

ASSESSING AND ADDRESSING CLIMATE CHANGE IMPACTS IN THE MINING SECTOR

Climate change impact and risk assessment training for mining professionals

Training session proposal for IAIA Conference

Montreal, Canada, April 2017

Submitted July 8th, 2016

Training session proposal submitted by

the following partners



Section 1 – Course Details and Trainers

TABLE 1: COURSE DETAILS

Title	ASSESSING AND ADDRESSING CLIMATE CHANGE IMPACTS IN THE MINING SECTOR
Level	Foundation
Prerequisites	N/A
Language	English
Duration	1 day
Maximum Number	N/A
Minimum Number	10
Laptop Required	Optional

TABLE 2: TRAINER DETAILS

Risk Sciences International (RSI) is a corporate member of IAIA. All trainers are committed to attending the conference, as outlined in this proposal, and as such will become IAIA members and sign the code of conduct when they register for the conference.

Name	Contact	IAIA Member	Code of Conduct
Heather Auld Principle Climate Scientist Risk Sciences International	55 Metcalfe St. Ottawa, ON. L1P 6L5 phone: 613-260-1424 X214 email: hault@risksciences.com	Corporate Member	To complete at time of registration
Joel Nodelman, P.Eng. Principle, CEO Nodelcorp	Nodelcorp Consulting Inc. 106 Goodridge Drive St. Albert, AB, T8N 2B2 email: joel@nodelcorp.com Phone: (780) 418-3380	To complete at time of registration	To complete at time of registration
Roger Rempel, P. Eng. FEC, IRP Senior Environmental Engineer Infrastructure Resilience Professional Climate Change Impacts Specialist Environmental Management	MMM Group Limited 111 – 93 Lombard Avenue Winnipeg, MB R3B 3B1 O +1 204-943-3178 #3818 F +1 204-943-4948 rempehr@mmm.ca	To complete at time of registration	To complete at time of registration
Al Douglas CAO, Mining Innovation Rehabilitation and Applied Research Corporation (MIRARCO); Director, Ontario Centre for Climate Impacts and Adaptation Resources (OCCIAR)	MIRARCO/Laurentian University Sudbury, ON, Canada 705-675-1151 x1506 www.climateOntario.ca	To complete at time of registration	To complete at time of registration

Roger Rempel and Joel Nodelman are professional engineers and adhere to their professional codes of conduct.

Section 2: Course Description

Summary of purpose, content and learning objectives

Last year, the Mining Institute of Canada identified \$140 billion in potential Canadian mineral project investments over the next decade, translating into billions in investments nationally. Shifting climate norms and extremes will impact the entire mine life-cycle. These impacts can have severe consequences on liability, asset value, efficiency, economic performance and regulatory compliance. The robust assessment of climate risks and opportunities will safeguard the social, environmental and economic benefits stemming from investments.

Climate change demands new approaches. Mining companies are already experiencing a range of climate-related disruptions. Understanding is increasing about the implications of a changing climate on businesses financing, operations, and legal liability. One third of Canadian mining companies consider climate change a risk for their business and are interested in information and tools to identify and act on risks. Investors and shareholders are increasingly requesting information on the management of climate risk.

Taught by leading engineers and scientists in the fields of climate change and infrastructure risk, this 1-day foundation-level training in climate resilient mining discusses trends and projections in climate change, impacts on the mining sector, and leads participants through available tools and frameworks to appropriately assess and manage climate risk. Lessons and examples from case studies are integrated throughout the training.

Participants will have an understanding of climate trends, and be able to identify, understand and apply available climate data sources. They will develop an appreciation for the impacts that climate shifts have on mine operations and planning from diverse perspectives including investment, asset and risk management, financial planning and legal liability. Participants will have knowledge of frameworks and tools that can be applied to assess climate risks and identify resilience solutions. Lastly, they will be provided guidance and examples to support communication of climate risks, strengthening their capacity to present risks and recommend actions.

Target Audience

The target audience for this foundational workshop include professionals and stakeholders in the mining sector. This could include professionals within mining companies or mining services companies with diverse fields of expertise including impact assessment, risk management, asset management, purchasing and procurement, operations, engineering, financial planning or legal. Additional mining sector stakeholders, including investors, executives and board members, and regulators would benefit from the training session.

Impact assessment professionals and experts from other sectors including natural resources or infrastructure sectors, would benefit from the training; the issues, concepts, tools and frameworks presented are applicable across sectors.

Course Structure and Content

The 1-day workshop will be presented by nationally-recognized experts in the fields of climate change science, climate change risk and vulnerability assessment, and climate adaptation. The trainers will draw on their collective years of experience to weave case studies into each module throughout the day, grounding the concepts and lessons with tangible examples.

Start Time	Module	Lead Trainer
9:00	<p>Climate Change Fundamentals</p> <p>Participants will gain a fundamental understanding of climate, climate change and appropriate data for application in vulnerability assessment work. Key concepts include:</p> <ul style="list-style-type: none"> - The baseline climate - Climate trends and projections - Climate change models - strengths and weaknesses - Fundamentals of climate change data, understanding how to identify, select and appropriately use climate data. - Using ensemble data sets to address uncertainty - Dealing with uncertainty - Recognizing the need for accurate data, and discerning the difference between sufficient accuracy and data precision - Identifying your data needs, understanding data formats - Establishing climate thresholds to assess system responses to climate events - Applying climate change information within context 	H. Auld
10:15	Break	
10:30	<p>Climate Impacts</p> <p>Participants will gain insight into the impact of climate change on the mining sector through case study analysis and facilitated discussion. Key concepts include:</p> <ul style="list-style-type: none"> - Real world impacts of climate change on mining operations - Analysis of response pathways tracing climate events to adverse system outcomes - Understanding the scope and reach of climate impacts on mining operations, management, and procurement systems - Legal liabilities in the mining industry arising from climate change - Defining the need for an accurate picture of climate change risk within mining activities 	J.Nodelman R. Rempel
12:00	Lunch	
1:00	<p>Tools and Techniques to Assess Climate Risk</p> <p>Building on the concepts of climate change and real world impacts on the mining sector developed during the morning sessions, this element</p>	J.Nodelman R. Rempel

	<p>of the workshop will provide participants with a general understanding of the techniques and tools for assessing climate change risk in the mining sector. Key concepts include:</p> <ul style="list-style-type: none"> - Defining climate change vulnerability and resiliency - How small changes in climate conditions can lead to significant impacts - Standard definitions of risk; understanding the difference between risk and vulnerability - How risk assessment provides a measure of system vulnerability - The value of tools and protocols for guiding and documenting risk assessment processes - An overview of the tools available to help assess climate change vulnerability <ul style="list-style-type: none"> ✓ Top down vs bottom up risk assessment processes ✓ The value of quantitative approaches and their limitations ✓ The value of judgment based approaches and their limitations - Dealing with data gaps - Dealing with uncertainty - The importance of local knowledge - The application of vulnerability assessment to demonstrate legal due diligence 	
2:45	Break	
3:15	<p>Best Practices in Climate Risk Assessment Equipped with the fundamental principles of climate change vulnerability assessment, this element of the workshop will provide participants with an opportunity to engage in facilitated discussions about best practice applications of climate change risk assessment in the mining sector. Key concepts include:</p> <ul style="list-style-type: none"> - Examples of the application of climate change risk assessment - Typical assessment findings and follow up activities - The evolution of best practices arising from the body of assessment work completed to date - Applying best practices within the mining sector to identify opportunities and address challenges - Identifying risks and adaptation solutions from the sector 	J.Nodelman R. Rempel
4:00	<p>Emerging Trends and Looking Ahead – Adaptation in the Mining Sector (Moderated Discussion) The moderator will lead the panel in interactive discussion with ample opportunity for participant engagement and input on these issues. Key concepts include:</p>	Al Douglas (moderator) with Panel

	<ul style="list-style-type: none"> - New emerging areas of concern, legal liability and reporting - Expectations for new directions: New regulatory requirements from impact assessment; Financial reporting; Shareholder and stakeholder engagement and reporting 	
4:30	<p>Best Practices in Communicating Climate Change (Moderated Panel Discussion)</p> <p>The moderator will lead the panel in an interactive discussion on best practices in communicating climate change impacts and risks. With ample opportunity for participant engagement and input, participants will discuss concepts:</p> <ul style="list-style-type: none"> - Understanding and addressing the unique needs and limitations of your audience to effectively communicate risk information without creating undue anxiety. - Effective communication to recognize and address uncertainty - Common barriers and solutions to communicating climate risks. 	Al Douglas (moderator) with Panel
5:00	Close	

Materials, Technology and Communication

Participants will receive the following resources.

TABLE 3: PARTICIPANT RESOURCES

Participant resources	
Workbook	The spiral bound, colour printed workbook will include material on each of the session themes. This will include presentation slides (with space for note-taking), supplemental material for further learning, and a glossary of terms.
USB Key	The electronic USB key will include a digital version of all workbook materials. In addition, the USB key will be pre-loaded with additional resources (pdfs) including: case studies; frameworks, tools and adaptation guides; climate data references.

Additional technology requirements are not expected.

Contact information for lead trainer and workshop facilitator will be provided to all participants in the lead-up to the workshop and conference. Each of the trainers is expected to attend the full IAIA conference, providing additional opportunities for networking and learning.

Trainers will provide all participants with contact information to facilitate follow-up conversations following the workshop and conference.

Section 3- Qualifications of Trainers

Qualifications

Each of the identified trainers has extensive and recognized expertise their field, and has a significant depth of experience in delivering effective training. Please see the appendix for abridged CVs for each trainer.

A letter of endorsement strongly recommending the lead trainer, issued by Engineers Canada, has been included in the appendix.

Course History

The proposed course follows the model and concepts that the trainers have delivered across Canada in recent years. The proposed course will, however, tailor its content to the mining sector by addressing mining-specific climate impacts and case studies.

TABLE 4: HISTORY OF CLIMATE IMPACTS COURSE

Course Title	Number of Events	Audience
<i>Climate Change and Infrastructure Vulnerability Assessment - Live</i>	>20	<i>Every provincial and territorial engineering association in Canada. Live workshops in major centers in every province and territory.</i>
<i>Climate Change and Infrastructure Vulnerability Assessment – Web Based</i>	3	<p>On line training delivered tailored to the needs of the client associations.</p> <ul style="list-style-type: none"> • Association of Professional Engineers of the Yukon • Northwest Territories and Nunavut Association of Professional Engineers and Geoscientists • Association of Professional Engineers and Geoscientists of Manitoba • Association of Professional Engineers and Geoscientists of Saskatchewan • Ontario Climate Consortium (Webinar)
<i>Climate Change and Infrastructure Assessment Workshop for Ghana Transportation Sep 25 & 26, 2014</i>	1	Two-day workshop for delegation of transportation engineers and decision-makers from Ghana.

Section 4 – Commitment of the Trainers

a) How many times have course been offered. Explain any cancellations if applicable.

The proposed course follows the model and concepts that the trainers have delivered across Canada numerous times, in person and through web-based training, in recent years. The proposed course will differ from previous iterations however, as it will tailor its content to the mining sector by addressing mining-specific climate impacts and case studies.

Previous training course have focused primarily on the Engineers Canada vulnerability assessment frameworks (PIEVC protocol); the proposed course will not focus exclusively on this tool but will provide participants with information on the selection and use of multiple frameworks and impact assessment tools.

The proposed training incorporates latest knowledge on impacts in the mining sector, addressing multiple fields of practice (engineering, finance, legal). Current best practices from the mining sector, as well as relevant lessons from other sectors, will be presented.

b) Earlier approved training courses / any cancellations

There have been no noted cancellations in previous planned training sessions.

c) Indicate the level of commitment to give this course at IAIA17 by noting any circumstances that would cause the course to be cancelled (other than if the minimum enrolment is not reached) or circumstances that would cause the instructor(s) not to be in Montréal to offer the course. Note also that courses that require a minimum of more than 10 participants will be at a disadvantage.

The team of trainers identified are committed to providing the training in person, and will attend the conference. Risk Sciences International is a corporate member of IAIA. All the identified trainers are based in Canada and therefore do not face significant international travel barriers.

d) Note backup strategy in the event an instructor must withdraw unexpectedly.

Each of the trainers have identified options for their areas of expertise in the unexpected event of having to withdraw. There is sufficient depth of knowledge within the training team and within their organizations to identify a replacement should one be required without a loss of quality in the participant's training experience.

The following table shows the identified trainer and their replacement in the unlikely event having to withdraw.

Identified trainer	Identified backup if required
Joel Nodelman	Roger Rempel, Heather Auld
Roger Rempel	Joel Nodelman, Heather Auld
Heather Auld	Neil Comer (Risk Sciences International) Erik Sparling (Risk Sciences International)
Al Douglas	Heather Auld Paul Cobb (OCCIAR)

- e) *Statement agreeing to provide free places to students based on formula described in the “Student participation” paragraph below.*

The training team is strongly supporting of student participation, as per the criteria outlined.

Appendices

The following pages provide a abridge CV for each trainer, as well as a letter of endorsement from Engineers Canada. Engineers Canada is the national organization of the 12 engineering regulators that license the country's 280,000 members of the profession. The identified training team has delivered numerous training workshops focusing on the Engineers Canada vulnerability assessment protocol.

Joel Nodelman is a professional engineer with over 38 years of progressive experience in engineering and management of energy, environment, climate change and sustainable development projects. Mr. Nodelman is a gifted speaker, facilitator and educator teaching engineering courses in sustainable development and engineering management at the University of Alberta for fifteen years.

Throughout his career Joel's work has had a significant focus on risk management. His activities in climate change adaptation evolved from this focus.

Joel was an active contributor to Engineers Canada work on engineering assessment of the vulnerability of Canadian infrastructure to climate change. This included technical advisory services to seven vulnerability assessments conducted under the auspices of the Engineers Canada initiative. He has had a central role in the drafting and ongoing refinement of the PIEVC Engineering Protocol for assessing the engineering vulnerability of public infrastructure to climate change.

Joel was the principle facilitator on the vulnerability assessment for Ontario Power Transmission System during which he successfully facilitated project workshops remotely via web-based meetings. He has facilitated numerous vulnerability assessments, including for northern ice roads and for regional watersheds.

EDUCATION AND REGISTRATIONS

Professional Engineer

Association of Professional Engineers, Geologists and Geophysicists of Alberta

M.Sc. (ENG) 1980

Chemical Engineering

Queen's University

Kingston, Ontario, CANADA

B.Sc. (HON) 1978

Chemistry

Queen's University

Kingston, Ontario, CANADA

SKILLS

Risk Assessment

Mr. Nodelman applies risk assessment as a fundamental approach to identifying clients' needs and to develop strategies and recommendations to reduce clients' overall risk profile.

Strategy and Policy Development

Mr. Nodelman has been instrumental in planning, designing and developing protocols and procedures to assess infrastructure vulnerability to climate change. Mr. Nodelman is the primary author of the Engineers Canada *PIEVC Engineering Protocol for Infrastructure Vulnerability Assessment and Adaptation to a Changing Climate*.

Training

Mr. Nodelman designs and presents workshops and lectures to update engineering and business professionals on leading-edge developments in climate change engineering vulnerability risk assessment and sustainable development.

Engineering and Technical Analysis

Mr. Nodelman employs engineering and engineering economic analysis to assess infrastructure vulnerabilities to changing climate. Based on a solid foundation of engineering science, he provides clear and pragmatic recommendations to assist clients establish more resilient infrastructure.

ROGER REMPEL, B.Sc., P.Eng., FEC, IRP

Senior Environmental Engineer, Infrastructure Resilience Professional
Climate Change Impacts Specialist, Environmental Management

PROFESSIONAL EXPERIENCE

Roger is an environmental engineer with over 20 years of experience in environmental assessment, climate change vulnerability assessment, quantitative risk assessment, environmental systems modeling and public consultation. He has conducted and managed assessments investigating emerging concerns such as climate change vulnerability for critical infrastructure, accidental chemical release modeling, water quality and runoff modeling.

Roger has conducted climate change impact assessments and served as technical advisor to a number of multi-disciplinary study teams assessing public infrastructure and related components for vulnerability to climate change impacts and extreme events. He conducted climate change impact workshops for Canadian impact assessors to define climate data requirements for modelling practitioners within Canada's Prairie Regional Adaptation Collaborative (PRAC), and has conducted scoping assessments and pilot applications of new climate change impact assessment tools for municipal planning, water demand forecasting and extreme runoff management.

Roger has worked repeatedly with Engineers Canada's Public Infrastructure Engineering Vulnerability Committee, assisting Engineers Canada in finalizing and periodic revision of its PIEVC Protocol. Roger is an instructor for Engineers Canada's PIEVC Protocol, conducting workshops to engineers and climate agencies on how to apply the PIEVC Protocol, and has taught these workshops throughout Canada and internationally. In June of 2016, Roger became one of the first six Professional Engineers in Canada to achieve Engineers Canada's new Infrastructure Resiliency Professional certification.

SELECTED PROJECT EXPERIENCE

City of Calgary, Climate Change Vulnerability and Risk Assessments, with associated adaptive actions and indicators across 15 City of Calgary Business Units. (Initiated June 2016)

Engineers Canada / Province of Manitoba Climate Change Branch and Green Buildings/Department of Finance – PIEVC Workshop – Assessing Climate Change Impacts on Buildings Infrastructure with Engineers Canada's PIEVC Protocol (June 2016)

Province of Manitoba Green Buildings Coordination Team - Climate Change Workshop Development and Delivery for Manitoba Government Buildings Infrastructure & Asset Managers: "Climate Change Impacts to Buildings and Related Infrastructure". An workshop designed to transfer knowledge to the Buildings Sector within Manitoba Government on Climate Change impacts on Buildings and approaches to reducing climate risk for buildings infrastructure. (January 2016)

Hudson Bay Mining and Smelting Snow Lake Projects, (2016) : **Lalor Crushing Study and New Britannia Concentrator Upgrades.**

PROFESSIONAL BACKGROUND

Climate Change Impacts Engineering Collaborative, Climate Resilient Systems, Ottawa, ON, Toronto, ON, Winnipeg, MB, Edmonton, AB (2015)

Managing Associate, Stantec, Winnipeg, MB (2010-2015)

Principal, Senior Environmental Engineer, TetrES Consultants Inc., Winnipeg, MB (1990 - 2010)

Professional Affiliations:

- Western Canada Water
- Air & Waste Management Association
- American Waterworks Association
- Engineers Geoscientists Manitoba (APEGM)
- Prairie Climate Centre Steering Committee
- American Meteorological Society

Professional Designations:

- Infrastructure Resilience Professional designation, Engineers Canada, Ottawa.
- Fellow of Engineers Canada (FEC)
- P. Eng. Manitoba

HEATHER AULD

PRINCIPAL CLIMATE SCIENTIST, RISK SCIENCES INTERNATIONAL

55 METCALFE STREET, SUITE 700, OTTAWA, ONTARIO, L1P 6L5

PHONE: 613-260-1424 X214 OR DIRECT 905-737-6026;

EMAIL: HAULD@RISKSCIENCES.COM



SUMMARY

Heather Auld is the Principal Climate Scientist at Risk Sciences International (RSI). She has over 37 years of experience in the fields of climate, meteorology and climate change science and adaptation. She spent over 32 years with Environment and Climate Change Canada as an engineering climatologist, climate change adaptation expert, weather forecaster, manager and operational meteorology instructor. Heather has significant experience in providing climate and weather services and research, including engineering codes and standards, transportation, water resources, environmental, air quality, energy, northern, natural resource and other sectors/issues.

For more than 26 years, Heather extensively researched and developed engineering climate and climate change design values for the National Building Code of Canada, various Canadian Standards Association standards. She has supported PIEVC engineering risk assessments across Canada and internationally, and has developed climate change adaptation tools, managed environmental assessment programs, provided expert analyses and testimony to several weather disaster inquiries and led the development of an internationally recognized climate hazards web Portal site to support disaster management planning. Heather has served on expert teams with the World Meteorological Organization, UN Strategy for Disaster Risk Reduction, World Federation of Engineering Organizations, as lead author for the Intergovernmental Panel on Climate Change and represented Canada on delegations to the UN Convention on Biological Diversity. She has published many peer reviewed articles.

SUMMARY of RELEVANT EXPERIENCE

- Recognized national expert on climate change impacts and adaptation, engineering climatology, national codes and standards, energy-climate research, extreme event forensic analyses, disaster risk reduction planning; (Past) Associate Director, Adaptation and Impacts Research Division, Environment and Climate Change Canada;
- National lead and Chair for Canadian Standards Association (CSA) Rainfall Intensity-Duration-Frequency Guide for Water Practitioners; National Lead for CSA standard on changing snow loads in Canada's North; Member of National Technical Committee on 5 new standards for North; Developed training materials for the new CSA Northern standards;
- Climate change team member for online Climate Resilient Systems Training in support of Engineers Canada PIEVC engineering vulnerability Protocol; Lead for a revised climate chapter in the updated PIEVC Protocol;
- Climate change lead for multiple PIEVC vulnerability assessments: Toronto Hydro electrical distribution system; City of Toronto public housing buildings; Ontario Hydro One transmission system; Peel Region stormwater, wastewater treatment and drinking water infrastructure.
- Customized weather forecasting training for Sudbury mining smelter operators; Instructor of new meteorology recruits (operational weather forecasting); training to upgrade professional weather forecasters;

EDUCATION AND PROFESSIONAL TRAINING

- Professional Meteorologist: Professional Meteorologist Operational Training and Accreditation (Environment and Climate Change Canada); B.Sc. (Physics and Mathematics); M.Sc. (Meteorology)

Allan G. Douglas



B.Sc., C.Chem., MBA

Director, Ontario Centre for Climate Impacts and Adaptation Resources

Chief Administrative Officer, Mining Innovation Rehabilitation and Applied Research Corporation (MIRARCO)

Summary

Al is the Director at the Ontario Centre for Climate Impacts and Adaptation Resources, located at Laurentian University in Sudbury. He has been working in the field of climate change impacts and adaptation for 15 years and has partnered with many different organizations in Ontario and Canada to develop and deliver adaptation resources and strategies. Al specializes in facilitating adaptation planning at the local and watershed level and has expertise in climate science; climate change impact, vulnerability and risk assessment; policy development and adaptation planning in natural resource sectors. Al has extensive experience in the mining sector, including multiple projects examining climate risks and adaptation opportunities in the sector.

He has had the privilege of contributing content to 2 Canadian National Assessments of climate change and acted as an expert reviewer for the last 2 Intergovernmental Panel on Climate Change assessment reports. Most recently, Al was the co-chair of the National Climate Change Adaptation symposium held in Ottawa in April 2016, and is an Advisory Panel Member for the Canadian Standards Association (CSA) Online Adaptation Training Module.

Education

2000 **MBA.** Cum Laude – Laurentian University, Sudbury, Ontario, 2000

1993 **B.Sc.** Honours, Chemistry – Laurentian University, Sudbury, Ontario, 1993

Employment Experience

Mining Innovation Rehabilitation and Applied Research Corporation/Laurentian University - Ontario Centre for Climate Impacts and Adaptation Resources – OCCAR

- Chief Administrative Office, MIRARCO 2016 - Present
- Director, OCCAR 2002 – Present
- Coordinator, Ontario Region 2002 - 2007

Additional Information

- Member of the **Adaptive Management Group** of the International Joint Commission's International Upper Great Lakes Study
- Advisory Panel Member – Canadian Standards Association (CSA) **Online Adaptation Training Module**
- Member of the **Tourism, Recreational Boating and Cruise Ship Technical Working Group** of the International Joint Commission's International Upper Great Lakes Study
- Advisor - Northeast Clay Belt Climate Change Vulnerability Assessment and Adaptation Planning Project. Ontario Ministry of Natural Resources
- Advisory Panel Member – International Council for Local Environmental Initiatives (ICLEI) Canada's **Changing Climate, Changing Communities: Guide and Workbook for Municipal Climate Adaptation**
- Expert Reviewer – North American Chapter – United Nations Intergovernmental Panel on Climate Change Fourth Assessment Report
- Expert Reviewer – North American Chapter – United Nations Intergovernmental Panel on Climate Change Fifth Assessment Report
- Advisor – Ontario Chapter of Natural Resources Canada's National Assessment – **From Impacts to Adaptation: Canada in a Changing Climate 2007**
- Professional Designation of **Chartered Chemist** under the Association of the Chemical Profession of Ontario

Letter of Endorsement



June 29, 2016

Mr. J. Nodelman, P.Eng.

President & CEO, Principal

Nodelcorp Consulting Inc.

106 Goodridge Dr.

St Albert AB T8N 2B2

Re: Letter of Endorsement – Training in the PIEVC Engineering Protocol

This letter is to certify that Mr. Joel Nodelman P.Eng. has served as a PIEVC Lead and Assistant Trainer and Speaker at well over 20 Engineers Canada training workshops on the PIEVC Engineering Protocol from November 2009 to the present day. The Protocol is a process to assess infrastructure climate risks and vulnerabilities. Joel is an accomplished lecturer, trainer, facilitator, speaker and consultant on the Protocol, having used it in professional practice as well as teaching it on behalf of Engineers Canada.

Joel is a highly regarded member of Engineers Canada's PIEVC Training Team. I would highly recommend he be considered for training opportunities that may arise related to the Protocol or other subject matters in the areas he practices.

If there are any questions or further information, please contact the undersigned.

Yours truly,

David Lapp FEC, P.Eng., IRP

Practice Lead, Globalization and Sustainable Development

david.lapp@engineerscanada.ca

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