



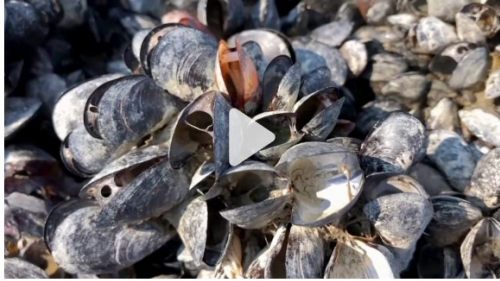
Advancing climate risk assessment in the mining sector

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High impact climate events in Canada are increasing in number and severity

Extreme heat cooked mussels, clams and other shellfish alive on beaches in Western Canada

By David Williams, CNN
 © 4 minute read · Updated 3:07 PM EDT, Mon July 12, 2021



Heat wave may have cooked around a billion shellfish

Video Ad Feedback
 they
 01:25 - Source: CNN

[...]

An analysis by more than two dozen scientists at World Weather Attribution found that the heat wave "would have been virtually impossible without the influence of human-caused climate change."

It was also incredibly dangerous.

Lytton, British Columbia, broke Canada's all-time record on June 30 when the temperature topped 121 degrees. The town was all but destroyed in a deadly wildfire.

There were 719 deaths reported to the province's coroners between June 25 and July 1 - three times as many as would normally occur during that time period, according to a statement from Lisa Lapointe, British Columbia's chief coroner. Hundreds of people died in the US and many had to be hospitalized because of the heat.

Extreme heatwaves in British Columbia, Summer 2021
 (Williams, D. (2021), via CNN)

WORLD & NATION

Canadian wildfire smoke spreads hazardous haze through northeastern U.S.

10/27/2023



Images: Jacobson, J. / Associated Press (2023);
 Canadian Forces/CPL Marc-Andre Leclerc/Canadian Forces via Reuters via ABC News

UNCLASSIFIED - NON CLASSIFIÉ
 Thompson, J. (2013) via Canadian Geographic



How climate change fits into Calgary's record flood

JUN 23, 2013 | 595 WORDS | 3 MINUTES

BY JIMMY THOMSON



PEI

Fiona reshaped P.E.I.'s coastlines, stoking fears for the Island's future

Federal minister says these atmospheric events are directly linked to climate change

Goodsell, D. (2023), via CBC
 The Coastie Initiative, 2023 (via CBC);
 Hennessey, S. (2023) (via CBC)



There are implications for the mining industry



Warmer temperatures and thawing permafrost can undermine infrastructure stability, access



Increases in the severity of extreme weather can challenge tailings ponds, dams



Climate induced droughts and altered precipitation patterns may affect water and energy availability, impacting processing, site rehabilitation, and other aspects of projects.

Multiple drivers point to increased integration of climate in infrastructure design and management

Infrastructure built today should....

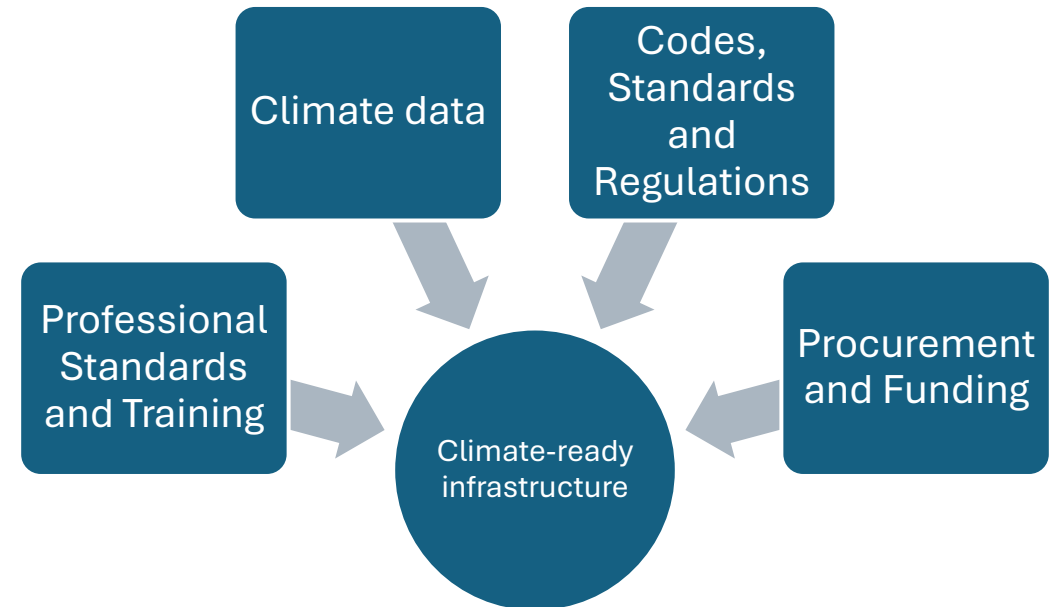
- ✓ Withstand current climate impacts.
- ✓ Withstand the increased frequency, severity of current impacts, and those expected in 20, 50 or more years.
- ✓ Support goal of net-zero emissions by 2050.

Combination of “carrots & sticks” are pushing us in the direction of regular, improved integration of climate risk and adaptation in infrastructure.

Examples:

- Supports (training, climate data, guidelines)
- Requirements (funding, standards, professional obligations, climate law)

Four areas driving us toward resilient infrastructure



Professional obligations

- Regulators and associations are making clear expectations and obligations for their members – *there's a need to consider climate risk and climate resilience.*

CLIMATE CHANGE AND GEOSCIENCE: CONSIDERATIONS FOR PROFESSIONAL PRACTICE

Key Messages

Professional Geoscientists Ontario (PGO) recognizes scientific evidence that climatic conditions have changed in Canada and that most research indicates the rate of change could continue to increase in the near future. Responses to manage the risks associated with this rapid change have economic, social and environmental implications that directly relate to the practice of professional geoscience and PGO's mandate of protecting the public.

As part of their professional practice, Professional Geoscientists should be appropriately informed of developments in scientific thought and best practice relating to changing climatic conditions, and are expected to take reasonable precautions to mitigate negative impacts created by the potential of accelerated climate change in their professional activities.

PGO is committed to supporting Professional Geoscientists in understanding and managing the implications of changing climatic conditions in their professional practice, and in particular, in managing climate-related risks that may impact public safety.

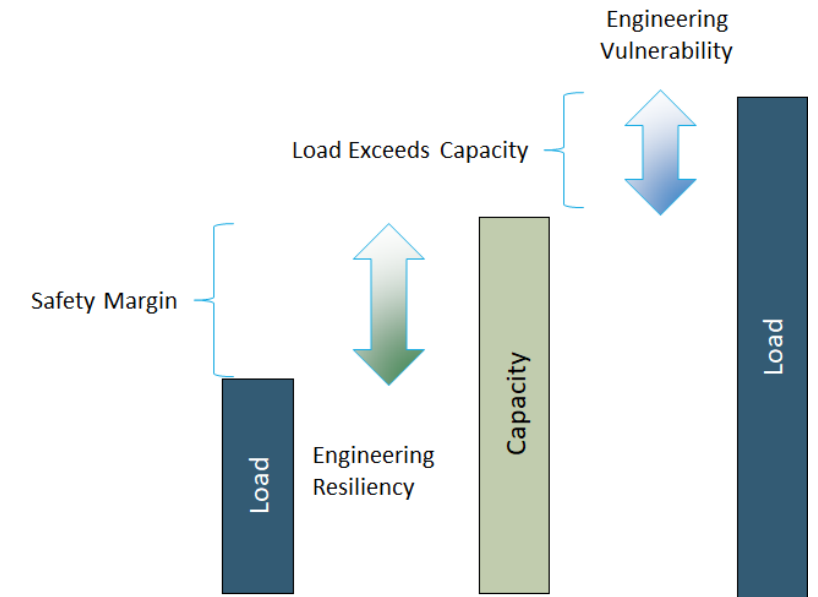
Professional Geoscientists need to understand and take reasonable precautions to address the effects of changing climatic conditions in their professional practice, in particular where future climate risks may impact public safety.

Projections of future climatic conditions and associated risks will continue to evolve, both over time and with advances in scientific understanding. Professional Geoscientists are expected to base their work on appropriate available climate data, climate science, and best practice guidance on its application.

Where appropriate and reasonable, projects undertaken by Professional Geoscientists should identify potential future climate-related risks and opportunities and include an assessment of the resiliency of the project to an appropriate range of potential future climate conditions, based on best available information.

Climate (change) risk assessment is a fundamental step

1. Scope and identify relevant existing and future climate conditions
2. Characterize natural areas, project sites and hazards
3. Identify and estimate vulnerabilities and the potential severity of consequences from hazards occurring
4. Recommend actions to reduce climate risks and evaluates resilience opportunities



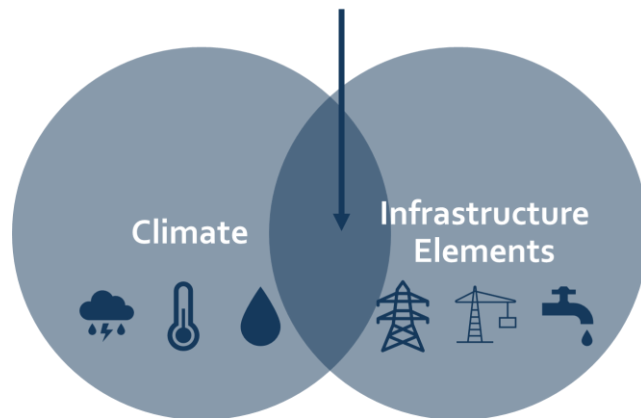
Canada has been a leader in *infrastructure* and climate change risk assessment

In the early 2000s Engineers Canada developed the **PIEVC** Protocol to assist professionals in increasing resilience of infrastructure and buildings to climate change.

In 2020, the PIEVC Program was transferred to the **PIEVC Alliance** of three not-for-profit organizations:

- The Institute for Catastrophic Loss Reduction (ICLR)
- The Climate Risk Institute (CRI)
- The Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ)

What we want to understand




PIEVC PROGRAM

PIEVC Protocol (full version)

Infrastructure category	2008 to March 2020	March 2020 to present
Buildings (all types, inc. affordable housing, fire halls, commercial, service roads)	23	21
Water, wastewater, stormwater	22	11
Transportation (highways, canals, bridges, rail, streets, mass transit, etc.)	12	16
Urban transit systems	1	6
Coastal infrastructures and ports (inc. search and rescue stations)	13	11
Airports (inc. associated infrastructure)	7	6
Utilities (inc. power distribution, wind, solar energy)	5	4
Indigenous communities	8	3
Other (inc. screening, portfolio, asset management)	1	11
Total	92	89+

100s of additional assessments (via public agency, consulting company processes, unreported applications)

PIEVC  CVIIP

The is now a Family of PIEVC Resources

Tool	Key points	ISO aligned	Level of Effort
PIEVC	<ul style="list-style-type: none"> ✓ Add-ons to methodology: Performance Response Criteria, Load-Capacity Analysis, Triple Bottom Line ✓ Adaptation Recommendations 	Yes	↑
High-Level Screening	<ul style="list-style-type: none"> ✓ Rapid Screening ✓ Prioritize further analysis ✓ Supports planning, conceptual and design stages 	Yes	↓
PIEVC Green	<ul style="list-style-type: none"> ✓ Socio-Ecological systems focus ✓ Triple-bottom line ✓ Sensitivity, Adaptive Capacity analysis ✓ Adaptation recommendations focus on Nature-based Sol'n 	Yes	↑
Large Portfolio	<ul style="list-style-type: none"> ✓ Uses archetypes ✓ Distinct vulnerability (sensitivity and adaptive capacity) step ✓ Streamlined for multiple assets 	Yes	↔

Kam Kotia Case Study

- Project *Assessing Climate Change Risks at Abandoned or Orphaned Mine Sites in Ontario, Yukon and Northwest Territories* included mine site assessment.
- Demonstrated ability to **translate proven methodologies** (i.e., PIEVC) for mining sector scenarios and sites.
- Multi-disciplinary team, sequential workshops → Final reports with detailed scenario-based risk analysis + identification of risk treatment options.

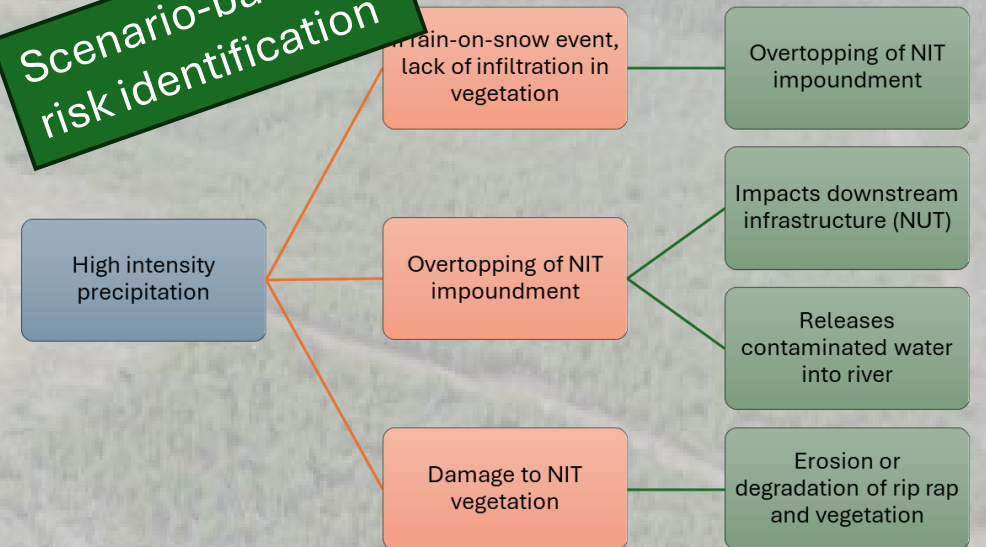
Climate Event Likelihood			
Current (Baseline)	Future (2050s)	Future (2080s)	
Likely	Almost Certain	Almost Certain	

Capacity to Cope			
Existing Adaptation(s)	Possible Adaptation(s)	Existing Adaptation Effectiveness	
Repairs and dam raise completed in 2014, improved spillway to prevent overtopping.	?	?	

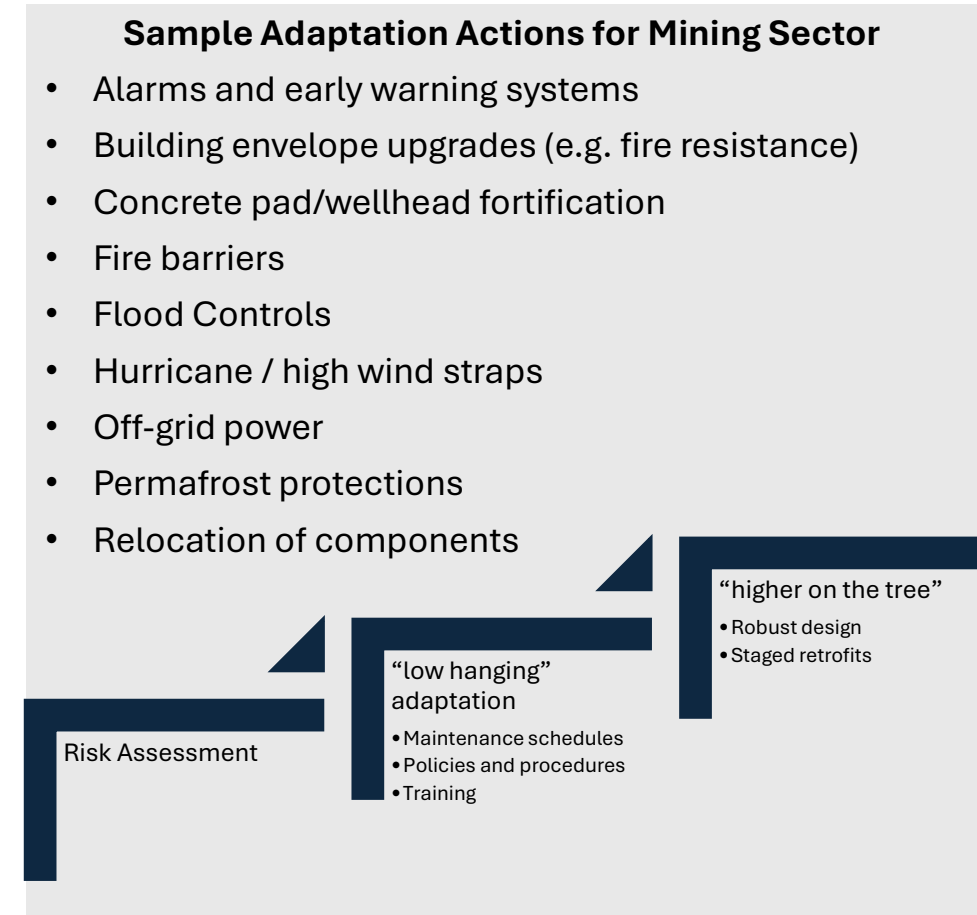
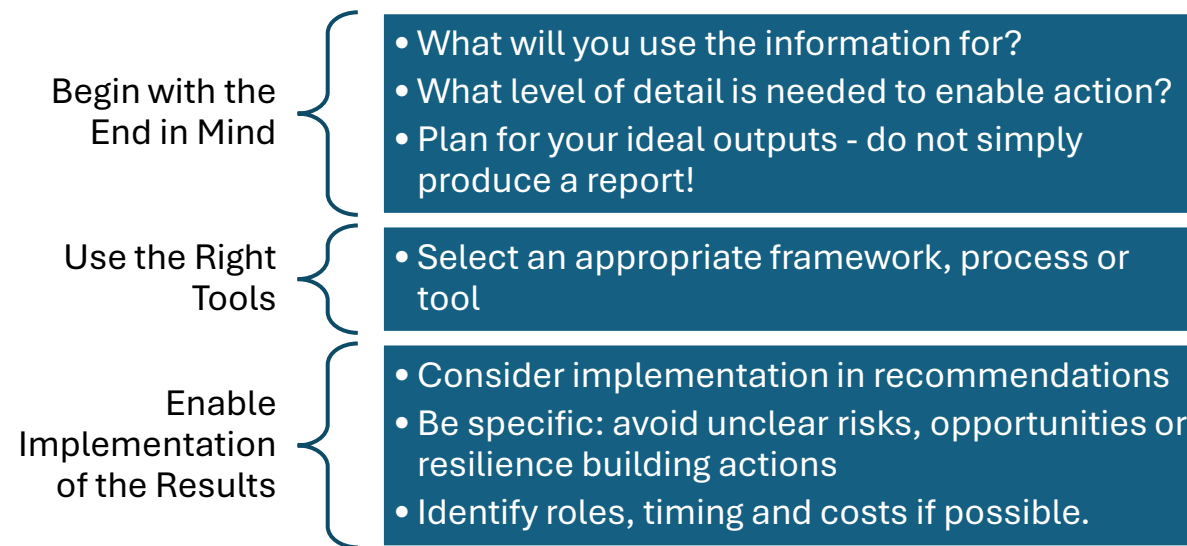
Severity of Consequences			
Financial Losses	Environmental Damage	Service Disruption	Human Health & Public Safety
?	?	?	?

Evidence-based methodology

Scenario-based risk identification



More attention needs to be placed on mobilizing risk assessment findings

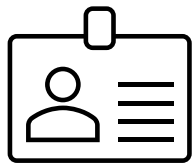


Skills development key component of national adaptation strategy

Development of competencies-based programs occurring throughout Canada, including academic / professional development.

Climate Risk Institute offers courses and credentials in climate change risk, adaptation and resilience.

- ✓ **Infrastructure Resilience Professional (IRP) credential.**
- ✓ **Infrastructure and Climate Resilience Planning Micro-credential**



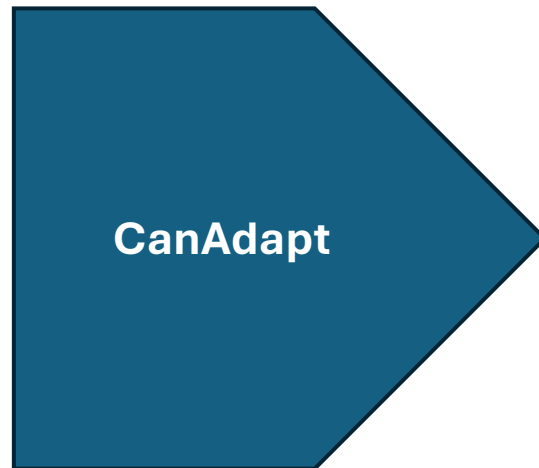
 Infrastructure Risk and PIEVC	Risk Principles Protocol Steps
 Asset Management for Resilience	Resilience strategies Natural Infrastructure
 Management of Risk	Analytical risk tools Risk Communication
 Applied Climate Science	Data in design Team-building
 Policy and Procurement	Policy fundamentals Resilience through procurement
 Climate Law	Legal implications Professional obligations
 Resilient Buildings*	Impacts and risk assessment Identifying and...
 Professional Planning	...
 Forestry	...
 Low-Carbon Buildings	Low-Carbon technologies and approaches Professional obligations
 Climate Change Awareness	Climate change foundations Climate literacy
 Coastal Management	Shoreline management planning Resilient coastline approaches



CRI delivers customized course (e.g. PIEVC for Contaminated Sites Custodians)

Engagement Opportunities – *Get involved!*

Current opportunities to support adaptation action in Canada's mining sector:



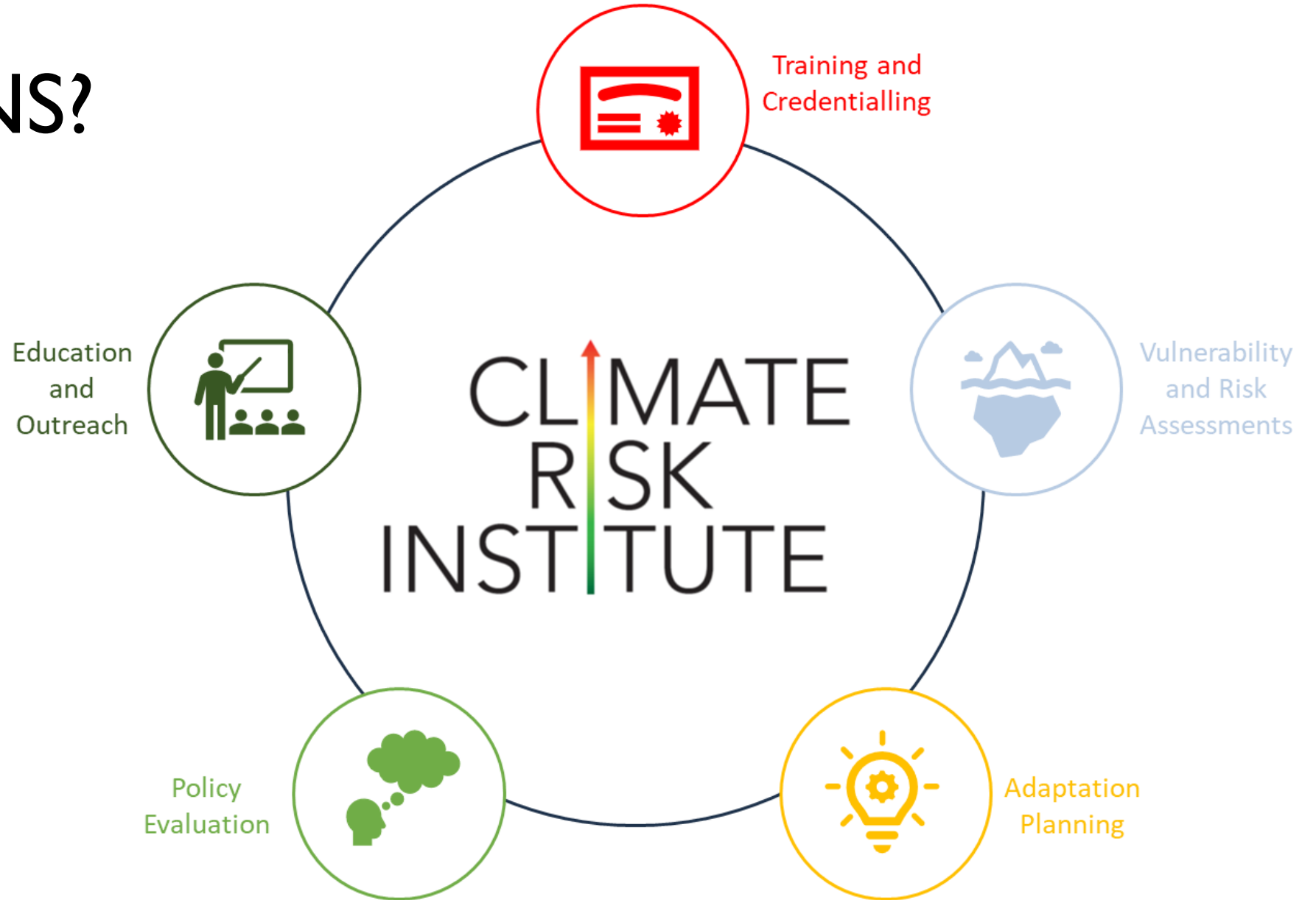
1. **Join CanAdapt:** <https://canadapt.network>
2. **Access the Mining Practitioner Network**
 - Connect with others in the industry
 - Exchange knowledge, ideas, and best practices
 - Access resources (e.g., case studies, reports, events)
 - Build skills and earn credentials through training opportunities
3. **Apply to be a Mining Expert Committee member**
 - Guide, the direction, vision and goals of the network.



1. **Project focused on empowering practitioners in natural resource sectors move from adaptation planning to implementation**
2. **Uncovers key drivers, enablers and barriers**
3. **Apply to be a Stewardship Committee member**
 - Join a group of sector representatives providing guidance, feedback and advising project activities and outputs.

Interested in joining any of these two Committees?
Express interest by contacting the Network Manager at: suzanne@canadapt.network

QUESTIONS?



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