Engineers Canada's Comments to Environment and Climate Change Canada

Strategic Priority Setting for the Climate Science 2050 National Climate Change Science Plan

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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 strategic priority setting exercise (RFI) that is part of the development of the Climate Science 2050 National Climate Change Science Plan.

Recent Advances in Climate Change Science

Guidance: What are the most important recent advances in your field that support climate change action?

NEGATIVE EMISSIONS TECHNOLOGIES (NETs)

An emerging set of tools is a suite of negative emission technologies (NETs). Unlike carbon-capture methods that reduce emissions from power plants and industrial facilities, NETs remove carbon dioxide in the atmosphere and sequester it in the ground or other forms of long-term storage, most often, underground geological formations where the carbon will stay. NETs differ from carbon capture and storage (CCS) systems as NETs pull CO2 directly from the atmosphere, whereas CCS draws CO2 typically from fossil fuel exhaust. NETs can lead to true carbon negativity as opposed to carbon-neutrality[1].

Knowledge Synthesis Opportunities

Guidance: What currently available science advice, resources or materials are under-utilized?

NATIONAL CLIMATE DATA FRAMEWORK

Currently, the use of up-to-date national climate data 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

[1] Snyder, Brian (2019). "NETs Offering New Opportunities for Negative Emissions". Retrieved from: https://sustainablebrands.com/read/cleantech/nets-offering-new-opportunities-for-negative-emissions

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 both present and future projects within the *Investing in Canada Plan* and the proposed Climate Science 2050 (CS2050) National Climate Change Science Plan.

PROFESSIONAL EXPERTISE OF THE ENGINEERING PROFESSION

Science and knowledge are critical in guiding the swift and ambitious action needed to build a resilient, carbon-neutral Canada. 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 the development and implementation of CS2050 is a key element to ensure that decision makers have the best available knowledge that will keep research efforts aligned with practitioners' needs. The Management of Climate Risks is a responsibility that is shared by many parties. 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 environmental, social, and economic impacts are at risk 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 Professional 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.[2] This benefits the CS2050 National Climate Change Science Plan during project assessments at the planning stage, as well as during the full lifecycle of a project. Professional engineers strengthen the design process, provide greater certainty to proponents, and maximize successful outcomes.

REGIONAL CLIMATE ASSESSMENTS IN NORTHERN AND REMOTE COMMUNITIES

Northern and remote communities are disproportionately affected by Canada's changing climate.[3] 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

[2] 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.

[3] 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.

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.

Theme 1: Earth Systems Climate Science

GHG LOW-GLOBAL EMISSIONS: REPRESENTATIVE CONCENTRATION PATHWAYS

Representative Concentration Pathways (RCPs) define four diverse pathways of greenhouse gas (GHG) emissions and atmospheric concentrations, land use, and air pollutant emissions.[4] RCPs have been developed using Integrated Assessment Models as input to a wide range of climate model simulations to project their consequences for the climate system.[5] Oftentimes, these climate projections are used by professional engineers and other practitioners for adaptation and impact assessments.

Four pathways have been selected for climate modeling and research. These RCPs represent the range of GHG emissions, beginning with a stringent mitigation scenario of RCP2.6, followed by two intermediate scenarios of RCP4.5 and RCP6.0, and one scenario of RCP8.5 to represent high GHG emissions. It is suggested that RCP4.5 be used instead of the current listed low forcing level of RCP2.6 in climate projections used by ECCC as RCP4.5 is now being viewed as a more realistic low forcing level scenario given the course of current emissions trends. This available advice will enhance Canada's ability to mitigate and adapt to climate change while relying on accurate climate projections.

Theme 4: Resilient Communities and Built Environments

EXTEND CLIMATE PARAMETERS

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.[6] Most indices use a single variable, such as sea level pressure, sea surface temperature, geopotential height,

[4] The Intergovernmental Panel on Climate Change (2020). "Topic 2: Future Climate Changes, Risks and Impacts." Retrieved from: https://ar5-syr.ipcc.ch/topic_futurechanges.php.
[5] Ibid.
[6] The National Center for Atmospheric Research (2019). "Overview: Climate Indices." Retrieved from: https://climatedataguide.ucar.edu/climate-data/overview-climate-indices.

while others use a combination of variables (i.e., temperature and precipitation).[7] 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, as well as extend the proposed Climate Science 2050 (CS2050) National Climate Change Science Plan to include specific climate parameters that go beyond temperature, rainfall, and precipitation. Extending the proposed Climate Science 2050 (CS2050) National Climate Change Science Plan to include 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
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; evidence that is currently missing from the proposed CS2050 National Climate Change Science Plan.

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.

INCLUSION OF LICENSED PROFESSIONALS

A successfully executed CS2050 National Climate Change Science Plan will have a significant impact on major projects in Canada. To support the priorities in the plan, specifically in assessing Canada’s infrastructure needs and establishing a long-term vision, it is imperative that professional engineers be consulted throughout the lifecycle of federal infrastructure projects to allow for a comprehensive, evidence-based, and expert-driven assessment of infrastructure needs in the short-and long-term. Whether the federal government is investing in assessments that will consider the infrastructure needed to support the transition to a net-zero economy, or improving access to affordable, clean, safe, and efficient transportation options, or considering how public buildings can better bring communities together, it is imperative that professional engineers be involved.

[7] Ibid.

Individuals performing assessments under the CS2050 National Climate Change Science Plan must do so with high levels of technical expertise and accountability. Public safety and confidence are at risk when professional engineers are not involved in the development and implementation of a wide range of regulations that require the application of engineering expertise.

NEW NET-ZERO ENERGY READY CODES REQUIREMENTS BE EXPANDED TO INCLUDE EXISTING BUILDS

Engineers Canada supports the government's efforts towards a cleaner energy system to reduce Canada's greenhouse gas emissions and to achieve a low-carbon economy. To effectively reduce greenhouse gas emissions in the building sector, action needs to occur when it comes to both new and existing builds. For new builds, policy direction from all levels of government suggests that net-zero energy ready standards could be reached by 2030. New builds account for a small portion of buildings in Canada and addressing only this aspect of the building sector will not be sufficient to achieve a significant reduction in greenhouse gas emissions. Engineers Canada strongly recommends that the proposed CS2050 National Climate Change Science Plan include energy ready model building codes for both new and existing builds.

Theme 6: Carbon Neutral Society

SUPPORTING A PEOPLE-CENTRED JUST TRANSITION

Engineers Canada strongly believes that building on the resilience of Canada's workforce so that it is well-equipped with the skills that are required to deliver on Canada's ambitious climate transition initiatives, requires the unbiased expertise, determination, and ingenuity of the engineering profession. The concept of a just and equitable transition towards a low-carbon economy not only encompasses a people-centred approach, but it includes other aspects of potential harm that are raised by the prospect of broad-scale structural transitions, such as the wider impact to public safety and the potential impacts of climate change on communities. This concept draws on a range of perspectives that share the common theme to properly consider and manage issues associated with structural change.

It is paramount that the federal government identify and anticipate the skills that are required for a successful structural change. Scaling up the use of green technologies, for example, requires individuals with the right set of technical skills to adapt them, and to transfer that knowledge successfully to users. The technical skills, transferable knowledge, and accountability held by professional engineers in Canada will be key in managing large-scale structural changes associated with a just transition to a low-carbon economy. Accelerated climate change presents new and evolving challenges, opportunities, and risks that are considered by professional engineers in the fulfillment of their professional responsibilities.

For these reasons, Engineers Canada recommends that the engineering profession be included as a key stakeholder in the development and implementation of projects and initiatives under proposed just-transition legislation. Our organization believes that adequate, informed, and ongoing dialogue with the right practitioners builds a strong social consensus around the goals and pathways that are required to achieve a low-carbon and a just economy. Additionally, we recommend that a professional engineer be a member of the federal government's proposed *Just Transition Advisory Board* to provide independent, unbiased, and expert technical advice to the government on regional and sectoral transition strategies that work to uphold public safety, the natural environment, and the economy.