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| Draft Environmental scan for the Engineers Canada Strategic Plan 2025-2027 |
| Fall 2022 |
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# Introduction

In support of the 2025-2027 Strategic Plan, Engineers Canada developed this environmental scan to provide an overview of the foreseen factors that will have an impact on the engineering regulators, Engineers Canada, and the profession.

To generate this scan, a literature review of internal and external reports, articles, and regulator strategic plans was conducted. Engineers Canada staff were interviewed, and regulators’ presentations and strategic plans were consulted. This draft environmental scan will be circulated to the following groups for consultation before it is finalized and approved by the Strategic Planning Task Force in December 2022:

* Canadian Engineering Accreditation Board (CEAB)
* Canadian Engineering Qualifications Board (CEQB)
* Chief Executive Officers Group (CEO Group)
* Engineering Deans Canada (EDC)

# About Engineers Canada

Engineers Canada works on the following 10 purposes on behalf of the provincial and territorial associations that regulate engineering practice and engineering license holders:

1. Accrediting undergraduate engineering programs.
2. Facilitating and fostering working relationships between and among the regulators.
3. Providing services and tools that enable the assessment of engineering qualifications, foster excellence in engineering practice and regulation, and facilitate mobility of practitioners within Canada.
4. Offering national programs.
5. Advocating to the federal government.
6. Actively monitoring, researching, and advising on changes and advances that impact the Canadian regulatory environment and the engineering profession.
7. Managing risks and opportunities associated with mobility of work and practitioners internationally.
8. Fostering recognition of the value and contribution of the profession to society and sparking interest in the next generation of professionals.
9. Promoting diversity and inclusivity in the profession that reflects Canadian society
10. Protecting any word(s), mark, design, slogan, or logo, or any literary, or other work, as the case may be, pertaining to the engineering profession or to its objects.

# Status of 2022-2024 strategic priorities

As per [Board Policy 1.4](https://engineerscanada.ca/about/governance/policies-documents-and-resources)., Engineers Canada has a three-year strategic plan, which includes the following strategic priorities[[1]](#endnote-2):

Figure 1: 2022-2024 strategic priorities, by themes

|  |  |  |
| --- | --- | --- |
| **1. Advance the engineering regulatory framework** | **2. Champion an equitable, diverse, inclusive, and trustworthy engineering profession** | **3. Uphold our commitment to excellence** |
| * 1. Investigate and validate the purpose and scope of accreditation   2. Strengthen collaboration and harmonization   3. Support regulation of emerging areas | 2.1 Accelerate 30 by 30  2.2 Reinforce trust and the value of licensure | 3.1 Uphold our commitment to excellence |

These priorities are well-aligned and support the similar objectives and themes that a majority of regulators are tackling, when compared against their own strategic priorities. A review of regulators’ strategic plans was performed, when available..

Figure 2: Engineering regulator’s strategic priorities and associated themes (as of July 2022)

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **Regulatory**  **excellence** | **Legislative framework** | **Public trust/**  **relevance** | **Public protection** | **Organizational**  **excellence** | **EDI (mainly women, may include other groups)** | **Indigenous participation/ representation** | **Climate change** | **Partnerships** | **Governance** |
| **APEGA** |  |  |  |  |  |  |  |  |  |  |
| **APEGNB** |  |  |  |  |  |  |  |  |  |  |
| **APEGS** |  |  |  |  |  |  |  |  |  |  |
| **EGBC** |  |  |  |  |  |  |  |  |  |  |
| **EGM** |  |  |  |  |  |  |  |  |  |  |
| **ENS** |  |  |  |  |  |  |  |  |  |  |
| **EY** |  |  |  |  |  |  |  |  |  |  |
| **OIQ** |  |  |  |  |  |  |  |  |  |  |
| **PEO** |  |  |  |  |  |  |  |  |  |  |

# Future trends and projected progress on each of the 2022-2024 strategic priorities

The following section provides an overview of issues foreseen in 2025 and beyond. These trends are not mutually exclusive but rather reinforce each other. Given that current strategic priorities are expected to be completed by the end of 2024, this document includes an overview of the work expected to be completed before the 2025-2027 Strategic Plan commences.

## Trends in engineering education and accreditation

This section provides an overview of trends related to engineering education and accreditation. These are based on research conducted by Higher Education & Beyond in 2022 and contained in two separate reports: Benchmarking the Canadian Engineering Accreditation System and Current and Emerging Practices in Engineering Education*.*

### Benchmarking against other accreditation systems

In 2022, Higher Education & Beyond[[2]](#endnote-3) conducted a benchmarking exercise of the Canadian engineering accreditation system against similar jurisdictions (Australia, France, Malaysia, and Poland) and similar regulated professions within Canada (information technology and processing professionals, nursing, and social work). Main findings indicate the Canadian engineering accreditation model is similar to others. Differences found indicate that other models include some experimental learning requirement, and the Canadian model is the only one with a minimum path requirement and a time-length input requirement for degree length. It also has less industry involvement than the similar accreditation systems.[[3]](#endnote-4)

### Use of competencies in measuring individual attainment of educational objectives

Some Canadian Higher Education Institutions (HEIs) are also demonstrating an interest in adopting competencies in the education system. Queen’s University[[4]](#endnote-5) and the University of Calgary[[5]](#endnote-6) have successfully piloted two initiatives that used competencies,[[6]](#endnote-7) which required students to demonstrate a certain level of mastery of some tasks before proceeding to the next level.[[7]](#endnote-8)

Accreditation criteria include the following graduate attributes (GAs):

* A knowledge base for engineering
* Problem analysis
* Investigation
* Design
* Use of engineering tools
* Individual and teamwork
* Communication skills
* Professionalism
* Impact of engineering on society and the environment
* Ethics and equity
* Economics and project management
* Life-long learning[[8]](#endnote-9)

These GAs are broader categories that encompass Canadian competencies, with the latter being more granular.[[9]](#endnote-10) There is an opportunity to develop detailed indicators for GAs that would provide a more direct link with existing Canadian competencies. These indicators would allow regulators to measure the progress of an individual from undergraduate programs to practising engineering independently and therefore increase their ability to justify their education and experience requirements and how they protect the public.

### Increasing proportion of under-represented groups

Between 2009 and 2015, the number of Canadians pursuing post-secondary education in Canada went from 1,119,679 to 1,202,765, a 7 per cent increase. During that same period, the number of immigrants pursuing post-secondary education grew from 84,582 to 166,242, a 97 per cent increase.[[10]](#endnote-11)

In 2012, Female representation in engineering was 11.3 per cent in 2010-2011[[11]](#endnote-12) and 14.2 per cent in 2020.[[12]](#endnote-13) Between 2016 and 2020, Canadian engineering accredited programs experienced the following growth:

Figure 3: Number of engineering students in CEAB accredited programs, and variation since 2016[[13]](#endnote-14)

|  |  |  |  |
| --- | --- | --- | --- |
|  | **# in 2020** | **Variance since 2016** | |
| **CEAB program enrolment** | 90,311 | +8% |
| **Engineering degrees awarded** | 18,185 | +5.1% |
| **Female enrolment in accredited programs** | 21,855 | +25% |
| **International students enrolled in accredited programs** | 16,188 | +28% |

The number of equity, diversity and inclusion (EDI) initiatives, which include other under-represented groups, have risen across the country. To attract a more diverse student population, education institutions are offering more flexible and personalized entry points into their programs. Some are also seeking to address:

* *Vertical barriers,* which is the ability to join the engineering program, such as removing calculus requirements, providing formal transfers from technology to engineering programs, etc.
* *Horizontal barriers*, which is the ability to enter popular engineering fields.
* *Internal barriers,* which is the offering of additional support to address underprivileged strains such as financial limitations, caregiver duties etc.

Other measures can also include removing biases in engineering design by offering flexibility to students to resolve non-traditional projects and posing engineering problems that impact minority communities. These measures can also make engineering education more inclusive and welcoming to under-represented groups.[[14]](#endnote-15)

Engineering education can also include culturally responsible pedagogy, which “refers to teaching diverse students through their ethnic, linguistic, racial, experiential, and cultural identities.” [[15]](#endnote-16) For example, culturally responsible pedagogy can encompass tackling issues specific to under-represented groups or offer different teaching styles such as learning through community rather than in the classroom.[[16]](#endnote-17)

The Truth and Reconciliation Commission's Calls to Action 62 to 65 calls for the acknowledgement that education is typically conducted through a colonial lens, and for the inclusion of Indigenous people in design and delivery of curriculum, and educate students on the history, colonial legacy and worldview of Indigenous peoples[[17]](#endnote-18). While some grassroots movements in engineering education are seeking to be more inclusive of Indigenous perspectives, the opposite of worldviews between the methods of teaching and learning, and ways to apply science, requires an in-depth look at the assumptions posed by the colonial engineering perspective, which goes beyond the typical work done under the EDI lens.[[18]](#endnote-19) For example, Canadian nursing and social work programs currently include an EDI and Indigenous content.[[19]](#endnote-20)

### Increase focus on non-technical skills

Higher education institutions (HEIs) are expected to go beyond teaching technical skills and to develop students with a professional identity that solves complex problems within multidisciplinary teams (challenge-based learning), manage and mitigate risks associated with the development and deployment of technology, and master non-technical skills (e.g., communications, leadership, teamwork, and critical thinking). Broadening admission criteria to include non-technical skills can help prepare students for the future while potentially increasing access to targeted diversity groups.[[20]](#endnote-21)

### Address students’ mental health issues

Engineering programs are also expected to address mental health issues affecting students and to change the culture of excessive workload as a badge of honour or rite of passage.[[21]](#endnote-22) This “superhero” culture of meritocracy[[22]](#endnote-23) can prevent engineering programs from being nurturing environments that attract individuals from a diverse background.[[23]](#endnote-24)

### Offer personalized program delivery and path

Institutions are increasingly tailoring their programs to attract a variety of students by allowing students to personalize their pathway to obtaining their degrees. Institutions that can leverage technology to be more accessible, efficient, and offer a more personalized form of education will have a comparative advantage.[[24]](#endnote-25)

### Offer continual learning and micro-credentials for lifelong education

In alignment with continuing professional development obligations, HEIs are also expected to offer more flexibility in education pathways and develop students who will seek lifelong learning opportunities. Increasingly, HEIs are expected to form partnerships with other education providers, companies, or others to deliver tailored information that can be used for varying engineering disciplines.[[25]](#endnote-26)

## 1.2. What Engineers Canada is currently doing to address trends in engineering education and accreditation

### Accreditation improvement

As part of the 2019-2021 Strategic Plan,[[26]](#endnote-27) the Canadian Engineering Accreditation Board (CEAB) adopted the Accreditation Improvement Program (AIP), which is a coordinated effort aiming to improve the delivery of accreditation and the Enrolment and Degrees Awarded Survey by improving stakeholder communication and consultation, providing training, implementing an improved data management system (the Tandem web application), and introducing a continual improvement process. The objectives of AIP are to improve the performance of the:

* Accreditation management process
* Enrolment and Degrees Awarded Survey process
* Stakeholder consultation process associated with accreditation management and Enrolment and Degrees Awarded Survey
* User experience(s) associated with accreditation management and the Enrolment and Degrees Awarded Survey
* Technical reliability of accreditation and the Enrolment and Degrees Awarded Survey
* Adoption by users when there are changes to the accreditation management and Enrolment and Degrees Awarded Survey processes
* Methods to ensure operationalization of continual improvement[[27]](#endnote-28)

The CEAB also implemented an annual evaluation process to inform continual improvements. Significant projects were, or are, being operationalized. The CEAB also struck the Accountability in Accreditation Committee and approved the Accountability in Accreditation Evaluation Strategy in 2020. The first annual evaluation results were published in 2021. Also, as per Engineers Canada’s purpose #1, accrediting undergraduate engineering programs, CEAB continues to grant accreditation to HEIs and fulfill its international commitments. This also happened during the COVID-19 pandemic, which required that HEIs and CEAB commit a significant level of resources to deliver engineering education and accreditation through virtual and remote methods.[[28]](#endnote-29)

### Reduction of the number of accredited units

In May 2020, to alleviate the workload of HEIs and students, the Engineers Canada Board approved a reduction of the number of accreditation units (AUs) from 1,950 AUs to 1,850 AUs.[[29]](#endnote-30)

### Support of the 30 by 30 initiative

The CEAB has also developed recommendations on how its work can support the 30 by 30 initiative. Proposed recommendations, which include changing graduate attributes and accreditation criteria, are currently under consultation and the final recommendations will be subsequently proposed to the Engineers Canada Board for approval.

### 2022-2024 Strategic Priority 1.1.: Investigate and Validate the Purpose and Scope of Accreditation

This strategic priority includes conducting a benchmark analysis of the accreditation system against others, investigating a minimum academic requirement for licensure, developing a new or confirmed purpose of accreditation, and providing recommendations to the Board on next steps. In an effort to alleviate the workload of CEAB volunteers, the Engineers Canada Board assigned this strategic priority to the CEO. It is expected that the Board will adopt recommendations resulting from this project into the 2025-2027 Strategic Plan.

### Feasibility study on alternative methods of academic assessment for non-CEAB candidates

The Canadian Engineering Qualifications Board (CEQB) was also directed by the Board to conduct a feasibility study on finding alternative methods for the academic assessment of non-CEAB applicants for engineering licensure. It is likely that this study will be completed in 2023 and finding a solution that could apply for both CEAB and non-CEAB applicants might be chosen by the Board as a 2025-2027 Strategic Priority.

## 2.1. Trends in addressing barriers and under-representation of diversity groups in engineering

Equity (access and opportunities for all), diversity (presence of differences) and inclusion (all feel like they belong) is often shortened to EDI.[[30]](#endnote-31) EDI is not a trend but rather the continued expenditure of long-term efforts and resources to address systemic gaps in engineering education, regulation, and practice.[[31]](#endnote-32) The term “accessibility” (similar access to same services and programs regardless of ability), is increasingly added to EDI and referred to as inclusion, diversity, equity and accessibility (IDEA).[[32]](#endnote-33)

Intersectionality is an analytical tool applied to address systemic barriers facing members of marginalized groups who possess intersecting identities and challenges. For example, one can consider the intersectionality of an individual who is a foreign-trained, Black, disabled woman.[[33]](#endnote-34) The following section considers that individuals belonging to more than one marginalized group may face systemic challenges that are inseparable from one another. Without an intersectional lens, our efforts to tackle inequalities and injustice towards women are likely to perpetuate systems of inequalities.[[34]](#endnote-35) Barriers to access or the practice of engineering include, but are not restricted to, a lack of:

* Knowledge of the licensing process and what being a professional engineer entails
* Availability of engineering programs locally (e.g., northern communities)
* Employers with staff and leaders from the same under-represented group
* Incentivization by employers to encourage their recent graduates to become licensed
* Mentors from the same under-represented group
* Relevant work in their engineering discipline[[35]](#endnote-36)

The length of time required to become a licensed engineer can be a deterrent, especially for those with limited financial resources, those who are balancing parental leave, [[36]](#endnote-37) or those who are experiencing other life circumstances. In addition, expected but unspoken professional standards tend to favour one group of people over other under-represented groups.[[37]](#endnote-38)

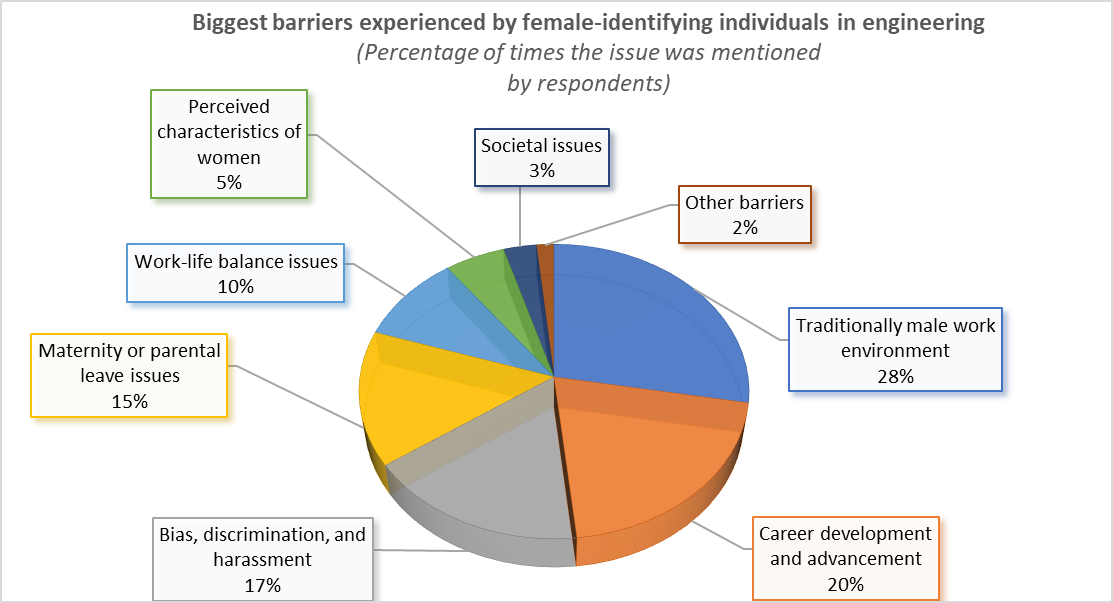
### Female-identifying representation in engineering

In 2020, the number of licensed engineers in Canada was 300,605, a decrease of 1.37 per cent since 2019.[[38]](#endnote-39) In 2019, female-identifying engineers represented 17.9 per cent of all the newly licensed engineers in Canada,[[39]](#endnote-40) whereas in 2020 they represented 20.6 per cent.[[40]](#endnote-41) This is lower than the percentage of female-identifying engineers in Europe (41 per cent) [[41]](#endnote-42) and Iran (70 per cent).[[42]](#endnote-43)

Female-identifying engineers are not promoted at the same rate as their male-identifying counterparts (3 per cent compared to 6 per cent), which results in only 24 per cent of female-identifying engineers achieving more senior level positions. Women also leave the engineering profession at a much faster rate than men (14 per cent compared to 4 per cent).[[43]](#endnote-44)

Salaries follow a similar trend, with female-identifying engineer earning the same as men at the entry-level, but only earning 95 per cent of men’s earnings once they have five to ten years of experience, and only 88 per cent for women with 20-25 years of experience. Across all experience levels, female-identifying engineers make 86.7 per cent of the base salary of their male counterparts.[[44]](#endnote-45)

Figure 4: Biggest barriers faced by female-identifying individuals in the engineering profession[[45]](#endnote-46)



Other barriers faced by female-identifying individuals include discriminatory attitudes towards them, familial constraints, as well as a lack of mentors, peers, and female leaders.[[46]](#endnote-47)

Research shows that lower representation of female-identifying individuals in positions of power and authority is not due to an inability to achieve a work-life balance but rather that, in cultures of overwork, they are encouraged to use accommodation measures to achieve a work-life balance, while male-identifying individuals are not. This results in career derailment for female-identifying individuals and prevent the workplace from providing better work-life balance for all employees.[[47]](#endnote-48)

### Representation of Indigenous peoples in engineering

Indigenous engineers earn 5.6 per cent less than their non-Indigenous counterparts across all position levels. Indigenous engineers were disproportionally represented in lower-level jobs.[[48]](#endnote-49)

Barriers to Indigenous engineers’ entry into the engineering profession include:

* Low Indigenous representation in engineering
* Racism
* Lack of pre-existing connections
* Lack of support from their engineering regulator to engage in concerted efforts to address systemic racism and discrimination
* Difficulty managing a work-life balance[[49]](#endnote-50)
* Lack of mentors
* Tokenism
* Lack of commitment from their employers to support their integration and career progression[[50]](#endnote-51)

Some individuals report hiding their Indigenous identity in fear of experiencing racism in their workplace.[[51]](#endnote-52) Indigenous people want more than be included in the profession, they also want engineering education and practice to include their cultural and world views.[[52]](#endnote-53)

### Representation of racialized individuals in engineering

In 2019, in the Canadian population at large, there was one worker aged 25-34 years old for every worker older than 55 years old, (0.96 women aged 25-34 years old for one woman aged 55 and old, and 0.86 for men). This ratio is higher for certain sub-populations, as outlined in Figure 5. These differences may lead to changes in the overall composition of the Canadian population.

*Figure 5: Ratio of 25–34-year-old for every 55 years or older in the same category*[[53]](#endnote-54).

|  |  |
| --- | --- |
|  | Ratio of 25-34 year old for every 55 years or older in the same category |
| Canada at large | 1 |
| Canada at large, women | 0.96 |
| Canada at large, men | 0.86 |
| South Asian women | 2.26 |
| South Asian men | 1.61 |
| Black women | 1.72 |
| Black men | 1.64 |
| Chinese women | 1.53 |
| Chinese men | 1.23 |

### Representation of immigrants in engineering

*The following sections present data from various Government of Canada methodologies and surveys. This report reuses the terminology used by the federal government to ensure accuracy of information. As a result, statistics should not be put in relation one to another unless the same terminology is used.*

Canada has been experiencing an increasing number of immigrants as shown by the figure that follows:

*Figure 6: Number of immigrants to Canada, from 2019-2021*[[54]](#endnote-55)

In 2021, Canada welcomed 401,000 new permanent residents (someone who has immigrated but is not yet a Canadian citizen). This is the most newcomers in its history.[[55]](#endnote-56) As part of the Global Skills Strategy, Canada has targeted individuals that already have a job awaiting them in Canada (Category A) as well as other occupations including computer and software engineers (Category B).[[56]](#endnote-57) As the Canadian population ages, the intake of immigrants and a diversity of engineering candidates will be needed to ensure the long-term sustainability of the profession.[[57]](#endnote-58)

In 2016, the percentage of Canadian-born individuals and immigrants with at least a bachelor’s degree in a STEM field and working in a STEM field was similar (48 per cent and 46 per cent, respectively). However, for those with a STEM degree working in engineering, the difference was much greater, with 66 per cent of Canadian-born individuals compared to 48 per cent of immigrants.[[58]](#endnote-59)

Foreign-trained individuals face the following barriers when seeking to have their experience and education recognized in Canada:

* Cost
* Process length
* Being paid lower than Canadian-educated individuals
* Lack of knowledge about the Canadian engineering regulatory system
* Lack of coordination among federal and provincial organizations[[59]](#endnote-60)

An influx of Ukrainian refugees has started to enter the country.[[60]](#endnote-61) The Association of Science and Engineering Technology Professionals of Alberta (ASET) has waived their application fees.[[61]](#endnote-62) Engineers & Geoscientists British Columbia has an internal guideline to address refugees.

### Representation of LGBTQ in Engineering

Sex refers to biological attributes; gender is socially constructed and includes roles, behaviours, actions, expression and identities; sexual orientation describes emotional, romantic, and sexual attraction.[[62]](#endnote-63)

Engineering is a more traditionally cis gender (someone whose gender identity matches their sex designation at birth), masculine, heterosexual environment. This means individuals who are lesbian, gay, bisexual, transgender, and queer/questioning (LGBTQ) are more likely to experience harassment and professional devaluation.[[63]](#endnote-64)

## 2.2. What Engineers Canada is currently doing to address trends related to the under-representation of marginalized groups in engineering

### National program in support of 30 by 30

In 2014, the Engineers Canada Board adopted the priority to increase the number of newly licensed engineers who are women to 30 per cent by 2030, as that proportion is recognized as the tipping point for sustained culture change. Efforts have been ongoing ever since. As part of the 2019-2021 Strategic Plan, under Strategic Priority 3: Recruitment, Retention, and the Professional Development of Women in the Engineering Profession, Engineers Canada published national baseline data, established goals, and created and implemented action plans to address under-representation of female-identifying engineers in the profession.

### 2022-2024 Strategic Priority 2.1: Accelerate 30 by 30

Under this strategic priority, external expertise will be hired to conduct research on the perceptions of female-identifying engineering graduates and/or women eligible for engineering licensure to identify the barriers that they encounter. Engineers Canada will also provide a 30 by 30 report card and needs assessment to interested regulators, and continue to organize a national, annual 30 by 30 conference. It is expected that the Board will continue supporting this work as part of the 2025-2027 Strategic Plan, with potentially a broadened scope that would include other under-represented groups.

### Ongoing operational work

As part of purpose 9: promoting diversity and inclusivity in the profession that reflects Canadian society, a marketing strategy was created and executed to raise the profile of the 30 by 30 initiative. A strategy was also developed to increase the representation of Indigenous people in engineering.

The collection and release of data is continuing as part of the National Membership Report. Engineers Canada is also continuing to facilitate the work of the Indigenous Advisory Committee and participating in Represent Canada (Canadian Indigenous Advisory Council - CIAC) as a voting member at the American Indian Science and Engineering Society (AISES, CIAC/AISES), Decolonizing and Indigenizing Engineering Education Network (DIEEN) working group. Work is also continuing to implement the Indigenous Inclusion and Reconciliation in Engineering Plan and establishing partnerships on research on women in engineering.

Engineers Canada has partnered with Geoscientists Canada and Engineers & Geoscientists British Columbia to offer free EDI training.[[64]](#endnote-65) While Professional Engineers and Geoscientists Newfoundland and Labrador (PEGNL) reached the 30 per cent threshold in 2021, it is expected that additional efforts are needed to reach and sustain the 30 per cent target at the national level.

The CEQB is also developing a new public guideline for engineers and engineering firms on the topic of Indigenous consultation and engagement and the new public guideline for engineers and engineering firms on the topic of Indigenous consultation and engagement.

## Trends in regulatory affairs

The following section provides an overview of trends related to the regulation of engineers, engineering businesses, and the practice of engineering.

### Ensuring career-long continuing professional development

The final two provincial jurisdictions that did not have mandatory continuing professional development (CPD), British Columbia[[65]](#endnote-66) and Ontario[[66]](#endnote-67), have adopted, or will be adopting, requirements, by January 2023. Lifelong learning is an ongoing trend.[[67]](#endnote-68)

An increasing number of engineering companies are starting to offer career-long continuing professional development options to their employees, especially in disciplines that evolve rapidly such as software engineering.[[68]](#endnote-69) Canadian HEIs are also promoting life-long continuing education as part of their engineering programs, as well as offering micro-credential refreshers. Regulators, educators, associations, and continuing professional development organizations can establish partnerships to deliver continual learning.[[69]](#endnote-70)

To respond to the increasing learning demand, some organizations have adopted learning management systems (LMS), which are software platforms specifically designed to create, distribute, and manage learning content over the internet.[[70]](#endnote-71)

### Use of competency-based assessment

All engineering regulators (except for Ontario) have adopted, or are committed to adopting, pan-Canadian competencies.[[71]](#endnote-72) With HEIs increasingly interested in competencies, work could be done to expand them to engineering education, which would allow regulators to clearly demonstrate a direct progression in skills from student to independent practice as an engineer.[[72]](#endnote-73)

### Regulation of engineering entities

All engineering regulators, except for l’Ordre des ingénieurs du Québec, regulate engineering businesses. A review of engineering acts demonstrates that the regulation of entities is typically similar to individual licensees where regulators can set admission, practice, and discipline requirements. There is an opportunity for regulators to provide ethical and practice guidance to engineering firms to further protect the public and the public’s interests.

Ethics continue to be at the center of discipline matters[[73]](#endnote-74) and setting clear ethical expectations for individuals and entities can help address public and government expectations.[[74]](#endnote-75)

### Increase mobility of engineering work

Increasingly, the regulation of engineering must consider national and international perspectives to remain effective and relevant.[[75]](#endnote-76) The practice of Canadian engineers is increasingly conducted across provinces, territories, and other countries,[[76]](#endnote-77) which could be improved through similar CPD requirements, consistent regulation of engineering firms, and consistency in practice guidance and standards.

### Leverage risk-based or “right-touch” regulation

With limited resources, increasing regulatory obligations, and an ever growing need to demonstrate how their work protects the public, regulators are increasingly turning to risk-based or “right-touch” procedures, processes and policies.[[77]](#endnote-78) According to the UK Professional Standards Authority,[[78]](#endnote-79) right-touch regulation should follow these principles:

* **Proportionate**: Regulators should only intervene when necessary. Remedies should be appropriate to the risk posed, and costs identified and minimized.
* **Targeted**: Regulation should be focused on the problem, and minimize side effects.
* **Transparent**: Regulators should be open, and keep regulations simple and user friendly.
* **Accountable**: Regulators must be able to justify decisions, and be subject to public scrutiny.
* **Agile**: Regulation must look forward and be able to adapt to anticipate change.

These principles need to be aligned with how regulators protect the public [[79]](#endnote-80) and efforts should be focussed on the ethical obligations of engineers of protecting the public.[[80]](#endnote-81)

Leveraging national or international standards, like the Pan-Canadian Framework for the Assessment and Recognition of Foreign Qualifications,[[81]](#endnote-82) the Lisbon Recognition Convention,[[82]](#endnote-83) or ensuring that jurisdictional requirements match other engineering regulators, can help regulators demonstrate why and how requirements were selected. Collaboration and harmonization of requirements and practices can help engineering regulators demonstrate how they protect the public.

### Support public safety

While the purpose of self-regulation is to protect the public from a system that otherwise would pose a risk to them,[[83]](#endnote-84) regulators have yet to provide concrete examples on how they fill this purpose.[[84]](#endnote-85) If “public interest” were understood and defined to include “public interests”, given that society is pluralistic and citizens have varying interests, regulators could demonstrate that they understand and are working for the public.[[85]](#endnote-86) Furthermore, if the concept of safety were to be expanded to address more than just physical safety and to include psychological and cultural safety, regulators could again demonstrate that their work benefits all publics.[[86]](#endnote-87)

To counter misinformation and fulfill their duties to protect the public, engineers need to be effective communicators. Engineers’ duties go beyond building infrastructure; they need to consider, incorporate, and protect the public in their practice.[[87]](#endnote-88)

The definition of engineering is broad in scope and varies across the country. This situation makes it challenging to communicate why an engineer should be hired to perform certain types of work to the public and governments. It also makes it difficult for engineering regulators to defend themselves against other professions seeking to encroach on the exclusive scope of practice of engineers.

In 2022 or 2023, new legislation is expected to be tabled in New Zealand that would introduce:

* mandatory registration for all engineers that would ensure that they meet professional standards and continuous learning
* mandatory licensing that assesses a competency that registered engineers will need to practice in high-risk areas, as identified in regulation.[[88]](#endnote-89)

### Increasing oversight of regulatory functions

Provincial governments are implementing fairness cts to oversee and standardize professions among the regulators within their jurisdictions. First was Ontario (2006),[[89]](#endnote-90) followed by Nova Scotia (2008),[[90]](#endnote-91) Manitoba (2009),[[91]](#endnote-92) Alberta (2020),[[92]](#endnote-93) New Brunswick (2022),[[93]](#endnote-94) and Saskatchewan (2022).[[94]](#endnote-95) Similarly, in 1973[[95]](#endnote-96) Quebec created the Office des professions to oversee the standardization of requirements across professions in the province.[[96]](#endnote-97)

There has also been a standardization of oversight and complaints, standards of practice, and codes of ethics across professions being implemented across the country. Prior to the adoption of their Professional Governance Act[[97]](#endnote-98) that replaced the Engineers and Geoscientists Act[[98]](#endnote-99), British Columbia had first adopted the Health Professions Act that regulates 26 health professions and a proposal to amalgamate oral health professions.[[99]](#endnote-100) A similar path was also taken in Alberta where the Health Professions Act that regulates 29 professions[[100]](#endnote-101) was followed by Bill 23 -the Professional Governance Act. This bill passed its second reading in May 2022,[[101]](#endnote-102) and if implemented, could replace the Engineering and Geoscience Professions Act.[[102]](#endnote-103)

While it is not clear if this trend will continue in the other provinces, the Manitoba Regulated Health Professions Act, which came into force in June 2022 regulates 20 health professions[[103]](#endnote-104) and the PEI Health Regulated Professions Act[[104]](#endnote-105) came into force in 2021.

Increasingly, it is expected and sometimes imposed, by the government that representatives of the public sit on engineering councils. Evaluation of regulatory and governance effectiveness is increasing. Competency profiles for boards, metrics to measure regulator effectiveness, and public reporting requirements are increasingly implemented by regulators to demonstrate competence and accountability.[[105]](#endnote-106)

## 3.2. What Engineers Canada is currently doing to address regulatory trends

### New vision of collaboration and Strategic Priority 1.2 Strengthen Collaboration and Harmonization in the 2022-2024 Strategic Plan

In 2022, the Board adopted a new vision for Engineers Canada to advance Canadian engineering through national collaboration. The Engineers Canada Board also created the Collaboration Task Force, which is leading a national effort to clarify Engineers Canada’s mandate for harmonization and collaboration and to develop a national statement of collaboration with all engineering regulators.

In parallel with these efforts, staff are also working with regulators to identify the barriers and opportunities for collaboration, with the intent to bring a recommendation forward in 2024 on at least one potential area for collaboration.

### Ongoing operational work

Engineers Canada has partnered with Geoscientists Canada and Engineers & Geoscientists British Columbia to offer free EDI training.[[106]](#endnote-107) Engineers Canada, in collaboration with Polytechnique Montréal, is also offering free training through the massive open online course (MOOC) on Sustainability in Practice.[[107]](#endnote-108)

In addition, work is continuing on:

* Purpose 2: facilitating and fostering working relationships between and among the regulators through the regulators’ officials group’s meetings.
* Purpose 3: providing services and tools that enable the assessment of engineering qualifications, foster excellence in engineering practice and regulation, and facilitate mobility of practitioners within Canada through the staff’s work on the National Membership Database (NMDB) and the following upcoming CEQB products:
  + New feasibility study to identify alternative academic assessments for non-CEAB applicants
  + New public guideline on duty to report / wrongdoing
  + New public guideline on fitness to practice
  + Review of the public guideline on good character, the public guideline on conflict of interest, and the public guideline on the code of ethics
  + Review of the agricultural/biosystems/bioresource/food complementary studies, chemical, electrical, mechanical and mechatronic engineering syllabi.
* Purpose 6: actively monitoring, researching, and advising on changes and advances that impact the Canadian regulatory environment and the engineering profession, through the development of research papers and monitoring the regulatory environment.
* Purpose 7: managing risks and opportunities associated with mobility of work and practitioners internationally through the International Institutions and Degrees Database (IIDD), the international accords, and the Engineers Canada Mobility Register, providing tools to regulators to assess non-CEAB applicants, and to engineers seeking to work abroad.

## 4.1. Trends related to trust and the value of engineering licensure

The following section provides an overview of trends related to the perception and trust of the public and governments on engineering.

### Engineering’s economic value

In 2020, 85.5 per cent of engineering small and medium enterprises were profitable, with an average revenue of $369,000.[[108]](#endnote-109) In 2021, the median salary of an engineer-in-training (EIT) in Atlantic Canada was $65,000, and $85,000 for an engineer,[[109]](#endnote-110) compared to between $56,900 to $59,000 for the general population. [[110]](#endnote-111) By comparison, the median salary for an EIT was $70,050 and $114,000 for an engineer in Saskatchewan,[[111]](#endnote-112) compared to $67,700 for the overall population of that province.[[112]](#endnote-113)

### Ongoing media scrutiny

Engineering failures continue to make headlines, such as the Dyck Memorial Bridge collapse in Saskatchewan,[[113]](#endnote-114) the Coquihalla highway collapse in British Columbia[[114]](#endnote-115) and the Boeing 737 MAX flight system failure.[[115]](#endnote-116) While the media cycle is fast, regulators’ requirements to exert due diligence is lengthy, which can negatively impact its ability to demonstrate how it protects the public. A good example is the Mount Polley mine, the largest environmental disaster in Canadian history. The investigation conducted by EGBC nearly took nearly eight years and resulted in two engineers being fined $226,500 and one having a brief suspension and required to take training.[[116]](#endnote-117)

### Ongoing public communication by regulators

Engineering regulators approach public communication with a variety of strategic goals, ranging from notices of significant discipline and enforcement notices, public service announcements regarding how engineering is regulated for the protection of the public, promoting engineering to youth audiences, and showcasing the role of engineers in society.

Several engineering regulators have been executing marketing strategies to raise the profile and trust in engineering regulation. To increase the public’s trust, marketing strategies should be focussed on telling a story, align with the values of the target audience, and be tailored to the channel that is used.[[117]](#endnote-118)

## What Engineers Canada is currently doing to address trends related to trust and the value of engineering licensure

### 2022-2024 Strategic priority 2.2 Reinforce Trust and the Value of Licensure

The Engineers Canada Board approved a three-year marketing and outreach project as part of the 2022-2024 Strategic Plan. Strategic Priority 2.2: Reinforce Trust and The Value of Licensure involves working alongside communication and marketing specialists to identify the target audience, develop key messages, and execute a multi-million, two-year marketing campaign in partnership with regulators.

As campaigns take a long time to change perceptions and require continual efforts to be successful, it is expected that the Board will continue this work as part of the upcoming 2025-2027 Strategic Plan.

### Ongoing operational work

As part of Purpose 8: fostering recognition of the value and contribution of the profession to society and sparking interest in the next generation of professionals, staff continue to work with partners, such as regulators, the Canadian Federation of Engineering Students, Scouts Canada, Girl Guides and DiscoverE to spark the interest of future generations. On behalf of engineering regulators, advocacy efforts are also targeted toward raising the profile of engineers and their role in protecting public safety with the federal government as per purpose 5: advocating to the federal government.

## 5.1. Trends in addressing a changing climate and ensuring long-term sustainability

Seventy-nine per cent of Canadians voice their concerns regarding the impact of climate change, with 85 per cent certain that it is indeed happening.[[118]](#endnote-119) The Royal College of Psychiatrists in the UK reported that 57 per cent of children and teenagers were distressed about the environment, which is sometimes referred to as “eco-anxiety.”.

The United Nations (UN) has adopted sustainable development goals, which lay out a path for areas of focus. The International Engineering Alliance is updating its Graduate Attributes and Professional Competencies (GAPC) framework to include the UN’s sustainability goals.[[119]](#endnote-120) Showing linkages with human activities and building the UN’s sustainable development goals into education curriculum can help.[[120]](#endnote-121) Several aspects are part of engineering practice, including gender equality, clean water and sanitation, affordable and clean energy, industry innovation and infrastructure, sustainable cities and communities, responsible consumption and production, climate action, and life below water and on land.[[121]](#endnote-122) Setting expectations of what engineers are expected to do through these goals could have a significant impact on addressing climate change.[[122]](#endnote-123)

As per their code of ethics, engineers are responsible for holding paramount the safety, health, and welfare of the public and the protection of the environment.[[123]](#endnote-124) Many professional associations, like engineering, are highlighting what their governments can do, including incorporating climate change in decision-making, sharing best practices, clarifying professional obligations in that area of practice and in their code of ethics, and working in partnership with other professional associations to address impact.[[124]](#endnote-125)

Engineering failures can have a significant ecological impact.[[125]](#endnote-126) There is a need to assess the impact of engineering on nature and instill that in engineering education.[[126]](#endnote-127) Sustainable development should be incorporated in engineering practice and the workplace.[[127]](#endnote-128) Some organizations are going carbon neutral, to meet the UN 2050 target.[[128]](#endnote-129)

Several organizations are implementing environmental, social and governance (ESG) tactics and reporting in support of sustainability. Over 92 per cent of Canadian companies now report on sustainability with leading sectors being financial services, industrial, manufacturing and metals, and utilities.[[129]](#endnote-130)

## 5.2. What Engineers Canada is currently doing to address climate change

### Support for sustainable practice of engineering

Engineers Canada, in collaboration with Polytechnique Montréal, is also offering free training through the massive open online course (MOOC) on Sustainability in Practice.[[130]](#endnote-131). The CEQB has also published the following [papers and guidelines](https://engineerscanada.ca/regulatory-excellence/national-engineering-guidelines) that apply to the environmental field:

* Paper on environmental engineering
* Principles of climate adaptation and mitigation for engineers
* Site remediation for engineers
* Sustainable development and environmental stewardship for engineers.

## 6.1. Trends in technological changes

Technological changes, artificial intelligence, new practices, and emerging engineering disciplines happen faster than regulation can adapt.[[131]](#endnote-132) Engineers need to be more than the designers of technology but also be its steward.[[132]](#endnote-133) Engineering is not one of the professions most likely to be replaced by robots in the future.[[133]](#endnote-134)

Offering licensing paths adapted to emerging engineering disciplines and entrepreneurial practice and setting up forums to discuss technological advancements could help ensure that regulators remain relevant.[[134]](#endnote-135)

Updating legislative requirements to meet new demands is another solution that can be pursued by regulators. They could also develop a regulatory framework that allows for the regulation of non-traditional engineering disciplines[[135]](#endnote-136) while fulfilling their mandate to protect the public by ensuring that engineers and engineering entities meet their ethical and practice obligations and sanctioning those that do not.[[136]](#endnote-137) Engineers & Geoscience British Columbia has released a guideline on the development of safety-critical software.[[137]](#endnote-138)

## 6.2. What Engineers Canada is currently doing to address technological changes

### 2022-2024 Strategic Priority 1.3: Support Regulation of Emerging Areas

This strategic priority will identify and investigate new and overlapping areas of engineering practice that will have a long-term impact on the public. The CEQB is also updating its Paper on Software Engineering.[[138]](#endnote-139)

These two areas of work fall under ongoing operational work and the Board decided to make it a strategic priority to raise its visibility. Whether the Board decides to carry the work forward in the 2025-2027 Strategic Plan or not, this work will continue under Purpose 6: actively monitoring, researching, and advising on changes and advances that impact the Canadian regulatory environment and the engineering profession.

# 7.1. Conclusion

This environmental scan presented trends that could impact Engineers Canada, engineering regulators, and the profession. This document also highlighted ongoing work that is conducted as part of the 2022- 2024 Strategic Plan. It is expected that this information will support the development and strategic priorities selected as part of the upcoming 2025-2027 Strategic Plan.

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