Upskilling for Canada's ClimateTransition

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ASI ACADEMY for SUSTAINABLE INNOVATION

Resilience by DesignLab INSPIRING CLIMATE ACTION

Future Skills Centre | Centre des Compétences futures

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FSC is a forward-thinking centre for research and collaboration dedicated to preparing Canadians for employment success. We believe Canadians should feel confident about the skills they have to succeed in a changing workforce. As a pan-Canadian community, we are collaborating to rigorously identify, test, measure, and share innovative approaches to assessing and developing the skills Canadians need to thrive in the days and years ahead. The Future Skills Centre was founded by a consortium whose members are Toronto Metropolitan University, Blueprint ADE, and The Conference Board of Canada

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EXECUTIVE SUMMARY

In Canada and around the world, wildfires, floods, and other climate disasters indicate the impacts of climate change are accelerating. To significantly address these impacts and their causes, we must accelerate economic and social transformation toward a low-carbon, climate resilient, and socially-inclusive society.

This transformation cannot happen solely through technology or policy development; it needs people: a climate-ready workforce that understands and can apply creativity and leadership to a broad range of complex climate issues. And to get there, the workforce requires education and training providers, communities, professional associations, businesses, non-governmental organizations, and the public sector, all working together to build widespread capacity.

Targeted, short-duration programs offer cost-effective opportunities to rapidly equip workers with the necessary competencies to lead climate change solutions. However, a scan of existing climate action courses and programs suggests that, despite an increase of climate-related programming from post-secondary institutions and other training service providers, there are few unified standards to support such programs. This lack results in learner and employer uncertainty, limited mobility of credentials across jurisdictions, and unclear connections between climate action competencies and defined training pathways.

A national approach to climate action-related training across Canadian jurisdictions could address these gaps. Improving both recognition and transferability of qualifications would ensure competencies were commonly understood, and ease their application to sector-specific curriculum development and training programs of optimal or short duration.

To better understand how to develop such a national approach, between September 2022 and September 2023, the Upskilling for Canada's Climate Transition research project explored ways to rapidly advance upskilling for climate action leadership in Canada. The study consisted of a literature review, a scan of climate action-focused training opportunities and jobs, exploratory interviews with leaders representing varied perspectives on Canada's climate transition, a survey, and operational interviews with existing related large-scale upskilling providers in Canada.

The study's findings suggest it is both possible and desirable to build national climate action leadership frameworks that serve as common references for understanding and comparing qualifications and competencies. Creating Canadian national qualifications and competency frameworks for climate action leadership will require research and consultation with key stakeholders – including industry experts, educators, and policymakers – to develop sector-specific standards and validation, and to obtain endorsement of these standards through further consultation. This report offers examples from existing upskilling initiatives across the country and summarizes key learnings about project initiation, offerings, and unique approaches.

Building on these learnings, this study proposes that a successful, nationally relevant organization, supported by diverse funding sources and devoted to rapid upskilling for climate action leadership in Canada, would include several key characteristics. Such an organization would be separate from

government; focused on the needs of learners in transition; developed with employers; and equipped to support learners and education and training institutions in charting a clear, tangible, and recognized path to skill development and, ultimately, toward a career that provides security and resiliency to the individual while also contributing more broadly to Canada's climate transition.

Finally, this report recommends six actions to rapidly upskill the workforce and accelerate economic and social transformation toward a low-carbon, climate resilient, and socially-inclusive society:

1. Raise climate literacy;
2. Convene actors and develop frameworks;
3. Strengthen collaboration, alignment, and governance;
4. Continue to identify job and competency gaps;
5. Develop and deliver sector-specific and role-specific expertise; and
6. Support workforce resilience and health.

ABOUT THIS STUDY

The Upskilling for Canada's Climate Transition research project is a collaboration between the Academy for Sustainable Innovation and the Resilience by Design Lab at Royal Roads University, in partnership with the Government of Canada's Future Skills Centre. The project was undertaken from September 2022 to September 2023 to explore possible approaches to rapidly advance upskilling for climate action leadership in Canada. The Upskilling for Canada's Climate Transition project is funded by the Government of Canada under the Future Skills program.

This initiative offered an opportunity to leverage ASI's and RbD Lab's experience developing climate action courses and micro-credentials, ASI's experience in Transition Leadership capacity building, and RbD Lab's experience in the design and development of competency frameworks to support climate action leadership. For more information on the lead organizations, please see Appendix A.

STUDY APPROACH

To develop project recommendations, the research team undertook a literature review on the current state of corporate and public policy on climate change-related economic transition and climate action-related workforce development challenges and approaches, both nationally and globally. Concurrently, the team undertook a scan of climate action-focused training opportunities across Canada, as well as a job scan of climate action leadership roles.

The project's interview approach was exploratory and included a phase of interviews with Canadian leaders from several sectors, representing varied points of view on Canada's climate transition. The goal was to gather perspectives on the readiness of Canadian institutions and organizations to be part of a national approach to climate action leadership upskilling. The outcomes of these interviews informed the development of a survey, which was distributed more broadly. The survey was used to source input on climate action competencies, perspectives on short-duration courses, and possible approaches to a pan-Canadian climate action leadership-focused rapid upskilling initiative.

To frame the competencies for climate action workforce requirements, the team built on previous work undertaken by the Resilience By Design Lab and applied the Climate Adaptation Competency Framework.

To inform what a pan-Canadian approach to climate action leadership upskilling could look like, the team conducted a review of several related Canadian upskilling organizations and initiatives, capturing their governance structures, program delivery methods to audiences in different stages of their careers, and relevant learnings from the organizations' experiences to date. Operational interviews supplemented the initial desktop research. Results from this review and interview set were combined with information from other project activities, then compiled into a list of the key characteristics of an organization or initiative that might lead or steward a national climate action upskilling effort.

Finally, the team synthesized the work to provide six actionable recommendations and associated tactics, as a possible roadmap for next steps.

A glossary of terms is provided in Appendix B. Detailed information on project methods are provided in Appendix C: Detailed Research Methods. Questions used in the interviews and survey can be found in Appendix D and Appendix E, respectively.

Background: The Need for a National Approach to Climate Action Skilling in Canada

Climate Action & Sustainability Workforce Development

THE CLIMATE CRISIS

> *The findings of the Intergovernmental Panel on Climate Change (IPCC) are clear: to avoid the most catastrophic effects of climate change, global temperature rise must be limited to 1.5°C or below. To reach this goal, greenhouse gas (GHG) emissions must be reduced 50% by 2030 and to net zero by 2050.*
>
> *IPCC AR6 report, Working Group III, 2022*

How should Canadian society respond to the challenges of the catastrophic effects of climate change?

The complex issue of climate change requires an acceleration of economic and social transformation toward a low-carbon, climate resilient, and socially-inclusive society. The challenge is to rapidly reduce greenhouse gas (GHG) emissions in all sectors, while preparing for and adapting to the impacts of wildfires, floods, drought, heat domes, sea level rise, and the cascading and compounding physical, social, health, economic, financial, and ecological impacts of climate change.

Actions that might hasten the reduction of GHG emissions, while also minimizing the systemic risks associated with impacts that are already "baked in," include the following:

- Bold public policies and regulations;
- New governance approaches;
- Novel technology development and application;

- Integration of Indigenous knowledges and perspectives into planning and action;
- Improved integration between climate actions (adaptation and mitigation) and disaster and emergency management practices;
- Shareholder-supported business strategies;
- Authentic measurement and reporting of both emissions and climate risks; and
- Evidence-based approaches to limit loss and damage.

Such actions require a climate-ready workforce that understands and can address the broad range of complex issues, and innovate solutions.

BUILDING A CLIMATE-READY WORKFORCE IN CANADA

The scale of workforce transformation needed will require capacity-building strategies that involve several actors, including education and training providers,[1] professional associations, labour organizations, businesses, non-governmental organizations, the various levels of government (Indigenous, federal, provincial/territorial, regional, and municipal), and the public sector.

In Canada, the need for a climate-ready workforce is outlined in numerous policy and strategy documents, including the National Adaptation Strategy. One core objective of this strategy is a skilled, diverse, adaptable workforce that is supported by education and training to respond to future impacts of climate change. The strategy has ambitious targets, including the following: "By 2027, 75% of the members of professional associations (i.e., civil engineers, planners, landscape architects, and accountants) have the capacity to apply climate change adaptation tools and information and communicate the business case for adaptation measures to their clients" (Environment and Climate Change Canada, 2023).

More specifically, a climate-ready workforce requires two things. The first is new competencies or know-how – comprised of knowledge, skills, and attributes – to translate knowledge and information into concrete actions to address the energy transition, climate change mitigation, and climate change adaptation. The second is leadership – both as a competency specific to climate action's demands and opportunities (e.g., collective leadership), and as "a process of social influence that maximizes our collective efforts to achieve national climate action and resilience" (Environics, 2022).

Whereas public policies in developed and emerging economies emphasize sustainable growth and environmental technology, all countries face great challenges in the implementation of such policies due to lack of financial and human capacity (Capozza & Samson, 2019).

When it comes to human capacity, a significant barrier exists between the competencies demanded by new climate action-related jobs and the opportunities for individuals to gain those competencies

[1] Throughout this report, the term "education and training providers" refers to post-secondary institutions like universities, colleges, polytechnics, and cégeps, as well as private, community-based, and non-profit training providers.

through defined education and training pathways. This prompts questions: (1) how do we equip the workforce with the competencies required to address climate change; (2) how might we create a standard approach to competency development across Canada as a baseline for a shared understanding of our current context and possible solutions; and (3) how might we approach a pan-Canadian effort to upskill the workforce with climate action leadership capacities?

> ***Upskilling:*** *Facilitating learning opportunities that allow for career expansion and advancement in a linear path through new skills and competencies.*
>
> ***Reskilling:*** *Facilitating learning opportunities outside of the worker's current skillset. The new skills and competencies allow for career changes and advancement.*

Rapid climate action upskilling, that is, learning opportunities that allow for career expansion and advancement, especially in a transitioning economy, could utilize short-duration training programs such as micro-credentials that aid in building workforce capacity to lead on climate change solutions. However, Canada currently lacks the frameworks necessary to define a structured and coherent approach to climate action competency development across the myriad sectors, industries, regions, and job types where these competencies are already critically required.

CLIMATE ACTION LEADERSHIP

> ***Climate action:*** *Climate action refers to efforts taken to combat climate change and its impacts. These efforts involve reducing GHG emissions (climate change mitigation) and/or taking action to prepare for and adjust to both the current effects of climate change and the predicted impacts in the future (climate change adaptation). Climate action includes any policy, measure, or program that supports and finances those goals (Publications Office of the European Union, 2021).*[2]

While there are many climate action-related competency areas that are relevant to Canada's climate readiness, this project focuses on leadership competencies versus more technical or trades-based competencies, which have had and continue to have significant focus by other initiatives. In common usage, the term "leadership" can be characterized as a skill, competency, or personal attribute, and in many instances it is used in reference to positional power within a group or organization. However, this research team aligns with framing leadership as the ability of an individual or group to influence momentum toward shared objectives. As such, leadership is the ability to influence change, regardless of role, title, age, or seniority.

[2] Naming conventions for climate and sustainability education and training programming have been debated for years, and include Environmental Education, Education for Sustainable Development, and more recently, Climate Action Education (Pavlova, M., 2013). In the context of this study and report, "climate action leadership" is intended to encompass efforts that work toward sustainability more broadly using a holistic perspective of the interconnectedness of socio-ecological systems.

Although many leadership competencies translate across a range of issues that include climate change, climate action leadership requires additional, specific new competencies. These new competencies emphasize widespread change management; leadership for cross-sector and cross-disciplinary collaboration that includes working with rivals and across public-private divides (Benulic et al., 2022); futures-thinking in the context of uncertainty, complexity, and emergence; and transformational approaches to leadership itself (e.g., collective models of leadership).

Distributed leadership is required to address the climate crisis effectively. Also critical are the ability to work effectively with the scale and scope of the direct, indirect, and cascading challenges posed by climate impacts (Benulic et al., 2022), and the ability to work in the urgent context of climate change adaptation and mitigation. Climate action leadership – at the individual, organizational, sectoral, or political level – is key to the systems transformation necessary to advance climate action and other sustainability efforts at scale, and should be a core focus of upskilling efforts.

Most jobs will soon require some level of upskilling, as career scopes broaden and roles transition to meet the complex issues and impacts of climate change. In Adapting Canada's Workforce, the authors address what is needed in terms of flood resilience (only one dimension of climate action):

> *The skills most in demand across the flood resilience workforce are process, social and problem solving skills, given the need to bolster soft adaptation skills to advance natural and built infrastructure projects. Soft adaptation measures pertain to equipping workers with the skills they need to execute these projects and build resilience to climate change-related flooding. This will have an impact on the entire workforce, including a number of skilled trades. Across all of the sectors expected to see growth in jobs as a result of spending on natural, built and hybrid adaptation measures, skills such as critical thinking, monitoring, social perceptiveness, coordination, complex problem solving, judgment and decision making, and time management will be the most important.*
>
> *Atiq, M., Islam, A., Jefferson, U., McNally, J. & Ramesh, H. (2022)*

Job functions that require climate action leadership competencies are diverse and span a multitude of role types, industries, sectors, and geographic locations. Procurement, employee engagement, strategy development, risk management, infrastructure planning, ESG reporting, and policy analysis are just a few examples of a vast number of job functions that require an understanding of climate change and related impacts.

Given this diversity, the articulation of specific expertise required – that is, the competencies and related job descriptions for new functions – must be well articulated. With an understanding of the jobs and functions needed for transition, and the competencies needed to support workers to perform those jobs and functions, upskilling opportunities and pathways can be mapped to needs.

INITIATIVES UNDERTAKEN FOR CLIMATE ACTION LEADERSHIP CAPACITY BUILDING

The United Nations Framework Convention on Climate Change (UNFCCC) recently stated of its global stocktake key findings that "capacity-building is foundational to achieving broad-ranging and sustained climate action and requires effective country-led and needs-based cooperation to ensure capacities are enhanced and retained over time at all levels." (UNFCCC Secretariat, 2023)

Numerous private and public sector organizations, and some professional associations in Canada and globally, have recognized the need for climate action upskilling and climate action leadership capacity building. Many of these organizations have initiated analyses of climate action and sustainability competency requirements, while some large multinational firms have undertaken internal capacity-building initiatives for climate action and sustainability. Examples include Deloitte (Aboud et. al, 2022), Microsoft (Sustainability Learning Centre, n.d.), and LinkedIn (LinkedIn Economic Graph, 2023).

Like the broader Canadian workforce, Canadian public servants need a better understanding of climate change and its cascading impacts, as a foundational step to engage employees in public policy and practice. To that end, over the past year courses have been developed to introduce federal government employees to the basics of climate change science, what adapting to climate change means, and both what is needed and being done to reduce greenhouse gas emissions. These courses will be included in the catalogue of courses offered by Canada School of Public Service, among many others (Canada School of Public Service, 2023).

Canadian climate action capacity-building programs have been sponsored by the federal government (e.g., NRCan BRACE, 2018), while new approaches to short-duration learning – such as micro-credentials and short certificates focused on climate action and sustainability – have begun to emerge from the post-secondary sector. Continuing professional development through professional associations and corporate training options have added to the inventory of climate-focused upskilling options.

While upskilling options exist, there is product and pricing confusion, a lack of credentialing coherence to validate skills gained, and challenges in finding the right options for learning delivery with the appropriate level of time and money commitment for professionals working in specific sectors and disciplines (D'Agostino, 2023).

In addition to training opportunities, Communities of Practice (CoPs), practitioner networks, LinkedIn and other online groups or communities, and corporate support services related to climate action and sustainability are emerging as approaches to support capacity building. For example, the

U.S.-based Association of Climate Change Officers (ACCO) offers Enterprise Climate Readiness Services (Association of Climate Change Officers, n.d.) and a toolkit for human resource professionals on the value of adding specific climate action and sustainability elements to job descriptions.

These CoPs, networks, and support services form an important element in capacity building. However, most Canadian climate action and sustainability-focused support services are more technical in nature (e.g., Canadian Centre for Climate Services) and do not directly address other climate-related business and leadership needs, such as change management, support for risk assessments, changes to governance models, potential impacts to shareholders and clients, etc.

To go beyond technical capacity building, programming like the Academy for Sustainable Innovation's new Sustainability Professionals Members Network (Academy for Sustainable Innovation, 2023) and the All We Can Save Project's Circles and Climate Wayfinding (All We Can Save Project, 2023) are beginning to address the gap in climate action-focused leadership and soft-skills development. That these programs remain siloed from other upskilling pathways highlights an opportunity to weave leadership development into the broader scope of climate action upskilling.

The Growth of Climate-Related Jobs

TRENDS IN CLIMATE-RELATED JOBS

According to the International Labour Organization (International Labour Organization, 2015) climate action and the transition to low-carbon economies will affect employment in several ways:

- Jobs will be created in new emerging green sectors, such as renewable energies, where the demand for goods and services is expanding;
- Certain jobs will be eliminated without direct replacement, for example, through banning or discouraging the use of particular processing methods or resources, especially in energy-intensive and polluting industries;
- Certain jobs will be substituted as a consequence of industrial transformation. For example, jobs in waste incineration plants will be substituted with jobs in recycling facilities;
- The majority of existing jobs will be transformed and redefined in terms of their profile requirements and working methods – i.e., plumbers and architects in the adoption of more environmentally friendly practices, such as efficiency improvements.

Over the past few years, corporate interest in sustainability and climate action, along with related organizational budgets and headcounts (GreenBiz, 2022), have grown materially. Individuals with climate or sustainability ("green") skills are now hired at a faster rate than those without, both within North America and globally (GreenBiz, 2022) – and North America's hiring trend is accelerating more rapidly than other continents (LinkedIn, 2022). The 2023 LinkedIn Green Skills Report notes that between 2022 and 2023, the share of "green talent" in the workforce rose by a

median of 12.3% across the 48 countries that were examined in the study. Meanwhile, the share of job postings with at least one green skill requirement grew nearly twice as quickly – by a median of 22.4% – indicating that at the current pace, demand for workers with green skills will surpass supply (LinkedIn Economic Graph, 2023). These studies show that the labour market needs increasingly more climate-competent workers, and that there is a shortage of workers with the knowledge and skills to step into those vacant positions.

Notable in Figure 1 (below), retrieved from the 2022 LinkedIn Green Skills Report, is the size of roles such as Sustainability Manager and Compliance Manager – roles which involve a high degree of leadership capability. These data indicate the growing rate, not only of sustainability-related or "green" jobs generally, but also of green leadership roles more specifically.

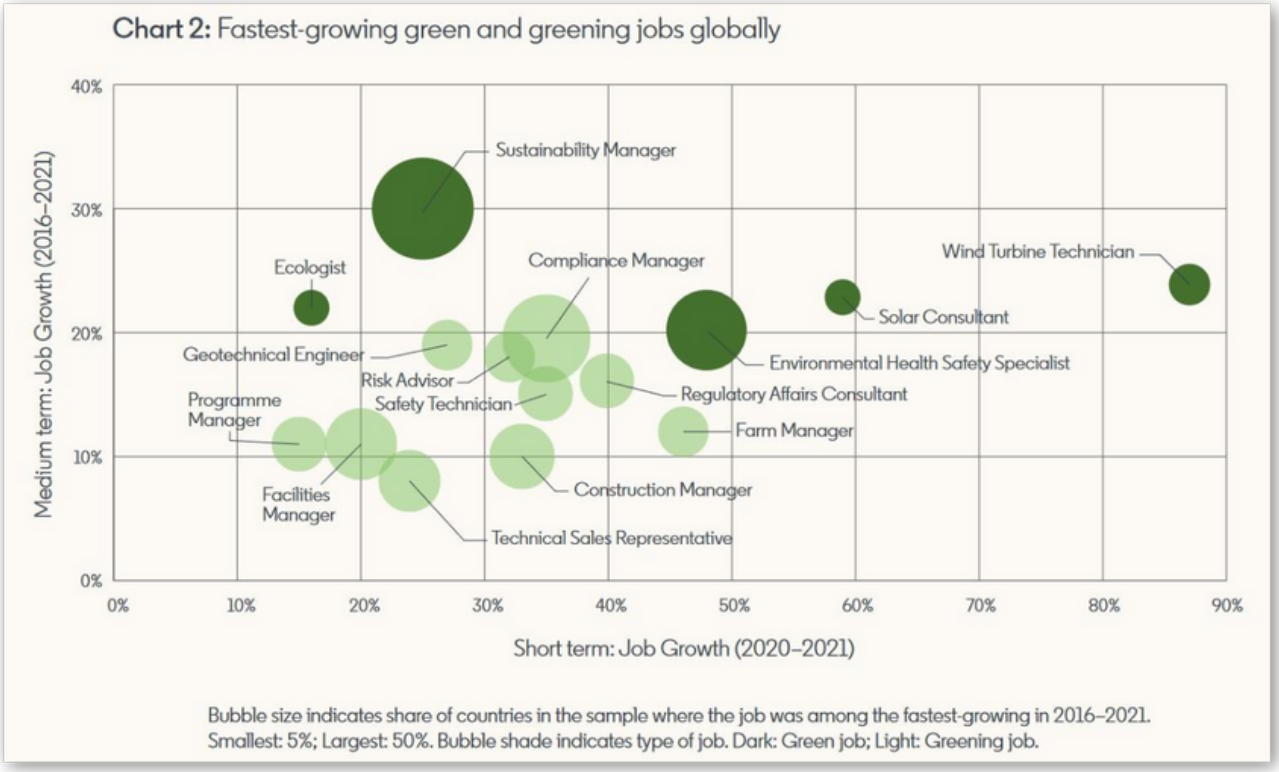

Figure 1. Fastest-growing green and greening jobs globally, as retrieved from the 2022 LinkedIn Green Skills Report (LinkedIn Economic Graph, 2022).

Appendix F includes information describing the top growing "green skills" in both the European Union (EU) and the United States (U.S.). There was substantial growth in many types of green skills between 2021 and 2022, with climate action planning the highest growing in the EU, at 153%, and carbon accounting in the U.S., at 241% (LinkedIn Economic Graph, 2022).

Several recent studies communicate the current and anticipated climate action labour shortages in Canada. These include, for example, Smart Prosperity Institute's analysis on climate-related skilled labour shortages (McNally, 2023), and work done by Blueprint, a partner of the Future Skills

Centre, which writes that workforce development is the missing piece in the transition to net-zero (Harding & Myers, 2022). The Conference Board of Canada's Green Occupational Pathways: From Vulnerable Jobs to Rapid-Growth Careers (2022) explores career pathways to rapid-growth occupations in the clean economy, opportunities present for short-duration education and training, as well as human factors that affect transitioning. M. Atiq, A. Islam, U. Jefferson, J. McNally, and H. Ramesh (2022) describe the critical need for advancing workforce development aimed at Canadian infrastructure adaptation, particularly in response to flood risk for municipalities. In *Blue Occupation Pathways: Career Transitions to a Sustainable Blue Economy*, Carpenter and Sonmez explore the potential career pathways and transition gaps for workers looking to enter the sustainable blue economy (2023).

The trends mentioned here, which overlap with the Canadian government's National Adaptation Strategy (2023) priorities, will drive a significant number of future upskilling opportunities. The specific competencies required for these growing job opportunities, and the upskilling pathways that will service development of the identified competencies remain to be addressed.

CLIMATE ACTION JOBS IN CANADA: WHAT'S AVAILABLE AND WHAT COMPETENCIES ARE REQUIRED?

As part of this study, a scan of job postings was undertaken from January to June 2023. The team used filters such as "climate change," "sustainability," and "environmental planner," to capture both the frequency of positions advertised and descriptions of positions' competency requirements (i.e., knowledge, skills, and attributes required to perform in the position). This scan focused on mid-to-senior level roles, with titles such as Director of Policy and Research, and Senior Sustainability Analyst. More than 100 job postings were extracted from Indeed.com and LinkedIn, aggregated, and then analyzed to determine the frequency of both climate-related job functions and more generic skills (often referred to as "soft skills" or "power skills"). The scan was done to illustrate the current trends regarding climate action leadership roles in Canada, specifically top priority job functions and skills.

Table 1. Indeed and LinkedIn Job Scan: Results

Climate- Related Job Functions	Total	Private Sector	Public Sector
Carbon accounting	14	10	4
Climate policy analysis	11	2	9
Climate adaptation planning	7	0	7
Climate risk assessment	6	2	4
Climate mitigation planning	6	3	3
Emissions reductions planning	6	4	2
Greenhouse gas modeling	5	3	2
Nature-based climate solutions	5	1	4
Climate resiliency planning	4	2	2

Climate communications	3	1	2
Climate education	3	0	3
Climate justice	2	0	2
Environmental management	2	2	0
Waste management	1	1	0
Environmental compliance	1	1	0
Building operations	1	0	1
Skills	**Total**	**Private Sector**	**Public Sector**
Communication	10	2	8
Project management	10	5	5
Research	9	3	6
Stakeholder engagement	9	2	7
Report writing	5	1	4
Data analysis	5	3	2
Leadership	5	2	3
Collaboration	3	1	2
Facilitation	2	0	2
Summary	**Total**	**Private Sector**	**Public Sector**
Total Jobs	101	47	54

JOB SCAN OBSERVATIONS

Public vs Private Sector: There is a fairly even split between public (54) and private sector (47) climate action jobs based on this sample, indicating demand across both sectors. Public sector roles emphasize climate policy analysis, adaptation planning, education, and justice, which illustrates the public sector's role in setting policy, regulations, and strategy. Private sector roles demand skills in carbon accounting, GHG modeling, and emissions reductions planning, which strongly suggests an increasing need for competence in strategy and implementation.

The most in-demand skills are communication, project management, stakeholder engagement, leadership, collaboration, and facilitation. These so-called "soft skills" likely reflect the need to work differently and build consensus on climate initiatives. Technical competencies like those associated with climate policy analysis, adaptation planning, and emissions reductions planning are also prevalent, showing the need for specialized expertise.

The Emergence & Role of Micro-Credentials

What are short-duration courses and micro-credentials?

Short-duration courses include micro-learning (2-20 hours), micro-credentials (25-100 hours), and certificate programs, separate from but complementary to traditional academic learning pathways. These include but are not limited to professional and continuing studies courses, and training offered through academic institutions. The defining feature when referring to these opportunities is a relatively short duration (tens to hundreds of learner hours), as opposed to traditional credential programs, such as degrees or diplomas (hundreds to thousands of learner hours).

A **micro-credential**, according to UNESCO (Oliver, 2022), has the following attributes:

- Is a record of focused learning achievement verifying what the learner knows, understands or can do;
- Includes assessment based on clearly defined standards and is awarded by a trusted provider;
- Has stand-alone value and may also contribute to or complement other micro-credentials or macro-credentials, including through recognition of prior learning; and
- Meets the standards required by relevant quality assurance.

Micro-credentials offer one format for rapid upskilling and have been proposed as a strategy to enable the ongoing development of knowledge and skills across the workforce. As the World Economic Forum Future of Jobs report (2020) notes, there is an increasing need to provide short-timeframe opportunities for upskilling and reskilling that will not diminish over time. The University of Waterloo (2021) emphasizes that "upskilling facilitates continuous learning by providing training programs and development opportunities that expand an employee's abilities, minimize skills gaps and enable career growth."

Observations such as these help us rethink our approach to learning and training, and advance our understanding of credentialing and the need for innovative approaches to workforce development. Through targeted micro-credentialling programs, the workforce can be equipped with necessary knowledge and skills more quickly and in a more targeted way than conventional, often lengthy programs.

For mid-career individuals who don't have the time to reinvest in full, conventional degrees or

certificate programs, short courses and micro-credentials offer one way to develop climate action and sustainability leadership competencies (Pozniak, 2021). Since short-duration courses are typically much less expensive than post-secondary degrees or certificate programs, a micro-credential approach might enable lower-income individuals to receive training for climate action and sustainability jobs, diversifying the field of work and contributing to a more equitable transition (Gamlath, 2022).

Existing Short-Duration Training Opportunities in Canada

An environmental scan of courses and programs related to climate action skills was conducted to assess existing training opportunities in Canada. The link to the full scan can be found on the research project website.[3] While not an exhaustive list, it demonstrates that climate-related programming is evolving rapidly.

Within this project scan, the duration of micro-credential programs in climate-related fields varies from 1-14 weeks. Learner hours vary based on the number of modules within a micro-credential, spanning 20-140 hours of time commitment. In some cases, other, longer credentialled programs (e.g., certificates, diplomas, degrees) allow learners to use their micro-credentials to contribute to, or "ladder" into longer programs.

Currently, there are no consistent standards outlined for micro-credentials, in terms of the use of competencies to justify or support learner outcomes, learner hours, or assessment methods. Nor is there a commonly understood definition of, or standards for, what constitutes a micro-credential.

Only a handful of micro-credential programs are tied to competency and assessment frameworks: the Carbon Literacy Standard and the Energy Step Code from British Columbia, and the Climate Adaptation Fundamentals Micro-credential at Royal Roads University. Other programs, such as the CleanBC initiative, are advertised with and supplemented by policy alignments.

There do not appear to be consistent funding mechanisms across ministries of advanced education, which encourage education and training providers to prioritize climate-related programs and courses. Provinces that supply searchable databases for educational offerings through post-secondary institutions often have trouble categorizing climate action and sustainability related credentials.

Training opportunities also exist with more specialized upskilling organizations, which assist those already in the workforce in some capacity, whether as newcomers to Canada or skilled workers looking to transition into low-carbon and renewable-energy industries. For a more nuanced scan of

[3] The project website is located at https://sustainableinnovation.academy/upskilling/

how these organizations provide rapid upskilling opportunities, please see the section on Learning From Existing Canadian Providers of Training and Workforce Development of this report.

The large variability in learner hours, endorsements, and frameworks among institutional offerings across Canada contributes to uncertainty on the part of consumers, policy makers, and private sector collaborations. The inconsistent use of validated competencies to inform the design and assessment of micro-credentials further exacerbates this uncertainty and limits the mobility of these credentials across jurisdictions.

The emergent nature of climate change, and the diversity of topics and disciplines it entails, suggest that many existing post-secondary programs may be slightly ahead of what is currently integrated into employer job profiles. Therefore, education and training providers and employers will need to continue to align and validate their offerings.

It is clear that rapid and/or on-the-job climate action and sustainability upskilling will be necessary to fill the growing number of climate-related roles in Canada. The existence and recognition of relevant credentials are important elements of a national upskilling ecosystem that provides employers and workers with opportunities for rapid upskilling and reskilling.

Recognized credentials that align with a national framework will allow for straightforward and transparent portability across roles, sectors, and regions. Without such transferability, existing micro-credential approaches will remain fragmented, leaving learners and employers with limited ability to identify robust, reliable, and nationally recognized learning opportunities.

In the face of the urgent need for action, leadership is required on multiple levels to ensure Canadians have the competencies to respond appropriately to climate risks. The time has come to be more intentional in our approach to rapid upskilling and reskilling, to equip the workforce with the know-how to deal with climate risks.

Building Toward an Aligned Approach to Climate Action Leadership in Canada

This section amplifies findings from the literature review by drawing on diverse voices from 21 interviews with senior thought leaders in Canada. Each interviewee offered a wealth of knowledge and expertise related to the challenges, opportunities, and possible next steps toward a pan-Canadian rapid upskilling initiative in service of climate action leadership capacity building. Please see Appendix D for the interview questions and an anonymized description of the interviewees.

Key themes identified from the interview research are as follows:

CLIMATE AWARENESS, URGENCY, AND DIVERSE PERSPECTIVES

- Emphasize the immediate challenges and impacts of climate change.
- Proactively incorporate diverse viewpoints, especially those of Indigenous communities and marginalized groups.
- Demonstrate the business value of climate action to gain broader support.

CAPACITY BUILDING, COMPREHENSIVE TRAINING, AND SKILL DEVELOPMENT

- Encompass sector-specific understanding, general upskilling, and targeted reskilling.
- Recognize essential skills, such as communication and critical thinking.
- Prioritize rapid upskilling to address the dynamic demands of climate action.

COLLABORATION, GOVERNANCE, AND GLOBAL ENGAGEMENT

- Highlight both local and international collaboration for effective climate solutions.
- Advocate for the establishment of consistent governance and regulation regarding climate action.

CREDENTIALING, LEADERSHIP, AND PROFESSIONAL GROWTH

- Emphasize the importance of credible, employer-validated credentials and certifications in climate-related knowledge and skill areas.
- Address the need for effective leadership and specialized competencies in navigating climate action challenges.

DATA-DRIVEN DECISION-MAKING AND REPORTING

- Stress the acquisition of skills in data management, visualization, and climate-specific accounting and reporting.
- Support data-driven approaches to assessing and managing climate change impacts.

Each theme identified from the interviews is important in its own right. A few have added significance when discussing how to design and develop approaches to advancing climate action leadership competency on a national level.

The Need for a National Approach

Climate change is a multifaceted issue that requires collaboration across diverse sectors. Encouraging participation from under-represented groups via interdisciplinary collaborations can drive innovative and equitable approaches that serve all Canadians.

By identifying the competencies needed for climate action leadership, professionals from different fields and experiences can work together more effectively, fostering innovation and comprehensive solutions. But how can this happen practically, in absence of a common framework that specifies competencies which could provide a basis for climate action education and training across Canada?

In several interviews, participants highlighted the need for a national approach to skill development that ensures recognition and standardization of climate action-related training across Canadian jurisdictions, to reduce fragmentation of credentials and qualifications across provinces and territories. A unified framework could enhance the recognition and transferability of qualifications, including micro-credentials. Sample quotations from three interviewees are shown below.

> *"What I see as the impediment is that outside of professional associations, who is being trained on understanding climate as a cross-sector issue? ... A national type of certification could be just that, saying the person who's received this training specializes in understanding the nuanced role of different sectors and how they all puzzle together around climate, around integrated climate action. So, it'd be really interesting to have a mechanism to document all the different types of training that happen."*
>
> *"I think within climate change... we need to start developing national occupational standards..."*
>
> *"We need to undertake an inventory of critical strategic skills infrastructure... we need to ensure that there are career roadmaps for key industries... We need a national dialogue with business and with industry, in developing a national commitment to recognition and transferability of micro-credentials. My dream is that any student that will enter into a program, no matter what the program... will only be asked to complete what's missing... that you would not need to have all those agreements between colleges to recognize your credentials, I need an agreement... you need it within the same province, you need it between the provinces, and you need it between colleges and universities..."*

Other researchers have commented on the need for a national approach, including Bonen and Oschinski (2021). Their report by the Institute for Research on Public Policy stresses the growing importance of skills training information and outlines a proposal for developing a national system linking skills and training to meet this need. The report also recommends starting small in a few provinces, collaborating closely with local training organizations, focusing on a target demographic, gathering comprehensive program data, carefully linking to skills, and testing with users. Some of the recommendations could provide guidance for climate action upskilling initiatives:

- Involve 2-3 provinces to start, which can then share lessons learned with other provinces;
- Identify and bring on board relevant training organizations in the pilot provinces;
- Keep the initial scope manageable by focusing on a target group like mid-career workers;
- Identify key players in funding, administering, and providing training in the provinces;
- Survey players to gather feedback on linking programs to skills;
- Update and validate the list of programs and associated skills; and
- Evaluate the linkages to identify themes and ensure consistency (Bonen and Oschinski, 2021).

How Do We Build Nationally Recognized Frameworks for Climate Action

The literature review, interviews, and survey results suggested that upskilling and reskilling programs to address climate action across the Canadian workforce are urgent needs. Operationalizing a national approach will require a process that makes sure competencies are described in ways that are commonly understood, and that can be applied to sector-specific curriculum development and training programs of optimal or short duration.

Educational jurisdictions often build national or regional occupational competency frameworks for several reasons, including the following:

- Identify key skills;
- Define standards;
- Guide the development of education and training programs;
- Support workforce planning and development; and
- Facilitate labour mobility.

NATIONAL QUALIFICATIONS FRAMEWORKS

A National Qualifications Framework (NQF) is a system used by many countries to organize and standardize qualifications and credentials within their education and training systems. The primary purpose of an NQF is to provide a clear and consistent framework for recognizing and comparing qualifications across different levels and sectors of education and training. Moreover, NQFs help ensure that qualifications are understood nationally; this promotes transparency and mobility in education and the labour market (Behringer & Coles, 2003; Tuck, 2007; CEDEFOP, 2021).

National Qualifications Frameworks typically specify key elements to support comparison, including some or all of the following:

- Single system of levels for all qualifications;
- Qualifications based on standards and/or clearly defined outcomes;
- Assessment based on explicit criteria;
- National system of credit accumulation and transfer;
- Demonstration of clear links between different parts of the education and training systems.

Examples of NQFs in action may be found in Australia, New Zealand, countries of the European Union, and South Africa, each of which has a national qualifications authority that administers the system, and its maintenance and quality assurance processes.

Although there is no national qualifications framework in Canada, there are examples of national skills frameworks, including the Red Seal Program (2023) for technical and vocational education and training (TVET), which is described as follows:

> *The Red Seal Program, formally known as the Interprovincial Standards Red Seal Program, is a program that sets common standards to assess the skills of tradespeople across Canada.*
>
> *Industry is heavily involved in developing the national standard for each trade. It is a partnership between the federal government and provinces and territories, which are responsible for apprenticeship training and trade certification in their jurisdictions.*

The Red Seal program stands as a model of what might be possible for establishing a climate action skills framework applied on a national level in Canada.

In the interim, education and training organizations, particularly post-secondary institutions, have begun to highlight the opportunity to create national competency frameworks that address upskilling and reskilling for specific workforce needs, including climate action leadership. This is happening in the context of emerging educational practices aimed at short-duration training that meets workforce needs.

Micro-Credentials as a Catalyst for Developing Competency Frameworks

With the emergence of micro-credentials as a new form of learning and skill recognition, education and training providers across Canada have begun to develop and offer short-duration programs for people who seek upskilling or reskilling to enhance employment opportunities or respond to

workforce needs. As these micro-credential programs become more commonplace, it will be important to identify how they relate to existing non-credit or credit-based programs within the credential structures of Canadian provinces and territories.

International jurisdictions across the globe are also dealing with upskilling and reskilling challenges in the context of dynamic economic and workforce demands. Some countries have begun the process of matching micro-credential programs with national skills frameworks. There are several different approaches to micro-credential design and certification programs organized by government agencies in New Zealand, Australia, and through the European Union's multi-country initiatives.

NEW ZEALAND

New Zealand's approach to micro-credentials is managed by its qualifications authority. The authority's website notes that NZQA quality-assured micro-credentials are listed on the Qualifications and Credentials Framework; are delivered by registered tertiary education providers; can be up to 40 credits in size and at any level of the framework; have learning outcomes; and have evidence of need from employers, industry, workforce development councils, iwi, and/or communities, as appropriate (New Zealand Qualifications Authority, 2023).

AUSTRALIA

The Australian Government published its National Microcredentials Framework in 2021 with the express purpose of addressing workforce needs, as well providing clarity for learners, employers, and institutions about the nature of micro-credentials, and the principles, standards, and information required for their deployment. Australia clearly states the purpose of the national framework: "The education landscape is changing with growing demand for shorter-form courses that enable workers to rapidly upskill and encourage lifelong learning" (Australian Government, 2021, p.2).

EUROPEAN UNION

The European Common Micro-Credential Framework (CMF) relates micro-credentials to credential pathways and qualifications frameworks. The framework was designed as a voluntary specification to be administered by the European Association of Distance Teaching Universities (EADTU) on behalf of their online learning platforms. It includes clear micro-credential aims, quality assurance features, requirements for employer engagement, and verifiable data records (European MOOC Consortium, 2019).

CANADA

In Canada, the national micro-credential framework that most closely approximates the micro-credential approaches of New Zealand, Australia, and the European Union comes from Colleges and Institute Canada. CICan (2021) describes its framework as follows:

> *With more and more Canadians looking to colleges and institutes for upskilling and reskilling opportunities, micro-credentials have never been in such high demand, or so important to Canada's economy.*

CICan provides seven guiding principles:

- Micro-credentials can be a complement to traditional credentials (certificate, diploma, degree or post-graduate certificate) or standalone.
- Micro-credentials are subject to a robust and rigorous quality assurance process.
- Micro-credentials should represent competencies identified by employers/industry sectors to meet employer needs.
- Micro-credentials may provide clear and seamless pathways across different credentials (both non-credit and credit) and may be stackable.
- Micro-credentials are based on assessed proficiency of a competency, not on time spent learning.
- Micro-credentials are secure, trackable, portable and competency is documented in students' academic records.
- Micro-credentials are to follow institutional approval processes.

However, there is no reference to a national skills framework, nor discussion of common standards that might work in a pan-Canadian context.

An Exemplar of Innovative Practice: Designing a Climate Adaptation Competency Framework (CACF v.1 & v.2)

In 2020, the Resilience by Design Lab at Royal Roads University undertook research to build a competency framework for climate adaptation. Working with consultants, the project team conducted a gap analysis, a survey, and a challenge dialogue, and also interviewed climate adaptation experts to explore their insights on relevant competencies.

Findings from the discovery process were synthesized and tested with partners and stakeholders (i.e., experts working in climate adaptation in roles within local or municipal, federal, and provincial government, academia, and business) to produce a first draft of the CACF v.1 (Cox R, Niederer, Forssman, & Sikorski, 2021).

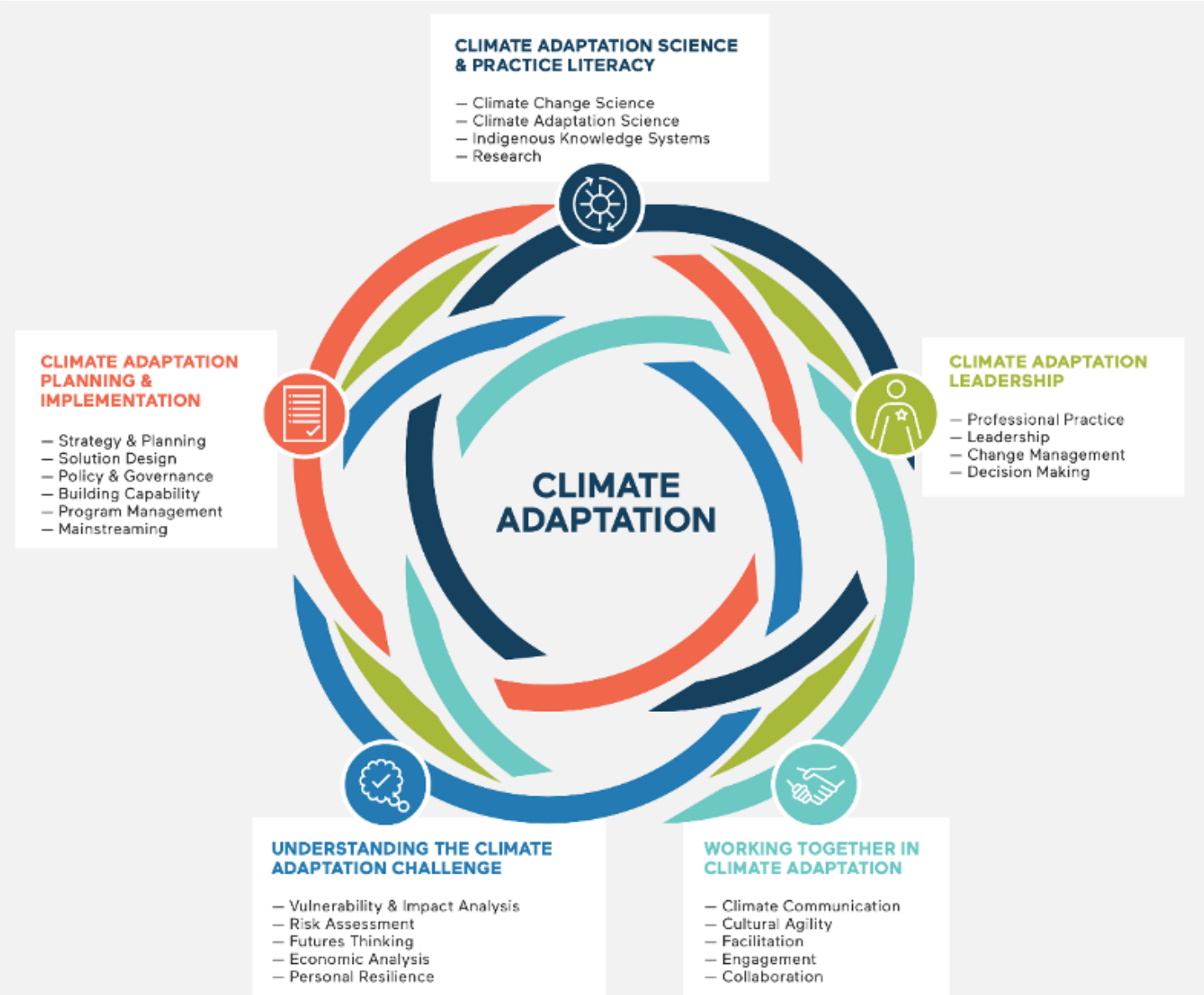

Figure 2. Overview of the CACF v.1 (Resilience By Design Lab, 2021)

At a high level, the CACF v.1 describes 24 competencies, divided into five domains that range from Climate Adaptation Leadership to Climate Adaptation Science and Practice Literacy. Work is underway to revise the CACF v.1 to integrate both adaptation and mitigation competencies in a Climate Action Competency Framework (CACF v.2), in order to provide a more robust and easy-to-use structure for applying the framework in human resources, education, and training environments.

Building on Existing Good Practice

The emerging Climate Action Competency Framework (CACF v.2)[4] provides an excellent example of the depth required to specify climate adaptation competencies and link these to specific roles or tasks within jobs. Further work will be needed to specify levels of proficiency, along with an assessment process and credentialing mechanisms to certify competencies, validated through a recognized authority.

[4] The Climate Action Competency Framework Version 2 (CACF v.2) was designed by the Resilience by Design (RbD) Lab at Royal Roads University (RRU) and funded by the BC Climate Action Secretariat and internal grants from RRU. This new version builds from the original Climate Adaptation Competency Framework (CACF, 2021) developed through funding from Natural Resources Canada and the BC Climate Action Secretariat.

The CACF v.2 responds to the need for workforce upskilling to meet the climate crises. The framework incorporates an equity-diversity-inclusion lens to focus on the broad range of skills, knowledge, and attributes necessary for climate action. It provides the basis for a practical, systematic, and easy-to-use developmental road map for individuals, organizations, and communities who are integrating the practices of climate adaptation and mitigation.

The CACF v.2 is grounded in Western cultural concepts and language and ways of working and does not replace the need to understand and work with Indigenous conceptualizations of climate change, climate adaptation and mitigation, ways of working, and the wisdom of Indigenous peoples.

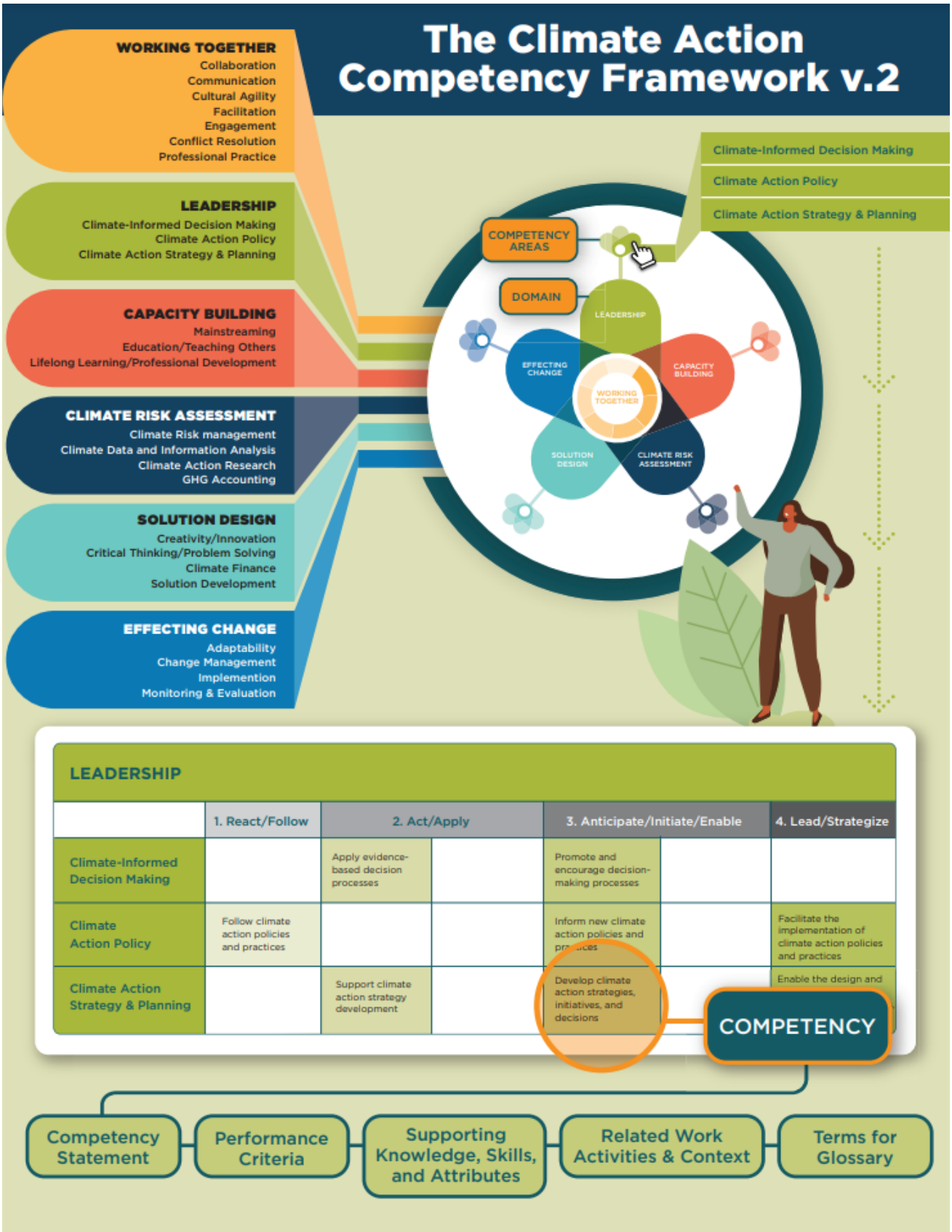

Figure 3. Overview of the CACF v.2 (Resilience By Design Lab, 2023)

This report can only provide a high-level snapshot of how this might be accomplished. A national approach will require a novel governance model that transcends traditional provincial approaches to education and training to nimbly address the critical need for climate action leadership upskilling.

Toward a National Approach to Climate Action in Canada

The research conducted for this report suggests that it is both possible and desirable to build a national competency framework for climate action. Developing a national approach to climate action is congruent with recommendations of the recently published National Adaptation Strategy from the Government of Canada (2023).

Operationalizing a national climate action strategy will require additional consultation with employers, as well as with education and training providers. Ideally, such a process will yield an inclusive approach for developing a national knowledge and skills matrix, along with training programs to address climate action.

Also required will be a series of steps, built on proven practices, to describe climate action competencies, and then expanded upon to encompass both the climate change adaptation and mitigation competencies required across a range of economic and workforce sectors.

The optimal approach should model the key attributes of a national competency framework, that is, identify key economic or workforce sectors and key competencies – both general and role specific; define standards; and guide the development of competency-informed education and training programs. All of these actions should be undertaken in ways that support and facilitate labour mobility.

The development of a national competency framework for climate action leadership will require an iterative process that includes these three steps:

1. **Research and Consultation:** This will involve identifying key stakeholders, including industry experts, educators, and policymakers; it will engage their review of and suggested revisions to the recently created CACF v.2. This work might also involve conducting research to understand current and future labour market trends in the context of climate adaptation and mitigation priorities.
2. **Development of Standards:** Based on the research and consultation, specific standards and/or qualifications will need to be developed. These will define the specific competencies required for different jobs or roles, typically described in terms of knowledge, skills, and attributes (as well as attitudes and values).

1. R
   well as attitudes and values).
3. **Validation and Endorsement:** Once the standards have been developed, they will require validation through further consultation with industry and education providers. Once validated, the standards can be officially endorsed and implemented. Overall, the creation of a national competency framework is a collaborative, complex, and iterative process and can be a powerful tool to drive workforce development, economic growth, and labour mobility.

A STRUCTURE FOR DESCRIBING CLIMATE ACTION LEADERSHIP COMPETENCIES

The following table identifies some key sectors and examples of potential sector-specific competencies required for climate action. The skills listed have been simplified for clarity, to provide a model of the kinds of information that would be needed to be acquired through research consultation, documentation, and validation to create a more robust competency framework.

It is also important to point out that these sector-specific knowledge and skills would sit on top of a more generic, transferable set of knowledge and skills – which might be considered "sector-agnostic" skills – such as communication, project management, research, stakeholder engagement, etc., that provide a solid foundation for specific climate action leadership competencies.

Table 2: Climate action competency framework: sector-based approach example

Sector	Knowledge (K)	Skills (S)
Agriculture and Forestry sector	K1: Impact of climate change on agriculture yields K2: Drought resistant crops	S1: Implementing sustainable agricultural practices S2: Soil and water conservation S3: Forestry management for carbon sequestration
Constructional and Infrastructure sector	K1: Green building materials K2: Impact of sea-level rise on coastal communities	S1: Designing energy efficient buildings S2: Installing renewable energy sources such as solar panels, wind turbines

Sector	Knowledge (K)	Skills (S)
Energy sector	K1: Evolution and impact of fossil fuels on global climate K2: Transition challenges from fossil fuels to renewable energy K3: Carbon capture and storage (CCS) technologies K4: Policies and regulations impacting fossil fuel extraction and usage	S1: Implementing and managing CCS techniques S2: Enhancing efficiency and sustainability in extraction processes. S3: Conducting environmental impact assessments for extraction projects S4: Developing and maintaining safety protocols in line with environmental considerations
Healthcare sector	K1: Impact of climate change on disease vectors K2: Stress and mental health effects due to climate disasters	S1: Disease prevention and response due to climate change S2: Implementing sustainable healthcare practices
Manufacturing sector	K1: Carbon footprints of various manufacturing processes K2: Renewable materials and a circular economy	S1: Implementing energy efficient manufacturing processes S2: Waste reduction and recycling
Transportation sector	K1: Emissions from transport modes K2: Sustainable transport technologies	S1: Designing and operating efficient mass transport systems S2: Maintaining electric or hybrid vehicles

Supporting Capacity Building for a Climate-Ready Workforce: Worker Perspectives

A survey was carried out in May-June 2023, receiving 157 responses. The goal of the survey was to identify the competencies (i.e., knowledge, skills, and attributes) required for climate action. The survey also explored considerations related to the delivery format and cost of climate action upskilling, as well as the credentialing value of the programs and courses that might be offered. While not intended to be comprehensive and representative of all workers, these findings provide some input to perspectives held by workers. Findings included the following:

Key Learning Experience Components	• Customizable, engaging, tailored courses, which have a positive impact on career prospects, are highly sought after. • Respondents appreciate courses that can be "stacked" into longer qualifications. • Respondents appreciate design elements that enable them to foster relationships with fellow learners. • The time and financial commitment for a course determines the ability to participate. Most respondents preferred courses lasting days to weeks.
Employer Influence	• Only 16.6% rated a course being mandatory by an employer as extremely important, while 44.6% found a course suggested by an employer to be important. • Employer influence did not vary significantly when data was disaggregated.
External Value and Accreditation	• Respondents transitioning in their careers showed the highest interest in short-duration courses. • External recognition and formal credentials were particularly vital for younger, less experienced, and BIPOC respondents. • Existing post-secondary institutions play a significant role in crafting valued climate action pathways. The institution's reputation was especially important for respondents early in their careers.

Learning Preferences	• 42.7% prefer virtual learning. Hybrid learning was chosen by 29.9%, and in-person by 10.2%. • For online learning types, 33.1% prefer synchronous, and 29.3% prefer asynchronous.
Course Cost Impact	• Cost was the dominant factor determining interest in such courses. • 49% of all respondents saw cost as crucial, but this was particularly important for early career professionals (56.8%) and career explorers (69.2%). • BIPOC participants felt the cost impact more acutely: 68% of BIPOC vs. 40% of white participants. Particularly, 77.8% of Black respondents and 75% of South Asian participants highlighted cost as a critical factor.

Many survey respondents said that learner needs must be central in developing upskilling opportunities. The majority were interested in upskilling and want courses that are accessible, cost-effective, and flexible in delivery.

Short duration courses, such as newly conceived micro-credential programs, would appear to be an appealing format for learners seeking to upskill quickly through programs and courses offered by reputable training organizations or academic institutions.

Learning From Existing Canadian Providers of Training & Workforce Development

Why Learn from Existing Canadian Entities & Initiatives?

When it comes to workforce development, we need to act with greater urgency and ramp up our collaborations to meet Canadian and global climate-related targets. We must act quickly to ensure

that available programs offer accessible upskilling and reskilling opportunities for workers as the economy transitions and more industries and sectors include climate action skills. As described above, workers need support to advance in or transition from their roles.

Thankfully, initiatives across the country are already addressing these challenges.

As part of this project, the research team sought out existing Canadian providers of larger, climate-related upskilling initiatives to better understand what aspects of workforce development for transition are being addressed. The goal was to learn how these entities and initiatives began, what programming they offer, their unique approaches, and what collaborations have been supportive to them. Their learnings help shape this project's recommendations for a national approach to rapid upskilling for climate action leadership.

The team collated promising practices from these initiatives' efforts to catalyze action toward workforce transition. In particular, the team looked for examples that could offer insight into the successful implementation of climate action leadership upskilling.

The following criteria were used to shortlist the initiatives reviewed:

- Offering upskilling and/or reskilling programming;
- Focused on short-duration training such as micro-credentials and certificates, rather than longer, multi-year degree training pathways;
- Based and operating in Canada (to explore the unique socio-economic and governance factors of operating in a Canadian context);
- Working in an area related to climate action, climate change, or sustainability; and
- Emphasizing workforce development as more expansive than offering siloed training opportunities.

This is not a comprehensive list of the entities, organizations, and initiatives that are working on climate action upskilling; the selected entities which follow are offered as models of different approaches to addressing the climate action skills gap. More detailed summaries of each selected entity are in Appendix G.

Key Takeaways from Canadian Entities & Initiatives

ECO CANADA

ECO Canada is a national non-profit workforce development organization that offers programming and services which focus on the end-to-end career of environmental professionals. They operate under a mandate to ensure an adequate supply of people with the skills and knowledge to meet

the human resource needs of the Canadian environmental sector and have been contributing to this mission since 1992 (ECO Canada, n.d.-c).

Notable approaches or features:

- ECO Canada takes a multi-pronged approach to support employers, learners/workers (at various career stages) and training providers.
- Programming is built to align with workforce needs, using the National Occupational Standards for Environmental Professionals, which they developed. (ECO Canada, n.d.-d). They also accredit post-secondary programs across Canada, educating institutions on how the institutions should tailor offerings to focus on employment needs (ECO-Canada, n.d.-b).
- Through the Canadian Centre for Environmental Education (CCEE), a partnership between Royal Roads University (RRU) and ECO Canada, they established an approach whereby a university and a non-profit collaborate to host programs and certificates, sharing cost, revenue, and intellectual property (Royal Roads University, n.d.-a). Within this structure, they also created an administrative approach to incorporate other, externally offered courses into a degree program.
- ECO Canada has developed effective approaches to partnering with Indigenous groups. As of 2023, the BEAHR programs have graduated more than 4000 Indigenous learners with programs delivered in more than 250 different Indigenous communities across all regions of Canada (ECO Canada, n.d).

IRON & EARTH

Launched in 2016, Iron & Earth is a worker-led not-for-profit with a mission to empower fossil fuel industry and Indigenous workers to build and implement climate solutions (Iron & Earth, n.d). The organization works to ensure that oil and gas professionals are able to transfer their skills into renewables and help diversify those technologies. Their larger vision is that the fossil fuel industry and Indigenous workers will play a leading role in building the policy and infrastructure required to reach global climate targets, most notably to help ensure a prosperous transition toward global carbon neutrality by 2050 (Iron & Earth, n.d.-b).

Notable approaches or features:

- Iron & Earth provides case workers, mentors, and coaches who offer fulsome and personalized support to ensure program participants transfer into jobs. Each individual receives approximately 24 hours with a case worker to walk through their career plan and life goals, focusing on topics such as their fears, hopes, opportunities, and barriers (personal communication, 2023).
- There is provision of a wage subsidy, which has been determined to effectively improve accessibility to the training, as transitioning workers can avoid the financial challenge of income precarity when taking full-time training (personal communication, 2023).
- Projects based in community serve multiple purposes of community development, environmental reclamation, and upskilling/training for workers.

PALETTE SKILLS

Palette Skills, a not-for-profit organization founded in 2017, specializes in designing employer-driven upskilling programs. Palette Skills is the national delivery partner for the Upskilling for Industry Initiative by Innovation, Science and Economic Development Canada. It recently launched Upskill Canada, a talent platform that will connect an ecosystem of employers and training providers nationwide to collaborate in new ways and help transition mid-career workers into new careers in high-demand roles (Innovation, Science and Economic Development, 2023).

Notable approaches or features:

- Palette Skills places strong emphasis on programs that support participants to obtain jobs after the training program. For them, it is only considered "upskilling" if there is job placement at the end (personal communications, 2023).
- Upskill Canada funds the development and delivery of training programs in key sectors for key roles, with an intention to serve a national audience.
- This model requires programs to follow Palette Skills' six core components of upskilling, while leaving space for various approaches to achieve the desired objectives. All intellectual property and all revenue are retained by the partner (Innovation, Science and Economic Development, 2023).

CANADAPT

CanAdapt is a collaborative initiative between the Resilience by Design (RbD) Lab at Royal Roads University and the Climate Risk Institute (CRI), a not-for-profit corporation. CanAdapt is currently an early-stage digital capacity-building hub for climate action upskilling in Canada, with the following offerings: hosting the Adaptation Learning Network Portal; facilitating professional communities of practice; and housing the Climate Adaptation Competency Framework to identify skills gaps for professionals. At this time, there are 18 courses and micro-credentials listed through the CanAdapt initiative (CanAdapt, 2023), along with three practitioner networks: Adaptation, Forestry Adaptation, and PIEVC Practitioners' Networks (CanAdapt, 2020).

Notable approaches or features:

- CanAdapt offers several communities of practice ("Practitioner Networks"), which have proven to be attractive and effective for working professionals.
- This collaboration has explored the merits of a cooperative governance model and has tentatively chosen instead to be set up as a not-for-profit federal corporation, to allow for a more nimble approach to governance and operations (personal communication, 2023).
- CanAdapt focuses more on working professionals developing within their current field of practice rather than on workers in transition or new job market entrants.
- Some courses found within the Adaptation Learning Network Portal are created and offered as open access (i.e, Creative Commons licensed) and housed in open education resource (OER) repositories (personal communications, 2023).

QUICK TRAIN CANADA

Quick Train Canada is a program led by Canadian Colleges for a Resilient Recovery (C2R2) that launched in January 2023. With funding from Employment and Social Development Canada's (ESDC) Sectoral Workforce Solutions Program (SWSP), Quick Train Canada provides rapid upskilling and education programs to Canadians in high-demand fields. Training is offered through academic institutions across the country that are leading climate action and sustainability programming (Quick Train Canada, n.d). C2R2, led by Mohawk College as the secretariat, came together in the Fall of 2020 as a coalition of leading Canadian colleges, cégeps, institutes, and polytechnics that are collaborating to address a transition to a clean, sustainable future (Economic and Social Development Canada, 2023).

Notable approaches or features:

- C2R2 has 14 National Industry Advisory Council (NIAC) partners that advise its education institution partners on micro-credentials that will help meet current industry demand (personal communications, 2023).
- Quick Train provides a platform listing sustainability and climate action-related micro-credential offerings from 14 partner institutions (Quick Train Canada, n.d.). Each partner institution engages directly with learners to offer the micro-credential and retains all intellectual property, as well as registration and instructional control (personal communication, 2023).
- Currently (until March 31, 2024), all micro-credentials are fully funded for participants.
- This model is an example of both rapid micro-credential creation and the upskilling of thousands of participants in a short period of time.

Recommended Characteristics of a Lead Organization or Initiative

What would it take to advance a national approach to climate action upskilling? In the previous section, five examples of upskilling for Canada's transition to a low-carbon economy were examined, showing evidence of the momentum and impactful work happening across the country to prepare the workforce for a changing climate. Should the federal government find value in a national approach to rapid upskilling for climate action leadership in Canada, this section outlines some considerations and recommendations for the business model, development, and governance processes.

Organizational Structure and Governance

- **Build Upon vs Start Anew:** Building upon an existing organization with established systems, processes, activities, and relationships – ideally in multiple regions of the country – may decrease the total time needed to get a large initiative up and running. It is also valuable to build on the existing knowledge base and learnings of existing organizations to better enable self-sustainability. This approach is likely to facilitate a quicker process from initiation to implementation.

- **Organizational Structure and Governance:** In order for an initiative to be built promptly and be able to respond to rapidly changing workforce contexts, it may be advisable to house the organizational leadership outside of government, likely within a non-profit organization. Many of this research project's interviewees advised to not discount the regional differences across our vast country – in terms of workforce needs, language(s), and civic and political cultural norms and expectations. A non-profit organization may be able to depoliticize the work and maintain momentum as governments shift power.

Business Model

CUSTOMER SEGMENTS & INTENDED AUDIENCES

Ladd, Reynolds, and Selingo of the Parthenon Group (2014) described six major student segment groups: Aspiring Academics, Coming of Age, Career Starter, Career Accelerator, Industry Switcher, and Academic Wanderer. Figure 4 describes the percentage of each student type within the full market of students in Canada as of 2014.

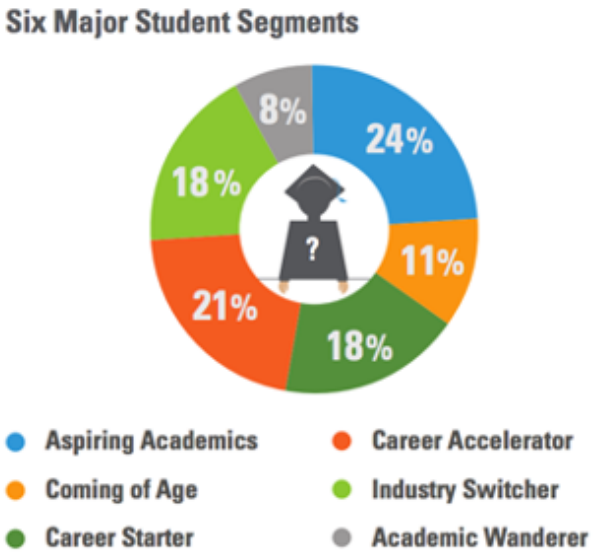

Figure 4. Six Major Student Segments Within Canada (Ladd, Reynolds, and Selingo, 2014).

For the purpose of this proposed business model, one can assume that an organization devoted to climate action leadership upskilling could provide value to Career Starters, Career Accelerators, and Industry Switchers. Together, these segments represent a combined total of approximately 57% of the total student/learner base in Canada. With the rapid growth of climate action leadership roles (including those commonly labeled as “sustainable” or “green”) as described in earlier sections, the number of possible customers for upskilling initiatives is substantial.

While each segment has nuanced learning needs, approaches and priorities, short-duration training such as micro-credentials are well situated to serve all three groups.

VALUE PROPOSITION

A Clear, Recognized, Transferable, and Modular Investment: As described in earlier sections, the development of nationally recognized or aligned qualifications and/or competency frameworks can help learners chart a path to skill development in a clear and tangible way, and feel more certainty that these learning pathways are reputable, recognized by, and valuable to employers. It should be clear for learners how to use their credentials for career entry or development, including how to build from or “ladder” into longer credentials.

Supports to Workers/Learners: Promising practices in existence include the following:

- On-demand or regularly scheduled offerings, so that learners can select a timing that works for them;
- Programming developed and delivered with and by the intended communities, particularly when the intended audiences hold marginalized identities;
- Opportunities for learners to complete a prior-knowledge assessment, so that they are able to focus on building the remaining knowledge/skills, rather than repeating content they already have attained through previous learning, work experience, or self-study;
- Funding to cover most or all of the training program costs, to lower the financial burden on participants;
- Wage subsidy to further reduce the financial burden, by providing supplemental income while training;
- Wrap-around supports, including online skill/career planning tools, case workers, mentors, and coaches, so that learners can be assisted with wayfinding and development in a personalized manner;
- Job placement support including internships, projects, job application support, job boards, wage subsidy programs, and more;
- Professional networks to share resources, practices, questions, and support with others in a similar field.

Supports to Education and Training Providers: Training providers will need to retain most or all of the revenue they would otherwise make if offering the training directly, so additional costs to collaborate, customize, align, or build new will need to be covered by government investment or other means.

micro-credentials. This may take the form of a national, provincial, or regional qualifications and/or competency framework(s).

Training providers will be better enabled to participate when they can retain their intellectual property and ability to control decisions related to application processes, instructor selection, learning management systems, and more.

REVENUE STREAMS

Multiple-year core funding by government and/or a mix of government and other aligned funders could cover the cost of establishing the model and initial offerings. It could also cover subsidies for participants, in order to reduce financial barriers.

Financial and design support could support the development of new offerings tailored to key workforce gaps using a common qualifications framework (including a competency-based model). In addition, or alternatively, financial support to education and training providers could help them navigate new collaborative models to work together on shared offerings.

Participation and investment of large employers, associations, and labour organizations could reduce the financial burden for both workers/learners and small and medium-sized enterprises (SMEs), which typically have less access to resources, yet play a critically important role in the Canadian economy. Large stakeholders could also aid in program design and validation, as well as with job placement.

Ultimately, the financial costs for the participants should be low, both in terms of tuition or fees, but also in terms of time away from other paid work.

Recommendations

Earlier this year, the Government of Canada released its interim Sustainable Jobs Plan (2023), articulating ten key action areas to describe a "federal governance, engagement, and accountability framework to guide the Government's efforts over time." The action areas are as follows:

1. Establish the Sustainable Jobs Secretariat.
2. Create a Sustainable Jobs Partnership Council.
3. Develop economic strategies through the Regional Energy and Resource Tables.
4. Introduce a sustainable jobs stream under the Union Training and Innovation Program.
5. Advance funding for skills development towards sustainable jobs.
6. Promote Indigenous-led solutions and a National Benefits-Sharing Framework.
7. Improve labour market data collection, tracking and analysis.
8. Motivate investors and draw in industry leadership to support workers.
9. Collaborate and lead on the global stage.
10. Establish legislation that ensures ongoing engagement and accountability.

In this report, the Government of Canada describes their understanding of a "sustainable job" as "any job that is compatible with Canada's path to a net-zero emissions and climate-resilient future. [It]... also reflects the concept of decent, well-paying, high-quality jobs that can support workers and their families over time." As such, the Sustainable Jobs Plan overlaps somewhat in scope and objectives with this study, which was designed to offer recommendations for a national approach to rapid upskilling for climate action leadership through the use of short-duration programs such as micro-credentials.

Upon conclusion of this research study, the project team proposes the following actionable recommendations, many of which align with and support the ten action areas described above:

ACTIONABLE RECOMMENDATIONS

1. Raise Widespread Climate Literacy and Promote a Value-Driven Approach

Motivating employers and workers to engage in and value upskilling and reskilling requires increased climate literacy, which includes not only a basic awareness of climate change, but also regionally specific risks and impacts (direct, indirect, complex, and cascading) resulting from climate change, as well as climate change mitigation and adaptation basics, including potential or existing strategies, initiatives, and policies.

Tactics

- Launch nationwide climate literacy campaigns that are customized to target both general audiences (i.e., the general public) and sector- and profession-specific audiences.
- Develop and support access to climate literacy courses and resources that are free, adaptable, and accessible, and that support enhanced and widespread climate literacy.
- Organize a federated working group that includes provincial/territorial ministries of advanced education and training, and public sector education/training institutions to explore options, opportunities, and incentives to advance this agenda. This could potentially be led by the Sustainable Jobs Partnership Council.
- Design and engage in campaigns that showcase the business and economic advantages of integrating climate action competencies and/or creating climate-related jobs. Frame outreach related to training, education, and employment as a positive opportunity to enhance one's career and market prospects.

2. Convene Actors and Develop Frameworks to Enhance Consistency and Confidence

All key stakeholders affected by workforce development initiatives (governments, training providers, employers, and workers) will benefit from additional consistency, certainty, and transferability regarding (a) what specific short-duration training credentials represent, and (b) what specific competencies are needed (including how they might be assessed), both generally and for specific sectors or industries.

Tactics

- Create a national framework that clearly defines the different types of short-duration programs, supports credential mobility, and has mechanisms to recognize prior learning to further validate the new skills acquired.
- Validate, refine, and publish a climate action competency framework that can be used to inform competency-aligned, climate action-related education, training, and initiatives.
- Draw from and extend existing climate action competency frameworks to develop and publish sector-specific competency frameworks, prioritizing key sectors (e.g., engineering, planning, healthcare, forestry, accounting) using recognized processes and structures for open competency frameworks to support consistency across these frameworks.

3. Strengthen Collaboration, Alignment, and Governance

Effective climate action requires cross-sector, cross-region collaboration. When it comes to rapid upskilling and reskilling, this poses some challenges related to the distributed nature of education

and training jurisdictions and governance. Challenges include how best to coordinate initiatives to maximize efficiency and unnecessary duplication, how to support the portability of credentials, and how to address gaps.

Tactics

- Explore and foster partnerships between post-secondary institutions, other recognized education and training organizations, employers, and government entities to create a coordinated approach to climate action capacity building. Whether the approach is to attempt to have a singular organizational driver/convener or multiple smaller drivers/conveners organized by region or sector, there are recommended characteristics described by the project team in the sections above.
- Create longer-term funding mechanisms and opportunities that support such collaboration, both in determining needs, gaps, and credentials, and in the design and delivery of relevant training and education.

4. Continue to Identify Job and Competency Gaps

Workforce development research needs to continue, both through the lens of specific role/job vacancies, and by addressing gaps in climate action leadership competencies across sectors. To date, limited work has been done to identify and develop skills for climate adaptation – generally, and for specific sectors – and the project team recommends additional focus be placed on climate adaptation specifically.

Tactics

- Develop or leverage existing mechanisms to facilitate inter-ministerial and cross-sectoral collaboration and coordination at the national and regional levels, in order to support the identification of climate adaptation competency gaps, prioritizing those that are or will be in high demand regionally, based on climate risk assessments.

5. Develop and Deliver Sector-Specific and Role-Specific Expertise

Building a climate-ready workforce will require both general climate action competencies (knowledge, skills, attributes) and sector- and role-specific climate action competencies. There is no one-size-fits all when it comes to upskilling and reskilling initiatives, as different learners, professions, and employers have different capacities, needs, and preferences. Issues of accessibility include those related to cost, delivery mechanism/modality, timing, etc., as described in earlier sections.

Tactics

- Engage post-secondary institutions and other education and training organizations in a coordinated response to the job and competency gaps identified above. Ensure that programs address the unique challenges and nuances present for employers within various sectors and/or regions, and that programs offer value in career progression, mobility, and/or readiness for workers.
- Ensure that all upskilling and reskilling initiatives, training, and education include a focus on developing competencies related to collaboration and engagement, including critical thinking, systems thinking, consensus building, conflict management, communication, and effective

decision-making in contexts of complexity and uncertainty.

- Offer financial support (e.g., bursaries, training grants such as the StrongerBC Future Skills Grant or the Canada-Ontario Job Grant) or proactively subsidize courses, to support more equitable access. This is particularly important for early career professionals, career explorers, Indigenous and BIPOC populations, as described in sections above.
- Offer incentives to post-secondary institutions and other education and training organizations for the development of climate action-focused credentials. This could and likely should involve both federal and provincial government incentives.

6. Support Workforce Resilience & Health

Climate change will not only require upskilling and reskilling, it will also require attention to how climate impacts affect worker health and resilience. Climate change has been identified as the number one health threat of our times, and proactively supporting workers' health and resilience is a critical component of upskilling and reskilling.

Tactics

- Develop a national strategy for supporting worker health and resilience that includes identifying key climate-related health risks in specific sectors (e.g., impacts of heat on outdoor workers; increased psychological stress and physical health issues related to direct and indirect climate impacts).
- Design and provide free access to general (all workers) and sector/role-specific education and training based on assessments that address health impacts and enhance stress tolerance, increase flexibility, and promote resilience – qualities that all workers will require as climate impacts their work and their lives directly and indirectly. Modules could be made available with Creative Commons licenses such that they can be integrated into existing programs and initiatives.



Appendix A: Project Partners & Authorship

Project Partners

The Academy for Sustainable Innovation (ASI) is a registered charity that launched in 2018 with a goal to empower Canada's current and future leaders to advance the transition to a low-carbon, socially-inclusive economy. ASI's Transition Leadership programs invite leaders to explore the mindsets, capabilities, and practices they need to affect positive change across the Canadian economic landscape. Current programs are organized within four categories: (1) Courses, including both open-enrollment as well as private courses for organizations, networks, and associations; (2) a Sustainability Professionals Members Network, which provides learning and networking opportunities related to leadership and 'soft-skill' development, specifically to professionals across Canada; (3) Custom Engagements, which offers bespoke support to organizations as needed, such as facilitation, best practice scans, stakeholder engagement, and more; and (4) Research, focused on building the knowledgebase of Transition Leadership competencies, Transition Leadership-related workforce development, and more. All of ASI's activities support individual and organizational capacity building for climate action. For more information, please visit https://sustainableinnovation.academy

Royal Roads University's Resilience by Design (RbD) Lab has been led by Dr. Robin Cox since 2010, and conducts applied research at the intersection of disaster risk reduction and climate change adaptation. From 2019-2022, RbD Lab led Adaptation Learning Network (ALN), a major capacity-building project funded by Natural Resources Canada BRACE and the BC Ministry of Environment and Climate Change Strategy. The ALN team consulted with climate adaptation experts worldwide to create the Climate Adaptation Competency Framework, as the foundation for defining learning outcomes for professional development and academic programs focused on Climate Action Leadership. ALN also developed and offered 11 new courses on climate adaptation topics through a community of 6 post-secondary institutions; and built a significant social network through professional associations, NGOs, and public sector organizations. In the final stage of the ALN project, RbD Lab collaborated with Climate Risk Institute to create an early-stage climate action upskilling portal, called CanAdapt, focused on brokering Canadian climate action education and training "suppliers" with the needs of consumers (e.g., firms, orgs, and individuals). Meanwhile, Royal Roads University, with its learning management system capabilities, now hosts courses offered by Climate Risk Institute and Academy for Sustainable Innovation, and has been successful

in attracting funding from the BC Ministry of Post-Secondary Education and Future Skills to deploy a micro-credential strategy focused on climate action topics. The Climate Adaptation Fundamentals micro-credential was launched in Fall 2022 (Royal Roads University, 2022), and is a credit pathway into the Royal Roads University Master of Arts in Climate Action Leadership. For more information, please visit: https://resiliencebydesign.com/

Future Skills Centre | Centre des Compétences futures

Future Skills Centre (FSC) is a forward-thinking centre for research and collaboration dedicated to driving innovation in skills development so that everyone in Canada can be prepared for the future of work. FSC partners with policymakers, researchers, practitioners, employers and labour, and post- secondary institutions to solve pressing labour market challenges and ensure that everyone can benefit from relevant lifelong learning opportunities. FSC is founded by a consortium whose members are Toronto Metropolitan University, Blueprint, and The Conference Board of Canada, and are funded by the Government of Canada's Future Skills Program. For more information, please visit: https://fsc-ccf.ca/who-we-are/

Authorship

The following individuals contributed to this project. They are listed in alphabetical order by last name:

- Tamara Connell - Chief Executive Officer, Academy for Sustainable Innovation
- Robin Cox, Ph.D. - Professor and Director of Resilience by Design Lab, Royal Roads University
- Vivian Forssman - Consultant, Resilience by Design Lab, Royal Roads University
- Ali Kazmi - Research Assistant, Academy for Sustainable Innovation
- Mabel Marin - Research Assistant, Academy for Sustainable Innovation
- Kirk Perris, Ph.D. - Principal, Karte Education Consultants
- David Porter, Ed.D. - Principal Consultant, DP+Associates
- Taylor Stimpson - Program Manager, Academy for Sustainable Innovation

Appendix B: Glossary

Carbon accounting/management: Carbon Accounting is used to estimate carbon footprints for businesses, governments, and individuals. It helps organizations manage and understand their carbon emissions, enabling them to prioritize reduction efforts where they are most needed (Vallindar, 2023).

Climate action: When measures are taken to tackle climate change through policies, programs, and plans to create a resilient pathway allowing for necessary climate change adaptation and mitigation.

Climate adaptation planning: The capacity of various levels of government to contend with the impacts, risks and opportunities posed by a changing climate. Adaptation planning is not the domain of any specific department or agency but requires considerable cooperation between government and community entities. It does not reduce the need to mitigate the causes of climate change (Canadian Institute of Planners, 2011).

Climate change adaptation: The adjustment in natural or human systems in response to the actual or expected climatic stimuli or their effects, which moderates harm or exploits beneficial opportunities (Klein, et. al., 2007).

Climate change mitigation: Anthropogenic intervention to reduce the sources or enhance the sinks of greenhouse gases (Klein, et. al., 2007).

Climate communications: On the surface, climate change communication is about educating, informing, warning, persuading, mobilizing and addressing the problem of climate change and global warming. At a deeper level, climate change communication is shaped by different experiences, mental and cultural models, and underlying values and worldviews. Consequently, communication and conversation around this topic occurs within a highly complex and dynamic system of individuals, organizations and institutions. These entities can have widely divergent knowledge, politics and cultures around climate change awareness, (mis)understanding, concern, and action. As an Academic field, climate change communication scientists and scholars seek to understand these processes and identify more effective communication strategies to address this challenge (Yale program on Climate Change Communication, n.d).

Climate justice: Born from the concept of environmental justice, climate justice involves “advancing climate solutions that link human rights and development in a human-centered approach, placing the needs, voices and leadership of those who are most impacted at the forefront (United Nations Development Programme, 2023).

Climate policy analysis: The analysis of data and policy developments surrounding environmental challenges and proposed solutions. The use of advanced statistical techniques and analytical models can support recommendations for legislation, awareness and fundraising approaches (EnvironmentalScience.Org, n.d)

Climate resiliency planning: The capacity of social, economic, and environmental systems to cope with a hazardous event, trend, or disturbance, responding or reorganizing in ways that maintain their essential function, identity, and structure, while maintaining the capacity for adaptation, learning, and transformation (Environment and Climate Change Canada, 2022).

Climate risk assessment: A structured method for evaluating and addressing uncertainties by identifying, appraising, taking action on, and conveying climate-related risks. In the context of climate change adaptation, a climate risk assessment framework would help devise strategies to respond to potential climate alterations (Canadian Council of Ministers of the Environment, 2021).

Emissions reductions planning: Actions taken to achieve substantial reductions in greenhouse gas emissions so that global warming can be limited to below 2 degrees Celsius. Beyond greenhouse gasses, emissions reduction will also allow for increased energy efficiency and climate resilience, as well as decreased social and economic vulnerability of communities on the margins (Environment and Climate Change Canada, 2022).

Greenhouse gas modeling: The ability to utilize energy, macro-economic, and other historical data sets in the estimation of emissions and economic interactions, which would produce scenarios of emissions projections. These are typically presented as a range of emissions under different economic, energy price and production scenarios (Environment and Climate Change Canada, 2016).

Green jobs: Green jobs are decent jobs that contribute to protecting and restoring the environment and addressing climate change. Green jobs can be found in both the production of green products and services, such as renewable energy, and in environmentally friendly processes, such as recycling. Green jobs help improve energy and raw material efficiency, limit greenhouse gas emissions, minimize waste and pollution, protect and restore ecosystems, and support adaptation to the impacts of climate change. As the market for green jobs is expanding, countries must ensure that the workforce is equipped with the specific skills and education required to carry them out. This can be achieved by investing in training young people for future green jobs and by retraining workers from carbon-intensive industries. The latter is a key part of ensuring countries are pursuing a just transition and leave no one behind (United Nations Development Programme, 2023).

Micro-credential: A micro-credential is a short-duration training program designed to rapidly upskill professionals with specific competency outcomes to support career mobility and professional development. Attributes of micro-credentials, and their relationship to existing credential frameworks are as follows (Oliver, 2022):

- Is a record of focused learning achievement verifying what the learner knows, understands or can do;
- Includes assessment based on clearly defined standards and is awarded by a trusted provider;
- Has stand-alone value and may also contribute to or complement other micro-credentials or macro-credentials, including through recognition of prior learning; and
- Meets the standards required by relevant quality assurance.

Reskilling: Facilitating learning opportunities outside of the worker's current skillset. The new skills and competencies allow for career changes and advancement.

Short-duration micro-learning, micro-credentials, or certificate programs: Include micro-learning (2-20 hours), micro-credentials (25-100 hours), and certificate programs, separate from but complementary to traditional academic learning pathways. These include but are not limited to professional and continuing studies courses, and training offered through academic institutions.

The defining feature when referring to these opportunities is a relatively short duration (tens to hundreds of learner hours), as opposed to traditional credential programs, such as degrees or diplomas (hundreds to thousands of learner hours).

Upskilling: Facilitating learning opportunities that allow for career expansion and advancement in a linear path through new skills and competencies.

Nature-Based Solutions: are actions to protect, conserve, restore, sustainably use and manage natural or modified terrestrial, freshwater, coastal and marine ecosystems, which address social, economic and environmental challenges effectively and adaptively, while simultaneously providing human well-being, ecosystem services and resilience and biodiversity benefits.

Net-Zero: Achieving net zero involves balancing human-generated carbon dioxide emissions with efforts to remove these emissions, such as creating carbon sinks. This prevents further increases in greenhouse gas concentrations in the atmosphere. Transitioning to net zero requires a profound transformation of our energy, transportation, and production systems to mitigate the most severe climate change impacts. To limit global warming to 1.5°C, governments worldwide must ensure that all greenhouse gas emissions peak by 2025 and reach net zero by the latter half of this century. The IPCC recommends a global 45% reduction in CO2 emissions by 2030 (compared to 2010 levels) and achieving net zero emissions by mid-century (United Nations Development Programme, 2023).

Appendix C: Detailed Research Methods

The research project employed an exploratory-sequential design. The initial work entailed a literature review of Canada's workforce development needs and climate action-related employment strategies, education and training approaches using short-duration courses, and an environmental scan of climate action resources. This literature review was used to design an interview guide focused on (1) the use of micro-credentials in educational settings, particularly post-secondary institutions; (2) the skills, knowledge, and attributes (i.e., competencies) necessary for engaging in climate action leadership; and (3) the core opportunities and barriers to a nationally-relevant rapid upskilling initiative for climate action leadership. The results of the interviews informed the design of a survey to explore similar themes with a broader audience. An additional set of operational interviews were facilitated with organizations and initiatives conducting upskilling programs in Canada, and this was used to supplement data retrieved through desktop research. Learnings from each of these project elements informed the recommendations.

Climate Action Resource Scan

Researchers used Airtable, a relational database tool to house an environmental scan targeting climate-related academic programs and published materials on desired climate action skills and workforce development. Built-in web scraping tools in the Airtable platform assisted in capturing a large volume of resources. Web scraping allows researchers to extract meta-data from a specific webpage including URL addresses, images, and summaries, which is collected, exported and arranged into a more readable and organized format for the user.

Over 10 months, a variety of reporting was captured from various sources on the state of workforce readiness for Canada's climate transition to a sustainable, low-carbon and socially-inclusive future. A parallel scan of climate-related courses, micro-credentials, training, and certificate programs in Canada was also conducted. These short-duration learning opportunities were organized in Airtable, with information collected about content, cost, learner hours, and industry endorsements and/or partnerships present in accreditation processes. Airtable's built-in web scraping tools were again deployed to source and display information.

Informational Interviews

The project team developed a list of more than 60 possible interviewees whose expertise could inform the project. A total of 34 leaders were selected from that list as invitees to participate in the interviews. They were chosen to represent the diversity of prominent Canadian organizations involved in climate action workforce development. 23 respondents agreed to participate in semi-structured interviews lasting approximately 60-75 minutes, and in total 21 individuals were interviewed. Interviews were conducted over the telephone or using video conferencing software. Appendix D contains the list of interview questions and provides an anonymized description of the interviewees' role and organization types.

The interviews' audio recordings were transcribed using the Otter AI transcription tool. After

removing all identifying information, interview transcripts were imported into the Dedoose qualitative analysis software. Three researchers on the team independently coded content in order to develop themes to guide the design of the survey. Impactful quotes were highlighted and captured for use in reporting activities, where consent for anonymous use was granted. This exploratory sequential design was used to identify core themes and design a quantitative research instrument in the form of a survey.

Survey

The results of the interviews informed the design of a survey, which was designed to gather diverse feedback at scale. The survey questions are included in Appendix E.

The survey was distributed through various social media channels, including LinkedIn and Twitter, as well as through newsletters sent via direct email. Survey participants were invited to provide their emails for an optional, random prize draw for survey completion; participant identifying information (i.e. emails) were separated from the data set prior to data analysis to fully anonymize all data entries. Only one submission was allowed per person for the chance to win one of three gift cards valued at CAD $500 each. To ensure that only single entries per participant were counted in the data analysis, the research team screened for duplicate entries, in addition to entries that appeared to be false, based on the nature of the content or frequency of consecutive responses from the same or similar IP addresses. Following the data screening, a total of 157 survey responses were deemed legitimate and were analyzed using Microsoft Excel data tools.

Job Scan

A scan of job postings was undertaken from January to June 2023. The team used filters such as "climate change," "sustainability," and "environmental planner," to capture both the frequency of positions advertised and descriptions of positions' competency requirements (i.e., knowledge, skills, and attributes required to perform in the position). This scan focused on mid-to-senior level roles, with titles such as Director of Policy and Research, and Senior Sustainability Analyst. More than 100 job postings were extracted from Indeed.com and LinkedIn, aggregated, and then analyzed to determine the frequency of both climate-related job functions and more generic skills (often referred to as "soft skills" or "power skills"). The scan was done to illustrate the current trends regarding climate action leadership roles in Canada, specifically top priority job functions and skills.

To further analyze this large volume of job postings, ChatGPT was prompted to isolate and record the frequency of the aforementioned skills from the document, including the identification of public and private sector jobs.

Existing Upskilling Initiatives

A scan was conducted to identify organizations currently engaged in larger scale climate action upskilling initiatives in Canada. The team examined organizational features and outputs which could best compliment and inform a pan-Canadian approach to climate action upskilling. Airtable was used to capture select features of these organizations, including governance models, partner

organizations, funding, and number of learners, users, or graduates who successfully used the services. Following desktop research, the team conducted operational interviews with leaders of each selected organization or initiative to address gaps in understanding, with nuanced discussions around how their upskilling approach supports climate action and worker transitions. Promising practices gleaned from this review informed content on the recommended characteristics of a lead organization or initiative.

Appendix D: Anonymized Interviewee Information & Interview Questions

Interviewees held roles such as:

- Program chair of a college diploma program associated the energy sector
- Vice President at an insurance corporation with responsibility for sustainability
- President of an Indigenous consulting firm
- Director within a federal government department associated with climate action
- Director of a university continuing professional education department
- Senior manager at a Canadian city's Economic Commission
- Senior economist at a national bank
- Senior administrator at a national body representing the college sector
- Senior manager of an NGO working with municipalities on climate action
- Senior manager at a multinational software company focused on human resources

The following questions were used to guide the interviews:

1. How do you see your sector/work engaged in climate action? What kinds of programs or activities are underway and how do you think that these initiatives can be expanded or improved?
2. What competencies and skills should be at the forefront of requirements to address climate action for professional and technical work within your work/employment sector?
   or
   Which competencies (knowledge, skills, and attributes) do you believe are the key elements of climate action professional and technical work?
3. Are you concerned that climate action activities related to "transition" might result in unemployment for workers? What are your concerns about transition, such as in the energy sector, and how it may result in the displacement of workers? How might we best address this issue?
4. We are aware that many professionals these days want rapid upskilling - short courses that provide upskilling in specific competency areas. Micro credentials are one way of doing this. What programs, resources, and skill training opportunities do you know about, or perhaps have sed, that provide rapid upskilling on climate action related competencies (relevant to your profession/sector)?

5. What programs are you aware of that might be redesigned to provide or include rapid upskilling - or micro-credential style learning -for upskilling of professionals in your sector for climate action? Are there programs that could be redesigned for micro-credential deployment to support upskilling for climate action professional and technical work across sectors?
6. We are interested in exploring how to create an alliance of training and education organizations across Canada invested in rapidly upskilling the workforce for climate action. What do you think would support this agenda? Are there organizations, processes and resources that you think might contribute to building such an alliance? What processes and resources might contribute to an alliance between climate action networks and skill development opportunities for professionals and employers?
7. If such an alliance were to be built, who do you think should be involved? (prompts to get at whether this is solely providers, or providers and users; should it also be a place to house resources)? Are there other services or needs that such an alliance might support?
8. With this agenda of upskilling for climate action professional and technical work, what organizational models and protocols do you think are required to enable concepts such as credit transfer within and across organizations or jurisdictions? What about equivalency and prior learning recognition across jurisdictions? and prior learning recognition? Are there professional specific opportunities or barriers to this?
9. What early role can employers play in the design of a pan-Canadian effort to address skill development, training and resource provision focused on climate action professional and technical work across sectors?

Appendix E: Survey Questions

1. (Radio) What is your age group?
    a. <19 - if this option is selected, survey ends
    b. 20-24
    c. 25-29
    d. 30-34
    e. 35-39
    f. 40-44
    g. 45-49
    h. 50-54
    i. 55-59
    j. 60-64
    k. 65+
    l. Prefer not to answer

2. (Checkbox) People in Canada come from many racial or cultural groups. How would you describe your background? Select all that apply:
    a. Arab
    b. Black
    c. Chinese
    d. Filipino
    e. Indigenous (First Nations, Metis, or Inuk (Inuit)

f. Japanese
g. Korean
h. Latin American
i. South Asian ((for example: East Indian, Sri Lankan, Pakistani, etc.)
j. Southeast Asian (for example: Vietnamese, Cambodian, Laotian, etc.)
k. West Asian (for example: Iranian, Afghani, etc.)
l. White
m. Unknown/Unsure
n. Prefer not to answer
o. Other

3. (Radio) In which Canadian Province or Territory do you primarily work/live? Please select the one where you spend the majority of your time, even if remote working or studying:
   a. Alberta
   b. British Columbia
   c. Manitoba
   d. New Brunswick
   e. Newfoundland and Labrador
   f. Northwest Territories
   g. Nova Scotia
   h. Nunavut
   i. Ontario
   j. Prince Edward Island
   k. Quebec
   l. Saskatchewan
   m. Yukon
   n. I am abroad and working/studying for/at a Canadian organization.
   o. I do not work or live in Canada.
   p. Prefer not to answer

4. (Radio) In which province or territory is your institution or company based?
   a. Alberta
   b. British Columbia
   c. Manitoba
   d. New Brunswick
   e. Newfoundland and Labrador
   f. Northwest Territories
   g. Nova Scotia
   h. Nunavut
   i. Ontario
   j. Prince Edward Island
   k. Quebec
   l. Saskatchewan
   m. Yukon
   n. Prefer not to answer

5. (Radio) How would you describe your career stage?
   a. Exploration / planning

b. Establishment / early-career
c. Mid-career
d. Late-career
e. Planning or in retirement
f. Prefer not to answer

6. What is your highest level of education?
   a. No certificate, diploma or degree
   b. Secondary (high) school diploma or equivalency certificate
   c. Apprenticeship or trades certificate or diploma
   d. College, CEGEP or other non-university certificate or diploma
   e. University certificate or diploma below bachelor level
   f. University certificate, diploma or degree at bachelor level or above
   g. Graduate degree or above
   h. Prefer not to answer

7. (Radio) In what sector do you work?
   a. Accommodation and food services
   b. Administrative and support, waste management and remediation services
   c. Agriculture, forestry, fishing and hunting
   d. Arts, entertainment and recreation
   e. Construction
   f. College, University, and Adult Education
   g. Primary/Secondary (K-12) Education
   h. Other education industry
   i. Finance and insurance
   j. Health care and social assistance
   k. Information and cultural industries
   l. Management of companies and enterprises
   m. Manufacturing
   n. Mining, quarrying and oil and gas extraction
   o. Professional, scientific and technical services
   p. Public administration
   q. Real estate and rental and leasing
   r. Retail trade
   s. Transportation and warehousing
   t. Utilities
   u. Wholesale trade
   v. Retired
   w. Unemployed
   x. Prefer not to answer
   y. Other. Please specify

8. (Radio) How would you describe your level of experience working (professionally or in your community, or both) to address climate change (referred to in this survey as ‘climate action’)?
   a. No experience
   b. Less than a year
   c. 1-3 years

d. 3-5 years
e. 5-10 years
f. 10-20 years
g. 20+ years
h. Prefer not to answer

9. (Matrix) How important do you feel the following knowledge, skills or attributes are when preparing to take effective climate action?
    a. Climate Risk Management
    b. Climate Vulnerabilities and Impacts
    c. Climate Policies and Regulations
    d. Climate Science
    e. Indigenous Perspectives on climate change
    f. Indigenous Approaches to climate action
    g. Climate Adaptation
    h. Climate Mitigation
    i. Behavioural Change
    j. Health (mental and physical) Impacts of climate change
    k. Climate Action Leadership
    l. Organizational Change Management
    m. Climate-Informed Decision Making
    n. Futures Thinking
    o. Cultural Agility
    p. Stakeholder and Community Engagement
    q. Climate-Informed Project Management

10. (Short-answer) Are there other skills, competencies or attributes you believe are critical for climate action within a Canadian context? Please describe.

11. What areas of formal education and/or training would you need to be better equipped to address and enable climate action in your workplace role? Select all that apply:
    a. Climate Risk Management
    b. Climate Vulnerabilities and Impacts
    c. Climate Policies and Regulations
    d. Climate Science
    e. Indigenous Perspectives on climate change
    f. Indigenous Approaches to climate action
    g. Climate Adaptation (e.g., how society needs to prepare for the multiple impacts of climate change - floods, fires, sea level rise, etc.)
    h. Climate Adaptation (e.g., how society needs to prepare for the multiple impacts of climate change - floods, fires, sea level rise, etc.)
    i. Behavioural Change
    j. Health (mental and physical) Impacts of climate change
    k. Climate Action Leadership
    l. Organizational Change Management
    m. Climate-Informed Decision Making
    n. Futures Thinking
    o. Cultural Agility

p. Stakeholder and Community Engagement
q. Climate-Informed Project Management
r. Unknown/Unsure

12. (Checkbox) What perspective(s) below most closely represent your interest in short-duration micro-learning, micro-credentials, or certificate programs for climate action? Select all that apply:
    a. My organization might offer some kind of short-duration courses (micro-learning, micro-credentials, or certificate programs) for climate action (university, college, other training organizations, etc.).
    b. I am an employer who might need employees to upskill or reskill so our organization can take climate action.
    c. As a policy-maker, I might make or inform decisions about the use of short-duration courses (micro-learning, micro-credentials, or certificate programs) as possible pathways for helping Canada with its climate transition.
    d. As a worker, I might upskill or reskill using short-duration courses (micro-learning, micro-credentials, or certificate programs).
    e. I'm not a worker yet/now, but I may be joining the workforce soon, and these opportunities might support my transition.
    f. Unknown/ Unsure
    g. Other. Please specify.

13. (Scale) Please rate your level of interest in participating in short-duration micro-learning, micro-credentials, or certificate programs as part of your career and professional development:
(1 not interested in taking training - 7 very interested in taking training)

14. (Matrix) Please indicate the degree of importance of the following considerations that might affect your interest in participating in short-duration micro-learning, micro-credentials, or certificate programs.
(Extremely important, Important, Somewhat Important, Neutral, Somewhat unimportant, Unimportant, Not important at all):
    a. Cost
    b. Required or suggested by an employer
    c. Recognized as valuable for the industry or sector
    d. Provided by an accredited University/College/Polytechnic or by another reputable training institution or organization
    e. Shorter duration (days to weeks)
    f. Lengthier duration trainings (months to years)
    g. Synchronous (distance learning, at the same time as instructor)
    h. Asynchronous (distance learning, at your own pace)
    i. In-person learning
    j. Virtual (online) learning

15. (Radio) Please pick your preference if you were to consider participating in short-duration courses (micro-learning, micro-credentials, or certificate programs).
    a. In-person learning
    b. Virtual (online) learning
    c. Hybrid learning (partially in-person and partially online)
    d. No strong preference; any option could work
    e. I don't know

16. (Radio) Please pick your preference if you were to consider participating in short-duration courses (micro-learning, micro-credentials, or certificate programs).
    a. Synchronous (online learning, at the same time as instructor)
    b. Asynchronous (online learning, at your own pace)
    c. No strong preference; any option could work
    d. I don't know

17. (Radio) Please pick your preference if you were to consider participating in short-duration courses (micro-learning, micro-credentials, or certificate programs).
    a. Shorter duration trainings (days to weeks)
    b. Lengthier duration trainings (months)
    c. No strong preference; any option could work
    d. I don't know

18. (Short answer) Please provide any additional thoughts on what would influence your interest in participating in short-duration courses (micro-learning, micro-credentials, or certificate programs).

19. (Short answer) Which professions (if any) do you foresee changing due to the impacts of climate change?

20. (Matrix) How important are the following considerations to ensure that equity-deserving groups are not faced with impediments or barriers when accessing high-quality learning opportunities? (Extremely important, Important, Somewhat Important, Neutral, Somewhat unimportant, Unimportant, Not important at all):
    a. Appropriate cultural representation
    b. Relevant content
    c. Inclusive language and/or communication
    d. Adequate gender representation
    e. Representation of equity-deserving groups participating in and/or developing the available learning opportunities
    f. Sufficient funding supports and/or financially accessible costs

21. (Short answer) Please provide any additional comments on how to ensure that equity-deserving groups are not faced with impediments or barriers when accessing short-duration courses (micro-learning, micro-credentials, or certificate programs).

22. (Radio) Are you aware of any existing training opportunities that could be redesigned or repurposed to support rapid upskilling in your industry/sector?
    a. Yes

23. (Short answer) What existing training opportunities do you suggest could be redesigned or repurposed to support rapid upskilling in your industry/sector?

24. (Checkbox) With the agenda of upskilling for accelerated climate action, what could best support enabling credit transfer within and across organizations or jurisdictions?
    a. Prior learning assessment / recognition of prior learning

b. Credit-equivalency
c. An inventory of skills needed for climate action
d. Career roadmap programs (support career transitions)
e. Unknown/Unsure
f. Prefer not to answer.
g. Other. Please specify.

25. (Checkbox) What are the impediments (if any) to developing a national climate action standards framework in Canada, invested in rapidly upskilling the workforce for climate action? Select all that apply:
    a. Governance and policy structures
    b. Canadian jurisdictions
    c. Cultural differences
    d. Funding
    e. Lack of understanding/research
    f. Unknown/Unsure
    g. Prefer not to answer.
    h. Other. Please specify.

26. (Scale) (Option to skip if necessary)
    How would you describe your level of interest in collaborating with other key partners to build and offer short-duration micro-learning, micro-credentials, or certificate programs across one or more industries/sectors:
    (1 extremely uninterested - 7 extremely interested)

27. (Radio) In your opinion, should short-duration courses (micro-learning, micro-credentials, or certificate programs) for climate action be grounded in identified climate action competencies (developed based on skills, competencies, and attributes described earlier in this survey, or similar)?
    a. Yes
    b. No
    c. Unknown/Unsure

28. (Radio) Do you believe it is possible for Canadian organizations to collaborate on skills development through the delivery of accredited short-duration micro-learning, micro-credentials, or certificate programs for climate action?
    a. Yes
    b. No
    c. Unknown/Unsure

29. (Short-answer) One option for rapidly upskilling Canada's workforce for climate action is to form a steering committee to advise on a national framework (competencies, performance criteria or qualifications)focused on standardizing rapid upskilling for climate action. What types of organizations do you believe should be involved in in such a steering committee?
    a. Professional associations
    b. Universities and colleges
    c. National or regional chambers of commerce

d. Private sector
e. Indigenous communities
f. Representatives of the government/public sector
g. Non-governmental organizations (NGOs)
h. Individuals/learners
i. Youth
j. Unknown/Unsure
k. Prefer not to answer
l. Other. Please specify.

30. (Long answer) One option for rapidly upskilling Canada's workforce for climate action is to form a national alliance of institutions (possibly including professional associations, universities and colleges, national or regional chambers of commerce, private sector, Indigenous communities, representatives of the government/public sector, non-governmental organizations (NGOs), individuals/learners, and/or youth) that would operate collaboratively to deliver short-duration courses (micro-learning, micro-credentials, or certificate programs) relevant to climate action.

Please share your thoughts on possible next steps to set up such a national alliance working towards Canada’s climate transition in terms of governance structure, mobilizing the right parties, setting up an agenda, etc. What would it take for this to happen?

Appendix F: Climate Job Scan

LinkedIn Green Skills Report (Fastest Growing Green Skills)

Table 1.1 Fastest Growing Green Skills EU (2022)		*Table 1.2 Fastest Growing Green Skills in the United States (2022)*	
Skill	Year-over-year growth in skill adds by LinkedIn members (2021-2022)	Skill	Year-over-year growth in skill adds by LinkedIn members (2021-2022)
Climate Action Planning	152.7%	Carbon Accounting	240.8%
Sustainability Education	140.4%	Drinking Water Quality	191.7%
Carbon Emissions	131.4%	Energy Engineering	173.1%
Carbon Accounting	130.1%	Carbon Credits	157.0%
Corporate Sustainability	127.6%	Carbon Emissions	141.0%
Hydrogen Storage	113.6%	Energy Audits	121.6%
Hydrogen Fuel Cells	107.5%	Hazard Communications	116.9%
Carbon Capture	93.2%	Environmental Protection	95.3%
Green IT	91.4%	Emissions Testing	91.1%
Sustainability Reporting	87.9%	Drip Irrigation	89.8%
Solar System Design	81.7%	Solar Systems	88.4%
Ecosystem Management	79.4%	Conservation Easements	84.9%
Impact Assessment	74.9%	Waste Disposal	84.3%
Sustainable Transport	73.7%	Landscape Assessment	81.1%
Solar Industry	70.6%	Tree Preservation	80.4%
Biogas	70.5%	Conservation Management	79.4%
Sustainable Procurement	68.9%	Renewable Energy Systems	76.1%
Bioassay	61.1%	Emissions Trading	75.1%
Soil Sampling	60.0%	Energy Efficiency	74.0%
Permaculture	58.7%	Energy Management	73.4%

Source: LinkedIn Economic Graph. (2022)

Appendix G: Summaries of Existing Canadian Providers of Training & Workforce Development

ECO Canada

ECO Canada is a national non-profit workforce development organization that offers programming and services which focus on the end-to-end career of environmental professionals. They operate under a mandate to ensure an adequate supply of people with the skills and knowledge to meet the human resource needs of the Canadian environmental sector and have been contributing towards this mission since 1992 (ECO Canada, n.d.-c).

A key part of their activity has involved developing National Occupational Standards (NOS) for environmental practitioners. Since the initial inception of the establishment of the environmental sector, these standards have served as the framework for certification of Environmental Professionals (EP®) in Canada. They are also used extensively as a self-assessment resource for practitioners, a recruitment screening tool for employers, and a guide for educators to develop career-driven post-secondary environmental curricula for their students (ECO Canada, n.d.-d).

ECO Canada also accredits post-secondary programs across Canada, educating institutions on how they should tailor offerings to focus on employment needs. This is the result of extensive labor market research and gap analyses. ECO Canada has accredited 34 post-secondary programs across Canada, where enrolled students can access wage funding for student jobs, additional career support and prequalification for the integrated Environmental Professional in-training (EPt) program (ECO Canada n.d.-b). Additionally, ECO Canada provides training programs to First Nation, Métis, and Inuit members through BEAHR Indigenous training programs, which offers customized learning for meaningful career development. As of 2023, the BEAHR programs have graduated more than 4000 Indigenous learners with programs delivered in more than 250 different Indigenous communities across all regions of Canada (ECO Canada, n.d).

One particular partnership of note is the Canadian Centre of Environmental Education (CCEE), a partnership between Royal Roads University (RRU) and ECO Canada. This partnership, in place since 2005, offers a vehicle for obtaining post-secondary level training in climate change and a broad range of environmental study areas. To date, more than 2,500 people have been part of the CCEE programming. The RRU courses offered through the CCEE can be taken to obtain an Indigenous Environmental Leadership Pathways Certificate, a Graduate Certificate in Science and Policy of Climate Change, a Master in Environmental Practice, or a Bachelor in Environmental Practice. A key feature of the programs offered through this partnership is the ability for learners to take courses from external post-secondary institutions - choosing from a list of previously approved courses or suggesting a new course. This offers an interesting example of what a multi-institution program model for upskilling could look like (Royal Roads University, n.d).

In the last few years, ECO Canada partnered with Meridus Management Inc. to create a course for Project Management Essentials training specifically for workers in the environmental, natural resource, and clean technology sectors. This course has already proven impactful, with over 400 learners completing the training to date. They are also currently expanding their human resources services, with small to medium-sized businesses having the opportunity to outsource using ECO Canada's customized HR Service packages (Wilson, 2021).

ECO Canada receives support from a broad range of government departments such as for example Employment and Social Development Canada and Innovation, Science and Economic Development Canada (ECO Canada, n.d.-c).

Iron & Earth

Launched in 2016, Iron & Earth is a worker-led not-for-profit with a mission to empower fossil fuel industry and Indigenous workers to build and implement climate solutions. The organization works to ensure that oil and gas professionals are able to transfer their skills into renewables and help diversify those technologies (Iron & Earth, n.d). Their larger vision is that the fossil fuel industry and Indigenous workers will play a leading role in building the policy and infrastructure required to reach global climate targets, most notably to help ensure a prosperous transition towards global carbon neutrality by 2050 (Iron & Earth, n.d.-b).

Significant output includes Iron & Earth's Climate Career Portal; this online platform doubles as a job board for net-zero companies, while also providing an in-depth look at the skills frameworks needed in the "Climate Solution Industries" such as EV charging, Energy Storage, Geothermal Energy, and Solar. Iron & Earth also hosts search portals for various technical training opportunities on behalf of academic institutes, as well as keeping users informed on both government and corporate climate-related projects across the country. In addition, their website features a climate career blueprint interactive tool, which is designed to help visualize and map a user's transition to a net-zero career. Iron & Earth also features a free-of-charge Climate Career Mentorship network to make the career transition as accessible and equitable as possible to all of the community (Iron & Earth, n.d.-a).

With the intention of embodying a community-based approach to the work that Iron & Earth does, they have brought in case workers to guide individuals through their career transition. Each individual receives approximately 24 hours with a case worker to walk through their career plan and life goals, focusing on topics such as their fears, hopes, opportunities, and barriers. This way, people are uniquely supported through their career shifts in a personalized way that goes beyond standardized resources. Iron & Earth training programs include a wage subsidy. This improves accessibility to the training, as transitioning workers can avoid the financial challenge of income precarity when taking full-time training. Iron & Earth is prioritizing getting people into new jobs that maintain dignity and quality of life by offering catered one-on-one support, financial assistance, and interactive tools to guide them through that journey (personal communications, 2023).

They have built a base of over 1000 fossil fuel industry worker members and have carried out a

range of innovative initiatives, including national advocacy campaigns, upskilling programs, climate change mitigation projects, technology platforms and community building events (Visser, 2021). Their multi - project and organizational capacity funders include ECO Canada, Suncor Energy, Small Change Fund, TD Bank, Peter Gilgan Foundation, Alberta EcoTrust, Municipal Climate Change Action Centre, McConnell Foundation as well as partial funding from the Sectoral Workforce Solutions Program (Iron & Earth n.d.-c).

Palette Skills

Palette Skills, a not-for-profit organization founded in 2017, specializes in designing employer-driven upskilling programs. Their aim is to assist innovative companies in meeting their talent demands and facilitating the career growth of high-potential workers. Palette Skills recognized that there is support for those entering the workforce or those looking for linear advancement in their roles, but there are gaps for those looking or needing to transition to different industries or sectors, oftentimes skilled workers who would only need to adjust to slightly different roles due to their already considerable experience and transferable skills (personal communications, 2023; Palette Skills, n.d).

Palette Skills has been delivering upskilling programs since 2019. Currently they offer short-duration upskilling programs in agri-tech (launched in 2022) and B2B sales (launched in 2019); to date, they have served over 600 participants, with 82% securing a job offer following program completion. The programs offered by Palette Skills are all driven by employer demand and led by industry needs. To ensure this, they collaborate with an expanding network of private sector and industry partners, including businesses, associations, post-secondary institutions, economic development groups, and other non-profits (personal communications, 2023; Palette Skills, n.d).

In February 2023, Palette Skills was selected as the national delivery partner for the Upskilling for Industry Initiative by Innovation, Science and Economy Development Canada. This selection was based on the government's desire to find a comprehensive, nationwide workforce-readiness solution through a single entity. With this funding, Palette Skills has launched Upskill Canada, a talent platform that will connect an ecosystem of employers and training providers nationwide to collaborate in new ways and help transition mid-career workers into new careers in high-demand roles. It will center employers in the program design process and result in new talent pipelines that help address the need for workers across key high-growth sectors, providing a competitive advantage for the Canadian industry. They are actively recruiting new program opportunities in key sectors such as digital technology, cyber security, agricultural technology, clean technology, biomanufacturing, and advanced manufacturing (Innovation, Science and Economic Development Canada, 2023).

Projects funded through Upskill Canada are required to address Palette Skills' model for upskilling, where the primary outcome is job placement. Their model creates a common standard for upskilling, and they view these components as "principles, not prescriptions." There are a range of approaches partners can use to address these components, which are (Tibando and Mackay, 2022):

- Demand-Driven: Demand for the target job is validated by local employers who are hiring.
- Rapid Delivery: Programs are launched within 6 months, and delivered in up to 16 weeks.
- Employer-Led: Programs are collaboratively codesigned with employers, with employers defining the learning requirements for the program. Partnerships with employers are formed before program design begins.
- Experiential and Industry-Integrated: Industry representatives are directly involved in program activities, either through guest lectures, panel discussions, networking events, or other activities.
- Potential-Focused Recruitment: Admissions criteria are designed to evaluate a person's transferable skills gained throughout their life and potential to succeed in the field, and not their previous accomplishments.
- Job Placement Support: Job placement support activities are integrated throughout the program, such as structured job readiness programming, individual or group coaching, additional employer networking opportunities, etc.

Funding is redistributed to successful applicants to support the development and delivery of their short-duration training programs, with the requirement that 30% of funding is supported by industry contributions. Delivery partners are encouraged to charge a fee for programming to encourage participant retention, and delivery partners maintain 100% of the revenue generated this way. Partners also retain all Intellectual Property related to their training. Upskill Canada provides guidance regarding program design and delivery, based on their own program delivery experiences (personal communications, 2023).

Upskill Canada's target audience includes mid-career Canadians, with a special emphasis on those from equity-deserving groups. A significant portion of their active participants are women, racialized, and newcomers to Canada, all aiming to transition into high-growth sectors.

Palette Skills is guided by a diverse Board of Directors representing leaders from industries and institutions across the country. Prior to receiving funding from ISED, Palette Skills' operations were partly funded by the Federal Economic Development Agency for Southern Ontario, the Province of Ontario, Innovate B.C., PacifiCAN, and Protein Industries Canada (personal communications, 2023; Palette Skills, n.d.).

CanAdapt

CanAdapt is a collaborative initiative between the Resilience by Design (RbD) Lab at Royal Roads University and the Climate Risk Institute (CRI), a not-for-profit corporation. CanAdapt is currently an early-stage digital capacity-building hub for climate action upskilling in Canada, originally funded by NRCan BRACE, a federal program whose mandate ended in 2022. The RbD Lab continued its partnership with the Climate Risk Institute to build out several offerings including the following: hosting the Adaptation Learning Network Portal; facilitating professional communities of practice; and housing the Climate Adaptation Competency Framework to identify skills gaps for professionals. At this time, there are 18 courses and micro-credentials listed through the CanAdapt initiative, along with 3 practitioner networks (Adaptation, Forestry Adaptation, and PIEVC Practitioners' Networks). The CanAdapt initiative grew out of program deliverables and activities

from each organization (e.g., RbD's Adaptation Learning Network; and CRI's Infrastructure Resilience Professional program, in collaboration with Engineers Canada)(CanAdapt, 2023; Natural Resources Canada, 2018; personal communications, 2023).

In 2022, RbD and CRI presented NRCan BRACE with recommendations for a plan for future development, that is, the CanAdapt operational and governance model, business plan and functional elements of a digital knowledge-brokering, and course aggregator platform. The CanAdapt product vision includes a national portal for courses and programs for climate upskilling, connected to a digitally-accessible competency framework, and enhanced with facilitation of many professional communities of practice. Following the completion of the National Adaptation Strategy in early 2023, and as of mid-2023, the CanAdapt team is preparing a proposal for ongoing operational funding for this product vision, through the NRCan Climate Change Adaptation Program (2022–2027), which aims to enhance adaptation knowledge and skills among Canada's workforce; and increase access to climate change adaptation tools and resources (personal communications, 2023).

CanAdapt is currently a not-for-profit corporation collaboratively run by RbD Lab and CRI, with the possibility of transitioning to a cooperative (co-op) model pending funding and support for that business model. CanAdapt requires an updated revenue model with support from the federal government and industry partners to assure scalability and sustainability. The partnership's continued vision is to create an inclusive space for climate education and training, catering to various career stages (personal communications, 2023).

Quick Train Canada

Quick Train Canada is a program led by the Canadian Colleges for a Resilient Recovery (C2R2) that launched in January 2023. With funding from Employment and Social Development Canada's (ESDC) Sectoral Workforce Solutions Program (SWSP), Quick Train Canada is providing rapid upskilling and education programs to Canadians in high-demand fields. Training is offered through academic institutions across the country that are leading climate action and sustainability programming. C2R2, led by Mohawk College as the secretariat, came together in the Fall of 2020, as a coalition of leading Canadian colleges, cégeps, institutes and polytechnics that are collaborating to address a transition to a clean, sustainable future (Economic and Social Development Canada, 2023).

As one of C2R2's significant outputs, Quick Train Canada aims to provide fully funded, high-impact, accessible and flexible training courses to help Canadians prepare for large sectoral shifts to more sustainable practices. In collaboration with education partners across the country, they host a wide array of micro-credentials which are sustainability and climate action-focused. Quick Train Canada's online portal allows users to find and register for a host of offerings focused on five key sectors: agriculture, natural resources, clean technology, construction, and transportation. These are open to individuals over the age of 18 who are Canadian citizens, permanent residents or individuals who have been granted refugee status in Canada. There has already been immense success within the first 6 months of the Quick Train Canada initiative, boasting 110 micro-credentials across the five aforementioned sectors, approximately 7,900 training seats allocated to

learners, and 56% of learners self-identifying as members of an equity-deserving group (including women, Indigenous people, racialized and visible minorities, people with disabilities, 2SLQBTQIA, and newcomers) (Quick Train Canada, n.d.-a; personal communications, 2023).

The SWSP funds sectoral projects that focus on a range of industry-driven activities and address labour market needs. As part of its mandate, it supports equity-deserving groups by promoting a diverse and inclusive workforce and providing wraparound support as needed to those facing barriers to participation. By March 31, 2024, Quick Train Canada aims to provide training for 10,000 learners, while developing and delivering 80 micro-credentials in that same timeframe - they are set to exceed that goal. Of this target, 3,000 workers currently employed will receive upskilling in the latest technologies and 1,000 new entrants, with little or no previous sector training, will also receive training. With the support of the program's federal funding, the micro-credentials are fully subsidized until at least March 31st, meaning that learners are able to participate in and complete the training at no cost to them. This significantly de-risks career transitions, allowing people to try new career experiences through free training opportunities, and reducing barriers for learners from under-represented and systemically marginalized groups, as well.

Though C2R2 is a coalition, it is led by Mohawk College as its coordinating secretariat. In addition to holding the role of one of 14 member institutions of C2R2, Mohawk College acts as the moderator for C2R2-led projects, receiving and allocating funding as needed. For Quick Train Canada, Mohawk College receives funding through ESDC's SWSP, and a call for proposals is put out to C2R2's institution partners for micro-credentials that fit the funding requirements. The proposed micro-credentials go through a selection and approval process, after which legal agreements are signed between the institution and Mohawk College. C2R2 has set up robust proposal, review, and reporting processes to ensure that not only are micro-credentials covering entire systems of climate action needed, including training needs less obviously related to climate action than others. Quarterly reporting for partner institutions to Mohawk College covers data such as learners registered, attrition, participant feedback, and more, to ensure that the programming is iterative and responsive to partner and learner needs (Economic and Social Development Canada, 2023; personal communications, 2023).

It is worth noting that not all micro-credentials offered through Quick Train Canada have the same process for certification, badging, or credentialing at the end of the learning experience. This is due in part to the challenge of provincial credential recognition and baselining across the country. This supports the notion that a national qualifications framework along with a national skills and competency framework for climate action training in Canada would assist projects like Quick Train to align all of the program offerings.

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