



REPORT

ALN Gap Analysis Report

2019



Adaptation Learning Network

INSPIRING CLIMATE ACTION

ROYAL ROADS UNIVERSITY

adaptationlearningnetwork.com



ADAPTATION LEARNING NETWORK GAP ANALYSIS SUMMARY REPORT

INTRODUCTION

The *Adaptation Learning Network: Inspiring Climate Action Project (ALN Project)* is intended to increase the province's capacity to adapt to climate change by enhancing the knowledge and skills of professionals, through climate change adaptation continuing professional development (CPD).

The ALN Project recognizes the sustained care Indigenous peoples have afforded the environment on which we all rely. The Project team is exploring reciprocal opportunities for involvement of Indigenous peoples and perspectives in this initiative, recognizing that they have adapted to changes in climate since time immemorial.

The ALN Project initiated in January 2019 with a 2-part Gap Analysis that gathered information from partnering professional organizations and post-secondary institutions, climate experts, and Indigenous knowledge-holders related to gaps in training/education, priorities and professional development needs. This report provides a summary of the findings of PART 1: COURSEWARE GAP ANALYSIS and PART 2: PROFESSIONAL ASSOCIATION SURVEY.

PART 1: COURSEWARE GAP ANALYSIS

As part of the Inspiring Climate Action project, we conducted a gap analysis in order to identify what relevant courseware was already available either through the participating Professional Associations, or the participating Post-Secondary Institutions (PSI's). The gap analysis was limited to offerings in BC from January 2018 onward, that were advertised between January 4 and May 12, 2019. These included online courseware that were published

prior to 2018 and were still available. The analysis included only the seven participating professional organizations and the seven participating post-secondary institutions. Many professional organizations had links to post-secondary institutions, commercial CPD providers, and other professional associations that may or may not have offerings; these were not explored or included.

METHODS/SCOPE

Professional Associations. For this gap analysis, we searched the websites of the seven participating professional organizations for courses and events that included climate change adaptation-related content. Such content included explicit references to climate change and adaptation, but also resilience, renewable energy, green infrastructure, and other topics that are known by climate experts to be necessary elements for climate change adaptation. Courses with climate mitigation and low carbon resilience content were also included.

Sustainability references were carefully examined to determine whether these were aligned with the aforementioned themes. Courses in and about BC, and courses in BC but about geographies outside of the province were included. Courses and events were typically listed on professional education or continuing education pages. We did not examine whether the organizations' divisions or branches had additional listings of courses or events.

Professional Association Membership. As part of the overarching gap analysis we conducted a survey with members of the participating professional associations. The survey focused on questions related to their



knowledge and understanding of climate change and climate adaptation, their sense of the relevance of climate adaptation to their professional practice, and questions related to their interest in continuing professional development (CPD) training, and their thoughts on priorities for the focus and style of CPD training in climate adaptation. The survey included both close ended (quantitative, Likert style questions) and open-ended questions. We had a great response from the members of various associations, totalling over 750 responses. Given this response, we are still in process with our analysis of the results and so have not included these in this summary. We will be sharing the results of the survey on our project website when the analysis is complete.

Post-Secondary Institutions. A similar process was used to find courses and events on the websites of the seven participating post-secondary institutions, with a focus on continuing education, professional education, and community education. We did not examine university for credit (i.e., degree) programs and their courses for climate change content.

There were several notable sources for climate education: Adaptation to Climate Change Team (ACT) at Simon Fraser University (SFU) <https://act-adapt.org>, Pacific Climate Impacts Consortium at University of Victoria <https://pacificclimate.org>, and Pacific Institute for Climate Solutions – which is hosted and led by University of Victoria in collaboration with SFU, UBC, and University of Northern BC (UNBC) <https://pics.uvic.ca/about>.

ADDITIONAL RESOURCES

As part of the gap analysis, additional information and links to other resources were identified through the Professional Association websites (e.g., Engineers and Geoscientists BC). These included climate change advisory groups, climate change/adaptation position papers, surveys and information portals. These were not included as part of the analysis process but have been noted in a database for potential follow up.

Examples include:

Climate Change Information Portal

<https://www.egbc.ca/Practice-Resources/Climate/Climate-Change-Information-Portal> with subheadings for:

- Design Flood Hydrology
- Vulnerability Risk Assessment
- Resources for Buildings Sector
- Compilations of CC Information
- Historic Climate Data
- Introduction to CC and CCA
- CC Adaptation Guidelines (e.g., BC MoE Sea Dikes and Coastal Flood Hazard Land Use, NYC Climate Resiliency Design Guidelines)
- Adaptation Case Studies (e.g., BCMOTI/Nodelcorp/PCIC CC Engineering Vulnerability Assessment of 3 BC Highway Segments)
- Projected Climate Data
- Adaptation Decision-making – tools and resources to communicate the results of vulnerability risk assessments so they may effectively incorporate CCA into decision-making processes (e.g., American Society of Civil Engineers – Adapting Infrastructure and Civil Engineering Practice to a Changing Climate; Canadian Institute of Planners – CCA Planning: A handbook for small Canadian communities)

CONTINUING PROFESSIONAL DEVELOPMENT REQUIREMENTS

In addition to identifying existing courseware, we examined what qualifies as CPD for participating professional organizations, including whether such training is mandatory. There was a broad range of requirements ranging from completely voluntary to specific requirements. The outcome of this part of the analysis is not included in this summary report, however, will be considered in the design and development of the courseware for this project.



There is also recognition of the changes to the Professional Governance Act

(<https://engage.gov.bc.ca/professionalreliance/proposed-professional-governance-act/>) and the implications of these changes for CPD; however this was not the focus of the gap analysis and is not addressed in this report.

COURSEWARE GAP ANALYSIS RESULTS

The gap analysis identified 126 relevant (or potentially relevant) courseware offerings accessed from professional organization websites, and 90 relevant (or potentially relevant) courseware offerings accessed from post-secondary institutions, and climate adaptation/climate science organizations associated with PSIs such as Simon Fraser University's Adaptation to Climate Change Team (ACT), and University of Victoria's Pacific Climate Impacts Consortium (PCIC) and Pacific Institute for Climate Solutions (PICS). The courses identified through this gap analysis have been grouped together under general topic headings in the section below.

IDENTIFIED CONTINUING PROFESSIONAL DEVELOPMENT COURSES (JAN-FEB 2019)

Agriculture

- | | | |
|---|------|---|
| 1 | BCIA | 4-part BC Agriculture & Climate Change Series |
|---|------|---|

Climate change mitigation/Low carbon resilience

- | | | |
|---|--------|---|
| 2 | ASTTBC | Relevance of Green Resilience Strategies to Professional Practice |
| 3 | EGBC | Relevance of Green Resilience Strategies to Professional Practice |

Energy

- | | | |
|---|--------|--|
| 4 | ASTTBC | Solar Energy, Kamloops |
| 5 | ASTTBC | Solar Energy, Vancouver |
| 6 | EGBC | AGM and Keynote Presentation: The Paradox of Energy Efficiency |
| 7 | EGBC | Environmental Benefits of District Energy Heating and Renewable Energy in BC |
| 8 | EGBC | Evening Seminar: CNC Machining, AI, Clean Energy, and Cyber Security |
| 9 | EGBC | Professional Practice Guidelines: Whole Building Energy Modelling |

It was worth noting that there were a number of courseware offerings that did not emphasize climate change adaptation (CCA) although there appeared to be clear relevance and links between CCA and the central topic of the course.

Other courses were identified that did not specifically mention key words (e.g., climate, resilience, etc.), but again may be relevant based on the presenter bios (e.g., Erosion and Sediment Control (EGBC, October 11, 2018); Developments in Tsunami Hazard Analysis: Wave and Inundation Modeling (EGBC, April 5, 2018). Finally, there were also courses that did not focus on climate change but included or may include resources that would be beneficial for climate change adaptation (e.g., EGBC's West Coast Oil Spill Response and Strategies in Port Alberni on April 5, 2018 included coastal mapping and protection strategies for coastal areas).



10	EGBC	Solar Energy, Kamloops
11	EGBC	Solar Energy, Vancouver
12	EGBC	State of the Art Modeling and Model Validation of Renewable Energy Systems
13	EGBC	Technical Talk: Clean Energy Generation
14	EGBC	The BC Energy Step Code
15	EGBC	The BC Energy Step Code

Forests

16	ABCFP	2019 Conference
17	ABCFP	BC Community Forest Association 2019 Conference - adapting to a changing climate
18	ABCFP	Climate change adaptation - Mycorrhizae to mushrooms and moose: Effects of climate change on a multi-trophic scale
19	ABCFP	Climate Change adaptation - Urban forestry adaptation to climate change
20	ABCFP	Managed Forests in a Changing Environment
21	ABCFP	Ten emerging BC forestry initiatives
22	ABCFP	Timber supply projections adaptation - Government actions
23	ABCFP	Timber supply projections adaptation - Industry actions
24	ABCFP	UNBC: Ecological Field Data Collection
25	BCIA	Winter webinar series: Conservation in the Context of Climate Change - Restoration in Action: Whitebark Pine Restoration, Wetland Restoration in the Kootenays, Riparian and Wetland Restoration in the Slocan Valley, Rocky Mountain Trench Ecosystem Restoration Program

General

26	CAB	2019 AGM and Conference
27	PIBC	Getting Climate Ready: Future Climate in the North Okanagan
28	PIBC	Getting to Know the Guides and Toolkits for Sustainable Land and Water Use Planning
29	PIBC	What's Climate Got to Do With It?

Health

30	PIBC	SHIFT Collaborative - Making the Links: Climate Change, Community Health and Resilience
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Infrastructure

31	EGBC	Climate Change and Resource Roads: Summary of three risk and vulnerability case studies
32	EGBC	Climate Change on VI and Coastal BC
33	EGBC	Developing CC-Resilient Designs for Highway Infrastructure in BC: Professional Practice Guidelines, Kelowna



- | | | |
|----|------|---|
| 34 | EGBC | Developing CC-Resilient Designs for Highway Infrastructure in BC: Professional Practice Guidelines, Prince George |
| 35 | EGBC | Developing CC-Resilient Designs for Highway Infrastructure in BC: Professional Practice Guidelines, Kelowna |
| 36 | PIBC | Vancouver's Mobility Future: Automating Policy into Sustainable Results |

Modeling

- | | | |
|----|-----|---|
| 37 | CAB | State-and-transition simulation modeling of landscape dynamics using ST-Sim |
|----|-----|---|

Multi-faceted

- | | | |
|----|--------|--|
| 38 | ABCFP | BC Land Summit - Deep Dive 101 - Fire Ecology & Urban Interfaces: Living Within Fire Dependent Ecologies; Deep Dive 02 - Changing Climate, Changing Coast: Building Resilience and Reducing Disaster Risk in BC Marine; Hidden Housing Solutions: Practical Action on Affordability and Climate; Embracing the BC Climate Action Charter: Creating Complete, Compact Communities; Mainstreaming Systems-level Adaptation Responses in the Mgmt of Land & Water |
| 39 | ASTTBC | #BCTechSummit: The Reality Revolution - CAS, The Future of Food, Digital Government/Procurement Concierge Challenges, Local Innovations That Are Powering Global Sustainable Growth, Cleantech Challenges |
| 40 | ASTTBC | BC Land Summit |
| 41 | BCIA | Adaptation Canada 2020: Conference on CCA |
| 42 | BCIA | BC Land Summit |
| 43 | BCIA | Keeping up with Environmental Change 2019 (annual) Workshop |
| 44 | BCIA | Retooling for Climate Change |
| 45 | BCSLA | 151 Continuing Education and Life[long] Learning Ideas for BC Landscape Architects (2018) |
| 46 | BCSLA | BC Land Summit |
| 47 | CAB | BC Land Summit |
| 48 | CAB | Keeping up with Environmental Change 2019 (annual) Workshop |
| 49 | EGBC | BC Land Summit |
| 50 | EGBC | Challenges and Opportunities for Sustainability in the Lower Mainland |
| 51 | EGBC | Sustainability in Engineering and Geoscience |
| 52 | PIBC | BC Land Summit |

Other

- | | | |
|----|--------|---|
| 53 | ASTTBC | 2019 AGM, Conference, & Technology Awards Luncheon: Shaping the Future Together |
| 54 | ASTTBC | 2019 CSLA Annual Conference - CSLA Committee on Climate Adaptation meeting |
| 55 | ASTTBC | Risks and Opportunities for Engineers and Geoscientists in a Changing Climate |
| 56 | BCIA | Adapting to Climate Change, 2017 AGM |



57	BCIA	Bettering Environmental Stewardship & Technology Conference (BEST 2019)
58	BCIA	European Institute of Innovation and Technology (EIT) Climate-KIC (Knowledge and Innovation Community)
59	BCSLA	2019 CSLA Annual Conference - CSLA Committee on Climate Adaptation meeting
60	CAB	2019 AGM, Conference, & Technology Awards Luncheon: Shaping the Future Together
61	CAB	Bettering Environmental Stewardship & Technology Conference (BEST 2019)
62	CAB	EGBC Annual Conference & 100th AGM
63	EGBC	EGBC Annual Conference & 100th AGM
64	EGBC	Navigating Complexity Webinar
65	EGBC	Navigating Complexity Webinar
66	EGBC	Risks and Opportunities for Engineers and Geoscientists in a Changing Climate
67	PIBC	Advancing Collaborative Climate Adaptation in BC
68	PIBC	Climate Services in the Private Sector: Integrated climate services into on-the-ground decision making

Planning

69	BCIA	Webinar: Planning for Resilience and Reconciliation in the Face of a Changing Climate
70	CAB	Webinar: Planning for Resilience and Reconciliation in the Face of a Changing Climate
71	PIBC	10th Annual SCARP Symposium: Encompass: Resilience Planning for the Social Implications of CC
72	PIBC	BCPRA Annual Symposium Conference: Making it Matter - Parks and Other Public Spaces: Creating Vibrant & Healthy Communities for All
73	PIBC	PIBC 2018 Annual Conference: The Game Plan! - The Changing Climate of Planning Policy: A More Sustainable & Resilient Framework, Climate Action - Mandate MashUp, Step-ing it Up! A Chance to Grill Planners Who Have Adopted the Energy Step Code, etc.

Restoration

74	BCSLA	40th Annual Professional Biology Conference and AGM - Building Literacy on Climate Resilience in the Okanagan, Restoring Ecosystems in a burning province: Can the damage be reversed?
75	BCSLA	ER505: Climate Change in Ecological Restoration
76	CAB	40th Annual Professional Biology Conference and AGM - Building Literacy on Climate Resilience in the Okanagan, Restoring Ecosystems in a burning province: Can the damage be reversed?
77	PIBC	ER502: Ecosystem Design Through Propagation of Native Plants
78	PIBC	ER505: Climate Change in Ecological Restoration

Species

79	CAB	Salmonid Enhancement Program Community Workshop - 2019 "Life in the Salmonsphere"
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Urban

80	ABCFP	SFU: Natural Assets and Climate Change Resiliency
81	ASTTBC	EcoCity World Summit 2019 - urban design, bio geo physical conditions, socio-cultural features, ecological imperatives
82	BCIA	EcoCity World Summit 2019
83	PIBC	2018 Asset Management BC Annual Conference: Competing Priorities in a Changing World
84	PIBC	Climate Change in the Urban Environment: Essential Steps to Enabling Resiliency
85	PIBC	EcoCity World Summit 2019
86	PIBC	Natural Assets and Climate Change Resiliency
87	PIBC	Toward a Resilient BC: Implementing Strategies to Reduce Natural Hazard Risk in BC's Built Environment

Water

88	ABCFP	Fraser Watershed Restoration Conference 2019
89	ABCFP	Regulated Rivers II: Science, Restoration, and Management of Altered Riverine Environments - Effects of climatic and flow-path modification on water quality in the upper Columbia Basin
90	ASTTBC	Wastewater Management Association of BC 2019 Convention
91	ASTTBC	Fraser Watershed Restoration Conference 2019
92	ASTTBC	Urban Watershed Planning
93	ASTTBC	Introduction to hydrogeology and groundwater management
94	BCIA	Fraser Watershed Restoration Conference 2019
95	BCIA	Regulated Rivers II: Science, Restoration, and Management of Altered Riverine Environments - Effects of climatic and flow-path modification on water quality in the upper Columbia Basin
96	BCIA	Wetland Conference & events *Cumberland* by BC Wildlife Federation - keynote Loys Maingnon; Water and Ice: Geology and hydrology of the Cumberland wetlands
97	BCSLA	Second Annual Vancouver Island Symposium on Water Stewardship in a Changing Climate
98	CAB	Second Annual Vancouver Island Symposium on Water Stewardship in a Changing Climate
99	CAB	Regulated Rivers II: Science, Restoration, and Management of Altered Riverine Environments - Effects of climatic and flow-path modification on water quality in the upper Columbia Basin
100	EGBC	Design Flood Hydrology for BC Natural Resource Professionals
101	EGBC	Professional Practice Guidelines for Flood Mapping in BC
102	EGBC	Coastal Hazards and Sea Level Rise Seminar
103	EGBC	Webinar: Watersheds in Four Dimensions
104	EGBC	Hydrologic Modelling with the Raven Framework
105	EGBC	Coastal Hazards and Sea Level Rise Seminar
106	EGBC	Aspects of Flood Management in BC
107	EGBC	Advanced Stormwater Management
108	EGBC	Climate Change and Water Management Seminar



109	EGBC	Urban Watershed Planning
110	EGBC	Introduction to Hydrogeology and Groundwater Management
111	EGBC	BCWWA Annual Conference: The Rise of Water, keynote Angry Planet host George Kourounis
112	PIBC	Rising Waters: Floodplain Management in the Lower Mainland
113	PIBC	Planning and Building for Regional Flood Resilience
114	PIBC	Second Annual Vancouver Island Symposium on Water Stewardship in a Changing Climate
115	PIBC	Second Annual Vancouver Island Symposium on Water Stewardship in a Changing Climate.

Wildfire

116	ABCFP	Wildfire adaptation - Modification of forest management practices for wildfire adaptation
117	ABCFP	WCC Spring 2019: Firesmart in BC
118	ABCFP	WCC Spring 2019: Identifying Barriers to Community Action
119	ABCFP	WCC Spring 2019: Effectiveness of Fuel Treatments
120	ABCFP	WCC Spring 2019: Wildfire Risk Reduction in National Parks
121	BCIA	Landscape and Community Scale Wildfire Risk Reduction for Whistler, BC
122	BCIA	Webinar: FireSmart in BC
123	CAB	Landscape and Community Scale Wildfire Risk Reduction for Whistler, BC
124	CAB	Webinar: FireSmart in BC
125	CAB	Webinar: Identifying Barriers to Community Action - Learning from Wildland-Urban Interface Disasters in the Past
126	CAB	Webinar: Effectiveness of fuel treatments in mitigating wildfire severity - lessons from large wildfire events in the interior Pacific NW

Courseware accessed from post-secondary institution websites

Agriculture

1	UVic	Northern Agriculture and Climate Change Research Forum
2	UVic	The Psychology of Change: Achieving a Transformation of the Global Food System

Climate change mitigation/Low carbon resilience

3	SFU	Low Carbon Resilience and BC Professional Associations Webinar
4	UVic	Evaluating our Climate Policy Options for Accelerating GHG Reduction
5	UVic	Health Impacts of Heat: Adapting to a Changing Climate

Energy

6	SFU	Renewable Energy Transition Strategies
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7	UVic	100% Renewable Energy Communities: Lessons From Germany With Dr. Manfred Fishedick
8	UVic	100% Renewable Transit: Seattle and Vancouver
9	UVic, PCIC	Awesome Potential: Airborne Wind Energy's Opportunities And Challenges
10	UVic, PICS	Awesome Potential: Airborne Wind Energy's Opportunities And Challenges
11	UVic	Carbon Pricing 2.0: Lessons From California And BC
12	UVic	Mathematical Sciences & Clean Energy Applications - A PICS Supported Workshop
13	UVic	Renewable Natural Gas - Unlocking Local Government Potential In BC

Forests

14	UVic	ER328: Forest Restoration and Sustainable Forestry
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General

15	SFU	Can We Avoid A Climate Catastrophe?
16	SFU	Climate Change? Yawn. It Hasn't Affected Our Lives Yet, So Why...
17	UVic	Weather And Climate On Vancouver Island

Health

none

Infrastructure

18	SFU	A Regional Approach to Biodiversity-Led Green Infrastructure
19	SFU	Next-Generation Transportation Certificate
20	UBC	Urban Systems
21	UVic	Bioenergy: Opportunities and challenges of harnessing waste to reduce GHGs
22	UVic	Hammers and Nails: Strategies for Addressing Climate Change in BC Communities
23	UVic, PCIC	Infrastructure for a low-carbon planet
24	UVic, PICS	Infrastructure for a low-carbon planet
25	UVic	New energy and mobility futures with Ethan Zindler
26	UVic	Prefab Wood Construction: Meeting B.C.'s ambitious energy, climate and economic objectives
27	UVic, PCIC	Reducing climate impacts in industrial buildings
28	UVic, PICS	Reducing climate impacts in industrial buildings



Modeling

29	UVic	A climatology of mechanisms that generate intense extratropical cyclones in the northern hemisphere
30	UVic	Applying machine learning methods to the environmental sciences—opportunities and pitfalls
31	UVic	Challenges in continental-domain hydrologic modelling
32	UVic, PCIC	Coupling ice sheets into climate models for self consistent sea level projections: progress and challenges
33	UVic, PICS	Coupling ice sheets into climate models for self consistent sea level projections: progress and challenges
34	UVic	The role of complex modelling in climate science
35	UVic	Understanding and modelling weather and climate extremes: challenges and opportunities for science and society
36	UVic	What can we learn about temperature extremes from millennial-scale equilibrium climate simulations?
37	UVic	You want how many climate variables?! towards multivariate bias correction and downscaling to support climate-impact modelers

Multi-faceted

38	SFU	Advancing Collaborative Climate Adaptation in British Columbia
39	SFU	Climate Change Adaptation Governance in BC: Workshop Proceedings
40	SFU	Climate Futures
41	SFU	Degrees of Change Live Recording
42	SFU	To Catch a Falling Sky
43	UVic	2018 CIRC Forum: Cumulative impacts policy and practice in northern BC
44	UVic	Beyond Climate Impacts....to Inspiring Solutions. Film screening and panel discussion
45	UVic	Climate Policy in Europe
46	UVic	Climate Solutions Showcase
47	UVic	Conference: State-City Collaboration on Clean Energy Transformations
48	UVic	EnVision Conference 2019: Accelerating Energy System Transformation
49	UVic	Event attribution - are we doing it reliably?
50	UVic	Germany's energy transition and cities: Economic insights and good policy
51	UVic	Ideafest - Climate change, water and governance: Challenges and opportunities in our backyard, and for our Earth
52	UVic	Impacts and risks of 1.5 and 2 degrees of warming
53	UVic	Investing Powerfully: How can universities go carbon neutral?
54	UVic	Limiting Global Warming to 1.5 degrees: What Does it Take & is it Worth it?



55	UVic	Love & Turtles: Reflections on the Art, Change, and Creativity (ACC) research project, and initial analyses of exhibition-collected “pebbles” on climate change
56	UVic	Making the Links 2018: Climate Change, Community Health & Resilience
57	UVic	Perspectives from climate services in Europe
58	UVic	Solutions for 1.5 Degrees
59	UVic	The Science of 1.5 degrees
60	UVic	Who We Are with Elizabeth May
61	UVic	Why the Paris Agreement Negotiations Succeeded while Those in Copenhagen Failed
62	UVic	You, Me & the IPCC

Other

63	SFU	Social Innovation Certificate courses
64	SFU	Women's Participation and Leadership in Climate Solutions
65	UVic	The Big Melt? Canada's Interests in a Changing Arctic

Planning

66	UVic	BC Advanced Conservation and Efficiency (BC ACE) Discussion with Climate Scientist – Trevor Murdock
67	UVic	British Columbia's Climate Plan and the Urban Opportunity

Restoration

68	UVic	ER338A: Special Topics in Environmental Restoration: Climate Change in Ecological Restoration
69	UVic	ER502: Ecosystem Design through Propagation of Native Plants
70	UVic	ERR501: Design Principles for Natural Processes
71	UVic	Green Shores Training Program: Level 1 Workshop
72	UVic	Green Shores Training Program: Level 2 Workshop

Species

73	UVic	The Future of Fishes and Fisheries in the Changing Ocean
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Urban

74	SFU, Prof	Climate Change in the Urban Environment: Essential Steps to Enabling Resiliency
75	SFU, ACT	Climate Change in the Urban Environment: Essential Steps to Enabling Resiliency
76	SFU	Community Capacity Building Certificate
77	SFU	Natural Assets and Climate Change Resiliency
78	SFU	NGTC101: Next-Generation Cities and Transportation



79	SFU	Urban Design Certificate courses
80	UBC	One Day at UBC: Cities to the Rescue-Urban Environmental Policies and Their Role in Global Climate Policy
81	UVic	Resilient Cities: An Integrated Economic Approach to Natural Hazard Risk Mitigation

Water

82	SFU	North Shore Rain Garden Project
83	UVic, PCIC	Disentangling the impacts of climate change and human interventions on the hydrology of key Canadian watersheds
84	UVic, PICS	Disentangling the impacts of climate change and human interventions on the hydrology of key Canadian watersheds
85	UVic	Humans and the Water Cycle
86	UVic	Seasonal glacier mass balance from airborne laser altimetry, Columbia River Basin, Canada
87	UVic	Water, Peace and Global Security: Canada's Place in a Changing water World

Wildfire

88	UVic	Are recent extreme fire seasons in BC attributable to human-induced climate change?
89	UVic	ER338B: Special Topics in Environmental Restoration: Fire Ecology
90	UVic	Our World on Fire

Additional potentially relevant courses

An additional list of courses was identified, that did not include any specific mention of climate adaptation in the calendar description or title. Those courses are not listed here but that may either include adaptation content or that might be modified to include because of their topic relevance to climate adaptation.



PART 2: PROFESSIONAL ASSOCIATION MEMBER SURVEY

Part 2 of the Gap Analysis involved a survey of professionals from seven BC professional organizations in spring 2019. The survey explored the self-perceived needs and priorities of BC professionals from seven associations, for ongoing climate change adaptation education. 703 members from the associations listed below participated in the survey.

Professional Organization	Membership
Association of British Columbia Forest Professionals (ABCFP)	5,300+
Applied Science Technologists and Technicians of British Columbia (ASTTBC)	10,215
British Columbia Institute of Agrologists (BCIA)	1,300+
British Columbia Society of Landscape Architects (BCSLA)	600-700
College of Applied Biologists (CAB)	2,300
Engineers and Geoscientists of British Columbia (EGBC)*	34,000
Planning Institute of British Columbia (PIBC)	1,500+



THE SURVEY

The *ALN Project* survey of BC professionals builds on two substantial climate change studies targeting professionals. In 2018, the BC Climate Action Secretariat (CAS) commissioned the ***Continuing Professional Development for Climate Change Adaptation in BC Scoping Study***, undertaken by the Pacific Institute for Climate Solutions (PICS) and Simon Fraser University (SFU)'s Adaptation to Climate Change Team (ACT). This scoping study involved a gap analysis of existing and desired CPD offerings, interviews with practicing professionals throughout the province, and a workshop with representatives of professional associations and continuing education experts. It signaled strong support in BC for developing multidisciplinary climate change adaptation CPD offerings, which interpret complex theoretical knowledge into practical knowhow and profession-specific materials. Recommendations for CPD included delivery methods that support easy access and multi-disciplinary participatory activities; a design approach that integrates continuing studies adult learning theory with content domain expertise; and course topics that include both general foundations on climate change adaptation as well as profession-specific offerings. See Appendix A for a more comprehensive summary.

The second study, by The Kresge Association, similarly examined American professionals in 2017. ***Professional Societies and Climate Change: An analysis of how urban-focused professional societies are integrating climate change into their member engagement activities*** reviewed publicly available material for 41 American professional societies to understand whether and how they were discussing climate change with their members, and then interviewed a subset of them. There was a wide variation in the level of sophistication and breadth of resources used to engage and educate society members. However, some clear themes emerged with recommendations to mainstream climate change into operations and engagement strategies of professional societies. These are outlined in Appendix B and will be further discussed in a future version of this report.

The *ALN Project* survey was designed to better understand:

- How BC professionals perceive their own level of knowledge of climate change;
- How BC professionals perceive their awareness of existing climate change adaptation tools and frameworks;
- The range of climate change-related challenges and issues BC professionals encounter or expect to encounter in their work;
- The extent to which BC professionals are already considering climate change in their work;
- How BC Professionals discover and select their CPD; and
- Their interests and needs that could be addressed with climate change adaptation CPD in the future.

The survey included both quantitative and qualitative questions. The qualitative questions have been analyzed in their own right, and individual responses have been inserted throughout the report to add context and illumination to the quantitative results. The following are some pertinent responses to set the scene:

- *There are many independent efforts occurring related to climate change and adaptation (e.g. municipalities, local government, provincial government). It seems some efficiencies could be made by combining and coordinating efforts to some degree, realizing that each entity is facing their own specific challenges.*
- *Please contact BC Agriculture climate adaptation research network (ACARN - bcacarn.com) and the Climate Action Network (CAI - bcagclimateaction.ca) both these organizations are doing a significant amount of the work you have proposed in the survey.*
- *We should be learning more from other regions of the world that have experience with climate*



- *impacts and adaptation. I would like to see us create linkages with 'sister' regions to transfer experiential knowledge. I would also like to see CPD that updates monitoring techniques and equipment-related knowledge to ensure we use appropriate indicators and methods to anticipate climate impacts.*
- *How to connect with others working in the same area. How to advance much more quickly than we are currently. To create a sense of urgency among decision makers and the public. Communication tactics would help.*
- *As well as practitioners and policy makers, councils and community leaders need to be educated about adaptation as they review and pass judgement on new policy, development proposals, etc.*
- *Need to integrate the environmental, economic and social issues, impacts and aspects - that's where the solutions are to be found.*
- *Adaptation is an iterative process which requires sustained collaboration and action.*
- *I think it is essential to understand how the dots are connected - from how we cause climate change, to how it impacts us, to how we can and must urgently mitigate and adapt to it and how the future in a low carbon, resilient and equitable world will be so much better than what we have now.*

METHODS

The ALN Project survey was crafted by the BC Professionals Adaptation Network Project organizing team and Jack Sarewitz of ACT, with feedback from BC's Climate Action Secretariat. The survey was administered through the mailing lists of seven participating professional organizations, primarily through newsletters or notices.

Data were collected in Survey Monkey in a password-protected Royal Roads University account. The survey was open for 26 days (March 14th to April 8th, 2019). Results were examined with Survey Monkey's analysis tool and Microsoft Excel. The complete set of survey questions is provided in the report's Appendix C.

Note: In this report, the terms professional 'organization' and professional 'association' are used interchangeably. Also, survey respondents did not answer every question; statements such as "percent of respondents" generally refer to the respondents to the question, not the entire survey.



SURVEY RESPONDENTS

There were 703 responses to the survey. Response rates ranged from less than 1% to nearly 15% (Table 1). Nearly 60% of all responses were from two organizations: ASTTBC and BCIA (Figure 1). (See Appendix D for 'Other organizations.')

Most respondents were relatively new to their organizations, with 27% reporting they were members for less than 5 years, and 22% for 5-10 years. Many respondents belonged to two or more organizations (Table 2).

Table 1. Membership response rates

Organization	Response rate (% of membership)
ABCFP	$41 / 5,300 = 0.8$
ASTTBC	2.6
BCIA	14.7
BCSLA	$51 / 650 = 7.8$
CAB	6.1
EGBC	0.09
PIBC	2.1

Figure 1. Composition of survey respondents

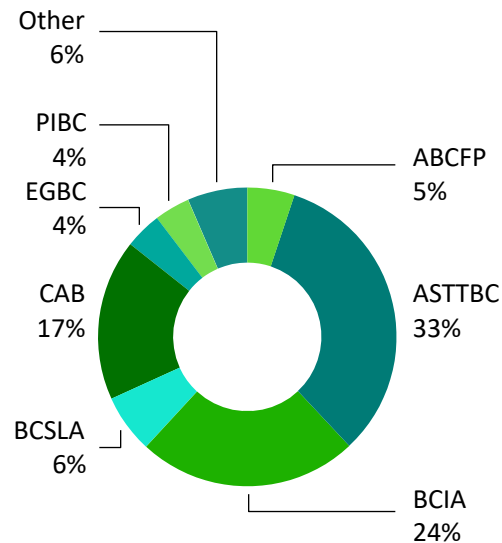


Table 2. Membership in participating and other organizations

	ABCFP	ASTTBC	BCIA	BCSLA	CAB	EGBC	PIBC	Other
ABCFP	41	2	9		6	3		2
ASTTBC	2	264	2	2	3	10	1	29
BCIA	9	2	191	1	11	5	2	9
BCSLA		2	1	51	1			1
CAB	6	3	11	1	140		1	9
EGBC	3	10	5			32	1	
PIBC		1	2		1	1	31	
Other	2	29	9	1	9			52



EMPLOYERS (QUESTION 3)

Employers (Question 3)

Most respondents were employed by private sector companies (41%) and as independent consultants (26%) (Figure 2). More than half worked for federal (5%), provincial (23%), or local governments (23%).

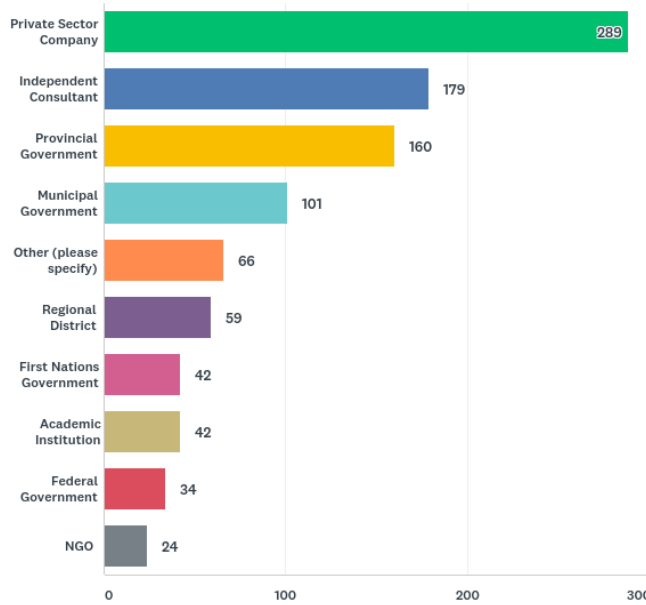


Figure 2. "I currently work for...."

Respondents could choose as many types of organizations as they wished. 'Other' responses included retired, student, Crown corporations, and public sector organizations such as school districts and health authorities.

JOBS (QUESTION 4 &5)

More than 42% of respondents cited project management as one of their top three job responsibilities (Figure 3).

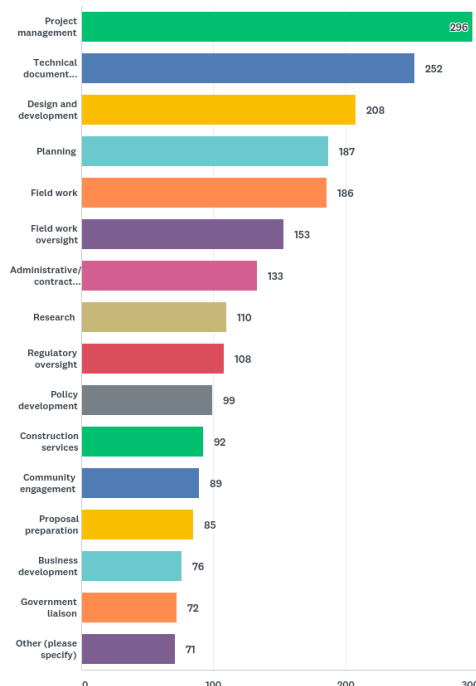


Figure 3. Primary job responsibilities

Respondents were asked to choose up to three responsibilities. 'Other' responses included "...strategy technical coordinator", wildlife assessment, review of work of other qualified professionals, material testing, lab analysis, scientific advice, occupational health and safety, reviewing documents and writing comments, student, securing customers, impact management/mitigation, adjudication of water license applications, and people management.



LOCATIONS (QUESTION 8)

Respondents worked in all regions of the province but were concentrated in the most populous areas (i.e., Metro Vancouver, Fraser Valley, and the Capital Region) (Figure 4).

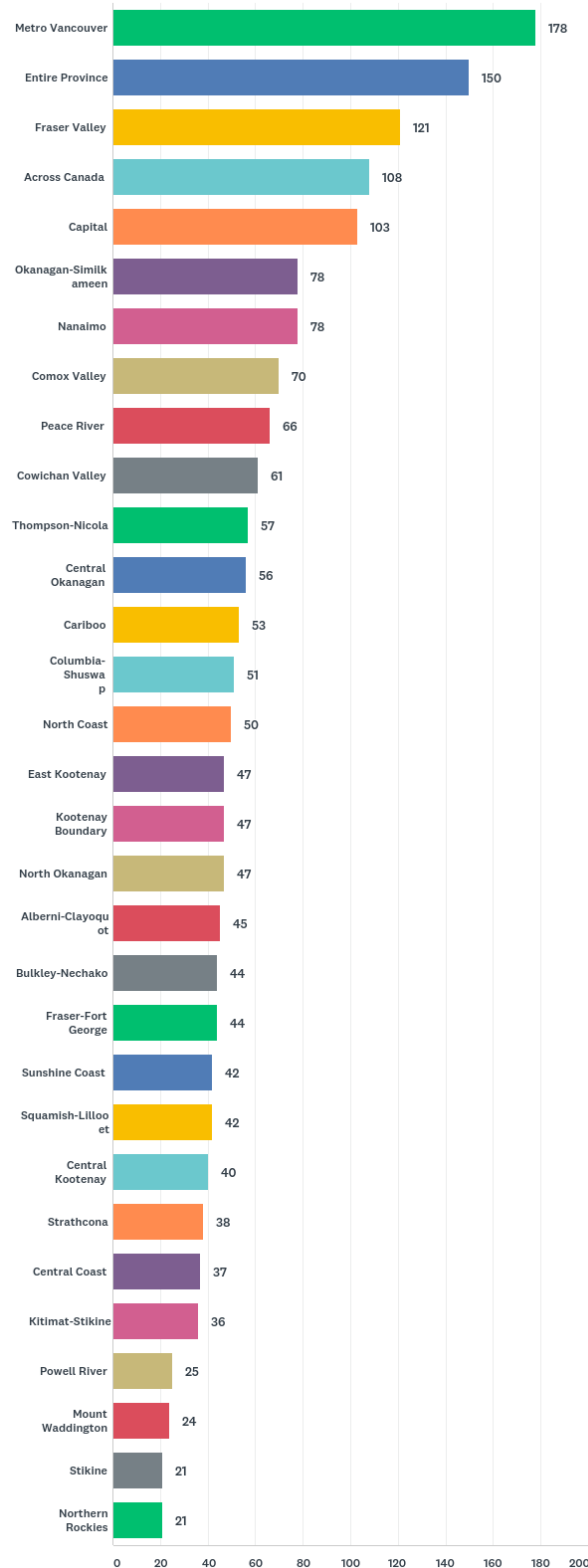


Figure 4. Geographic places of work

Respondents were asked where their work “primarily focused”. They could select as many regional districts as they wished, as well as ‘entire province’, ‘across Canada’. There are some minor ‘errors’ in this chart. There are 27 regional districts in BC. Northern Rockies Regional District, formerly Fort Nelson-Liard Regional District, is now Northern Rockies Regional Municipality. Stikine is in the Regional District of Kitimat-Stikine. Powell River Regional District has been renamed qathet Regional District. Missing is the Islands Trust, a federation of local governments serving islands in the Salish Sea.

Specific responses included:

- *I have missed a couple of opportunities because I wasn't willing to travel, I feel like using webinars or other virtual platforms that can prevent all the travel makes sense to prevent generating a carbon footprint*
- *make it easy and accessible. many members live in remote areas and travel can be difficult.*
- *How to work with First Nations groups to bring the visions and goals to life*



LEARNING ABOUT CPD (QUESTION 9)

Respondents were most likely to discover CPD opportunities from their organizations (82%) (Figure 5). Notably, some of the other offerings (e.g., conference-conference-related brochures) may also arise from associations.

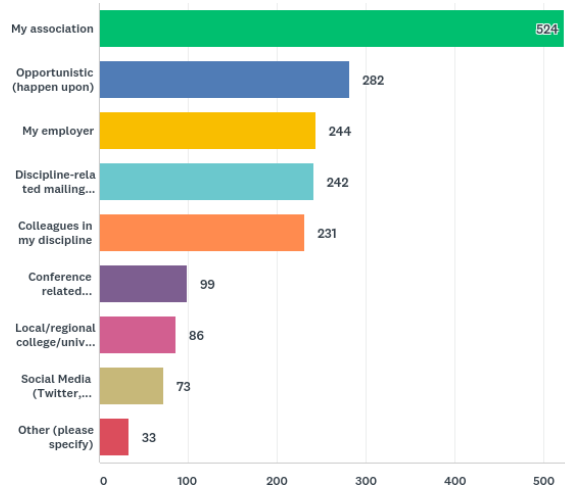


Figure 5. Learning about CPD

Five percent of total responses were 'Other'. These included other professional associations, similar organizations in other jurisdictions, non-profit organizations, self-taught education, edx.org [MOOC], publishers, periodicals, scientific organizations, webinars, word of mouth from others outside of the discipline, project work, labs, clients, suppliers/contractors, government, and web searches. Some respondents included specific organizations, such as Fraser Basin Council, Columbia Mountains Institute of Applied Ecology, and BC Housing.

DECIDING ON CPD (QUESTION 11)

Where respondents *learned* about CPD may have had some impact on how they came to *decide* on CPD. However, many appeared to weigh several factors, such as travel (Figure 6). Fourteen percent of total responses were 'other'. These respondents tended to be highly deliberate in their selections. Some weighed ease of attending, including cost, travel, scheduling, childcare, and courseware design (e.g., self-directed). Some considered recommendations by employers or managers, reputation of institution, relevancy to work or career goals, competencies and opportunities for advancement, organizational needs, themes or trends, skill-building with technical equipment, knowledge of codes and regulations, networking, and community engagement.

Discussions with colleagues often played a role.

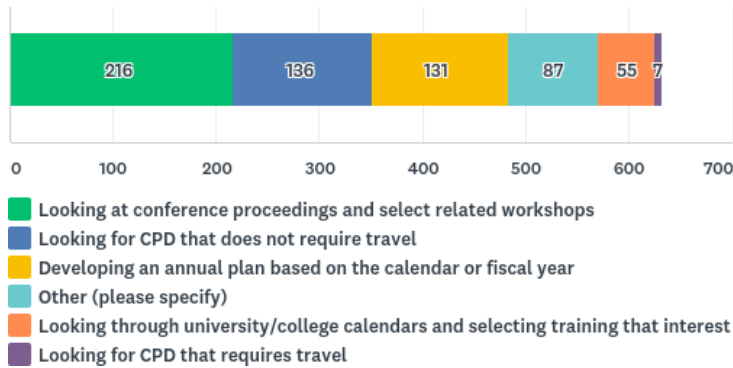


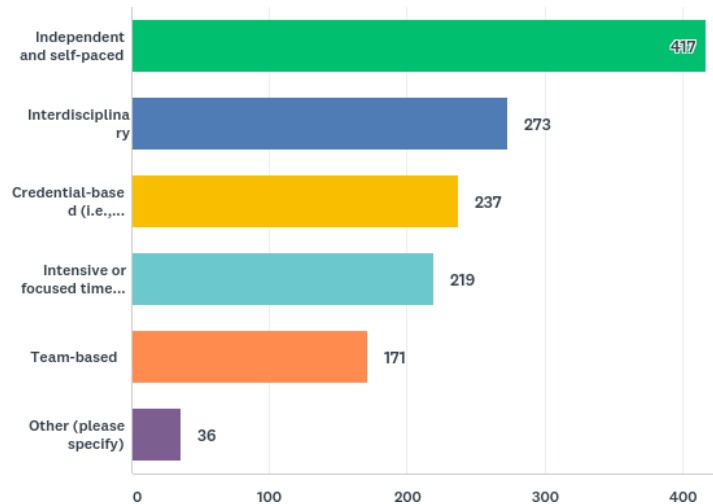
Figure 6. Deciding on CPD

LEARNING APPROACHES (QUESTION 12)

Respondents had a range of learning approaches or styles, including independent and self-paced (65%), interdisciplinary (43%), credential-based (37%) and intensive or focused time to learn deeply (34%) (Figure 7).

'Other' responses (6% of total responses) included hands-on, onsite or field training; face-to-face; applied ("i.e., grounded in projects, whether real or hypothetical"); learning by doing; on the job; "college courses"; local, regional; "staying connected with my community"; expert-led; mentoring; "learning by assisting/teaching/working with senior customer engineers and research centres developing new processes"; "active learning"; "passive - reading, listening"; and "idiosyncratic".

Figure 7. Learning approaches



COST (QUESTIONS 10, 13 AND 14)

More than 28% of respondents (or their employers) spent between \$300 and \$800 on their CPD each year, and 21% spent more than \$800. Yet, cost was a factor for many.

When respondents were asked what their top three choices for learning would be if cost was *not* an issue, they prioritized:

- in-person workshops (e.g., full day) (51% of all responses),
- in-person workshops associated with a professional conference (e.g., half day) (38%),
- multi-day intensive in-person courses (30%), and
- in-person workshops (e.g., half day) (29%).

When cost *was* an issue, they chose:



- self-directed online courses (41%),
- brief online courses (e.g., 1 hour) (36%),
- short live webinar with opportunity to ask questions and hear others' questions (e.g., 1 hour) (32%), and
- online short courses (e.g., 1 day) (30%).

Specific responses of note included:

- *Need combination of carrots and sticks. Early adopters will always adopt, laggards will always lag, need standardized mandate at the professional practice and/or provincial level to ensure adoption*

KNOWLEDGE OF CLIMATE CHANGE (QUESTION 19)

Most respondents perceived their own understanding to be good (40%) or moderate (32%) (Figure 8).

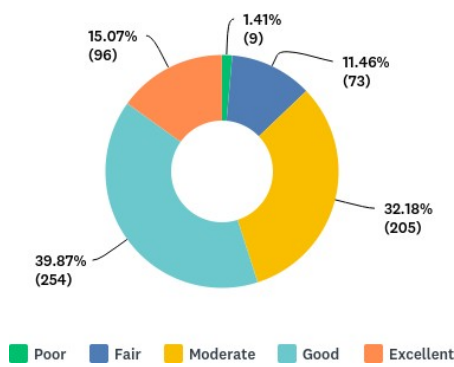


Figure 8. Perceived understanding of climate change.

AWARENESS OF TOOLS AND FRAMEWORKS (QUESTION 23)

A third of all respondents agreed with the statement, "I am aware of climate change adaptation-specific tools and frameworks relevant to my field," but only 8.5% strongly agreed. Nearly a third were neutral, and more than 26% disagreed or strongly disagreed, suggesting there is a need and opportunity to improve this measure.

PREVIOUS CLIMATE CHANGE CPD (QUESTION 20)

Most respondents had not taken climate change adaptation CPD (61%, n=387).

CURRENTLY CONSIDERS CLIMATE CHANGE ADAPTATION AT WORK (QUESTION 22)

A majority of respondents claimed to consider climate change adaptation into their work (54.5%) (Figure 10).

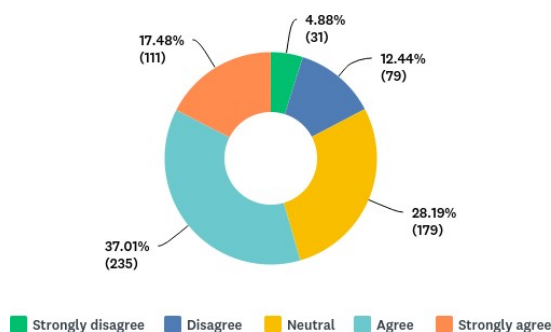


Figure 10. Currently integrate a consideration of climate change adaptation in my work.



MOTIVATED TO CONSIDER CLIMATE CHANGE AT WORK (QUESTION 16)

A majority of respondents were motivated to understand and consider the impacts of climate change in their work (88%)(Figure 11).

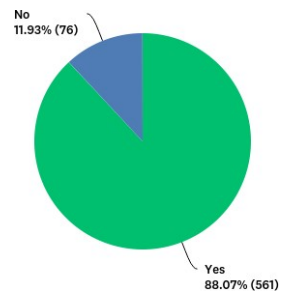


Figure 11. “I am motivated to understand and consider the impacts of climate change.”

EXPECTS TO CONSIDER CLIMATE CHANGE ADAPTATION AT WORK (QUESTION 21)

Most respondents believed their work “requires, or will require, an understanding and integration of climate change adaptation” (38% agreed, and 39% strongly agreed, for a total of 77%) (Figure 12).

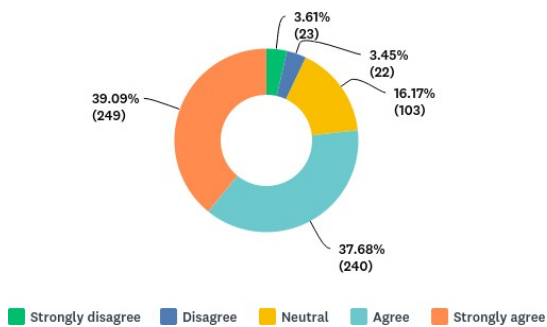


Figure 12. Work requires or will require a consideration of climate change adaptation in my work.



MOTIVATED TO TAKE CLIMATE CHANGE ADAPTATION CPD (QUESTION 17)

Still a large majority of respondents were motivated to take climate change adaptation CPD (82%) (Figure 13). At least 80% of respondents would take climate change adaptation CPD within the timeline of the ALN Project project (Figure 14).

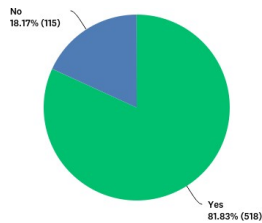


Figure 13. "I am motivated to take climate change adaptation CPD."

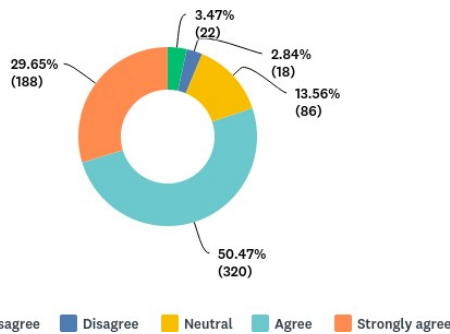
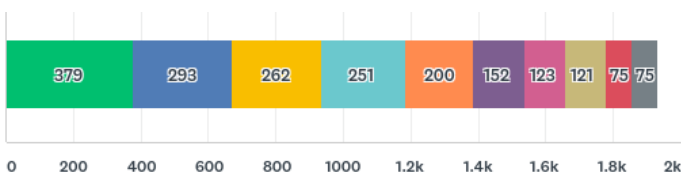


Figure 14. "I would take climate change adaptation CPD in the next 1-3 years if it were available."

CPD INTERESTS (QUESTION 15)

What did BC professionals wish to learn? Of greatest interest were applied, advanced principles, concepts, and processes specific to one's profession (60%), followed by technical knowledge and practices (47%) (Figure 15). A significant proportion of respondents were interested in learning about the application of basic principles (42%), and interdisciplinary scenarios and experiences focused on sharing knowledge and practices (40%). Nearly a third wanted to learn to use specific adaptation tools.

Figure 15. Climate change adaptation CPD of greatest interest.



Respondents were asked to identify the climate change adaptation CPD of greatest interest to them, by selecting their top 3 choices among 10 options.

- Application of advanced principles, concepts, processes specific to my profession
- Technical and sector specific knowledge and practices
- Application of basic principles, concepts, processes specific to my profession
- Cross disciplinary scenarios/experiences focused on sharing knowledge, practice
- Training in the use of specific adaptation tools
- Multi-sector regional/local case studies
- Basic concepts, principles and processes of climate change and adaptation
- Sector specific regional/local case studies
- Sector-specific provincial case studies
- Multi-sector provincial case studies

regulations exist and how to make
currently available when making



DISCIPLINE/SECTOR-SPECIFIC OR INTERDISCIPLINARY/CROSS-SECTOR (QUESTION 24)

With whom did they wish to learn? More than 62% of respondents recognized the benefits of discipline and sector-specific CPD, as they agreed (50%) or strongly agreed (12%) that “the most effective climate change adaptation CPD would bring professionals together within my discipline/sector”. In a separate question, a greater proportion of respondents (74%) thought the most effective climate change adaptation CPD would bring professionals together from multiple disciplines/sectors (49% agreed, 25% strongly agreed).

Specific responses of note included:

- *“Basically, integration/collaboration of all disciplines involve with the Project Design in considering climate change.”*
- *If there could be courses offered that were discipline/industry specific that would be great.*
- *Making it relevant to one's own profession or discipline is helpful to actually engaging in it as CPD.*
- *All sectors, government and industry, and the general public need to know what can be done... make this as interdisciplinary as possible please :)*

RATIONALE FOR TAKING CPD (QUESTION 18)

What would motivate BC professionals to take climate change adaptation CPD? Most respondents wished to take CPD for professional training (72%), and/or to develop or participate in an interdisciplinary or discipline-specific climate change adaptation learning community (62% and 54% respectively, reiterating the sector and cross-sector findings above) (Figure 16).



Figure 16. Reasons for taking climate change adaptation CPD.

Respondents were asked to select their top 3 choices. Selections that are cut off in the chart should read, “learning community focused on climate change adaptation issues and practices”.



ADDITIONAL QUESTIONS

Survey question #28, “What issues related to climate change adaptation do you see as a priority for your profession and/or for your discipline?” drew 450 responses. The total number of categorized issue responses was 618; many respondents offered responses in multiple issue categories.

In our analysis, Seventy-four (74) issue categories were identified, some noted only once, with one category being noted across all professions with a high of 101 mentions (“water management-planning”); as this was not a statistical survey, categories with only few counts may still be important as a courseware topic.

Approximately 12 percent of the respondents were members of more than one profession, and this led to a broader spectrum of responses including multiple issue categories.

Almost 20 percent of the categorized issue responses were some of same kind of “challenge areas” identified in the responses to Question #27 – e.g., costs; data gaps; funding; frameworks; knowledge gaps; integration into practice; policies, regulations, practices; standards, guidelines, tools; etc. These challenge areas are noted in yellow in Table 1.

While there is clearly some relationship between the kind of issues and the profession (e.g., foresters noted “forest management-planning” related issues more than other professions), this correlation appeared to be minimal.

Excluding the responses that were more akin to ‘challenge’ areas (as noted above), the following issue topics were mentioned most prevalently (15 and above mentions).

- a. water management-planning – 101
- b. ecosystem management-planning – 35
- c. wildfire management-planning – 35
- d. building/construction design – 25
- e. forest management-planning – 18
- f. sea level management-planning – 17
- g. agriculture management-planning – 16 (note – crop, grassland and soil management-planning would add 9 more)

More detailed subject matter information for each of these issue areas, and hence potential courseware topics and content, can be gleaned from the detailed responses within the raw response information presented in the Appendix E.

Table 1 below provides a summary of the issue categories by profession sorted by the prevalence of their mentions.

Categories with total mentions of 10 and above are shaded blue. Again, those responses that were more akin to ‘challenge’ areas are highlighted in yellow.

Those responses categories with total mentions fewer than 10 are presented in the following pages.


Table 1 - Summary of Issues Categories (sorted by prevalence of mentions)

CATEGORY	AGR	BIO	E&G	FOR	LA	PLN	TECH	OTHR	Total*:
WATER MANAGEMENT-PLANNING	28	19	7	2	15	3	24	3	101
ECOSYSTEM MANAGEMENT-PLANNING	10	19	1		5				35
WILDFIRE MANAGEMENT-PLANNING	18	5	2	4	3	2	1		35
KNOWLEDGE GAPS	8	11		2	1	2	6	2	32
INTEGRATION INTO PRACTICE	3	12	2		4	3	5	1	30
BUILDING/CONSTRUCTION DESIGN		1			4		14	6	25
FOREST MANAGEMENT-PLANNING	4	4		10					18
SEA LEVEL MANAGEMENT-PLANNING			1		8		7	1	17
AGRICULTURE MANAGEMENT-PLANNING	12	1		1	1	1			16
ECOSYSTEM/HABITAT MANAGEMENT-PLANNING	2	10		2					14
INFRASTRUCTURE MANAGEMENT-PLANNING	1	2	3			2	4	2	14
POLICIES REGULATIONS	2	3	1	1	1		4	1	13
ENERGY MANAGEMENT-PLANNING			1			1	6	4	12
PUBIC ENGAGEMENT EDUCATION	4	1	2			1	3	1	12
LAND MANAGEMENT-PLANNING	4	5	1			1			11
EMISSIONS MANAGEMENT-PLANNING	4	1				1	3	1	10
EXTREME WEATHER PLANNING-RESPONSE	1				2		6	1	10



CATEGORY	AGR	BIO	E&G	FOR	LA	PLN	TECH	OTHR	Total*:
VEGETATION MANAGEMENT-PLANNING	1	1			6				8
KNOWLEDGE GAPS GENERAL	3		1			1	2		7
LANDSCAPE DESIGN					7				7
WASTE MANAGEMENT-PLANNING	1						6		7
CROP MANAGEMENT-PLANNING	5	1							6
INTEGRATION ACROSS SECTORS	1	1			1	2	1		6
COASTAL ZONE MANAGEMENT-PLANNING		1			1	1	2		5
FISHERIES MANAGEMENT-PLANNING	1	4							5
OCEAN MANAGEMENT-PLANNING	3	2							5
TRANSPORTATION MANAGEMENT-PLANNING		1				1	3		5
COMMUNITY PLANNING	1	2			1				4
FOOD MANAGEMENT-PLANNING	3				1				4
FOREST HEALTH	2	2							4
FUNDING	2						1	1	4
HEALTH PHYSICAL/MENTAL CARE	1	1			1			1	4
KNOWLEDGE INFORMATION SHARING NETWORK	1	2				1			4
RECLAMATION MANAGEMENT-PLANNING	2	1				1			4
STANDARDS GUIDELINES TOOLS	3						1		4
AIR QUALITY MANAGEMENT-PLANNING		1		1	1				3
DATA GAPS	1			1			1		3
EMERGENCY RESPONSE MANAGEMENT-PLANNING	2						1		3
GRASSLAND MANAGEMENT-PLANNING	3								3
LEADERSHIP						2	1		3
NATURAL DISASTER MANAGEMENT-PLANNING	1				1		1		3
PEST MANAGEMENT-PLANNING	3								3
(WILD)FIRE MANAGEMENT-PLANNING					1		1	1	3
AQUATIC ECOSYSTEM MANAGEMENT-PLANNING		1			1				2
COST	1						1		2
CUMULATIVE EFFECTS MANAGEMENT-PLANNING		1		1					2
ECONOMIC PLANNING						1		1	2



CATEGORY	AGR	BIO	E&G	FOR	LA	PLN	TECH	OTHR	Total*:
HAZARD MANAGEMENT-PLANNING						2			2
INDIGENOUS PEOPLES IMPACTS	2								2
INSECT AND DISEASE MANAGEMENT-PLANNING				1	1				2
MITIGATION	2								2
SOIL MANAGEMENT-PLANNING	1				1				2
TERRAIN/NATURAL DISASTER MANAGEMENT-PLANNING			2						2
WIND MANAGEMENT-PLANNING	2								2
ALTERNATIVE ENERGY DEVELOPMENT	1								1
ALTERNATIVE FEED DEVELOPMENT	1								1
DEVELOPMENT OF TECHNOLOGIES	1								1
DISEASE MANAGEMENT-PLANNING	1								1
ENVIRONMENTAL ASSESSMENT	1								1
FACILITIES MANAGEMENT-PLANNING	1								1
HEALTHCARE	1								1
HUMAN CENTRED DESIGN					1				1
INDIGENOUS ECOSYSTEM/HABITAT MANAGEMENT-PLANNING	1								1
INDIGENOUS VALUES AND RECONCILIATION		1							1
INDUSTRY CLEAN ENERGY ADOPTION	1								1
INDUSTRY DEVELOPMENT PLANNING	1								1
INFORMATION FRAMEWORKS	1								1
MONITORING		1							1
NURSERY MANAGEMENT-PLANNING					1				1
PLANNING LONG-TERM						1			1
PROFESSIONAL FRUSTRATION						1			1
RECREATION MANAGEMENT-PLANNING					1				1
SOCIAL BEHAVIOUR CHANGE COMMUNICATION						1			1
URBAN PLANNING AND DESIGN						1			1
Total relevant responses*:	160	118	24	26	71	33	105	27	564
Total responses:	176	128	27	28	75	35	120	28	617



CLIMATE ADAPTATION CHALLENGES (QUESTION 27)

There were 462 responses to question 27, “What specific **challenges** do you face in integrating a consideration of climate change risks and adaptation in your work?”

Total number of categorized challenge responses is 499, with some respondents offering responses in more than one category.

In examining the responses, there appeared to be no meaningful trends related to any particular professional group, therefore all 462 responses were analyzed together.

The 499 categorized responses were first divided into what we termed ‘practice-specific knowledge challenges’ and ‘more generic challenges’.

The practice-specific challenges related to the categorization of ‘issues’ discussed in the previous section of this report, whereas the more generic challenges were of a different nature and order. The practice-specific challenges were as follows:

PRACTISE-SPECIFIC KNOWLEDGE CHALLENGES

- *Agriculture/Crop Management*
- *Agriculture/Grazing Management*
- *Agriculture/Livestock Management*
- *Air Quality Management*
- *Water Management*
- *Ecosystem Management*
- *Ecosystem Habitat/Wildlife Management*
- *Fisheries Management*
- *Aquatic Ecosystem Management*
- *Ocean/Marine Ecosystem Management*
- *Vegetation Management*
- *Forest Management*
- *Landscape Level Planning*
- *Wildfire Management*
- *Land Development*
- *Built Environment*
- *Ecosystem Reclamation Restoration Management*
- *Chemical Analysis Interpretation*
- *Emergency Response Management*
- *Community/Social Services*
- *Electric Vehicle Management*

MORE GENERIC CHALLENGES

The more generic challenge categories and subcategories were also of two somewhat different natures. Some focused on what might be termed ‘content’ challenges (ie a framework for more generic, cross-practice course content), while some were more focused on what might be termed ‘barrier’ challenges (ie challenges to be addressed or overcome if we are to move forward). One challenge, cultural change, appeared to be a more universal challenge. These challenges were formed into the following hierarchical typologies:


CONTENT CHALLENGES
DATA CHALLENGES

- *Data Access*
- *Data Completeness (Fitness-For-Purpose)*
- *Data Costs*
- *Data Integration*
- *Data - Meta*

KNOWLEDGE CHALLENGES

- *Currency*
- *Modelling*
- *Cause-Effect Understanding*
- *Knowledge Gap – Clients (see also Client Receptivity to CCA)*
- *Knowledge Gap - Others*
- *Research*

FRAMEWORKS, PROCESSES AND TOOLS (BEST PRACTICES) AND INTEGRATION RELATED CHALLENGES

- *Directory*
- *Framework, Process, Approach*
- *Integration, Multi-Disciplinary*
- *Knowledge Translation*
- *Decision Making, Tools*

POLICY-REGULATION, STANDARDS-GUIDELINES RELATED CHALLENGES

- *Standards*
- *Policy-Regulation*

CULTURAL CHANGE / SKEPTICISM RELATED CHALLENGES
BARRIER CHALLENGES
COSTS, RESOURCES, TIME, SCOPE, AND NETWORK RELATED CHALLENGES

- *Costs - Generally*
- *Costs to Client*
- *Costs – Capital*
- *Cost Perceptions*
- *Costs - Business Case*
- *Resources - Funding*
- *Time - Scope*
- *Network – Community Of Practice*

CULTURAL CHANGE / SKEPTICISM RELATED CHALLENGES
CLIENT RECEPTION TO THE CLIMATE CHANGE ADAPTATION CHALLENGE
LEADERSHIP RELATED CHALLENGES
CLIMATE CHANGE SKEPTICISM



EXAMPLES OF EXEMPLARS COURSES IN CCA (QUESTION 29 & 30)

In response to question 29, “*Have you participated in a CPD course that you thought was excellent? What specifically made that course effective?*”, 313 respondents shared positive opinions of courses that were online, local, regional, national, and international. They provided information on a wide range of topics ranging from seed transfer to Antarctica.

The general consensus was that for courses to be effective they must have all or most of the following characteristics:

- Be practically oriented, such as including case studies or be delivered on site or in a location where there can be practical hands on learning.
- Have a skilled facilitator and include high levels of interaction
- Be strongly science based
- Be interdisciplinary
- Provide useful tools and resources to take away and share with colleagues
- Be intensive in terms of time and content – generally short courses are preferred, one or two day max
- Reasonably priced.

Question 30 added to this understanding. - *Is there any other information that you think would be important to know about climate change adaptation CPD?*

This ‘any other information’ question gave respondents an opportunity to make any key, final points that they thought important. Of the over 700 respondents, 178 provided comments. The main themes noted in these final comments are noted below. A selection was made of those thought to be most reflective of the general themes.

These 47 comments are noted in the appendix and many have been inserted earlier in this report as quotes.

The following are some broad themes.

Learning approach

Numerous responses reinforced previous comments on how the CPD learning should be delivered, such as:

- Make it practical – include case studies
- Target to specific industries/application.
- Online delivery - webinars or other virtual platform
- Certification incentives – a combination of carrots and sticks
- Courses should be short, intense, and frequent such as with monthly, quarterly or semi-annual updates - a maximum length of one day at a time
- Be offered in various packages from basic to comprehensive,

Interdisciplinary approaches (or not)

There were two views – one that courses should be inter-disciplinary, one that they needed to be discipline or professional organization focused.

It's broader than 'adaptation'

Many respondents stressed that it is more than climate change ‘adaptation’ – prevention, mitigation, increasing community resilience were also noted as needing to be part of CPD courses.



The science is important

Many respondents wanted more basic science and evidence included in all courses.

Linkage to First Nations

Several respondents noted the importance of working with First Nation groups to bring their visions and goals to life.

Partners

A wide range of partners in this venture was noted. They included specific organizations, but also the need to involve and to connect with others working in the same area:

- municipalities, local government, provincial government
- community leaders
- other regions of the world - 'sister' regions

The bigger picture

Various comments noted that climate change adaptation was in many ways a subset of broader ideas and challenges. Comments included these kinds of phrases:

- *learn to work with the complexity of social-ecological systems:*
- *support systems thinking, and interdisciplinary and integrative problem solving*
- *be more effective communicators, leaders, and collaborators.*
- *A basic and unified definition of climate change adaptation.*
- *Need to frame this around a regenerative future, not doom and gloom*
- *Need to integrate the environmental, economic and social issues, impacts and aspects*
- *existing hazard/risk. This is the core competency that needs to be developed (risk management, liability, ethics) before you can talk about adaptation, which is a gradual increase in existing natural hazards.*
- *essential to understand how the dots are connected - from how we cause climate change, to how it impacts us, to how we can and must urgently mitigate and adapt to it and how the future in a low carbon, resilient and equitable world will be so much better than what we have now.*

Professionalism

While only a few responses, this one comment stood out:

- *As a component of CPD, this is a professional reliance issue. With the College of Applied Biology, how will climate change adaptation integration, which by its nature is dynamic and open to varying interpretation, be applied with respect to Codes of Ethics/Practice. This is a slippery slope where Professionals are potentially being required to conform to political based policy/positions as opposed to "formulate and present opinions, conclusions and recommendations from an impartial and factual science base" (CAB Code of Ethics). Who gets to decide what is acceptable CPD and what is not?*

The full set of identified comments are segmented by professional group in the appendix.

Part 2 of the question asked: *Have you participated in a CPD course that you thought was excellent? Can you provide the name of the course and by whom it was offered?*

Summary

- Almost every respondent noted a different course. This reflects the variance in the jobs that these professionals do and the impacts of climate change on their particular work area.
- It also indicates that there are lots of courses already offered – looking for gaps will be a challenge at this aggregate level, although it is true that responses when segmented by professional association also noted the high numbers of courses and their variety. Rather than look to developing new courses, an alternative approach might be to identify courses which meet certain criteria and promote these through some kind of integrative learning framework.



IMPLICATIONS OF RESULTS FOR ALN PROJECT

The survey received excellent response from over 700 members of the seven professional organizations. Those results painted a vivid picture of the needs and desires of members for continuing professional development courses focused on climate change adaptation. Of particular relevance to the project:

Characteristics of Excellent CPD Courses

Respondents noted the following characteristics:

- Be practically oriented, such as including case studies or be delivered on site or in a location where there can be practical hands on learning.
- Have a skilled facilitator and include high levels of interaction
- Be strongly science based
- Be interdisciplinary
- Provide useful tools and resources to take away and share with colleagues
- Be intensive in terms of time and content – generally short courses one or two day max
- Well priced.

Priority Practice Areas

Respondents noted the following priority practice areas:

- Water management-planning
- Ecosystem management-planning
- Wildfire management-planning
- Building/construction design
- Forest management-planning
- Sea level management-planning
- Agriculture management-planning

CPD Course Content/Organizing Framework

Respondents noted the following organizing framework:

- Data challenges
- Knowledge challenges
- Frameworks, processes and tools (best practices) and integration related challenges
- Policy-regulation, standards-guidelines related challenges
- Cultural change / skepticism related challenges

Barriers to activating CPD courses and more generally addressing climate change adaptation

Respondents noted the following barriers that would need to be overcome:

- Costs, resources, time, scope, and network related challenges
- Cultural change / skepticism related challenges
- Client reception to the climate change adaptation challenge
- Leadership related challenges
- Climate change skepticism

