

THE PROFESSION'S POSITION

- Engineers accept the overwhelming scientific evidence that the world's climate is changing and there is a strong urgency to adapt to this change while still encouraging mitigation efforts to slow the rate and magnitude of climate change.
- In serving the public interest, engineers are uniquely qualified and positioned to ensure that Canada's infrastructure can resist and recover from the impacts of extreme weather and long-term changes to our climate.
- Bodies responsible for engineering codes, standards, and work practices must consider climate change when reviewing, establishing, or updating codes, standards, and work practices. Improved climate science understanding and modelling future projections is crucial to reducing uncertainties associated with future scenarios.
- Federal and provincial governments must consult and collaborate with the engineering profession on climate change policies for the benefit of the public that they both serve.
- Education and professional development must provide engineers with the required information, skills, and techniques to properly design and adapt to the new challenges posed by climate change.

The issue

Extreme weather and rapid changes to Canada's climate present a profound risk to both public safety and the reliability of Canada's infrastructure. The disruption and cost to Canada's economy when infrastructure is damaged or destroyed by extreme weather events is growing and becoming more frequent across Canada.

Much of Canada's current infrastructure is vulnerable. The damages from the Fort McMurray wildfire in 2016 illustrated the impacts in terms of cost and potential loss of life. The expense of this event is estimated to reach \$9 billion.¹

Infrastructure owners need the capacity to assess the climate vulnerability of new and existing infrastructure in order to plan and manage potential impacts. Such analysis provides evidence to improve existing policies and procedures as well as develop new ones to address emerging needs, issues, and concerns.

How Engineers Canada has contributed

Since 2005, Engineers Canada has partnered with the engineering regulators and other organizations to engage engineers with scientists, policy planners, industry leaders, and government decision-makers to discuss how to adapt public infrastructure to climate change.

These and related actions have been executed through a national action plan on climate change, in collaboration with the engineering regulators, for the benefit of engineers and governments.

CBC News (2017). "Fort McMurray wildfire costs to reach almost \$9B, new report says." Retrieved August 21, 2017, from: <http://www.cbc.ca/news/canada/edmonton/fort-mcmurray-wildfire-costs-to-reach-almost-9b-new-report-says-1.3939953>.

Between August 2005 and June 2012 Engineers Canada, with funding from Natural Resources Canada and in collaboration with partners from all levels of government and other sectors, formed the Public Infrastructure Engineering Vulnerability Committee (PIEVC). Now an operational committee of Engineers Canada, the committee continues to examine, from an engineering point of view, the threats to Canada's infrastructure arising from rapid climate changes.

Between 2007 and 2012, the committee developed and validated the PIEVC Protocol to be used for vulnerability assessments of infrastructure systems located in small communities and large urban centres, in Canada's North and most recently in First Nations communities. Since 2008, the protocol has been used in over 45 infrastructure assessments in Canada, with additional projects in Honduras and Costa Rica. PIEVC has also attracted interest from the United Nations and international development banks that finance infrastructure projects. Reports from these studies are available at www.pievc.ca.

The experiences and outcomes from these assessments have enabled the profession to engage with stakeholders on climate-related infrastructure policy and procurement. Engineers Canada was an active contributor to the federal government's Pan-Canadian Framework for Climate Change that was published in the fall of 2016.

Engineers Canada has taken an active role in developing national practice guidelines on the principles of climate change adaptation for professional engineers to consider.

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Recommendations for the federal government

Engineers Canada encourages the federal government to require climate vulnerability and risk assessments as a condition for funding approvals of infrastructure projects. This principle should extend to approving environmental impact assessments and designs for infrastructure projects involving rehabilitation, re-purposing of existing infrastructure, as well as new construction.

The federal government will benefit greatly by working with the engineering profession on this significant public policy issue through a range of collaborative efforts that include:

- consultation and collaboration with the engineering profession on climate change policy. The profession can provide independent and unbiased technical expertise and advice on adaptation and mitigation that governments can use to develop sound evidence-based policies and implement technically feasible and cost-effective strategies
- continue to fund climate research to assess impacts and adaptation, and thereby increase the reliability of scientific data used by engineers
- promote awareness of climate change impacts and adaptation to engage communities and industry. This includes working with provincial and territorial governments to understand, assess, and adapt to changes in Canada's climate, including the specific challenges in Canada's North.
- promote information-sharing between engineers, scientists, and other key stakeholders regarding current best adaptive practices and regional climate data sets
- maintain and improve a national network of climate and watershed data collection systems, including partnerships with other levels of government in accordance with national standards and quality control measures
- continue efforts to improve the accuracy and resolution of climate change projection models and support provincial efforts to develop up-to-date, reliable regional climate data sets and trend analyses. This includes supporting demonstration projects and validating best practices to become standard practices.

- continue to support the Natural Resources Canada Climate Adaptation Platform, which continues to provide an excellent forum for collaboration, communication, and capacity-building between all stakeholders.

Experienced engineering professionals are available to provide technical expertise and impartial advice on a voluntary basis to governments on adaptation and mitigation requirements, and to advise on and help develop sound policies, appropriate processes, and technically feasible implementation strategies.

How Engineers Canada will contribute

Engineers must adapt their professional practice to consider the impacts of extreme weather and the changing climate. They should acquire the requisite knowledge, skills, experience, and consult with other professionals including climate specialists to properly address this issue in each project.

Engineers Canada will continue to work with engineering regulators to raise awareness and educate engineers on the needs and methods when considering extreme weather and longer-term climate change in engineering decisions. This includes developing guidance to embed climate adaptation principles in professional practice and an engineers' standard of care.

Engineers Canada can advise the federal government on the research, information, and funding needed to safeguard infrastructure and communities that are vulnerable to the effects of climate change.

Engineers Canada will continue working with all infrastructure owners to improve knowledge and build their capacity to assess risks arising from extreme weather and changing climate. We will continue to take a leadership role in ensuring that codes, standards, and practices embody principles that promote a clean environment and a sustainable economy.

Engineers Canada will continue to provide advice and leadership to our regulators by developing and maintaining national practice guidelines, such as the National Guideline for Principles of Climate Change Adaptation and Mitigation for Professional Engineers. This effort includes the delivery of professional development to engineers in partnership with our regulators on national guidelines, as well as promoting tools such as the PIEVC Protocol and information needed for engineers to adapt their designs, improve operations and maintenance of public infrastructure, and improve measures to mitigate emissions that contribute to climate change.