Housing affordability, cost of living, and competition with other sectors or jurisdictions are some of the most commonly-cited barriers to attracting or retaining new workers. The demographic shift is another challenge driving demand for new entrants, particularly in the trades, as retirements create job openings.
- **Lack of Access and Capacity in Rural Areas** - Many rural and remote areas of the province do not have adequate access to training and/or mechanisms to build workforce capacity in line with clean economy sector needs. One of the key barriers to accessing the training and mechanisms to build key skillsets is reliable infrastructure to enable participation, including both transportation and broadband / connectivity.

This project also applied a gender and equity approach (also known as Gender-based Analysis Plus or GBA+), which focuses on enhancing the inclusion of under-represented populations in B.C.'s workforce, including women, youth (including those not following a traditional K-12 path to employment), and Indigenous Peoples, as well as those with high barriers to employment such as rural and remote communities and workers with complex retraining needs. Recommendations reflect that the transition to a clean economy presents an opportunity to shift current training and workplace processes and cultures to be more inclusive, as well as an opportunity to increase workforce participation in the current supply-constrained environment.

THE WORKFORCE READINESS MODEL

Leveraging best practices in both systems thinking and strategic planning, and to provide a framework for the data and information collected through the research and engagement, the project team developed a Workforce Readiness Model showing clear line of sight between project goals, outcomes, focus areas, strategies, as illustrated in **Figure 2**. Work to develop the Model also included cross-referencing the major issues, barriers, and challenges raised through the stakeholder engagement process to ensure adequate focus on addressing them in the recommended actions.

Figure 2: B.C. Clean Economy Workforce Readiness Model

WORKFORCE READINESS MODEL

PROJECT GOALS

SUPPORT
British Columbians to get the skills they need to take advantage of the opportunities presented by a low-carbon economy

AGGREGATE
and update relevant clean economy sector labour market information (LMI) and profile the workforce and education/training needs

ENSURE
B.C.'s clean economy is globally competitive and able to respond to emerging opportunities through training, retraining and ongoing professional development programs

OUTCOMES

OUTCOME 1
A diverse, empowered and skilled workforce drives B.C.'s clean economy

OUTCOME 2
B.C.'s clean economy workforce embraces change to maximize the opportunities afforded by a robust clean economy

OUTCOME 3
Safe, inclusive workplaces enhance competitiveness and provide clean economy opportunities to a diverse workforce in all regions of the province

OUTCOME 4
British Columbians understand the benefits of a clean economy and see clear pathways to meaningful careers in the clean economy workforce

FOCUS AREAS

- Attract new entrants into the clean economy workforce
- Ensure clean economy workers have the skills they need to succeed
- Create responsive and adaptable communities and employers
- Ensure equal access to supports and resources
- Establish strong governance and regulatory frameworks to underpin the clean economy

STRATEGIES

1 Provide flexible training programs and design curriculum that reflects the needs of B.C.'s diverse population, including Indigenous Peoples and underrepresented groups

2 Ensure the education and training system can anticipate emerging global trends, priorities, and is responsive to skill shortages in the clean economy

3 Provide on-the-job training programs to ease the transition of B.C.'s workforce to clean economy jobs

4 Prepare clean economy workers to meet the needs of changing occupations and emerging industries

5 Remove barriers for Indigenous Peoples and under-represented populations to participate in the clean economy

6 Support B.C. businesses to be competitive, resilient, and adaptable participants in the clean economy

7 Create employers of the future by fostering inclusive, flexible, and modern workplaces

8 Build awareness of the benefits of B.C.'s clean economy and the available career opportunities

9 Ensure all regions and communities across the province can actively participate in the clean economy

10 Create opportunities for businesses of all sizes to participate in the clean economy

11 Create partnerships across all contributors to B.C's economy to chart the path to a clean, thriving, and innovative economy

12 Expand regulations and requirements to ensure the safety of the workforce and maintain the quality of made-in-B.C. products and services

GUIDING PRINCIPLES

· **Ensure capacity meets demand** · **Support a just transition** · **Long-term outlook with a near-term focus** · **Consider regional contexts**
· **Build on existing initiatives & strategies** · **Evidence-based, specific, actionable & time-bound** · **Aligned to UNDRIP** · **GBA+ lens**
· **Consider the impact of Covid-19 on the global economy**

SUMMARY OF RECOMMENDED ACTIONS

To support progress in all focus areas and to support achieving the desired outcomes and project goals for B.C.'s clean economy, 21 recommended actions (and 81 sub-actions) were developed. The list in **Table 2** below has been prioritized based on principles set out by the Steering Committee.

Table 2: Recommended Actions

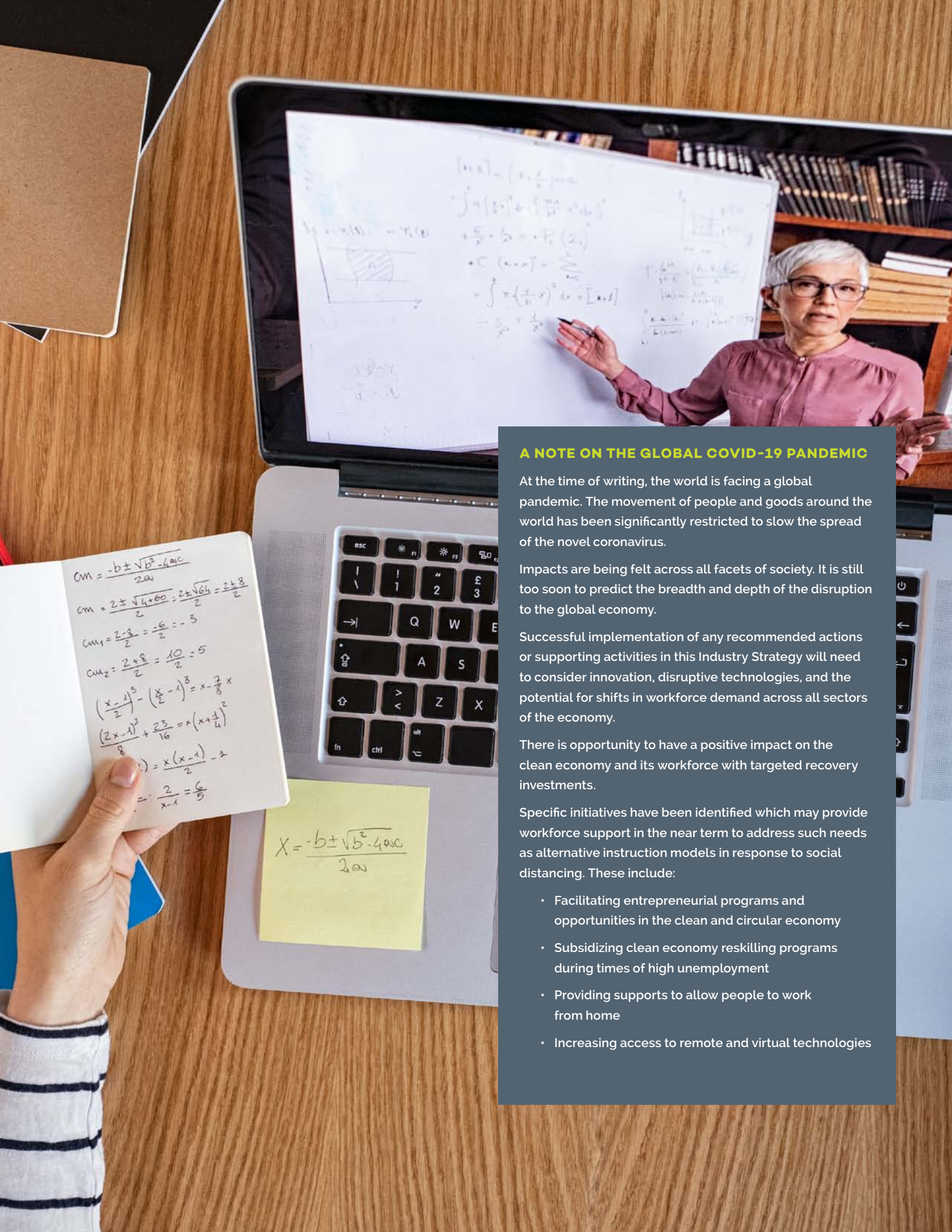
RECOMMENDED ACTIONS
1. Reduce barriers for small and medium-sized enterprises to transition to and participate in the clean economy.
2. Adopt education, training and reskilling models that bring real world context and experiences into classrooms to keep pace with global shifts and emerging trends.
3. Address youth readiness for clean economy occupations, with a focus on developing the skills and competencies needed for success in the clean economy.
4. Ensure workers in at-risk occupations receive the support they need to remain successful during the transition to the clean economy.
5. Develop industry-specific career planning tools to communicate available clean economy careers and potential pathways.
6. Facilitate networks of regional, community-based partnerships to ensure all parts of the province are prepared for the transition to the clean economy.
7. Encourage employers to support a culture of lifelong learning and provide opportunities for ongoing skills development and reskilling to their existing workforce.
8. Design alternative and flexible training models that promote inclusion and remove barriers to participation for rural, remote, and Indigenous communities.
9. Expand professional requirements and enforce safety standards that protect and provide assurances to consumers of B.C. products and services.
10. Establish safety and certification requirements for clean economy workers and workplaces.

RECOMMENDED ACTIONS
11. Create opportunities for members of rural, remote, and Indigenous communities to work in their home communities.
12. Provide more opportunities to build the skills of the workforce through on-the-job learning with employers.
13. Develop strategies and materials that promote clean economy opportunities to all British Columbians.
14. Create incentives for learners to participate in programs aligned with in-demand jobs and sectors.
15. Review approaches for delivering training programs to cultivate safe and inclusive learning environments and remove barriers to participation.
16. Minimize labour shortages in priority occupations by addressing the systemic issues that limit access to training and upskilling.
17. Support employers in preparing their workplaces for the clean economy and promoting upcoming job opportunities.
18. Champion and support diverse and inclusive employers.
19. Tailor energy efficiency and renewable energy project development and maintenance training programs to the needs of rural, remote, and Indigenous communities.
20. Establish ongoing oversight and collaboration to support a thriving clean economy workforce.
21. Document and share employer policies, tools and other best practices for fostering inclusive, safe, and flexible work environments.

NEXT STEPS – IMPLEMENTING THE STRATEGY

CleanBC presents an opportunity for British Columbia to continue to show climate action leadership through targeted GHG emission reductions while simultaneously creating new investments and jobs across BC's clean economy sectors in all regions of the province. Through CleanBC, the province can become more resilient to future economic and environmental shocks, businesses more resource and energy efficient enabling enhanced competitiveness and profitability, and communities large and small more diverse and connected around common purpose.

Partners will need to assess their implementation plans through a financial sustainability lens for the long-term maintenance and operations of their initiatives or programs. Partners should seek long-term, shared funding from multiple sources to diversify and reduce risk, including through sources that may include industry, post-secondary institutions, non-profits, and others.



A NOTE ON THE GLOBAL COVID-19 PANDEMIC

At the time of writing, the world is facing a global pandemic. The movement of people and goods around the world has been significantly restricted to slow the spread of the novel coronavirus.

Impacts are being felt across all facets of society. It is still too soon to predict the breadth and depth of the disruption to the global economy.

Successful implementation of any recommended actions or supporting activities in this Industry Strategy will need to consider innovation, disruptive technologies, and the potential for shifts in workforce demand across all sectors of the economy.

There is opportunity to have a positive impact on the clean economy and its workforce with targeted recovery investments.

Specific initiatives have been identified which may provide workforce support in the near term to address such needs as alternative instruction models in response to social distancing. These include:

- Facilitating entrepreneurial programs and opportunities in the clean and circular economy
- Subsidizing clean economy reskilling programs during times of high unemployment
- Providing supports to allow people to work from home
- Increasing access to remote and virtual technologies

1. INTRODUCTION & BACKGROUND

This Industry Strategy for Workforce Readiness for the Clean Economy (the Industry Strategy) is designed to address the labour and workforce opportunities that will emerge through the implementation of the initiatives outlined in CleanBC and the broader transition to a skilled clean economy workforce in British Columbia. It identifies education, training, and professional needs and opportunities which align with the growing demand for clean economy jobs and related skills in B.C. It is intended to support workforce capacity building, guide investment in relevant skills training, and highlight new opportunities for workers to equip themselves to thrive in the emerging clean economy.

B.C.'S CLEAN ECONOMY OPPORTUNITY

The decarbonization of energy systems, buildings, transportation, and industry is becoming a growing priority globally. Influenced by climate change policy, market demand, and technology trends, this shift is creating new investment and job opportunities for communities and workers in B.C.'s clean economy.

Defining the Clean Economy

For the purposes of this Project, the clean (or low-carbon) economy is defined as an economic state that results from the decarbonization of all industries through meaningful actions taken to address the impacts from climate change, in the pursuit of creating more resilient communities.

The clean economy is a subset of the broader green economy, which in addition to a focus on reducing GHG emissions, seeks to decouple economic growth from natural resource consumption and minimize negative impacts on ecosystems. The green economy also encompasses broader social issues such as advancing lasting reconciliation and self determination for Indigenous Peoples, reducing poverty and hunger, and advancing gender equality.

Defining Clean Economy Sectors

Through this Project, five sectors (see **Figure 3**)[3] were identified as "core" to B.C.'s clean economy. They are responsible for supplying technologies, products, and services that have measurable environmental benefits in terms of their abilities to reduce GHG emissions, improve both energy and process efficiency, and enhance society's resilience in the face of climate change. This broad sector framework includes a number of sub-sectors and green goods producing and service-based industries, including nearly 75 North American Industry Classification System (NAICS) codes at the 4 digit level.[4] Overall, these sectors and industries represent areas of employment growth potential in B.C.'s clean economy.

COMPANION DOCUMENT TO THE INDUSTRY STRATEGY: Readers interested in more detail about the research and analysis that underpins this Industry Strategy may wish to consult the Clean Economy Sector Labour Market Information Summary Report produced in Phase 2 of this Project.

3 Source: The Delphi Group

4 NAICS codes classify business establishments by type of economic activity. The NAICS numbering system is hierarchical, with additional numbers indicating greater level of detail; the first two digits designate the largest business sector, the third digit designated the subsector, the fourth digit designated the industry group, the fifth digit designated the NAICS industries, and the sixth digit designates the national industries.

Figure 3: Core Sectors of B.C.'s Clean Economy

CLEAN ECONOMY SECTORS

CLEAN TRANSPORTATION

Includes the network of transportation modes within and between communities across the province. Within this network, key industries and sub-sectors include low-carbon and zero emission vehicles; renewable and low-carbon fuels; public transit services and smart mobility solutions; low-carbon rail, marine, trucking, and air for the movement of people and goods; and land use planning and transportation infrastructure.

CLEAN POWER SUPPLY & STORAGE

Includes electricity generation from hydroelectric and other renewable sources, transmission infrastructure that connects sources with users across the province, smart/microgrid solutions, and energy storage solutions in the form of dam reservoirs and an expanding array of battery technologies.

GREEN BUILDINGS AND RESILIENT INFRASTRUCTURE

The built environment, made up of residential, commercial, industrial, and institutional buildings. Industries in this sector include building design, engineering, and operations; construction and renovation; manufacturing of building materials and related equipment; and land use planning.

MATERIALS MANAGEMENT AND WASTE-TO-RESOURCE

Includes some of the products and services to measure, prevent, limit, or minimize waste, efficiently process materials and resources, and manage GHG emissions. This sector also includes municipal and industrial waste and organics management, including methane capture, composting, recycling, and material recovery.

INDUSTRIAL ENERGY AND PROCESS EFFICIENCY

Includes a mix of industries that produce goods or provide services that benefit the environment or conserve natural resources, and jobs and activities that involve making production processes more environmentally friendly and/or use fewer natural resources. Traditional industries that fall within this sector include extraction, processing, and manufacturing within the primary and secondary industries. Technologies being used to improve the energy and process efficiency of these industries include carbon capture, utilization, and storage, waste heat recovery, bio-products and fuel, and other energy efficiency technologies.

Defining Clean Economy Jobs

For quantification purposes in line with the LMI research, clean economy jobs are defined[5] as either:

1. **Production Jobs** - Jobs in businesses that produce goods or provide services that benefit the environment or conserve natural resources but are not in and of themselves concerned with the environmental impact of the production process (e.g., clean technology design and manufacturing, hydroelectric facility engineers, and electric vehicle technicians); or
2. **Process Jobs** - Jobs in which workers deploy and adopt practices and/or technologies with a favourable impact on the environment, regardless of the good or service produced (e.g., mining engineers who apply technologies and processes to lower energy consumption and environmental impact).

The clean economy jobs profiled in the LMI research are primarily production jobs, except for certain occupations in more traditional industries of the *Industrial Energy and Process Efficiency* sector that are focused specifically on the reduction of their companies' energy consumption and GHG emissions.[6] Both production and process jobs will be required to meet the CleanBC policy goals and GHG emission reduction targets.

The transition to the clean economy, which includes the adoption of climate action policies and the implementation of new programs and the associated capital investments, will impact the workforce in three ways:

1. **Job Creation** - increase in labour demand and job openings in a given sector, resulting from new capital investments, regulatory drivers, and/or the expansion of clean economy products, services, and infrastructure.
2. **Job Transformation** - existing occupations (e.g., construction workers and trades) that will be redefined as workplace practices, skill sets, work methods, and job profiles increasingly integrate climate change considerations and the use of low-carbon technologies, processes, and operations.
3. **Job Displacement** - job losses that may occur due to economic and policy factors, including the structural changes that will be made to reduce or phase out economic activities that have a high GHG emissions intensity.

5 United States Bureau of Labour Statistics definition of green jobs

6 For example, forestry, agriculture, oil and gas, mining, cement production, smelting and refining, and manufacturing.

2. CONTEXT: ALIGNMENT TO CleanBC

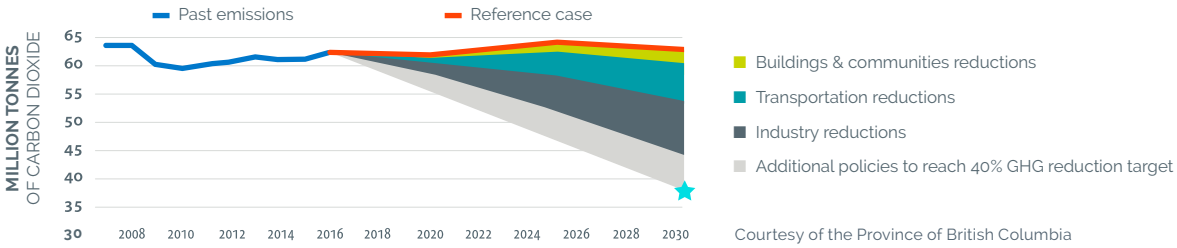
British Columbia has been a climate action leader since the release of its 2008 Climate Action Plan, which included policies and actions such as a revenue-neutral carbon tax, carbon neutral government operations, the development of a Low Carbon Fuel Standard, and a voluntary Climate Action Charter committed to by nearly every local government across the province.

The combination of strong economic growth and established policy set the stage for the next phase of climate action with the December 2018 release of CleanBC. CleanBC aims to reduce climate pollution while creating more jobs and economic opportunities for people, businesses, and communities. It is focused on actions to reduce GHG emissions by 40% by 2030, 60% by 2040, and 80% by 2050, from 2007 levels. Initial CleanBC actions provide a pathway for achieving 75% of the GHG emission reductions toward the 2030 target through policies, programs, and incentives in the areas of clean power, buildings, transportation, industry, and waste (see **Figure 4**).

Further, the Province of BC has announced work on a Climate Adaptation Strategy in 2020 under the broader CleanBC Plan, with investments in adaptation and resiliency also bringing with them potential impacts on and opportunities for employment.

Successfully implementing the targets, policies, and actions in CleanBC will require participation and coordination from all sectors of the economy. With the global shift to a low-carbon economy, there is an opportunity to bring together B.C.'s traditional resource sectors, emerging cleantech and technology sectors, and world-class training institutions to capitalize on opportunities and maintain a globally competitive clean economy. There is also a responsibility to ensure the shift provides opportunities for individuals traditionally under-represented in good jobs, including Indigenous Peoples, women, people with disabilities, newcomers to Canada, and people living in rural and remote communities.

Figure 4: Planned Emissions Reductions to 2030 in CleanBC



Courtesy of the Province of British Columbia

3. PROJECT SCOPE

Figure 5: Clean Economy Workforce Readiness Project Goals

PROJECT GOALS

SUPPORT
British Columbians to get the skills they need to take advantage of the opportunities presented by a low-carbon economy

AGGREGATE
and update relevant clean economy sector labour market information (LMI) and profile the workforce and education/training needs

ENSURE
B.C.'s clean economy is globally competitive and able to respond to emerging opportunities through training, retraining and ongoing professional development programs

PROJECT GOALS

Guided by a project Steering Committee made up of a diverse group of individuals and organizations, three project goals were established at the outset to ensure the work would meet the needs of industry as outlined in **Figure 5**.

MODELLING SCOPE

In Scope

The modelling in this Project seeks to address the labour supply and workforce needs and opportunities that will emerge through the implementation of the initial 2018 CleanBC policy actions. As such, the LMI research and analysis summarized in this Industry Strategy applies only to a shortlist of key occupations most relevant to the 2018 CleanBC's actions and the initial 75% of the GHG reduction targets. These occupations were identified by using the framework of the five core sectors, and the sub-sectors and industries classified within them.

Out of Scope

The results of the job modelling do not represent the entire spectrum of employment opportunities likely to arise from CleanBC. The additional 25% of the GHG emission reduction pathways for the Plan will likely have additional employment impacts worth considering in the future.

Furthermore, the jobs modelling summarized in this document does not consider the impacts of broader macro trends and disruptive technologies (e.g., automation) with potential displacement implications, due to the challenge of isolating their impact from that of CleanBC. Further, market trends and investments by the private sector and others are having large impacts on job creation within B.C.'s clean economy. For example, BC Hydro and independent power producers in B.C. will be investing millions into hydroelectricity and renewable power infrastructure as part of maintenance and upgrade projects. FortisBC is investing millions into its demand-side management and energy efficiency initiatives, as well as a host of other efforts related to renewable natural gas (RNG) and liquefied natural gas (LNG) for transportation (marine and road). BC Transit and Translink will be investing millions into transit infrastructure, as well as natural gas powered and electric bus fleets. Initiatives such as these are not captured in this specific modelling.

INDUSTRY STRATEGY SCOPE

The project team approached development of the Industry Strategy using systems thinking. Rather than limit the Workforce Readiness Model and recommended actions to the needs identified in modelling the initial CleanBC policies announced in 2018, all aspects of a thriving workforce were considered – from workplace diversity, to modern, progressive employers, to a supportive regulatory framework, to the need to remain flexible and adaptive to emerging trends and global context as B.C.'s clean economy matures.

4. METHODOLOGY

GOVERNANCE

The Delphi Group developed a governance structure to guide the Clean Economy Workforce Readiness Project (see **Figure 6**). A Steering Committee was made up of representatives from industry (including major employers and small businesses), post-secondary education and training institutions, labour organizations, non-governmental organizations and training providers, regional economic development groups, and First Nations technology and training organizations. The Steering Committee was engaged over a 12-month period through three in-person meetings and several online engagement sessions and surveys.

The project team also established five sub-committees, with the goal of providing a range of perspectives on industry trends and workforce issues, including sector-specific knowledge and expertise on the five core clean economy sectors. The Steering Committee and sub-committees provided input into the issue areas identified through the research and stakeholder engagement, which formed the basis for the Workforce Readiness Model, the focus areas, strategies, and recommended actions.

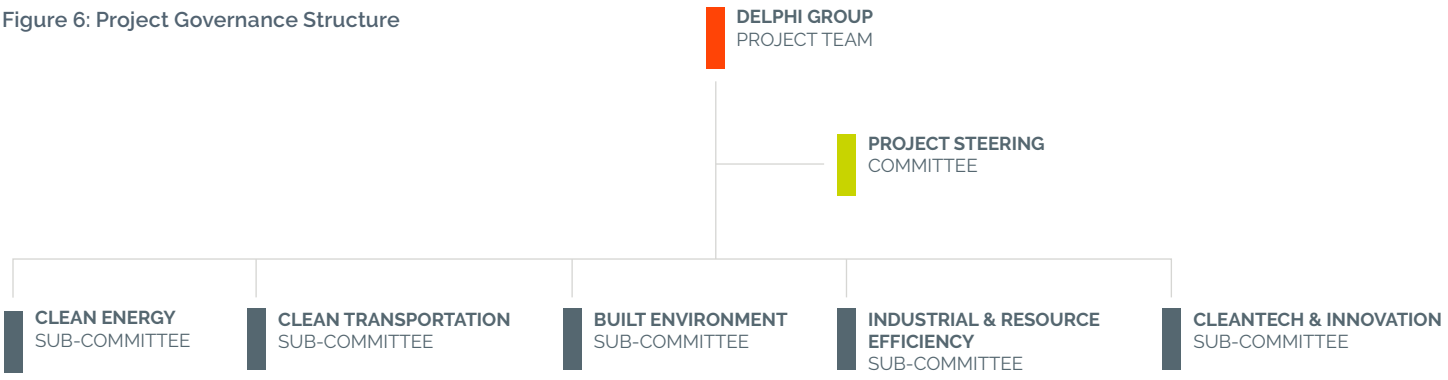
RESEARCH & LABOUR MARKET INFORMATION ANALYSIS

Delphi performed detailed LMI research to identify sector and workforce trends, and to examine key industry and occupation/employment forecasts. This included examining key occupations, demographics, and regional issues and broader trends that may influence the demand and supply of labour to 2030.

Researchers projected "incremental" (i.e., additive) and "transformational" jobs in B.C.'s clean economy within the scope of the 2018 CleanBC Plan. These projections addressed the number of clean economy jobs that would be created by sector, industry, and top occupations as a result of the initial CleanBC policies to 2030.

Delphi performed a gap analysis for the most relevant clean economy occupations likely to be impacted by CleanBC's success over the next decade. Efforts were made to align with insights and outcomes from existing LMI research and workforce capacity-building projects in B.C. across the five clean economy sectors.

Figure 6: Project Governance Structure



ENGAGEMENT PROCESS

More than 500 stakeholders were engaged throughout the project to support the secondary research. In addition to the sector-specific sub-committees, stakeholders were engaged through key informant interviews, an industry survey, regional workshops, an online discussion forum, and Indigenous-focused workshops. See **Table 3** for a summary of engagement activities.

Table 3: Engagement by the Numbers

PROJECT STEERING COMMITTEE	27 DIVERSE MEMBERS Including: 16 Women, 2 Youth Organizations, 2 Indigenous Organizations, 8 Regional Perspectives
INDUSTRY SURVEY	178 PARTICIPANTS
SECTOR-SPECIFIC SUB-COMMITTEES	5 SUB-COMMITTEES
REGIONAL WORKSHOPS	13 WORKSHOPS
INDIGENOUS-FOCUSED REGIONAL WORKSHOPS	8 WORKSHOPS
STAKEHOLDERS ENGAGED THROUGH THE OVERALL PROCESS	500+ INDIVIDUALS

Interview participants included a diverse set of workforce development stakeholders and industry experts. More than 50 key informants were interviewed to build on existing knowledge, fill-in research gaps, review the relevant industry and market trends, and inform the gap analysis. The interviews focused on skills shortages to add to the LMI research and quantitative data collection.

Delphi also conducted an online industry survey between October 10 and November 22, 2019. The survey provided an opportunity for stakeholder groups across British Columbia to provide suggestions, ideas, and recommendations for advancing opportunities and addressing gaps in workforce and skills development related to CleanBC. A total of 178 people responded to the survey representing businesses, industry associations, labour unions, post-secondary institutions, and non-profit organizations.

Finally, 21 regional community workshops were hosted between June and November 2019 in all eight economic development regions of the province. Workshops were structured to explore workforce challenges and opportunities. The Province's EngageBC platform also hosted four "open dialogue" fora on clean economy workforce related topics to garner additional public input.

Indigenous Consultation

Delphi engaged Indigenuity Consulting Group to develop and conduct a consultation process for Indigenous Peoples across the province. Between August and October 2019, Indigenuity planned and conducted eight engagement sessions and 15 telephone interviews. Session participants included community representatives (including Treaty Nations), employment and training counsellors, Indigenous training and education providers, Métis funding providers, Council members, urban Indigenous service providers, and a Friendship Center participant. In total, 37 participants were engaged through the workshops, including 18 communities and seven tribal councils.

Gender and Equity Considerations

The LMI research for this project, as well as the design of the Steering Committee and sub-committees applied a Gender-based Analysis Plus (GBA+) approach which focused on enhancing the inclusion of under-represented populations of B.C.'s workforce. An example of how GBA+ was used throughout the project is through the application of questions adapted from the Government of Canada's GBA+ approach, such as:

- **What are the current socio-demographic characteristics of the clean economy sector workforce? Are there any segments of the population that are under-represented (e.g., women, Indigenous Peoples, youth)?**
- **What are the barriers to participation for under-represented groups (e.g., remote location, employer stereotypes)? Can measures be developed to address any perceived or identified barriers?**
- **In developing approaches to the issues, have a wide range of stakeholders been consulted, including under-represented groups?**

It also incorporated considerations for those with high barriers to employment, rural and remote communities, and workers with more complex retraining needs (e.g., older workers).

Researchers reviewed the B.C. Labour Market Outlook (LMO) 2018-2028 and occupational data and conducted interviews to identify populations that are under-represented or could experience barriers in industries that are part of the transition to a clean economy. Populations identified included women, youth, individuals with disabilities, and rural or remote communities. Researchers noted that data was absent on other groups that might require specific considerations.

DEVELOPING THE WORKFORCE READINESS MODEL

Leveraging best practices in both systems thinking and strategic planning, the project team developed a Clean Economy Workforce Readiness Model showing clear line of sight between project goals, outcomes, focus areas, and strategies (see **Figure 7**). Work to develop the Model also included cross-referencing the major issues, barriers, and challenges raised through the stakeholder engagement process to ensure adequate focus on addressing them in the recommended actions.

Figure 7: B.C. Clean Economy Workforce Readiness Model

WORKFORCE READINESS MODEL

PROJECT GOALS

SUPPORT
British Columbians to get the skills they need to take advantage of the opportunities presented by a low-carbon economy

AGGREGATE
and update relevant clean economy sector labour market information (LMI) and profile the workforce and education/training needs

ENSURE
B.C.'s clean economy is globally competitive and able to respond to emerging opportunities through training, retraining and ongoing professional development programs

OUTCOMES

OUTCOME 1
A diverse, empowered and skilled workforce drives B.C.'s clean economy

OUTCOME 2
B.C.'s clean economy workforce embraces change to maximize the opportunities afforded by a robust clean economy

OUTCOME 3
Safe, inclusive workplaces enhance competitiveness and provide clean economy opportunities to a diverse workforce in all regions of the province

OUTCOME 4
British Columbians understand the benefits of a clean economy and see clear pathways to meaningful careers in the clean economy workforce

FOCUS AREAS

- Attract new entrants into the clean economy workforce
- Ensure clean economy workers have the skills they need to succeed
- Create responsive and adaptable communities and employers
- Ensure equal access to supports and resources
- Establish strong governance and regulatory frameworks to underpin the clean economy

STRATEGIES

1 Provide flexible training programs and design curriculum that reflects the needs of B.C.'s diverse population, including Indigenous Peoples and underrepresented groups

2 Ensure the education and training system can anticipate emerging global trends, priorities, and is responsive to skill shortages in the clean economy

3 Provide on-the-job training programs to ease the transition of B.C.'s workforce to clean economy jobs

4 Prepare clean economy workers to meet the needs of changing occupations and emerging industries

5 Remove barriers for Indigenous Peoples and under-represented populations to participate in the clean economy

6 Support B.C. businesses to be competitive, resilient, and adaptable participants in the clean economy

7 Create employers of the future by fostering inclusive, flexible, and modern workplaces

8 Build awareness of the benefits of B.C.'s clean economy and the available career opportunities

9 Ensure all regions and communities across the province can actively participate in the clean economy

10 Create opportunities for businesses of all sizes to participate in the clean economy

11 Create partnerships across all contributors to B.C's economy to chart the path to a clean, thriving, and innovative economy

12 Expand regulations and requirements to ensure the safety of the workforce and maintain the quality of made-in-B.C. products and services

GUIDING PRINCIPLES

· Ensure capacity meets demand · Support a just transition · Long-term outlook with a near-term focus · Consider regional contexts

· Build on existing initiatives & strategies · Evidence-based, specific, actionable & time-bound · Aligned to UNDRIP · GBA+ lens

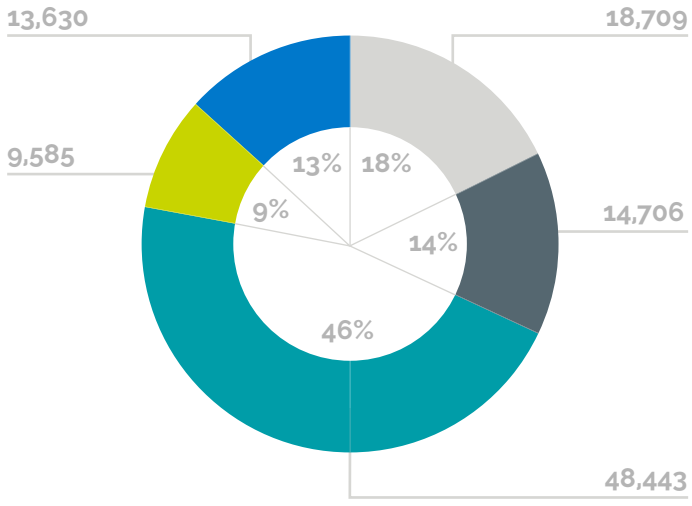
· Consider the impact of Covid-19 on the global economy

5. SUMMARY OF LMI FINDINGS

This section outlines the findings of the review of existing literature, LMI research, and engagement with stakeholders across British Columbia. More detailed information is found in the Clean Economy Sector Labour Market Information Summary Report.

In 2018, B.C.'s clean economy was estimated to directly employ approximately 105,070 people and contribute $16.6 billion to provincial gross domestic product (GDP).

Figure 8: Direct Clean Economy Jobs in B.C. by Sector, 2018



Source: The Delphi Group

WORKFORCE DEMAND

There are a number of key factors influencing the demand side of B.C.'s clean economy:

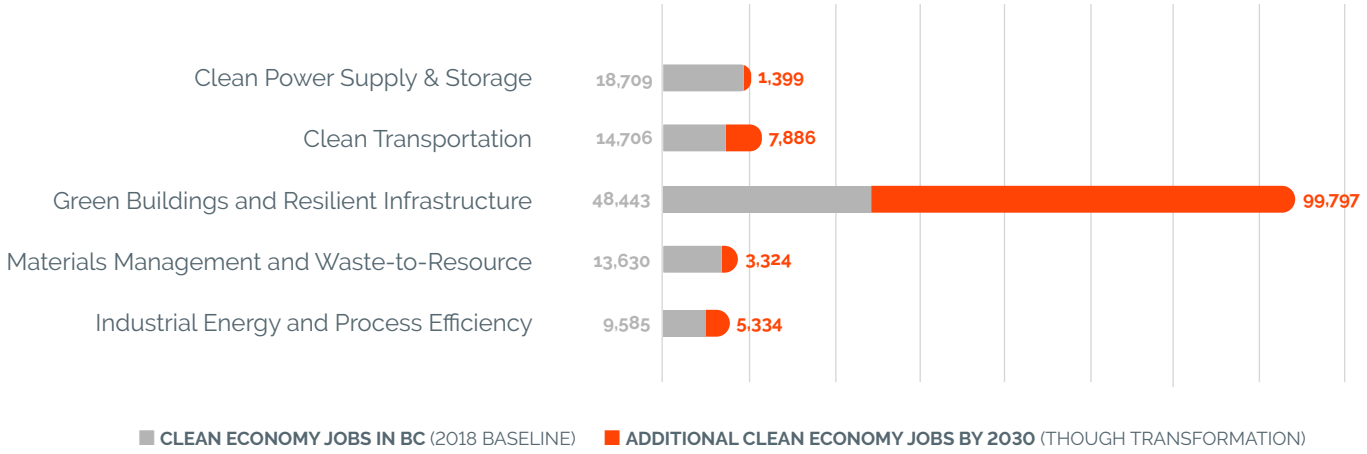
- **Policy Drivers** - policy drivers encompass several different levels of government, from international agreements to federal policy, to provincial climate leadership, to regional and local-level targets, policies, and actions. CleanBC, a primary focus for this Project, is a key policy driver at the provincial level.
- **Major Projects and Investments** - based on the B.C. Major Projects Inventory, there are currently 220 major clean economy-related projects at various stages of planning and development, making a significant contribution to job opportunities in British Columbia. These projects include clean energy, green building, waste/wastewater management, and clean transportation projects.
- **Technology and Global Market Shifts** - technological advancements are being made across the five core clean economy sectors, driving the demand for new and emerging technical skills. This includes technologies such as energy storage, remote sensing, high-performance building heating and cooling equipment, autonomous vehicles, advanced manufacturing, and machine learning, among others.

The still-to-be determined impacts of the COVID-19 pandemic will likely also impact workforce demand across all sectors of the economy.

JOB TRANSFORMATION

Initial modelling of CleanBC policies and targets (see **Table 4**) suggest that job transformation[7] arising from CleanBC within existing industries and occupations will be greater in number than the new job openings. This will result in greater market penetration within the existing labour pool as more workers focus their skills and expertise on clean economy-related projects and the use of clean technologies, equipment, and/or processes. Employment modelling suggests that clean economy-related jobs in B.C. will grow from approximately 105,070 jobs in 2018 to more than 222,810 jobs in 2030; a growth of approximately 117,740 more workers that will be active in B.C.'s clean economy by 2030 (see **Figure 9**).

Figure 9: Projected Clean Economy Workers in B.C. by Sector Due to Job Transformation, 2018-2030, Based on Modelled CleanBC Policies



Source: The Delphi Group

The greatest impact in terms of job transformation is expected within the *Green Building and Resilient Infrastructure* sector, due largely to the policy goal for all new construction in B.C. to be net zero energy ready by 2032, which has ripple effects across the broader building value chain. The *Clean Transportation* sector is also expected to see job transformation impacts as a result of greater market penetration of lower-carbon fuels and zero emission vehicles (ZEVs) by 2030. In addition, the *Industrial Energy and Process Efficiency* sector will see more workers involved with clean technologies as they look to reduce GHG emissions across all carbon-intensive industries.

TRAINING PARTNERSHIPS – EV CURRICULUM

The Province of B.C. is investing in new models of training such as the Electric Vehicle Maintenance Training program which is a partnership with BCIT to develop and test an EV curriculum with 12 Red Seal mechanics working on the City of Vancouver's 120 vehicle EV fleet. This program will be available to the public as a part-time studies course in 2020.

While not creating an overall net change in terms of jobs within the labour pool, the impact of job transformation is important to consider as it relates to retraining and upskilling for key occupations to align supply with the demand of climate action policy and broader market shifts. Related to CleanBC, architects, mechanical engineers, carpenters, plumbers, and electricians working on more energy-intensive buildings can be re-skilled/re-oriented to carry out similar work, but focused more on improved energy performance (e.g., net zero energy buildings). Automotive service technicians may need retraining for electric and zero emission vehicles (see sidebar). Related to the production of biofuel, as well as managing GHG emissions from industrial waste (e.g., managing forestry-related slash piles), will require attracting truck drivers with skills and knowledge related to transporting renewable feedstock (e.g., forestry fibre, recycled cooking oil, tallow/lard, and other organic feedstocks), as well as those working with the equipment to extract organic materials and forest-based fibre from their sources to where they can be cost-effectively processed.

Based on projected clean economy market and policy shifts in B.C., initial modelling suggests a number of important occupations (listed in **Table 4** in order of total numbers) will require specific knowledge and skills, and potential training/upskilling, in order to work in their relevant clean economy sectors on projects and initiatives.

7 Many existing occupations are seeing their jobs transformed and redefined as day-to-day workplace practices, skill sets, work methods, and job profiles increasingly integrate considerations related to climate change and low-carbon technologies, processes, and operations. Job transformation is different from job creation in that it does not result in a growing labour pool, but rather a 'greening' of existing occupations through reskilling.

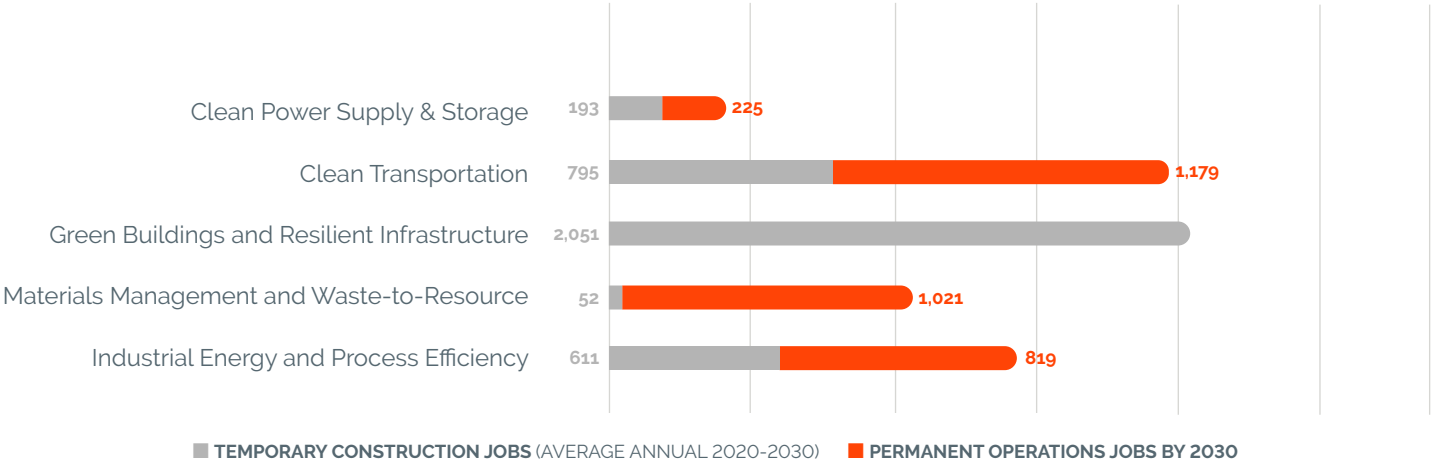
Table 4: Clean Economy Job Transformations in B.C. by Occupation, 2018-2030

NOC	NOC - OCCUPATION TITLE	# OF JOBS
7271	Carpenters	9,795
7611	Construction Trades Helpers & Labourers	5,882
7241	Electricians (Except Industrial & Power System)	4,334
0711	Construction Managers	3,191
7294	Painters & Decorators (Except Interior Decorators)	2,984
7251	Plumbers	2,829
0712	Home Building & Renovation Managers	2,069
7284	Plasterers, Drywall Installers, Finishers & Lathers	2,010
7521	Heavy Equipment Operators (Except Crane)	1,986
7291	Roofers & Shinglers	1,648
7512	Bus Drivers, Subway Operators & Other Transit Operators	1,511
7205	Contractors & Supervisors, Other Construction Trades, Installers, Repairers & Servicers	1,404
7441	Residential & Commercial Installers & Servicers	1,391
6733	Janitors, Caretakers & Building Superintendents	1,106
7513	Taxi & Limousine Drivers & Chauffeurs	938
8612	Landscaping & Grounds Maintenance Labourers	905
7313	Refrigeration & Air Conditioning Mechanics	754
2171	Information Systems Analysts & Consultants	667
7511	Transport Truck Drivers	601
2131	Civil Engineers	552
7321	Automotive Service Technicians, Truck & Bus Mechanics & Mechanical Repairers	536
7292	Glaziers	532
7302	Contractors & Supervisors, Heavy Equipment Operator Crews	516
7237	Welders & Related Machine Operators	514
7362	Railway Conductors & Brakemen/Women	459
9614	Labourers In Wood, Pulp & Paper Processing	442
0911	Manufacturing Managers	399
7293	Insulators	399
7311	Construction Millwrights & Industrial Mechanics	369
7231	Machinists & Machining & Tooling Inspectors	352
9431	Sawmill Machine Operators	311
7361	Railway & Yard Locomotive Engineers	298
0821	Managers in Agriculture	284
7531	Railway Yard & Track Maintenance Workers	267
7312	Heavy-Duty Equipment Mechanics	248
2151	Architects	243
7522	Public Works Maintenance Equipment Operators & Related Workers	223
8241	Logging Machinery Operators	195
8431	General Farm Workers	179
0912	Utilities Managers	178
7621	Public Works & Maintenance Labourers	177
7314	Railway Carmen/Women	169
7322	Motor Vehicle Body Repairers	153
2225	Landscape & Horticulture Technicians & Specialists	144
7235	Structural Metal, Platework Fabricators & Fitters	142
8255	Contractors & Supervisors, Landscaping, Grounds Maintenance & Horticulture Services	141
9533	Other Wood Products Assemblers & Inspectors	132
7233	Sheet Metal Workers	124
9434	Other Wood Processing Machine Operators	118
9612	Labourers In Metal Fabrication	112
9416	Metalworking & Forging Machine Operators	110
7452	Material Handlers	107
9436	Lumber Graders & Other Wood Processing Inspectors & Graders	107
9215	Supervisors, Forest Products Processing	100
65	Other Core Occupations, Projected to Each Have < 100 Jobs Transformed	2,487

JOB CREATION

Initial economic and employment modelling undertaken as part of the LMI research suggests that, across the five core sectors, existing CleanBC policies and targets will create an average of 3,700 temporary construction jobs per year (2020 to 2030), as well as approximately 3,240 ongoing jobs in operations by 2030. **Figure 10** outlines the projected job openings for both temporary and ongoing jobs by sector.

Figure 10: Projected Job Openings by Sector, Based on Modelled CleanBC Policies

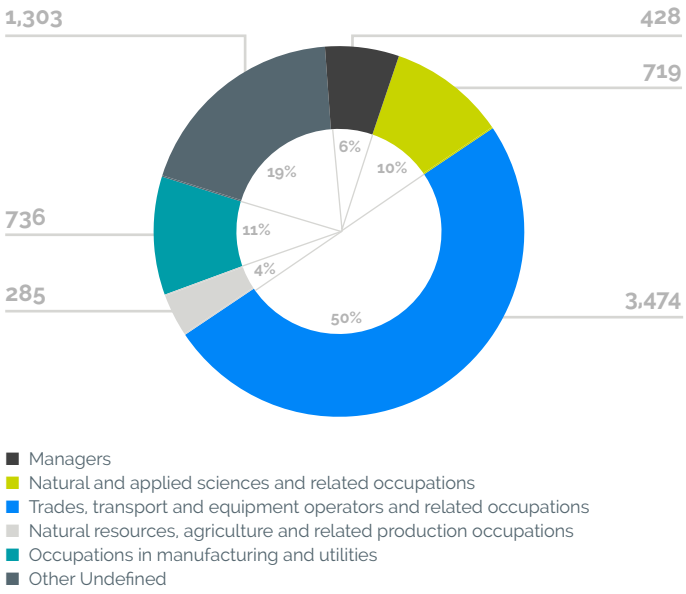


Source: The Delphi Group

The *Green Building and Infrastructure* sector is projected to see more than half (55%) of the temporary construction jobs, followed by the *Clean Transportation* sector (22%), and the *Industrial Energy and Process Efficiency* sector (17%). It has been assumed that the construction investments related to the CleanBC policies are evenly spread between 2020 and 2030. However, investments related to some policies are likely to be made prior to 2025 (e.g., reductions related to methane emissions from the natural gas industry) while others may come after 2025 (e.g., scale-up of larger biofuel production facilities). In terms of ongoing jobs in operations, the *Clean Transportation* and *Materials Management and Waste-to-Resource* sectors are projected to see approximately 1,180 and 1,020 jobs created by 2030, respectively, equal to two-thirds (67%) of the total operational jobs.

Figure 11 provides an overview of the types of jobs that will be required to meet the current CleanBC policy goals and targets. It includes a breakout of the forecasted demand by occupational category based on the modelling. More details on the projected employment impacts of the CleanBC policy goals on a sector-by-sector basis are provided in **Table 5**.

Figure 11: Projected Jobs by Occupational Category Based on Modelled CleanBC Policies (average annual temporary construction job openings between 2020-2030 and permanent operations jobs by 2030)



Source: The Delphi Group

Table 5: Initial CleanBC Job Creation, Policies, Regional Distribution, and High Demand Occupations

SECTOR	CleanBC POLICY GOALS	REGIONAL DISTRIBUTION	OCCUPATIONS IN HIGHEST DEMAND
 CLEAN POWER SUPPLY & STORAGE Temporary Construction (average/year): 193 JOBS Permanent Operations: 225 JOBS	1. Increased renewable power for remote and Indigenous communities 2. Increased electricity transmission infrastructure for powering industrial operations	1. Rural and remote communities (Indigenous and/or diesel-dependent) outside of the Mainland/Southwest region 2. Northeast and North Coast/ Nechako regions	• Electrical Power Line and Cable Workers • Residential and Commercial Installers and Servicers • Contractors and Supervisors, Heavy Equipment Operator Crews • Contractors and Supervisors, Other Construction Trades, Installers, Repairers and Servicers • Electrical and Electronics Engineers • Facility Operation/ Maintenance Managers • Construction Managers • Power Engineers and Power Systems Operators
 GREEN BUILDINGS & RESILIENT INFRASTRUCTURE Temporary Construction (average/year): 2,051 JOBS Permanent Operations: N/A	1. All new buildings to be net-zero energy ready by 2032 2. 70,000 homes and 10 million m2 of commercial buildings retrofitted to use electricity in space heating by 2030 3. $400 million to support retrofits and upgrades for B.C. publicly-funded buildings	1. Dispersed throughout the province, but faster adoption for Vancouver Island/ Coast, Mainland Southwest, Thompson-Okanagan, and Kootenay regions in line with current B.C. Energy Step Code adoption 2. 90% of activity will take place in three regions based on population and climate considerations: Mainland/ Southwest, Vancouver Island /Coast, and Thompson Okanagan 3. Evenly distributed across the province in line with the presence of public housing stock	• Electricians • Carpenters • Plumbers • Refrigeration/AC Mechanics • Manufacturing Engineers (Fenestration, Pre-Fabrication) • Construction Managers • Civil Engineers • Concrete Finishers • Facility Operators/Managers • Construction Estimators • Sheet Metal Workers • Mechanical Engineers • Roofers and Shinglers • Architects • Electrical and Electronics Engineers • Ironworkers • Welders and Related Machine Operators • Construction Inspectors • Insulators • Glaziers

Table 5: Initial CleanBC Job Creation, Policies, Regional Distribution, and High Demand Occupations *cont'd*

SECTOR	CleanBC POLICY GOALS	REGIONAL DISTRIBUTION	OCCUPATIONS IN HIGHEST DEMAND
 CLEAN TRANSPORTATION Temporary Construction (average/year): 795 JOBS Permanent Operations: 1,179 JOBS	1. 30% of all new LDV and truck sales to be ZEVs by 2030 2. Production of 650 million liters of renewable fuels per year by 2030 3. Investments in active transportation infrastructure	1. Largely in southwestern and urban centres in B.C., linked to the EV passenger vehicle market 2. Potential for all regions, linked to feedstock access 3. Evenly distributed across province	• Electricians • Petroleum/Chemical Process Operators • Construction Trades Helpers and Labourers • Contractors and Supervisors, Heavy Equipment Operator Crews • Transport Truck Drivers • Process Control and Machine Operators • Heavy-Duty Equipment Mechanics • Construction Managers • Chemical Plant Machine Operators • Chemical Engineers • Carpenters • Chemical Technologists and Technicians • Civil Engineers • Steamfitters/Pipefitters
 MATERIALS MANAGEMENT & WASTE-TO-RESOURCE Temporary Construction (average/year): 52 JOBS Permanent Operations: 1,021 JOBS	1. 95% of organic waste diversion target by 2030 2. 75% of landfill methane captured by 2030	1. Province-wide, although largely rural areas 2. Province-wide, although largely rural and remote areas	• Public Works Maintenance Equipment Operators and Related Workers • Transport Truck Drivers • Water/Waste Treatment Plant Operators • Supervisors, Logging and Forestry • General Farm Workers • Utilities Managers • Managers in Agriculture • Heavy Equipment Operators • Forestry Professionals • Forestry Technologists and Technicians • Material Handlers • Chemical Technologies and Technicians

SECTOR	CleanBC POLICY GOALS	REGIONAL DISTRIBUTION	OCCUPATIONS IN HIGHEST DEMAND
 INDUSTRIAL ENERGY & PROCESS EFFICIENCY Temporary Construction (average/year): 611 JOBS Permanent Operations: 819 JOBS	1. Reduce industrial GHG emissions by 2.5 Mt per year 2. 15% renewable gas in the natural gas system by 2030 3. Reduce methane emissions from the natural gas sector by 45% by 2025	1. All regions of B.C. in line with GHG emissions intensive industrial activities (extraction, processing, and manufacturing) 2. Geographic distribution will be largely based on farm activities and in line with suitable landfill locations, as well as access to natural gas pipeline infrastructure and customers. Forestry-based opportunities distributed, largely for Vancouver Island/Coast and the Cariboo regions 3. Northern B.C. regions, as well as along natural gas pipeline routes	• Construction Millwrights and Industrial Mechanics • Transport Truck Drivers • General Farm Workers • Steamfitters, Pipefitters and Sprinkler System Installers • Industrial Electricians • Heavy-Duty Equipment Mechanics • Managers in Agriculture • Water/Waste Treatment Plant Operators • Petroleum, Gas and Chemical Process Operators • Plant and System Operators • Pulp Mill Machine Operators • Wood Processing Machine Operators • Chemical Technologists and Technicians • Chemical Engineers • Heavy Equipment Operators • Construction Managers • Mining Engineers • Industrial Engineering and Manufacturing Technologies/Technicians • Mechanical Engineers • Industrial and Manufacturing Engineers • Gasfitters

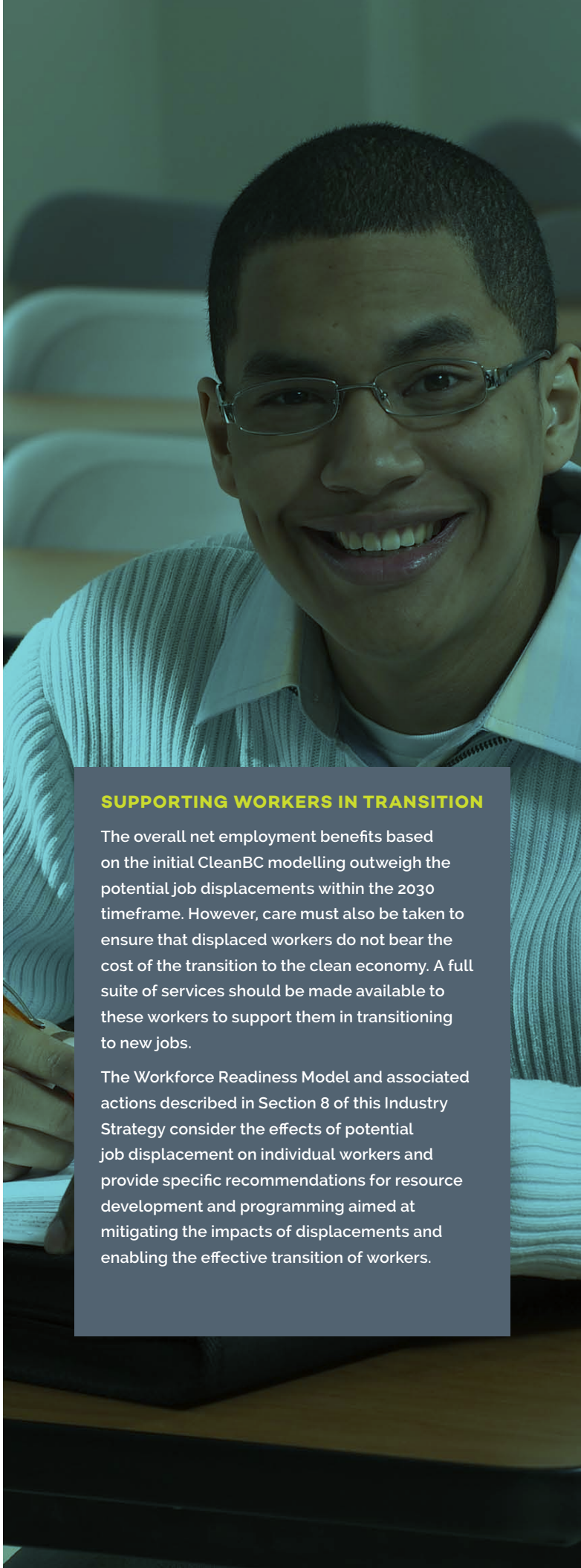
JOB DISPLACEMENT

The results of the LMI research suggest that the risks for job displacement from initial CleanBC (2018) policies are relatively low. However, the shift toward more electrically-heated buildings (e.g., to heat pumps and electric boilers) and away from natural gas equipment is expected to result in some job transformation and potential displacement within the HVAC sector; work may shift from gas equipment installation to more work undertaken by refrigeration and air conditioning mechanics, plumbers, and electricians. Based on initial modelling for the Part 9 residential sector,[8] electric heating is expected to generate an average of 147 temporary construction jobs per year for HVAC trades (2020-2030). In contrast it has the potential to displace 73 temporary jobs in construction per year (the most at risk being residential gasfitters). The overall net result is a creation of 73 construction jobs related to the residential HVAC sector.

Initial modelling suggests that job displacement may also occur for traditional automotive mechanics with the transition from internal combustion engine (ICE) vehicles to electric vehicles; electric vehicles not only require less maintenance, but also typically have warranties that require going direct to dealerships and manufacturers. The estimated displacement here is approximately 1,460 permanent jobs by 2030. However, immediate layoffs are unlikely as the existing vehicle market will continue to have considerable ICE vehicles to 2030, and there will be opportunities for retraining.

Finally, initial modelling suggests that some additional job displacement may occur as a result of broader macro trends and disruptive technologies. This may include the shift from high- to low-carbon products (e.g., from coke-fired cement kilns to biomass, or from coal exported for metallurgic steel to carbon fibre alternatives), as well as technological advancements such as automation, pre-fabrication, modular construction, and additive manufacturing. These potential job displacement factors were not modelled as part of the LMI research given the challenge of isolating their impact from that of CleanBC; however, it is important to consider strategies for managing the potential risks.

It should be noted that job displacement is not synonymous with job elimination. Though fewer workers may be required in a given occupation, care should be taken not to eliminate programs completely or discourage people from pursuing these careers at levels required to meet ongoing demand.



SUPPORTING WORKERS IN TRANSITION

The overall net employment benefits based on the initial CleanBC modelling outweigh the potential job displacements within the 2030 timeframe. However, care must also be taken to ensure that displaced workers do not bear the cost of the transition to the clean economy. A full suite of services should be made available to these workers to support them in transitioning to new jobs.

The Workforce Readiness Model and associated actions described in Section 8 of this Industry Strategy consider the effects of potential job displacement on individual workers and provide specific recommendations for resource development and programming aimed at mitigating the impacts of displacements and enabling the effective transition of workers.

8 Part 9 Buildings are 3 storeys or less, have a building area less than 600m2 and are primarily residential, office/service, retail, or medium-and low-hazard industrial.

WORKFORCE SUPPLY

The supply of workers to fill clean economy job demand is a potentially limiting factor for the growth of B.C.'s clean economy. Factors include current population forecasts, labour force participation rates, attrition rates, migration and immigration flows, and trends in the number of students graduating from training institutions across B.C. The unforeseen impacts of the global COVID-19 pandemic may also have yet-to-be determined impacts on the supply of skilled workers.

Relevant training programs exist in a wide variety of formats, starting with curriculum for K-12 education, to college and trades training (including apprenticeship programs), to undergraduate programs and advanced multi-disciplinary degrees. There are also a number of continuing education programs through industry-led training offering clean economy skills to mid-career professionals. These include reskilling programs through labour organizations and opportunities provided by professional industry associations.

EMERGING SKILLS

In addition to new and emerging technical skills, the transition to a clean economy will require both basic and cross-functional skills.[9] Stakeholders identified the following work-related skills in additional to technical skills as important to all types of occupations:

- **Project Management**
- **Collaboration/Teamwork**
- **Social Interaction**
- **Critical Thinking**
- **Learning Agility**
- **Leadership**
- **Problem Solving**
- **Cultural & Diversity Awareness**
- **Social Perceptiveness**
- **Systems Thinking**

Almost all (97%) of the clean economy employers in BC that responded to the industry survey identified complex problem solving and critical thinking as the most important work-related skills required over the next five to ten years. Respondents also identified skills related to interpreting the changing political and regulatory landscape as important, particularly for those with technical backgrounds who many be moving into management or senior roles.

CLIMATE ADAPTATION

With an increasing risk of climate-related hazards in B.C., the importance of climate change adaptation is paramount for bolstering resiliency while maintaining stability, human health, and economic security. Climate change impacts present not only a risk but also opportunities in B.C.'s clean economy, with implications across all five of the core clean economy sectors. Incorporating climate change considerations within existing occupations is an ongoing process, with many industry professionals reporting they lack the tools, information, resources, and client support necessary to make this shift.[10]

Innovation continues to progress in the field of climate change adaptation, highlighting the importance of industry professionals and managers being able to understand climate change impacts and incorporating those into planning, design, and implementation. Training will be required for industry professionals including engineers, agrologists, biologists, planners, landscape architects, and technicians to design, upgrade, and maintain our existing infrastructure, transportation, technology, and energy systems in a way that protects the natural and built environments from extreme weather and other climate-related events and disasters.

Skills such as land use management, lifecycle assessment, climate risk assessment, and science-based decision-making are examples of the skills industry professionals will need to develop and adopt. In addition, new skillets are required for employees in industries endeavoring to adapt to climate change. These include skills such as risk management, adaptive management, and scientific capacity.[11] An example includes forestry professionals who must recognize growing wildfire risks and identify tree species that can resist extended periods of drought and new pests.

In addition to technical skills, companies are looking for employees to be capable of strategic planning, being self-motivated and taking initiative, able to innovate and learn quickly, as well as think critically and creatively. Team-based skills including communication, language skills, conflict management, and negotiation are important for workers to collaboratively find solutions to industry problems.[12]

9 The 2019 BC Labour Market Outlook uses skills definitions adapted from the US Department of Labor, Employment and Training Administration. This skills taxonomy identifies 35 total work-related skills, which are separated into 10 basic skills and 25 cross-functional skills (also called competencies).

10 APEGBC CCAG, Climate Change Survey, (2017).

11 Simon Dale-Lace, Elise Pare WSP, The Future of Stormwater Design in the Face of Uncertainty, ACEC-BC Fall (2019).

12 GLOBE Advisors, British Columbia's Clean Transportation Sector, (September 2012).

CLIMATE ADAPTATION is increasingly becoming an area of knowledge that will be needed across all professional occupations as businesses and government plan for infrastructure and services that can better account for increasing frequency and severity of extreme weather events and longer-term, structural changes such as rising sea levels. For example, the Inspiring Climate Action project, led by Royal Roads University, has identified more than 40 gaps in current programming available for professional occupations relevant to the clean economy (e.g., engineers, geoscientists, foresters, biologists, agrologists, technicians, etc.).

While work is underway to roll out the first series of professional development courses and programs, more will be needed to fill the gaps and better integrate a climate action lens to key professions. This will require drawing from evidence-informed competency frameworks. These competencies, along with other mitigation-related competencies, organizational capabilities, and ISO standards, should inform professional development training requirements and guide practice standards.

climateactionbc.com

6. BARRIERS & CHALLENGES

KEY ISSUES

Several key themes and issues were highlighted through the extensive research undertaken as part of this Project, some of which apply to specific regions while others to the province as a whole.

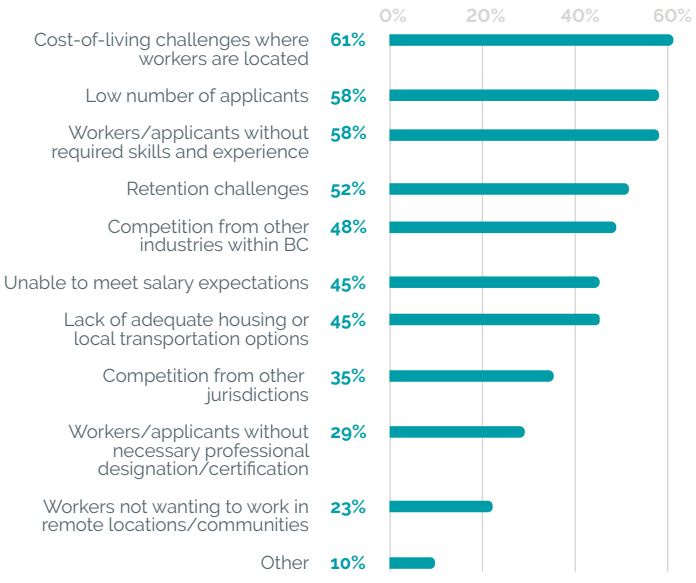
Employers across the province responded to the industry survey describing challenges with filling openings for key occupations in their businesses. Approximately four out of five (78%) of respondents reported experiencing staffing challenges in the last two years.[13] Regional workshop participants described challenges unique to their regions in attracting specific occupations and skillsets, and also finding trade contractors with a current knowledge of low-carbon technologies and CleanBC policies and incentives.

Specific occupations were identified by clean economy employers from various sectors responding to the industry survey as being both important for their companies and particularly difficult to staff. These included:

- **Power Engineers & Power System Operators**
- **Utilities Managers**
- **Electrical & Electronics Engineers**
- **Chemical Engineers & Technologists**
- **Transport Truck Drivers**
- **Supervisors for Supply Chain & Logistics Planning**
- **Material Handlers**
- **Home Building, Renovation & Construction Managers**
- **Industrial & Manufacturing Engineers**
- **Construction Millwrights & Industrial Mechanics**

When asked to describe the issues in more detail, the most commonly reported reasons for staffing challenges included the high cost-of-living (61%), low numbers of applicants (58%), applicants without the required skills and experience (58%), and retention challenges (52%). Other challenges highlighted included seasonal work cycles, balancing working conditions with worker expectations, and the high cost and time commitment required to train new employees. **Figure 12** provides more detail.

Figure 12: Reasons for Current Staffing Challenges identified by Clean Economy Employers (n=31)



Source: Clean Economy WRP Industry Survey

13 It should be noted that B.C. has been experiencing an overall tight labour market over the last couple of years, a situation which is not unique to the clean economy sector.

GAPS, BARRIERS & CHALLENGES BY SECTOR

Industry stakeholders participating in regional workshops, key informant interviews, and sector-specific sub-committees were asked to describe workforce-related gaps and challenges they are experiencing.

CLEAN POWER SUPPLY & STORAGE

In the **Clean Power Supply and Storage** sector, stakeholders highlighted challenges associated with the historic focus in B.C. on large hydroelectric projects. These projects reduce the demand for more local community projects and tend to make it challenging for small and medium-sized businesses to attract qualified professionals to work on smaller hydroelectric, solar, and wind projects. This, in turn, reduces the number of professionals working in communities to mentor new entrants into the clean economy. Among stakeholders who are developing clean power projects, a need was highlighted for broader skillsets related to community and government relations in order to navigate complex consultation and approvals processes.

GREEN BUILDINGS & RESILIENT INFRASTRUCTURE

In the **Green Building and Resilient Infrastructure** sector, challenges include the lack of trades with knowledge and experience in relevant clean technologies (e.g., heat pumps, building operation systems), high employee turnover, and the lack of regulations and requirements for training. A lack of minimum training requirements for many trades decreases the demand for apprenticeships and work-integrated learning opportunities. Carpenters, insulators, glaziers, and energy advisors and modellers are examples of occupations that will face both increased demand due to energy efficient building code upgrades and supply shortages due to anticipated retirements.

Other reported skills gaps that apply across the Green Building and Resilient Infrastructure sector (for both new construction and retrofits, as well as residential and non-residential buildings) included knowledge of building-as-a-system, airtight envelopes, and integrated project delivery methods (i.e., systems-based approaches to construction which ensure all systems align to the original goals for the project).

THE CleanBC GOAL OF RETROFITTING 70,000 HOMES IN BC TO ELECTRIC HEAT PUMPS BY 2030 will require an increase in relevant, qualified contractors in line with projected demand. Given the current 4-year Refrigeration and Air Conditioning Mechanic program is designed more for the commercial sector, an option exists for developing a shorter program specifically for the residential sector to allow more qualified HVAC workers to enter the market faster. This model has been tested in Ontario and could also serve as a retraining program for potentially displaced gasfitters.

CLEAN TRANSPORTATION

Challenges reported in the **Clean Transportation** sector include competition for employees from other industries, the negative stigma sometimes associated with heavy-duty mechanic jobs, and the increasing demand for a combination of both transportation-specific knowledge and information and communications technology (ICT) skills. Many of the challenges identified in the Clean Transportation sector have existed for over a decade, but stakeholders felt these challenges are even more pronounced today. Increasing electrification and digitalization of transportation technologies and services are creating a need for more nimble and flexible programming, safety training for high-voltage electricity, and greater hands-on learning environments.

MATERIALS MANAGEMENT & WASTE-TO-RESOURCE

In the **Materials Management and Waste-to-Resource** sector, stakeholders described gaps and challenges associated with systems approaches and the emerging application of circular economy principles to traditional business models. Technical skills related to managing feedstock and material supply chains will be needed, along with skills in connecting complex networks of resource inputs and outputs (including reverse logistics). There is also a growing need for proficiency in the operation and management of digital systems, as well as data analysis. There remain greater challenges associated with developing important skills and industries in rural and less-populated areas, many of which do not have basic infrastructure to manage recycling and organics streams.

INDUSTRIAL ENERGY & PROCESS EFFICIENCY

The **Industrial Energy and Process Efficiency** sector includes activities associated with making industrial production processes more efficient and environmentally-friendly, and also activities that produce goods and services that benefit the environment. While traditional resource industries require updated skillsets and talent to improve processes and their operations, they are also vulnerable to boom-bust resource cycles and competition for labour from nearby jurisdictions with different policy landscapes (i.e., competition with jurisdictions outside B.C. with less stringent environmental or climate policies). Workforce attraction and retention was also highlighted as a significant challenge for this sector, both with respect to the cost of living in urban areas and finding workers willing to work in remote areas.

GENERAL ISSUES ACROSS ALL SECTORS

Several challenges and issues were identified that are common across all sectors. These issues are grouped into four main categories, described below.

Lack of Flexible and Responsive Programming

Education and training programs need to be flexible and responsive to emerging industry trends and technology shifts. Without this flexibility, there is a risk that skill gaps will form or widen as graduates or trainees are not sufficiently equipped with the skillsets and knowledge that align with employers' needs.

Nearly half (44%) of the employers that responded to the industry survey were only "somewhat satisfied" with B.C.'s post-secondary institutions' current ability to understand and meet the training and education needs of their industries (see **Figure 13**). Survey respondents specifically suggested that post-secondary institutions could provide more exposure to applied research facilities where technicians can be cross-trained and could also provide more practical working time through co-op programs and site visits. Respondents also highlighted a need for programs combining both technical and management skills, and more offerings in rural regions of the province to mitigate the cost of travelling long distances for training.

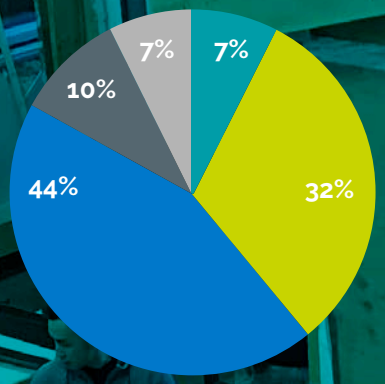
In order to improve responsive programming, there are challenges that need to be addressed around finding qualified instructors, maintaining valuable industry-academic partnerships, and ensuring programs and training are accessible to prospective students. Other barriers and challenges associated with flexible and responsive programming include, but are not limited to:

- **Regional programs struggle with minimum registration numbers and/or lack capacity and flexible delivery formats;**
- **The education system does not match the pace of industry change; new education/training programs often take a long time to develop and go through the approvals process;**
- **Lack of partnerships between industry, government, and academia may result in programs not having access to the most current technologies needed by industry, which may create misaligned skills development and missed learning opportunities;**
- **Lack of support and demand for apprenticeships; employers will hire educated and more experienced workers from other provinces over hiring local apprentices; and**
- **Lack of clean economy lens on K-12 curriculum.**

Figure 13: Summary of Survey Responses Regarding Post-Secondary Education and Training Programs (n=41)

Q

How satisfied are you with B.C's post-secondary educational institutions' current ability to understand and meet the needs of your industry in providing education and training for the clean economy?



Source: The Delphi Group

BCIT'S HIGH PERFORMANCE BUILDING LAB in Burnaby is an excellent model of flexible and responsive programming, providing hands-on learning and exposure to the latest net zero energy building practices, technologies, and related equipment in a lab type setting. The Lab's professional development courses have been popular with industry, relevant for carpenters, insulators, fenestration, and HVAC trades, as well as for architects, designers, energy advisors, building officials, local governments, and others. The Lab has recently evolved to including virtual and online workshops and programming, opening up access to workforce training to communities province-wide.

commons.bcit.ca/energy/research/high-performance-building-lab

Photo Credit: BCIT

Lack of Lifelong Learning and Demand for Training

Many occupations in the clean economy do not have effective incentives for continuous learning, which may impact safety, quality assurance, and accountability. The concept of lifelong learning and continuing professional development (CPD) is not yet a common practice for many construction trades; but more value will continue to be placed on a worker's ability to adapt and develop new capabilities as industries shift. Key barriers and challenges associated with lifelong learning include, but are not limited to:

- **Lack of clarity on how certain occupations and industries fit in the clean economy;**
- **Unwillingness of employers to allow the necessary time away for training and skills development because of the disruption to business;**
- **Need for more fostering of core "soft skills" and leadership/mentorship opportunities;**
- **Lack of demand for training and continuing professional development due to lack of regulations and/or value placed on training;**
- **Resistance by employers to provide training or to support co-op placement; and**
- **Lack of understanding of specific skills gaps by sector and region.**

A lack of common understanding, climate and energy literacy, and awareness of the CleanBC Plan is a barrier to the successful and coordinated implementation of targets, policies, and actions. Information resources developed for a province-wide or cross-sector audience are often too vague to resonate with a community's unique culture, values, and industrial base, which can be a barrier to the uptake of CleanBC programs and policies. Specifically, builders and contractors face a lack of access and awareness of available resources related to updating their knowledge of new standards and building practices, techniques, and technologies.

PROGRAM REGISTERED CONTRACTOR PROGRAM

The BC Government (Ministry of Energy, Mines, and Petroleum Resources) has developed a voluntary Program Registered Contractor (PRC) program, in collaboration with BC Hydro and FortisBC. The PRC program requires contractors to take professional development training in exchange for allowing them to access energy efficiency rebates for customers through the Better Buildings BC program, boosting their business opportunities while improving the quality of work in the field.

Recruitment and Retention Challenges

Many employers in B.C. struggle to recruit and retain employees. Cost of living was one of the most commonly cited barriers to attracting or retaining new workers, as the combined costs of housing, car ownership, and internet service may limit people's options. This is especially relevant to the Southwest/Lower Mainland region, where a lack of affordable housing options prevents potential employees from moving to a new job. The demographic shift is another challenge driving demand for new entrants, particularly in the trades, as retirements create job openings.

In addition, the lack of awareness of career options in the clean economy was repeatedly referenced during the labour market research consultation efforts. Many communities lack a centralized resource that can provide a starting point to learn about the CleanBC Plan, clean economy workforce opportunities and programs, and connect to potential partners within their community and more broadly.

In order for CleanBC to be successful, specific attraction and training programs will be required to support specific targets and projects.

For example, plans to build more electrification capacity in northern BC, including transmission and distribution infrastructure linked to a memorandum of understanding (MOU) signed by the Province of BC and federal government in 2019, will require powerline technicians, electrical engineers, and construction trades (e.g., welders, crane operators, truck drivers, etc.) who will be in competition with other major resource development projects in those regions. There is also a projected gap in the supply of Building Energy Advisors due to the demand created for this occupation/skillset through the BC Energy Step Code.

Immigration can help to fill gaps where existing capacity and increased participation is not enough. Skilled immigrants have long been and will continue to be an important component of B.C.'s workforce, supported by programs such as WelcomeBC and the BC Provincial Nominee Program.

Other specific barriers and challenges associated with recruitment and retention include, but are not limited to:

- **Competition from other industries/sectors or jurisdictions putting pressure on workforce recruitment, particularly for major projects;**
- **Workers that lack an accurate picture of their career options in the clean economy (e.g., stigma around the trades);**
- **Under-represented groups that often have unequal access for participating in the clean economy workforce (e.g., under-representation in the post-secondary education system and gender pay gap); and**
- **Immigration policy barriers that limit hiring immigrant talent or that do not reflect emerging jobs and skillsets.**

Lack of Access and Capacity in Rural and Remote Communities

Many rural and remote areas of the province do not have adequate access to training and/or mechanisms to build workforce capacity in line with clean economy sector needs. One of the key barriers to this is lack of reliable infrastructure, including both transportation and broadband/connectivity. While recognizing that infrastructure barriers are much broader than the focus of this project, maintaining an awareness of the unique challenges faced by different groups and coordinating with other initiatives seeking to address these issues is essential to a strong and equitable clean economy. In addition to infrastructure, underlying barriers such as poverty and literacy affect access to training and employment, and Indigenous Peoples, women, youth, people with disabilities, and people living in remote communities are disproportionately affected by these barriers.

A recurring theme in this area was the lack of resources that interpret CleanBC initiatives and the associated opportunities within the context of individual communities. Many rural and remote communities in B.C. are closer in proximity to major upcoming industrial projects; however, without targeted action, members of these communities will not have the necessary knowledge and skillsets to participate in these opportunities.

Other challenges and barriers associated with access and capacity in rural areas include, but are not limited to:

- **In-Community Training:** There is a desire to have training delivered in-community to limit training costs associated with travel and accommodations. However, there is often not the volume of people to deliver training relevant to available jobs. Bulk training is difficult to offer at the local level and is not always appropriate.
- **Work Experience:** There is a desire for on-the-job and work experience accompanied training. This may be a challenge if there are no experienced mentors or companies doing early adoption of clean economy industries, goods, or services.
- **Temporary Work Camps and Community Impact:** Companies coming into communities to build clean economy projects and/or green infrastructure come with a mix of challenges and opportunities. Communities may be impacted by the negative aspects of "camp life", not see a corresponding boost in local employment, or the employment is in lower entry level labour jobs. When the companies leave, they take the jobs with them. Conversely, local employees may not want to enter camp life due to the time away from family, community, and perceived unhealthy work/life experiences connected to such camps.
- **Sustained Workforce:** Communities reliant on a single industry or employer may have challenges providing their population with sustained workforce opportunities and managing through boom-bust resource cycles.
- **Transportation:** Transportation is an oft-cited issue for rural and remote communities. This has already been recognized as a barrier for youth and lower income employees and is also an issue for locations that do not have access to public transit that aligns with work hours or work locations.

As resource and infrastructure projects are planned and approved, there is an opportunity for companies and training institutions to partner in delivering local project-based training. Investment in green building and infrastructure projects in rural and remote areas, for example, can provide a basis for training opportunities for local communities.

As one example of capacity building, the Heiltsuk Nation has been working in partnership with Ecotrust Canada since 2016 to retrofit community homes with high-efficiency heat pumps. In addition to providing savings on heating costs and improving indoor air quality, capacity building is a priority for the project. Project coordination is managed locally and installations are completed by local workers trained by a qualified project contractor.

Due to the time required for environmental assessments and other approvals, some training may even be possible before construction is underway.

Challenges Specific to Indigenous Peoples and First Nations

Despite the rich and diverse historical relationship that Indigenous Peoples have with the land now known as British Columbia, Indigenous Peoples are under-represented in B.C.'s workforce and face significant barriers to employment.[1] There is both an opportunity and a responsibility to transition to a clean economy in a way that considers Indigenous Peoples. As such, the design and implementation of this project was aligned to reconciliation efforts, the principles of the UN Declaration on the Rights of Indigenous Peoples (UNDRIP), and the Truth and Reconciliation Commission's Calls to Action.

In a series of workshops with Indigenous training providers, participants highlighted the important role of traditional Indigenous knowledge, values, and stewardship activities for supporting workforce readiness and the CleanBC programs. Participants stressed that more information about CleanBC and its associated initiatives and opportunities needs to be shared with communities and that government and industry need to work directly with communities to provide education on the emerging clean economy.

While a majority of participants made clear their interest in pursuing economic, employment, and training opportunities related to a clean economy, they said that systemic barriers – including socio-economic issues such as poverty, as well as issues related to literacy and life skills – need to be addressed before Indigenous Peoples can fully take advantage of those opportunities. It was also consistently noted that opportunities will be most successful if they are locally-based. Given this feedback, a key goal should be to train people locally for opportunities that are available locally and align with local culture and values so that ultimately people can live with their families in their own communities.

Several challenges and barriers to training and economic opportunities for Indigenous Peoples were identified through this research, including but not limited to:

- **Conflict of Values:** These comments focused on the challenges created by cultural differences and how those impact both participation and success levels of Indigenous students and employees.
- **Demand for Employment:** The fact that many communities lack access to long-term, sustainable jobs was cited as a barrier to developing successful training programs.
- **Funding Restrictions:** Various issues associated with funding programs (lack of coordination among funders, inability to leverage dollars, and onerous reporting requirements) were cited by many participants.
- **Knowledge:** Lack of knowledge about green-related economic and employment opportunities was cited as a major barrier to accessing training and employment.
- **Social Issues:** Issues such as addictions, poverty, residential school impacts, and literacy were raised as significant barriers.
- **Transportation:** Transportation, or lack thereof, was cited as a major issue at virtually every session.
- **Wraparound Supports:** Limited resources for supports such as child-care, housing costs, parking, and living allowances was cited as an issue by a majority of participants.

PARTNERING FOR INCLUSION

Greater collaboration between industry and non-profits and community organizations is a good opportunity to connect with demographics traditionally served by the social sector, helping to raise awareness and connect under-represented groups to employment opportunities. These organizations include local employment societies and registered charities that connect employers to job seekers to federal-provincial training supports such as the Workforce Development Agreement. Examples include the Kootenay Employment Services Society, North Island Employment Foundations Society, Women in Leadership, Organizing for Change, and Hecate Strait Employment Development Society.

Challenges Specific to Gender and Equity

The transition to a clean economy presents an opportunity to shift current training and workplace processes and cultures that may exclude certain groups. Gender balance in the clean economy workforce is an important consideration, as many occupations have traditionally been, and continue to be, male-dominated. Failure to address barriers to employment for under-represented groups also misses an opportunity to increase workforce participation to address potential supply constraints for certain sectors and occupations.

Women are currently under-represented in many occupations that will be key to B.C.'s clean economy transition. Except for the *Materials Management and Waste-to-Resource* sector, workers in the top clean economy occupations in the five core sectors are 80% or more men and 20% or less women. Women are even less likely to be employed in high-paying jobs ($65,000 per year and over). The analysis identified four critical barriers to women in clean economy-related trades:

- **Trades are Largely Male Dominated:** The industry creates unwelcoming and non-inclusive environments. There is engrained gender bias and a lack of critical mass in terms of women.
- **Common and Pervasive Harassment:** Many women experience bullying and harassment regardless of the stage in their career, and there are limited organizational practices and capacity to address these issues.
- **Discriminatory Recruitment:** Discriminatory hiring and advancement practices prevent women from getting their foot in the door or obtaining the necessary skills and tools to advance.
- **Lack of Role Models:** Lack of mentors and networks directly affect the resources, supports, and capital available to women from pre-apprenticeship through to journey.

Youth under 25 were also underrepresented in many key occupations, though it was noted that training and certification is a factor in some of these cases. Significant barriers for youth entering the workforce were identified, and include:

- **Transportation:** This especially impacts rural and remote areas. Infrequent public transportation and cost of vehicle ownership impact the ability to get to work on time, stay late as needed, or accommodate varying shifts.
- **Start-Up Cost:** Uniforms, equipment and tools, and initial pay delay.
- **Developing Soft Skills:** Communication, time management, initiative and motivation, problem solving, anger and frustration management, and knowledge of employment rights and responsibilities are all skills that youth have difficulty developing.
- **High Cost of Living:** Affordability is an issue, particularly for those coming from lower income backgrounds or in low wage jobs. Affordable housing may be located farther from urban centres, compounding transportation issues.
- **Lack of Access to Training:** Youth lack of access to training and little to no related job experience was cited as a key issue.

There are approximately 334,000 British Columbians ages 15-64 who self-identify as having a disability, with approximately 50% of those individuals currently employed.[14] The participation rate for people with disabilities, in 2014, was 55% compared with 84% for people without disabilities. Of the people experiencing unemployment, there are several factors that can lead to lower rates of employment: the severity of the disability, the level of education and the type of disability (mental or psychological was more likely to indicate higher unemployment rates).

Trades and construction companies are key employers of people with disabilities, which presents important linkages to the clean economy. Among men, 16% of those with a mild or moderate disability were in the industrial, construction, or equipment operation trades - a proportion like those without a disability. In each group, transportation and construction workers and labourers also made up about 10% of the workforce. These statistics hold true regardless of the severity of the disability.

When a gender lens is applied, significant differences become evident as women with disabilities are not registering as participating in any statistically measurable way. This may indicate that the trades and construction sectors incorporate workplace accommodations to meet the needs of disabled workers, but women with disabilities face the same barriers experienced by women in trades.

To move from an old economy into a clean economy requires not only a translation of new knowledge and skills but also a transformation of the work culture. This overarching cultural transition will require changes in companies, training institutions, government programs, and individual perceptions and biases. It requires a holistic cultural change which can be served by a systems approach.

Table 6: Gender and Age Representation Across the Core Clean Economy Sectors[15]

SECTOR & MEDIAN ANNUAL SALARY	EMPLOYMENT BY GENDER		EMPLOYMENT BY AGE GROUP			
	M	W	15-24	25-44	45-64	65+
CLEAN POWER SUPPLY & STORAGE $72,411	80%	20%	7%	52%	37%	3%
GREEN BUILDING & RESILIENT INFRASTRUCTURE $55,390	88%	12%	9%	43%	43%	5%
CLEAN TRANSPORTATION $65,288	89%	11%	6%	45%	45%	5%
MATERIALS MANAGEMENT & WASTE-TO-RESOURCE $46,415	60%	40%	14%	39%	42%	5%
INDUSTRIAL ENERGY & PROCESS EFFICIENCY $62,006	82%	18%	9%	45%	40%	6%

14 See: https://www.workbc.ca/employer-resources/your-workforce/employers-engage-people-with-disabilities.aspx

15 Source: The Delphi Group based on data from Statistics Canada.

7. WORKFORCE READINESS MODEL

APPROACH TO DEVELOPING THE MODEL

The Clean Economy Workforce Readiness Model (see **Figure 14**), developed using best practices in systems thinking and strategic planning, serves as a roadmap for how the Clean Economy Workforce Readiness Project will prepare British Columbians to succeed in the low-carbon economy. It clearly defines what the project hopes to achieve (outcomes) and how it will be achieved (strategies and focus areas). The model was developed using a "line of sight" methodology that allows for the most detailed and specific activities and tasks to flow logically through to the highest-level outcomes. In this way, the Model underscores how concrete actions align to and support the strategic direction.

It is important to note that the line of sight is not a one-to-one alignment. Rather, each strategy supports one or more of the focus areas and, in turn, each focus area supports one or more of the outcomes. Further, the strategies may be inter-dependent with some requiring that others are first completed.

Appendix B includes the alignment of the specific Recommendations in the following section to the 12 Strategies.

Figure 14: B.C. Clean Economy Workforce Readiness Model

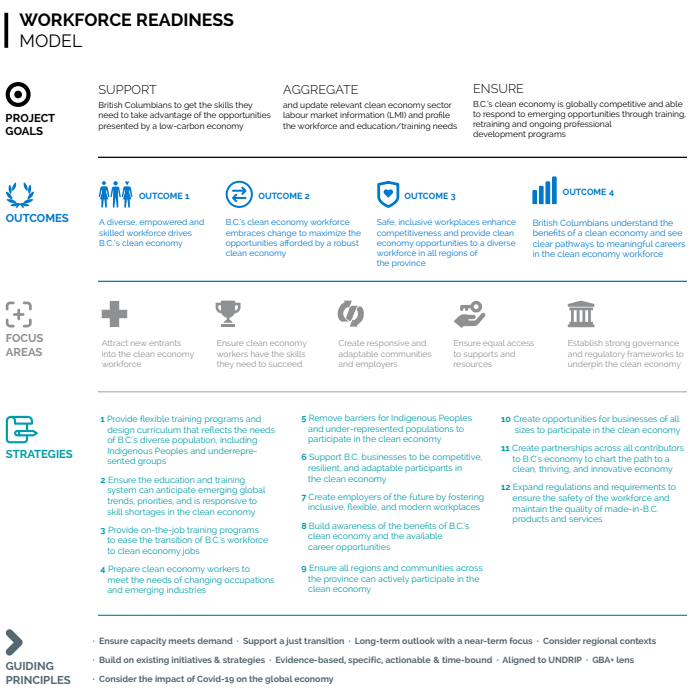


Figure 15: Workforce Readiness Model Outcomes

OUTCOME 1

A diverse, empowered and skilled workforce drives B.C.'s clean economy

OUTCOME 2

B.C.'s clean economy workforce embraces change to maximize the opportunities afforded by a robust clean economy

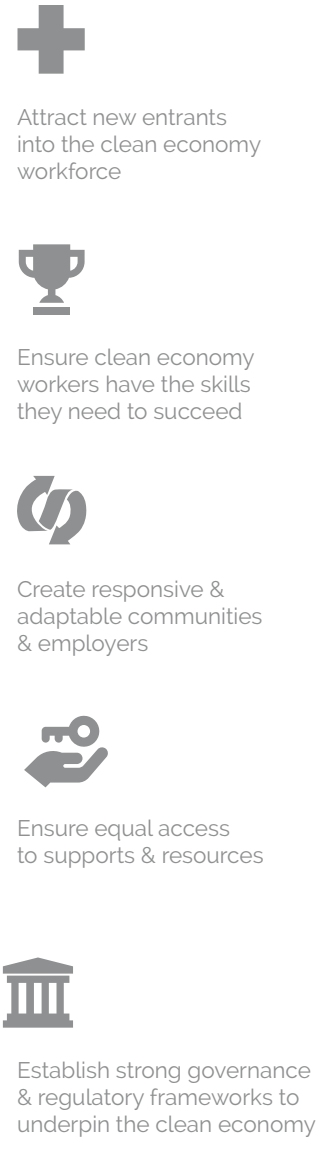
OUTCOME 3

Safe, inclusive workplaces enhance competitiveness and provide clean economy opportunities to a diverse workforce in all regions of the province

OUTCOME 4

British Columbians understand the benefits of a clean economy and see clear pathways to meaningful careers in the clean economy workforce

Figure 16: Clean Economy Workforce Readiness Model Focus Areas



DESIRED OUTCOMES

The desired outcome statements (see **Figure 15**) describe the desired future state of the workforce once success has been achieved through implementation of the recommended actions and supporting activities.

FOCUS AREAS

The Focus Areas presented in **Figure 16** are the key priorities from which the recommended actions flow. They are comprised of activities, initiatives, projects and programs that, if implemented and managed properly, will be critical in addressing the four over-arching, cross-sector challenges and issues and in making progress towards achieving the workforce outcomes. A short description of each Focus Area is provided below to provide additional context.

Attracting New Entrants

Employers struggle to attract and retain employees given current demographic trends, as well as competition with other sectors and/or jurisdictions. Many sectors face a disparity in the number of women and minority groups included in the workforce. In addition, workers in many First Nations communities lack the necessary supports to move from training programs to full-time employment. Programs targeted at engaging and supporting under-represented groups can address labour shortages and increase the supply of skilled workers.

Targeted programs can expose youth to solutions, training, and projects that exist outside of their communities that could be brought home and applied/adapted to their local contexts. Resources can also be designed to attract under-represented demographics (e.g., showcasing women in senior job roles, First Nations-owned businesses and clean energy projects, individuals with disabilities active in cleantech entrepreneurship), helping to address projected workforce shortages in relevant sectors.

Ensuring the Skills to Succeed

A focus on lifelong learning and reskilling as it relates to clean economy occupations provides ongoing opportunities for continuous skills development within broader career pathways, ensuring that no one gets left behind. Many of the key occupations important to the clean economy do not have effective incentives for continuous learning, which may impact on safety, quality assurance, and accountability. Encouraging continuing professional development and enabling skills alignment between industry and the education system can help to mitigate potential risks from industries in transformation and encourage lifelong learning at all stages of career development.

While current K-12 curriculum covers concepts that include broad-based sustainability and climate change, there is a need for more specific language and learning outcomes that include a greater linkage to advancing the clean economy. In particular, specific employment and entrepreneurship opportunities, career pathways, and skills training, can be improved.

WORK-INTEGRATED LEARNING (WIL)
is essential to ensuring that new workforce entrants have the foundational skills and capacity to meet the needs of industry and can "hit the ground running" upon graduation. There are multiple ways to enhance WIL opportunities, from providing more flexible co-operative education programs, to enhanced practicums and capstone projects focused on clean economy and CleanBC-relevant issues, to mentorship and coaching opportunities, to better access to lab facilities and the latest technologies relevant to clean economy sectors and industries.

As one successful example of WIL, the Prince George Chamber of Commerce has been coordinating and administering a multi-year collaboration between with the University of Northern British Columbia (UNBC), with funding support from CN Rail. The initiative links local small businesses and industry to university students from UNBC's Carbon and Energy Management courses in order to undertake carbon footprint analyses and GHG emission reduction plans with business owners and operators. The successful program is building capacity for both the businesses and students and provides an example model of collaboration between industry, academia, and youth to build capacity in the community.

Creating Responsive and Adaptable Communities and Employers

Education and training programs need to be flexible and responsive to emerging clean economy industry trends and technology shifts in order to ensure that workforce supply meets the needs of industry and businesses in their communities. The CleanBC Plan, more specifically, includes a number of goals and targets that will drive new projects and capital investments, including the development of more net zero energy ready buildings, investments by industry in GHG reduction technologies, and the construction of new and scaling up of existing renewable gas and biofuel production facilities, as examples.

It is important to ensure that training and workforce development aligns with this policy direction, is flexible and adaptable to the needs of local communities and employers, and that programs are able to provide the ideal number of new graduates at the right time in order to serve the regions where they will be needed. Furthermore, many people do not consider the option of self-employment, so resources could include a focus on entrepreneurship and social enterprise and how flexible and small-scale solutions can be adapted to community needs.

Ensuring Equal Access to Supports

Many areas of the province do not have equal access to infrastructure, training, and support mechanisms to build workforce capacity in line with clean economy sector needs. A lack of critical infrastructure, such as transportation options and/or broadband connectivity, can be a significant barrier for people to accessing training or employment opportunities. In some regions, particularly some of B.C.'s more populated urban centres, the combined costs of housing, car ownership, and internet service may limit options.

The lack of flexible training and work models in some clean economy occupations can be a barrier to increasing workforce supply and participation of under-represented groups (e.g., women with young children). Training needs to consider transitional and support services for those on income assistance to ensure that people do not need to be cut off from social assistance when taking training programs. Innovative partnership can help to address these issues (see next page, **"Partnering to Drive Innovation"**).

Establishing Strong Governance and Regulatory Frameworks

Ensuring B.C.'s clean economy workforce can meet the needs of industry and businesses will require having the effective governance, underlying regulatory frameworks, and market conditions to drive the demand for clean economy-related education and training and support workforce development.

This is particularly important as it relates to construction trades where, currently, there are no minimum training or installation standards for many trades active on building projects, including people involved with installing energy efficient windows, heat pumps, and insulation. This, in turn, can result in products and systems not operating optimally and not delivering the expected results in terms of energy and GHG emission reductions – with negative results for consumers, utilities, and government. Strengthening regulations and building effective cross-sector networks can help to drive the uptake of training, while enhancing worker safety and the quality of work being done in the field.

A number of clean economy-related occupations and professions are regulated through the federal government. As the nature of work for these occupations changes in line with climate change (and with B.C..at the forefront in Canada with respect to the adoption of emerging clean technologies such as hybrid and electric marine vessels and aircraft), there is an opportunity to ensure these regulatory and professional licensing bodies are staying current and adapting quickly enough in line with clean technology shifts and worker safety best practices (e.g., working with high-voltage).

The following table shows how the cross-cutting workforce challenges identified through the clean economy sector labour market research will be addressed, by applying the lens of each of the five focus areas when developing the needed activities, initiatives, and programs to enable the transition to B.C.'s clean economy. **Table 7** also highlights the key considerations within each of the focus areas for designing these specific initiatives.

PARTNERING TO DRIVE INNOVATION

Opportunities exist to implement new models of on-going industry and sector-based training that support innovation across GHG emission-intensive sectors. For example, industry-specific challenge programs could bring together companies, cleantech solution providers, the finance sector, and the research community to build awareness and exposure to the latest GHG emission abatement practices, skillsets, and technologies for their sector.

Shared research facilities can help improve access to equipment and knowledge through cost-sharing models where the private sector and academia can collaborate and teach leading edge skills and expertise using the latest technologies. Examples could include areas such as artificial intelligence and robotics that can be used for extracting value from recycling streams, to pre-fabrication for green construction sector, and related to data analytics and sensors to reduce the GHG footprint of mining. These shared facilities can serve as valuable hubs for skills updating and can serve as launch pads for apprenticeship training, business start-ups, and mentorship programs.

One example is the Selkirk Technology Access Centre (STAC) in Trail, B.C., that provides access to students from Selkirk College to its digital fabrication and advanced manufacturing lab, metal shop, wood shop and computer-based training centre. It provides a leading example of public-private-academic collaboration to kickstart economic development via applied research and skills training. The lab has received contributions from Western Economic Diversification Canada, Selkirk College, InnovateBC, the National Research Council of Canada Research Assistance Program (NRC IRAP) and the Columbia Basin Trust.

Table 7: Focus Areas to Address Cross-Sector Challenges

FOCUS AREA	ACTIVITIES, INITIATIVES & PROGRAMS SHOULD BE DESIGNED IN CONSIDERATION OF:	ADDRESSING CROSS-SECTOR CHALLENGES			
		Lack of Flexible & Responsive Programming	Lack of Lifelong Learning & Demand for Training	Recruitment & Retention Challenges	Lack of Access & Capacity in Rural Areas
ATTRACT NEW ENTRANTS INTO THE CLEAN ECONOMY WORKFORCE	• Removing barriers to entry into clean economy occupations • Incentivizing the labour force to participate in clean economy sectors • Addressing the readiness of potential clean economy workforce participants		●	●	
ENSURE CLEAN ECONOMY WORKERS HAVE THE SKILLS THEY NEED TO SUCCEED	• Enabling skills alignment between industry and the education system and ensure training programs keep pace with changes in clean economy sectors • Encouraging continuing professional development, including fostering core competencies and soft skills	●	●		
CREATE RESPONSIVE AND ADAPTABLE COMMUNITIES & EMPLOYERS	• Supporting employers to transition their workplaces to the clean economy • Enabling all communities across the province to take advantage of clean economy opportunities	●		●	●
ENSURE EQUAL ACCESS TO SUPPORTS & RESOURCES	• Providing infrastructure or designing innovative programming and workplaces that allow for members of rural and remote communities to participate in the clean economy • Removing barriers for under-represented groups from participating in clean economy training programs and sectors			●	●
ESTABLISH STRONG GOVERNANCE & REGULATORY FRAMEWORKS TO UNDERPIN THE CLEAN ECONOMY	• Strengthening regulations that affect clean economy sectors and occupations • Building networks and partnerships that enable cross-sector management of clean economy activities	●	●	●	●

STRATEGIES

The 12 Strategies presented in **Figure 17** below are the specific areas of work to which time and resources should be allocated.

Figure 17: Clean Economy Workforce Readiness Model Strategies

1 Provide flexible training programs and design curriculum that reflects the needs of B.C.'s diverse population, including Indigenous Peoples and underrepresented groups

2 Ensure the education and training system can anticipate emerging global trends, priorities, and is responsive to skill shortages in the clean economy

3 Provide on-the-job training programs to ease the transition of B.C.'s workforce to clean economy jobs

4 Prepare clean economy workers to meet the needs of changing occupations and emerging industries

5 Remove barriers for Indigenous Peoples and under-represented populations to participate in the clean economy

6 Support B.C. businesses to be competitive, resilient, and adaptable participants in the clean economy

7 Create employers of the future by fostering inclusive, flexible, and modern workplaces

8 Build awareness of the benefits of B.C.'s clean economy and the available career opportunities

9 Ensure all regions and communities across the province can actively participate in the clean economy

10 Create opportunities for businesses of all sizes to participate in the clean economy

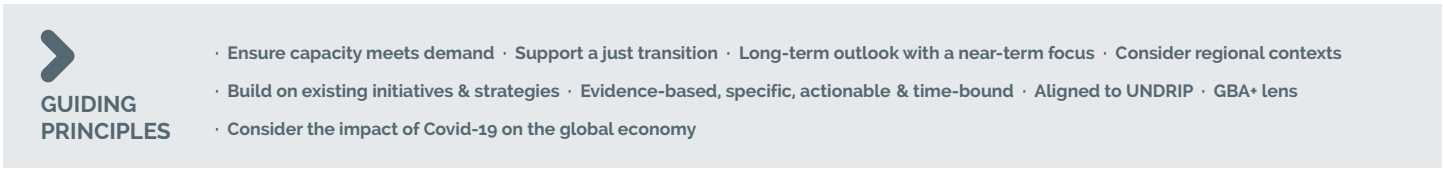
11 Create partnerships across all contributors to B.C's economy to chart the path to a clean, thriving, and innovative economy

12 Expand regulations and requirements to ensure the safety of the workforce and maintain the quality of made-in-B.C. products and services

GUIDING PRINCIPLES

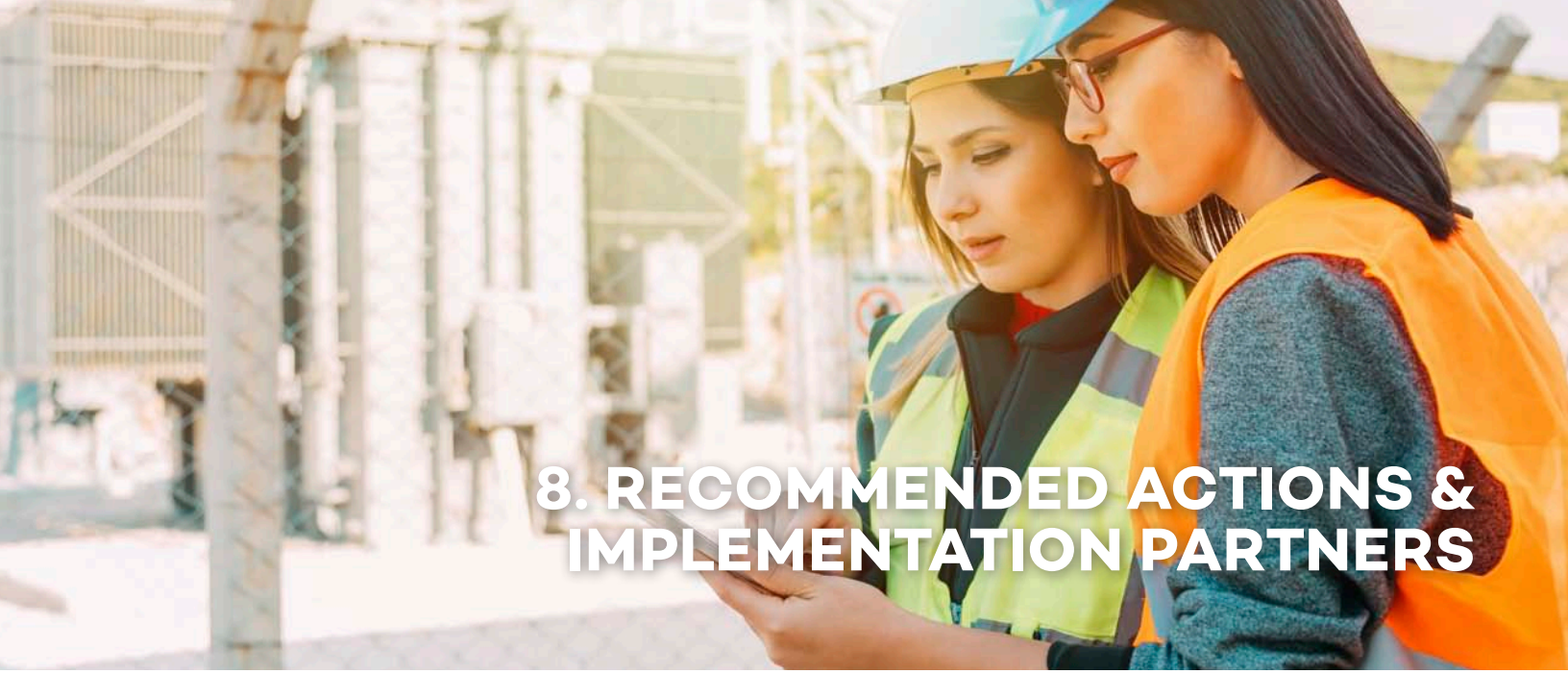
The Guiding Principles (summarized in Figure 18 and listed below) are the values that guide behaviours and anchor the way decisions are made in pursuit of achieving the desired outcomes.

Figure 18: Workforce Readiness Model Guiding Principles



The project team worked with the support of the Steering Committee to establish these principles to guide the development of the recommendations found within this Industry Strategy. These principles state that the recommendations will:

1. Focus on ensuring workforce capacity meets projected demand.
2. Consider both the opportunities and risks presented by the transformation to a clean economy to support a just transition for all British Columbians.
3. Consider a 30-year outlook to 2050, with a near-term focus on the CleanBC 2030 targets, and with recommendations that could be actioned in the next 3 years.
4. Build on existing initiatives, strategies, and other relevant information while seeking to avoid duplication of efforts or working at cross-purposes.
5. Be based on sound qualitative and quantitative information and evidence, will consider unique regional contexts, and will focus on addressing critical gaps that have been identified where workforce supply (current or projected future) does not meet industry needs/demand (either in terms of capacity or required skills).
6. Be specific and actionable, with clear responsibility assigned to relevant organizations (e.g., industry, government, Indigenous and non-Indigenous training organizations, NGOs) for each recommendation in the Strategy.
7. Support the United Nations Declaration on the Rights of Indigenous Peoples (UNDRIP) and the Truth and Reconciliation Commission's Calls to Action.
8. Apply a gender and equity lens that focuses on enhancing the inclusion of under-represented and/or under-employed populations of B.C.'s workforce.
9. Consider the impact of the COVID-19 pandemic and resulting shifts in the global economy.



8. RECOMMENDED ACTIONS & IMPLEMENTATION PARTNERS

STRATEGIC LEADS AND IMPLEMENTATION PARTNERS

Potential strategic leads have been identified for each recommended action based on ability to influence outcomes and engage other parties to participate. Implementation partners have been identified who might play a role in delivering on the more detailed actions identified. It is recognized that further collaboration is required to establish a plan to implement these actions, and that factors such as funding, capacity, and executive support will determine the ability of any organization to take on this work. Organizations have been divided into four major groups as follows:

Table 8: Potential Strategic Leads and Implementation Partners

GROUP	ORGANIZATIONS INCLUDED (OTHERS MAY BE IDENTIFIED)
GOVERNMENT & REGULATORS	• Provincial (Including Regulatory Function of Crown Corporations) • Federal • Local (Includes Municipalities & Regional Districts) • First Nation Governments • Industry Training Authority
EDUCATIONAL INSTITUTIONS	• K-12 School Districts • Post-Secondary Institutions (PSI)
INDUSTRY	• Major Employers (Including Crown Corporations) • Small & Medium-Sized Businesses • Industry Associations
OTHER PARTNERS	• Labour Unions • Professional Associations & Regulatory Bodies • NGOs (e.g., Youth Organizations, Indigenous Youth Organizations, Gender & Equity Organizations) • Community Training Providers & Employment Agencies (Including those Funded through the WorkBC Program) • Indigenous Training Organizations • Small Business Representatives (e.g., Small Business BC, Chambers of Commerce) • Economic Development Organizations

RECOMMENDED ACTIONS AND SUPPORTING ACTIVITIES

The recommended actions below are the concrete assignments undertaken to deliver on the strategies. Recommended actions, as shown below, may support more than one strategy.

Table 9: Recommended Actions and Supporting Activities

RECOMMENDED ACTIONS & SUPPORTING ACTIVITIES	
1	**Reduce barriers for small and medium-sized enterprises to transition to and participate in the clean economy.** **Potential Strategic Leads:** Government, Industry **Potential Implementation Partners:** Provincial Government, Local Government, Community Training Providers, Industry Associations, PSIs, Labour Unions, Small Business Representatives (e.g., Small Business BC, Chambers of Commerce)
1a	Review and streamline the application process for all small and medium-sized enterprises in clean economy sectors accessing government-funded training and professional development grants.
1b	Expand the incentives for small and medium businesses in targeted clean economy sectors to take on apprentices or provide trades people work experience. Offer incentives in the form of wage subsidies, in addition to promoting the Small Business Venture Capital Program as a way to improve access to capital and funding for businesses of all sizes.
1c	Support contractors by providing targeted resources to update their knowledge and understanding of new building codes, building-as-a-system approaches, rebate programs, product eligibility, and marketing green building initiatives to consumers. Establish individualized support (e.g., hotlines, Q&A sessions) to foster better understanding the of resource materials.
1d	Establish a concierge service for small and medium-sized businesses in clean economy sectors. The service would offer navigation support on accessing existing available resources and federal and provincial funding programs. Example programs include: Apprenticeship Job Creation Tax Credit, the Environmental Careers Organization of Canada (ECO) internship program, WorkBC Older Worker Program, B.C. Community and Employer Partnerships Program. Navigation support would also include guidance on program eligibility requirements and the application process(es) (i.e., gathering the correct information and documentation).
2	**Adopt education, training and reskilling models that bring real world context and experiences into classrooms to keep pace with global shifts and emerging trends.** **Potential Strategic Lead:** PSIs **Potential Implementation Partners:** Provincial Government, Federal Government, Major Employers, Small Business, Industry Associations, Labour Unions, Indigenous Training Organizations, Community Training Providers, Professional Associations, NGOs that work with youth, Industry
2a	Engage industry professionals to bring current, real-world context to the classroom experience. Focus the content on climate change risk and mitigation best practices, the best available technologies, as well as processes and tools for improving energy and process efficiency, including for carbon sequestering and climate change adaptation.
2b	Establish and implement scheduled reviews across inter-provincial and regulatory bodies to update learning outcomes for trades training and apprenticeship programs. Ensure training courses and curriculum continue to address skills gaps in clean economy sectors and remain aligned with the evolving needs of industry.

RECOMMENDED ACTIONS & SUPPORTING ACTIVITIES

2c	Continue to create opportunities for industry, the ITA and post-secondary institutions to co-design curriculum that aligns the skills of the workforce with clean economy opportunities and builds core competencies for students in specific, key trades and apprenticeship programs (i.e., carpenters, building envelope trades, HVAC, heavy duty mechanics, truck drivers, automotive mechanics).
2d	Develop targeted training programs for entrepreneurs in clean economy sectors that includes content related to the economics of start-ups, interpreting government policy, and the realities of B.C.'s regulatory environment and market drivers.
2e	Integrate clean technologies and climate change best practices into post-secondary curriculums for professional occupations (engineers, architects, agrologists, forestry professional, and technicians), which includes integrating a stronger focus on sustainability principles.
2f	Invest in shared research facilities, which could include mobile trailers and virtual simulators, for the provision of lab-based learning opportunities focused on net zero energy technologies, in all parts of the province. Lab-based learning will give students and instructors alike the opportunity to develop applicable clean economy skills and expertise through hands on learning using the latest technologies, practices and equipment.
2g	Match industry leaders with academic institutions and instructors to deliver training modules that incorporate the latest technologies and trends, and industry best practices. Explore potential 'train the trainer' models to broaden the reach of programs among instructors who teach clean economy focused subjects.
2h	Ensure adequate training and standards exist in B.C. (based on a core competencies framework) for building energy advisors and energy modelers to enable building code compliance services for the BC Energy Step Code pathways (beyond the EnerGuide license, training, and quality assurance program).

3 Address youth readiness for clean economy occupations, with a focus on developing the skills and competencies needed for success in the clean economy.

Potential Strategic Leads: Government, K-12
Potential Implementation Partners: Provincial Government, Community Training Providers, Major Employers, Small Business, Industry Associations, Labour Unions, Local Government, NGOs

3a	Develop and implement K-12 curriculum content and learning outcomes that are specifically linked to advancing the clean economy through career and educational pathways in clean economy sectors.
3b	Update curriculum and provide opportunities for students to develop the soft skills critical to success in the clean economy workforce; e.g., critical thinking, complex problem solving, communications, learning agility, social perspectives, creativity, business fundamentals and finance, basics of entrepreneurship and adaptability. Scale and replicate current efforts in secondary schools.
3c	Review all new and existing clean economy curriculum to ensure it applies culturally sensitive and gender inclusive language and showcases diversity in the workforce through communication materials. Use case studies, digital promotions, and other materials to address diverse interests, perspectives and potential concerns/risks.
3d	Design and provide experiential learning opportunities and projects for youth. Include hands-on mentoring support and embed content that cultivates personal attributes such as interviewing and networking skills.
3e	Collaborate with industry partners in clean economy sectors to expose youth to the emerging jobs, skills, and education opportunities through youth job fairs, skills competitions, and other youth centered events. Design booths, competitions and events to showcase under-represented demographics who have achieved success in clean economy professions; e.g., women in senior roles and First Nations-owned businesses.

RECOMMENDED ACTIONS & SUPPORTING ACTIVITIES

4 Ensure workers in at-risk occupations receive the support they need to remain successful during the transition to the clean economy.

Potential Strategic Lead: Government
Potential Implementation Partners: Provincial Government, Federal Government, Local Government, Industry Training Authority, PSIs, Community Training Providers, Indigenous Training Organizations, Major Employers, Small Business, Industry Associations, Labour Unions, NGOs, Professional Associations, Industry

4a Catalogue at-risk occupations and develop industry specific resources to assist employers in identifying transferable skills and mapping out career transition pathways for workers, including programs to support upskilling or reskilling.

4b Implement flexible and adaptable re-skilling programs that remove barriers for at-risk workers. Include training programs during the off-season for seasonal workers, and establish a job transition fund to provide support packages for workers to maintain employment in communities where jobs are at the highest risk.

4c Evaluate the potential of a Workforce Transition Fund to support workers and communities transitioning from carbon-intensive to lower-carbon industries and operations. Considerations should include income replacement, bridges to retirement, relocation assistance, education and training assistance, counselling and employment services, and support for alternative economic development opportunities for communities.

4d Establish an industry-led advisory panel on carbon-intensive industries to work with the BC Climate Solutions Council and provide recommendations to industry and government about how to manage the job transition within carbon intensive industries and support at risk workers.

5 Develop industry-specific career planning tools to communicate available clean economy careers and potential pathways.

Potential Strategic Lead: Industry
Potential Implementation Partners: Provincial Government, Industry Training Authority, Community Training Providers, Major Employers (including Crown Corporations), Small Business, Industry Associations, Labour Unions, School Districts, employment agencies (youth, general, Indigenous), PSIs, NGOs

5a Identify, map and broadly communicate career pathways for clean economy professions/occupations. Tailor career maps to reflect the needs, interests, perspectives, and potential concerns of under-represented groups, including Indigenous Peoples, women, newcomers to Canada, youth, and people with disabilities. Ensure career maps are focused on helping workers identify how their existing skillsets are transferable to the clean economy.

5b Create a website to house an inventory of clean economy training options, current and potential employers in clean economy sectors, average salaries, skills profiles, required skill sets, and specific locations for job opportunities.

5c Develop tools and resources, including updated career planning tools and materials, to help career counsellors and recruiters clearly communicate with individuals looking for work or training on the opportunities that exist in the clean economy and subsequent workforce skills. Ensure that these resources use language, imagery and examples that are gender, cultural, and age diverse.

RECOMMENDED ACTIONS & SUPPORTING ACTIVITIES

6 Facilitate networks of regional, community-based partnerships to ensure all parts of the province are prepared for the transition to the clean economy.

Potential Strategic Lead: Government
Potential Implementation Partners: Provincial Government, Local Government, First Nations, PSIs, Community Training Providers, Indigenous Training Orgs, Major Employers, Small Business, Industry Associations, Labour Unions, NGOs

6a	Designate liaisons to meet directly with Indigenous, rural and remote communities to provide information on the impacts of CleanBC and the related community-based opportunities.
6b	Develop an inter-community/inter-Nation exchange program to provide Indigenous workers with the opportunity to use their skills on a variety of projects in different regions and broaden their exposure to different types of clean economy occupations, employers and skillsets.
6c	Promote the development of partnerships between academia and local businesses to co-develop action plans for reducing the carbon footprint of industries in line with CleanBC targets and objectives, such as Prince George's Chamber Carbon Action Plan.
6d	Establish regional clean jobs resource hubs to centralize coordinated communication material on career pathway resources, including information on skills training and upgrading programs, access to mentorship and coaching, and types of grants, scholarships, tax credits, or other financial incentives available to BC's workforce.
6e	Expand existing programs that bring high-speed internet to rural, remote and Indigenous communities across B.C. and support last-mile connectivity. Scale these programs across all communities to address the challenges around connectivity and enable education, training programs and economic growth opportunities in all parts of the province.
6f	Invest in transportation solutions (e.g., car sharing and pooling programs, drivers' licenses) to address gaps in transit infrastructure that affect the ability for rural and remote residents to attend training.

7 Encourage employers to support a culture of lifelong learning and provide opportunities for ongoing skills development and reskilling to their existing workforce.

Potential Strategic Lead: Industry
Potential Implementation Partners: Provincial Government, Industry Training Authority, PSIs, Community Training Providers, Indigenous Training Organizations, Major Employers, Small Business, Industry Associations, Labour Unions, Professional Associations

7a	Build climate change understanding and capacity across B.C. by scaling existing efforts to provide working professionals with clean economy related professional development courses and programming and encourage employers, particularly in carbon-intensive industries, to provide paid time off and/or paid course fees for employees taking climate mitigation and adaptation courses.
7b	Coordinate efforts between labour unions and industry associations to offer flexible training resources and programs. This includes continuous or own-schedule timelines for completion of courses, off-season availability of programs, and experience-based pre-requirements to enable seasonal workers to participate in training that further their skillsets and career development during slower work months.

RECOMMENDED ACTIONS & SUPPORTING ACTIVITIES

8 Design alternative and flexible training models that promote inclusion and remove barriers to participation for rural, remote, and Indigenous communities.

Potential Strategic Lead: PSIs
Potential Implementation Partners: Industry Training Authority, Community Training Providers, Indigenous Training Organizations, Major Employers, Small Business, Industry Associations, Provincial Government, Labour Unions

8a	Implement flexible pilot programs at the college level to test models of training and education that fit the regional context, needs, and values of local industry. Provide alternatives to bricks and mortar classrooms, such as virtual simulators, mobile labs, or equipment trailers that allow members of rural and remote communities to engage in hands-on learning experiences in new clean technologies.
8b	Work with PSIs and industry to catalogue the needed skills and competencies for upcoming projects in communities across the province and look to expand relevant program options in these targeted locations.
8c	Re-evaluate funding for training models in rural and remote communities. This includes reviewing funding provisions for minimum class sizes in areas with a small population base, or providing bursaries or travel and accommodation subsidies for rural and remote participants where an online or 'in-community' option is not available.

9 Expand professional requirements and enforce safety standards that protect and provide assurances to consumers of B.C. products and services.

Potential Strategic Lead: Government
Potential Implementation Partners: Provincial Government, Local Government, First Nations, Industry Training Authority, PSIs, Major Employers, Small Business, Industry Associations, Labour Unions, Professional Associations

9a	Develop and enforce performance-based standards for the installation of energy efficient equipment that receives funding through provincial government incentive programs.
9b	Expand government's existing voluntary Program Registered Contractor to other sectors to improve the quality of work through the provision of incentives for contractors to participate in professional development training.
9c	Review the *Professional Governance Act* to ensure climate change mitigation and adaptation thinking has been integrated into professional development program planning. *The Professional Governance Act* provides a lever that can be used to standardize climate change information and integrate education and best practice thinking across professionals, such as engineers and technicians, biologists, agrologists, foresters, and landscape architects.
9d	Review the requirements of professional associations and regulatory bodies for key occupations to ensure they reflect the relevant skills, competencies, safety certification requirements, and continue to align with trends in clean technology.

RECOMMENDED ACTIONS & SUPPORTING ACTIVITIES

10 Establish safety and certification requirements for clean economy workers and workplaces.

Potential Strategic Lead: Government
Potential Implementation Partners: Federal Government, Provincial Government Industry Training Authority, PSIs, Community Training Providers, Indigenous Training Orgs, Major Employers, Small Business, Industry Associations, Professional Associations, Labour Unions

10a	Review training programs and professional development course content to ensure climate action and the clean economy are being considered for key professions. This will require drawing from evidence-based competency frameworks, organizational capabilities and ISO standards.
10b	Enhance safety and certification requirements established by certification agencies for relevant, regulated clean economy occupations, and ensure these requirements keep pace with evolving clean economy technologies and best practices.
10c	Expand safety definitions to include social safety, including bullying and harassment policies and complaints processes, related employee training, as well as reporting and accountability expectations. These social safety expectations could be demonstrated in funding or procurement processes and related evaluations.
10d	Develop and adopt sector-wide, clean economy Codes of Conduct and safe workplace policies and training. These materials will set out the principles, values and processes for actions for safe and inclusive workplaces.

11 Create opportunities for members of rural, remote, and Indigenous communities to work in their home communities.

Potential Strategic Leads: Industry, Government
Potential Implementation Partners: Federal Government, Provincial Government, Local Government, First Nations, Major Employers, Small Business, Industry Training Authority, Community Training Providers, PSIs, Indigenous Training Orgs, Industry Associations, Labour Unions, NGOs

11a	Provide incentives for companies in clean economy sectors that have resource or infrastructure projects in rural, remote, and Indigenous communities to hire a set number of community members. These project-based opportunities build community capacity in the deployment of renewables and low-carbon energy, while providing community members with the opportunity to build valuable skillsets, which could include project feasibility assessment and planning, procurement and regulatory expertise, energy management, expertise in industrial process and resource efficiency technology, reverse logistics thinking, etc.
11b	Create partnerships between companies operating in rural, remote, and Indigenous communities, the ITA, and training institutions to design specific programs or internship opportunities for Indigenous Peoples and members of the communities to build the skillsets needed for clean economy occupations that are in demand in their local communities.
11c	Offer community-based workshops that provide information on the training requirements for the specific economic development initiatives taking place in their local communities.

RECOMMENDED ACTIONS & SUPPORTING ACTIVITIES

12 Provide more opportunities to build the skills of the workforce by providing on-the-job learning with employers.

Potential Strategic Lead: Industry
Potential Implementation Partners: Provincial Government, Community Training Providers, Industry Training Authority, PSIs, Indigenous Training Orgs, Major Employers, Small Business, Industry Associations, Labour Unions, NGOs that work with youth, Federal Government (for EI programs)

12a Create a central repository of work-integrated learning programs in clean economy sectors, connecting the potential workforce to opportunities to complement their academic curriculum with work-integrated learning.

12b Implement work-integrated learning structures and terms for trainees taking targeted education programming that includes more co-op programs, enhanced practicums, and capstone projects focused on clean economy issues, so that academic learning is balanced with the practical needs of employers. Work with employers to provide mentorship and coaching to trainees.

13 Develop strategies and materials that promote clean economy opportunities to all British Columbians.

Potential Strategic Lead: Government
Potential Implementation Partners: Provincial Government, Local Government, First Nations, PSIs, Community Training Providers, Indigenous Training Orgs, Major Employers, Small Business, Industry Associations, NGOs, Labour Unions

13a Initiate an information campaign and create resources that describe the value of being part of the clean economy workforce, the types of careers that exist, and how to prepare for working in the clean economy. Develop a supporting speaker series focused on job opportunities in clean economy sectors that can be broadcast through live streaming to regional hubs.

13b Develop a CleanBC climate and energy literacy outreach program that provides British Columbians with a clear understanding of the clean economy, articulates government's plans and priorities, and builds awareness of targets, policies and actions. Develop a platform to share CleanBC success stories, community-specific initiatives, and best practices.

13c Create promotional materials targeted to employers that promote the benefits of participating in the clean economy and ensure they have access to the information they need to transition their workplaces to achieve targets and objectives.

RECOMMENDED ACTIONS & SUPPORTING ACTIVITIES

14 Create incentives for learners to participate in programs aligned with in-demand jobs and sectors.

Potential Strategic Lead: Government

Potential Implementation Partners: Provincial Government, Federal Government, Local Government, First Nations, Industry Training Authority, PSIs, Indigenous Training Orgs, Community Training Providers, Industry Associations, Major Employers, Small Business, Industry Associations, Labour Unions, WorkBC

14a	Work with clean economy sectors to provide scholarships or low interest / reduced pay back student loans for targeted entrepreneurship educational programs in line with clean economy sectors that are facing an identified gap in supply. Use financial incentives to encourage new entrepreneurs to launch innovative projects and create new job opportunities for B.C.'s workforce.
14b	Review the complement of funded training programs to ensure job classification codes relevant to the clean economy are included in the eligibility criteria.
14c	Review existing grants, including eligibility criteria and amounts, to ensure they align with the needs of Indigenous communities and provide the necessary supports and incentives to help trainees move from clean economy-focused programs into full-time employment.
14d	Create flexible and subsidized co-op programs in line with clean economy occupations that are projected to see the highest demand by industry. Consider extending the subsidized co-op terms to 8 or 12 months to ease the burden on employers for training-related costs, while allowing interns to further build and enhance their skills and competencies.
14e	Provide wrap-around financial supports to learners taking training programs that have a specific focus on GHG emission reduction practices and technologies, including access to childcare, eldercare, rent subsidies, and flexible student loans.
14f	Revise student financial aid policy for students accessing loans for participation in targeted clean economy trades training programs and relocating to parts of B.C. with projected labour shortages in key occupations.
14g	Provide incentives to ensure an adequate capacity of certified Building Energy Advisors (BEAs) exists in all regions of the province to meet projected demand created as a result of the B.C. Energy Step Code. Scale incentives based on the communities and regions where there is an existing or projected shortage of BEAs.

15 Review approaches for delivering training programs to cultivate safe and inclusive learning environments and remove barriers to participation.

Potential Strategic Lead: PSIs

Potential Implementation Partners: Industry Training Authority, Community Training Providers, Indigenous Training Organizations, Major Employers, Small Business, Industry Associations, Labour Unions, NGOs, (Government to lead review of provincial policy)

15a	Remove barriers to training programs for under-represented groups, by developing culturally sensitive training programs for those with barriers to employment, ensuring programs have flexible dates, timelines, and eligibility requirements. Review provincial policy that limits the ability of those on B.C. Employment and Assistance from participating in upskilling or reskilling training for key occupations.

RECOMMENDED ACTIONS & SUPPORTING ACTIVITIES

15b Require training and apprenticeship programs to report out on attraction and retention rates of under-represented groups and encourage training institutions to develop mentorship programs that support students to transition into employment.

15c Develop training in partnership with First Nations and Indigenous communities that builds on traditional ecological knowledge and identities and incorporates Indigenous values into training content and programs for clean economy sectors.

15d Review existing curriculum content for clean economy-related skill sets and develop new content aimed at reducing the bias that discourages young women from pursuing careers in targeted trades and STEM occupations.

16 Minimize labour shortages in priority occupations by addressing the systemic issues that limit access to jobs, training, and upskilling.

Potential Strategic Leads: Government, Industry
Potential Implementation Partners: Federal Governments, Community Training Providers, Provincial Government, Industry Training Authority, PSIs, Major Employers, Small Business, Industry Associations, Labour Unions, Indigenous Training Orgs, Industry

16a Attract skilled clean economy workers through updating the Provincial Nomination Program and re-aligning immigration qualification requirements to fast-track individuals with specific skillsets into occupations in B.C. to meet the demand in clean economy sectors.

16b Assess regional offerings of existing programs and courses to determine whether additional funding, flexible delivery options, or more locations or seats at existing locations are needed to train and upskill the workforce for key occupations in high demand.

16c Explore modifying existing programs for refrigeration and air conditioning mechanics active in the residential sector to allow for scale up of heat pump installation training (e.g., adjusting the length of time to completion from a four-year to a two-year program similar to the former model in Ontario).

17 Support employers in preparing their workplaces for the clean economy and promoting upcoming job opportunities.

Potential Strategic Lead: Government
Potential Implementation Partners: Local Government, First Nations, Major Employers, Small Business, Industry Associations, Provincial Government, Industry Training Authority, PSIs, Community Training Providers, Indigenous Training Orgs, Labour Unions

17a Encourage employers to talk directly to communities to share the skills required for job opportunities and when they might become available. Employers and training institutions could also partner, so that employers could direct individuals interested in job opportunities to specific programs.

17b Invest in developing retraining programs for automotive service technicians to upgrade their skills related to electric vehicle (EV) battery technology and power trains to ensure repair shops have the capacity to provide services to the EV market.

17c Enhance communication channels and increase points of contact between industry and PSIs, through Program Advisory Committees and other models, to help ensure alignment of curriculum and improve the flow of information.

RECOMMENDED ACTIONS & SUPPORTING ACTIVITIES

18 Champion and support diverse and inclusive employers.

Potential Strategic Leads: Industry, Government
Potential Implementation Partners: Provincial Government, NGOs, Industry Training Authority, PSIs, Indigenous Training Orgs, Major Employers, Small Business, Industry Associations, Community Training Providers, Labour Unions, NGOs

18a Review B.C.'s Social Impact Procurement Guidelines and provide increased weighting on the criteria that values the following:

- Employment of target employees
- Local employment and community benefits
- Training and apprenticeships
- Social value supply chain
- Demonstrated attraction and retention strategies, safe workplaces (bullying and harassment) policies and processes, and accompanying staff diversity training

18b Report annually on attraction, employment, and retention of women in clean economy occupations. Require training institutions or employers that receive government funding or contracts to report on their local employment, wages paid, and retention of women.

18c Work with implementation partners in clean economy sectors to establish apprenticeships and project-based training opportunities for disadvantaged youth, women, and people with disabilities. Provide employers with information and best practices for making workplaces conducive to the needs and interests of under-represented groups, including resources for shifting traditional workplace culture.

18d Support the ability for social enterprises to train and stream employees towards clean economy jobs by raising awareness of social enterprises, encouraging contractors to integrate social enterprises into their supply chain, and reviewing labour market funding programs through a social enterprise lens.

19 Tailor energy efficiency and renewable energy project development and maintenance training programs to the needs of rural, remote, and Indigenous communities.

Potential Strategic Leads: PSIs, Industry Associations
Potential Implementation Partners: Local Government, First Nations, Industry Training Authority, PSIs, Indigenous Training Orgs, Major Employers, Small Business, Industry Associations, Community Training Providers, Labour Unions

19a Expand energy efficiency training program offerings for rural, remote, and Indigenous communities in line with CleanBC targets for net zero energy ready new construction and energy efficiency retrofits.

19b Build partnerships between rural, remote, and Indigenous communities, training organizations, and clean economy employers to develop and deliver project-based training programs. Local green building and infrastructure projects in these communities can provide hands-on opportunities for local workers to learn quality installation and maintenance of new clean technologies.

19c Develop and deliver targeted skills and capacity building programs in rural, remote, and Indigenous communities, that are looking to become energy self-sufficient and/or transition away from diesel generation and provide needed equipment and supports to achieve CleanBC objectives for diesel reduction and adoption of biofuel and renewable energy projects.

RECOMMENDED ACTIONS & SUPPORTING ACTIVITIES

20 Establish ongoing oversight and collaboration to support a thriving clean economy workforce.

Potential Strategic Lead: Government
Potential Implementation Partners: Provincial Government, Local Government, First Nations, Industry Training Authority, PSIs, Community Training Providers, Indigenous Training Orgs, Major Employers, Small Business, Industry Associations, Labour Unions, NGOs, Professional Associations

20a Establish a cross-sector governance committee that includes representatives from Indigenous communities, industry, government, and post-secondary institutions to provide ongoing oversight to support the transition to a clean economy workforce and proactively address potential challenges. Use this governance committee to improve communication and collaboration and to oversee implementation activities designed to ensure the workforce has the skillsets to support the clean economy.

20b Establish goals for the clean economy workforce and develop and implement a performance management and accountability framework to monitor progress toward those goals.

21 Document and share employer policies, tools and other best practices for fostering inclusive, safe, and flexible work environments.

Potential Strategic Lead: Industry
Potential Implementation Partners: Provincial Government, Major Employers, Industry Training Authority, Small Business, Industry Associations, Community Training Providers, Labour Unions, Local Governments, First Nations, NGOs, Professional Associations

21a Develop tools to help employers identify and implement the benefits and workplace policies and programs that will be meaningful to the clean economy workforce by removing barriers to participation for under-represented groups. This could include considerations for in-community training, off-site travel and accommodation stipends, student loan payback support, provision for up-front costs related to new jobs, maternity leave top-ups, subsidized childcare, workforce housing, transportation support, flexible schedules, and working remotely.

21b Review current sector hiring practices and develop tools for employers that enable inclusive hiring, including providing information on how to implement flexible workplace accommodations and best practice examples for the development of job descriptions, applications, interview guides, pay equity guidelines, and other workplace training resources focused on reducing bias and increasing attraction, training, advancement, and retention of under-represented groups.

21c Integrate requirements for local community employment and benefits into provincial and/or local government procurement practices, with regular reporting of employment statistics and wages paid by community.

21d Provide clean economy employers with best practices for codes of conduct (including bullying and harassment, human rights, complaints process) and encourage organizational training for employers and employees on these best practice approaches.

9. CONCLUSION & NEXT STEPS

The initial CleanBC Plan contains policies and actions designed to meet B.C.'s GHG emission reduction targets to 2030. It also serves as an economic driver in terms of investments in new project and clean economy jobs province-wide. While this Industry Strategy is focused on addressing supply-side workforce and skills gaps related to CleanBC, and the broader transition to a clean economy in British Columbia, a number of additional barriers affecting the potential growth of clean economy jobs (i.e., demand-side factors) were identified through the research and stakeholder engagement activities.

Examples of the barriers identified include a lack of incentives for small-scale community renewable energy projects (such as a revitalization of BC Hydro's former Standing Offer Program), the lack of recycling and waste/organics management infrastructure in more rural areas of the province, and the need for more support for manufacturers to expand the export market potential for their solutions. These barriers are not addressed as part of this Industry Strategy but could be a future focus for efforts by government and other key stakeholders in order to maximize the job creation opportunities in B.C.'s clean economy and the related benefits.

In addition, many workforce-related barriers and challenges identified through this project's research and consultation phases were deemed to be economy-wide issues rather than clean economy-specific. Many of these barriers are fundamental underlying issues, with many of them currently being addressed through other government and/or non-government efforts and initiatives.

While this Industry Strategy does not include specific recommendations for addressing these broad, economy-wide, systemic barriers, it is important to recognize these initiatives and mention that this Strategy looked to align with and complement these efforts wherever possible, while avoiding duplicative efforts. Examples of these initiatives include:

- **TogetherBC** – BC's Poverty Reduction Strategy is helping to address the rising cost of living in many areas of the province.
- **Active Transportation Strategy and ConnectingBC Communities Program** – helping to address transportation and broadband/internet connectivity barriers for residents in communities across the province.
- **Community Benefits Agreement** – providing job and training opportunities for groups traditionally under-represented in the construction sector.
- **Small Business Task Force** – helped to understand barriers and opportunities for small business owners across the province.
- **InnovateBC** – Crown agency delivering programs across the province to support innovation, entrepreneurship, and business development in the technology sector.
- **Emerging Economy Task Force** – helping to better understand how changing global trends, emerging technological advancements, changing business processes, climate change, and a variety of other factors will shape the future of B.C.'s economy and its workforce.
- **Economic Recovery Task Force** – leaders from business, labour, First Nations, and not-for-profits helping to ensure an effective economic response to COVID-19.

IMPLEMENTING THE STRATEGY

The Steering Committee met twice in April 2020 to discuss implementation considerations including prioritizing the recommended actions, identifying work already underway in support of the clean economy workforce, surfacing other considerations, and identifying near term initiatives to address the current context.

Prioritizing the Recommended Actions

Recommended actions were prioritized based on their alignment to the following criteria, which were developed to mirror the guiding principles set out at the beginning of this Project:

1. **Supports achieving one or more of the outcomes.**
2. **Is fair, just, and supports transition for all British Columbians.**
3. **Is based on sound qualitative and quantitative information and evidence.**
4. **Addresses existing barriers and gaps where workforce supply does not meet industry needs/demands.**
5. **Builds on existing initiatives, strategies, and other relevant information while seeking to avoid duplication of efforts or working at cross purposes.**
6. **Directly or indirectly supports the United Nations Declaration on the Rights of Indigenous Peoples (UNDRIP) and the Truth and Reconciliation Commission's Calls to Action.**
7. **Directly or indirectly considers a Gender-based Analysis Plus (GBA+) lens that focuses on enhancing the inclusion of under-represented and/or under-employed populations of B.C.'s workforce.**
8. **Makes sense within the shifting global economy.**

The tables of recommended actions in this document have been sorted in priority order as identified by the Steering Committee. Other factors such as partner availability, budget and other pressures will drive the decision to launch initiatives.

Identifying Work Already Underway

In some cases, work is already underway amongst stakeholder organizations that supports the outcomes identified in the Clean Economy Workforce Readiness Model.

Many existing initiatives can be further supported or scaled. Clean economy-related work being led by organizations such as the Home Performance Stakeholder Council (HPSC), the Energy Step Code Education and Training Council, Student Energy, First Nations Technology Council, Indigenous Adult Higher Learning Association, and Women in Leadership are but a few examples. The HPSC, for example, has established a network of home renovation contractors, trades, suppliers, and energy advisors, with support from BC Hydro and FortisBC, and is looking to raise the bar on residential energy efficient retrofits in B.C. The HPSC recently developed a vision and industry-led roadmap for advancing the sector, including with respect to education and training, as well as for quality installation standards.

Partners will need to assess their implementation plans through a financial sustainability lens for the long-term maintenance and operations of their initiatives or programs. Partners should seek long-term, shared funding from multiple sources to diversify and reduce risk, including through sources that may include industry, post-secondary institutions, non-profits, and others. Ultimately, if the program is delivering value and supported by the community, then a value proposition should exist for the funder, investor, or partner.

Identifying Near Term Initiatives – Responding to a Global Pandemic

At the time of writing this Industry Strategy, the world is challenged by the disruption brought by the global COVID-19 pandemic. The movement of people and goods between communities and around the world has been significantly restricted to slow the spread of COVID-19.

Initial impacts of this pandemic are being felt across many industries, especially in the case of health care, front line workers, and others who regularly interact with the public. It will be some time before we understand the full breadth and depth of the disruption to the global economy.

Successful implementation of any recommended actions or supporting activities in this Industry Strategy will require special consideration of innovation, disruptive technologies, and the potential for shifts in workforce demand across all sectors of the economy.

Considering Other Implementation Factors

The Steering Committee identified several factors to be considered when implementing this Industry Strategy. Some are common to many recommended actions, while others are more specific.

Overarching Considerations:

- The Industry Strategy reflects a long-term planning horizon. It must be reviewed and renewed regularly to reflect B.C.'s shifting context and ensure ongoing relevance. As the clean economy and technology continues to evolve, gaps should be identified and recommendations should be assessed for relevance, updated, reprioritized and/or dropped from the list.
- Care must be taken not to lose the broad foundation of learning in the trades in favour of boutique training that focuses on a short training period and a narrow skill set. Trades workers depend on their foundation of transferrable skills to help them be resilient when an industry experiences a downturn and they must find new occupation paths.
- While online learning is a necessity during physical distancing, care must be taken to not shortchange the learners, who will continue to need hands on experience.
- Other groups and committees, such as the Economic Recovery Task Force recently established to plan for post-COVID-19 recovery, will have perspectives to offer in the implementation of the recommended actions outlined in this Industry Strategy. Collaboration and information sharing among related groups will be important to the success of these initiatives.
- Success in addressing systemic issues will require strong collaboration across multiple parties. There is a leading role for government in helping employers to create inclusive work environments.
- British Columbians have varying degrees of climate literacy, which affects opportunities to participate in programs and find supports. There is a need to make a better connection between "what I do now" and "what I can do based on my transferable skills, experience and education," particularly among under-represented groups who struggle to see their place in clean economy occupations.

Monitoring & Evaluating Success

The recommendations in this strategy affect a wide range of partners and stakeholders. Measuring successful outcomes will vary by sector, community, and workforce population across B.C.'s clean economy. High-level performance indicators will need to be developed to align with the cross-sector issues and focus areas in this strategy. Examples of indicators that could be considered include:

- Job growth for key occupations across regions of the province;
- The number of education and training programs in B.C. that have a climate change lens applied;
- Participation rates of women, Indigenous Peoples, and other under-represented groups in the clean economy workforce; and
- The accessibility of training programs and workforce supports to different under-represented groups, either through regional offerings or online resources.

Developing a suite of performance indicators that can be regularly used for monitoring and evaluating success is a good task for the cross-sector, industry-led organization or governance body described in recommendation 20. As this governance body is designed to be broad and representative, it is likely the participating organizations will be in a good position to identify suitable performance indicators and align with related initiatives.

Strategically aligning B.C.'s workforce with the CleanBC Plan will be essential for meeting the province's GHG emission reduction targets, while capitalizing on the investment and employment opportunities. The recommendations outlined in this strategy seek to ensure:

- Education and training systems are more responsive to the rapidly emerging trends and technologies needed for addressing climate change mitigation and adaptation priorities;
- Workers that may be exposed to any downsides from the transition to a low-carbon economy are adequately supported;
- Labour force supply is optimized by leveraging the province's diverse population through inclusive workforce participation models; and
- Unique urban, rural, remote, and Indigenous communities have the capacity to benefit from the CleanBC Plan and broader clean economy opportunities.

CleanBC presents an opportunity for British Columbia to continue to show climate action leadership through targeted GHG emission reductions while simultaneously creating new investments and jobs across BC's clean economy sectors in all regions of the province. Through CleanBC, the province can become more resilient to future economic and environmental shocks, businesses more resource and energy efficient enabling enhanced competitiveness and profitability, and communities large and small more diverse and connected around common purpose.

As the implementation of this Industry Strategy moves forward, collaboration across all levels of government, non-government organizations, industry, academia, and First Nations will be essential for ensuring the benefits are shared by all British Columbians.

APPENDIX A: STAKEHOLDER ENGAGEMENT LIST

PROJECT STEERING COMMITTEE

CleanBC Steering Committee Organizations

Applied Science Technologists & Technicians of British Columbia (ASTTBC)
BC Climate Action Secretariat^
BC Federation of Labour
BC Hydro
BC Ministry of Advanced Education, Skills & Training^
BC Ministry of Jobs, Economic Development & Competitiveness^
BC Transit
BCIT
BCTECH
Canfor
Climate Guides
Environmental Dynamics Inc
First Nations Technology Council
FortisBC
Government Communications & Public Engagement^
Industry Training Authority (ITA) BC
Lower Columbia Initiatives Corporation
MoveUP
Nicola Valley Institute of Technology
North Island Employment Foundations Society
Organizing for Change
Research Universities' Council of BC
Student Energy
Synergy Enterprises
Unifor
Women in Leadership

^ Ex-officio member

SECTOR-SPECIFIC SUB-COMMITTEES

Built Environment Sub-Committee

BC Building Trades
BC Construction Association
BC Housing
BCIT
BC Ministry of Energy, Mines & Petroleum Resources
Brantwood Consulting
Canada Green Building Council
Fenestration Association of BC
Home Performance Stakeholder Council
Independent Contractors Association of BC
Passive House Canada
Pembina Institute
Thermal Environmental Comfort Association (TECA)
UBC Department of Civil Engineering

Clean Power Supply & Storage Sub-Committee

BC Community Energy Association of BC
BC Hydro
BC Ministry of Energy, Mines & Petroleum Resources
Clean Energy BC
FortisBC
Portable Electric
SFU Faculty of Applied Science
UVIC Institute for Integrated Energy Systems

Clean Transportation Sub-Committee

Advanced Biofuels of Canada
BCIT Motive Power Programs
BC Ministry of Energy, Mines & Petroleum Resources
BC Ministry of Transportation & Infrastructure
Clean Energy Canada
Coast Mountain Bus
FortisBC
Green Car Reports
Modo Car Coop
Novex Courier/West Coast Sightseeing
Port of Vancouver
Urban Logiq
Westport Innovations

CleanTech & Innovation Sub-Committee

BC Ministry of Energy, Mines & Petroleum Resources (ICE Fund)
BC Ministry of Jobs, Trades & Technology
Carbon Engineering
Cascadia Windows
Chrysalix Venture Capital
First Nations Technology Council
Foresight Cleantech Accelerator Centre
Powertech Labs
UBC Clean Energy Research Centre
UVIC Institute for Integrated Energy Systems

Industrial & Resource Efficiency Sub-Committee

B.C. Climate Action Secretariat
BC Ministry of Agriculture
BC Ministry of Forests, Lands, Natural Resource Operations & Rural Development
Canadian Council of Forest Industries
Eco Inspire Planning
Iron and Earth
Lafarge
LafargeHolcim
Lighthouse Sustainable Building Centre
Metro Vancouver/National Zero Waste Committee
Minesense
Paper Excellence
Parkland Fuels
Recycling Council of BC
LNG Canada
UFV Institute for Resources, Environment & Sustainability

REGIONAL WORKSHOPS

Kootenay Region (Trail)

Chamber of Mines of Eastern BC
City of Rossland
College of the Rockies
FortisBC
Hemmera
Kootenay Employment Services
Lower Columbia Initiatives Corp
Member of Parliament,
South Okanagan – West Kootenay
MIDAS Lab
Selkirk College
PodTech
Teck Operations
West Kootenay Eco Society

Thompson-Okanagan (Kamloops)

Adventure Tourism Coalition
BC Ministry of Social Development
& Poverty Reduction
BC Sustainable Energy Association
City of Kamloops
Construction Foundation of BC
Kamloops Innovation
Venture Kamloops
WorkBC Office (Open Door Group)

Cariboo (Prince George)

Bid Group
Canfor Pulp
Cariboo Mining Association
City of Prince George
Clean Energy Consulting
College of New Caledonia
Conifex Inc
Environmental Dynamics
Fraser Basin Council
Northern Development Initiative Trust
Peroxychem
Pinnacle Pellet
Radloff Engineering
UNBC Wood Design Innovation Centre

Northeast (Fort St. John)

BCGEU
BC Ministry of Social Development
& Poverty Reduction
Dawson Creek Chamber of Commerce
Industry Training Authority of BC
Fort St. John Chamber of Commerce
Independent Contractors
& Businesses Association
Northern Environmental Action Team
Northern Lights College
School District 59 Peace River South
UNBC Community Development Institute
WorkBC Employment Services Centre

North Coast – Nechako (Prince Rupert)

BC Ministry of Forests, Lands, Natural
Resource Operations & Rural Development
Coastal Training Centre
Ecotrust North Coast Innovation Lab
Hecate Strait Employment
Development Society
LNG Canada
Metlakatla First Nation
Port of Prince Rupert
Prince Rupert Chamber of Commerce
Redesign Rupert

Vancouver Island – Coast (Nanaimo)

Barkley Project Group
BC Hydro
BC Ministry of Social Development
& Poverty Reduction
Canadian Electric Vehicles Ltd
City of Campbell River
City of Nanaimo
Cowichan Valley Regional District
District of Cumberland
Ergo Eco Solutions Inc/Cowichan Valley
Biodiesel Coop
Industry Training Authority of BC
Mid-Island Business Initiative
Nanaimo Association for
Community Living
Nanaimo Chamber of Commerce
Nanaimo Recycling Exchange
North Island College
Remark Design Solutions
Shift Energy Group
SRM Projects
Tectonica
Vancouver Island Construction Association
Vancouver Island University
Western Forest Products Inc.

Mainland – Southwest (Abbotsford)

Advantage Hope
Cascadia Windows
City of Abbotsford
City of Mission
Food Mesh
Fraser Valley Regional District
Industry Training Authority of BC
MLA Abbotsford-Mission
Net Zero Waste
Pacific Mattress Recycling
UFV

INDIGENOUS-FOCUSED SESSIONS

Indigenous Communities, Organizations and Tribal Councils

Blueberry First Nation
Carrier Chilcotin Aboriginal Training Employment Center (CCATEC)
Carrier Chilcotin Tribal Council
Coast Salish Employment & Training
Cowichan Tribes
Daylu Dena Council
Doig River First Nation
Fort St John Friendship Society
Gitanyow Hereditary Chiefs Office
Gitxsan Development Corporation
Ktunaxa Nation Council (KNC)
Kyah Wiget Education Society
Lake Babine Nation
Lax Kw'alaams Business Development LP
Lheidli T'enneh
Little Shuswap Indian Band
Métis Nation of BC
Nadleh Whut'en First Nation
Native Education College
Neskonlith Indian Band
Nisga'a Employment Skills & Training
Nisga'a Village of Laxgalts'ap
Nuu-chah-nulth Tribal Council (NTC)
Shuswap Nation Aboriginal Employment & Training Centre
Tahltan Central Government
Tk'emlúps te Secwe̓pemc (Kamloops Indian Band)
Ts'kw'aylaxw First Nation
Williams Lake Indian Band
Witset First Nation

Public Engagement Workshop Locations

Fraser Valley (Matsqui)
Masset
Nanaimo
Saik'uz Nation (Vanderhoof)
Cranbrook
Fort Nelson

OTHER ORGANIZATIONS ENGAGED

Architectural Institute of BC
Ballard Power
BC Ferries
BC Ministry of Jobs, Trade & Technology
Blu Earth Renewables
Camosun College
City Green Solutions
CN Rail
Ecotrust
Engineers & Geoscientists BC
Etalim
Forest Innovation Investment
Forest Products Association of Canada
Fraser Basin Council
Harbour Air
Ionomr Innovations Inc
Nelson Hydro
Pacific Northern Gas
Parkland Fuels
Passive House Canada
Port of Vancouver
Schneider Electric
Semios

APPENDIX B: ALIGNMENT OF RECOMMENDED ACTIONS TO STRATEGIES

ALIGNMENT OF RECOMMENDED ACTIONS TO STRATEGIES

Recommended Action 1 Reduce barriers for small and medium-sized enterprises to transition to and participate in the clean economy

- Strategy 6 Support B.C. businesses to be competitive, resilient, and adaptable participants in the clean economy
- Strategy 10 Create opportunities for businesses of all sizes to participate in the clean economy

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2 Adopt education, training, and reskilling models that bring real world context and experiences into classrooms to keep pace with global shifts and emerging trends

- 2 Ensure the education and training system can anticipate emerging global trends, priorities, and is responsive to skill shortages in the clean economy
- 6 Support B.C. businesses to be competitive, resilient, and adaptable participants in the clean economy

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3 Address youth readiness for clean economy occupations, with a focus on developing the skills and competencies needed for success in the clean economy

- 1 Provide flexible training programs and design curriculum that reflects the needs of B.C.'s diverse population, including Indigenous Peoples and underrepresented groups
- 2 Ensure the education and training system can anticipate emerging global trends, priorities, and is responsive to skill shortages in the clean economy

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4 Ensure workers in at-risk occupations receive the support they need to remain successful during the transition to the clean economy

- 3 Provide on-the-job training programs to ease the transition of B.C.'s workforce to clean economy jobs

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5 Develop industry-specific career planning tools to communicate available clean economy careers and potential pathways

- 3 Provide on-the-job training programs to ease the transition of B.C.'s workforce to clean economy jobs
- 4 Prepare clean economy workers to meet the needs of changing occupations and emerging industries
- 5 Remove barriers for Indigenous Peoples and underrepresented populations to participate in the clean economy

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6 Facilitate networks of regional, community-based partnerships to ensure all parts of the province are prepared for the transition to the clean economy

- 9 Ensure all regions and communities across the province can actively participate in the clean economy
- 11 Create partnerships across all contributors to B.C.'s economy to chart the path to a clean, thriving and innovative economy

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7 Encourage employers to support a culture of lifelong learning and provide opportunities for ongoing skills development and reskilling to their existing workforce

- 7 Create employers of the future by fostering inclusive, flexible, and modern workplaces

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8 Design alternative and flexible training models that promote inclusion and remove barriers to participation for rural, remote and Indigenous communities

- 1 Provide flexible training programs and design curriculum that reflects the needs of B.C.'s diverse population, including Indigenous Peoples and underrepresented groups
- 9 Ensure all regions and communities across the province can actively participate in the clean economy

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9 Expand professional requirements and enforce safety standards that protect and provide assurances to consumers of B.C. products and services

- 12 Expand regulations and requirements to ensure the safety of the workforce and maintain the quality of made-in-B.C. products and services

10 Establish safety and certification requirements for clean economy workers and workplaces

- 2 Ensure the education and training system can anticipate emerging global trends, priorities, and is responsive to skill shortages in the clean economy
- 6 Support B.C. businesses to be competitive, resilient, and adaptable participants in the clean economy
- 12 Expand regulations and requirements to ensure the safety of the workforce and maintain the quality of made-in-B.C. products and services

11 Create opportunities for members of rural, remote, and Indigenous communities to work in their home communities

- 5 Remove barriers for Indigenous Peoples and underrepresented populations to participate in the clean economy
- 9 Ensure all regions and communities across the province can actively participate in the clean economy

12 Provide more opportunities to build the skills of the workforce through on-the-job learning with employers

- 4 Prepare clean economy workers to meet the needs of changing occupations and emerging industries
- 6 Support B.C. businesses to be competitive, resilient, and adaptable participants in the clean economy
- 7 Create employers of the future by fostering inclusive, flexible, and modern workplaces

13 Develop strategies and materials that promote clean economy opportunities to all British Columbians

- 8 Build awareness of the benefits of B.C.'s clean economy and the available career opportunities
- 9 Ensure all regions and communities across the province can actively participate in the clean economy

14 Create incentives for learners to participate in programs aligned with in-demand jobs and sectors

- 4 Prepare clean economy workers to meet the needs of changing occupations and emerging industries
- 5 Remove barriers for Indigenous Peoples and underrepresented populations to participate in the clean economy

15 Review approaches for delivering training programs to cultivate safe and inclusive learning environments and remove barriers to participation

- 1 Provide flexible training programs and design curriculum that reflects the needs of B.C.'s diverse population, including Indigenous Peoples and underrepresented groups

16 Minimize labour shortages in priority occupations by addressing the systemic issues that limit access to training and upskilling

- 2 Ensure the education and training system can anticipate emerging global trends, priorities, and is responsive to skill shortages in the clean economy
- 6 Support B.C. businesses to be competitive, resilient, and adaptable participants in the clean economy
- 7 Create employers of the future by fostering inclusive, flexible, and modern workplaces

17 Support employers in preparing their workplaces for the clean economy and promoting upcoming job opportunities

- 6 Support B.C. businesses to be competitive, resilient, and adaptable participants in the clean economy
- 7 Create employers of the future by fostering inclusive, flexible, and modern workplaces
- 8 Build awareness of the benefits of B.C.'s clean economy and the available career opportunities
- 10 Create opportunities for businesses of all sizes to participate in the clean economy

18 Champion and support diverse and inclusive employers

- 6 Support B.C. businesses to be competitive, resilient, and adaptable participants in the clean economy
- 7 Create employers of the future by fostering inclusive, flexible, and modern workplaces

19 Tailor energy efficiency and renewable energy project development and maintenance training programs to the needs of rural, remote, and Indigenous communities

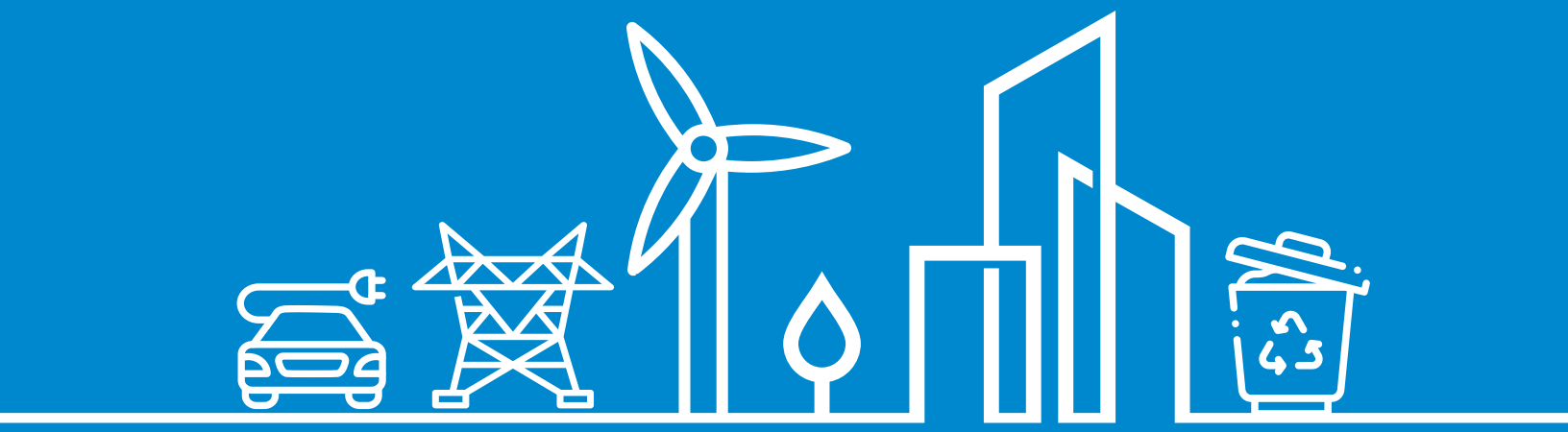
- 2 Ensure the education and training system can anticipate emerging global trends, priorities, and is responsive to skill shortages in the clean economy
- 9 Ensure all regions and communities across the province can actively participate in the clean economy

20 Establish ongoing oversight and collaboration to support a thriving clean economy workforce

- 11 Create partnerships across all contributors to B.C.'s economy to chart the path to a clean, thriving and innovative economy

21 Document and share employer policies, tools and other best practices for fostering inclusive, safe and flexible work environments

- 6 Support B.C. businesses to be competitive, resilient, and adaptable participants in the clean economy
- 7 Create employers of the future by fostering inclusive, flexible, and modern workplaces



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