

March 2021

A Green Economic Recovery: Trends, Developments, and Opportunities for the Environmental Workforce



A Note from our President and CEO

It's no secret that the last year has been exceptionally tough for all of us, regardless of the industry we work in.

COVID-19 has left our country in a challenging situation, but as we look forward to rebuilding, both governments and those in the industry agree that the environmental sector is a key area of growth and economic recovery. That's why we have identified some exciting developments related to the environment in this trends report.

In order to rebound from the COVID-19 recession, workforce development decisions, training investments, and business decisions need to be grounded in solid research - research that ECO Canada provides, along with detailed analysis of gaps, opportunities, and investments that can help with the economic recovery. Reports such as these help inform government, industry, and academia about the supply and demand of the labour market.

In this report, we have identified developments related to technology, various industries, and to the workforce. One trend that we foresee further growth in is cleantech. Since the release of our cleantech report early in 2020, we have spoken with various government, industry, and media representatives about the tremendous opportunities that Canada is well-positioned to pursue - so much so, that we have dedicated sections of this report to industrial cleantech, and consumer-facing cleantech.

Because our work at ECO Canada is focused on the environmental labour force, we would be remiss if we did not identify any trends about the growth and development of workers. One area that stands out is the abundance of opportunities for young people entering the sector, and the need to recruit the best and brightest young minds. In the next decade, job growth and retirement will account for 233,500 net environmental job openings by 2029 — equivalent to 38 per cent of 2019 environmental employment levels. Employment is expected to grow by 8 per cent, resulting in 50,100 new green jobs needing to be filled within the next decade. Close to 30 per cent of the workforce is expected to retire within the forecast period, resulting in 183,400 additional job openings.

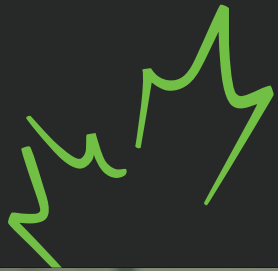
At ECO Canada, we are working hard to influence the sector, government, and investors to ensure that environmental innovation and jobs are supported with policy and funding to grow and thrive. It is also instrumental that key industry and government leaders continue talks about how we can work together to help our economy recover, while protecting our environment. To do just that we need to have the talent trained and available to support this new direction, and that's where we come in. We have strong foundations in Canada already, now we just need to build on them.

Kevin Nilsen

President & CEO, ECO Canada

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MOVING TO A SKILLS-BASED ECONOMY



What is a skills-based economy?

Skills-based hiring, or a skills-based economy, has been touted as a growing trend over the last decade. However, the tectonic shift brought on by COVID-19 has highlighted the urgent need for it as we work towards economic recovery. The shift to skills-based hiring is a move away from experience-focused hiring. Although historically, those in the workforce learned role-specific skills while on the job, today's employers need to hire workers who have skills, both technical and soft, that they can apply to the job, and shift accordingly.

One of the main drivers of the shift to skills-based hiring is the exponential growth of technology, especially digital transformation. Technology is automating many jobs and tasks. According to The Future of Jobs Report 2020 from the World Economic Forum, this, and the COVID-19 pandemic, are "creating a 'double-disruption' scenario for workers," as both are leading to job losses. However, this shift is also leading to a call for broader skill sets, as technology continues to change what is needed in terms of knowledge from workers.

"We estimate that by 2025, 85 million jobs may be displaced by a shift in the division of labour between humans and machines, while 97 million new roles may emerge that are more adapted to the new division of labour between humans, machines and algorithms."

- The Future of Jobs Report 2020¹, World Economic Forum

The Skills Employers are Looking for

Even with a significant segment of the workforce back on the market for employment as a result of the pandemic, employers are still not finding a suitable fit for the jobs that they are looking to fill, because of a growing gap both in technical skills and transferable, or soft skills.

The gap in technical skills will increase as workers retire. Our Labour Market Demand Outlook² research has shown that nearly 30 per cent of the current environmental workforce in Canada will be retiring in the next decade, taking with them their knowledge, skills, and experience. Substantial hiring of core workers, or those in roles requiring environmental-specific knowledge, skills or training, will need to occur.

THESE OCCUPATIONS INCLUDE:



**Mechanical
engineers**



**Life science
professionals**



**Facility
operation and
maintenance
managers**



**Landscape
architects &
Urban and land
use planners**



**Forest
technologists
and technicians &
Conservation and
fishery officers**



**Utilities
equipment
operators and
controllers**

Source: LABOUR MARKET INFORMATION | Environmental Labour Market Challenges and Opportunities in the Decade Ahead, ECO Canada

However, with over a third of core environmental net job openings in managerial roles, workers filling these openings must build up their transferable skills. While workers with post-secondary education specific to core environmental jobs have technical knowledge, academic curricula does not always cover the essential workplace soft skills.

Therefore there is an urgent need to close this skills gap for workers to not only meet this replacement demand, but also to fill upcoming jobs.

Investing in Upskilling and Reskilling: A Win-Win for Employers and Workers

For employers, onboarding and training an employee is a significant investment. Employers also recognize the importance of investing in upskilling and reskilling their current employees:

“ An average of 66 percent of employers surveyed expect to get a return on investment in upskilling and reskilling within one year. [...] On average, employers expect to offer reskilling and upskilling to just over 70 percent of their employees by 2025.

- The Future of Jobs Report 2020³, World Economic Forum

Organizations looking to attract and retain quality talent must also invest in developing them. Training and development opportunities, not only with job-specific upskilling, but also soft skills, keep employees motivated to stay with the organization and move into future senior roles.

Diversity and Inclusion in the Workplace

There is also an opportunity presented to employers by the current pool of job seekers, as underrepresented populations remain an untapped talent source for industry. An influx of highly educated people entering the workforce is another opportunity, those whose jobs have been impacted both by COVID-19 as well as economic shifts, who are transitioning from their previous careers:

“ As you look to attract new workers to meet the demand and prepare them for career progression as others retire, consider exploring underrepresented candidates like women, youth, Indigenous and immigrant workers, many of whom often have high levels of skill and experience.

The pandemic and pre-existing factors have had permanent or long-lasting impacts to certain industries, regions and occupations. Displaced workers are a viable talent solution; one that could also mitigate productivity risks given their prior experience, applied knowledge and accumulated skill sets.

- Labour Market Demand Outlook⁴, ECO Canada

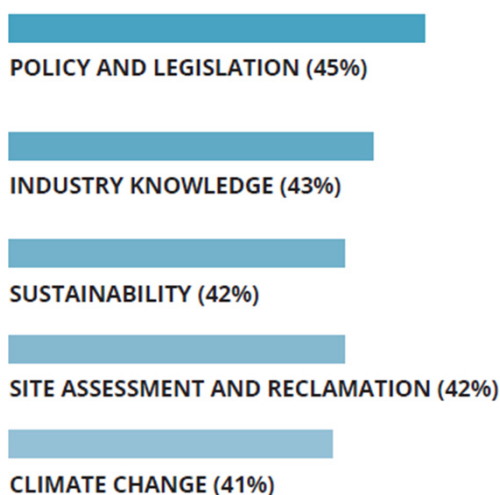
For workers, reskilling and upskilling is a personal investment that pays off in the long run. As external factors like digital transformation are driving exponential change within the workplace, there is an urgent need to continually update one's existing skill set, sometimes reskilling entirely, to remain part of the workforce. Upskilling also allows workers to progress within the organization and in their careers, whether they choose to specialize further, or move into managerial roles.

Upskilling and Reskilling Opportunities for Environmental Roles

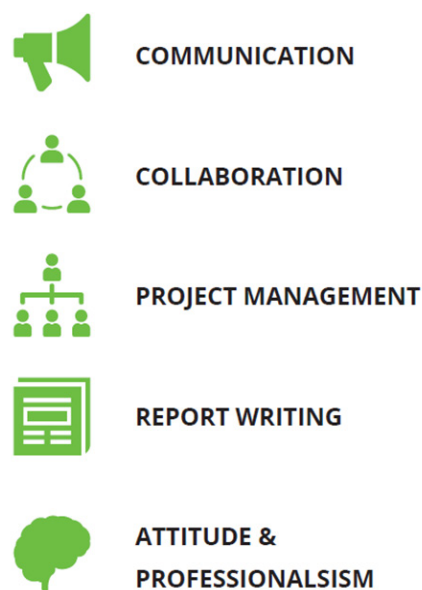
Professional development opportunities are available to workers looking to shore up their technical skills as well as their soft skills. In the past, skills gaps have been difficult to identify because of a lack of information around the labour market - something that Canada in particular has addressed over the last decade.

At ECO Canada, the notion of lifelong learning is core to our approach in designing short- and long-term training opportunities. Our Labour Market Research fuels what we select as development opportunities for our clients. We have determined the following as the top sought after skills by environmental employers:

TOP 5 SOUGHT AFTER TECHNICAL SKILLS



TOP 5 SKILLS THAT EMPLOYERS LOOK FOR



Source: Skills Essential for Success in the Environmental Industry⁵, ECO Canada

SIMILARLY, THE TOP SKILLS DESIRED BY ENVIRONMENTAL WORKERS ARE:

- ✓ **Project Management (which is a blend of both soft and technical skills)**
- ✓ **Leadership**
- ✓ **Communication**

In order to support the upskilling and reskilling of workers, work must be done to help remove barriers to training. Programs are available for employers to support essential skill development for their employees.



YOUTH IN THE ENVIRONMENTAL WORKFORCE



The youth of today have become increasingly aware about the climate crisis and climate change, while also acknowledging the power and effect they can have on the environment moving forward and how their generation can enact change. Through education, young people are tapping into skills they possess to take a stand against climate change - and this moving forward is going to be an undoubtable trend in the environmental sector: young voices.

Young people are increasingly choosing academic and training programs that are either focused on the environment, or choosing jobs that put them in a career path towards becoming an environmental professional. Generation Z, who are now entering the workforce, are making career choices⁶ that are heavily influenced by their upbringing, in which they have always been acutely aware of the effects of climate change.

In Canada, there is a wide variety of programs that can lead towards a career in the environment, whether they are core workers with specialized environmental competencies, or are employed by an organization working in the sector. University graduates tend to have training in science, technology, engineering, and mathematics (STEM). Workers in specialized trades (e.g. technicians, equipment operators) can also choose to work with environmental employers.

Youth seeking environmental careers are faced with tremendous opportunities. With new jobs arising, and a significant number of current environmental workers retiring, ECO Canada forecasts that there will be as many as 233,500 net job openings in environmental work by 2029.⁷

However, employers are finding that new graduates are coming into the workforce with a skills gap. University graduates, even with academic backgrounds that are geared towards the careers they have chosen, are not “job ready⁸,” and even the students themselves have agreed in surveys that they do not feel ready for the job market. This skills gap is not exclusive to the environmental workforce, and therefore needs to be addressed systematically.





Investing in Youth Employment

As much as universities and colleges can modify their curricula to adjust to the quick changes occurring in each program's focus, there is an opportunity for youth to gain job experience earlier in their careers in order for them to build both technical and soft skills, even before they graduate. And while professional development courses are available to those already in the workforce, the cost is not always covered by employers.

To help address the youth skills gap, the Government of Canada has made several investments into youth employment across a wide range of sectors.

Canada's government has acknowledged that innovation translates into more jobs, business opportunities, a cleaner environment, and provides higher living standards for Canadians. Their Innovation and Skills plan will help grow the economy and provide Canadians with the skills they need to succeed.

This plan supports Canadians and helps the entire innovation continuum, by establishing Canada as one of the most innovative countries in the world and fostering a culture of innovation from coast to coast to coast.

Initiatives such as the Youth Employment and Skills Strategy (YESS⁹) show the Government of Canada's commitment to helping young people gain the knowledge and skills needed to make a successful transition into the job force. This strategy spans 11 federal departments and agencies by providing funding for youth, most notably those facing barriers to employment.

ECO Canada is one of several delivery organizations of recent investments by the federal government into youth employment, which have already resulted in thousands of new job placements.

The Student Work Placement Program, under Employment and Social Development Canada, has provided wage funding for employers to hire youth in science, technology, engineering, art, math (STEAM) and business. This past fall, the government announced that the program would receive an additional \$266.1 million¹⁰, covering up to 75 per cent of wages across all placements.

Environment and Climate Change Canada continued the Science Horizons Internship Program in 2020, offering job placements for youth in STEM, particularly in the clean technology sector. The new funding was announced as an important part of Canada's economic recovery from COVID-19.

Also in 2020, Natural Resources Canada announced \$15.8 million¹² to create green jobs and training opportunities for Canadian youth in STEM through the Science and Technology Internship Program.⁴ 500 green job internships were funded as a result.

Innovation, Science, and Economic Development Canada's Digital Skills for Youth (DS4Y) Program connects youth with employers where they can gain meaningful work experience in the digital skills-based economy. By focusing on small to medium sized business and non-profit organization employers, DS4Y¹³ is also helping these organizations future-proof their businesses. In its first year with the program, ECO Canada was able to place digitally skilled youth with environmental employers across the country through DS4Y.

Through the four above programs, ECO Canada secured a total of 3000+ job placements for youth for the 2020-21 year. Opportunities are grounded in experiences that will prepare youth to adapt to the major changes projected in tomorrow's workplace.

"The uncertainty many young Canadians have felt over the past few months can be overwhelming. But in Canada, we look out for each other. We value education and hard work. The set of comprehensive measures we put in place over the last few months are helping students get through these difficult times, so they can build their career and the future they've been working for. We are steadfast in our commitment to build on the measures we have put in place to help students during the pandemic and will continue supporting them in the upcoming school year."

- The Honourable Carla Qualtrough, Minister of Employment, Workforce Development and Disability Inclusion

"As Canada continues to safely restart our economy and build a more sustainable future, your skills, passion, and expertise will help to scale up our efforts to fight climate change and reach our goals of being net zero by 2050."

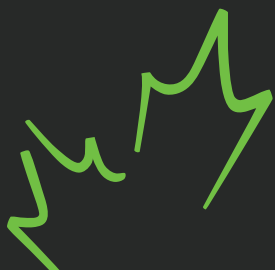
- The Honourable Jonathan Wilkinson, Minister of Environment and Climate Change¹¹

"I am excited about this investment in the workforce of tomorrow. By expanding employment and skills development for youth and students, the Government of Canada is providing 500 young Canadians with career experience in fast-growing and future-friendly green jobs. By encouraging employers to hire youth, including northern, remote and Indigenous youth, we are helping build a diverse, qualified labour pool and create a green economy that benefits all Canadians."

- The Honourable Seamus O'Regan, Minister of Natural Resources

"Our government is working hard to ensure our youth have the skills they need to succeed in today's digital economy. Partnerships with organizations such as ECO Canada also enable our government to help build Canada's environmental workforce and position Canada as a global leader in environmental innovation and clean technology. The Digital Skills for Youth program will help participants gain real-life experience and valuable skills to contribute to future employers who are striving to innovate and succeed in an ever-changing landscape."

- The Honourable Navdeep Bains¹⁴, Former Minister of Innovation, Science and Industry



THE ENERGY INDUSTRY AND CHANGING PERSPECTIVES





Over the last several years, the global energy sector has begun a significant shift towards sustainability and the diversification of energy sources. Governments and those in the industry have committed to transforming the way energy is processed, from extraction to usage, ultimately to reduce greenhouse gas emissions and environmental impact while finding long-term solutions that can not only meet demand but provide profit.

The Drive Towards Net Zero and Its Implications for Canada's Current Energy Industry

In order to limit the global temperature increase to 1.5 degrees Celsius as per the Paris Agreement, many countries, including Canada, have committed to a target of net-zero greenhouse gas emissions by 2050. In November 2015, the Government of Canada began the process of legislating this goal of net zero by 2020, when they tabled the Canadian Net-Zero Emissions Accountability Act in the House of Commons.

According to the report Canada's Energy Future 2020: Energy Supply and Demand Projections to 2050 (EF2020) from the Canada Energy Regulator (CER), the following dynamics will contribute significantly towards the net-zero goal:



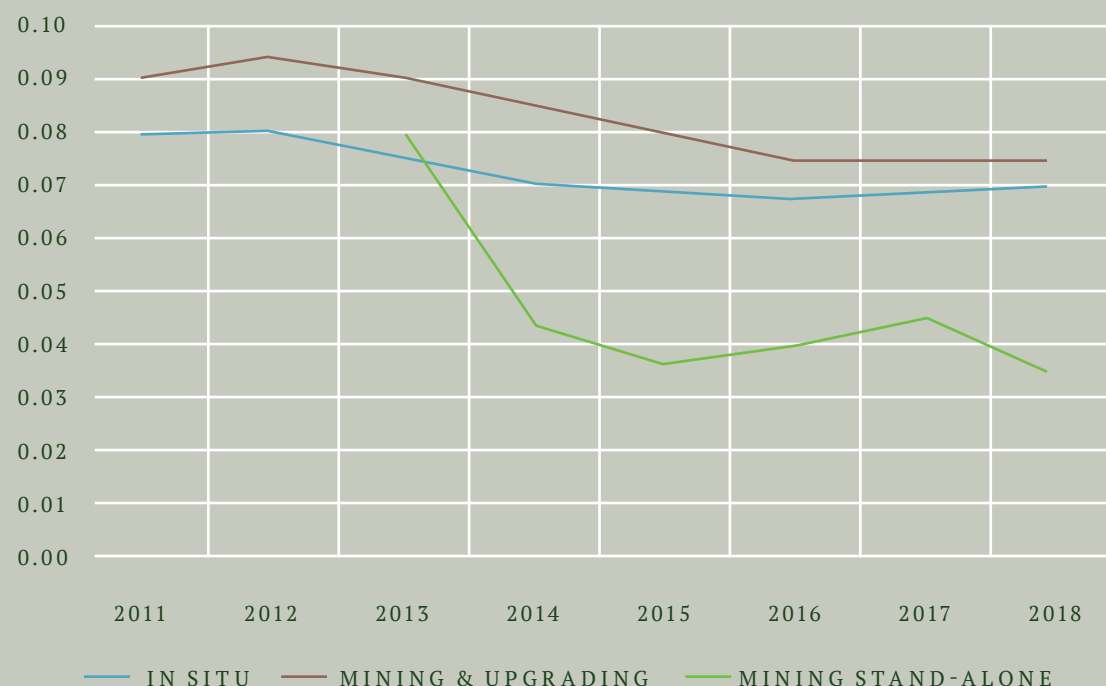
“Increasing the share of zero and low carbon energy sources, such as low carbon electricity, used across the entire economy will be key, as will the contributions from existing trends in energy efficiency. Even with considerable improvements in energy conservation and efficiency, research suggests shifting away from burning fossil fuels for energy and replacing them with low carbon alternatives will be crucial to long-term deep decarbonization of the Canadian economy.”

- Canada's Energy Future 2020¹⁵; Energy Supply and Demand Projections to 2050 (EF2020)

Currently, much of Canada's energy still comes from non-renewable sources, as does the world's. Fossil fuels continue to be resilient because they are able to meet the increasing demand for energy, although reliance on them will decline as advances in the production of renewables help lower its costs.

According to Environment and Climate Change Canada¹⁷, 26 per cent of Canada's greenhouse gas emissions come from the oil and gas industry. However, Canada's oil and gas sector has been taking several steps to decrease its greenhouse gas emissions and increase efficiency in extraction. The GHG emissions per barrel of oil produced have already been on a downward trend in recent years:

EMISSIONS PER BARREL IN THE OIL SANDS ARE DECLINING



This graph shows historical GHG emissions from the oil sands from 2011 to 2018. In situ emissions fall from 0.08 tonnes of CO₂/bbl in 2011 to 0.07 CO₂/bbl in 2018. Mining and upgrading emissions fall from 0.09 CO₂/bbl in 2011 to 0.07 CO₂/bbl in 2018. Emissions from standalone mining operations fall from 0.08 CO₂/bbl in 2013 to 0.04 CO₂/bbl in 2018. The first standalone mine came into operation 2013

Source: [Canada Energy Regulator](#)

In an effort not only to reduce carbon emissions but also to look forward to the future, oil and gas companies have taken significant steps towards sustainability, including:

- Investing in the research and development of clean technologies and innovation for crude oil recovery
- Developing technology that will improve the cost competitiveness of Canadian oil and gas, compared to other oil products
- Implementing carbon capture, use, and storage (CCUS) technology
- Reducing methane emissions

Within the industry, companies are transforming their own operations to be more sustainable. Crescent Point Energy shared their Green Energy Initiatives with ECO Canada and our members at the ECO Impact Awards in January 2020. Green Energy Advisor, Scott McNally, shared Crescent Point Energy's¹⁸ efforts to reduce emissions, water use, and impact on the land. The company is also using clean power at its sites, either using solar power at offices and well sites, hybrid power at pump jacks, and power generation with produced gas.



Diversification of Energy and Revenue Sources

Both government and private industry are also working on diversifying the energy sources that Canadians depend on, and are being exported globally.

Canada is exploring clean hydrogen production as part of its long-term energy strategy. In December 2020, Natural Resources Canada (NRCan) unveiled The Hydrogen Strategy¹⁹ for Canada. The strategy aims to position Canada as a leader in the production of clean hydrogen.

Canada is already one of the top 10 producers of hydrogen, mainly of “blue” hydrogen - produced when carbon is captured and stored when natural gas is reformed. It has been called a “logical first step²⁰” as it is an easier way to harness hydrogen. This article from Canada’s National Observer said that during the process where blue hydrogen is produced, experts estimate that 90 per cent of the carbon is captured²¹. However, NRCan aims to focus on technologies that create clean hydrogen which produces zero GHG emissions. “Green” hydrogen, produced from splitting a water molecule, is the cleanest, but its production is also the most expensive.

Organizations are also investing in clean technologies for the greater oil and gas industry. Suncor Energy, Cenovus Energy, and the BC Cleantech CEO Alliance have funded Evok Innovations²², a cleantech venture capital firm investing in companies that are developing technology that addresses urgent environmental and economic issues faced by the industry.

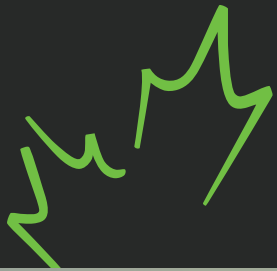
The Canadian Energy Centre²³ cited notable industry groups that are collaborating within the industry to drive cleantech innovation in the oil and gas industry, such as:

- Canada’s Oil Sands Innovation Alliance (COSIA)
- Clean Resource Innovation Network
- Petroleum Technology Alliance Canada
- Natural Gas Innovation Fund
- Alberta Clean Technology Industry Alliance

With governments recognizing opportunities and setting standards, and industry driving research and innovation, Canada’s energy sector is poised to take a leap into a new, clean-powered future.

“There is more than just hydrogen on the horizon for energy diversification; renewable natural gas, solar, pumped storage, nuclear. A sentence covering the breadth of options would be impactful.”

- An ECO Member certified since 2014 in the oil and gas industry



WESTERN ENVIRONMENTAL PRACTICE &
INDIGENOUS TRADITIONAL KNOWLEDGE





Indigenous peoples have generations' worth of traditional knowledge about the land that is holistic, informing not only their emotional, physical, mental, and cultural heritage and spiritual relationship with the land. The land is part of the cultural identity of Indigenous peoples: there are protocols and ceremonies for everything they take from the earth; it is a reciprocal relationship guided by respect of the land.

"The world only has 25 per cent of its biodiversity left, and Indigenous people influence or control 82 per cent of that, so that tells me that the Indigenous worldview and its relationship with nature is a solution that all populations of the world can look towards."

- Steven Nitah, former elected chief of Lutsel K'e Dene First Nation in the Northwest Territories, to CBC²⁴

Unlike the Western approach to conservation which has been around preservation from human activity, Indigenous peoples approach conservation as responsible land use by humans. Indigenous peoples cannot be separated from the land; they are essentially one and the same.



Indigenous Peoples as Guardians of the Land

It is an understatement to say that Indigenous peoples know the land. Their knowledge of the land transcends today's environmental sciences - it is from time immemorial. Over thousands of years, generations have passed down information related to living on the land, such as caribou routes, to salmon runs, to bird migrations - and more importantly, how they are all connected with each other.

Even though organizations undergo environmental assessments of projects using Western Science, local Indigenous peoples bring tremendous knowledge to the table that is vital for a complete picture of the land, informing environmental and natural resource-related decision making.

Over the last several years, there has been a growing movement to bring Indigenous knowledge, especially traditional ecological knowledge, into development projects, specifically those that involve natural resources. In 2019 the Impact Assessment Act came into law in Canada, which ensures that Indigenous and community knowledge is made part of the impact assessment of projects in Canada.

The goal is to go beyond consultation with local communities, although it is integral not only for local relations and for respect of cultural heritage; bringing in local and Indigenous community members to work alongside organizations on projects and be active participants is the goal.

There has been an increase in Indigenous-led conservation projects as well in Canada - one notable example is the Thaidene Nëné National Park Reserve, Canada's newest national park, led by the Łutsel K'e Dene First Nation. The local community plays a significant role in managing the park, acting as guardians of the territory, as ambassadors to tourists, while continuing to hunt and fish as they have for generations. It also shows that Indigenous collaboration projects brings employment opportunities, especially for the local communities. Young people have also chosen to stay within the community to be part of the guardian workforce in the national park.

"Economic diversification has to be part of conservation," says Tracey Williams, Northwest Territories lead for Nature United. "You have to have revenue," she says, if the community is going to have a diversity of opportunity for its people.

- Thaidene Nëné heralds a new era of parks²⁵, TheNarwhal.ca



Environmental Employment Opportunities for Indigenous Peoples in Canada

Canada's Indigenous peoples: First Nations, Métis, and Inuit still see underrepresentation in the workforce. The Indigenous population is not only young, but growing quickly, with more than 400,000 Indigenous youth expected to enter the job market in the next decade.

According to the Government of Canada, their goal is to “reduce the skills gap between Indigenous and non-Indigenous people by 50 per cent and the employment gap by 25 per cent.” The Government of Canada continues to work closely with Indigenous partners to bring forward meaningful changes to training programs for Indigenous people.²⁶

“This commitment will play a key role in shaping the future for our people and Canada. This partnership provides better opportunities for families by giving them the necessary tools to support themselves and the future of their children. The success of our program is how we work together utilizing the strength of our culture, values and identity to help our people gain the skill sets needed to enter into the labour market.”

- Kukpi7 Wayne Christian, Tribal Chair, Shuswap Nation Tribal Council

The environmental workforce, therefore, is a sector that can help address the gap for Indigenous peoples, with opportunities and resources from government and industry. Braiding Indigenous knowledge with Western environmental science provides opportunities for a holistic view of environmental practice, particularly with natural resource-related projects. Employers must work collaboratively with Indigenous environmental practitioners across Canada in the communities they live in, respecting the unique connection they have with their land and environment, and recognize the knowledge that they bring to the table.

As an organization that focuses on the environmental workforce, ECO Canada works proactively to build relationships with Indigenous communities on a basis of respect, understanding, and mutual trust, working with the following guiding principles:

- Acknowledging that the Treaty Rights of Indigenous peoples in Canada are affirmed, recognized and protected by the Canadian Constitution.
- Acknowledging the United Nations Declaration on the Rights of Indigenous Peoples (UNDRIP) and committing to working with Indigenous Peoples within the Canadian legal and constitutional framework.
- Acknowledging and recognizing the diversity of Indigenous peoples in Canada and committing to interacting with each Indigenous community in a way that respects their culture, customs, and history.
- Acknowledging and respecting that each Indigenous community has its own distinct and unique connection with the land and environment.
- Appreciating the importance of learning from and respecting the cultures in which we operate.

In Canada, employers can reach out to organizations such as Indigenous Works, as well as community offices, to initiate relationships and reach Indigenous environmental professionals. Resources such as ECO Canada's Indigenous Recruitment Guide²⁷ are available for employers to inform their recruitment strategies.

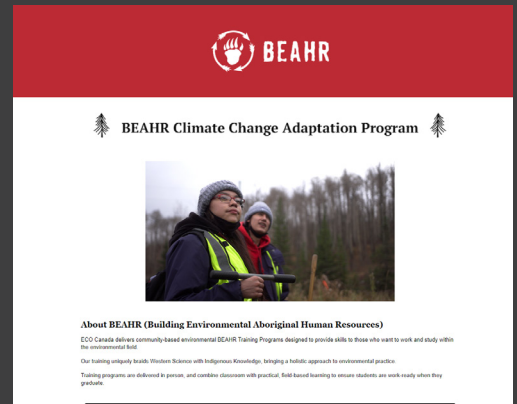


Valuing Indigenous Knowledge while Training for a Green Career

As Indigenous Ecological Knowledge with Western environmental science becomes more prevalent in industry projects and sustainability efforts, there has also been an increase in the training opportunities that have been created to get Indigenous peoples into the environmental workforce.

At ECO Canada, we offer BEAHR, a collection of customizable environmental training programs for Indigenous Communities that braid Traditional Ecological Knowledge with Western Science. The courses are customized to the local communities where projects are located.

Academic institutions in Canada are also starting to offer programs with Indigenous traditional knowledge and environmental science as the focus. The University of Guelph offers a Bachelor of Indigenous Environmental Science and Practice degree, while the University of Regina has the Bachelor of Indigenous Environmental Science program.

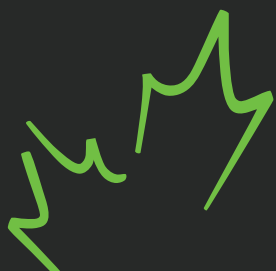


The newest BEAHR course, Climate Change Adaptation Training For Indigenous Leaders, is now available.

This training program will help communities to identify specific issues impacting them, and then develop a plan and build resiliency using traditional methods and tools. Contact us to learn more about how to bring BEAHR training to your community, or how to become a BEAHR trainer.

"Indigenous traditional knowledge can be successfully applied to a number of today's problems, like climate change. Western environmental science can't address these issues alone, issues that many of our Indigenous communities are already facing. Indigenous peoples are the knowledge holders of sciences that have evolved over thousands of years - for example, predicting weather patterns based on the changes around them. When it comes to climate change adaptation, learnings from Indigenous knowledge should be used as the invaluable asset they are."

- Dr. Yogendra Chaudhry, EP, CRSP, Vice President, Professional Services at ECO Canada



RENEWABLE ENERGY: CANADA'S ENERGY MIX AT A GLANCE



The Generation Energy Council presented the report Canada's Energy Transition: Getting to Our Energy Future, Together to Natural Resources Canada in 2018. In the report, one of the pathways to energy transition that the council identified was the need to generate and use more renewable fuels:

"Alongside reducing energy demand and boosting the use of clean electricity, we will continue to require liquid and gas fuels in transportation, heating and cooling, and some industrial processes. We must reduce the impact of those fuels by expanding Canada's capacity to produce and use cleaner fuels – biofuels and biogas from plants and waste, for example – that can heat homes, power vehicles and support manufacturing with much less carbon pollution."

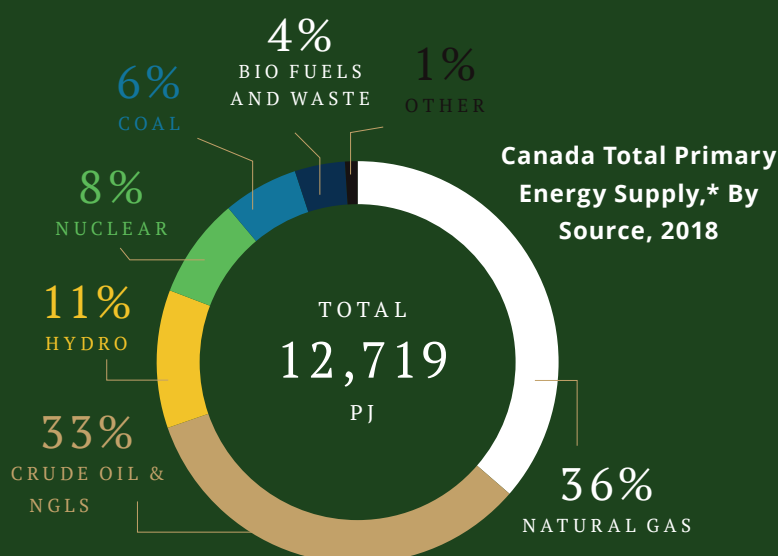
- Canada's Energy Transition: Getting to Our Energy Future, Together²⁸

As of 2018, 16.4 per cent of Canada's total primary energy supply came from renewable energy sources, compared to the global 14 per cent.

CANADA'S ENERGY PRODUCTION AND USE

A look at Canada's total primary energy supply (TPES) helps to better understand the impact of energy sources on GHG emissions. The TPES is calculated as:

$$\text{PRODUCTION} + \text{IMPORTS} - \text{EXPORTS} + \text{STOCK CHANGES} = \text{TPES}$$



Renewable energy sources made up 16.5% of Canada's TPES in 2018



Fossil fuels made up 76% of Canada's TPES in 2018

Comparatively, the global TPES is made up of

81%	Fossil Fuel (oil 32%, coal 27%, natural gas 22%)
14%	Renewables
5%	Nuclear

Source: Natural Resources Canada Energy Factbook 2020 / 2021 ²⁹

According to Natural Resources Canada³⁰, renewable energy is used in Canada as follows:

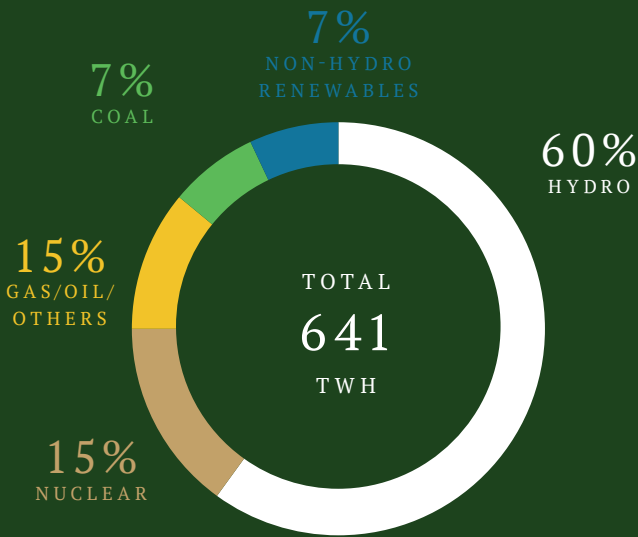
“Hydro, wind, tidal, geothermal, solar, and biomass are all used to generate electricity. Geothermal, solar, and biomass can also be used for heat. In addition, biomass, such as wood waste and landfill gas, can also be transformed into fuels.”

- Natural Resources Canada



Canada has improved its GHG emission reduction significantly through the increased generation of electricity from non-GHG emitting sources and the phase out of coal. By 2018, 67 per cent of the electricity generated in Canada came from renewable energy:

CANADIAN SUPPLY

Generation in Canada - 641 TWh
Generation by Source, 2018



In order for Canada’s energy mix to include more renewable sources, governments and industry have invested in the development and implementation of clean technologies throughout the country.

		
HYDRO	NUCLEAR	WIND
59.6%	14.8%	5.1%
Man. 96.8%	Ont. 56.8%	P.E.I. 98.3%
N.L. 95.6%	N.B. 35.9%	N.S. 11.6%
Que. 93.9%		Ont. 7.5%
B.C. 88.7%		N.B. 6.1%
Y.T. 87.1%		Alb. 5.5%
N.W.T. 37.4%		Que. 5.0%
Ont. 24.1%		Sask. 2.9%
N.B. 18.7%		Man. 2.8%
Sask. 14.9%		N.W.T. 2.7%
N.S. 9.3%		B.C. 2.5%
Alb. 2.7%		N.L. 0.5%

Source: Natural Resources Canada Energy Factbook 2020 / 2021

A photograph of two men standing in a field of tall grass, looking at a laptop. They are both wearing yellow safety vests. In the background, several large white wind turbines are visible against a blue sky with scattered white clouds. The man on the right is pointing towards the turbines.

The shift to renewables gains ground

Canada is not only rich in natural resources, but renewable energy sources. Wind and solar energy, in particular, are two of the highest areas of growth for electricity generation in the country. In 2020, the Canadian Wind Energy Association and the Canadian Solar Industries Association merged to create the Canadian Renewable Energy Association³², whose goal is to advocate for renewable energy industries to play a greater role in transforming Canada's energy future.

Across the country, activity in renewable energy production has increased.



Alberta

According to Rystad Energy, Alberta is poised to become Canada's leader in renewable energies³³ as early as 2025. The province is working towards phasing out the use of coal in electricity generation by 2030. Therefore, there is a need for utility-scale wind and solar energy projects to fill in the gap in the market. Of note is the Travers Solar project in Vulcan³⁴, which is set to be the largest solar farm in Canada. The project, which is being developed by Greengate Power, received a \$500M investment from Copenhagen Infrastructure Partners³⁵. Suncor is developing the Forty Mile Wind Power Project³⁶ in the province, however, construction was halted and pushed back to 2021 due to the COVID-19 pandemic.



Atlantic Canada

Prince Edward Island has a significant wind farm industry. According to the CBC³⁷, "about 98 percent of the power generated on the Island is from wind farms." However, a lack of infrastructure is holding back the local industry's ability to export its electricity to neighbouring provinces. The island is also currently using electricity from New Brunswick.

The federal government is pledging to move forward with the Clean Power Fund⁴⁹, which "will help support the electrification of Canadian industries, including our resource and manufacturing sectors, and make Canada home to the cleanest mills, mines, and factories in the world." The Clean Power Fund should support The Atlantic Loop, a green infrastructure project that is touted to help move clean energy in the region, phasing out coal as the area's primary generator of electricity. The Atlantic Loop is still in the early stages but has received support from the premiers of the four Atlantic provinces.

The shift to renewable energy, especially across Canada, needs government and industry support in terms of innovation and infrastructure in order to make a significant change in the energy mix not just of the country overall, but especially in regions not directly connected to major population centres.



Hydro-Québec

Established in 1944, Hydro-Québec has grown to become one of Canada's largest electric utilities that purchases and generates clean energy, and its Robert-Bourassa dam is the largest hydroelectricity facility in Canada, and is the fourth-largest network of hydro generating stations in the world. Québec itself produces more hydro power than the rest of the country combined, and is a symbol of the province's innovation, technology, and talent. It is incredibly important not only to Québec and Canada's economy – Hydro-Québec generated roughly \$14 billion in revenue in 2019³⁹ – but is important for the country's ability to generate and consume renewable energy and position itself as a world leader in producing renewable energy sources on its path to net-zero. Hydro-Québec serves some four million customers and comes complete with one of the lowest electricity rates in North America.

With climate change at the forefront as the world combats its climate crisis, Hydro-Québec's power and electricity source is a highly sought after commodity. Early in December 2020⁴⁰, Hydro-Québec announced construction of an electrolyzer facility with a capacity of 90 MW, making it one of the most powerful electrolyzers in the world to produce green hydrogen. The facility will transform non-recyclable waste into biofuels, and will generate 11,000 metric tonnes of hydrogen and 88,000 metric tonnes of oxygen annually.

"Thanks to our fleet of over 60 hydroelectric generating stations with a total output of 36,700 MW, the power produced by Hydro-Québec is over 99 per cent clean. This puts Québec in a prime position to take on a leading role in the production of green hydrogen," said Hydro-Québec's President and CEO, Sophie Brochu.

By generating 99 per cent of its electricity from water, a clean and renewable energy source, Hydro-Québec is well-positioned to be part of the solution to the challenges around climate change and become a leader in producing renewable energy sources for North Americans.



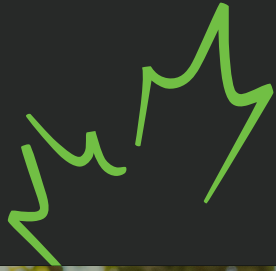
Nothern Canada

Natural Resources Canada's Clean Energy for Rural and Remote Communities program is funding clean energy projects in Canada's North, with \$220 million committed over six years to support clean energy infrastructure projects. The region still relies heavily on diesel for electricity and heating, especially in remote communities not connected to the continental grid. The program is in place to help reduce this reliance on diesel and provide reliable renewable energy technologies to support the communities.

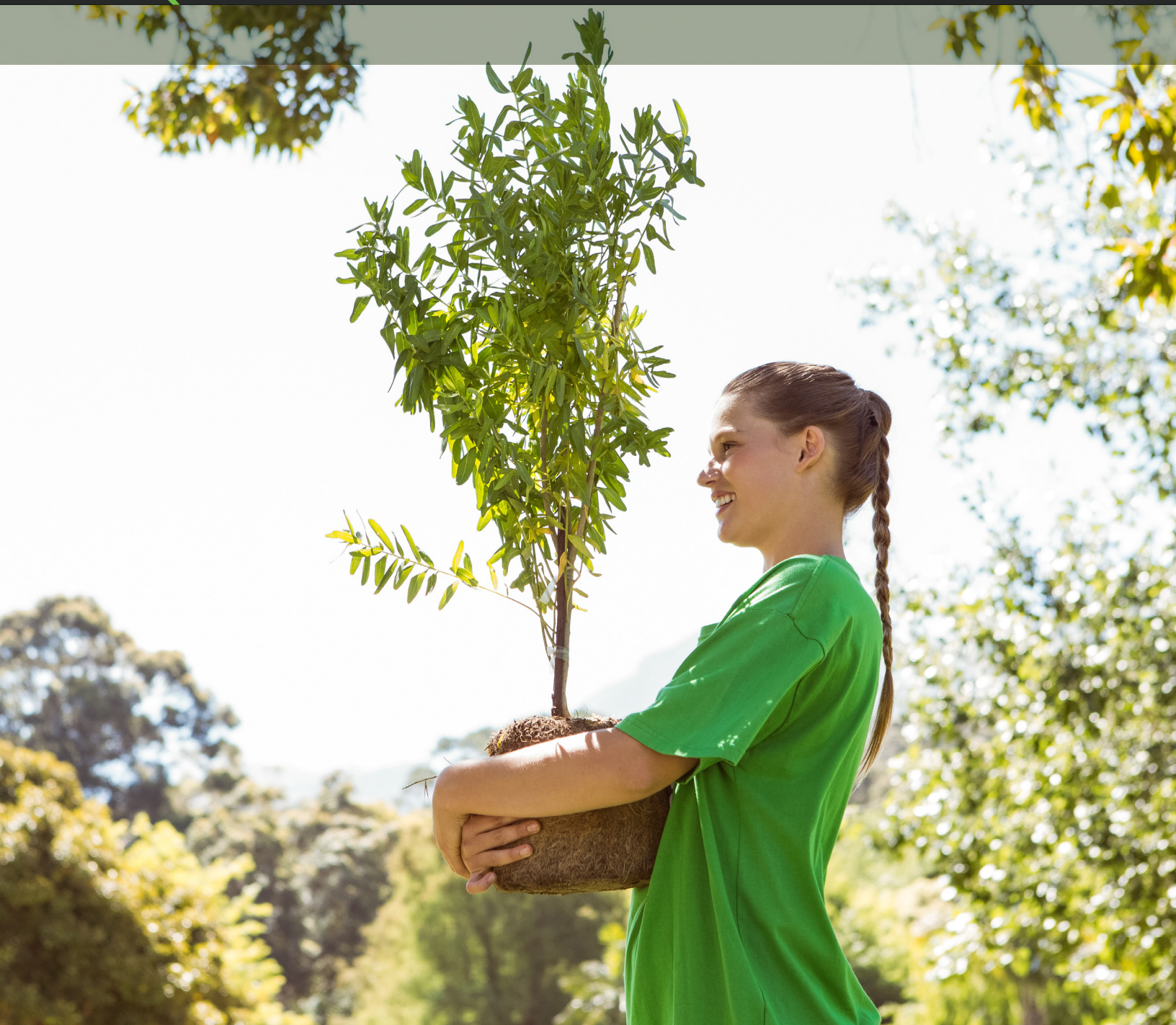
In September 2020, NRCan announced several investments⁴¹ in the Northwest Territories, which includes replacing diesel boilers with biomass heating systems, as well as engaging with local communities to integrate renewable energy sources into isolated grids, encourage participation in energy planning, and generate local green jobs.

Green Job Opportunities in Northern Canada

- Although the territories has less than 1 per cent of Canada's current environmental workers, the region boasts the highest proportion of environmental to total workers
 - The Northwest Territories has the highest concentration of environmental workers at 7.2 per cent EnviroShare, with Yukon a close second at 6.9 per cent EnviroShare
- Together, job growth and workforce retirements will result in 1,200 net environmental job openings in the next decade:
 - Replacement demand is a strong driver of net hiring in the Territories as current environmental workers retire
- The now closed Faro Mine in Yukon and Giant Mine in the Northwest Territories, as well as a growing number of similar sites, provide tremendous opportunities for local and Indigenous businesses and workers



COMBATING CLIMATE CHANGE WITH NATURE-BASED SOLUTIONS



Canada's biodiversity and nature is a fundamental ally in combating climate change. During the most recent election campaign, Prime Minister Justin Trudeau committed to "plant two billion trees to clean our air and protect our communities," and aims to protect 30 per cent of Canada's lands and oceans by 2030 via the Natural Climate Solutions fund. The fund's goal is to achieve annual emissions reductions of 30 million tonnes by 2030. This promise has the potential to bring many benefits to the environment. Newly planted trees would help capture atmospheric carbon and help mitigate the effects of climate change, while also rebuilding forests after natural disasters and helping cities to expand.

In the 2020 throne speech⁴², the federal government pledged that climate action will be an essential part of Canada's efforts to create new jobs, while also stimulating economic recovery. The speech was delivered by former Governor General Julie Payette, saying, "climate action will be a cornerstone of our plan to support and create a million jobs across the country. Global consumers and investors are demanding and rewarding climate action."

The International Union for Conservation of Nature (IUCN) defines Nature-based solutions as "actions to protect, sustainably manage, and restore natural and modified ecosystems that address societal challenges effectively and adaptively, simultaneously providing human well-being and biodiversity benefits." By harnessing the power of nature to help reduce greenhouse gas emissions and adapt to the impacts of climate change, nature-based solutions are win-win solutions to not only protect and restore the environment and ecosystems, but promote human physical and emotional well-being.

Canada's vast lands offer many unique areas for nature-based solutions, those that include more than forests, but also include wetlands, peatlands, and agriculture. The planet is facing a climate and biodiversity crisis. Millions of animals and plant species face the threat of extinction⁴³. The climate crisis also threatens to expose billions of people to extreme weather patterns and fluctuations that exhaust resources.

In a brochure published by Ecologic Institute⁴⁴ it states that a nature-based approach is often more cost-effective in the long-term than purely technical approaches and can produce important additional socio-economic benefits for the environment, citizens, and the local economy. This would be welcome news for the Canadian economy, which has been depressed due to COVID-19. Even prior to 2020, climate change and nature devastation were at the forefront as never before. COVID-19 added another wrinkle, plunging countries all over the world into recession and governments scrambled to stop the spread and do their best to prevent health systems from being overwhelmed.

Much of the country's jobs are dependent on nature and a healthy ecosystem, from farming to fishing, forestry and tourism, and the energy and renewables sector. Throughout the country's history, agriculture played a major role and Canada remains one of the largest agricultural producers and exporters in the world. The country has over 167 million acres of agricultural land⁴⁵. From Manitoba and Saskatchewan's sprawling wheat and farming fields to the summer produce in the Okanagan Valley, agriculture plays an integral role in a beneficial economy for the country. The agriculture sector is vitally important to the economy and food security. The government's climate solutions fund will help create about 3,500 seasonal jobs in tree planting each year, and will be part of a \$3 billion commitment to better conserve and restore forests, grasslands, agriculture lands, wetlands, and coastal areas. Agriculture lands account for roughly 7 per cent of Canada's land.

Agriculture is susceptible to the extreme volatility of climate change and a destabilized climate. The sector also has great potential to contribute to the rebalancing of the climate system. Both forests and land have the ability to sequester carbon and due to the sheer scale of Canada's vast land mass, nature-based solutions can have a large impact on both biodiversity and the climate crisis.

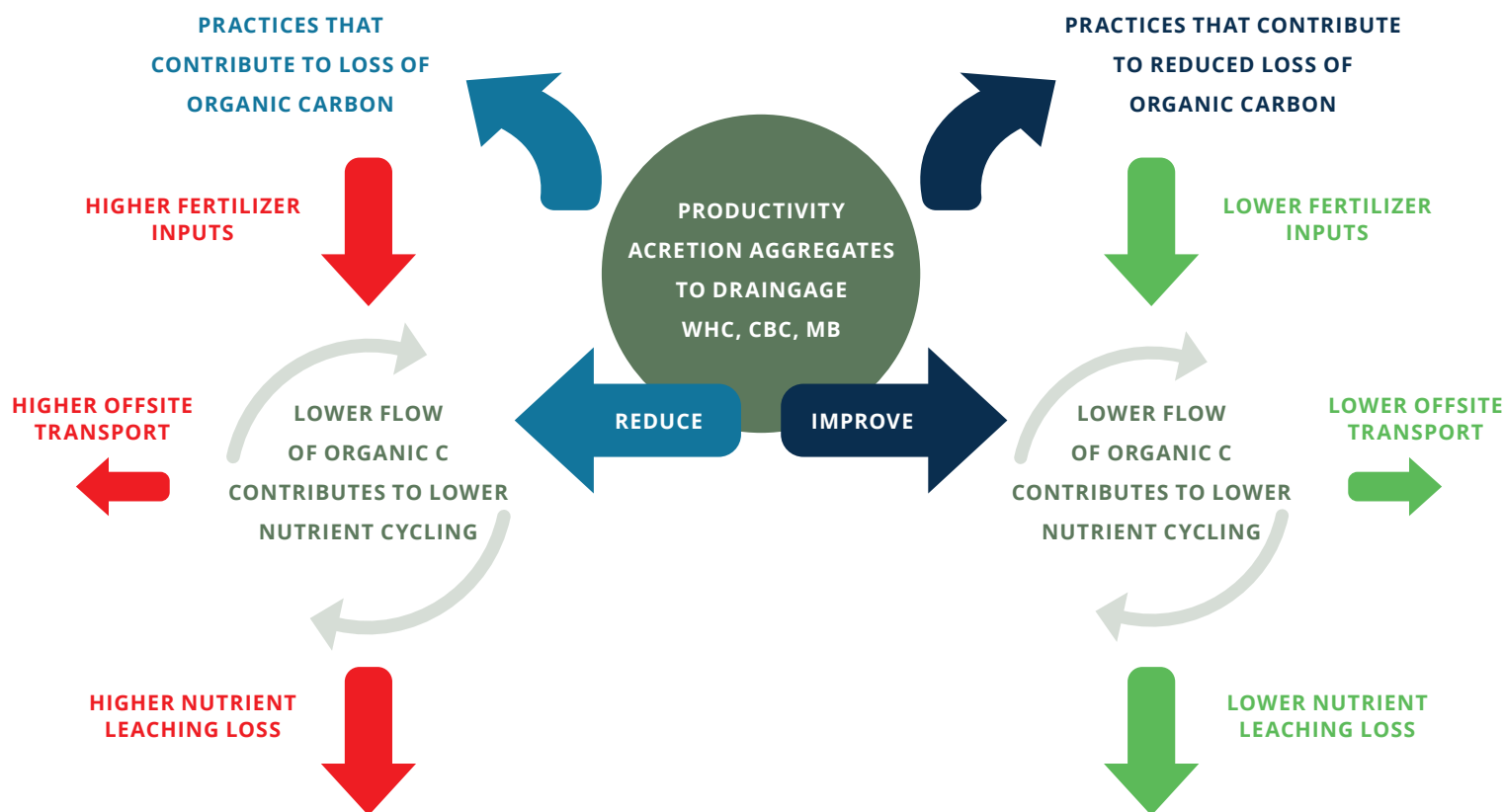
Aside from the energy sector⁴⁶, farming has often been painted as a contributor to climate change, being accused of emitting large amounts of methane from cattle, carbon being released into the atmosphere from breaking ground, the heavy use of pesticides and fertilizers, and stripping the land in favour of massive industrial farming facilities. Farming and agriculture can play a large role in reducing emissions and the fight against climate change through innovation and new technologies. One conservation technique is zero tillage, which is a minimal technique for growing crops or pasture without distributing the soil through tillage. Zero tillage presents a significant opportunity to offset carbon emissions.

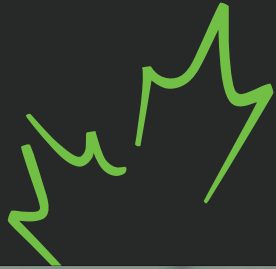
Another factor for agriculture and how it fights against climate change is the use of nitrogen fertilizer, which is another significant contributor to climate change. Roughly 20 per cent⁴⁷ of nitrogen fertilizer is lost through surface runoff or leaches into groundwater (Source). This also causes a need for environmental remediation programs, which are expensive, but require skilled environmental professionals. Farmers are cognizant of nutrient management. This has led to Fertilizer Canada advocating for the 4Rs: right source, right rate, right time, right place, ensuring food has been sustainably grown through nutrient management and has limited environmental effects.

Responsible use of fertilizer and applying innovative practices such as zero tillage plays a significant role in sustainable agriculture. These practices and technologies undoubtedly have a climate benefit. This not only helps to reduce the effects agriculture has on climate change, but helps to support the economy, as fertilizer plays an important role in Canada's economy, contributing billions of dollars and thousands of jobs.

By identifying technologies and practices that make farming and agriculture more efficient, this can drastically help reduce emissions that make their way into the atmosphere, and can help farmers grow more food by improving the crops.

POSITIVE CROP RESIDUE CYCLE⁴⁸





CLEANTECH IN INDUSTRY



Cleantech is a well-known and commonplace word in today's society. With the climate under crisis due to a rapidly warming planet, humans, wildlife, and nature face dangers like no other. This is where cleantech factors into the equation. Defined as any process, product, or service that reduces negative environmental impacts through significant energy efficiency improvements, the sustainable use of resources, or environmental protection activities. In short, cleantech is technology that's good for the environment. Six notable areas include water, transportation, energy generation and storage, waste and sustainable materials, built environment, and agriculture and food services.

The Government of Canada has not only recognized that Canada is and can be a leader in the cleantech space, but that the country must continue to work towards building a better future. Canadians want a future with clean air, healthy and vibrant communities, and the ability to have sustainable and fruitful lives. This also means a future with new jobs and careers in a thriving economy that will last for decades to come. By investing in clean technologies now and moving forward, this future is well within the reach of Canada and its inhabitants.

The Government of Canada earlier this year announced Canada's goal of net zero by 2050, tabling the Canadian Net-Zero Emissions Accountability Act in the House of Commons. This act will legally bind the government to a process to achieve net-zero emissions by 2050, set rolling five-year emissions-reduction

targets, establish the Net-Zero Advisory Board to provide independent advice to the government on the best ways to reach its targets, require the Government of Canada to publish an annual report considering the financial risks and opportunities of climate change in their decision making, and enshrine greater accountability and public transparency.

"Reaching net-zero greenhouse gas emissions is what the science says we must achieve, and this 30-year project will require every future government to take actions to grow our economy while reducing emissions in every sector. This achievement is necessary to ensure our kids and grandkids can live in a world with cleaner air and water and to ensure our businesses maintain and gain a competitive edge by producing the low-carbon products the world wants to buy, well into the future." – The Honourable Jonathan Wilkinson, Minister of Environment and Climate Change

Cleantech is not only good for the environment and all who take up space here, but it's good for the global economy, and could represent a trillion dollar opportunity. The 2019 Alberta Clean Technology Sector Report lists Calgary as one of the world's top 15 cleantech ecosystems by San Francisco Startup⁴⁹ Genome. Through myriad emerging innovations in the oil and gas, electricity, and agriculture sectors, both Calgary, Alberta, and the country as a whole are burgeoning centres with sectors and companies capable of offering solutions and ideas to the cleantech space.



A large oil pumpjack is silhouetted against a vibrant sunset sky with orange and blue hues. The pumpjack's complex mechanical structure, including its walking beam and counterweights, is clearly visible. In the foreground, a horizontal metal pipe runs across the frame. The ground is dark and appears to be a dirt or gravel surface. The background shows a distant horizon with some hills or mountains under the twilight sky.

Oil & Gas

Canada's oil and gas sector is one of the world's leaders, and is an integral part of Canada's economy. COVID-19 has had a significant impact on the industry, seeing thousands of workers lose their jobs, depressed oil prices, and projects and travel all but ground to a halt.

From technologies for oil spill response and cleanup, bioremediation of tailings ponds, asset visualization, and industrial-scale hydrogen production, the oil and gas sector is actively engaged in moving solutions forward. Cleantech innovation has driven significant improvement in the environmental performance of the sector, and has lowered greenhouse gas emissions, through many clean fuel technologies, digital solutions, innovative water technologies, reclamation and methane technologies, and hydrocarbon extraction.

Canadian cleantech oil and gas companies are working in unison to transform the economic landscape and environmental competitiveness. The Energy Innovation Program (EIP) has received \$50 million over two years to support the development of clean oil and gas technologies in order to help develop Canada's hydrocarbon resources in sustainable ways. The industry also has a leg up in its development and deployment of new technologies due to a level of collaboration that is unifying and fighting for the common good.

This kind of collaboration has also received support from the Royal Bank of Canada, as they have committed to providing \$100 billion in sustainable finance by 2025⁵⁰. Canada's Oil Sands Innovation Alliance (COSIA), with the power and help from companies such as Cenovus Energy, ConocoPhillips, Imperial, and Suncor, have come together to share innovation and intellectual property related to COSIA's Environmental Priority Areas to enable responsible and sustainable growth of Canada's oil sands while delivering accelerated improvement in environmental performance.



There are many examples of the oil and gas sector moving solutions forward. One example of Cleantech is Steam Assisted Gravity Drainage. There is Radio Frequency assisted SAGD from Acceleware. See details at: <https://www.acceleware.com/press-releases/2020/acceleware-announces-regulatory-approval-of-marwayne-pilot-project.html>; and <https://www.acceleware.com/technology/overview.html>. There is also Solvent Assisted SAGD at Cenovus (requires less steam and less GHGs association with production of steam). See details at: <https://www.cenovus.com/technology/solvents.html>. Note that other companies are involved in solvent assisted SAGD as well.

- Doug Koroluk, EP

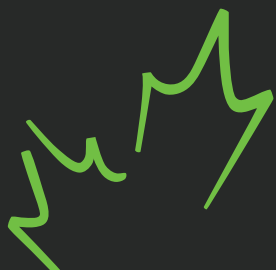
Transportation

For example with transportation, how people get around includes what sustainable transportation and infrastructure options are available to them. There are challenges such as improving the carbon-free vehicle options currently available, while also increasing the number of them on the road. With emissions being steadily on the rise for decades, the electrification of vehicles is a key way to lower emissions.

Whether by air, land, or sea, humans have always been in motion and had inquisitive natures about the world. Inevitably this movement has consequent impacts with the effects of pollution and climate change. People and companies have begun to be aware of how they commute, what mode of transportation they use, and how they can reduce their environmental footprint on their travels and commutes, as are governments.

In 2019, the Government of Alberta announced that it would be investing \$100 million in green transportation projects throughout the province. The release stated that 16 new clean technology projects will receive the funding from Emissions Reduction Alberta Biotechnology, Electricity, and Sustainable Transportation (BEST) challenge. It was said that the reduction in greenhouse gas emissions from the 16 projects is equivalent to taking 530,700 cars off the road, and will also result in 114 new jobs⁵¹ throughout the province.

Also in 2019, the Québec government invested more than \$12 million in its new Innovative Vehicle Institute (IVI) building⁵². The building is intended to be a unique innovation space in Canada that will reflect the best energy efficiency practices. The announcement of the project is timely for IVI as it also has plans to increase its staff in the coming years. "The project announced today will generate significant spinoffs with regards to the development of energy sources in the transportation sector and the college and university training of students. We can expect an innovation space that is unique in Canada, and the Government of Québec is proud to contribute to it." - Minister Pierre Fitzgibbon



CONSUMERS AND CLEANTECH





The rise and boon of consumer cleantech in the past decade has meant a transition towards goods and services that offer a more sustainable way of life. It has Canadians increasingly on the lookout for green products that save natural resources by creating new, more flexible, and better forms of living, with many even willing to pay more for them. This shift in consumers and in the cleantech industry has caused a demand for sustainable products and services. People believe that these new products offered to the market will play an important role in tackling the current climate crisis. A focus of consumer cleantech is not just in the creation of new technologies and products, but in serving people in smarter ways.

In a news release published in October 2020, Canada is one step closer to zero plastic waste by 2030⁵³. This comprehensive plan includes banning single-use plastic items. With plastic polluting rivers, lakes, oceans, and harming wildlife every year, Canadians throw away three million tonnes of plastic waste, and only 9 per cent ends up being recycled. Not only will the plan protect aforementioned lakes, oceans, and animals, but will reduce greenhouse gas emissions, and create jobs. Improving how plastic waste is managed, and investing in innovation can reduce 1.8 million tonnes of greenhouse gas emissions and create 42,000 jobs.

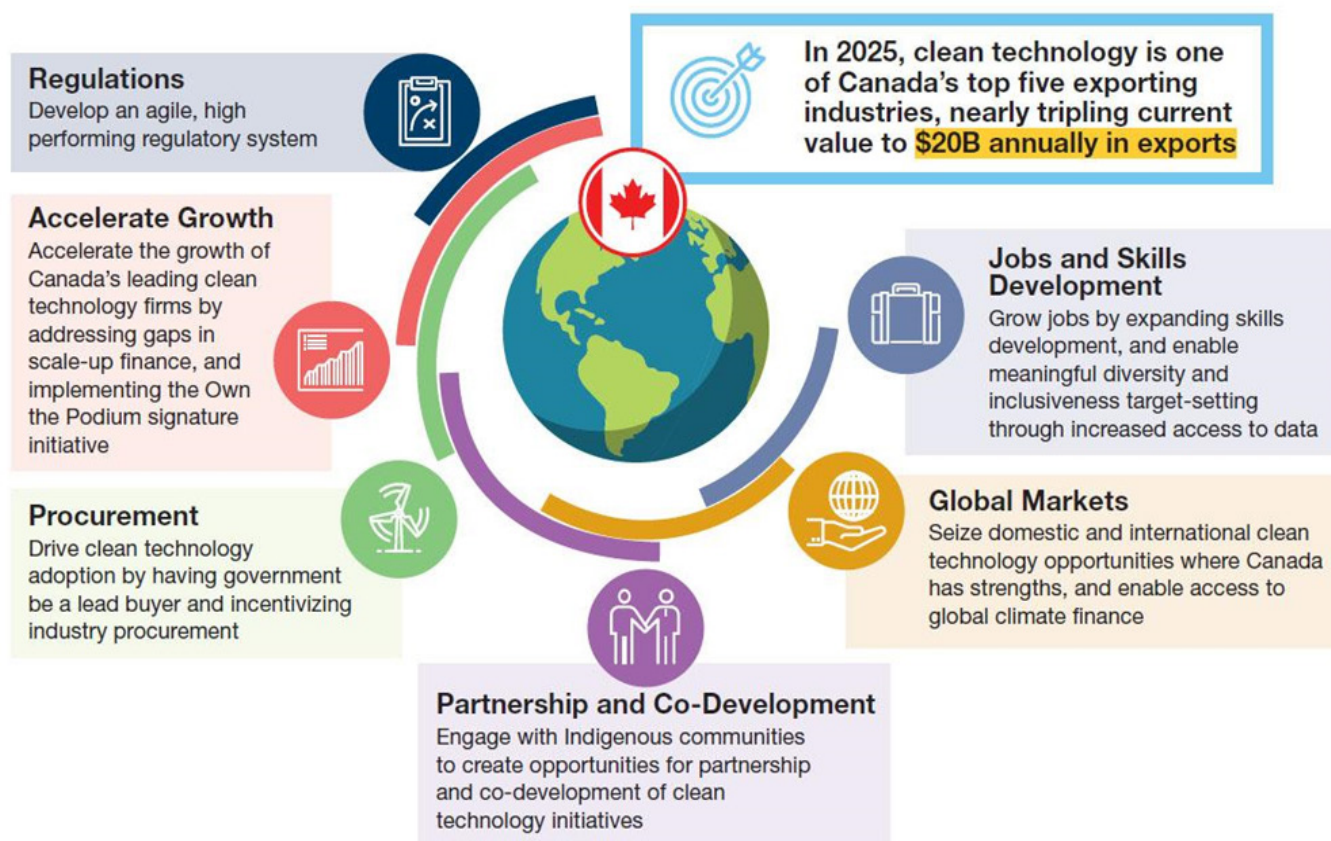
“Canadians see the effects of plastic pollution in their communities and waterways and they expect the Government to take action. Our Government is introducing a comprehensive plan to get to zero plastic waste. We intend to ban plastic bags, straws, stir sticks, six-pack rings, cutlery, and hard-to-recycle take out containers. These items are harmful to our environment and their value is lost from the economy when they are tossed in the trash. This proposed ban will help drive innovation across the country as new and easier to recycle items take their place in our economy.” – The Honourable Jonathan Wilkinson, Minister of Environment and Climate Change

Canada is one of the world’s leading countries around innovation and producer of clean technology solutions, and is well positioned to seize future opportunities presented by the cleantech sector⁵⁴. More and more people are being cognizant of what they purchase, and who from. They conduct research on the company, who said company is supporting, how the company produces their products, and how they source materials. From no longer using single-use plastics and bringing reusable bags to the grocery store, sustainability and the environment are the motivators behind many purchases.

Canada has a vision that by 2025, Canada’s cleantech companies will be transforming industries and improving environmental outcomes, not only within the country, but around the world. Its target is to see clean technology as one of Canada’s top five exporting industries, nearly tripling current value to \$20 billion annually in exports. It’s important for the government to create more and more policies that allow cleantech to further develop and innovate. With more policies enacted, it can drive consumer engagement and get more people supporting the green movement in their daily lives.

Via Export Development Canada⁵⁵, with 82,000 employees and annual revenues of \$17 billion, the cleantech industry is primed and poised for growth.





Source: <https://www.ic.gc.ca/eic/site/098.nsf/eng/00023.html>⁵⁶

For companies in the cleantech space, and companies looking to make operational differences where they can, being sustainable means more than having organic produce in stock or compostable napkins. Businesses now have to show depth in their authenticity and show how they are protecting the environment. Taking steps toward sustainability not only supports the community, earth, and its local ecosystems, but helps businesses stand out in a crowded and oversaturated market.

In addition, COVID-19 has exacerbated people's concerns about the environment, with people shifting purchases based on environmental claims, some 11 per cent said, in a report by Retail Dive⁵⁷ earlier this year. The report noted that plastic has fallen out of favour with consumers in recent years, seeing an 85 per cent increase of respondents who have expressed a commitment to turn down plastic utensils with food orders in the next 12 months. It also saw an increase in people showing a willingness to use reusable drinkware (37 per cent), 21 per cent to use reusable shopping bags and a 164 per cent increase in consumers saying they will purchase in bulk to save on individual packaging.

With companies such as Toms, whose mission has been "using business to improve lives, and that includes taking good care of the place we call home. We're committed to making choices that benefit our customers, employees, and the planet – from the materials and vendors we choose to the way we get each product to

you.” By using sustainable cotton, greener packaging, reducing their carbon footprint, and transparent reporting, the company is taking appropriate steps to play its part in the fight against climate change.

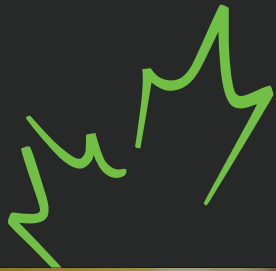
Companies are also noticing these trends, taking steps to reduce their waste and shifting from the way things used to be done, such as Vancouver-based Canopy⁵⁸, who work with textile producers and paper manufacturers to promote conservation and develop sustainable solutions adopted by some big brands. Calgary Co-op, one of the largest retail corporations in North America, for example, has been transitioning towards reducing the number of plastic bags they use, and now have 100 per cent compostable shopping bags that can then be used as a compost bag at people’s homes. “We are increasingly hearing from our members that they want us to cut back on plastics, so we’re taking action to reduce the number of plastic shopping bags we provide,” – says Ken Keelor, Calgary Co-op CEO.

By stating the benefits of adopting new lifestyle practices such as composting and using compostable bags from grocery stores, to sustainably sourced products and services, businesses and companies operating within the cleantech space offer people avenues to support and help not only the planet, but to help diversify their local economies. A vibrant and healthy cleantech sector has a myriad of benefits, from job and local business creation to reducing greenhouse gas emissions and plastic waste, and can also help industries transition to sustainable and green business models. Consumers are increasingly aware of where and how they spend their money, and it’s important to them to support industries and businesses with sustainability at the vanguard.



“It is important for consumers to consciously make the sustainable choice in the products they buy. At the same time, we need governments at all levels to set environmental regulations and large corporations to take the lead by incorporating cleantech strategies such as shifting from a linear to a circular economy in the fight against climate change and towards zero-waste.”

- Connie Lum, EP



A DIGITAL TRANSFORMATION



A digital transformation is sweeping the globe, and is spanning many sectors and industries, helping them overcome barriers they have faced in becoming more sustainable in their operations, while facing the other transformation currently underway - climate change. The latter disrupts ecosystems, jeopardizes biodiversity, as well as food and water sources, and the future of life on earth. Companies and organizations are harnessing incredible computing power and advances in data science with an increased digital connectivity. These trends are transforming the way businesses operate and have become trusted allies in becoming sustainable. Technology and digitization can both play crucial roles in developing solutions for a greener and better tomorrow focused on sustainability and the environment.

The development of new technologies and digital solutions within a product service environment is as much about organizational change as technological. Technology has allowed companies and businesses to redesign current work and continue to evolve.



Seeking out innovative ways to incorporate green technology and a sustainable mindset is at the forefront of business operations. From renewable energy (solar panels) to paper free to reduce waste, working remotely to reduce emissions and cars on the road, there are many ways companies and businesses can operate with an eco-centric mindset.

Customers are continuously on the lookout to buy ethically sourced, sustainable products, especially with regards to food, clothes, and other essential products. Many businesses have taken risks along the way in their efforts to become more sustainable.

This digital transformation has meant integrating digital technology into all areas of a business, fundamentally changing how companies operate. Companies have had to adapt business models to remain relevant and in business. Both technology and the streamlining of digitization has helped keep companies agile. The World Economic Forum COVID Action Platform⁵⁹ has noted that transformation is also a change of culture, which requires a radical rethinking of people, processes, and technologies. Businesses transitioning to becoming digital organizations means not only having digital products and services, but powering core business processes and operations with technology.

One benefit of this digital transformation is the reduction in global emissions of greenhouse gases that have been a catalyst for climate change. Both climate change and digital transformation are linked together, the former looking like it will be one of the biggest drivers of organizational change over the coming decades. And moving forward, these two factors will co-exist in a somewhat symbiotic relationship, as digitization allows companies to set and meet decarbonization targets (oil and gas, agriculture, manufacturing, et al), while the looming pressures of climate change will help create accelerated ascension into digital transformations.

Many Canadian companies have been making waves with regards to how they have adopted the

digital transformation, which has not only benefited the economy and its workers, but helped against the threat of climate change and created more sustainable businesses capable of adapting to the new normal.

While farming has traditionally been a laborious practice complete with long and arduous days, the industry and its practices are evolving, and with the help of technology such as Internet of Things (IoT), analytics, Artificial Intelligence (AI), and machine learning, the industry has begun its transition to a technological age to help streamline and improve productivity and enables improved resource management.

At the core of this technological and innovative future is smart farming, giving farmers a real-time picture of what's happening with their crops. The first smart farm of its kind in Canada⁶⁰ was launched in the Ottawa area and announced by Invest Ottawa and the City of Ottawa at Area X.O, the futureplex of innovation and collaboration. The farm will help drive economic recovery and the long-term sustainability of the province's agriculture and agri-food sector. This provides producers and agricultural technology (ag tech) innovators access to one of the most advanced communication systems in the world, cutting-edge AI and analytic technologies, 100 acres of secure, completely gated farmland, and the highest tech talent concentration per capita in North America.

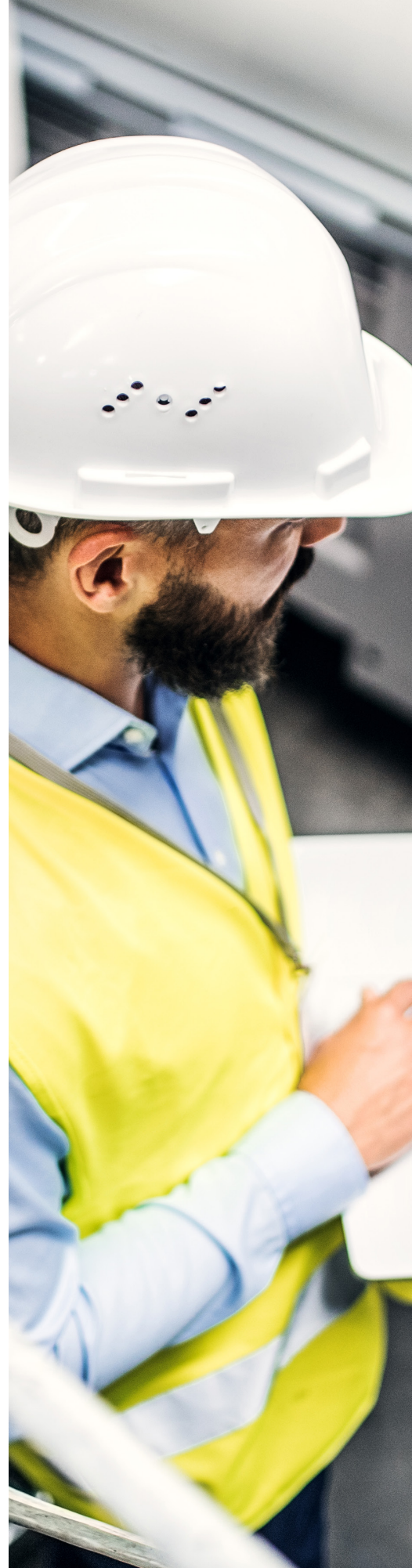
These capabilities and assets will facilitate the development, commercialization, and application of new agtech solutions, catalyze new global market opportunities for agtech innovators, and create new agtech products and high-value jobs. These emerging solutions will help improve crop yield and quality, optimize production efficiency, and reduce waste and carbon emissions from agricultural operations, traditionally one of the higher carbon emitters.

"The Ottawa Smart Farm allows us to support our important agricultural sector at a time when uncertainty is high due to the changing climate, price instabilities, access to labour and now, a global pandemic. The cutting-edge agricultural technologies in use at the farm will reduce uncertainty for producers, support more sustainable agriculture and build resilience. The Ottawa Smart Farm really is growing the future." His Worship Jim Watson, Mayor of Ottawa

Innovative solutions in the industry will help pave the way to help feed the global population, and as the world's population increases at rapid levels, having healthy and sustainable food options, with the help of smart farming, is more important than ever. By providing these solutions and equipment for smart farms, this helps generate economic growth, new jobs, and prosperity for the province and country by producing crops that feed the world.

RamSoft, in the healthcare industry, for example, offers cloud-enabled medical imaging technology, allowing medical providers to quickly collaborate, securely and remotely on patient diagnosis.

A Forbes article⁶¹ posted 10 digital transformation trends to watch out for





in 2021, notably: 5G going mainstream, Customer Data Platforms (CDP) explosion, cybersecurity getting a jolt, and working from home outlasting COVID-19.

For Canadian businesses, transformation is integral, facing the reality of having to adapt in today's world of converging digital, physical, and biological changes. Technological breakthroughs are the new norm and have helped push businesses to new heights and adjust in how they do business. This current wave of transformations has been a boon for Canadian businesses, and it is clear said businesses believe technology will accelerate traditional keys to business sustainability and growth, and seeing new and diverse products. This enables a quicker path to collaboration with both suppliers and vendors, creates jobs for Canadians, and injects dollars into the economy.

According to PwC Canada⁶², business leaders in the country are “positive” about their digital strategy, but are “less positive” about the digital competencies of their existing workforce.

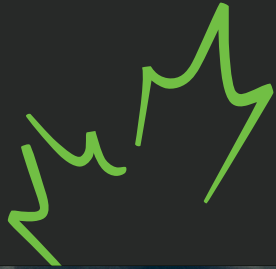
Only about a third of Canadian executives are addressing the digital talent shortage through upskilling:

- 36 per cent train employees on tech-driven changes to their jobs
- 32 per cent hire new employees with relevant tech skills
- 27 per cent train employees on new tech

In *A Digital Strategy for Canada: The Current Challenge*⁶³, Canada's future competitiveness and growth prospects are undeniably linked to its ability to seize opportunities created by the rapidly evolving digital economy. The report states Ottawa's innovation should be focused on three main goals: promoting rapid adoption and diffusion of digital technologies across all sectors of economy, assist companies that have demonstrated commercial potential to grow to a global scale, and promote creation of businesses capable of developing disruptive technologies.

Turning to technology has helped companies glean insights into not only what their customers are doing, but other businesses in their sector as well. Technologies such as carbon capture and technological innovations are also helping in the fight against climate change and putting Canada on its path to net zero.

With the digital revolution underway, the further advancement and continuation of digital technologies are critical to the wellbeing of Canada's future economic growth and prosperity. With the threat of climate change, it also creates the opportunity for new products, services, and innovative organizations to challenge the existing system of production, and create sustainable businesses now, and moving forward.



THE BLUE ECONOMY





Surrounded by three oceans, complete with a bountiful freshwater resource capacity amongst the highest in the world, Canada, as much as it is known for its vast and sprawling lands, is also a water nation. Millions of Canadians throughout its rich history have built and shaped families and communities by having a deep relationship with water. Seafood production has long been tied to Canadian culture, from Atlantic Canada fishing off the coast to Indigenous people's powerful relationship with fish and seafood. Not only is seafood connected to culture, but it also provides people's livelihoods, employing thousands of Canadians.

For Canada to recover from the COVID-19 pandemic and have a strong economy, it has to use the coasts and oceans to its advantage and further its Blue Economy, protect ecosystems and tackle climate change. A sustainable Blue Economy harnesses the potential of oceans, lakes, and rivers, and makes life better for Canadians. Much like 'Green Economy' and the human's relationship with the land, Blue Economy highlights humanity's close bond with oceans and bodies of water.

In an interview on Innovating Canada with MediaPlanet⁶⁴, Honourable Bernadette Jordan, Canada's Minister of Fisheries, Oceans, and the Canadian Coastguard, alluded to the opportunities for Canada that are within the surrounding oceans. When asked what it means for people living and working by the changing tides of three oceans, Jordan said, "I want Canadians to understand the incredible opportunities that lie within our oceans. The blue economy — the economy driven by sustainable, ocean resources — is worth more than \$31 billion annually. That's not just fishing — that's marine transportation, ship building, tourism, and so much more. The blue economy does not stop with our coastal communities, its benefits spin inland and lift up our rural communities.

"Over 300,000 Canadians are currently employed by the blue economy and my goal is to keep that number growing. That's exactly why we are building a blue economy strategy, to ensure Canadians are positioned to take advantage of new opportunities. It really is an opportunity, because we have so much more to gain. Canada has the largest coastline in the world, and it's time we have a sustainable approach to its development. We need to invest in this now and become real competitors on the world stage."

Talking about the ecosystem and what efforts are being done to protect the oceans' ecosystems, Jordan said Canada had a goal to protect 10 per cent of its oceans by 2020, and that the government exceeded target ahead of deadline, closely reaching 14 per cent. Over 790,000 km² are now conserved, adding they have a new target of 25 per cent by 2025, working their way to 30 per cent by 2030. The concern and threat of climate change is on the minds of people all over the world, and the impact it has on people's lives.

“We just announced over \$13 million dollars to fund 24 more projects like this one. We’re supporting the Haida Nation, as they work to restore marine areas damaged by past forestry practices, and the Kivalliq Inuit Association as they revitalize the Arctic char populations in the North, and The St. Mary’s River Association as they continue to help the Atlantic salmon recover in the St. Mary’s River.”

Acknowledging that sustainable aquaculture is a cornerstone of Canada’s fish and seafood sector and the role it plays in Canada’s food security, helping drive economic growth, particularly those in rural and Indigenous communities, earlier in 2020, Jordan announced the next phase of the Government’s first-ever Aquaculture Act⁶⁵. The act aims to provide more clarity and certainty as the industry continues to develop across the country, while also respecting federal, provincial, and territorial jurisdictions.

The importance of aquaculture production and its relation to the impact on climate change is vast. Climate change impacts on aquaculture are reflected in temperature changes of the air and water, as well as oceanographic conditions such as current, waves, and wind speeds. With extreme weather conditions and episodes happening with more regularity, creatures beneath the surface are subject to myriad stresses and physiological effects, affecting both growth and development. A challenge facing aquaculture is access to proteins, minerals, and omega 3 fatty acids that come from a diverse species of fish and sea creatures. These essential vitamins and minerals sustain people and are important factors in a healthy diet.

The Fisheries Council of Canada-released Canada’s Blue Economy Strategy 2040⁶⁶ highlights the problems posed by COVID-19, and how they are looking for ways to drive recovery, strengthen the country’s communities and economies, and things Canada can do to regain its position as a global leader with its blue economy. Over the years, the government has pledged and contributed millions of dollars for sustainable growth and helping the country on its path to being a leader in the global Blue Economy. The stark reality is that Canada has fallen behind.

Just 25 years ago, Canada was the top fish and seafood exporter. Current day, Canada is eighth. The vision is for Canada to be a global top three best sustainable fish and seafood producer by 2040, as well as doubling the value of Canadian seafood, and doubling economic benefits and domestic consumption of fish and seafood. With concerns over both food security and employment, Canada’s seafood producers are ready for these challenges and the opportunity presented to create jobs and a sustainable food supply for Canadians.



By tapping into innovations and scientific advances in the industry, Canada can further its prosperous blue economy. Humans must work together to protect the oceans and seas and its marine resources, while ensuring sustainable livelihoods and diets for the future. Due to its vast resources, Canada has room for growth in the aquaculture industry, can continue to employ thousands, foster strong relationships with Indigenous peoples and communities, all while focusing on sustainability and the healthy functioning of the earth’s environment and ecosystems through innovative practices⁶⁷, coast to coast to coast.

ABOUT ECO CANADA

ECO Canada is the steward for the Canadian environmental workforce. From job creation and wage funding, to training and labour market research – we champion the end-to-end career of an environmental professional. Our aim is to promote and drive responsible, sustainable economic growth within industry while also ensuring that environmental care and best practice is a priority.

We gather and analyze trends within the environmental workforce and provide up-to-date, relevant data and insights for policy, business, and educational purposes. Our reports support our stakeholders in four key areas: (1) employers—plan and attract qualified candidates, (2) individuals—prepare for and build their environmental careers, (3) governments—develop programs and update policies, (4) educators and trainers—adapt their offerings to prepare the workforce that is and will be in demand.

For nearly three decades we have worked with some of Canada's brightest minds, and the organizations that employ them. Our workforce knowledge spans nationally across all provinces and territories, as well as within major Canadian industries including agriculture, construction, energy, forestry, manufacturing, and mining. As thought leaders in the environmental labour market, we not only look back at historical data of the sector, we also continuously work to find and identify trends that will impact the future of the workforce. About 620,100 of Canada's 18.7 million employed population in 2019 were environmental workers.

Canada is a global leader in environmental innovation and jobs. It is imperative that ECO Canada continues to work alongside both government and policy makers as well as industry and academia to ensure we continue to be a global authority.



6,000+

ENVIRONMENTAL
PROFESSIONALS CERTIFIED



8,500+

ENVIRONMENTAL JOBS
CREATED



33

ACCREDITED
ENVIRONMENTAL
PROGRAMS



\$50M

WAGE FUNDING
DISTRIBUTED

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