Professional Engineers and Geoscientists of BC

APEGBC Guidance on the Evolving Responsibilities for its Members in a Changing Climate

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APEGBC's Positions

Professional Engineers and Geoscientists of BC

A. APEGBC recognizes that the climate is changing and commits to raising awareness about the potential impacts of the changing climate as they relate to professional engineering and geoscience practice, and to provide information and assistance to APEGBC registrants in managing implications for their own professional practice.

A. APEGBC registrants are expected to keep themselves informed about the changing climate, and consider potential impacts on their professional activities.

APEGBC's Role

Professional Engineers and Geoscientists of BC

- In accordance with the *Engineers and Geoscientists Act* [RSBC 1996] c. 116, APEGBC has the expressed legal authority to establish, maintain and enforce standards of practice

- APEGBC's Professional Practice Guidelines:
  - www.apeg.bc.ca/guidelines

- 35+ guidelines on wide range of topics from flood hazard assessments to building codes

Professional Practice Guidelines

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- These Guidelines:
  - Respond to demand side legislation from Provincial and local governments
  - Develop a standard level of expectation for stakeholders
  - Sets minimum acceptable standard of practice for members and licensees

Evolving Field of Practice

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- APEGBC professionals are reminded of the Professional Reliance model in a changing climate.
- Climate science and how it relates to the practice of the profession is evolving.
- Provincial governmental ministries have prescriptive requirements. Examples include:
  - FHALUMG provide guidance for establishment of FCLs
  - Manitoba Transportation considering scour potential for 1:100 precipitation events in Red River watershed bridges instead of 1:50 year, historically

Key Knowledge Gaps

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- **Translation of Climate Projections into Variables/Formats Engineers Can Readily Use**
  - E.g. Develop a method to meld the local historical trends with future projections
  - E.g. Storm surge models can predict surge level but not if, when or with what frequency these storms might occur
- **Engineering Solutions for Preparing for Climate Change**
  - E.g. Transportation networks depend on a host of ancillary systems
- **Methods for Evaluating Efficacy and Costs/Benefits of Implementing Adaptation Measures**
  - E.g. City of Vancouver has 4 adaptation strategies, cost-benefit analysis should be done to see which options are viable

From US FHWA's Transportation Engineering Approaches to Climate Resilience

The Uncertainty Cascade

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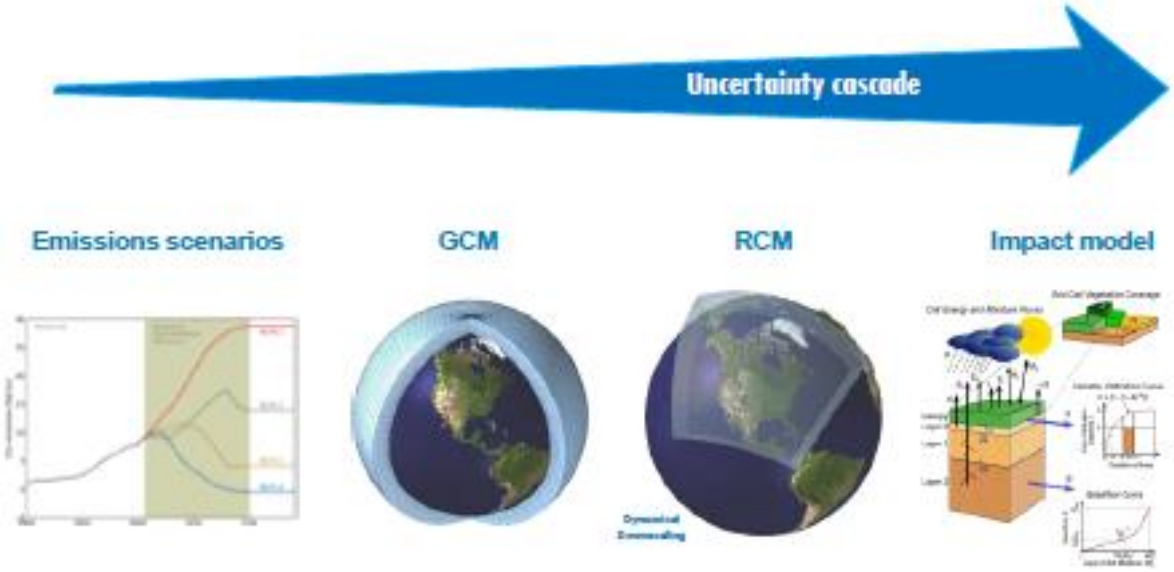

Photo and Idea Credit: Ouranos

Process of developing APEGBC Climate Resilience Guidelines

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Initiation

- BCMoTI Technical Circular T-06/15 (June 2015): Climate Change and Extreme Weather Event Preparedness and Resilience in Engineering Infrastructure Design

– "This Technical Circular serves as a directive to consider climate change and extreme weather events in infrastructure project design. While it provides directive, further practice guidance, as well as examples of engineering practices, can be obtained from professional associations"

– BCMoTI Design Criteria Sheet for Climate Change Resilience

Consultation

- Steering Committee with professionals from:

– BCMoTI, Urban Systems, Associated Engineering, BC Ministry of Environment, Metro Vancouver, Engineers Canada, PCIC, WSP Canada, ISL, Fraser Basin Council, and Kerr Wood Leidal

Climate Resilience Guidelines: An Overview

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Interim guidelines

- One year adoption and consultation period
- Use by BCMoTI Engineers from date of release

Applicability to:

- BCMoTI highway infrastructure design projects
- New and retrofit projects

Established Standard of Care

- Not a technical standard of care
- Standard of care for engineers and geoscientists to meet their duty of care in professional practice

Standard of Care

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Project Component	Professional Considerations
Project Scope	• Identify if an *owner*-defined risk tolerance is available • Establish *owner*-defined time horizon for the infrastructure
Project Team	• Assemble qualified multi-stakeholder team with the *owner*
Regional Climate Projections	• Could be developed by a *climatologist* • A range of RCP or equivalent SRES scenarios should be used to generate regional climate projections • An ensemble of models should be used to generate regional climate projections. For example, the top 3 climate models for Western North America as indicated by PCIC are CNRM-CM5-r1, CanESM2-r1 and ACCESS1-0-r1[1] • At a minimum, the *highway infrastructure* should be designed considering existing climate parameters: e.g. a design should not be based on an anticipated future reduction in snow loading
Background Information	• Sufficient fieldwork should be conducted by the *QP* • The *QP* should review available and collect additional background information (see step 2b. in figure 3)
Climate adaptation method	Explore the following adaptation methods: • *Robust design* that makes the infrastructure resilient to a wide range of future climate projections is preferable • *Flexible design* • If appropriate, revisit adaptation options after a time period agree with the *owner*
Highway infrastructure Climate Resilient Design Report	• Convey in plain language, the risks associated with status-quo/worst-possible emissions scenarios to the *owner* to enable decision-making • Address the frequency of re-assessment and monitoring required
Project Documentation	• The recommendations made by the *QP* and the decisions made by the *EOR* should be clearly documented • Climate model ensemble used • Version of the vulnerability risk assessment tool

Best Practices on Small Projects

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- Investigate whether design-relevant regional climate data of the area where the infrastructure is located is available,
- Investigate whether prescriptive design requirements have been provided by the owner or a regulatory authority,
- (Where applicable) incorporate climate change adaptation in the design, and
- Communicate to the owner:

  – the possible unmitigated risks associated with the infrastructure and a suggested plan to address those risks or

  – the need for a climate vulnerability risk assessment (if identified).

Climate Vulnerability Risk Assessment Assurance Statement

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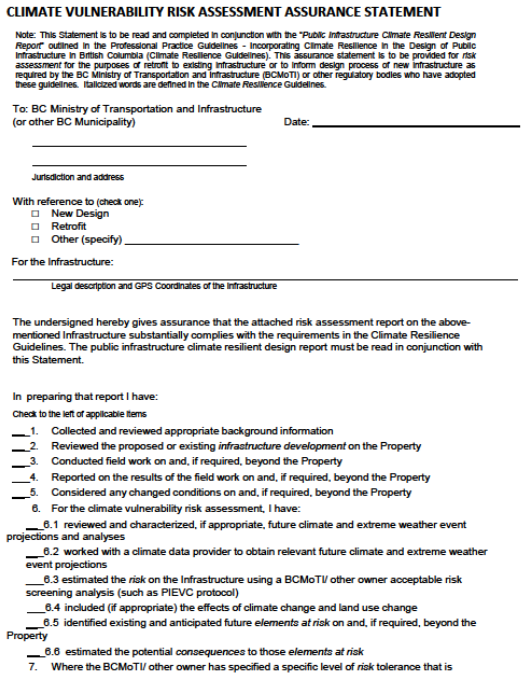
- For BCMoTI projects
- New Design/Retrofit
- Assurance that a certain standard of care has been applied in conducting the *climate vulnerability risk assessment* not an assurance on the design
- For BCMoTI projects, provided with the *public infrastructure climate resilient design report* and the design criteria sheet
- Reference made to other provincial and national guidelines for determining the level of risk tolerance



CLIMATE VULNERABILITY RISK ASSESSMENT ASSURANCE STATEMENT

Note: This Statement is to be read and completed in conjunction with the "*Public Infrastructure Climate Resilient Design Report*" outlined in the Professional Practice Guidelines – Incorporating Climate Resilience in the Design of Public Infrastructure in British Columbia (Climate Resilience Guidelines). This assurance statement is to be provided for *risk assessment* for the purposes of retrofit to existing infrastructure or to inform design process of new infrastructure as required by the BC Ministry of Transportation and Infrastructure (BCMoTI) or other regulatory bodies who have adopted these guidelines. Italicized words are defined in the *Climate Resilience* Guidelines.

To: BC Ministry of Transportation and Infrastructure
(or other BC Municipality) Date: _____

_____
_____
Jurisdiction and address

With reference to (check one):
☐ New Design
☐ Retrofit
☐ Other (specify) _____

For the Infrastructure:
_____
Legal description and GPS Coordinates of the Infrastructure

The undersigned hereby gives assurance that the attached risk assessment report on the above-mentioned Infrastructure substantially complies with the requirements in the Climate Resilience Guidelines. The public infrastructure climate resilient design report must be read in conjunction with this Statement.

In preparing that report I have:
Check to the left of applicable items

__1. Collected and reviewed appropriate background information
__2. Reviewed the proposed or existing *infrastructure development* on the Property
__3. Conducted field work on and, if required, beyond the Property
__4. Reported on the results of the field work on and, if required, beyond the Property
__5. Considered any changed conditions on and, if required, beyond the Property
6. For the climate vulnerability risk assessment, I have:
__6.1 reviewed and characterized, if appropriate, future climate and extreme weather event projections and analyses
__6.2 worked with a climate data provider to obtain relevant future climate and extreme weather event projections
__6.3 estimated the *risk* on the Infrastructure using a BCMoTI/ other owner acceptable risk screening analysis (such as PIEVC protocol)
__6.4 included (if appropriate) the effects of climate change and land use change
__6.5 identified existing and anticipated future *elements at risk* on and, if required, beyond the Property
__6.6 estimated the potential *consequences* to those *elements at risk*
7. Where the BCMoTI/ other owner has specified a specific level of *risk* tolerance that is

Interesting Quotes..

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- **“Engineers need a paradigm shift in the way they practice in the light of a changing climate”**
  - ASCE white paper on Adapting Infrastructure and Engineering Practice
- **“This is not rocket science folks! It’s just Civil Engineering”**
  - Dirk Nyland, Chief Engineer, BCMoTI

Contact Information

Professional Engineers and Geoscientists of BC

If you have questions regarding the *APEGBC Professional Practice Guidelines – Incorporating Climate Resilience in the Design of Public Infrastructure in British Columbia*, please contact:

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