

Clean Growth **3.0**

Achieving Canadian Prosperity
in a Net Zero World





Preface

Clean Growth 3.0 is the third in a series of major policy papers by the Business Council of Canada related to climate change. The first, in 2007, recognized the serious challenge posed by greenhouse gas emissions. It advocated for a coherent national plan to achieve ambitious environmental and economic goals. In that paper the BCC was the first Canadian business organization to advocate for a price on carbon.

Three years later, in the aftermath of the global financial crisis, the BCC released Clean Growth 2.0. It made the case for a coordinated approach to carbon pricing across the country. It also argued for a national energy framework to develop clean energy solutions and position Canada for leadership internationally.



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Executive summary

Canada's business leaders are convinced that the goal of net-zero greenhouse gas (GHG) emissions is achievable for Canada, even if the means by which we will get there are not yet fully defined. The private sector is ready to do its part, but all Canadians should understand that achieving net-zero will entail significant changes to their daily lives. We need to start putting the key pieces in place, with flexibility to adjust as time and experience dictate.

Our ambition to reduce GHG emissions must be matched by an equal and unwavering commitment to sustainable economic growth. An expanding economy will help repair the damage from the pandemic, create new high-value jobs, and put Canada's public finances back on a sustainable path. Economic growth makes it possible for both the public and private sectors to invest in climate solutions.

There is an urgency to getting this right. Canada faces increasing competition in the global economy, and those pressures will likely intensify as the pandemic recedes and the world prepares for a lower-carbon future. Other nations are seizing the initiative now and building their own economic and environmental strategies to achieve comparative advantage. Policymakers in Canada will need to work with the private sector to co-create sector-based industrial strategies that support our shared goals.

Strategic engagement with our largest trading partner is critical. There may be areas where it makes sense to proceed independently, but for the most part alignment between Canada and the United States on transition strategies will be mutually beneficial. Key opportunities include: exports of clean electricity; an enhanced North American supply chain for electric vehicles (EVs), batteries, and charging infrastructure; and strategic partnerships on hydrogen, carbon capture, utilization and storage (CCUS), critical minerals and nuclear technology.



Our ambition to reduce GHG emissions must be matched by an equal and unwavering commitment to sustainable economic growth.

At the same time, both countries should develop a policy statement that recognizes the continuing need for secure and stable supplies of oil and gas to meet domestic demand, as well as the critical role that Canadian and U.S. energy and resource companies will play in financing much of the research and development, and investments in clean technology, that will be required to achieve net zero.



This is a key point, because our energy and resource sectors can lead the transition. They have the scale, the people and the technological capability to make it happen. They also produce many of the materials and minerals the world will need to achieve a low-carbon future. In terms of GHG emissions, they are among the cleanest and most efficient producers of these products anywhere in the world. Far from seeking to divest from these industries or diminish their role, we should be bolstering their ability to invest in climate solutions and capture market share domestically and abroad.

In a world in which “sustainable finance” and environmental, social and governance (ESG) metrics are growing in importance, governments must work with the private sector to position Canada as a destination of choice for new investments that support our net-zero ambitions. For their part, Canadian companies need to continue to demonstrate that they are assessing, managing and communicating the opportunities and risks that climate change poses for them.



Our energy and resource sectors can lead the transition. They have the scale, the people and the technological capability to make it happen.

Companies and investors need long-term policy clarity and predictability so they can plan effectively for the transition. Governments must provide a policy framework that drives investment and supports commercialization and widespread deployment of promising technologies. We also need a supportive policy environment that allows clean technology start-ups to stay and grow in Canada.

Government must support large-scale research and development for breakthrough climate solutions, both through specific funding and by creation of a mission-driven agency such as the United States’ ARPA-E to focus on the most promising advanced technologies.

A Canadian net-zero strategy should build on our country’s strategic advantages in areas such as CCUS, hydrogen, critical minerals, and nuclear energy. This could include funding for research and development, demonstration projects, and tax policies that attract investment. The goal should be to increase adoption of low-emissions technologies while expanding exports of Canadian products, technologies and expertise.

Canada is a global leader in the production of clean electricity. Already, 82 per cent of the electricity we generate comes from non-GHG-emitting sources. Even so, achieving net-zero will require a massive scale-up of low-emissions electricity, particularly in the transportation sector with increasing adoption of electric vehicles. To build on our strengths, Canada must focus on four interdependent goals: generating clean electricity at scale; maintaining reliable electricity systems as new generating technologies come on stream; delivering clean electricity efficiently to support existing and new applications; and keeping electricity a cost-competitive form of energy in all regions of the country.

The transition to a low-carbon economy offers myriad opportunities to improve the lives and well-being of individuals and families in every part of the country. In particular, there is significant scope to advance Indigenous reconciliation through partnerships with the private sector in responsible resource development. The federal government should appoint an expert panel of Indigenous business leaders and financial executives to examine innovative ways to finance Indigenous-owned businesses and ensure access to risk capital for investment in major projects.

The race to develop cleaner forms of energy and low-carbon products and technologies also will require an adept and well-trained Canadian workforce. The federal and provincial governments need to partner with the private sector, universities and colleges to ensure that Canadian workers have the skills necessary to support the transition to net zero.



There is significant scope to **advance Indigenous reconciliation** through partnerships with the private sector in responsible resource development.

Even as we prepare for net zero, we cannot ignore what is happening now. Canada needs to manage the immediate impacts of climate change and advance climate adaptation and resiliency strategies. That means working with provincial and municipal governments, the private sector and other stakeholders to develop and deploy a robust climate change adaptation framework.

Introduction

Canada's business leaders recognize the compelling scientific evidence on climate change and the need to act decisively, both to limit current and future damage and to improve the lives of future generations. Smart public policy can ensure a healthy post-COVID recovery that creates jobs, builds strong and resilient communities, and puts Canada firmly on a path to achieving net-zero greenhouse gas (GHG) emissions over the next three decades. We readily acknowledge that the scale of the challenge is enormous, but we are convinced that, with a supportive policy environment and sustained public and private investment, Canadians can look forward to a strong and vibrant economy that reaches the net-zero target by 2050.



Smart public policy can ensure a healthy post-COVID recovery that puts Canada firmly on a path to achieving net-zero emissions over the next three decades.

Part one

Our challenge

Under the 2015 Paris Agreement, Canada and nearly 200 other countries have pledged to limit the rise in global average temperatures to “well below” two degrees Celsius (2°C) above pre-industrial times, and to strive for a ceiling of 1.5°C.¹ Nevertheless, global GHG emissions continue to rise and scientists believe the world could warm by at least 3°C this century, with potentially catastrophic results including rising sea levels and extreme weather. Some parts of the world could be rendered uninhabitable, fuelling hunger, migration and potentially violent conflicts.²

This point was driven home by the United Nations climate science panel in 2018 when it concluded that man-made carbon dioxide (CO₂) emissions need to fall by about 45 per cent by 2030, compared to 2010 levels, and reach “net zero” by mid-century to give the world a good chance of limiting warming to 1.5°C and thereby avoiding the worst impacts of climate change. Net-zero emissions are effectively achieved when any human-produced CO₂ is removed from the atmosphere through technological or natural means over a specific period.³

In response to this challenge, Canada, in cooperation with more than 120 countries and G7 partners, has pledged to achieve net-zero by 2050. The federal government is now seeking to formalize this target through the *Canadian Net-Zero Emissions Accountability Act*, which was tabled in Parliament in November 2020. The Act envisions a series of GHG reduction targets in five-year increments from 2035 to 2050. In December 2020, the federal government published “A Healthy Environment and A Healthy Economy” (HE&HE), a plan it says would enable Canada to meet its Paris Agreement commitment – a 30 per cent reduction in GHG emissions from 2005 levels by 2030.⁴

Achieving net zero will be a challenging task. Among the reasons:

- CO₂ from the combustion of fossil fuels and biomass accounts for about 90 per cent of global emissions. During the pandemic’s most constrained point, when air and road travel was drastically reduced and many businesses were shuttered, global oil consumption dropped by only 20 per cent.⁵
- The HE&HE plan expresses the ambition to go beyond the Paris target and aim for a 32 to 40 per cent reduction. Yet while Canada’s emissions intensity (GHGs per dollar of GDP) has improved 23 per cent since the base year of 2005, overall emissions have fallen just 1.1 per cent over the same period.⁶

¹ Source: <https://unfccc.int/process-and-meetings/the-paris-agreement/the-paris-agreement>

² Source: <https://public.wmo.int/en/media/press-release/wmo-confirms-2019-second-hottest-year-record>

³ IPCC definition: Net zero emissions are achieved when *anthropogenic emissions of greenhouse gases to the atmosphere* are balanced by *anthropogenic removals* over a specified period. Where multiple greenhouse gases are involved, the quantification of net zero emissions depends on the climate metric chosen to compare emissions of different gases (such as global warming potential, global temperature change potential, and others, as well as the chosen time horizon).

⁴ Government of Canada, “A Healthy Environment and a Healthy Economy”, December 2020; available at: <https://www.canada.ca/en/services/environment/weather/climatechange/climate-plan/climate-plan-overview/healthy-environment-healthy-economy.html>

⁵ Source: <https://www.arcenergyinstitute.com/a-60-to-0-round-trip-nine-oily-lessons-from-the-pandemic/>

⁶ Source: <https://www.canada.ca/en/environment-climate-change/services/climate-change/greenhouse-gas-emissions/sources-sinks-executive-summary-2021.html>

- On a per capita basis, Canada’s GHG emissions intensity is among the highest in the OECD, and 3.25 times higher than the global average.⁷
- Canada’s ability to invest heavily in clean technology and innovation is constrained. The pandemic ignited an explosion in government spending and debt that will impose serious constraints on public finances in the years to come. Meanwhile, our economy is forecast to grow by a tepid 1.4 per cent annually between now and 2025.⁸
- Few Canadians understand the scale of change that will be required. Energy is a fundamental part of our everyday lives. Transforming the energy system will affect everything we do and everything around us: our homes, offices and vehicles, how we travel locally and beyond, and the kinds of jobs that will be available in the future. There is a collective responsibility to educate Canadians on the costs and implications of this transformation to ensure they continue to be supportive over time.

These challenges should not deter us from moving forward. We are convinced that Canada can both regain its economic strength and lead in the fight against climate change. Many Canadian businesses have already made significant net-zero commitments, and our financial services sector is capable of mobilizing hundreds of billions of dollars to finance clean innovation. Canadian companies produce many of the products – ranging from energy in all of its forms, to steel, cement, and precious metals – that are necessary to achieve net zero emissions. In many cases Canadian producers have some of the lowest GHG footprints anywhere in the world. Canada also has emerging strengths in innovative technologies – such as hydrogen, biofuels, battery storage, small modular reactors and carbon capture – that can help it and the world achieve their climate objectives.



Many Canadian businesses have **made significant net-zero commitments**, and our financial services sector can mobilize hundreds of billions to finance clean innovation.

Beyond our energy and resource advantage, the opportunity for Canadian leadership is rooted in our relatively low-emissions electricity grid; stringent regulatory and approval processes; high standards of ethical business conduct; and several global ESG⁹ champions among our leading resource companies.

The challenges noted above underscore why we need to accelerate our pace. Other countries are not waiting. It is critical that we not fall behind or lose out in the race to seize low-carbon opportunities. Early investment will allow us to learn by doing, to achieve scale faster, and to reap the benefits over time as the costs of new technologies fall. What we need is a cohesive national plan that positions Canadians for success based on a vibrant energy and resource sector and ambitious climate policies.

⁷ Source: <https://ourworldindata.org/per-capita-co2>

⁸ Source: <https://www.arcenergyinstitute.com/a-60-to-0-round-trip-nine-oily-lessons-from-the-pandemic/>

⁹ Environmental, social and governance

Part two

Principles for making Canada a net-zero leader

Along with the UN's Sustainable Development Goals and the Paris Agreement, the government's commitment to net zero by 2050 must be viewed in the broader context of building a more prosperous and equitable society for all Canadians. Canada's approach to realizing this vision must reflect the following principles:

” The government must be **open and transparent about the cost implications of Canada's climate and energy policies.**

- **Close cooperation between the public and private sectors.** Canadians must be capable of competing effectively in a low-carbon economy. Other nations are seizing the initiative now and developing their own transition strategies to achieve comparative advantage. In addition to maintaining a price on carbon, the government will need to work with the private sector to develop sector-based industrial strategies that support economic and environmental goals.
- **Policy predictability.** To plan effectively for the ongoing transition, business needs long-term policy stability and clarity. The federal and provincial governments must work more closely together to provide that clarity. Public policy should incent widespread investment in existing and emerging technologies and attract the capital necessary to support large-scale deployment and commercialization of promising technologies. We also need a supportive policy environment that allows clean tech start-ups to stay in Canada and grow to scale.
- **Recognition of the role Canada's energy and resource sector will play in the transition to net zero.** Canada cannot enjoy a healthy economy and a healthy environment without a strong and vibrant energy and resource sector. Canada's leading energy and resource companies have the people, the technological know-how and the financial scale to make it happen. Far from seeking to divest from these industries or diminish their role, we should be bolstering their ability to invest in climate solutions and grow their market share domestically and abroad. Importantly, Canada should be a visible champion in international climate negotiations of its resource sector and the country's ability to reduce emissions.

- **Full transparency on costs.** The government must be open and transparent about the cost implications of Canada’s climate and energy policies. Full public disclosure of these costs is imperative in order to (i) assess and optimize the allocation and investment of capital in ways that are most affordable for Canadians, and (ii) ensure that Canadians understand and support the key elements of the transition.
- **Partnerships with Indigenous communities.** The transition to a low-carbon economy represents an unprecedented opportunity to advance Indigenous reconciliation through partnerships with the private sector in responsible resource development. Opportunities for Indigenous employment, training, contracting and commercial partnerships should be maximized.
- **Embracing climate resilience and adaptation strategies.** As the World Bank has pointed out, “The impacts of climate change are already here and fast increasing, and there is no silver bullet to prevent them.”¹⁰ Given this reality, Canada needs to up its game on building climate resilience and adaptation strategies. That means working with provincial and municipal governments, the private sector and other stakeholders to develop a robust climate change adaptation framework and appropriate funding mechanisms.

These principles can serve as a starting point and shape a vision that is shared by all Canadians.

¹⁰ Source: World Bank, 2020. “The Adaptation Principles: 6 Ways to Build Resilience to Climate Change”.

Part three

The plan

The COVID-19 pandemic triggered an economic crisis that has severely stressed public finances. Canadians now face the dual challenge of rebuilding the economy through strategic investments in infrastructure, skills and innovation while simultaneously striving to put the country on a path to achieve net zero.¹¹ We outline below 12 key elements that should be part of a net-zero plan.



Embrace public-private partnerships to substantially boost investment in low-GHG technologies

To start on the path toward net zero requires a clear signal from the federal government that it is willing to partner with the private sector in facilitating the investments necessary to reduce emissions, enhance the competitiveness of Canada's natural resource and manufacturing base, and create opportunities for Canadian clean technology innovators to grow their market share, both domestically and abroad. The government's role needs to evolve to become a long-term and predictable partner that enables investment and helps to de-risk the most promising opportunities.

Early, strategic, and substantial investment is required to enable GHG-reduction technologies to move down the cost curve and to facilitate broad deployment at a scale necessary to meet the government's 2030 and 2050 targets.



The government should develop a policy framework that provides clarity and predictability to businesses that make long-term investments in emissions-reducing technology.

To enhance the private sector's ability to invest in existing and emerging GHG-reduction opportunities – including carbon capture, utilization and sequestration (CCUS), hydrogen, battery storage, renewable natural gas, nuclear power and other clean technologies – the Government of Canada should develop a policy framework that:

- Provides clarity and carbon policy and regulatory predictability to businesses that make long-term investments in the development and implementation of emissions-reducing technology;
- Creates stable revenue streams for companies and includes a broad suite of investment incentives benchmarked against international best practices, such as production tax credits for CCUS (potentially modelled on the 45Q provisions in the United States), low-carbon fuel production and renewable power generation; accelerated capital cost allowances; access to a suite of verified carbon offsets; and flow-through shares;

¹¹ Last year the Business Council of Canada released a report that presents a bold new economic growth strategy for Canada. It aims to incent higher levels of investment in Canada through a modern and agile regulatory environment, and enhance the country's ability to grow innovative companies at scale. See: <https://thebusinesscouncil.ca/report/powering-a-strong-recovery>

- Clarifies the role of the federal government in supporting strategic investments in R&D related to potential breakthrough technologies and in helping to de-risk private investment in emerging technologies. The Canada Infrastructure Bank, for example, could be the source of significant and long-term funding support;
- Brings coherence and focus to federal funding that is designed to stimulate cleantech research and innovation. This includes funding from Sustainable Development Technology Canada, Business Development Canada and Export Development Canada; and
- Streamlines the approval and permitting processes necessary to develop GHG emissions-reduction projects.



Aggressively pursue Canada's leading low-emission opportunities

Canada has comparative strengths in a number of technologies that will be critical to the world's ability to achieve net zero. These stem from our natural resource wealth as well as government and private-sector expertise developed over many years. A deliberate strategic approach can harness these competitive advantages in ways that strengthen our economy and create significant export opportunities. Among the most important are the following:

Carbon Capture, Utilization and Storage (CCUS). CCUS is a critical GHG technology in which Canada has developed considerable expertise. Two Canadian projects – SaskPower's Boundary Dam coal-fired power station and Shell Canada's Quest facility near Edmonton – were among the world's first commercial-scale CCUS facilities. In total some four million tonnes of CO₂ emissions are captured annually in Canada. Meanwhile, innovative Canadian firms are developing technologies that can convert captured CO₂ into commercial products such as plastics, soaps and synthetic fuels.



While carbon capture costs today are relatively high, that is likely to change as more projects come on stream and economies of scale are realized.

CCUS is the best means of reducing emissions from the production of “blue” hydrogen – hydrogen made via steam methane reformation. The existence of high- and mid-concentration CO₂ streams from other emissions-intensive industries – such as steel, cement and fertilizers – combined with high-quality storage options in nearby geological formations, makes CCUS an especially promising technology for Canada.

The federal government's 2030 climate plan recognizes the importance of CCUS. So did the recent report of the Industry Strategy Council, which identified CCUS as an area of competitive strength and a source of “exportable expertise”¹². The International Energy Agency has concluded that, “Reaching net zero will be virtually impossible without CCUS”¹³. One reason is that approximately 40 per cent of the world's electricity is still generated from coal.¹⁴

While capture costs today are relatively high, that is likely to change as more projects come on stream and economies of scale are realized. There also are opportunities to build expertise and reduce costs related to CO₂ transportation and storage. Establishing local networks that interconnect major emissions sources with nearby geological storage sites, such as the recently completed Alberta Carbon Trunk Line, can greatly reduce both transportation and storage costs and spark further innovation.

¹² Government of Canada, “Restart, Recover and Reimagine Prosperity for All Canadians: Report of the Industry Strategy Council, December, 2020; <https://www.ic.gc.ca/eic/site/062.nsf/eng/00118.html>

¹³ International Energy Agency, “CCUS in Clean Energy Transitions”, September, 2020; <https://www.iea.org/reports/ccus-in-clean-energy-transitions>

¹⁴ Source: <https://www.iea.org/fuels-and-technologies/coal>

Other countries are moving quickly to position themselves as key suppliers of CCUS technologies. Canada must not be left behind. Recent experience in the United States, the United Kingdom and Norway have demonstrated that public investments in R&D can spur the search for innovation and less expensive capture technologies. As well, a U.S. tax measure known as 45Q provides a tax credit that has helped to propel several new CCUS projects in that country.

To support further development of CCUS and build export capability for Canadian CCUS technologies, the federal government should:

1. Implement a production tax credit for CCUS activities that result in permanent storage of CO₂ in secure geological formations;
2. Offer financial support to help establish CO₂ collection and storage networks that can efficiently link large industrial sources of CO₂ with suitable storage locations; and
3. Fund additional R&D aimed at improving the efficacy and lowering the cost of capture technology.

Hydrogen. As Canada and the world look to satisfy increasing energy demand with lower environmental impact, hydrogen is once again attracting serious attention. Hydrogen is relatively energy-dense, with few of the negative attributes associated with conventional fossil fuels. It has potential environmental benefits in our transportation system, particularly replacing carbon-based fuels used in heavy trucks, trains and ships. It can supplement or replace natural gas for commercial and residential heating and in some industrial applications. Hydrogen can displace natural gas in power generation and has potential as an energy-storage medium to supplement more variable power from wind and solar.

Hydrogen is a source of potential comparative advantage for Canada. Western Canadian natural gas combined with CCUS offers considerable scope for low-emissions hydrogen production. Regions with abundant, low-cost hydroelectricity have the potential to develop “green” hydrogen through advances in electrolysis. Canada’s existing oil sands upgrading and refining infrastructure produces and uses large quantities of hydrogen. That expertise will serve us well, as will our experience in scaling up new energy projects, backed by a world-class energy financing system.

The federal government’s hydrogen strategy,¹⁵ released in late 2020, suggests that hydrogen could satisfy 30 per cent of Canada’s energy needs by 2030. The Honourable Seamus O’Regan, Minister of Natural Resources, indicated that expanding Canada’s use of hydrogen could reduce annual GHG emissions by as much as 45 tonnes by 2030 and create up to 350,000 new jobs by 2050.¹⁶ We need to seize this opportunity. Several other countries are investing heavily in hydrogen, despite not having the strategic natural advantages we possess.

Companies and capital markets need a clearer signal that government is committed to making Canada a leader in this evolving and competitive field. The federal hydrogen strategy committed \$1.5 billion to the development of low-carbon fuels but it is unclear what portion of that might actually be devoted to hydrogen. More fundamentally, the government needs to ensure long-term policy clarity and consistency so as to enable the private sector to invest the considerable sums that are necessary. As noted elsewhere in this paper, this requires a climate technology innovation strategy. Research on technologies to reduce the cost of CCUS and electrolysis in particular is critical to making Canada a cost-competitive location for hydrogen investment and production. Existing pipeline infrastructure in North America can be utilized to transport hydrogen across borders, but a prerequisite is clear regulatory alignment between countries. Finally, the federal government needs to work collaboratively with the provinces and territories to ensure that Canada can take advantage of regional strengths to develop a truly national hydrogen strategy.

¹⁵ Government of Canada, “A Hydrogen Strategy for Canada”, December, 2020, accessed at: <https://www.nrcan.gc.ca/climate-change/the-hydrogen-strategy/23080>

¹⁶ Source: <https://www.canada.ca/en/natural-resources-canada/news/2020/12/minister-oregan-launches-hydrogen-strategy-for-canada.html>

Critical minerals. As the world proceeds toward a lower carbon future, global demand will increase for minerals and metals that are essential to the transition. Canada is well-positioned to expand production as a major global supplier of those minerals. We have mining and mineral-processing expertise and world-leading ESG standards. We have an abundance of copper, cobalt, lithium, graphite and nickel – all of which are key components of the batteries and electrical vehicles of the future – plus other minerals that are used in semiconductors, solar panels, and aerospace applications.

Last year, Canada and the United States signed a “Joint Action Plan on Critical Minerals Collaboration”¹⁷. The plan should strengthen North American supply chains, allow cooperation on R&D and facilitate further development of critical minerals. It must be noted that China already dominates the supply of certain “rare earth” minerals that are used in telecommunications systems and defence equipment, and is seeking to expand its influence over the supply of other minerals. For those reasons, an effective Canadian and North American critical-minerals strategy focused on increasing the continental supply is a matter of national security. Earlier this year Canada released a list of 31 critical minerals that are essential to the country’s economic security and required for the transition to net zero. The publication of the list is intended to provide greater certainty and predictability on Canada’s mineral priorities and enable policymakers to target and address key points in supply chains.¹⁸



Canada has an abundance of copper, cobalt, lithium, graphite and nickel – key components of the batteries and electrical vehicles of the future.

Canada needs additional mining capacity for critical minerals as well as downstream processing capacity to create refined materials and value-added products. The federal government should partner with the private sector to de-risk promising critical-minerals development through assistance in funding of pilot and demonstration projects. As well, since many critical mineral deposits and operating mines are in remote regions that currently depend on diesel power, the federal government should consider creating an off-grid clean electrification fund. Such a fund could also benefit local communities, many of them Indigenous.

Nuclear energy and small modular reactors (SMRs). Nuclear is Canada’s second-largest zero-emission power source. This contribution to the country’s net-zero goal is multiplied many times when one takes account of Canada’s participation in the global nuclear fuel cycle, and the GHG emissions that are avoided through the use of nuclear energy. The federal government should promote increased use of all clean, low-carbon forms of energy, including nuclear, at home and around the world. Ensuring global market access for Canadian uranium, nuclear products and expertise would strengthen supply chains and allow Canada to capitalize on global new-build opportunities and the emerging SMR market.

SMRs offer the ability to provide a significant new source of clean electricity at smaller scale and significantly lower cost than larger-output nuclear power plants. They also have the advantage of shorter lead times and less environmental impact and land requirements compared to full-sized reactors. Very small modular reactors (VSMRs) or microreactors could also be used to power significant industrial developments, such as oil sands operations, as well as to supply secure power in remote locations which typically rely on diesel. Canada’s SMR Action Plan recognizes the potential of SMRs in Canada and strives to make Canada a world leader in SMR technology.¹⁹

To capitalize on SMRs’ potential contribution to Canada’s net-zero objectives, considerable new capital will be required to facilitate demonstrations and deployment of SMRs. Government funding will be required to support the early-stage, high-risk, R&D and licensing necessary for SMRs to succeed. Once an SMR design is chosen for deployment, further support in the form of tax credits, accelerated depreciation and/or tax abatements may also be required. Early government investments to support commercial SMR deployment in Canada will result in increased low-carbon electricity options and the creation or build-out of the supply chains required to support these new reactors.

¹⁷ <https://www.canada.ca/en/natural-resources-canada/news/2020/01/canada-and-us-finalize-joint-action-plan-on-critical-minerals-collaboration.html>

¹⁸ Natural Resources Canada, “Canada’s Critical Minerals List”; available at: <https://www.nrcan.gc.ca/our-natural-resources/minerals-mining/critical-minerals/23414>

¹⁹ Source: https://smrroadmap.ca/wp-content/uploads/2018/11/SMRroadmap_EN_nov6_Web-1.pdf

While SMRs are an important part of the future of nuclear generation, among the largest clean energy projects currently underway in Canada are the multibillion-dollar refurbishments being undertaken at Ontario's nuclear plants. These refurbished plants will generate carbon-free electricity for decades to come.



Build a world-class innovation system to support economic renewal along the path to net zero

Accelerating the pace of clean innovation in Canada is not only an important tool for meeting our net-zero objectives. It also represents a critical economic opportunity to continue our rich history of producing global resource champions. But time is not on our side. The United States, China, the United Kingdom, Japan, South Korea and others are racing to invest in technologies that enable energy transition. This underscores the urgent need to deploy technology-specific policies to achieve Canada's net-zero ambitions. Late last year, the federal government laid the groundwork in areas such as hydrogen, low-carbon fuels and small modular reactors. Much work remains to be done in other areas such as direct air capture, battery storage, low-carbon energy infrastructure and CCUS. Government must be active in each of these areas by supporting innovation and facilitating economic transformations.

Canada has a long track record of supporting basic research. Our country is known for its robust R&D policies and impressive levels of capability within the private sector, government agencies and research laboratories, at least at the beginning of the innovation chain. However, we rank poorly relative to most OECD countries when it comes to scaling up innovative companies and developing globally competitive firms.

Canada must ensure that it has the right institutional design in place to match its climate policy ambitions. No fewer than 16 federal departments and agencies currently offer funding for clean technology. Each of these organizations allocates funding to clean technology opportunities in its specific area – agriculture, fisheries, forestry and mining, and so on. The result is an often-confusing patchwork of programs and subsidies that in theory supports innovation across the economy.



Adopting a mission- or challenge-driven approach to innovation could increase our chances of achieving net zero.

Government support for innovation has given the world countless paradigm-changing technologies, including the Internet, GPS and lithium batteries. More recently, a joint effort between government agencies and the biotech industry produced the mRNA technology that underpins several COVID-19 vaccines. Now is the time for Canada to think big about energy innovation. Adopting a mission- or challenge-driven approach could accelerate the commercialization of innovative technologies, goods and services and increase our chances of achieving net zero. In the United States, the Advanced Research Projects Agency-Energy (ARPA-E)²⁰ is spurring research and development of advanced energy technologies. It could be a model for Canada.

Canada has a significant number of start-up companies that are at the leading edge of clean tech innovation. It is important that they not suffer the fate of too many past Canadian startups, which reached a certain stage of maturity but then ran out of financing and were acquired by a foreign firm. When that happens Canada loses not only a promising company, but also valuable intellectual property and sought-after talent.

²⁰ Advanced Research Projects Agency – Energy; for more information: <https://arpa-e.energy.gov/about>



Leverage the Canada-United States relationship to strengthen both existing energy trade and collaboration on promising low-carbon technologies

As Canada and the United States strive to rejuvenate their economies after the pandemic, there is an obvious need to buttress our economic interdependence in a way that creates good jobs and enables strong, sustainable economic growth. Cross-border collaboration will be critical for driving down GHG emissions and capitalizing on emissions-reduction opportunities where the two countries have comparable strengths and interests.

The Canada-U.S. energy relationship is critical to each country's energy security and economic prosperity – a point that was highlighted recently when President Biden held his first bilateral meeting with Prime Minister Trudeau. Canada is the United States' largest foreign supplier of crude oil and natural gas,²¹ and will likely continue to be for decades to come. Heavy oil is still in high demand, particularly for refineries in the U.S. Midwest and along the Gulf Coast that cannot be easily re-configured to refine lighter crudes (and have experienced dramatic reductions in shipments of heavy crude from Mexico and Venezuela).



Canadian exports of liquified natural gas and uranium could allow countries in Asia to reduce their reliance on higher GHG-emitting sources of electricity.

Both countries should develop a policy statement that clarifies the role oil and gas production (including transportation and use) will play in providing a secure and stable supply to meet domestic demand. This will be critical to raise the capital necessary to finance a significant portion of the clean energy technology and innovation required to achieve net zero.

A comparison of the two countries' climate policies would clearly place Canada in the lead. Alberta and British Columbia were the first jurisdictions in North America to implement a carbon price, in 2007 and 2008 respectively, and carbon policy overall is considerably more stringent in Canada. Among jurisdictions with a significant hydrocarbon basin, Alberta is the first in the world to impose a GHG emissions limit on that basin. Canada, and particularly Alberta, have led the way on methane-reduction targets.

There may be areas where it makes sense for Canada and the United States to proceed independently, but for the most part alignment on transition strategies will benefit both countries. As laid out in the "Roadmap for a Renewed U.S.-Canada Partnership"²², key opportunities include:

Cross-border clean electricity infrastructure. Bilateral trade in electricity is significant and will grow more important given the Biden administration's desire to end U.S. dependence on coal-fired electricity. Excess electricity capacity in several provinces could help address that challenge cost-effectively. Canada should seek early assurances from the Biden administration that it will work to enhance cross-border electricity infrastructure.

Leading the global community toward greater climate action. During their recent meeting, Prime Minister Trudeau and President Biden agreed to increase the ambition of their current 2030 GHG targets and called on other countries to do likewise, including through an explicit commitment to achieving net-zero emissions by 2050.

Canada and the United States can work together to develop the rules to operationalize Article 6 of the Paris Agreement, which would facilitate international trading of emissions credits. The establishment of international carbon markets would reduce the overall costs of emissions

²¹ Source: <https://www.nrcan.gc.ca/science-data/data-analysis/energy-data-analysis/energy-facts/crude-oil-facts/20064>

²² Source: <https://pm.gc.ca/en/news/statements/2021/02/23/roadmap-renewed-us-canada-partnership>

reductions and allow developing countries to bolster their climate ambition. It also could provide recognition for actions Canada could take to help other countries cut their emissions. For example, Canadian exports of liquified natural gas (LNG) and uranium could allow countries in Asia to reduce their reliance on higher GHG-emitting sources of electricity.

One idea that originated in the European Union, and is now being actively considered by the Biden administration, is to impose “carbon border adjustments” on imports from countries that are perceived to be taking insufficient action to cut their GHG emissions. The concept of carbon border adjustments gives rise to a wide range of questions – notably the criteria by which countries would be judged, who would do the judging, and whether such a system would be compatible with international rules against protectionism. There would need to be a common approach to verifying emissions intensity for countries that lack Canada’s rigorous reporting requirements. Nevertheless, the federal government has signalled Canada’s intention to explore the use of carbon border adjustments. It is imperative that we stay closely aligned with the United States on the development of such a regime to avoid unintended consequences that could negatively impact Canada’s key exports and/or adversely affect the competitiveness of key industrial sectors.

Collaboration on key low-emissions technologies. Canada should work closely with the United States on key opportunities such as hydrogen, CCUS, critical minerals, low-carbon fuels, smart grids, renewable natural gas, and nuclear technology and SMRs. This would include exchanging best practices, aligning regulatory standards, optimizing cross-border supply chains, and working collaboratively on government-sponsored R&D for the most promising technologies. Canada also must ensure that its tax policies to encourage R&D and technology investment are competitive with those of the United States (for example, on production and investment tax credits for CCUS and low-carbon fuels).

Alignment on efforts to achieve a zero-emission vehicle future. Canada and the United States have pledged to work together to build the necessary supply chains to become global leaders in all aspects of battery development and production, including for electric vehicles. The “Roadmap for a Renewed U.S.-Canada Partnership” also highlighted the need to “align and accelerate” policy actions to achieve a zero-emissions vehicle future.²³ It is critical that Canada work closely with the United States on the development of a North American battery supply chain while ensuring regulatory alignment on policies aimed at increasing adoption of zero-emission vehicles (ZEVs).

²³ In support of the roadmap, Secretary Buttigieg and Minister Alghabra released a joint statement that commits both countries to work together to coordinate efforts across the land, air and marine transportation sectors.



Expand the North American advantage in the auto industry to include production of ZEVs and related battery systems

The transportation sector contributes 25 per cent of Canada's GHG emissions. Of this, just under half come from light-duty trucks and passenger vehicles. Broad adoption of ZEVs and especially battery electric vehicles (BEVs) is a critical step on the path to net zero.

There already is considerable momentum behind ZEVs in Canada. Within the last few months, and with financial assistance from the federal and Ontario governments, Ford, General Motors and Stellantis (formerly Fiat Chrysler) have committed to new investments totalling \$5.7 billion in Canadian vehicle assembly plants, mostly to produce BEVs. In January, General Motors said it will phase out gasoline-powered vehicles and sell only BEVs by 2035. Other manufacturers are moving in the same direction. Even so, Canadians have been slow to purchase ZEVs. In 2020 such vehicles accounted for less than four per cent of new car and light truck purchases and only 0.7 per cent of the total stock of vehicles on the road.²⁴

The federal and some provincial governments offer purchase incentives for ZEVs and will likely have to continue to do so until the price of a new ZEV approximates that of a similar gasoline-powered vehicle. Meantime, manufacturers and governments have work to do to educate consumers about the lower operating costs of a BEV over its lifetime, and to dispel so-called "range anxiety". Lack of refueling / recharging infrastructure is also a barrier to wider adoption of ZEVs. Currently there are more than 12,000 gasoline stations across Canada, but only 980 DC fast-charging stations (those capable of delivering a full charge in less than an hour).²⁵ Suncor and Shell, among others, are investing heavily in charging stations, and with the help of federal and provincial funding the situation is sure to improve over time.



Broad adoption of zero-emission vehicles and especially battery-electric vehicles is a critical step on the path to net zero.

The Canadian and U.S. auto markets are deeply integrated and likely to become even more so given the recent signing of the Canada-United States-Mexico Agreement (CUSMA). Compared to its predecessor, NAFTA, CUSMA imposes stronger requirements on manufacturers to source materials and components within North America. The industry is highly competitive so Canada will need to make every effort to remain a location of choice for manufacturers of ZEVs and related components. Fortunately, as noted earlier, Canada has significant quantities of many of the key minerals found in vehicle batteries, including lithium, cobalt, graphite and nickel.

Government and industry need to work together to ensure that access to critical minerals, R&D related to battery chemistry, and BEV software development are areas of comparative domestic advantage. Following up on the "roadmap", Canada should work with the Biden administration to ensure a sound ongoing framework that supports investment in EV assembly in Canada and strengthens the supply chain network. Canada should deepen its commitment to harmonized North American emissions and safety standards, and avoiding duplicative or conflicting sub-national (state or provincial) rules or mandates.

²⁴ Source: Electric Mobility Canada.

²⁵ https://www.nrcan.gc.ca/energy-efficiency/energy-efficiency-transportation-and-alternative-fuels/electric-charging-alternative-fuelling-stationslocator-map/20487#/analyze?country=CA&fuel=ELEC&ev_levels=dc_fast



Make transformation of our oil and gas industry a national priority

The downturn in oil prices that started in 2014, combined with pandemic-related reductions in energy demand, have exacted a heavy toll on Canada's oil and gas sector. Many thousands of jobs have disappeared, along with billions of dollars in investment. Canada urgently needs an economic strategy that fosters private investment in productive industries that contribute to job creation and improved environmental performance. A healthy oil and gas sector is essential to provide the capital that is necessary to fund research into innovative solutions and ensure adoption of lower-GHG technologies. Even with relatively low prices, oil generated \$62 billion of net export earnings for Canada in 2019, far exceeding any other product.²⁶ As former Bank of Canada Governor David Dodge so cogently expressed it, "Opponents of a strong oil and gas export sector fail to recognize that these earnings are needed to pay for the greening of our energy supplies This is a sector that cannot be abandoned but must be transformed and must be given appropriate fiscal incentives to finance its clean conversion."²⁷

The past six years have pushed Canadian energy firms to pare costs and embrace innovation. Prices are firming up as pandemic restrictions ease, and most experts believe that North American demand is likely to return to something close to pre-pandemic levels. Recent forecasts from the International Energy Agency suggest that global demand will also pick up over the course of the decade, driven by population increases as well as by rising incomes in emerging and developing economies, before levelling off sometime in the 2030s.²⁸ Canada should aspire to capture a larger share of that demand on the basis of cost, reliability, ability to innovate, and ESG performance. Canadian energy and climate policy can either assist or hinder that effort.

Leading Canadian companies in the sector already are innovating toward a low-carbon future, and several have embraced net-zero emissions as a corporate goal. The industry is investing in low-carbon solutions throughout the value chain, from energy efficiency to digitization, transportation, and new resource-recovery technologies. The sector accounts for an estimated 75 per cent of Canadian business spending on clean tech.²⁹ Organizations such as the Canadian Oil Sands Innovation Alliance and the Clean Resources Innovation Network function as hubs for cross-industry collaboration on promising technologies and environmental solutions. The oil sands industry is developing solvent-based extraction processes that reduce the use of natural gas, as well as other technologies to reduce the emissions intensity of upstream production. Emissions intensity per barrel has fallen by 21 per cent since 2009, with a further decline of 23 per cent expected by 2030.³⁰



The energy industry is investing in low-carbon solutions throughout the value chain, from energy efficiency to digitization, transportation, and new resource-recovery technologies.

As we argue elsewhere in this paper, capital will increasingly flow to companies that demonstrate a strong commitment to their people, to the environment and to the communities in which they operate. In 2018, a report by BMO Capital Markets ranked major oil-producing countries according to their combined score on three global ESG indices. Canada scored second overall, behind Norway.³¹

The federal government should build on Alberta's "Bitumen Beyond Combustion"³² program and partner with the industry to examine opportunities for non-combustion uses of bitumen. For example,

²⁶ David Dodge, "Two Mountains to Climb: Canada's Twin Deficits and How to Scale Them", Public Policy Forum, September, 2020.

²⁷ Ibid.

²⁸ International Energy Agency, "World Energy Outlook 2020", September 2020; accessed at: <https://www.iea.org/reports/world-energy-outlook-2020>

²⁹ Source: Canadian Association of Petroleum Producers.

³⁰ Source: Canadian Association of Petroleum Producers.

³¹ Source: <https://capitalmarkets.bmo.com/en/news-insights/sustainable-finance/banking-the-transition-to-a-more-sustainable-future/>

³² See: <https://albertainnovates.ca/focus-areas/clean-resources/bitumen-beyond-combustion-bbc/>

there is considerable opportunity to convert bitumen to carbon fibre, a high-strength, low-weight material that is increasingly in demand for aerospace and vehicle applications, wind turbines, concrete additives, bicycles, and many other products.

Canada's energy industry can be a key player in the development and use of low-emissions hydrogen, given our abundant supply of natural gas and expertise in carbon capture and storage technologies. The industry can leverage the country's existing and extensive energy distribution network, lowering the need for new infrastructure – with their attendant social and environmental impacts – and speeding the move to lower-carbon fuels.

There also is significant opportunity to further exploit higher-value-added use of our energy resources, including natural gas liquids, petrochemicals and advanced plastics. Canadian supplies of liquified natural gas (LNG) can play a significant role in helping some Asian countries shift from coal to lower-emission natural gas for electricity generation. Canada can make a powerful contribution to the global fight against climate change by exporting responsibly produced energy, along with Canadian technology and expertise.



Expanding clean electricity

Generating and delivering clean electricity will be fundamental to achieving Canada's net-zero goals. Canada has an enormous advantage over other countries when it comes to our ability to produce cleaner electricity. As previously mentioned, our grid is already 82-per-cent non-GHG-emitting.³³ Canada is third in the world in hydroelectricity production, behind only Brazil and China, and has vast untapped sources of renewable energy sources such as solar, wind, geothermal and tidal. Nuclear has been a mainstay of electricity in the country's most populous province, representing 60 per cent of Ontario's base-load generation.

To build on our strengths, Canada must focus on four interdependent goals: generating clean electricity at scale, maintaining reliable electricity systems as new generating technologies join the market, efficiently delivering clean electricity to support existing and new applications, and ensuring that electricity remains cost-competitive in all regions of the country.

Generating clean electricity at scale. Canada continues to see tremendous growth in renewable electricity generation as wind and solar become competitive with other forms of generation. To this point, government support for the electricity sector has focused on bringing these technologies down the cost curve. It is time now to focus on the next generation of clean-generation technologies. The private sector is actively working with government on CCUS, nuclear (including small modular reactors), and hydrogen, among other technologies. Public policy should aim to reduce the costs of these technologies over the next few decades, reducing the country's overall emissions without adversely eroding Canadian competitiveness.

Maintaining reliability. Wind, solar and some other generating technologies supply electricity intermittently. Rapid adoption of these technologies, while phasing out coal, creates challenges for governments as they seek to maintain the reliability of the electricity system. Scaling up emerging technologies such as distributed energy, micro grids, utility-scale battery storage, and hydrogen will help ensure secure, reliable power at reasonable costs to consumers over the longer term. Meantime, hydro and natural gas will continue to serve as the backbone of electricity generation in a number of Canadian provinces. Governments should ensure that natural gas can continue to play this role as new technologies come down the cost curve. Continued use of natural gas does not pose a threat to Canada's net-zero goal in the foreseeable future. Indeed, in combination with CCUS and hydrogen, it can play a critical role in a net-zero economy.

³³ "Energy Facts", Natural Resources Canada, accessed at: <https://www.nrcan.gc.ca/science-data/data-analysis/energy-data-analysis/energy-facts/electricity-facts/20068>

Delivering electricity. New regional links between partnering provinces could make more renewable power available to provinces that still rely on GHG-emitting sources of electricity. The so-called “Atlantic Loop” or “Eastern Clean Energy Initiative” is a prime example. By providing new transmission capacity for surplus hydroelectricity from Quebec and Newfoundland and Labrador, the project is accelerating the shut-down of Nova Scotia’s remaining coal plants. This will strengthen regional grids, enable the deployment of new wind and solar resources, and bring significant economic stimulus to the region. A similar but broader electricity strategy in Eastern Canada could boost supplies of clean electricity to New England, offsetting coal-fired power. Investments in these and other distribution systems are a win-win for Canada: they drive economic growth while reducing GHG emissions.

Keeping costs competitive. The rising use of electricity for transportation, heating and cooling of buildings, and across industry implies a need for a massive and unprecedented scale-up of generating capacity, as well as the infrastructure to deliver it. Some experts predict that Canada will need to triple its production of clean electricity by 2050.³⁴ The challenge will be to ensure that new supplies of electricity are affordable. Otherwise, governments risk significant public backlash. They will also weaken the competitiveness of the very industries they are trying to de-carbonize.

So long as Canadian policymakers maintain a clear focus on ensuring low electricity costs, Canada has the energy resources and technologies to achieve net zero while strengthening economic competitiveness.



Enable meaningful Indigenous participation in the clean energy economy

The transition to a low-carbon economy represents an unprecedented opportunity to advance Indigenous reconciliation through partnerships with the private sector in responsible resource and clean-energy development.

Canada’s energy and resource industries are the largest employers of Indigenous peoples and the largest contractors with Indigenous-owned businesses. In the forestry sector alone, there are more than 1,400 Indigenous-owned businesses; Indigenous people control nearly 10 per cent of the country’s wood supply.³⁵ In recent years, new revenue-sharing and equity partnerships have flourished between the private sector and Indigenous communities. In 2017, for example, the Fort McKay First Nation and the Mikisew Cree First Nation acquired a 49-per-cent share (worth more than \$500 million) in Suncor Energy’s East Tank Farm development. In addition, several Indigenous coalitions have expressed an interest in purchasing the Trans Mountain Pipeline from the federal government.

More and more, Indigenous communities are saying they do not just want a share of resource revenue – they want to be owners. Ownership provides opportunities to improve the lives of their people while ensuring that economic development takes place in a way that safeguards their distinct social, cultural and environmental interests. This is particularly relevant for remote communities that are looking to negotiate joint ventures to develop renewable power sources, thereby ending their reliance on electricity generated with diesel and other fuel oils.

There are several barriers to overcome to support Indigenous communities and their ability to capitalize on such initiatives. Access to competitive risk capital will be necessary for Indigenous peoples to co-invest in major projects. As more projects come on board, capacity building will be essential to assist Indigenous communities in assessing the merits of such projects and in negotiating and managing their participation in them. The Alberta Indigenous Opportunities Corporation is an important new initiative but more can be done to help Indigenous peoples secure partnerships in natural resource projects.

³⁴ Government of Canada, “A Healthy Environment and A Healthy Economy”, December 2020.

³⁵ Source: Forest Products Association of Canada, 2021

The government should appoint an expert panel of Indigenous business leaders and financial executives to examine innovative ways to finance Indigenous-owned businesses and provide them with access to risk capital for investment in major projects. This should include assessment of whether there is a larger role for the Canada Infrastructure Bank, and a review of best practices for creating equity partnerships for low-carbon and other infrastructure initiatives.



Give priority to a national climate resiliency and adaptation action plan

The impacts of a changing climate are already being felt in Canada. Canadian communities in recent years have experienced increased flooding, wild fires, extreme heat, sea-level increases and permafrost thawing. The costs are substantial. Eight out of the 10 worst years for insurance losses in Canada's history have occurred in the past decade. In 2020, insured catastrophic losses totalled \$2.4 billion.³⁶ Under a scenario in which average global temperatures rise 2°C, scientists predict Canada would warm by an average of 4°C, with the North warming by double that amount.³⁷ The HE&HE plan dedicates just one and half pages to discussing climate risks, which is underwhelming in light of the challenge.

Canadian companies are vitally interested in protecting against the worst impacts of a changing climate. Their operations and their employees depend on the country's transportation infrastructure – ports, bridges, roads, railways and more. Climate-related disruptions pose serious risks for the economy.



The federal government's commitment to developing the country's first-ever National Adaptation Strategy is a positive step.

The federal government's commitment to developing the country's first-ever National Adaptation Strategy is a positive step. The process needs to include provincial and local governments, employers, Indigenous communities and other stakeholders. Meantime, policymakers should act at the earliest opportunity to better prepare Canadians for the impacts of a changing climate:

Improve our ability to price climate risk. Access to credible data is essential to price climate risks accurately and make evidence-based decisions. Unfortunately, such data is largely lacking in Canada. The federal government should implement the recommendation of the Expert Panel on Sustainable Finance to establish the Canadian Centre for Climate Information and Analytics.

Double down on flood mitigation measures. Flooding is the most costly climate risk facing Canadians. In recent years, the Canadian Standards Association and the National Research Council have developed standards to mitigate flood risk at the level of residential housing, new community design, existing residential communities, and commercial real estate. The federal government should support the deployment of these standards. It should also work with provinces to preserve existing natural infrastructure – such as wetlands and urban forests – and, where possible, restore what has been lost. Over the past century, southern Canada has lost an estimated 60 to 80 per cent of its wetlands to housing, agriculture and other forms of development, which exacerbates flood risk.³⁸

³⁶ Insurance Bureau of Canada, 2021 Federal Pre-Budget Submission.

³⁷ Source: https://changingclimate.ca/site/assets/uploads/sites/2/2020/06/CCCR_FULLREPORT-EN-FINAL.pdf

³⁸ Source: https://www.intactcentreclimateadaptation.ca/wp-content/uploads/2018/09/IBC_Wetlands-Report-2018_FINAL.pdf

Support fire risk mitigation. Fire is the second most costly climate risk affecting Canadians. In response, the federal government should support deployment of the FireSmart program, which will limit risk of fire to homes and communities in fire prone zones.

Reduce the cost of future natural disasters by investing in resilient infrastructure. Administered by Public Safety Canada, the Disaster Financial Assistance Arrangements (DFAA) is the primary mechanism by which the federal government provides relief to provinces and territories in the event of a large-scale natural disaster. Future payments under the program can be reduced by:

- Requiring the Canada Infrastructure Bank to identify opportunities to finance infrastructure projects that help municipalities adapt to climate change;
- Providing further increases in funding to municipalities to build resilient infrastructure and improve their ability to manage increasing levels of stormwater; and,
- Making eligibility for DFAA assistance contingent upon communities having up-to-date flood-risk maps.

Assign the right value to nature. The federal government should work with the private sector and relevant accounting standards boards to develop a strategy that recognizes the role nature can play in supporting a company's net-zero commitment. The goal should be to identify appropriate principles and guidance to enable companies to offset their carbon footprints by adding natural assets to their balance sheets.



Prepare our workforce to excel in a low-carbon economy

Building a workforce with the right mix of skills to respond to the net-zero challenge will require continued investment and adaptation by Canadian businesses, as well as strong partnerships with government and post-secondary institutions. According to research by Clean Energy Canada and Navius, employment in Canada's clean energy sector is expected to grow from 298,000 to nearly 560,000 by 2030.³⁹ Most of these new jobs are likely to be in the transportation sector, as companies seek to satisfy growing demand for electric cars, buses and transit systems. Efforts to improve the energy efficiency of residential and commercial buildings, and to expand clean energy capacity and distribution systems, will also drive job creation. With the appropriate skills and credentials, Canada's labour force will be capable of taking full advantage of these opportunities.

Canada's universities and vocational schools have well-deserved reputations for nurturing and attracting world-class talent. Post-secondary researchers are helping to identify early-warning signs of climate change impacts, while also finding new ways to de-carbonize existing industries and develop new commercial uses for carbon. Canada's business leaders recognize the essential role that post-secondary institutions will play in the drive to achieve net zero and in the development of market-ready innovations.

Canada boasts one of the world's best post-secondary attainment rates and an immigration system that is among the world's most successful. These strengths should serve us well in attracting and developing the talent we need to thrive in a low-carbon economy. Canada's oil and gas and resource-based sectors also employ large numbers of highly skilled workers whose knowledge and experience will be needed in the clean energy transition. Policymakers must be mindful, however, of the need for appropriate employment transition policies and retraining programs. Canada's skills strategies must also take account of the growing number of retirees in many sectors. In the broader construction and maintenance sector, for example, almost 260,000 workers – more than one-fifth of the current workforce – are expected to retire over the next decade.⁴⁰

³⁹ Source: https://cleanenergycanada.org/wp-content/uploads/2019/10/Report_TER2019_CleanJobsFuture_20191002_FINAL-FORWEB.pdf

⁴⁰ BuildForce Canada, National Summary Report, March, 2021; available at: <https://www.buildforce.ca/en/lmi/forecast-summary-reports>

The federal and provincial governments need to partner with the private sector, universities and colleges to ensure that Canadian workers have the skills necessary to support the net-zero transition.



Make Canada a market of choice for sustainable finance

Canada's leading companies long ago recognized that their responsibilities extended far beyond profit maximization and shareholder value. Both in their day-to-day operations and their long-term strategies, they pay close attention to the interests of employees, customers, communities, and other stakeholders. Canadian companies are among the leaders in environmental, social and governance (ESG) performance. Among other things, this manifests itself in efforts to reduce their environmental footprints, protect the health, safety and wellbeing of their employees and surrounding communities, and strong governance practices to ensure that company goals and management oversight are fully aligned with their societal obligations.

As concern about climate change has grown exponentially in recent years, so too has pressure on financial institutions and major companies to properly assess the risks that climate change may pose to their future prospects – and indeed to society. Internationally, this led to the creation of the Task Force on Climate-Related Financial Disclosure (TCFD) in 2017. Its signature effort was to develop a reporting framework to guide companies and financial institutions toward a common set of metrics for assessing and reporting on climate risks.⁴¹ Such risks include severe weather events, insurance losses, infrastructure damage, supply-chain disruptions, and so on. Equally of concern for companies with significant GHG profiles are things like reputational risk, increasing legal and regulatory obligations, emerging technologies, changing consumer preferences and market dynamics, and potential for stranded assets.

In November 2020, eight of Canada's largest pension plans issued a statement calling on companies to improve their ESG disclosures.⁴² Through this and other channels, firms are increasingly being asked to explain how they assess climate-related opportunities and risks internally, the structures they have put in place to manage risks, and how their governance and business strategy align with a net-zero future.



The opportunities and risks facing any one company will depend on a wide range of market dynamics, technology options and customer expectations.

Canada's robust financial markets and strong, stable financial institutions have served the country well through successive economic challenges. The country is well positioned to lead in the emerging field of sustainable finance, owing in part to our large pension funds, sophisticated institutional investors and private pools of capital. The 2018 report of the Expert Panel on Sustainable Finance⁴³ – chaired by Tiff Macklem, now Governor of the Bank of Canada – put forward a number of thoughtful and practical recommendations on how to capitalize on this opportunity.

The disclosure recommendations of the TCFD are widely seen as the international gold standard for climate risk transparency. It is therefore critical that we think about how they should be implemented in Canada. We agree with the conclusion of the Expert Panel on Sustainable Finance that we need a Canadian approach that fits our particular circumstances, and that TCFD reporting in Canada should be phased in over several years, beginning with the largest companies. Furthermore, it should be

⁴¹ Financial Stability Board, "Recommendations of the Task Force on Climate-Related Financial Disclosure", June, 2017; accessed at: <https://www.fsb-tcfd.org/publications/>

⁴² AIMCo, BCI, Caisse de Depot, CPPIB, HOOPP, OMERS, Ontario Teachers, and PSP Investments.

⁴³ Government of Canada, "Final Report of the Expert Panel on Sustainable Finance", June, 2019; available at: <https://www.canada.ca/en/environment-climate-change/services/climate-change/expert-panel-sustainable-finance.html>

based on a “comply or explain” approach. We note that Ontario’s Capital Markets Modernization Task Force also recently recommended a phased approach to TCFD implementation based on a company’s market capitalization.⁴⁴

Having said that, climate risk is an extremely complex subject. The opportunities and risks facing any one company will depend on a wide range of market dynamics, technology options and customer expectations. They may differ considerably depending on whether that company operates in the energy, forestry, steel or mining sector. In addition, there is a need to enhance skills and training in this specialized field to ensure that firms have the internal and external resources they need to conduct and report on climate risk analysis. We also agree with the Expert Panel on the need for a “safe harbour” provision so companies do not risk legal liability related to “forward-looking information” when they report on what, by definition, are speculative future scenarios.

In its 2020 fall economic statement, the federal government outlined plans for a Sustainable Finance Action Council to guide federal actions in enhancing climate disclosures and developing standards for sustainable investments. We welcome this announcement and hope it reflects an intention on the part of the government to create a strong partnership with the private sector in this field. It should start by naming senior business representatives to the council and creating working groups with private sector financial and operational expertise to develop some of the detailed action items.

In a world in which sustainable finance and ESG metrics are growing in importance, governments and the private sector must work together to position the country as a destination of choice for new investment tied to net-zero ambitions. Canadian companies must continue to demonstrate that they are adequately assessing, managing and communicating the opportunities and risks that climate change poses for their future business success.



Engage key economic sectors in creating sector-specific net zero strategies

A credible pathway toward net zero will require massive and sustained private-sector investment, which can only occur within a stable and predictable policy environment. A recent example of policy predictability was the federal government’s announcement that the price of carbon will rise to \$170 per tonne by 2030. But much more is needed in terms of the overall policy environment, including a partnership between the public and private sectors to develop sector-specific net-zero strategies.⁴⁵ This is especially important for sectors in which emissions reductions will be difficult and costly to achieve. Additional ideas for policies in key economic sectors are set out below.

Buildings and energy efficiency. Residential and commercial buildings contribute 13 per cent of Canada’s GHG emissions.⁴⁶ It is to Canada’s advantage that a substantial share of the country’s office and commercial building stock is owned by a relatively small number of large institutions, including the property arms of major pension funds. Together they have made significant progress in recent years in energy efficiency and building envelope improvements, including obtaining LEED status. As well, some energy service companies now offer financing to building owners to develop and implement building retrofits, with the capital and financing costs repaid over several years out of the energy savings. For its part, the Canada Infrastructure Bank has committed \$2 billion to large-scale building retrofits. Still, more needs to be done to achieve the ambitious goals that the federal and provincial governments have in mind.

⁴⁴ Ontario Ministry of Finance, “Final Report of the Capital Markets Modernization Task Force”, January, 2021. Accessed at: <https://www.ontario.ca/document/capital-markets-modernization-taskforce-final-report-january-2021>

⁴⁵ We agree with the Expert Panel on Sustainable Finance on the need to map Canada’s long-term path to a low-emissions, climate smart economy, sector by sector, with an associated capital plan.

⁴⁶ Environment and Climate Change Canada, “Greenhouse gas sources and sinks in Canada: executive summary 2020”; available at: <https://www.canada.ca/en/environment-climate-change/services/climate-change/greenhouse-gas-emissions/sources-sinks-executive-summary-2020.html>

For the average homeowner, energy retrofits bring the challenge of large upfront costs – which may be difficult to finance – and extended payback periods in terms of energy savings. Federal and provincial governments have launched a range of programs over the years to incent homeowners to invest in energy efficiency, with mixed results. Currently the federal government, through the Greener Homes initiative, is offering up to 700,000 grants of as much as \$5,000 to help homeowners make energy-efficient improvements. It has also committed up to one million free EnerGuide energy assessments and is working to increase the supply of EnerGuide auditors. In total, the HE&HE plan promises \$2.6 billion over seven years to help homeowners make their homes more energy efficient. In our view, the government should expand the EnerGuide program to include home flood risk assessment. Recognizing that residential flooding is the most costly extreme weather risk facing Canadians, this would create a one-stop delivery program for residential energy efficiency and flood protection.



The government should **accelerate efforts** to create a lifecycle inventory for measuring, publicly reporting and labeling the carbon content of construction material.

It is important not to underestimate the potential to reduce GHG emissions through new construction as well as deep retrofits, which typically involve extensive overhaul of a building's energy systems. Residential emissions can be reduced by 50 to 90 per cent through a combination of better insulation, air- and ground-source heat pumps, new energy efficient technologies, lower-emissions energy and control optimization technology.⁴⁷ Sustainable and long-term incentives, financing, and tax credit programs will be necessary to encourage developers to participate in the net-zero challenge and to incent adoption by consumers.

Here again, achieving net zero will require policymakers to move beyond what has been tried in the past. In the Netherlands, the “Energiesprong” (Energy Leap) program is helping families retrofit their homes without sacrificing their savings or living standards. The program creates net-zero houses by installing new technologies such as prefabricated facades, insulated rooftops with solar panels, and smart heating systems. When the work is complete, the house is capable of generating all of the energy required for its own heating, hot water and electrical appliances. Renovation costs are financed by future energy cost savings plus budgeted expenses for planned maintenance and repairs over 30 years.

The federal government can do more to work with the provinces to incent performance-based efficiency improvements. The publication and adoption of tiered net-zero-ready energy codes should be accelerated so developers of new buildings can begin to work toward those targets. Codes should focus on outcomes, rather than specific equipment or technologies, to ensure flexibility and cost-effectiveness. For existing buildings, the government should be guided by the recommendation of the Expert Panel on Sustainable Finance, which called for “a mandatory labeling and public disclosure program to enhance the transparency of Canadian building performance”. Lastly, while some progress has been made, the government should accelerate its efforts to create a national lifecycle inventory for measuring, publicly reporting and labeling the carbon content of construction material.

Industry and manufacturing. Canada's roughly 90,000 manufacturers are responsible for 10 per cent of the country's GDP and more than two-thirds of the country's merchandise exports.⁴⁸ They also directly employ 1.7 million Canadians and indirectly support another three million jobs.⁴⁹

For several years the industry has wrestled with low levels of investment, declining productivity and reduced export demand for Canadian-manufactured products. The pandemic has only made matters worse, with supply chain disruptions and depressed domestic demand for many goods.

⁴⁷ Source: https://www.ipcc.ch/site/assets/uploads/2018/02/ipcc_wg3_ar5_chapter9.pdf

⁴⁸ Source: Canadian Manufacturers and Exporters, 2021

⁴⁹ Source: <https://www.ic.gc.ca/eic/site/mfg-fab.nsf/eng/home>

On top of this, Canada’s climate policy threatens to increase the cost of doing business and alter the competitive landscape. Many Canadian companies produce and trade GHG-intensive commodities in competition with companies located in countries with less stringent environmental requirements. Policies that put our industries at a significant cost disadvantage may simply cause production to shift to those jurisdictions, resulting in so-called “carbon leakage”. Especially critical is the cost impact vis-a-vis key competitors in the United States. Despite the lofty ambitions of the Biden administration on climate change, the President did not campaign on instituting a national carbon price. Nor does it appear likely that such a policy will emerge from Congress.

While a predictable carbon price offers an efficient, long-term policy signal, Canada’s manufacturing sector would benefit from a comprehensive series of measures to support the transition to a low-carbon economy and strengthen its ability to compete internationally. Funds collected through federal and provincial output-based carbon pricing systems should be used to assist industry decarbonization efforts. The number one recommendation of the federally-appointed “Economic Strategy Tables” was to ensure Canada has “agile” regulation that protects Canadians and the environment while leveraging regulation as a competitive advantage.⁵⁰ A combination of smart regulatory policy and government support to de-risk investments in promising technologies is key to ensuring Canadian industry can thrive in a net-zero world.

Despite the challenges noted above, there is room for optimism. Canada will be home to the first demonstration plant of a zero-emissions aluminum smelter and there are important advances in technologies to make low-emissions cement and steel. Canada’s mining industry produces many of the metals and minerals that are used in the production of renewable electricity. The chemicals and plastic industry, meanwhile, is innovating to provide the products Canadians need with a lower environmental footprint.



Advances in science and crop chemistry are key to overcoming the challenges associated with producing more food per acre with fewer emissions.

Agriculture. To meet the United Nations’ Sustainable Development Goal of zero hunger by 2050, the global agriculture industry will need to feed another two billion people – and it will need to do so with less environmental impact. Canada is home to world-leading agri-food firms, including the first major food company anywhere to become carbon neutral: Maple Leaf Foods.⁵¹ The country also produces many essential food crops. Canada’s world-class fertilizer and agricultural technology companies are working with farmers around the world to increase crop yields, providing affordable food to consumers with much lower environmental impact.

From crop production to livestock management, Canadian companies are deploying best-in-class emission-reduction strategies while continuing to meet the demands for global food security. Canadian beef has one of the lowest GHG emissions footprints in the world.⁵² Canadian potash is made with 70 per cent fewer GHG emissions than potash from other countries⁵³ – making it the most sustainable in the world.

Advances in science and crop chemistry are key to overcoming the challenges associated with producing more food per acre with fewer emissions. Firms such as Nutrien and Terramera are helping growers around the world adopt progressive farming practices that improve soil health, enhance its natural ability to sequester carbon, and reduce the need for pesticides, all while increasing farm yields and improving profitability. Regenerative agriculture, no-till farming and the

⁵⁰ “Report from Canada’s Economic Strategy Tables: Seizing opportunities for growth”, September 2018; available at: <https://www.ic.gc.ca/eic/site/098.nsf/eng/00027.html>

⁵¹ See: <https://www.mapleleaffoods.com/news/maple-leaf-foods-becomes-first-major-food-company-in-the-world-to-be-carbon-neutral/>

⁵² Source: https://capi-icpa.ca/wp-content/uploads/2019/06/2019-06-11-CAPI-Van-Hoepen-Paper_WEB.pdf

⁵³ Source: Fertilizer Canada, 2021

mixing of trees with agriculture land are just a few of the options available to reduce emissions in the sector.

Nitrogen is critical to the production of healthy crops, and makes possible higher yields. At the same time, the manufacturing of nitrogen and its use in the field produces GHG emissions. Further innovation will be required to achieve meaningful reductions in these areas.

There are a range of technology options to reduce emissions from the manufacture of fertilizer. When combined with sound fertilizer application in the field, the full life-cycle emissions of agricultural production can be reduced. CCUS would reduce emissions significantly, but would need government incentives to make it economic. There also is scope to look at new production technologies to reduce emissions.

To embrace the full potential of our agriculture sector, the federal government should work with industry to co-create a regulatory framework that supports the growth of Canadian firms and advances long-term emission-reduction opportunities. A robust and accessible carbon credit market would allow companies to seize long-term emission-reduction opportunities.

Forestry. Forest management has long been recognized by the international community as essential to achieving sustainability goals and mitigating climate change impacts. Canada has the world's largest area of independently certified forests (168 million hectares) and is renowned for its leadership in this area.⁵⁴ Forests that are managed sustainably and for the long-term, together with the wood products harvested from them, are key tools to support Canada's move to a net-zero carbon economy by 2050. The forest industry plants upwards of 600 million seedlings a year, and the federal government has committed \$3 billion to plant an additional two billion trees over the next decade. By monitoring the future impacts of climate on our forests, and planting the right trees in the right places, we can support climate mitigation and increased forest resiliency.

The Canadian forest products sector is committed to removing 30 megatonnes (Mt) of CO₂ a year by 2030, which represents about 13 per cent of the federal government's 2030 climate change mitigation target.⁵⁵ More than \$2 billion have been invested to date in green energy (co-generation) solutions. These investments have reduced GHG emissions intensity at mills by nearly 70 per cent since the early 1990s, ensuring that Canada's pulp and paper mills are among the lowest emitters in the world.⁵⁶ The sector has invested significantly in technologies to develop next-generation bio-refinery capabilities and bio-sourced products that can displace more GHG-intensive materials. Biofuels are an increasingly important energy source for remote communities that still rely on diesel and other types of fuel oil.

The federal and provincial governments must accelerate efforts to develop a national strategy that enhances forest management, realizes the potential of the forest bio-economy, and reflects smart regulatory policy. Doing so would ensure more sustainably sourced forest products for Canada and the world, and contribute to the net-zero goal.

Lowering transportation emissions through low-carbon fuels. Canadians have relied on liquid transportation fuels for nearly 125 years. Today, gasoline, diesel and aviation fuel are available 24/7 through a sophisticated nation-wide system – the result of billions of dollars of investment and decades of innovation.⁵⁷ Transportation is one of the largest sources of GHG emissions in Canada, and transportation demand is projected to grow with population and GDP growth.⁵⁸ Reducing the carbon footprint of the fuels we use will contribute significantly to the net-zero transition.

⁵⁴ Forest Products Association of Canada, 2021.

⁵⁵ Source: https://www.fpac.ca/wp-content/uploads/FPAC_CCC_Small_ENGLISH-1.pdf

⁵⁶ Forest Products Association of Canada [FPAC] (2016). https://www.fpac.ca/wpcontent/uploads/2016_ClimateChange_Summary_EN_final_web.pdf

⁵⁷ Source: https://www.canadianfuels.ca/wp-content/uploads/2020/11/CFA_Driving-to-2050.pdf

⁵⁸ Source: <https://www.canada.ca/en/environment-climate-change/services/environmental-indicators/greenhouse-gas-emissions.html>

Conventional fuels, supported by existing biofuel mandates, will remain vital to meeting Canadians' transportation and energy demands while we continue to develop and scale alternative fuels for tomorrow. Meantime, the environmental performance of liquid fuels will continue to improve while Canadian companies innovate and create a more diversified fuel future.

Canada's net-zero future will require a variety of fuels to service a variety of transportation modes. Cleaner fuel means lower carbon intensity – for example, through increased biofuel blending. Today, agricultural crops such as corn and canola are the primary feedstocks used to produce liquid biofuels. These are often referred to as “drop-in” fuels because of their ability to be used in existing infrastructure and transportation systems. Currently five provinces have renewable fuel mandates that require up to 10 per cent ethanol to be blended with gasoline, and 5 to 10 per cent biodiesel to be blended in diesel. The federal Clean Fuel Regulations propose to set ethanol and biodiesel content requirements at 15 and 5 per cent respectively by 2030.

” **Canada's net-zero future will require a variety of fuels to service a variety of transportation modes.**

Biofuel feedstocks are poised to grow as Canada's agriculture, forestry and waste management sectors continue to innovate and identify more products that can be co-processed with conventional petroleum fuel. Synthetic fuels – also known as e-fuels or “power to liquids” (PtL) – are another area of innovation. They are created using captured CO₂ and green or blue hydrogen. Synthetic fuels are compatible with existing fleets and liquid fuel infrastructure. They have the potential to fuel aviation, rail and heavy road-freight modes where high energy density is critical and electrification is impractical. Over time, governments and industry will need to develop sector-specific strategies that enable heavy commercial fuel users to switch to alternatives efficiently and cost-effectively.

So-called “second generation” biofuels are derived from materials that are not a food source – grasses, biomass, crops, wood or other waste. Currently, however, supplies of such biofuels are insufficient to make an impact on overall vehicle emissions. Nor are they cost-competitive with traditional transport fuels. Significant investment and research will be required to overcome these challenges. Going forward, policymakers must be laser-focused on ensuring that low-carbon fuels are a practical, cost-competitive alternative to conventional fuels.

Conclusion

In addition to a coherent, comprehensive and ambitious plan, the country needs a compelling new narrative about Canada's opportunities and responsibilities along the road to net zero. A positive, inclusive vision focused on jointly fostering economic recovery and climate action can guide government policy, incent action by the private sector and Canadian innovators, and inspire and motivate Canadians.

The opportunity for Canadian leadership is rooted in our energy and resource advantage, which includes: significant reserves of materials critical to the low-carbon transition; a track record in developing low-carbon energy and emissions reduction technologies; our relatively low-emissions electricity grid; stringent regulatory and approval processes; high standards of ethical business conduct; and several global ESG champions among our leading energy and resource companies.

Scores of Canadian companies proved during the pandemic that they can innovate and pivot to meet rapidly changing Canadian needs and priorities. We need to seize on that private sector creativity and ensure we have the fiscal and innovation framework that both enables existing industries to re-invent their products and processes, and nurtures innovative new firms as they develop and commercialize cleaner technologies. Canada's business community is prepared to do its part and support the country's net zero ambition.

We argue that getting this right is urgent and will require a substantive reworking of how we will finance the multitude of projects and activities that will be required across the country to fulfil our net-zero ambition. This paper includes several ideas for enhancing the public sector's ability to support major emission reduction opportunities, and for launching a new approach that will translate our research efforts into commercial successes.

The first real test will come with this spring's federal budget. It needs to clearly signal that the federal government will partner with the private sector to pave the way for the unprecedented levels of investment that will be needed. A coherent policy framework also is essential as the federal government looks to increase the country's climate ambition in preparation for the COP 26 global climate summit later this year.

Many other countries will compete with Canada to attract investment in the low-carbon solutions of tomorrow. Some might say that Canada is already behind, but we beg to differ, for the reasons outlined in this paper. Regardless, what is important is what we do next.

