


Designing Agile Pathways for Climate Adaptation Skill Development: Leveraging Open Competency Frameworks, Micro-Credentials, and Open Educational Resources

David A. Porter 

DP+Associates, Consultant

Robin S. Cox 

Royal Roads University, Professor and Director, Resilience by Design Lab

Vivian Forssman 

Royal Roads University, Project Manager Resilience by Design Lab

Correspondence:

David A Porter

[DP+Associates](mailto:david[at]dpassociates.ca)

Email: david [at] dpassociates.ca

Abstract

Capacity building for advancing climate-change leadership has become a critical workforce development requirement for both professionals and front-line workers. As the World Economic Forum Jobs 2020 report noted, there is an increasing need to provide short-timeframe opportunities for reskilling and upskilling that will keep step with the increasing issues of the climate crisis. Micro-credentials have been proposed as a strategy to enable the ongoing development of knowledge and skills to address this workforce development requirement, which we examine in the context of a university initiative that has prototyped skill pathways to address key climate adaptation themes.

We report and discuss the strategic use of the Climate Adaptation Competency Framework (2020)—a Creative Commons-licensed (CC) open competency framework—along with the use of open educational resources to create agile pathways to skill development for climate adaptation and action. The pathways we have designed and are testing combine self-directed learning resources, individual and group activities, and authentic assessment practices to validate skill development. Micro-credentials are awarded from a university continuing and professional studies division to learners from multiple practice domains for demonstrations of competence.

Keywords: climate, adaptation, competency, micro-credentials, OER, skills, pathways



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Introduction

Capacity building for advancing climate-change leadership has become a critical workforce development requirement for both professionals and front-line workers in 2023. There is an urgent need to address the growing impacts and risks of climate change. Individuals will require upskilling quickly and conveniently through short duration learning and training experiences to achieve this critical requirement across workforce sectors including corporate, government, small-business, consulting services and NGO roles.

As experienced across Canada in recent years, communities have been hard hit by the impact of just 1°C of warming, from extreme heat to uncontrollable fires to the issues of both drought and flooding, and the inevitability of sea level rise in Canada's coastal communities. Recent events resulting from excessive rainfall have also demonstrated the fragility of infrastructure and services, requiring us to rethink and prepare for a changing climate, invest in human, natural, and physical infrastructure to advance climate adaptation knowledge and skills.

As the World Economic Forum's Jobs 2020 report noted, globally there is an increasing need to provide short-timeframe opportunities for reskilling and upskilling that will keep step with the increasing issues of the climate crisis. In this context, climate adaptation knowledge and capabilities are among the world's most pressing needs.

Micro-credentials have been proposed as a strategy to enable the ongoing development of knowledge and skills across the workforce (Brown et al., 2021; Chaktsiris et al., 2021; Colleges and Institutes Canada, 2022; Contact North, 2021; Oliver, 2019; OECD, 2023). We examine micro-credentials in the context of a university initiative that has prototyped skill pathways to address key climate adaptation themes.

Design: Micro-Credentials as a Workforce Development Strategy

In workplace environments increasingly influenced by dynamic change and emergent upskilling or reskilling needs, individuals are often encouraged and are sometimes incentivized by their employers to participate in and to demonstrate their continuing commitment to professional growth. New forms of credentialing that have emerged, such as micro-credentials, have been suggested as means to enable clear demonstrations of what individuals can do, and these new forms of learning and recognition might serve to empower individuals to showcase their knowledge and skills over the course of their careers. Micro-credentials have been proposed as means to bring recognition to an individual's competencies (e.g., knowledge, skills and behaviours) that bring targeted capabilities into the workforce to deal with emergent needs, such as in the domain of climate adaptation, climate action and leadership, and the subject of this paper.

Much has been written over the past five years on the topic of matching workforce needs to professional learning and training programs that can be nimbly implemented within short timeframes. Micro-credentials have featured in recent frameworks and financial investments by governments in British Columbia (Government of British Columbia, 2022), Ontario (eCampusOntario, 2021; 2022) and Saskatchewan (Government of Saskatchewan, 2021).

However, there is no agreed standard that defines micro-credentials. Rossiter and Tynan (2019) proposed that, “unlike more formal qualifications, such as the degree, which has some intra-global frameworks, the fledgling world of micro-credentials has no such framework.” They offer some initial parameters including that, “a micro-credential is shorter... and can represent from one to 100 hours of learning, may or may not be certified by an accrediting institution or association, and may be taken online or as a face-to-face experience.”

Oliver (2022) led a UNESCO initiative to better define the attributes of micro-credentials and their relationship to existing qualifications and credential frameworks. The UNESCO report offered four specific guidelines about micro-credential attributes.

A micro-credential:

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

McGreal and Olcott (2022) noted that the accelerating interest in micro-credentials would likely lead institutions to consider how micro-credentials might better align with existing qualifications and credential frameworks, as well as influence the strategic initiatives that differentiate institutions and their programs. There is indeed a need for micro-credentials to align with credential frameworks to provide clarity about their value (beyond their potential) for both learners and employers, a perspective that was emphasized in the Australian Government’s *Microcredentials Framework* (2021), and also underscored in the work of the New Zealand Qualifications Authority (2022; 2023).

These new credential formats have the potential to become important pathways for enhanced employability and productivity. They offer an accessible recognition of learning and can empower individuals to demonstrate the knowledge, skills and capabilities they have. Micro-credentials might also provide objective, secure and digitally verified information to allow organizations to have better metrics on what their employees know and can do, as measured by commonly accepted standards of practice, existing skill frameworks or by emergent open competency frameworks (Forth, 2020; Green & Levy, 2020).

In contrast, higher education degrees have traditionally been seen as macro-level documents representing larger, program-focused learning accomplishments that are most often supported by transcripts—static documents that were designed in an era predating the networked capabilities of the Internet and the opportunity for individuals to represent their knowledge and skills through networked systems. Traditional academic records have usually been shared in limited ways that are not always learner or employment-centric and do not always reflect the entirety of the knowledge, skills, and capabilities a learner has achieved inside and outside the classroom. Matkin (2018) has emphasized the need for alternative digital credentials that better align with the new realities associated with workforce development and employment mobility.

The Role of Digital Transformation in the Emergent Micro-Credential Space

The move to upskill and re-skill individuals for a dynamically changing economic environment, affected by climate change and other unforeseen global challenges, has also become integral to recovery and resilience strategies for a post-COVID world (Davidson, 2020). Consequently, the need to harness digital transformation in ways that better equip individuals and institutions to respond to opportunities for further learning and differentiated employment opportunities is a new imperative.

Micro-credentials might provide viable and expedient pathways to explicitly certify competence and facilitate the match between individuals and employment opportunities. Higher education institutions are well-placed to operate within and advance this upskilling strategy as providers of micro-credentials. However, they might also need to be innovative in their thinking about the scale of learning units, authentic and relevant assessment practices, credentialing, and recognition of prior learning, as well as being proactive in harnessing emerging opportunities for “laddering” micro-credentials into graduate certificates or degree programs.

In a 2018 paper, Gary Matkin of the University of California Irvine presented a clear and pointed summary of the need to rethink the ways in which higher education institutions provide credentials for learners.

Matkin (2018) noted:

Alternative Digital Credentials (ADCs) will significantly transform the relationship between higher education institutions and society. By providing fully digital, workplace-relevant, and information-rich records of an individual’s skills and competencies, ADCs will render traditional university transcripts increasingly irrelevant and obsolete. Universities and colleges that do not adopt in some measure the ADC movement will begin to experience a slow decline in market position and patron support. (Matkin, 2018)

The Inherent Value in Recognizing Skills and Competencies Digitally

Digital credentials can capture rich, dynamic, and verifiable information about the skills and competencies that individuals possess (Chartrand et al., 2020; Credential Engine, 2023; Digital Credentials Consortium, 2023). They might also identify the shelf life of skills and competencies, particularly in dynamic employment sectors, fostering a mindset of continuous upskilling for individuals and an authenticated layer of legitimacy for employers through verifiable metadata embedded within micro-credentials and badges. This authentication and verification process is important, as opposed to the self-generated nature of LinkedIn profiles. Matkin (2018) proposed that digital learning records would evolve and grow over time as the individual acquired additional knowledge and skills inside and outside classrooms, and ideally be stored in a digital record to provide authentication and verification, which could also be shared with employers or professional bodies by the individual.

Digitization is becoming pervasive. Digital transformation of the higher education sector accelerated during the Covid pandemic and required institutions to further consider new strategies and new pathways for learning and teaching (Antonopoulou et al., 2023; Fernandez

et al., 2023; Bygstad et al., 2022). Increasingly, institutions are undertaking digital transformation processes that are focused on re-designing learning and teaching practices as well as in the administration of curriculum, credentials and records (Matkin, 2018). Digitization will continue to push innovation in designs for learning, including an increasing focus on short duration learning and training with micro-credentials, digitally awarded and sharable by individuals to recruitment sites, social media networks and also to employers.

Reinforcing this need for transformative designs are trends occurring beyond our institutions, where changes in the workplace should compel us to adapt or innovate educational practices. Modular learning is gaining in popularity. Learners and employers are increasingly seeking and valuing short duration modules of learning—not just 20 minute, micro-learning experiences, but also longer engagements of multiple hours or more, which can be awarded micro-credentials and can potentially be “stacked” in learning pathways. LinkedIn Learning, Google Career Certificates, edX, and Coursera online courses provide useful examples of short-duration, targeted learning models that fit the needs of many early or mid-career professionals.

In addition to promoting continuous professional growth, employers are increasingly sourcing talent digitally. Employers are expanding their search processes, seeking candidates by scanning targeted employment profiles on social networking sites such as LinkedIn. Systems such as Indeed.com, which list available jobs across various employment sectors, use digital screening techniques to help employers identify and short-list candidates. Micro-credentials might add credibility to an individual’s profile by providing digitally verifiable records of learning in addition to other kinds of evidence about the skills and competencies they can demonstrate.

Development: A Climate Adaptation Capacity Building Initiative Expands to Encompass Open Educational Resources, an Open Competency Framework and Micro-Credentials

In the context of micro-credentials and workforce developments across Canada, a project aimed at climate adaptation capacity building and leadership, led by the Resilience by Design (RbD) Lab at Royal Roads University (RRU), has taken an innovative approach to address upskilling and reskilling needs of professionals. The project described and discussed in this paper is an example of how micro-credentials can be employed to address emergent workplace needs, and how they can be designed and developed in ways that build value from both existing and new resources.

The program of micro-credentials that resulted from this project is currently being offered by the Professional and Continuing Studies department at RRU, to learners from across multiple workforce sectors, as a four-course micro-credential titled Climate Adaptation Fundamentals (Royal Roads University, 2023). The program is also building additional courses to address specific climate action leadership needs in domains including policy and planning, finance, nature-based solutions, communications, and other relevant practice areas where professionals require upskilling through a rigorous but short-duration training strategy.

The micro-credential project began as a strategy of the Adaptation Learning Network (ALN) project, a climate-adaptation capacity-building initiative of the RbD Lab. Over a three-year period, the project collaborated with six BC universities to design and deliver 11 courses on climate adaptation topics, with course resources made available as open educational resources

(OER). *The Adaptation Learning Network: Final Report* (Cox, Forssman & Withers, 2022) is a multi-media and openly licensed publication that is available digitally.

The [ALN OER are available from the BCcampus Open Library](#) (Adaptation Learning Network, 2021). Over a 15-month period, 576 people enrolled in these 11 courses, with average enrolment in each course at about 20 per course, with highest registration in the Adaptation Fundamentals course.

The project also consulted with many climate adaptation experts and built and tested the use of a Climate Adaptation Competency Framework (CACF) (Cox et al., 2021). The Lab subsequently developed and operationalized a Climate Adaptation Micro-Credential Strategy based on the CACF, as a way to sustain the value and reach of ALN courses, resulting in micro-credential programs that are being further developed and refined to meet specific needs in climate action domains.

Implementation: Designing Agile, Digital Learning Pathways to Address Climate Adaptation

The design brief for the ALN climate adaptation project included the following elements:

- Collaborative design: The ALN project would work with multiple BC post-secondary institutions, to expand the project's reach and impact.
- Open content licensing: The ALN project would develop and distribute course materials using Creative Commons open licenses so the course materials could be reused and improved by others.
- Open competency framework for climate adaptation: Complementing the decision to develop course resources openly was the intent to engage a network of experts to create a comprehensive Climate Adaptation Competency Framework that would inform the way the climate adaptation courses would be developed and potentially align the courses with emergent needs in workplaces where climate adaptation leadership was required.
- Proactive engagement with Indigenous knowledge: Rather than restricting course content to traditional Western science and practices, the project would engage with Indigenous experts and elders to try to find new ways to integrate their knowledge and perspectives into approaches that engineers, foresters, biologists and planners might better address these problems.
- Micro-credential prototyping: Instead of offering standalone courses through professional and continuing studies departments, the project would identify and adopt a new kind of accreditation for professionals—micro-credentials—and develop a strategy and operational framework to pilot the climate adaptation fundamentals micro-credential concept.
- Sustainable networked community of knowledge and practice: To engage a new community of climate adaptation learners, the project also built a communications strategy and network to empower communities of professionals to grow their knowledge and skills, which has

since become an online resource site and community of practice hosted through the website, [Can-Adapt.ca](https://www.can-adapt.ca).

Developing Climate Adaptation Courses Collaboratively as OER

An early design decision for the project was to develop openly licensed courses (Creative Commons, 2023) in thematic areas working with six participating institutions across British Columbia. The rationale was straightforward—to make climate adaptation mainstream and involve as many players and influencers as possible. By engaging a network of academic institutions, the project sought to build capacity among professionals and also among educators.

Designing and developing all course materials and content as OER would also facilitate access to the resources and encourage their use, reuse, remixing and redistribution. This decision was in line with the project's core philosophy of making it as easy as possible for learners and educators to use, share and build upon the climate adaptation materials. The urgency with which an agile response to climate adaptation was needed directly aligned with the sharing and reuse philosophy inherent in open educational resources.

The development process was also expanded beyond academia by inviting experts from various climate adaptation specialties to create courses to share their knowledge, skills and tools. Each course development team was provided with initial development funding of \$11,000 per course from the project budget. In practice however, the final course development cost was closer to \$25,000 each, with this additional cost offset by the provision of in-kind services by participating universities.

The project team also partnered with Indigenuity Consulting Group, to develop a unique multi-media, open course with local Indigenous knowledge-keepers and elders to introduce learners to Indigenous perspectives on climate adaptation and ways to respectfully engage with Indigenous communities. The original goal was to have Indigenous partners work with the project team on all courses to embed their critical perspectives. But the pandemic affected the execution of this goal, resulting in a single Indigenous Knowledge course being developed.

Building a Climate Adaptation Competency Framework

A competency framework describes the knowledge, skills and behaviours that individuals need to perform specific roles or jobs. Within the project, research was required to build a competency framework for climate adaptation to better understand what competencies individuals would require to be able to anticipate and reduce the impact of climate change.

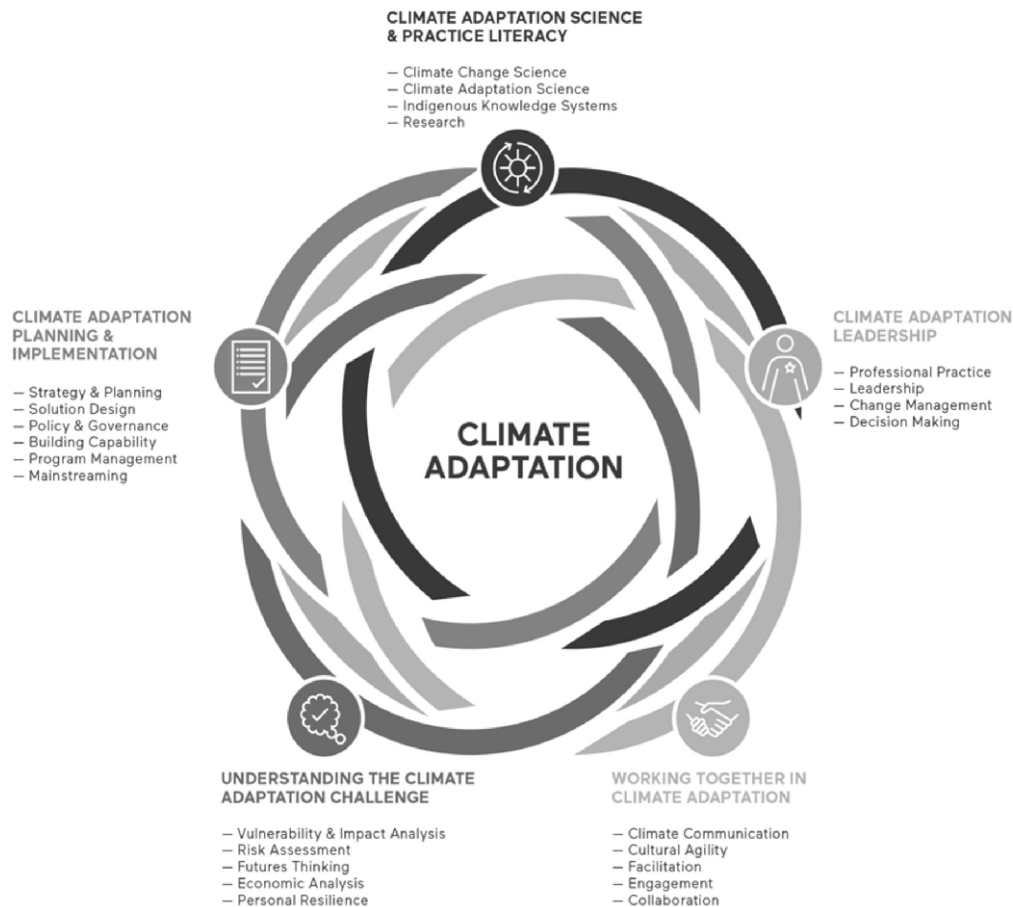
Initial desk-top research was undertaken to identify potential climate adaptation competencies. At the time of this work, there was very little research that specifically focused on climate adaptation competencies, and the research team analyzed research on climate adaptation that implied competencies or elements of competencies (knowledge, skills, behaviours). As part of this work, the team identified resources that existed for climate adaptation competency development, so that the project might build on existing findings to articulate an initial set of core competencies. The project team conducted a gap analysis, a survey and a challenge dialogue (multiple actors engaged in this dialogue over a period of two months), and also interviewed

climate adaptation experts (N=28) from across the globe to explore their insights on relevant competencies, begin to identify thematic groupings for those competencies, and then validate the climate adaptation competencies that were identified.

The consultants synthesized findings from the discovery process, and these were then tested with partners and stakeholders (i.e., experts working in climate adaptation in roles within local or municipal-level, federal, and provincial government, academia, and business) to result in a first draft of the framework released in January 2021.

Figure 1

Climate Adaptation Competency Framework Domains and Competency Clusters



Positive feedback from partners and stakeholders on the initial draft also produced additional insights which needed to be incorporated in an updated draft, which a skills management framework expert completed.

Based on this input, the Climate Adaptation Competency Framework described 24 competencies, divided into five domains that range from Climate Adaptation Leadership to Climate Adaptation Science and Practice Literacy.

From these efforts it became clear that a climate adaptation competency framework had promising potential that might have value and benefit beyond the project, including:

- Enabling and empowering employers to make smart investments in climate adaptation training; and,
- Aligning the Climate Adaptation Competency Framework (CACF) with existing and emergent open standards for competency frameworks (Forth, 2020; Green & Levy, 2020)

Early in 2021, the ALN project launched the draft [Climate Adaptation Competency Framework](#) (Figure 1) with a series of webinars, publications and a social media campaign. The resulting document is CC-licensed and available for further development.

The team also discovered that it needed to know more about how organizations could use the competency framework—in particular, municipalities and the consulting firms who work with municipalities.

The project team arranged to test the CACF with an environmental consulting firm that works with regional governments, industry and other clients in Vancouver. While this work is ongoing, it appears that this firm found the CACF particularly useful as a way to determine where and how it needed to invest in capacity-building for individual employees, and as an organization.

Response to the initial framework was positive and as the project began sharing the CACF with partners and communities, the team realized that developing competencies wasn't enough. The project also needed a way to assess, manage and accredit these new competencies. And so, we began working on a micro-credential strategy to address that gap.

Developing a Pathway-Focused Climate Adaptation Micro-Credential Strategy

In discussions with senior education experts and partners in the climate adaptation community, the project team learned that micro-credentials could be a key strategy to help the project's target audience meet their upskilling needs.

Targeted participants were professionals who already have one or more qualifications, such as a degree and/or a professional designation, but individuals who didn't necessarily have the time to invest in a large-scale training program like a graduate degree or even a multi-course certificate program. They might need training in a few specific areas and certification to acknowledge their competency. And they might want that training to be portable so that it could be recognized by a variety of employers as they moved through their careers and to different regions of the country.

By the end of 2021, the project team was convinced that micro-credentials could be a critical piece of the capacity-building strategy for climate adaptation. The team reached out to the BC Ministry of Advanced Education, and Skills Training (MAEST) to request funding. The Ministry agreed with the assessment of the situation and awarded the project a contract to create a Climate Adaptation Micro-Credential Strategy in 2021. Another of the ALN project's sponsors, provided matching funding to further support the development of the micro-credential strategy

for climate adaptation upskilling. A goal of the Climate Adaptation Micro-Credential Strategy included undertaking an international scan of proven micro-credential practices to support the development of a pilot initiative that could be tested in a proof-of-concept initiative.

As work on both the Climate Adaptation Micro-Credential Strategy and the Climate Adaptation Competency Framework (CACF) progressed, the team began to see the potential benefit that a micro-credential approach could be for both learners and employers. Employers would be able to identify their organization's unique expertise and promote their capabilities when competing for bids and contracts (e.g., an application of the CACF). At the same time, they could create training and development plans for employees to address gaps in skills and knowledge development within their organizations that needed improvement through micro-credential offerings. Similarly, learners could be rewarded for skill and knowledge training that added value to their professional profile and their work.

With these fundamental building blocks in place, a micro-credential strategy and program were developed with many key features of micro-credential practices from research and jurisdictional frameworks emphasized in the development process.

In the fall of 2021, the BC Ministry of Advanced Education and Skills Training announced funding for micro-credential development. In December 2021, the project was awarded funding to transition some of the ALN courses into a climate adaptation micro-credential that included assessment activities in each course to validate the skills acquired to receive the credential.

Principles for Development of the Climate Adaptation Fundamentals Micro-Credential

The following principles guided the development process for the micro-credential program:

1. Base the RRU Climate Adaptation Micro-credential strategy on research-informed micro-credential definitions, principles, and practices.

The RRU-ALN micro-credential strategy will align with guidance provided by the BC Micro-credential Framework (Government of British Columbia, 2021), its micro-credential definition and core principles. Definitions and principles provided from research conducted by the Higher Education Quality Council of Ontario (Pichette et al., 2021) and UNESCO (Oliver, 2022) will supplement the approach, along with strategic perspectives such as those described by the State University of New York (2022) and Rutgers University (Van Noy et al., 2019).

2. Base RRU micro-credentials on a blend of relevant, existing openly licensed courses and new courses custom designed for the micro-credential.

The RRU micro-credential program will use existing OER short courses created through funding from Natural Resources Canada and the BC Ministry of Environment and Climate Change Strategy. The 11 continuing professional development courses are currently offered to working professionals through five BC post-secondary institutions (UBC, SFU, UVic, VIU, and RRU). The courses will require upgrading to add knowledge and skill components as well as relevant, competency-based assessments that acknowledge the needs of working professionals. Additional courses will be required for new or emergent topics.

3. Assess all RRU micro-credential courses using the Climate Adaptation Competency Framework (CACF) to establish a standard for employer endorsement.

The CACF provides an established set of competencies in each of five practice domains. There are 24 sub-domain competencies which can be used to guide instructional development of the RRU micro-credential courses to add knowledge and skill components to the courses that can be evaluated using competency-based assessments. To activate the CACF as a practice standard for the RRU micro-credential program, refining the learning objectives and course scope for each existing RRU course to explicitly align with the Climate Adaptation Competency Framework (CACF) was required.

4. Design each RRU-ALN course for short duration, online delivery (3-4 weeks per course), with a blend of synchronous and asynchronous work facilitated by expert practitioners.

Each RRU course will be designed for 25-30 hours of learning, in a format that includes asynchronous online learning (using learning management system templates) and synchronous learning opportunities (using web conferencing and ideation tools). In addition, media and resources will be available for asynchronous review, along with discussion boards for interaction among participants, instructors and guest experts. Assessment for the credit Climate Adaptation Fundamentals pathways will use project-based assignments, relevant to the learners' workplace experience using assessment strategies that add authenticity, engagement and integrity to the process (Commonwealth of Learning, 2021).

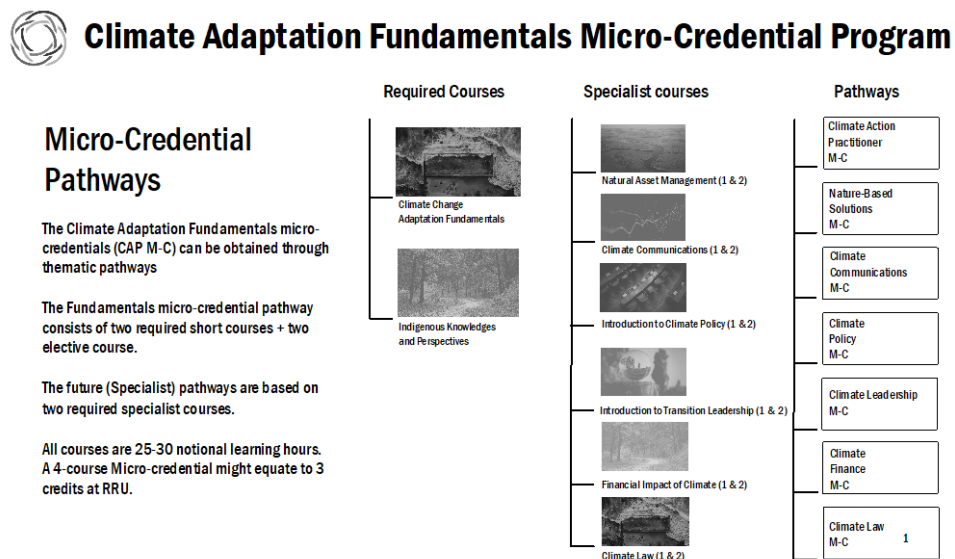
Structure and Implementation of the Climate Adaptation Fundamentals Micro-Credential

Based upon the strategy and principles for micro-credential development, a roadmap (Figure 2) describing the Climate Adaptation Fundamental Micro-Credential Program was created. Content experts and instructional developers were engaged to create a core set of hybrid courses, using the existing OER resources, and a new course on Transition Leadership (Academy for Sustainable Innovation, 2022), that could be delivered beginning in September 2022.

A low-risk prototype pilot was undertaken in winter and spring 2022 to test the viability of course content with internal staff and interested colleagues. From learner and instructor feedback on the pilot offerings, refinements to the delivery process, the courses content and assessments were made. The first offering of the program was announced in June 2022, with initial intake for Climate Adaptation Fundamentals Micro-Credential program offered in September 2022. The Indigenous Knowledges and Perspectives course, along with Introduction to Transition Leadership 1, and Introduction to Climate Policy 1, were offered in winter and spring 2023.

Figure 2

Climate Adaptation Fundamentals Micro-Credential Pathways Roadmap



Further Enhancements to the Micro-Credential Program: Stacking and Laddering Pathways

Some micro-credential designers create their programs to be modular so that individual micro-credentials can be grouped together to form a larger credential, facilitating thematic pathways and/or stacking and laddering opportunities. And, as noted in the design principles for the Climate Adaptation Fundamentals micro-credential, the program should be structured for short duration delivery, embedding the idea of both horizontal (fundamentals) stacking and vertical (deeper knowledge and skills) stacking to account for emergent skill areas where both broad foundational knowledge and skills and specialist knowledge and skills will be a requirement of learners.

A prototype option to enable stacking is to build “micro-credential pathways.” The RRU Climate Adaptation Fundamentals Micro-credential illustrates the potential of a pathways concept by including both horizontal and vertical pathways in its design, as noted in Figure 2.

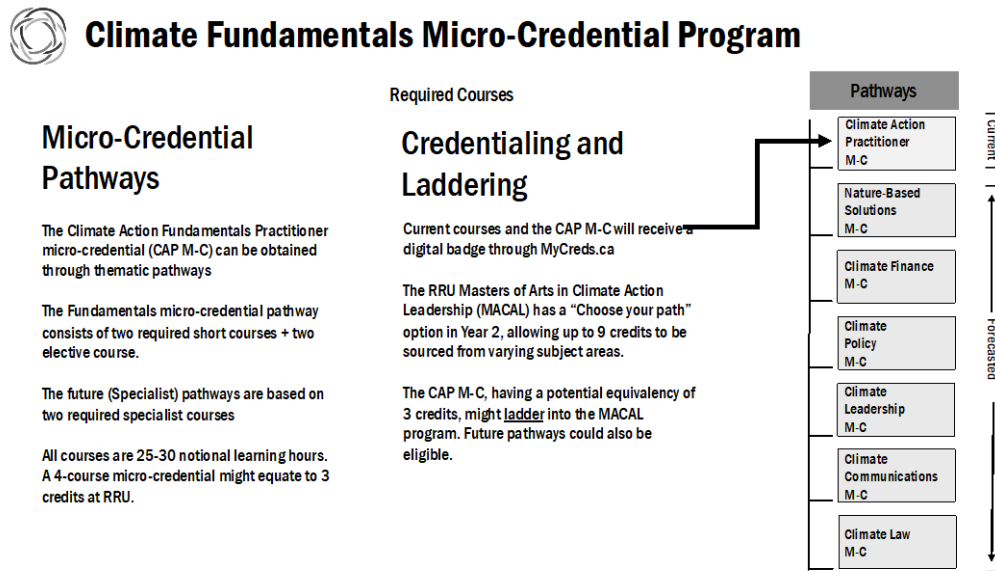
Designing micro-credential programs with a view to stacking and laddering into undergraduate or graduate programs would typically require a common currency of credit-hour equivalency. In the case of the Climate Adaptation Fundamentals program, each course is based on 25-30 notional hours of instruction and learner engagement. Using 100-120 hours as a baseline for each four module micro-credential provides an opportunity for aligning with both undergraduate and graduate degree programs that might use these micro-credentials as qualifying courses for the program, as-is, or through a recognition of prior learning (RPL) process that provides an equivalency.

The potential to ladder micro-credentials upward into both undergraduate and graduate programs is a feature that is currently being explored by the project team from the Resilience by

Design Lab, piloting this concept as part of RRU’s Master of Arts in Climate Action Leadership (MACAL).

Figure 3

Stacking and laddering pathways concepts for Climate Adaptation Fundamentals



Conclusion and the Path Ahead

In November 2022, Canada published its draft *National Adaptation Strategy* (Environment and Climate Change Canada, 2022). Within the document, the government outlined its strategy to address adaptation challenges and noted a significant need for knowledge and skill, development across economic sectors.

“Shared challenges can be addressed by building sector-specific adaptation knowledge and skills, and in areas such as labour, trade and supply chains, finance, investment, and insurance underwriting.”
(Environment and Climate Change Canada, 2022, p.27)

The *National Adaptation Strategy* also outlined bold targets for a skilled workforce:

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, 2022, p.49)

It is a national challenge on how to address these bold targets; and so the question of how we rapidly upskill and reskill the workforce to address climate-related leadership and action is of high priority. To that end, the RbD Lab and the Academy for Sustainable Innovation are

currently undertaking research titled *Upskilling for Canada's Climate Transition* (Future Skills Centre, 2022). This research initiative is investigating three areas:

- The skills and competencies required for leaders to take climate action within a variety of professional and vocational pathways.
- Opportunities for Canadian organizations to collaborate on skills development to support climate action leadership.
- Programs, including micro-credentials, resources, and training opportunities that provide rapid upskilling for climate action.

It is the expectation of the research team that we will report on the outcomes of the study in September 2023.

Author's Contributions

DAP provided leadership and support for micro-credential research and design, as well as the development of a pathways approach for horizontal and vertical stacking for the micro-credential modules. DAP also contributed to testing the Climate Adaptation Competency Framework with an environmental consulting firm to assess its suitability for use with professional organizations.

RSC provided overall leadership and direction for the project, including the development of the Climate Adaptation Competency Framework (CACF) and its on-going development to include climate mitigation competencies. RSC provided leadership for the development and deployment of micro-credentials within Royal Roads University, including strategy discussions for the laddering of the micro-credential into the Master in Climate Adaptation Leadership (MACAL) program.

VF provided reflections on the multi-year process of co-ordination and quality management for all course and micro-credential development; establishment of the OER library of climate adaptation courses; and provided contributions to the development and testing of the Climate Adaptation Competency Framework.

Open Researcher and Contributor Identifier (ORCID)

David A. Porter  <https://orcid.org/0000-0001-5173-5726>

Robin S. Cox  <https://orcid.org/0000-0001-8763-2366>

Vivian Forssman  <https://orcid.org/0009-0002-4753-9284>

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Ethics Statement

This is a paper reporting on a practice innovation. No research with human subjects was undertaken.

Conflict of Interest

The authors do not declare any conflict of interest.

Data Availability Statement

This is a paper reporting on a practice innovation. No research with human subjects was undertaken.

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