

THE ENGINEERING PROFESSION'S POSITION

- Sound and reliable public and private infrastructure play a fundamental role in upholding public safety, driving economic prosperity, and promoting overall societal well-being. Infrastructure serves as the backbone of growth and development, but outdated or poorly maintained infrastructure may pose risks to public health, safety, and the environment, while also impeding economic growth and competitiveness.
- All levels of government have a responsibility to provide predictable funding for the design, construction, and maintenance of safe and resilient public infrastructure throughout its full life cycle. This necessitates adopting a long-term perspective and conducting comprehensive life cycle analyses, recognizing that investing in infrastructure today will yield benefits for future generations. Engineers possess the technical expertise and skills to evaluate infrastructure conditions, identify potential issues, and develop effective solutions to deliver safe and sustainable infrastructure that serves the public interest. They are committed to delivering infrastructure that meets the highest standards of quality, safety, and reliability, with due consideration for comprehensive life cycle analyses.
- To achieve sustainable infrastructure development aligned with long-term societal needs, it is vital to prioritize sustainable practices in design codes and standards, focusing on energy efficiency, low carbon emissions, and climate resilience. Robust maintenance standards must also be established to ensure ongoing safety and integrity.

The challenge(s)

Infrastructure plays a critical role in ensuring public safety, quality of life, and economic competitiveness in Canada. However, there are several challenges that need to be addressed to ensure that Canadian infrastructure can meet the needs of the future. These challenges can be categorized into four main areas:

1. Deterioration from aging and use: A significant portion of public infrastructure in Canada is aging and in poor condition, which poses challenges. Bridges, roads, and water treatment plants are becoming outdated and require repair or replacement.¹
2. Climate change resilience: The impacts of climate change, including extreme weather events and rising sea levels, present a significant threat to the resilience of infrastructure. Such events may lead to substantial damage and service disruptions. This in turn can result in direct harm to the public, emphasizing the need for infrastructure to be
3. Reduction of infrastructure's contribution to global warming: The manufacturing process of infrastructure materials, such as cement, contribute significantly to global CO₂ emissions. Addressing the impact of infrastructure on global warming is a critical challenge that requires implementing measures to reduce emissions and adopt sustainable practices throughout the infrastructure lifecycle.
4. Financing infrastructure responses: The cost of addressing infrastructure challenges is substantial. Effective funding and financing models are required. Finding innovative approaches to secure adequate financial resources for infrastructure projects is crucial to meeting these challenges and ensuring the timely completion of necessary improvements.

¹ The Canadian Infrastructure Report Card (2019). *Informing the Future: Assessing the Health of Our Communities' Infrastructure*. [The Canadian Infrastructure Report Card](#)

Significant efforts are already underway to address these challenges. Infrastructure Canada is leading the development of Canada's first National Infrastructure Assessment², which aims to assess infrastructure needs, improve coordination among owners, and determine funding/financing models. Additionally, Natural Resources Canada is working on the Canada Green Building Strategy to advance progress in achieving net-zero emissions and enhancing climate resilience in the building sector.³

As the effects of climate change accelerate, establishing a long-term vision for climate-resilient infrastructure becomes increasingly critical. With projections of significantly increased infrastructure by 2050, prioritizing energy efficiency, low embodied carbon, and climate resilience aligns with emission reduction goals.^{4,5} and supports Canada's National Adaptation Plan⁶. Implementing new procurement requirements and standards that consider sustainable principles, such as energy and carbon performance, and climate considerations, will facilitate informed decision-making and contribute to the development of thriving and resilient communities.

While traditional engineering approaches have typically relied on grey infrastructure solutions, there is a growing recognition of the value of nature-based solutions, such as green infrastructure, in addressing challenges like flood management, erosion control, and urban cooling⁷. Imparting nature-based solutions into the application of traditional engineering practices not only addresses technical challenges but also provides additional co-benefits, including improved air and water quality, enhanced biodiversity, carbon sequestration, flood mitigation, and aesthetic, cultural, and recreational benefits. With increasing consideration for nature-based solutions, engineers play a crucial role in all aspects related to their adoption, implementation, and maintenance.

Addressing these infrastructure challenges necessitates a coordinated effort involving all levels of government, industry stakeholders, and the engineering profession. Engineers shall continue

to collaborate closely with practitioners, officials, and decision-makers to advocate for investments in energy-efficient, low-carbon, and climate-resilient infrastructure. Furthermore, securing the expertise of engineering professionals to assist in policy development and implementation is crucial. Supporting the active engagement of engineers in the modernization of infrastructure codes, standards, and maintenance protocols enhances public safety, ensures reliability, and maximizes the value of infrastructure investments. By addressing these challenges collectively, Canada can build a sustainable, resilient, and future-ready infrastructure network.

How Engineers Canada has Contributed

Engineers Canada has collaborated closely with the federal government to advise on policies and programs related to public and private infrastructure in Canada. Engineers provide technical expertise and input on best practices, codes, and standards related to infrastructure development, maintenance, and sustainability. Together with the 12 provincial and territorial engineering regulators, Engineers Canada has contributed to enhancing the safety and resiliency of communities across Canada and mitigating the impact of climate change on infrastructure. This collaboration involves:

- Issuing [National Position Statements](#) that highlight timely issues and reflect the engineering profession's stance on critical issues related to public interest including infrastructure, infrastructure on Indigenous reserves and in remote Indigenous communities, and climate change mitigation and adaptation.
- Supporting [federal initiatives](#) by providing evidence-based recommendations.
- Creating [national guidelines](#) and papers that serve the needs of regulators, engineers, and applicants for licensure regarding the environment and sustainability.

² Infrastructure Canada. (2021). Building Pathways to 2050: Moving Forward on the National Infrastructure Assessment. <https://www.infrastructure.gc.ca/alt-format/pdf/nia-eni-nia-eni-2-en1.pdf>

³ Natural Resources Canada. (2023). The Canada Green Building Strategy. [The Canada Green Buildings Strategy](#).

⁴ Canadian Net-Zero Emissions Accountability Act, S.C. 2021, c. 22 (2021). <https://laws-lois.justice.gc.ca/eng/acts/c-19.3/fulltext.html>

⁵ Government of Canada. (2022). 2030 Emissions Reduction Plan: Clean Air, Strong Economy. <https://www.canada.ca/en/services/environment/>

[weather/climatechange/climate-plan/climate-plan-overview/emissions-reduction-2030.html](#)

⁶ Washington Post. (2023). World is on brink of catastrophic warming, U.N. climate change report says. <https://www.washingtonpost.com/climate-environment/2023/03/20/climate-change-ipcc-report-15/>

⁷ Asset Management British Columbia. (2019). Integrating Natural Assets into Asset Management: A Sustainable Service Delivery Primer <https://www.assetmanagementbc.ca/wp-content/uploads/Integrating-Natural-Assets-into-Asset-Management.pdf>.

The provincial and territorial engineering regulators play a vital role in supporting the federal government's efforts toward sustainable infrastructure development in Canada. They uphold high standards of competency and ethics among engineering professionals and prepare guidelines for sustainable engineering practices. Additionally, regulators provide education and training opportunities to equip engineers with the necessary knowledge and skills to implement sustainable technology and systems in infrastructure projects. By collaborating with industry associations, academic institutions, and other stakeholders, regulators help promote the adoption of sustainable engineering practices across Canada's public and private infrastructure.

Through close collaboration with the engineering profession, the federal government can ensure that public infrastructure in Canada is safe, reliable, and sustainable.

Recommendations to the federal government

Infrastructure investments and renewal are vital for the development of Canadian communities and stimulating economic growth. To address emerging challenges such as climate change, population growth, and technological evolutions, it is crucial to involve licensed engineers in decision-making and throughout the life cycle of federal infrastructure projects. This assists in developing comprehensive, evidence-based, and expert-driven assessments and delivery of infrastructure assets. It is also crucial to involve engineers in the development of national strategic plans related to Canada's infrastructure that can be adopted by each of the provincial and territorial governments. Engineers, with their professional expertise, recognize their moral responsibility to implement projects that are technically sound and ethically responsible, considering the potential harm to marginalized, vulnerable, or structurally oppressed communities.

To promote the safety, reliability, and sustainability of Canada's public infrastructure, the federal government should foster and commit to ongoing collaboration with the engineering profession and other stakeholders to ensure that infrastructure projects meet community needs and comply with applicable regulations and building codes. The beneficial outcomes of such a commitment would include:

1. Integration of sustainable design practices (low carbon, energy efficiency and climate resilience) into new infrastructure projects to minimize environmental impacts and emissions and ensure infrastructure is better prepared for physical climate risks, such as warming and extreme heat, floods, wildfires, and other extreme weather events.
2. Utilization of advanced materials and scientifically validated technologies to enhance the durability, safety, and functionality of public infrastructure.
3. Foster ongoing collaboration with the engineering profession and other stakeholders to ensure that infrastructure projects meet community needs and comply with applicable regulations and building codes.
4. Ongoing improvements to infrastructure design codes and standards including the development of maintenance standards that support and reinforce the objectives of safety, reliability and sustainability in a fiscally responsible manner.

In addition, the federal government should consistently incorporate climate vulnerability assessments in funding approvals, environmental impact assessments, and infrastructure project designs. Establishing clear, transparent, and consistent evaluation criteria that comply with best asset management practices for project selection is essential. Flexibility in the timing of expenditures should be provided to ensure funds are spent wisely and effectively.

For the longevity and reliability of public infrastructure in Canada, ongoing improvements to infrastructure design codes and standards should include the development of maintenance standards. These standards ensure robust infrastructure designs that withstand the test of time, reducing the likelihood of costly repairs and minimizing the risk of catastrophic failures. The engineering profession is committed to playing a key role toward achieving such outcomes through development and maintenance of sound and reliable infrastructure, which is critical to the health and prosperity of society.

Lastly, the federal government can support the Atlas Initiative for Climate Resilient Infrastructure (Atlas),

which aims to unite engineers, governments, and financial institutions to improve connectivity, protect people, and safeguard the planet. The Atlas initiative is based on two pillars: involving engineers in decision-making from the outset and recognizing that no single entity can solve the climate/infrastructure challenge alone. The Atlas plan offers engineering policies to national governments, multilateral development banks, insurance, and reinsurance organizations. By adopting the Atlas call for climate-resilient infrastructure, the federal government can secure Canada's competitiveness in the race to a resilient net-zero future while protecting communities from climate disasters.

How Engineers Canada will Contribute

Engineers Canada is committed to:

- Engaging in ongoing collaboration with practitioners, government officials, and decision-makers to emphasize the value and benefits of sustained long-term investments in climate-resilient core public infrastructure and adequate funding for infrastructure maintenance to ensure safe and reliable service while protecting public health, safety, and the environment.
- Securing the services of engineering experts as needed to assist policy and decision-makers in proposing, developing, and implementing appropriate policies, procedures, and processes for long-term solutions to enhance public safety, reliability, environmental sustainability, and the value of public infrastructure. This includes supporting governments in their ongoing efforts to modernize infrastructure codes, standards, and other instruments, including new infrastructure maintenance standards.
- Collaborating with other infrastructure stakeholders to promote consistent messaging on the importance of educating and informing Canada's engineers about the impacts and risks of extreme weather and our changing climate on infrastructure design, operations, and maintenance, using climate vulnerability assessments and practice guidance.