Engineers Canada's Comments to Environment and Climate Change Canada

Preparing for Climate Change
Canada's National Adaptation Strategy
Discussion paper

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Overview

Engineers Canada is the national organization that represents the 12 provincial and territorial engineering regulators that license the more than 300,000 members of the engineering profession in Canada. As the only national voice for the engineering profession, our organization has a long-standing history of working and collaborating with the federal government to help inform and develop legislation, regulations, and policies.

Engineers Canada would like to thank Environment and Climate Change Canada for the invitation to participate in the development of Canada's first National Adaptation Strategy. Engineering is on the front line in the provision of infrastructure to society. For this reason, engineers have a significant role to play in addressing climate change issues and incorporating them into engineering practice in Canada. The profession has been engaged in this issue for over 15 years with a focus on infrastructure climate vulnerability and risk assessment, as well as proposing adaptation policies, strategies, and professional practices to improve resilience. Engineers, under their professional code of ethics, play a fundamental role in ensuring infrastructure designs and operations are continuously adapted to the impacts of the environment to ensure public safety. For this reason, engineers are well positioned to offer their expertise on measurable and achievable short-term actions to support long-term transformational goals and medium-term objectives that the federal government is seeking as a result of these consultations.

Natural Environment

Nature-based solutions

Nature-based solutions is a design approach that leverages the positive benefits of natural systems in conjunction with traditional engineering. It encompasses a wide range of approaches—from the restoration of habitats, to water resource management, disaster risk reduction, and green infrastructure—to address societal problems. As we continue to see the devastating impacts of climate change due to warmer global temperatures, nature-based solutions can provide value as a result of their vital roles in carbon sequestration. Engineers have the technical expertise and are working to use green infrastructure and natural areas for flood prevention, to eliminate heat islands, and to improve air, water, and soil quality.

Engineers Canada believes that the federal government should continue to invest in nature-based solutions to address climate change. We applaud the federal government's $780-million investment into the *Nature Smart Climate Solutions Fund* for nature-based solutions as these are important steps in recognizing the role that natural infrastructure can play.

Disaster Resilience and Security

Utilization of Canada's national climate data framework

Currently, available information within the national climate data used to inform the development, implementation, maintenance, rehabilitation, and decommissioning of federal infrastructure projects and initiatives is under-utilized. To meet national environmental information and community needs, the federal government should effectively measure and evaluate the short- and long-term environmental effects of natural resource activities, projects, and assessments. Having consistent and reliable climate data will enable us to understand the effects of climate change more fully and will ensure that issues arising from Canada's changing climate can be better mitigated. The federal government should have better data to understand the effects of climate change to effectively understand its impacts, which will help plan for future investments.

Engineers Canada welcomes the federal government's proposed investment of $120 million (which began in 2018 and will run until 2023) to adapt Canada's weather and water services to climate change. However, by doing so, we must ensure that the collection of national climate data remains up-to-date, consistent, and accurate to increase public confidence in federal environmental assessments and regulatory processes, while simultaneously supporting evidence-based decisions to guide project planning activities. Consistent national climate data will ensure that accurate climate projections are made, enabling effective planning for disaster mitigation and adaptation.

A climate index provides a diagnostic quantity that is used to characterize the state of and/or changes in a climate system, such as a circulation pattern. There are a variety of methods that can be used to derive assorted indices, including classically, selected station, grid point, or regional average data.[1] Most indices use a single variable, such as sea level pressure, sea surface temperature, geopotential height, while others use a combination of variables (i.e., temperature and precipitation).[2] Each climate index has certain measurable parameters that influence the properties of a climate system.

Engineers Canada recommends that ECCC work together with the engineering profession to align engineering needs with climate projections and include specific climate parameters that go beyond temperature, rainfall, and precipitation. Including these additional climate parameters will build confidence in climate projections, support accurate risk assessments in built environments, and will provide engineers with defensible and authoritative climate data when supporting resilient communities across Canada.

There are several climate parameters that can be included, such as:

1. Wind speed and direction

[1] The National Center for Atmospheric Research (2019). "Overview: Climate Indices." Retrieved from: https://climatedataguide.ucar.edu/climate-data/overview-climate-indices.
[2] Ibid.

2. Fog
3. Snow accumulation, duration, and intensity
4. Freezing rain and hail
5. Freeze-thaw cycles
6. Long duration rainfall / Atmospheric river tracking

The role of various climate parameters on various types of infrastructure is of high importance and changes must be anticipated. Understanding meteorological and climate parameters, such as temperature, local changeability, heavy snow, fog, etc., is essential before designing and constructing physical infrastructure across Canada. The combination of extensive climate parameters and infrastructure indicators provides sufficient evidence for professionals to assess specific infrastructure responses to an identified climate condition. Additionally, it would be beneficial to see a database of climate impacts attributed to climate parameters, which provides strong forensic evidence that is often needed to support the development of new climate change-integrated standards for increased climate resiliency in decision-making. For example, a climate and infrastructure forensic database capturing high impact climate events and the associated failures of assets or services would help to inform many standards, risk assessments, decisions, and designs on important "breaking point" climate thresholds

Expertise of the engineering profession

Science and knowledge are critical in guiding disaster mitigation and adaptation. The breadth and complexity of the science and knowledge needed to meet this challenge requires collaboration across disciplines and sectors, including the engineering profession in Canada. Climate action must draw on existing knowledge and consider new insights as they become available. The inclusion of the unbiased expertise of the engineering profession in dealing with disaster resilience and security is a key element to ensure that decision makers have the best available knowledge that will keep research efforts aligned with practitioners' needs. An effective approach to risk management is one that recognizes and capitalizes on the collective strengths and capabilities that exist within the various stakeholders.

Public safety is threatened, and the risk of adverse environmental, social, and economic impacts increases when professional engineers are not directly involved in the design, review, implementation, and maintenance of projects that require the application of engineering principles. Where engineering work is performed, it is in the public interest that a licensed engineer be involved. Professional engineers bring innovative and diverse ideas to solve complex problems. Professional engineers are bound by their code of ethics to hold paramount the safety, health, and welfare of the public and the protection of the environment, as well as to ensure that clients and employers are made aware of societal and environmental consequences of actions or projects.[3]

[3] Engineers Canada (2018). "Public Guideline: Principles of climate adaptation and mitigation for engineers." Retrieved from: https://engineerscanada.ca/public-guideline-principles-of-climate-adaptation-and-mitigation-for-engineers#notice.

In 2018, Engineers Canada released a national public guideline entitled: Principles of climate adaptation and mitigation for engineers, which sets out general concepts and principles to inform engineering professionals on why adaptation to and mitigation of climate change is relevant in professional practice.[4] The guideline helps inform engineers of the guiding principles, how to address the implications of climate change in their professional practice, and most importantly, how to create a clear record of the outcomes of those considerations. We would encourage the federal government to consider this document for helpful context as they consider the National Adaptation Strategy.

Regional climate assessments in northern and remote communities

Northern and remote communities are disproportionately affected by Canada's changing climate.[5] The extreme change in Canada's climate has threatened public infrastructure and public safety in northern and remote communities and has negatively affected the development of projects in these regions. For example, the community of Jean Marie River in the Northwest Territories has been negatively impacted by melting permafrost. Melting permafrost has caused unstable ground for building foundations, unreliable pathways for both hunters and animals, and incidents of massive flooding that have impacted local transportation. Melting permafrost continues to threaten food security, public safety, natural environments, and future infrastructure developments within this region.

Regional climate assessments would provide data that would be used to construct baseline measurements for northern and remote communities to understand future climate projections. These measurements then allow professional engineers and other practitioners to factor in future climate projections into their design, building, and maintenance of infrastructure in these northern and remote communities that are most susceptible to the effects of climate change.

Strong and Resilient Economy

To ensure that Canada's economy is structured to anticipate, manage, and respond to climate change impacts, the federal government must guarantee that all adaptation actions lead to an outcome of improved resiliency for all communities be they municipalities, cities, towns, or reserves. Part of this would be ensuring that climate risk assessment is incorporated as part of the policy framework for environmental impact assessment of infrastructure projects. In addition, the federal government would benefit greatly from a range of efforts with respect to this policy issue that include:

- Consultation and collaboration with the engineering profession on policies relating to climate change. The profession can provide independent, unbiased, and credible expertise and advice on climate

[4] Engineers Canada (2018). "Public Guideline: Principles of climate adaptation and mitigation for engineers." Retrieved from: https://engineerscanada.ca/public-guideline-principles-of-climate-adaptation-and-mitigation-for-engineers#notice.

[5] Ogden, Aynslie (2002). "Climate Change Impacts and Adaptation in Northern Canada." Retrieved from: https://sencanada.ca/content/sen/committee/372/agri/power/north-e.htm.

adaptation and mitigation that governments can consider in developing sound evidence-based policies.

- Continuing to fund climate research to assess impacts and adaptation, and inform the development and updating of codes, standards, and other instruments, thereby increasing the confidence of climate design data used by engineers. This includes providing updates to the Federal Flood Mapping Guideline Series.
- Promoting awareness of climate change impacts, adaptation measures, and GHG reductions with communities and industry. This includes working with provincial and territorial governments to understand, assess, and adapt to changes in Canada's climate, including the unique challenges in Canada's North.
- Promoting information-sharing between engineers, scientists, and other key stakeholders regarding current best adaptive practices and regional climate data sets.
- Maintaining and improving 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. This includes supporting established regional hubs including OURANOS and the Pacific Climate Impacts Consortium that provide more localized products and services as well as newer developing hubs such as the Prairie Adaptation Research Collaborative at the University of Regina.
- Continuing 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.
- Continuing 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.
- Continuing to support the Canada Centre for Climate Services (CCCS) in its provision of climate data, information products, and advisory services to Canadians. Engineers require scientifically defensible climate information and future projections that are supported by the legal authority of the federal government through CCCS.