



Capturing the opportunity:

A Carbon Management Strategy for Canada



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Introduction

When it endorsed the 2015 *Paris Agreement*, the global community agreed that the world must hold the increase in the global average temperature to well below 2 °C and pursue efforts to limit warming to 1.5 °C to avoid the most catastrophic impacts of climate change. This is a daunting challenge that requires a rapid transition to a net-zero emissions economy, but it offers enormous potential for a prosperous and cleaner future.

Carbon management—a range of approaches to capture carbon dioxide (CO₂) from point sources or the atmosphere to be reused or durably stored—is recognized as a critical piece of global climate action. According to the Intergovernmental Panel on Climate Change (IPCC) and the International Energy Agency (IEA), there is no credible path to net-zero emissions without carbon management technologies, and their deployment must be rapid and immense, scaling up by nearly 200 times by 2050.^{1,2}



Vision

Carbon management technologies are deployed to help achieve Canada's climate objectives, underpinned by the development of a world class, multi-billion-dollar carbon management sector in Canada that supports inclusive, high-value employment and a more sustainable economy.

Carbon management technologies are important tools in the broader climate toolbox that work with a range of other measures that reduce or remove emissions. Innovative countries like Canada must help lead the way

1

1 Intergovernmental Panel on Climate Change (IPCC) (2021). Special Report on Climate Change.

2 International Energy Agency (IEA) (2021) Net Zero by 2050. <https://www.iea.org/reports/net-zero-by-2050>

by harnessing the ingenuity of its people, communities, and businesses to accelerate climate action. This is why Canada increased its climate ambition, aiming to reduce greenhouse gas (GHG) emissions by 40–45% below 2005 levels by 2030, and enshrined a commitment to reach net-zero emissions by 2050 into law. Meeting these goals requires transforming the way energy and industrial products are produced and used to nearly eliminate CO₂ pollution over the next 3 decades.

To that end, in collaboration with provincial, territorial, and municipal governments, the private sector, Indigenous groups, and other strategic partners, the Government of Canada is taking important steps towards achieving its ambitious climate goals. Canada has developed a comprehensive climate plan that includes a price on pollution, regulations, and over \$150 billion in federal investments since 2015 to advance climate action. From introducing a world-leading price on pollution, to making major investments in zero-emission vehicles and energy-efficient buildings, as well as helping Canadian industries transition to net zero through solutions like carbon capture, the Government has been working to enable the transition to a prosperous and cleaner future.

Reducing emissions remains the top priority of Canada's climate plan, recognizing that the best way to tackle climate change is to stop new emissions from entering the atmosphere. Carbon management technologies will be a

critical emissions reduction tool for many sectors, including upstream oil and gas, cement, iron and steel, and chemicals. At the same time, Canada needs to scale up solutions that permanently remove emissions from the atmosphere, since some residual emissions are likely to remain despite aggressive mitigation efforts, including in agriculture, aviation, and shipping. The removal of CO₂ from the atmosphere is also the only way to directly address historical emissions, which have accumulated in the atmosphere over centuries of industrial activity and continue to contribute to global temperature rise.

The broad suite of carbon management practices, tools, and technologies to reduce, remove, or re-use CO₂ from the atmosphere is not a silver bullet for addressing the climate crisis, but it is an essential element within the suite of measures to address GHGs as detailed in Canada's 2030 Emissions Reduction Plan. This means scaling carbon management alongside ongoing efforts to meet Canada's primary goal to aggressively reduce absolute emissions.

Reducing emissions remains the top priority of Canada's climate plan, recognizing that the best way to tackle climate change is to stop new emissions from entering the atmosphere.

Canada can leverage its natural resource advantages, technical and technology leadership, and expertise to advance carbon management to help meet net-zero goals at home and abroad, while creating inclusive and sustainable economic growth across the country. Carbon management offers new economic opportunities to create good, sustainable jobs, it can unlock new export markets, and it can attract foreign direct investment in Canada and in Canadian solutions providers that can serve a rapidly growing, multi-billion-dollar global market for carbon management solutions.

Canada has already established itself as a first mover and leader in the global carbon management sector, with some of the world's first large-scale projects, favourable geology, cutting-edge innovators and start-ups, early investments in research, development, and demonstration (RD&D), deep technical expertise, a robust policy and regulatory environment at federal and provincial levels, and active international collaboration. Approximately one-seventh of the world's active large-scale carbon management projects can

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be found in Canada, with a growing number in the design and development phase across multiple sectors and regions.³ In response to the climate imperative, global momentum in the carbon management sector has grown substantially in recent years, with over 570 carbon capture, utilization, and storage (CCUS) projects in development. By 2030, 368 projects are expected to be operational, with an anticipated capacity to capture 743 Mt of CO₂ per year.⁴ Even more projects are needed if carbon management is to deliver the reductions projected in scenarios to achieve net zero.^{5,6} Competition in this sector is also rapidly increasing with major investments made from Canada's allies like the United States, the United Kingdom, and the European Union.

3 GCCSI (2022). Global Status of CCS 2022. <https://www.globalccsinstitute.com/resources/global-status-of-ccs-2022/>. Note: The Government of Canada considers a hub as a single project, whereas the GCCSI counts it as two.

4 IEA (2023). CCUS Projects Explorer. <https://www.iea.org/data-and-statistics/data-tools/ccus-projects-explorer>

5 IEA (2022). An updated roadmap to Net-Zero Emissions by 2050. <https://www.iea.org/reports/world-energy-outlook-2022/an-updated-roadmap-to-net-zero-emissions-by-2050>

6 Smith, S. M., et al. (2023). The State of Carbon Dioxide Removal — 1st Edition. <https://www.stateofcdr.org/>

This Strategy takes a targeted approach to focus on technology-enabled carbon management solutions that support reducing, removing, and reusing CO₂ — while recognizing the importance of nature-based solutions in supporting a net-zero economy. Already, the Government of Canada is taking important steps to support carbon management with nature-based solutions, including through conservation efforts, a commitment to plant 2 billion trees by 2030, and supporting Indigenous-led nature-based solutions.

Canada's Carbon Management Strategy is the result of more than a year of concerted engagement with nearly 1,500 stakeholders from across sectors, provincial and territorial governments, Indigenous organizations, and other key partners to gather perspectives and create a vision for a robust Canadian carbon management sector (see [Annex A](#) for Roadmap to 2050). This Strategy delivers on Canada's commitment to develop a comprehensive CCUS Strategy and recognizes that provinces, territories, and other levels of government are already providing important leadership and have a key role to play in supporting the scaling up of carbon management solutions.

**This Strategy outlines
5 federal priorities guiding the
Government's approach to promoting
a competitive and robust carbon management
sector in Canada:**

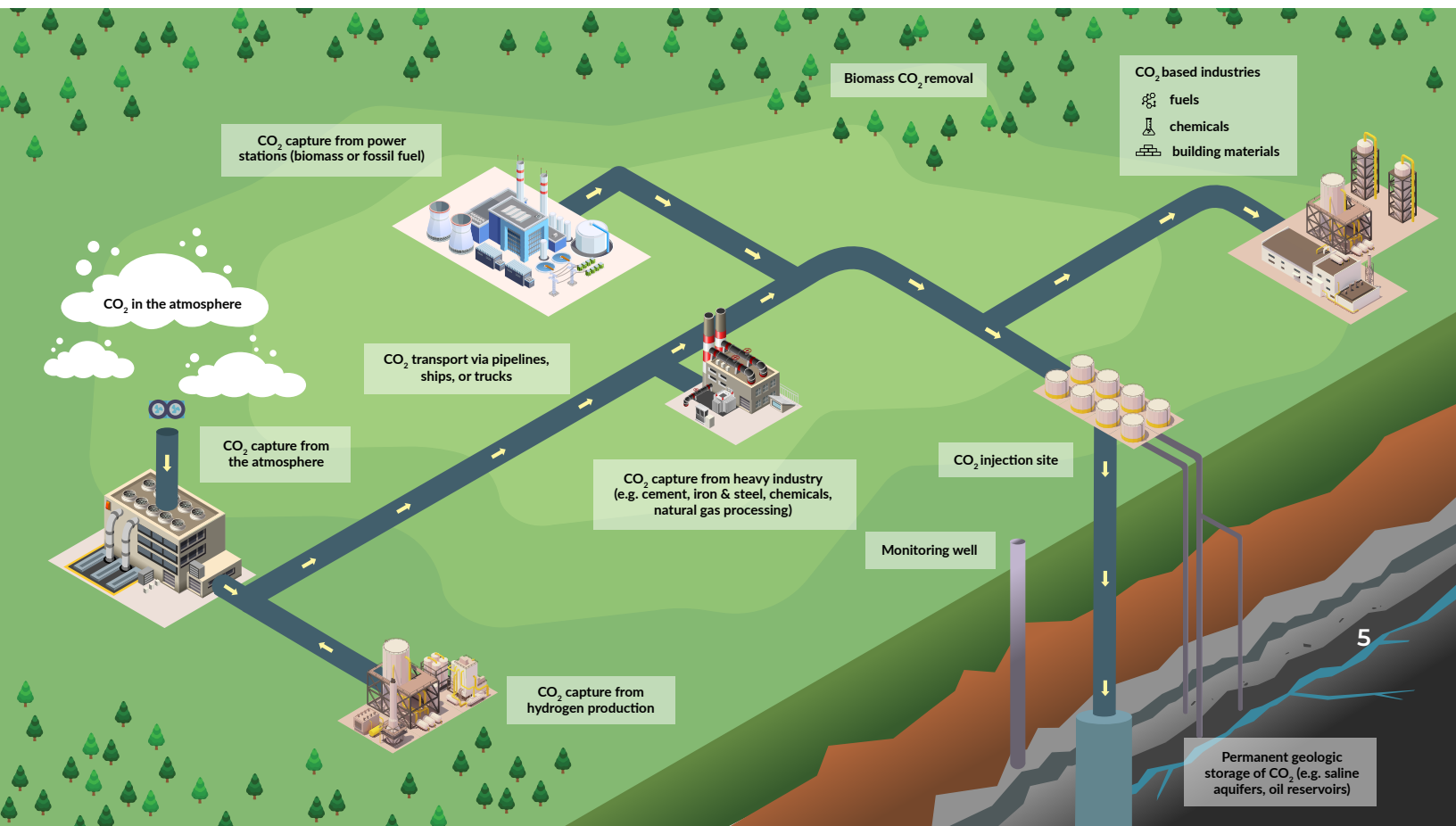
- 1. Accelerating innovation and RD&D**
- 2. Advancing policies and regulations**
- 3. Attracting investment and trade opportunities**
- 4. Scaling up projects and infrastructure**
- 5. Building partnerships and growing inclusive workforces**

What is carbon management?

Carbon management refers to an ecosystem of technologies and approaches that help to reduce and remove CO₂ emissions. It encompasses any activities that capture, utilize, or store CO₂, or that connect these activities. It includes, but is not limited to:

- **CCUS technologies** that mitigate point-source emissions; and,
- **Carbon dioxide removal** approaches like direct air capture to carbon storage (DACCS), biomass carbon removal and storage (BiCRS), and enhanced carbon mineralization.

Figure 1. Diagram of carbon management processes



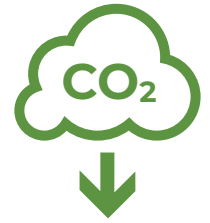
Carbon capture, utilization, and storage (CCUS) technologies

CO₂ can be **captured** from emissions streams (point-source capture) or directly from the atmosphere (direct air capture) and transported for utilization or storage in a carbon sink. Each segment of the value chain — capture, transportation, utilization, and storage — is crucial to growing carbon management in Canada, which involves many industries and sectors (see Figures 1–3). Globally, 36 such commercial projects are in operation, capturing CO₂ from a range of emission sources, such as ethanol, fertilizer, steel, hydrogen production, gas processing, and power generation.

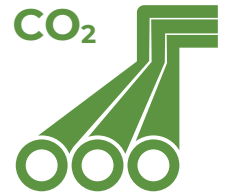
Point-source capture separates CO₂ from waste stream emissions, including from industrial processes and the combustion of fossil fuels or biomass. Point-source capture rates of over 90% have been demonstrated at commercial scales in Canada (e.g., Sturgeon Refinery, Glacier CCS Project). CO₂ capture is typically the highest cost associated with carbon management projects, ranging from US\$15 to US\$25 per tonne for highly concentrated CO₂ streams, and from US\$40 to US\$120 per tonne where CO₂ is more dilute.⁷ Economies of scale and innovation are enabling cost reductions.

Direct air capture (DAC)

technologies capture CO₂ directly from the atmosphere. While less mature than point-source capture, DAC still holds significant potential, and like point-source capture, the CO₂ can be stored or utilized. Since atmospheric CO₂ is more dilute than CO₂ in industrial emissions, DAC is more expensive than point-source capture.



CO₂ can be **transported** by truck, rail, pipe, or ship. Since CO₂ is a valuable feedstock in many sectors, such as food, chemicals, and oil and gas, the technologies and infrastructure to purify and transport it have been used for decades. Significantly more infrastructure is needed to support the scaling up of carbon management to meet Canada's climate goals. Transportation costs account for a fraction of the cost of abatement and can be as low as US\$5 per tonne when the point of capture is close to storage sites.⁸



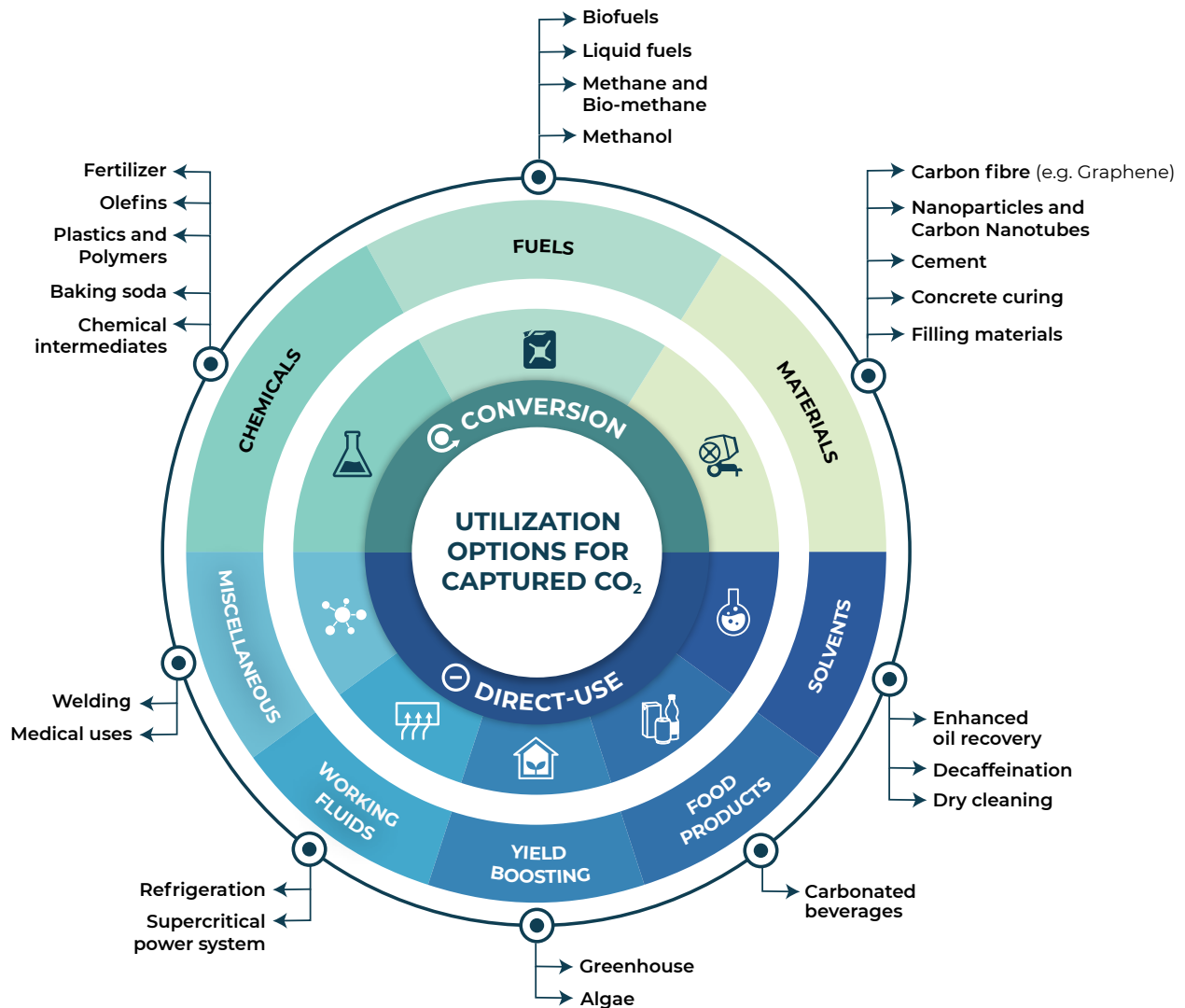
7 IEA (2021). Is Carbon Capture Too Expensive? <https://www.iea.org/commentaries/is-carbon-capture-too-expensive>

8 Ibid.

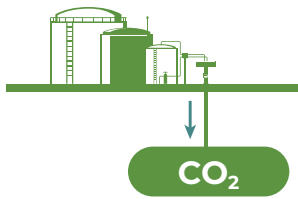
CO₂ **utilization** includes either direct use or chemical conversion into useful products such as synthetic fuels, nanomaterials, and additives for building materials. The diverse suite of CO₂ utilization applications has spurred the creation of a “carbontech” industry, providing lower carbon alternatives for products. Converting CO₂ “waste” into valuable products can generate revenue

to help recoup the costs of carbon capture and supports the shift to a more circular economy. While most captured CO₂ will need to be permanently stored to limit global temperature rise, utilization can enable low-carbon alternatives such as synthetic fuels for freight and aviation, and support CO₂ use as a feedstock for the chemical industry, such as in fertilizer production.⁹

Figure 2: Diagram of CO₂ utilization processes



9 IEA (2020). CCUS in Clean Energy Transitions. <https://www.iea.org/reports/ccus-in-clean-energy-transitions>



The most mature method of CO₂ **storage** dating back almost 30 years, involves CO₂ injection into deep

geological formations for permanent storage, where it is trapped beneath impermeable cap rocks—in the same way that fossil fuels and other hydrocarbons have remained in place for millions of years.¹⁰ Conventional geologic storage costs range between US\$2 and US\$11 per tonne with potential for further cost reductions through innovation.¹¹ Newer mechanisms include CO₂ storage in organic-rich shales and basalt rock formations. CO₂ injected into basalt can mineralize, meaning the CO₂ reacts with the rock to create carbonate minerals that lock away the CO₂.¹² This mineral carbonation process is also being explored as a pathway for CO₂ storage within mine tailings.¹³ Other storage options include soil carbon storage (e.g., heat-treated biomass, known as biochar, and pulverized silicate rocks), biomass burial, ocean sequestration pathways, and CO₂ use in long-lived products, such as concrete.

Carbon dioxide removal (CDR)

Carbon management also includes CDR approaches that remove CO₂ from the atmosphere and store it durably in natural carbon reservoirs, such as rock formations, soils, plants, oceans, or in long-lived products. The removal and durable storage of CO₂ can also be understood as “negative emissions.”

While it remains critical to considerably scale up mitigation efforts, significant deployment of CDR will be needed to remove CO₂ already in the atmosphere.¹⁴ CDR is not an alternative to decarbonization—it can decrease historical and residual emissions in support of net zero and even net-negative emissions, meaning that more GHGs are removed from the atmosphere than emitted. Undertaking life-cycle assessments (LCAs)—a method to assess the full GHG impact of a project—is key to determining the extent to which CDR approaches can contribute negative emissions.

CDR activities can be nature-based, technological, or a hybrid approach of the two. A variety of CDR methods will be needed to meet climate goals,

10 IEA (2022). CO₂ storage resources and their development. <https://www.iea.org/reports/co2-storage-resources-and-their-development>

11 IEA (2021). Is Carbon Capture Too Expensive? <https://www.iea.org/commentaries/is-carbon-capture-too-expensive>

12 Snæbjörnsdóttir, S. Ó., Sigfússon, B., Marieni, C. et al. (2020). Carbon dioxide storage through mineral carbonation. *Nat Rev Earth Environ* 1, 90–102. <https://doi.org/10.1038/s43017-019-0011-8>

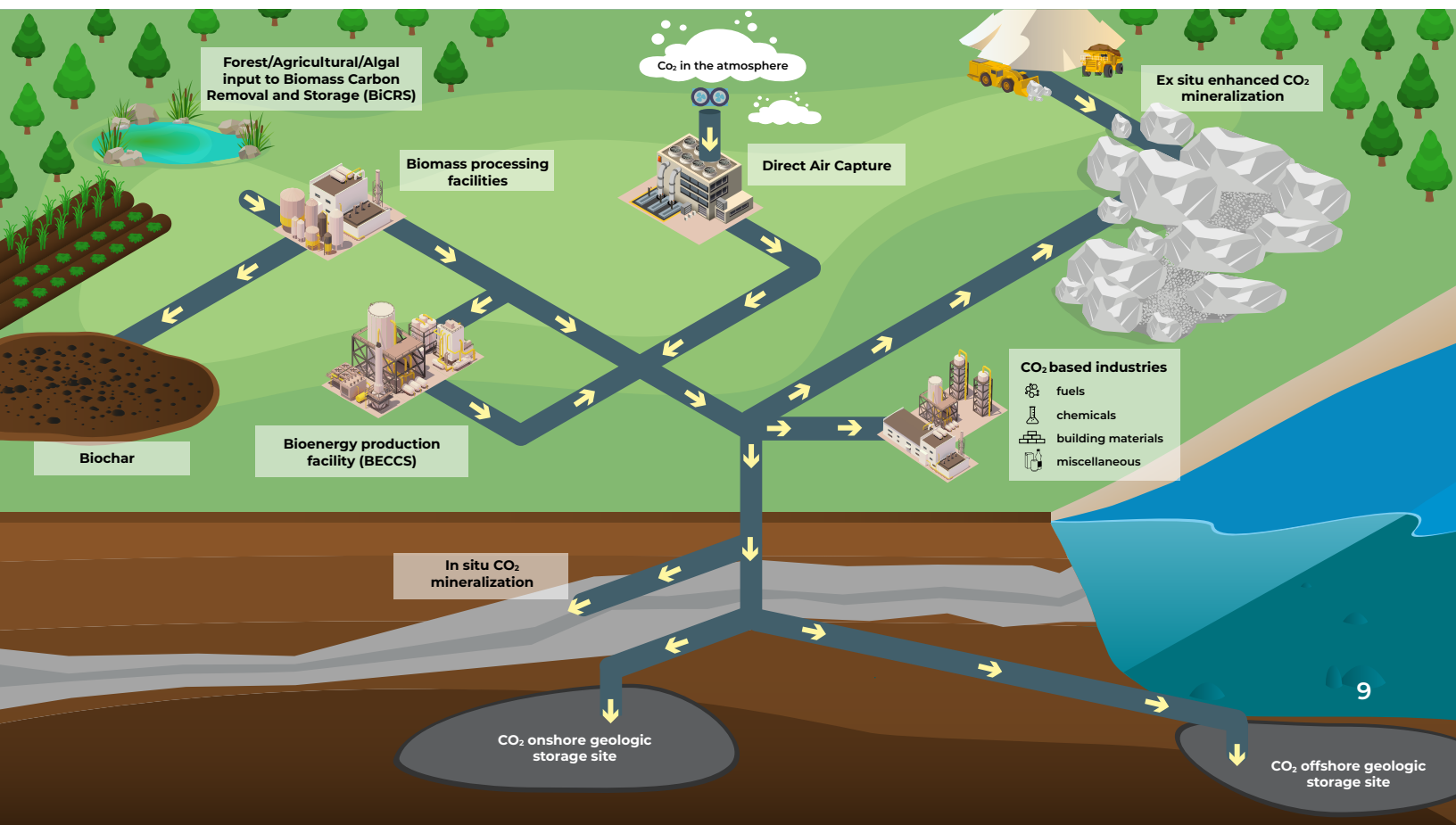
13 University of BC (2018). CCUS in Mine Tailings. <https://www.nrcan.gc.ca/science-data/funding-partnerships/funding-opportunities/current-investments/carbon-capture-utilization-and-storage-mine-tailings/22222>

14 IPCC (2022). Climate Change 2022: Mitigation of Climate Change. <https://www.ipcc.ch/report/ar6/wg3/>

and each has benefits and limitations.¹⁵ This Strategy focuses on technology-based CDR approaches, with specific consideration of DAC, BiCRS, and enhanced carbon mineralization, all of which have significant long-term CO₂ removal and storage potential. This Strategy also recognizes the early potential of ocean-based CDR approaches, such as direct

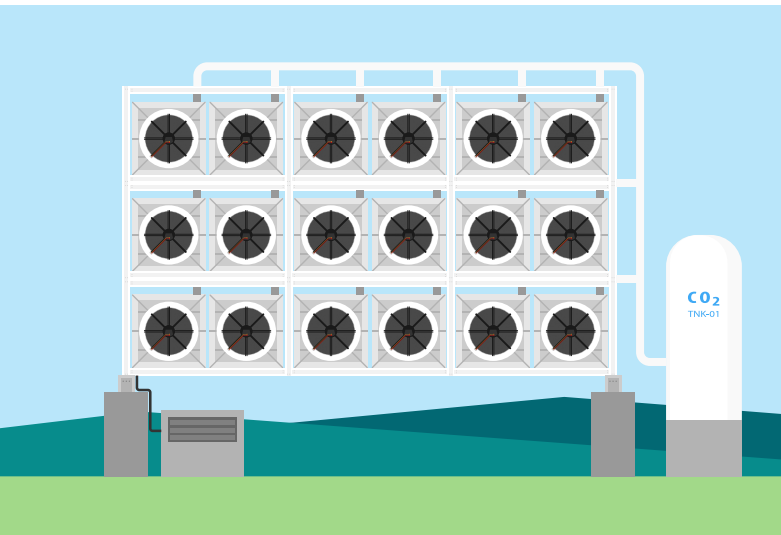
ocean capture and ocean alkalinity enhancement, and will continue to carefully monitor progress and emerging opportunities as science advances. Further RD&D and innovation are critical to advance technology-based CDR approaches required to meet climate goals, as many are at the early stages of commercial readiness.¹⁶

Figure 3. Diagram of carbon dioxide removal processes



15 National Academy of Sciences (2019b). Negative Emissions Technologies and Reliable Sequestration. <https://doi.org/10.17226/25259>

16 The IEA's Net Zero by 2050 report finds that achieving global climate goals hinges on dramatically scaling up and accelerating CCUS RD&D and innovation, as about 55% of the needed global CCUS reductions in 2050 will have to come from technologies and applications not yet commercial today (e.g., carbon capture at cement, iron and steel, and chemicals facilities; DACCS; and BECCS). <https://www.iea.org/reports/net-zero-by-2050>



Direct air carbon capture and storage

(DACCS): DACCS refers to the CDR approach when non-emitting energy is used to power DAC technologies and the captured CO₂ is permanently stored, removing more CO₂ from the atmosphere than was emitted.¹⁷ The deployment of DAC technologies is currently limited by very high energy needs and costs, given CO₂ is more dilute in the atmosphere, and by the availability of CO₂ storage resources in some parts of the world. A key benefit of DACCS is the small amount of land required for a DAC facility compared to other CDR methods to achieve the same level of removal. Transportation costs can be negligible if DAC facilities are co-located with CO₂ storage sites.

Biomass carbon removal and storage

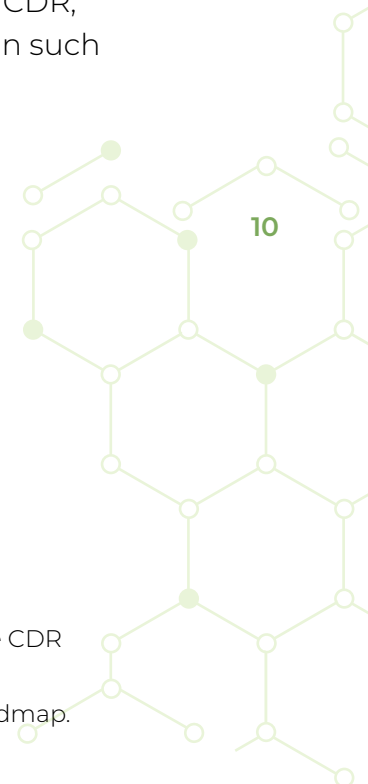
(BiCRS): BiCRS describes a range of technology-based approaches that use plants and algae (which naturally remove CO₂ from the atmosphere as they grow) to capture CO₂, and then permanently store that CO₂ underground or in long-lived products. BiCRS approaches follow a set of “do no harm” principles to value food security, rural livelihoods, and biodiversity conservation.¹⁸ BiCRS includes various biomass-enabled CDR approaches such as bioenergy with carbon capture and storage, biomass gasification, biomass pyrolysis, biomass burial, and bio-oil burial.

Bioenergy with carbon capture and storage (BECCS):

BECCS generates energy from the combustion of biomass, with CO₂ capture technology applied to the resulting emissions. If the captured CO₂ is permanently stored, the process can result in negative emissions. BECCS can therefore enable CDR, making it a subset of BiCRS in such cases.

¹⁷ The carbon capture technology is typically referred to as DAC, while DACCS refers to the CDR approach since the CO₂ must be stored to enable negative emissions.

¹⁸ Innovation for Cool Earth Forum (ICEF) (2021). Biomass carbon removal and storage roadmap. <https://www.icef.go.jp/roadmap/>





Enhanced carbon mineralization:

Carbon mineralization is a naturally occurring process where CO₂ becomes bound in rocks as a solid mineral, but it can also be enhanced through 2 technology-based approaches to help permanently remove atmospheric CO₂:

- *In situ* mineralization, where CO₂ is injected deep underground, reacts with mafic or ultramafic rocks, and becomes part of the rock.¹⁹
- *Ex situ* mineralization, where certain types of crushed rock react with CO₂, causing it to solidify in a process known as “surface mineralization.” This process occurs naturally but can be sped up with human intervention to deliver permanent CDR (sometimes referred to as “enhanced weathering”). Mining and industrial wastes often contain suitable rocks for *ex situ* mineralization, while also reducing environmental impact and disposal costs, and in the case of mining waste, can facilitate further extraction of valuable minerals.²⁰

19 Mafic and ultramafic rocks are rich in magnesium, iron and/or silicon, making them the best reactants and sources of alkalinity to mineralize CO₂ and form solid carbonate minerals (e.g., calcite, magnesite).

20 ICEF (2021). Carbon Mineralization Roadmap. <https://www.icef.go.jp/roadmap/>

Role of carbon management in the path to net zero

Within the broader toolkit of approaches and technologies needed to tackle climate change and reduce emissions, carbon management will be one of many important tools to support the decarbonization of the economy and achieve net-zero emissions in Canada and around the world. As part of Canada's continued clean economic growth, a competitive carbon management industry in Canada offers opportunities to decarbonize many industrial sectors and develop new ones in support of a prosperous, net-zero economy of the future.

Under the IEA's 2022 Updated Roadmap to Net-Zero Emissions by 2050, CCUS technologies need to scale up rapidly this decade to capture 1.2 Gt globally by 2030 and 6.2 Gt by 2050, accounting for approximately 15% of total required GHG reductions.²¹ Canada's international peers have recognized that this is both a challenge and an opportunity, prompting other G7 economies such as the United States, the United Kingdom, and Germany, as well as the European Union, to prioritize carbon



management technologies, including through developing national strategies and making significant investments to seize the environmental and economic benefits.

The IPCC found that all pathways that limit global warming to 1.5 °C use CDR to compensate for residual emissions, or in cases where warming peaks beyond 1.5 °C, to achieve net-negative emissions to restore a maximum of 1.5 °C by the end of the century.²² The required level of CDR will depend on the amount of emissions that need to be offset.

21 IEA. (2022). An updated roadmap to Net-Zero Emissions by 2050. <https://www.iea.org/reports/world-energy-outlook-2022/an-updated-roadmap-to-net-zero-emissions-by-2050>

22 IPCC (2018). Special Report: Global Warming of 1.5 °C. <https://www.ipcc.ch/sr15/chapter/spm/>

Adding to the IPCC's and IEA's global analysis, the Canada Energy Regulator (CER), in its Canada's Energy Futures 2023 report, highlights the key role that carbon management will play in domestic emissions reductions. In the CER's Global Net-Zero Scenario, in which Canada and the rest of the world achieve net-zero emissions by 2050, CCUS sequesters nearly 60 Mt annually in Canada by 2050, 25 Mt of which occurs in heavy industry. In an alternative Canada Net-Zero Scenario, in which Canada reaches net-zero emissions by 2050 but the rest of the world moves more slowly, the CER estimates that CCUS costs are likely to fall more slowly and result in higher captured emissions of 80 Mt due to the greater global demand for fossil fuels.²³ Similarly, the CER projects that DAC will capture 46 Mt annually in Canada in the Global Net-Zero Scenario, rising to 55 Mt in the Canada Net-Zero Scenario.²⁴

How carbon management can support Canada's path to net zero

Canada's capture capacity is projected to grow from the current 4.4 Mt of CO₂ mitigation per year to 16.3 Mt of CO₂ per year by 2030, with significant further scaling required to help reach net zero by 2050.²⁵ With a focus on technology-based approaches, this

Strategy identifies 5 pathways where carbon management is expected to play a critical role in many sectors to help achieve Canada's 2030 climate targets and enable a prosperous net-zero economy by 2050:

Decarbonizing heavy industry, including oil and gas:

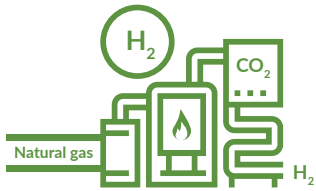
Fixed-process emissions and high-temperature heat requirements make reducing emissions in many industrial sectors especially challenging. Point-source CO₂ capture is a leading option for deep emissions reductions from heavy industrial sectors with long-lived infrastructure, such as cement, iron and steel, and chemicals (e.g., fertilizer), which together account for almost 11% of Canada's emissions. It is also one of the key technologies supporting decarbonization of the upstream oil and gas sector. Given the long lifespan of many existing heavy industrial facilities and the value of these industries to the Canadian economy, public-private collaboration is critical to advance strategic, economical, and regionally appropriate decarbonization pathways.



23 Canada Energy Regulator (2023). Canada's Energy Future 2023. <https://www.cer-rec.gc.ca/en/data-analysis/canada-energy-future/2023/>

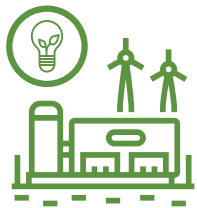
24 Ibid.

25 Government of Canada (2022). Eighth National Communication and Fifth Biennial Report. <https://www.canada.ca/en/environment-climate-change/services/climate-change/greenhouse-gas-emissions/fifth-biennial-report-climate-change-summary.html#toc8>



Low-carbon hydrogen production: Producing hydrogen from Canada’s abundant and low-cost natural

gas, paired with a high capture rate of CO₂ to mitigate emissions, provides one of the lowest-cost production methods of large-scale, low-carbon hydrogen. The competitive life-cycle emissions performance should continue to improve through federal and provincial action to reduce methane emissions across the production and transport of natural gas.

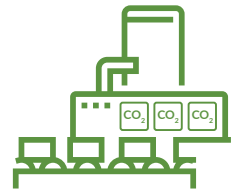


Low-carbon dispatchable power: CO₂ capture can enable power plants to provide low-carbon power on demand as renewables are integrated,

grid modernization advances, and long-duration storage capabilities improve. Gas-fired power generation paired with CCUS to abate emissions may be one of the technical solutions pursued by some provinces and regions to significantly reduce emissions from the electricity grid. Carbon management technologies, such as CCUS and BECCS, could enable low- or even negative-carbon dispatchable power, further supporting the Government of Canada’s goal of a net-zero electricity system by 2035.

CO₂-based industries:

Although the vast majority of captured CO₂ may need to be permanently stored to reach net-zero emissions, CO₂ utilization has a role to play in supporting climate goals, including by providing market demand for captured CO₂.²⁶ As a valuable commodity with many applications, captured CO₂ can be converted to make fuels, chemicals, and building materials, or used directly, such as in food and beverage products, and in industrial processes. CO₂ utilization helps strengthen the business case of carbon capture projects and the broader carbon management sector.



Carbon removal: CDR technologies, such as DACCS, BiCRS, and carbon mineralization,



have significant potential given Canada’s early technology leadership, abundant sources of biomass, high proportion of non-emitting electricity, and suitable geology for CO₂ storage. Accelerated innovation and scale-up of CDR technologies is critical to enabling large-scale deployment to support a net-zero economy by offsetting emissions from the hardest-to-decarbonize industrial sectors, and to address historical emissions already in the atmosphere.

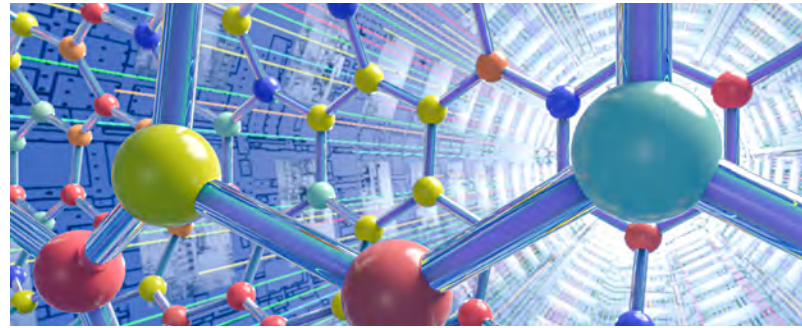
26 IEA (2020). CCUS in Clean Energy Transitions. <https://www.iea.org/reports/ccus-in-clean-energy-transitions>

Canada's carbon management advantage

When it comes to the global race to grow the carbon management sector, Canada has an enviable early advantage. Canada is well positioned to capitalize on its globally recognized expertise, wealth of favourable CO₂ storage geology, and leading innovators. Early investment in projects has resulted in a burgeoning carbon management ecosystem and world-class research and testing facilities across many regions. This early leadership, combined with its natural resource advantage, positions Canada to deploy carbon management to mitigate emissions across sectors, advance CDR approaches, and continue to research and develop world-renowned technologies.

CO₂ storage capabilities and resource potential

The availability of CO₂ storage capacity is essential to carbon management. Globally, it is anticipated that 95% of all CO₂ captured will need to be permanently stored.²⁷ Canada has vast geological storage resources, which present opportunities to



store CO₂ sourced domestically and internationally—with potential to generate revenue and investment from abroad. Canada is rich in sedimentary basins that are suitable for CO₂ storage, such as the vast Western Canadian Sedimentary Basin (WCSB) that spans from BC to Manitoba, and the Williston Basin, located mostly in southern Saskatchewan. Geological formations in the BC portion of the WCSB could store an estimated 4.2 Gt CO₂—more than 66 years of the province's emissions.²⁸ In Southern Ontario and Quebec, there are several sedimentary basins that may also be suitable for CO₂ storage. The Canadian capacity of saline aquifers alone (within Canada's sedimentary basins) is estimated at over 100 billion tonnes, which could provide enough CO₂ storage for hundreds of years.^{29,30}

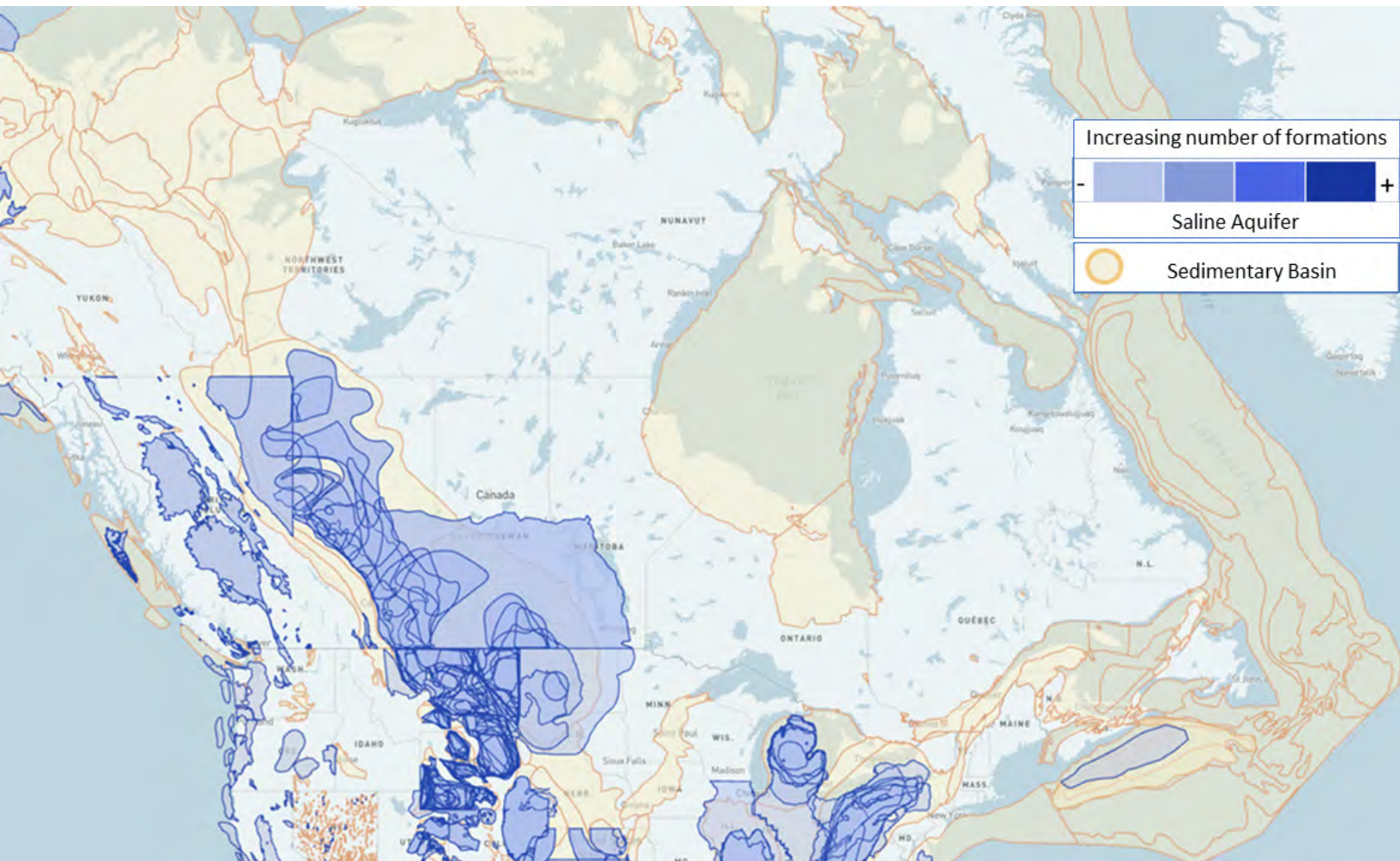
27 IEA (2021). Net Zero by 2050. <https://www.iea.org/reports/net-zero-by-2050>

28 Geoscience BC (2023). <https://www.geosciencebc.com/study-northeast-bc-geology-key-to-provinces-carbon-management/>

29 US DoE, NRCAN. (2012). North American Storage Atlas.

30 Oil and Gas Climate Initiative (2021). CO₂ Storage Resource Catalogue. <https://www.ogci.com/co2-storage-resource-catalogue/>

Figure 4. Map of Canada showing saline formations and sedimentary basins



Data source: North American Carbon Storage Atlas.

Canada's offshore seabed geology could also hold significant potential for CO₂ storage. For example, Nova Scotia and Newfoundland and Labrador have suitable geology for conventional sub-seabed CO₂ storage, as well as offshore expertise and infrastructure that could be leveraged to support CO₂ storage. Further research, regulatory work, and engagement are needed before offshore activities could occur.

This significant underground CO₂ storage potential, including in the Western provinces and the Eastern offshore, could present business

opportunities for regional or even cross-boundary CO₂ storage hubs. Further source-sink matching analysis, through tools such as NRCan's CCUS Assessment Framework, alongside provincial systems enabling the evaluation of onshore geological CO₂ storage, are being used to advance understanding of these opportunities.

Canada has been an early leader in geological storage. Most notably, the Saskatchewan-based Weyburn-Midale CO₂ Monitoring and Storage Project was an international research program, and after over 20 years of operation,

its sites are still being used and have successfully stored over 40 million tonnes of CO₂.³¹ Nearby, the Aquistore Project CO₂ storage initiative includes a field lab for the study of dedicated CO₂ storage and monitoring.^{32,33}

Cutting-edge research and deep technical capacity

Canadian researchers and firms have long been major contributors to the development of the global carbon management ecosystem. In addition to full commercial-scale projects in operation, Canada has world-class research and testing facilities in British Columbia, Alberta, Saskatchewan, Ontario, and Quebec to develop and scale up carbon management technologies. This includes 8 publicly funded laboratories and test beds for developing technologies, as well as post-secondary labs and labs run by private organizations. An important aspect of RD&D is the testing of concepts and pilot technologies for scalability and reliability at technology test centres. Canada is a global leader in this space with several test facilities providing access to this specialized infrastructure in Canada.



Canada has a myriad of carbon management technology developers, many of which are emerging from academic labs at universities across the country. These technological advancements have led to successful spinoff companies³⁴ and co-development projects with industry.

Canadian researchers and firms have long been major contributors to the development of the global carbon management ecosystem.

31 IEAGHG Programme. (2014). IEAGHG Weyburne CO₂ Monitoring and Storage Project. https://www.ieaghg.org/docs/general_publications/weyburn.pdf

32 PTRC (2022). Aquistore project webpage. <https://ptrc.ca/projects/co2-eor-and-storage/aquistore>

33 SaskPower (2022). Boundary Dam project webpage. <https://www.saskpower.com/Our-Power-Future/Infrastructure-Projects/Carbon-Capture-and-Storage/Boundary-Dam-Carbon-Capture-Project>

34 e.g., CERT Systems Inc., Carbin Minerals

Figure 5. Snapshot of Canada's growing carbon management sector from coast to coast, as of summer 2023

Canada: A Carbon Management Snapshot – Summer 2023



Strong enabling policy and regulatory environment

Canada has consistently been ranked as having one of the most enabling policy and regulatory environments for carbon management adoption thanks to both federal and provincial policy and regulatory frameworks.^{35,36} The

federal government's introduction of an economy-wide price on pollution is a key measure that improves the economics of carbon management projects. Based on the jurisdictional authorities in Canada, provinces own their subsurface resources—including the “pore space” underground where CO₂ will be stored—and hold primary

35 Only 5 countries rank in the highest category—Australia, Canada, Norway, the UK, and the US—as per GCCSI's 2018 Carbon Capture and Storage Readiness Index. This is supported by analysis from the Global CCS Institute, as well as by groups such as the Oil and Gas Climate Initiative and the Boston Consulting Group.

36 IEA (2021). Legal and Regulatory Frameworks for CCUS. <https://www.iea.org/reports/legal-and-regulatory-frameworks-for-ccus>

responsibility for regulating CCUS activities. Alberta, Saskatchewan, and British Columbia have regulations in place to support safe and permanent geological CO₂ storage. These regulations cover pore space tenure acquisition, project permitting, management of long-term liability for CO₂ storage, as well as measurement, monitoring, and verification requirements. In Alberta's CO₂ storage hubs funding competition, the initial projects approved reflect a strong emphasis on Indigenous partnerships, which has been lauded as a key step in ensuring that Indigenous rights are reflected as this emerging sector is established. Other provinces, such as Manitoba, Ontario, and Nova Scotia, are taking steps towards developing enabling frameworks for CO₂ storage.

Enabling policies, regulations, and investment tools

Canada has a robust policy and regulatory environment, along with strong investment tools that support carbon management deployment, including:

- Canada's price on pollution, currently \$65/t, rising to \$170/t in 2030, to incentivize innovation, including the development and deployment of carbon management technologies
- Refundable CCUS Investment Tax Credit (ITC), valued at \$3.1 billion over the first 5 years, and around \$7.6 billion up to 2030, for projects that enable permanent CO₂ storage
- \$319 million over 7 years for RD&D to advance the commercial viability of emerging carbon management technologies
- Strategic Innovation Fund Net Zero Accelerator, with \$8 billion in funding to help companies reduce emissions and sustainably grow their business
- Canada's GHG Offset Credit System Regulations, which includes a protocol for direct air carbon dioxide capture and sequestration (DACCS) that is under development to further incentivize permanent storage opportunities
- The Canada Infrastructure Bank (CIB) invests in CCUS infrastructure projects, including through its Project Acceleration funding for front-end engineering and design (FEED) capital expenditures
- The Clean Fuel Regulations, which came into force in June 2022 and include CCUS-related opportunities for credit creation
- Other complementary measures under development, such as the Oil and Gas Emissions Cap and the Clean Electricity Regulations
- The Canada Growth Fund, totalling \$15 billion, will offer investment tools designed to address risk and accelerate private sector investment in the carbon management sector, such as contracts for differences

See Annex B for additional details on the federal policy and regulatory framework.

Economic opportunities for carbon management in Canada

Carbon management plays a critical role in advancing progress towards Canada's 2030 climate targets and enabling a prosperous, net-zero economy by 2050. In addition to enabling emissions reductions, carbon management is also a tremendous economic opportunity. Canada has what is needed to attract international investment in the sector and leverage its expertise to strengthen exports, boost inclusive economic growth, and create high-quality jobs. Given Canada's vast geological storage resources, this includes potential future opportunities for carbon removal facilities in Canada to advance emissions reduction goals. The emerging sector also presents opportunities to embrace new approaches to partnerships with Indigenous Peoples that are being seen across other natural resource sectors, which boosts the competitiveness of projects and can help advance economic reconciliation.

In addition to enabling emissions reductions, carbon management is also a tremendous economic opportunity.

International investment attraction

Canada can offer project investment opportunities that have a competitive cost per Mt of CO₂ reduction, as well as vast CO₂ storage potential. Public funding and trade promotion of Canadian carbon management technology companies have already helped pave the way for international investment.

Industry commitment to net zero is also increasing, along with investment and collaboration to advance the technologies needed to achieve it. For example, under the Glasgow Financial Alliance for Net Zero, 550 of the world's leading financial institutions, managing a combined US\$150 trillion, have committed to reduce their financed emissions in line with reaching net zero by 2050.³⁷ Leading private standards such as the Science-Based Targets Initiative require value-chain emissions to be reduced by approximately 90%, and only allow residual emissions to be neutralized by permanent carbon removal before a corporation can claim achievement of their net-zero targets.³⁸ This strong signal for ESG (environmental, social, and governance) performance improvement can help attract investment in Canada and create opportunities for Canadian SMEs to work with firms looking to adopt carbon management solutions worldwide.

³⁷ Carney, Mark (2022). *Remarks: Climate Finance in a Polycrisis Era*, 9/11/2022

³⁸ Science-Based Targets Initiative (2021). *SBTi Corporate Net-Zero Standard*

Sustainable jobs and clean growth

The global carbon management sector represents a multi-billion dollar and fast-growing global market opportunity. The IEA projects that US\$160 billion of cumulative investment in CCUS technologies is needed globally by 2030—signifying a rapidly expanding market for related technologies and services. New industries associated with carbon management, including hydrogen, negative emissions, and CO₂ utilization, can provide an increasingly significant source of export and economic growth.³⁹ Commercial development in these adjacent industries is accelerating quickly. Canadian carbon management companies, such as Svante, CarbonCure, and Carbon Upcycling are already expanding their operations outside of Canada and are considered world leaders in their respective technology solutions. Another leading technology provider founded in Canada, Carbon Engineering, has entered into a purchase agreement to be acquired for CAN\$1.48 billion (US\$1.1 billion) by Oxy Low Carbon Ventures; Carbon Engineering's research and development activities and Innovation Centre will remain in Squamish, British Columbia.



The near-term clean growth opportunities from advancing carbon management in Canada bring the potential to create and retain jobs in a variety of sectors across the country. For example, the economic benefit of 3 large-scale carbon capture and storage (CCS) projects in Canada could lead to an increase of \$2.7 billion in GDP based on a 4-year construction and development timeframe.⁴⁰ The IEA estimates that approximately one to five jobs are created per million dollars of capital spending on CCUS technologies.⁴¹ Existing large-scale projects in Canada, such as the Alberta Carbon Trunk Line (ACTL) system and the Shell-operated Quest CCS project, have directly employed thousands during their planning and construction, with estimates of thousands more indirect jobs. As the sector rapidly scales up, labour needs will grow immensely, bringing high-value employment opportunities in engineering and RD&D, along with jobs in construction, operation, and maintenance.

39 WEO (2020). Sustainable Recovery Report.

40 International CCS Knowledge Centre (2020). *Incentivizing Large-Scale CCS in Canada*. <https://ccsknowledge.com>

41 Ibid.

Federal priorities to promote a robust carbon management sector in Canada

For Canada to fully seize the opportunity and continue its global leadership in carbon management, accelerated and coordinated action is needed across the public and private sectors. The Government of Canada's actions are guided by 5 key priority areas:

- 1) Accelerating innovation and RD&D;
- 2) Advancing policies and regulations;
- 3) Attracting investment and trade opportunities;
- 4) Scaling up projects and infrastructure;
- and 5) Building partnerships and growing inclusive workforces.

This section outlines the 5 federal priority areas in greater detail, including actions the Government of Canada has already taken, and next steps to capitalize on the progress made to date.

1. Accelerating innovation and RD&D

Objectives

Develop, scale up, and improve the commercial viability of carbon management technologies across sectors, advance the geological science required to further quantify and develop Canada's CO₂ storage potential, and inform future regulatory development.



To develop and deploy carbon management technologies on the scale required to achieve net-zero emissions in Canada by 2050, industry, government, and research institutions must work together to accelerate innovation that supports technology development, scale-up, piloting, demonstration, and de-risking across different sectors, applications, and stages of development.

In the near-term, deployment of higher-readiness technologies will be required to get the projects and supply chain in place to deliver emissions reductions that help Canada meet its 2030 climate target. In parallel, key lower- and medium-readiness carbon management applications in

cement, iron and steel, chemicals, and DAC require advancement through piloting and demonstration at large and commercial scales to be ready for large-scale deployment beyond 2030.

Strategic support across the innovation continuum will work to advance the full commercialization of mature technologies while scaling up emerging approaches. Targeted early-stage and foundational support will advance new technologies and applications as support for large-scale deployment and market development expands demand for innovative carbon management technologies and services.

What the Government of Canada is doing

Natural Resources Canada has been a leader in carbon management research, development, and demonstration, working in coordination with domestic and international partners.

Public funding for RD&D is critical to incentivize clean technology development and cost reductions, helping to drive greater private sector investment, particularly in later stages of development and commercialization. This is why, in Budget 2021, the Government of Canada announced an investment of \$319 million over 7 years

to improve the commercial viability of CCUS technologies through external and federal RD&D activities delivered by Natural Resources Canada (NRCan).

NRCan is funding a range of innovation priorities, including earlier-stage RD&D activities across the CCUS value chain. Funding has also focused on front-end engineering and design (FEED) studies to support demonstrations of novel CCUS technologies and first-of-kind deployment projects in hard-to-decarbonize industries or of DAC facilities. These FEED studies help address uncertainty about technical and financial risks to support a final investment decision.

Other federal support through Sustainable Development Technology Canada, the Strategic Innovation Fund—Net Zero Accelerator, and the National Research Council of Canada’s Industrial Research Assistance Program can help innovative carbon management firms commercialize their technologies through access to capital, as well as access to strategic advisors, incubators, and accelerators. The Canadian CCUS Research and Technology Network, launched in fall 2022, serves to connect technology innovators and industry to organizations providing expertise with the facilities and equipment to help demonstrate, scale, and validate technologies.⁴²

⁴² Carbon Management Canada. <https://cmcghg.com/facilities-activities/canadian-ccus-research-and-technology-network/>

Complementary to external RD&D projects, federal scientists across the Government of Canada's research laboratories are working on R&D activities that contribute to technology advancement and knowledge development, including work on CO₂ storage and biomass carbon sequestration. Federal science also supports the development of codes and standards to enable safe and efficient deployment of carbon management solutions. This work is helping to create reliable, publicly available data, with modelling tools also supporting techno-economic analysis and LCA.

Canada is a leader in advancing international collaboration on carbon management, including through the Clean Energy Ministerial (CEM) CCUS Initiative, the Mission Innovation (MI) Carbon Dioxide Removal Mission that Canada co-leads, and more recently, the Carbon Management Challenge—a joint effort and call to action launched by the US at the April 2023 Leaders' meeting of the Major Economies Forum on Energy and Climate.⁴³ Through these partnerships, Canada will continue to advance international discussions across the full innovation spectrum of carbon management solutions.

Advancing foundational science to help with decision-making and regulatory development for emerging carbon management approaches is another key area of importance. For instance,

there is growing domestic interest in ocean-based CDR, but foundational scientific research is required to better understand the potential benefits and risks of these approaches.

What's next

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Advance research, development, and demonstration for early-stage CDR technologies; lower CO₂ capture costs; advance CO₂ utilization opportunities; and develop codes, standards, and geotechnical mapping across Canada.

Canada has an opportunity to build on its early leadership as an innovator of carbon management technologies by continuing to advance RD&D of emerging applications that have the highest potential to contribute to emissions mitigation and removal efforts. The next generation of capture technologies, including non-solvent-based technologies, aims to increase efficiency and reduce energy use to improve capital and operating costs. Further support is required for field demonstrations to scale up and commercialize these solutions, thus ensuring their readiness and availability to supply growing markets.

Further support is also needed to advance mid- and high-readiness technologies to achieve first-of-their-kind commercial scale applications, with priorities such as industrial capture

⁴³ <https://www.whitehouse.gov/briefing-room/statements-releases/2023/04/21/chairs-summary-of-the-major-economies-forum-on-energy-and-climate-held-by-president-joe-biden-2/>

applications, modular technologies, facilities with the potential for net-negative emissions (e.g., DAC, BiCRS, and enhanced mineralization), and permanent sequestration solutions.

The growth of Canada's carbon management sector can be further supported by expanding the availability of reliable and publicly accessible data to support the innovation system. This includes modelling tools like techno-economic analysis and LCA to inform further RD&D, policy, adopter uptake, and accurate carbon accounting. To enable continued growth of the sector, the Government of Canada will continue to advance geological science to help identify and quantify domestic storage potential and support the safe and permanent storage of CO₂.

2. Advancing policies and regulations

Objectives

Ensure evidence-based regulatory frameworks underpin safe and responsible development of carbon management technologies; take a collaborative approach that recognizes federal and provincial/territorial responsibilities; and work with global partners to advance codes and standards that promote international alignment and evolve as the carbon management industry grows.

The Canadian carbon management business environment must be globally competitive to attract the level of investment needed to achieve its emissions reduction potential. Global companies can select where to invest in carbon management, and this decision is often determined by the policy and regulatory environment of a jurisdiction. To strengthen Canada's attractiveness as an investment destination, policies should aim to provide certainty, transparency, and durability, recognizing that carbon management projects are capital-intensive and require long-term investment decisions.

At all levels of government, it will be critical to enact, maintain, and enhance stable, simple, and predictable policies and regulations to incentivize carbon management development and investment. Provinces hold much of the responsibility for regulating carbon management activities (e.g., requirements for monitoring and oversight of CO₂ geological storage). However, there are federal responsibilities for certain aspects. The Canada Energy Regulator, for instance, has responsibilities to regulate cross-border (interprovincial and international) CO₂ transport by pipeline. Under the *Impact Assessment Act*, certain projects could trigger a federal impact assessment. In the marine environment, the *Canadian Environmental Protection Act, 1999* will apply for environmental aspects of CO₂ storage activities.

Further research and engagement are needed before offshore activities on Canada's east and west coasts can take place. As Canada does not yet have a comprehensive regulatory framework specific to offshore carbon management, offshore CO₂ capture and storage projects would require legislative changes and regulatory development, as well as further foundational science.

Alignment of international standards could improve confidence for industry and investors as the global carbon management industry grows. The International Organization for Standardization and Canada's CSA Group are advancing standards for CCUS technologies, including standardization of design, construction, operation, risk management, quantification, and monitoring and verification.⁴⁴

Consideration of incentives for CDR can help enable and accelerate the deployment of measures that achieve negative emissions. Supporting the development of an international carbon market and trading system will also be important to enable the supply and demand for CDR projects that deliver carbon removal credits.

What the federal government is doing

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Canada has a well-aligned suite of investment tools, incentives, and regulatory frameworks designed to work together to add value to carbon management, support investor certainty, and incentivize early adoption.

The Government of Canada is continuously seeking opportunities to strengthen federal-provincial-territorial collaboration to ensure Canadians across the country can reap the benefits from the transition to a net-zero economy by 2050. Canada's 2030 Emissions Reduction Plan outlines climate policies to enable Canadian investments in clean energy technologies that are needed to achieve Canada's climate targets. Late in 2022, NRCan launched the Regional Energy and Resource Tables, a collaborative initiative supported by joint partnerships between the federal government and several provincial and territorial governments, as well as formal collaboration with Indigenous partners and key stakeholders. It aims to align priorities, funding and financing opportunities, as well as policy and regulatory approaches on a regional basis to accelerate economic activity and sustainable job creation towards a net-zero economy.

⁴⁴ <https://www.iso.org/committee/648607.html>

The Government of Canada has taken crucial steps to support the development of a positive policy environment for carbon management. Canada has an economy-wide carbon pricing system with a benchmark price across the country. This clear price signal, combined with other economic and climate policies and incentives, work together to push in the same direction to support carbon management development and deployment. Alongside rising carbon prices, increasingly stringent emissions standards—such as the Clean Electricity Regulations, Clean Fuel Regulations, and the emissions cap for the oil and gas sector—will further encourage adoption of carbon management technologies. To support access to capital for carbon management projects, the federal government introduced the refundable CCUS ITC, valued at \$3.1 billion over the first 5 years. The CCUS ITC will be available for investments from 2022 to 2040, with rates decreasing after 2030 to incentivize early investment. The \$15 billion Canada Growth Fund will also catalyze private investment to support the rapid deployment of carbon management projects through tools including carbon contracts for differences and project financing.

To make carbon pricing even more predictable and to support investments to build a competitive clean economy, the Government of Canada will consult on the development of a broad-based approach to carbon contracts for differences that would

complement contracts for difference offered by the Canada Growth Fund. A comprehensive list of enabling federal programs, policies, and regulations is detailed in [Annex B](#). In addition to federal measures, actions taken by provincial and territorial governments, including through partnerships and joint investments with the federal government, are essential to strengthening the policy and investment environment for developing Canada's carbon management sector.

What's next

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Continue an adaptive approach to support the carbon management industry as it grows, contribute to market demand for low-carbon products through government procurement, and continue to support the development of codes, standards, and regulations to enable the safe deployment of carbon management solutions.

Federal action will continue to focus on durable, predictable, and enabling policy measures for carbon management as a key component of Canada's broader climate change policy. Through collaboration with provinces and territories, including through the Regional Energy and Resource Tables, the Government of Canada will emphasize the importance of complementarity with provincial and territorial carbon management-related policies and regulations, aim to reduce jurisdictional overlap, and address gaps.

As noted, Canada does not have a comprehensive regulatory framework specific to CO₂ storage in areas of federal jurisdiction (i.e., federal lands and offshore). Further assessment is required to determine the best path forward to address these gaps.

It is also important to continue federal support for emerging markets through demand-side mechanisms,

such as the Government of Canada's upcoming Buy Clean initiative and the procurement of low-carbon products produced by industries that use GHG mitigation technologies or leverage CO₂ utilization. Federal procurement of CO₂-utilization products and CDR credits, once available, could help stimulate emerging markets while offsetting residual federal GHG emissions on the Government's path to net zero.

Carbon Engineering's pioneering DAC innovation—British Columbia (BC)

Founded in Squamish, BC, Carbon Engineering is a world-leading innovator in Direct Air Capture (DAC). Their technology captures CO₂ directly from the atmosphere, which can then be permanently stored underground or transformed into low-carbon synthetic fuels.

The Governments of Canada and British Columbia are early supporters of the company's technology—with funding of over \$30 million towards pilot-scale testing of CO₂ capture and conversion into synthetic fuels—and an Innovation Centre



Carbon Engineering's Innovation Centre in Squamish, BC – Carbon Engineering

for technology development (both in Squamish). The British Columbia government is also supporting the preliminary engineering and design of a commercial AIR TO FUELS™ plant in Merritt, BC, being developed by Carbon Engineering's Canadian plant development partner, Huron Clean Energy.

Continued development and alignment of international standards on carbon management would also improve confidence for industry and investors as the global carbon management industry grows. The Government will continue to support international efforts to address governance gaps and

establish global standards for accounting and the measurement, reporting, and verification of emissions. Standards for conducting life-cycle assessments and Environmental Product Declarations will also be important to advance the CO₂-based products industry.

3. Attracting investment and trade opportunities

Objectives

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Continue expanding Canada's opportunities to capitalize on foreign investment as international competition grows.

Carbon management represents a multi-billion dollar and fast-growing global market opportunity. The IEA projects that US\$160 billion in cumulative investment is needed globally by 2030, a target that looks to be in reach with recent CCUS project announcements pushing annual investment as high as US\$40 billion by 2024.⁴⁵ Within the US alone, the National Petroleum Council projects required investments of over US\$680 billion in CCUS over the next 25 years. These projections signify a rapidly expanding market for carbon management technologies in North America and around the world. New industries associated with carbon management (low-carbon hydrogen, negative emissions, CO₂ utilization) are expected to provide an increasingly significant source of export and economic growth. For instance, market growth for CO₂-based products has been forecasted to reach US\$1 trillion per year by 2030.⁴⁶

Canada is a leader in carbon management technologies, and given its relatively small domestic market, Canadian clean technology firms are looking to enter highly competitive international markets. Canada has the expertise, regulations, and resources needed to attract significant international investment, particularly as public and private demand for emissions reductions and responsible investment solutions (e.g., ESG performance) are intensifying globally. As the carbon management industry continues to grow globally, Canadian firms need to be positioned and supported to take advantage of these international growth opportunities to maximize the potential of turning Canadian technologies into global solutions, in addition to providing domestic market opportunities.

Globally, over \$160B in cumulative investment is needed in CCUS by 2030 to support its role in achieving our climate target.

⁴⁵ IEA (2022). World Energy Investment. <https://www.iea.org/reports/world-energy-investment-2022>

⁴⁶ CMC, ACTIA, Pembina Institute (2020) The Carbontech Innovation System in Canada: An evaluation of national carbon conversion technology development competitiveness.

Heidelberg Materials' World-Leading Carbon-Neutral Cement Plant — Alberta (AB)

The cement sector is responsible for around 7% of global CO₂ emissions. Capturing and storing CO₂ from cement production is a critical technology to reduce industrial emissions. Heidelberg Materials—one of the world's largest integrated manufacturers of building materials with an ambitious CO₂ reduction strategy—has signed a Memorandum of Understanding with the Government of Canada to support a first-of-its kind carbon management project in North America.

The partnership intends to support the company's \$1.36 billion project to build a full-scale CCUS and combined heat and power system at its Edmonton cement facility. This CCUS system will enable the company to produce the



Heidelberg Materials' cement plant in Edmonton, AB – Heidelberg Materials

world's first net-zero cement through the capture and transportation of CO₂ for subsequent permanent storage, reducing GHG emissions by up to one million tonnes annually.

This project would be a major step forward in establishing Canada as a global leader in the production of low-carbon concrete and supports actions outlined in Canada's Roadmap to Net-Zero Concrete by 2050—spearheaded by a joint government-industry working group co-led by the Cement Association of Canada and the Government of Canada.

Canada can offer project investment opportunities that have a competitive cost per tonne of CO₂ sequestration. Western Canada, in particular, has a vast resource potential for CO₂ storage, as well as midstream infrastructure. Canada's strong forestry, agriculture, and minerals sectors also offer promising opportunities for emerging carbon management solutions. Capital investment from foreign strategic investors can be an important driver for the development of Canadian

carbon management projects, as well as technologies and their subsequent integration into global value chains.

As global investors set their sights on the opportunities offered by carbon management, ongoing government engagement and support is critical to maintain Canada's competitiveness, especially in light of recent movement by the US to grow its own domestic carbon management industry. The *Inflation Reduction Act (IRA)* passed

in August 2022 provided at least US\$369 billion in new investments to reduce emissions through tax credits and other financial incentives aimed at making clean energy options more accessible. Alongside the 2021 *Infrastructure Investment and Jobs Act (IIJA)*, the 2 pieces of legislation contain provisions that give rise to several measures to accelerate the development and deployment of carbon management technologies and related infrastructure in the US through tax incentives, loans, grants, and investments in RD&D.

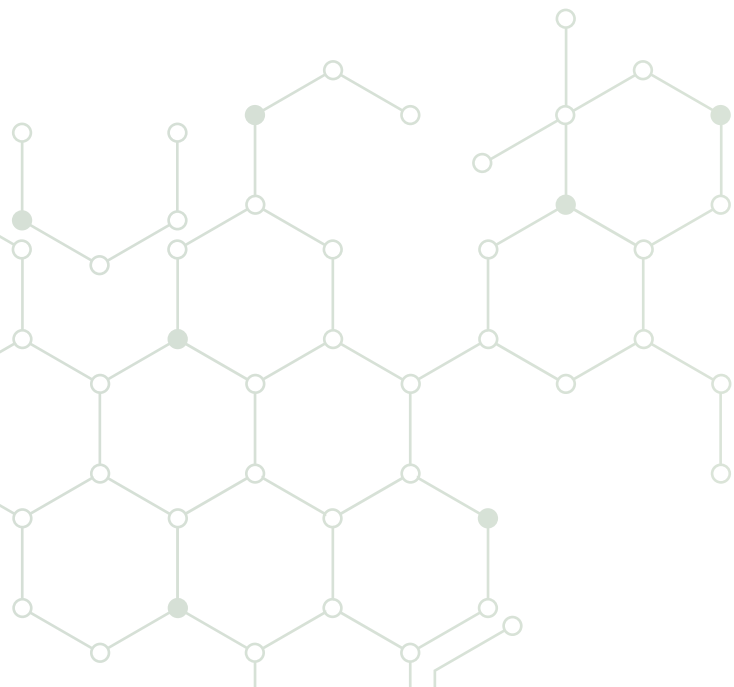
While the new measures introduced by the US and the European Union pose a challenge to Canada's own carbon management sector, Canada continues to develop a suite of measures to remain competitive, including direct investments in RD&D and deployment projects, investment tax credits, support for workers, demand-side incentives, and federal-provincial/territorial dialogues, all built on the foundation of Canada's climate plan that puts a rising price on pollution.

What the Government of Canada is doing

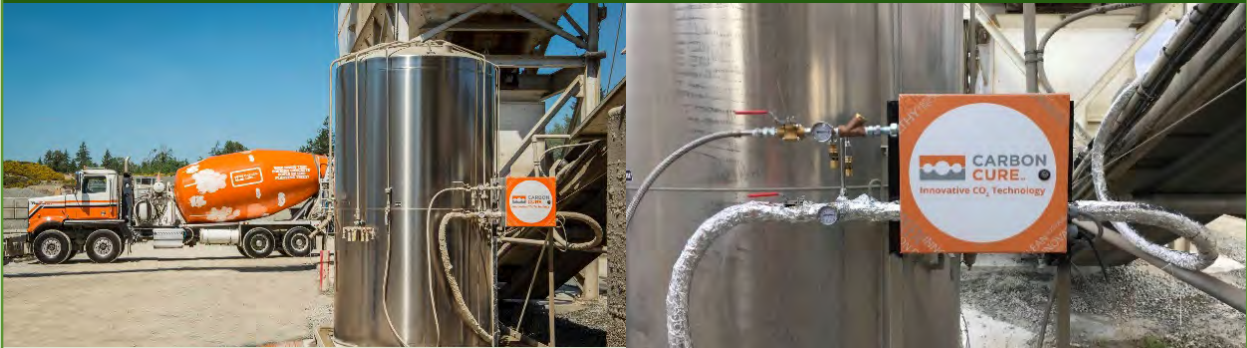
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Canada's suite of federal policy and programming supports work alongside other federal measures and provincial/territorial policies, resulting in a competitive investment environment across Canada.

Public funding and trade promotion of Canadian carbon management technology companies help secure Foreign Direct Investment (FDI). Canada's Trade Commissioner Service (TCS), through its global network, supports Canadian carbon management companies in their export-oriented objectives and efforts to commercialize carbon management technologies in key global markets. This work includes showcasing technologies and solutions to foreign buyers, strategic partners, and foreign investors and facilitating partnerships between Canadian researchers, innovators, and foreign partners.

Public funding and trade promotion of Canadian carbon management technology companies help secure Foreign Direct Investment.



CarbonCure's green concrete solution — Nova Scotia (NS)



CarbonCure's proprietary system and CO₂ tank installation at a concrete plant.

Founded in Halifax in 2012, CarbonCure uses its technology to inject CO₂ into its concrete mix during production to reduce CO₂ emissions via carbon mineralization, while improving the strength of the mix. With 650+ systems sold across 16 countries and 5 continents, over 3 million truckloads of CarbonCure CO₂-based concrete mixes have supplied a broad range of sustainable construction projects globally.

CarbonCure's cutting-edge technology has garnered global recognition such as the Cleantech 100 Hall of Fame (as a Global Cleantech 100

company for 7 consecutive years), a 2022 CNBC Disruptor 50 List Company, and the NRG COSIA Carbon XPRIZE Winner (natural gas track). In addition to receiving support from the Government of Canada and BDC Capital, the company is backed by investors such as Amazon, Microsoft, Breakthrough Energy Ventures, Shopify, and Mitsubishi Corporation.

In early 2023, CarbonCure's demonstration project with Central Concrete and Heirloom achieved what is believed to be the first-ever concrete storage of atmospheric CO₂ captured by direct air capture.

An important characteristic of Canada's carbon management policy environment is the ability to take advantage of benefits from multiple policy measures at once. Federal measures are intended to be "stackable" or combined with other federal measures, including Clean Fuel Regulation credits, incentives from the Canadian Infrastructure Bank, as well as provincial policies, which together are anticipated to help spur carbon management adoption (reaching a total of over 16 Mt/year captured by 2030).⁴⁷

What's next

Continue to incentivize carbon management investment and use government procurement policies to create supportive lead markets for carbon management-enabled products.

For Canada to remain competitive in the growing global carbon management sector, the Government will continue to advance carbon management-specific policies and incentives that help level the playing field with other countries in terms of capital and operating support, as well as revenue support (e.g., carbon pricing/credits, contracts for differences). This includes dedicated efforts to pull high-readiness technologies into commercial deployment via complementary and stackable government measures at timescales that bring certainty to

future revenue streams for the carbon management value chain, and which enable private investment for large-scale deployment projects.

Canada will continue building on its successes and promote Canada's carbon management opportunities to attract foreign direct investment. With a robust policy framework and competitive incentives, Canada is well positioned to further attract investment, both in support of advancing emerging technologies, and to support the domestic capacity to deliver CO₂ sequestration as part of climate action. The Government can also leverage comprehensive free trade agreements and increase bilateral cooperation with key partners, engage in international standards development, and promote the mutual recognition of carbon management norms and standards.

Public procurement of low-carbon products is another policy tool that can help accelerate the adoption of carbon management technologies by supporting the development of a robust market for carbontech products with superior emissions performance that is not yet properly valued. That is why the Government of Canada is also advancing activities under its Buy Clean Initiative, providing a policy signal that can stimulate carbon management technologies that reduce the carbon

⁴⁷ Government of Canada (2022). Eighth National Communication and Fifth Biennial Report. <https://www.canada.ca/en/environment-climate-change/services/climate-change/greenhouse-gas-emissions/fifth-biennial-report-climate-change-summary.html#toc8>

content in building materials (i.e., embodied carbon). Calculating and comparing the embodied carbon of products will require robust life-cycle assessment methodologies, which has been identified as an area for continued federal action. Other mechanisms, such as advance market commitments for GHG removal credits, may be considered to signal demand for CDR, which may in turn stimulate private investment and encourage other organizations to make similar commitments.



4. Scaling up projects and infrastructure

Objective

Ensure Canada develops and deploys the carbon management projects and infrastructure needed to achieve targeted emissions reductions.

The related infrastructure expansion to meet the evolving capacity needs of the carbon management sector across the value chain—CO₂ capture, transportation, utilization, and storage—is critical and requires continued government support at all levels. Potential for Indigenous partnerships is present across all areas of the value chain and are already being recognized as important opportunities for industry to effectively advance projects while contributing to economic reconciliation. Indigenous communities are already active in advancing carbon management opportunities, such as in Huron Clean Energy's first-of-its-kind Electro Fuels Project in Merritt, BC, where the Upper Nicola Band has an equity partnership and land-lease arrangement with Huron Energy that will continue to benefit the community and create economic opportunities.⁴⁸

⁴⁸ Government of BC. (2021). Province investing in proposed world-leading clean fuels plant in Merritt. <https://news.gov.bc.ca/releases/2021EMLI0063-001970>

The continued growth of Canada's carbon management sector must be inclusive to meet its full economic potential, with an emphasis on meaningful consultation with Indigenous communities throughout all stages of major projects. This would ensure equitable access to jobs, training, education, and leadership opportunities for Indigenous Peoples, and guarantee that First Nations, Métis, and Inuit communities gain long-term sustainable benefits, such as equity ownership in carbon management firms and projects. As with the broader transition to a cleaner economy, Canada's growing carbon management sector presents an opportunity to ensure Indigenous women and 2SLGBTQQIA+ people are included in—and benefit from—the carbon management value chain.

Most CO₂ in the carbon management value chain will need to be permanently stored in geologic reservoirs, mineralized into rock, or locked away in long-lived products, signalling a need for significant global expansion of CO₂ transport and storage capacity.⁴⁹ Permanent geological storage site development is determined by the suitability of the geology, and is most desirable where emission sources are nearby and concentrated, given that the cost of CO₂ transport by rail, pipe, or ship increases with distance.

Carbon management hubs, where shared CO₂ transportation infrastructure links clusters of emitting facilities with CO₂ storage sites or CO₂ utilization opportunities, are a leading model within the carbon management sector. These hubs help spur innovation, enable new business models, reduce barriers to entry for new technology adopters, and encourage the development of cost-effective carbon management technologies at scale. Economies of scale, standardization, and shared facilities can help drive down costs and decrease commercial risk for all stakeholders. Developing infrastructure in a targeted way, such as building transport and storage infrastructure to meet anticipated future capacity needs, can lay a foundation for adding future capture projects to a network that maximizes benefits for all hub participants by reducing future CO₂ transportation and storage costs. For example, the 240-kilometre Alberta Carbon Trunk Line (ACTL) pipeline, which has been operational since 2020, is one of the largest-capacity CO₂ transportation pipelines in the world and provides the infrastructure to connect CO₂ sources with storage. It currently transports 1.6 Mt CO₂ annually from 2 industrial emitters and in September 2023, it was announced that a new extension, the Edmonton Connector, will expand the ACTL network to collect captured CO₂ from

49 IEA (2023). Energy Technology Perspectives. <https://www.iea.org/reports/energy-technology-perspectives-2023>

industrial facilities, including the Air Products Net-Zero Hydrogen Energy Complex.⁵⁰

Collaboration among players in one region can also make more efficient use of shared operations, and technical, administrative, and commercial resources. Given the cost, size, and intended lifespan of hubs, it is crucial that they be developed in a timely and predictable manner that allows potential users to incorporate their availability into future planning. For example, the Pathways Alliance, representing Canada's 6 largest oil sands companies and 95% of Canada's oil sands production, is currently undertaking a regional collaborative approach to develop one of the world's largest industrial carbon management facilities in northern Alberta. This foundational project proposes a CCS network that would capture CO₂ from more than twenty oil sands facilities, transport it to a hub for safe underground storage, and make it available to other industries in the region interested in capturing and storing CO₂. Similarly, the Open Access Wabamun Carbon Hub will see Enbridge enter into a 50/50 development and ownership model with Indigenous partners in Alberta to advance an integrated sequestration hub west of Edmonton.

Canada's carbon management future will likely include a combination of large low-carbon industrial hubs that can include various technology applications, such as low-carbon hydrogen production, carbon capture and use at cement production facilities, smaller distributed hubs, and stand-alone carbon management projects—each driven by location and project specifics, and market forces. Large-scale “anchor” projects, typically capturing over 1 Mt CO₂ per year, can help spur hub development. Hubs are often planned in industrial zones, making overall acceptance, planning, and permitting processes easier. In many instances, Indigenous communities have expressed interest in partnerships to continue advancing carbon management projects in their territories.

Hubs also deliver local economic development benefits, as they often provide additional economic opportunities to industrial areas. This may help preserve and create high-quality jobs, while generating new opportunities for industrial clusters. Co-deployment of carbon management with other technologies can stimulate adoption, enable greater emissions reductions, and encourage innovation spillovers.

50 Wolf Midstream Canada LP (2023). Wolf Midstream to Extend Alberta Carbon Trunk Line into the Edmonton Region, Enabling Large-Scale Emissions Reduction. <https://www.newswire.ca/news-releases/wolf-midstream-to-extend-alberta-carbon-trunk-line-into-the-edmonton-region-enabling-large-scale-emissions-reduction-872102700.html>

Air Products' first-of-a-kind net-zero hydrogen energy complex — Alberta

Low-carbon hydrogen can be produced from natural gas when combined with Carbon Capture and Storage. Canada's early leadership in carbon management includes the Shell-operated Quest Project, and the Sturgeon Refinery linked to the Alberta Carbon Trunk Line.

Air Products is building on Canada's carbon management expertise and infrastructure to produce low-carbon hydrogen. The company is building a first-of-a-kind facility in Edmonton — deploying autothermal reforming (ATR) hydrogen production technology using natural gas, while capturing 95% of the CO₂ for storage underground. This innovation is part of Air Products' Net-Zero Hydrogen Energy Complex, which will also feature a hydrogen-fuelled power plant and a world-class liquefaction facility to access new markets



Air Products hydrogen production facility near Edmonton, AB.

and enable the transition of the transportation sector to zero-emission fuels. The complex is scheduled to start operations in 2024 and is supported by the federal and provincial governments:

- \$300 million from the Strategic Innovation Fund's Net Zero Accelerator (SIF-NZA) initiative
- Over \$160 million from the Alberta Petrochemicals Incentive Program (APIP)
- \$15 million from Emissions Reduction Alberta's Shovel-Ready Challenge



What the Government of Canada is doing

Working to support planning and decision-making for carbon management projects in Canada.

The Government is working to support carbon management infrastructure development to enable a robust domestic value chain. The Geologic Survey of Canada and NRCan's CanmetENERGY labs work to enhance knowledge and data on CO₂ storage and transport. CanmetENERGY has developed a Canadian CCUS Assessment Framework to provide open-source tools to guide the strategic advancement of carbon management across regions. These tools will help facilitate the planning of large-scale, integrated CO₂ transportation and storage infrastructure, supporting coordination among key stakeholders from industry, academia, and government.

The suite of federal supports for carbon management infrastructure has continued to expand in recent years, which is helping to stimulate private sector and provincial funding. This includes the Strategic Innovation Fund's \$8 billion Net-Zero Accelerator to support the decarbonization of Canada's largest industrial emitters, to scale up clean technology, and to accelerate Canada's industrial

transformation across all sectors, with a target of 23.5 Mt in GHG reductions per year by 2030.

Budget 2022 announced the expansion of the Canadian Infrastructure Bank's mandate to support the deployment of CCUS technologies and related infrastructure projects. The Canada Growth Fund will also complement these supports with tools designed to address risk and accelerate private sector investment in the sector.

The CCUS ITC, announced in Budget 2022 and enhanced in Budget 2023, will further help to drive near-term scale-up and investment in project and hub development, while ensuring Canada remains competitive in this sector. The CCUS ITC will only be eligible for projects in specific jurisdictions where provincial regulatory frameworks are in place to support the safe and permanent storage of CO₂. This currently includes Alberta, Saskatchewan, and British Columbia,⁵¹ with eligibility for other jurisdictions to be evaluated as regulatory frameworks advance.

As part of the global effort to scale up decarbonization technologies, Canada joined the First Movers Coalition in January 2023 as a government partner. This collaborative public-private initiative leverages the purchasing power of businesses to stimulate market demand for near-zero or zero-carbon

51 Details of the ITC will be confirmed with the Royal Assent of the CCUS ITC Legislation, anticipated in late 2023.

solutions and send a clear signal to industry to accelerate the transition to net-zero emissions.

Through the Regional Energy and Resources Tables, NRCan is working with provincial and territorial government counterparts on advancing work plans, some of which focus on carbon management. Indigenous partners and industry stakeholders are also contributing to these work plans, bringing together key actors to collaborate and support the advancement of infrastructure planning and large-scale project development.

What's next

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Work with the private sector to explore blended finance options and alternative financing tools to support strategic investments in key industrial sectors; spur large-scale projects; and advance hub development.

The Government will continue to collaborate with domestic and international financial institutions to support the financing of carbon management projects in a way that recognizes verified climate benefits and encourages clean economic growth opportunities. Dialogue with key financial institutions can explore blended finance options and alternative financing tools to support strategic investments in key industrial sectors

and to spur large-scale project and hub development, collaborating with private-sector initiatives aimed at decarbonization.

The Government will conduct further assessment of CO₂ storage potential, infrastructure needs, and carbon management techno-economics to support science and evidence-based decision-making as the carbon management industry grows and evolves. This includes continued federal research and collaboration to advance science and regulatory development in CO₂ storage options, including sub-seabed storage and cross-border geological basins. Federal action is also important to advance international discussions on techno-economic analysis and LCA frameworks, certification, and standards to support internationally verified GHG reductions and CDR.

High-potential carbon management hub locations have already been identified across Canada, with sites in Alberta and Saskatchewan ranking among the top in the world for immediate hub development.⁵² British Columbia also has clusters of emission sources, and like Saskatchewan and Alberta, has regulations in place to support carbon management development; however, most clusters of emission sources are far from potential CO₂ storage sites, so transport will be needed. Clusters of emissions in Ontario,

52 Oil and Gas Climate Initiative & Boston Consulting Group (2022). The CCUS Hub Search. <https://ccushub.ogci.com/ccus-hub-search/>

Quebec, and Atlantic Canada indicate potential for carbon management hub development, but policy, regulations, and storage opportunities need to be advanced.

Since carbon management hubs are best suited for regions where CO₂ storage and utilization opportunities are near clusters of high-emitting facilities, analysis of clusters of emitting sources across Canada were assessed as a starting point to determining potential hub locations. To maximize the value of infrastructure and promote a coordinated approach, NRCan and federal partners are working with other experts to further advance the Canadian CCUS Assessment Framework, which will support implementation of this Strategy.

5. Building partnerships and growing inclusive workforces

Objective

Build a diverse and inclusive workforce in the carbon management industry that leverages existing skill sets and offers new opportunities that contribute to the resilience and competitiveness of Canada's natural resources labour force.

Canada is home to a large and growing clean energy workforce, and carbon management presents a significant

opportunity for Canada to leverage its diverse labour market, contribute to climate solutions, and deliver high-quality employment. Historically, there has been little consideration of gender and diversity factors in research studies related to carbon management advancement, deployment, and market adoption. As such, there is a recognized need to better understand the current state of workforce diversity and inclusion in the emerging carbon management value chain.

It is important to specifically recognize the significance of Canada's commitment to reconciliation with Indigenous Peoples, including through the implementation of the *United Nations Declaration on the Rights of Indigenous Peoples Act* (UNDA).⁵³ Measures under the UNDA Action Plan include the importance of developing and implementing actions to increase the economic participation of Indigenous peoples and their communities in natural resource development. The Government of Canada is committed to working with Indigenous Peoples to build relationships founded in mutual respect, partnership, and recognition of rights, including Indigenous Peoples' participation, ownership, and decision-making related to sustainable natural resource development and deployment of clean technologies. Indigenous leadership and entrepreneurialism, Indigenous knowledge, and Indigenous-led projects will play a

53 Justice Canada (2021). Implementing UNDA. <https://www.justice.gc.ca/eng/declaration/index.html>

valuable role in Canada's emerging carbon management sector, which demonstrates the sector's potential in contributing to economic reconciliation.

Indigenous communities are already expressing interest in supporting the growth of Canada's carbon management sector, as they see opportunities to gain long-term sustainable benefits from economic development projects as participants and workers in project development and operations, and as project owners themselves. The Truth and Reconciliation Calls to Action also provide important guidance as the carbon management sector advances, including Call to Action 92—Business and Reconciliation, in which the corporate sector in Canada is called on to adopt UNDRIP as a reconciliation framework and to apply its principles, norms, and standards to corporate policy and core operational activities involving Indigenous Peoples and their lands and resources.⁵⁴ While some research has focused on Indigenous-led nature-based CDR opportunities,⁵⁵ additional research and engagement is needed to gather the perspectives and identify the interests of Indigenous communities regarding the opportunities offered by carbon management technologies.

What the Government of Canada is doing

The Interim Sustainable Jobs Plan and introduction of legislation; focus on the inclusion of labour considerations in the CCUS ITC, Clean Technology ITC, and Clean Hydrogen ITC rates; and expansion of the Indigenous Natural Resource Partnerships Program.

To support the development of this Strategy, the Government undertook more than a year of meaningful engagement with provincial and territorial governments, industry, innovators, academia, ENGOs, Indigenous organizations, the financial sector, and other interested Canadians. This engagement process highlighted the importance of the carbon management industry growing in an inclusive manner that respects Indigenous Peoples and equity seeking groups, inspires public confidence, and creates sustainable jobs across the country.

The 2022 Fall Economic Statement proposed that prospective businesses adhere to certain labour conditions to be eligible for the maximum investment tax credit rates for clean technologies and clean hydrogen, and Budget 2023 announced that labour conditions will also be applied to the

54 Government of Canada (2019). Delivering on Truth and Reconciliation Commission Calls to Action. <https://www.rcaanc-cirnac.gc.ca/eng/1524506030545/1557513309443>

55 Townsend and Craig (2020). Nature-based solutions: Indigenous-led conservation and carbon storage in Canada. <https://conservation-reconciliation.ca/ipcaresources/nature-based-solutions-indigenous-led-conservation-and-carbon-storage-in-canada>

CCUS ITC. These labour requirements will come into effect on October 1, 2023. Labour conditions will include paying prevailing wages based on local labour market conditions and ensuring that apprenticeship training opportunities are being created. This will help incentivize companies to support and create good jobs for the workers our economy relies on.

The expansion of NRCan's Indigenous Partnerships Office and the Indigenous Natural Resource Partnerships Program (\$100 million in Budget 2022) will also provide opportunities for Indigenous communities to partner and participate in all types of natural resource projects, including carbon management, and will support the readiness of Indigenous Peoples, communities, and businesses to actively partner and participate in carbon management projects.

Recognizing that with the right plan in place, the transition to a net-zero economy will create good, well-paying jobs for Canadians in every part of the country, the Government recently released the Interim Sustainable Jobs Plan. Through this Plan, the Government is announcing a federal accountability, transparency, and engagement framework to guide national efforts over time and to help ensure that all Canadians succeed in this era of net-zero aligned economic growth, including in the carbon management sector.

Recognizing that with the right plan in place, the transition to a net-zero economy will create good, well-paying jobs for Canadians in every part of the country, the Government recently released the Interim Sustainable Jobs Plan.

Following the release of this interim plan, proposed legislation was introduced that will require Sustainable Jobs Action Plans to be released every 5 years, beginning in 2025, to help guide and organize efforts to support a transition to a net-zero economy over time. These plans will aim to put in place measures to encourage growth in the net-zero economy and promote labour market readiness. Through updated Action Plans, these measures would be revised to address any identified gaps and adapt to the evolving net-zero transition. Future job growth to power the net-zero transition will come from new opportunities in the energy sector and beyond, including in the carbon management sector.

What's next

Identify workforce gaps and regional opportunities to foster diversity and inclusion in the carbon management sector, and advance Indigenous leadership and participation in the carbon management industry.

The Government of Canada will continue to ensure that the accelerated growth of the carbon management sector is guided by principles of inclusion, diversity, equity, and accessibility. Continued communication and engagement are important in ensuring a broader understanding of the potential of carbon management, and in supporting fact-based public confidence in the sector. A public that is more engaged in the development and deployment of carbon management solutions will be more poised to benefit from the opportunities of growing a globally competitive carbon management industry.

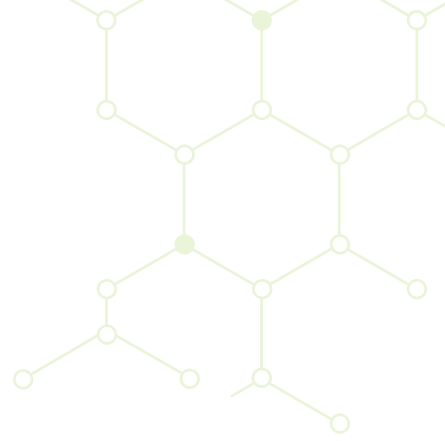
The Government will advance engagement with Indigenous organizations and stakeholders on the implementation of this Strategy, leveraging initiatives such as the Regional Energy and Resource Tables and the National Benefits-Sharing Framework to further explore

perspectives and opportunities linked to carbon management. The Government will take steps to ensure that the deployment of carbon management technologies remains people-centred and integrates local and Indigenous knowledge, and that these technologies are developed alongside communities and with respect for land rights.

Support for Indigenous and public engagement, including of underrepresented groups, not only raises awareness and public confidence in carbon management, but is also crucial in fostering a better understanding of equity, diversity, inclusion, and accessibility along the carbon management value chain. Meaningful engagement further identifies workforce gaps and regional opportunities, and suggests actions to promote diversity and inclusion to advance opportunities where carbon management can contribute to an equitable transition to a low-carbon future for workers and their communities. Indigenous participation can give rise to partnerships with communities, as is the case in Alberta, where First Nations and Métis communities have already begun to participate in carbon management projects.⁵⁶

⁵⁶ Radio-Canada (2022). Des groupes autochtones parient sur l'avenir du stockage du carbone. <https://ici.radio-canada.ca/nouvelle/1860368/environnement-premieres-nations-csc-petrole-emissions-carbone1>

Consultations with partners, stakeholders, and engaged Canadians



This Strategy builds on more than a year of significant engagement led by NRCan with a diverse range of groups, including provincial and territorial governments, Indigenous organizations, industry, technology innovators and adopters, infrastructure stakeholders, academia, environmental non-governmental organizations, the finance community, and other interested Canadians, with the goal of reflecting the various opportunities that carbon management technologies offer across regions and industrial sectors.

Partners and stakeholders have made it clear to the Government that an effective carbon management strategy should help ensure that the technologies, policies, regulations, and markets are in place so that carbon management technologies are available as part of the portfolio of low-carbon solutions needed to enable a prosperous, net-zero economy. Specific supports and measures for federal action identified through this engagement process include:

- Enacting, maintaining, and enhancing stable and predictable federal policies and regulatory frameworks to incentivize carbon



management technology development and deployment, provide clear policy signals, and help create a market and revenue streams;

- Working closely with provinces and territories on GHG emissions management, and to advance carbon management technology development and deployment, ensuring that policies and regulatory frameworks are complementary;
- Establishing GHG compliance mechanisms for carbon management technologies across jurisdictions, with management of CO₂ storage permanence and long-term liability;

- Fostering the development of a CO₂ transportation and storage network to enable commercial hubs for CO₂ storage within an integrated cross-border North American network;
- Advancing carbon management to support growth in clean energy priority areas (e.g., low-carbon fuels, electrification) and industry decarbonization, in tandem with sector-specific strategies and policies;
- Understanding and addressing social and environmental impacts of carbon management, and building on Canada's ESG leadership;
- Supporting Canada's leadership as a top innovator, adopter, and supplier of carbon management technologies around the world, including through trade promotion, investment, international science, and RD&D;
- Creating frameworks to account for life-cycle climate benefits of carbon products and storage strategies that are aligned with international carbon accounting frameworks;
- Helping to support land tenure regimes for the management and allocation of carbon sequestration (or pore space) rights to allow Canada to monetize its vast geologic storage capacity, enabling markets at home and potentially abroad; and
- Understanding the importance of workforce diversity and inclusion in the carbon management industry, and identifying measures to harness all talent representing Canada's diverse population.

While this Strategy is focused on federal priorities and actions, all levels of government have an important and complementary role to play in supporting the continued advancement of a carbon management sector in Canada.

Opportunities for carbon management across Canada will vary by region, based on industrial sector composition and geological resources. It will be critical for sub-national jurisdictions to continue taking a leadership role in developing regional plans based on their specific priorities and opportunities. Federal, provincial, and territorial governments are actively working together to advance regional opportunities, such as through a working group established by the Government of Alberta and the Government of Canada which is advancing cooperation on emissions reduction developments and other shared priorities.

As the carbon management sector continues to develop globally and within Canada, the breadth of activities is expected to grow across sectors and regions of Canada. Alberta and Saskatchewan continue to focus on deploying technologies that are essential to achieving Canada's emissions reduction goals. The Government of Alberta has committed over \$1.32 billion to support the deployment of carbon capture infrastructure, while the Government of Saskatchewan is looking to build on its early leadership in CO₂ utilization and storage through its provincial

CCUS strategic plan to drive private sector investment while supporting job creation and economic growth in industrial, manufacturing, and resource sectors.

The Governments of British Columbia, Manitoba, Ontario, Quebec, Nova Scotia, and Newfoundland and Labrador are also taking action in the carbon management space, aiming to leverage their own competitive advantages, whether these are rooted in their unique geology, innovative companies on the cutting edge of technology, or long-standing industry-related experience. British Columbia, Nova Scotia, and Newfoundland and Labrador have all identified several geological advantages in relation to carbon management development and deployment, including the Northeast B.C. region for carbon storage, the offshore Scotian Basin's world-class potential for carbon management in Nova Scotia, and the Newfoundland and Labrador offshore continental margins that have the potential to provide gigatonne-scale storage of captured CO₂.

Many provinces also have active R&D sectors, homegrown innovators in the carbon management space, and a history of highly skilled workforces in related sectors. British Columbia-based companies, such as Carbon Engineering and Svante, along with Nova Scotia-based CarbonCure, have garnered global attention and accolades for their pioneering technologies that will advance carbon management deployment around the world. Newfoundland and Labrador continues to explore opportunities to seize the potential of carbon management technologies, building on the extensive experience of government, industry, and generations of workers in the offshore oil and gas sector.

The contributions to this Strategy from provincial governments highlight the impressive progress being made across the country to advance a robust domestic carbon management sector.

Conclusion

As Canada transitions towards a net-zero economy by 2050, a broad suite of technologies will be needed to support the transformation of the way we produce and use energy and resources. Carbon management technologies will be an essential part of the solution and present a tremendous opportunity for clean and inclusive growth. Experts from the International Energy Agency, the International Panel on Climate Change (IPCC), and the Canada Energy Regulator recognize the importance of carbon management technologies to achieve reduce emissions. In its 2023 report, the IPCC indicated that the rate of deployment for carbon management technologies needs to significantly ramp up to limit global warming to 2° C instead of 1.5 °C and that further enabling conditions need to be put in place to do so.⁵⁷

To fully seize this opportunity, it is crucial for Canada to implement a strategy to continue advancing the development of a carbon management industry that supports high-value employment and a more sustainable economy, reduces emissions, and provides the technologies and services needed in a net-zero world. Carbon management is an enabler that can help Canada



accelerate the decarbonization of fuels and industrial processes, strengthen its competitiveness, and increase the value of our industries and manufacturing, while leveraging our existing resources and expertise.

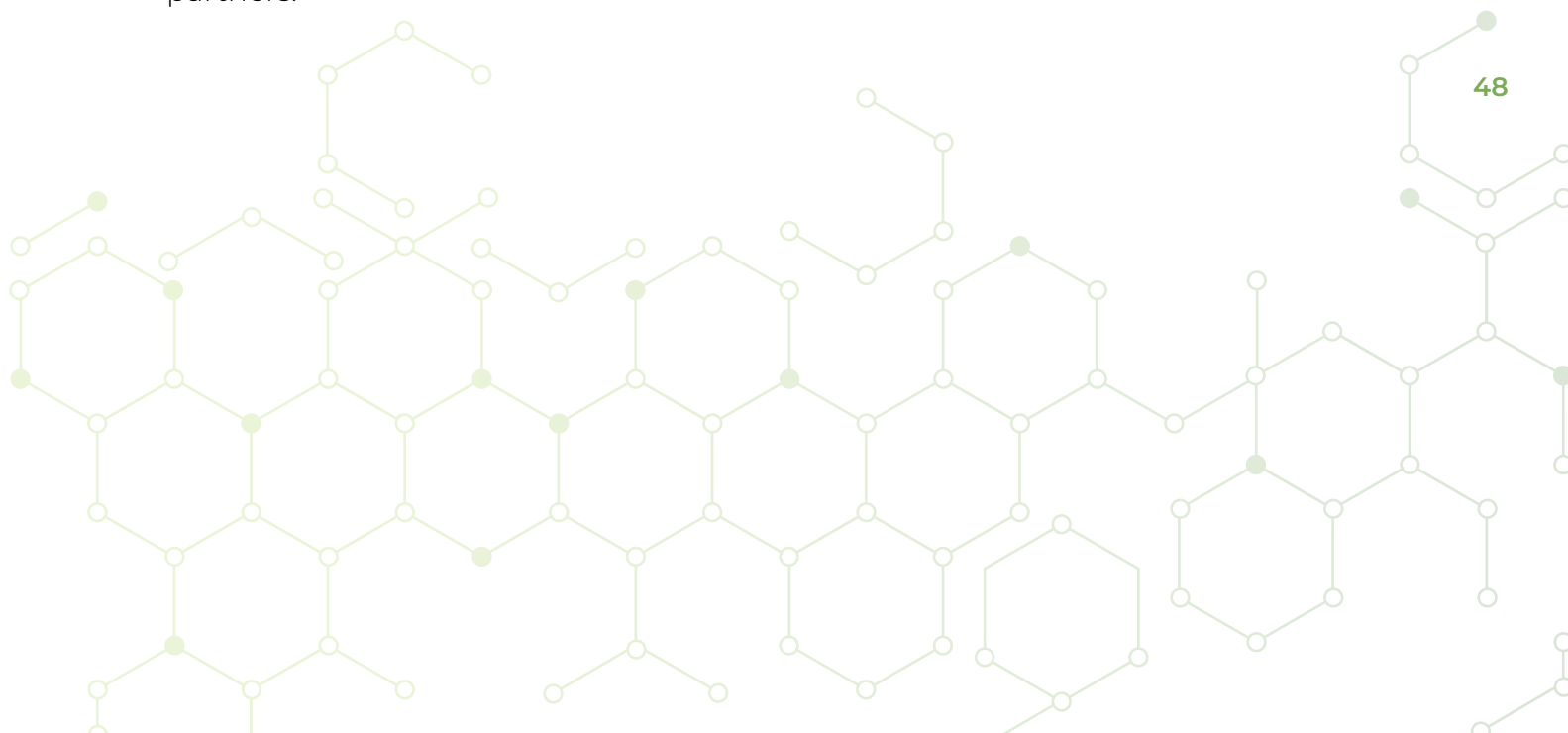
As Canada transitions towards a net-zero economy by 2050, a broad suite of technologies will be needed to support the transformation of the way we produce and use energy and resources.

⁵⁷ IPCC. (2023). Climate Change 2023: Synthesis Report. https://www.ipcc.ch/report/ar6/syr/downloads/report/IPCC_AR6_SYR_FullVolume.pdf

In addition to playing a role in meeting climate commitments alongside other emissions reduction tools and approaches, carbon management offers Canada new market and export opportunities, as well as the potential to share expertise and help other countries meet their climate goals. Canada is already well positioned as an early leader, but global competition is increasing. Further policy and technical innovation are needed to enable the sector to realize its full potential. The Government of Canada has heard the calls for strengthened federal action, and this Strategy is responding by demonstrating continued federal support for the accelerated growth of Canada's carbon management sector.

This Strategy is forward-looking and long-term. Its successful implementation will require a coordinated and multi-pronged approach, in collaboration with provincial, territorial, and municipal governments, the private sector, Indigenous groups, and other strategic partners.

Growth in the sector requires continued strategic investment by the federal, provincial, and territorial governments, as well as from the private sector. Ongoing federal-provincial-territorial collaboration is important to accelerate the adoption of existing technologies and the advancement of emerging carbon management technologies. The 5 federal priorities outlined in this Strategy are guiding the Government of Canada's next steps in realizing its ambitious vision, where Canada is a global leader in carbon management, is driven by a competitive domestic sector that enables the achievement of net-zero emissions, creates inclusive economic growth, and supplies the world with innovative technologies, products, and expertise.



Key next steps across federal priority areas

1. Accelerating innovation and RD&D:

- Advance early-stage CDR technologies
- Drive down CO₂ capture costs
- Explore CO₂ utilization opportunities
- Develop codes, standards, and geotechnical mapping across Canada

2. Advancing policies and regulations:

- Continue an adaptive approach to support the carbon management industry as it grows
- Respond to market demand for low-carbon products through government procurement
- Continue to support the development of codes, standards, and regulations to enable the safe deployment of carbon management solutions

3. Attracting investment and trade opportunities:

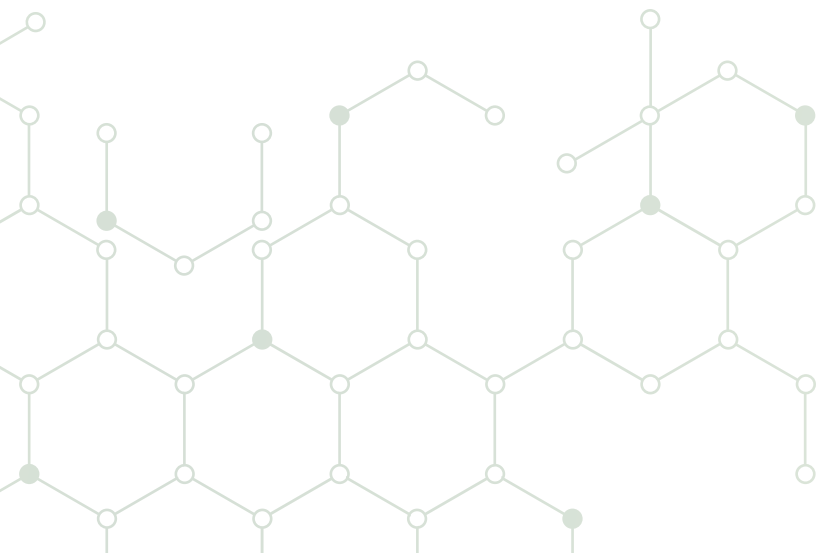
- Continue to incentivize carbon management investment
- Use government procurement policies to create supportive lead markets for carbon management-enabled products

4. Scaling up projects and infrastructure:

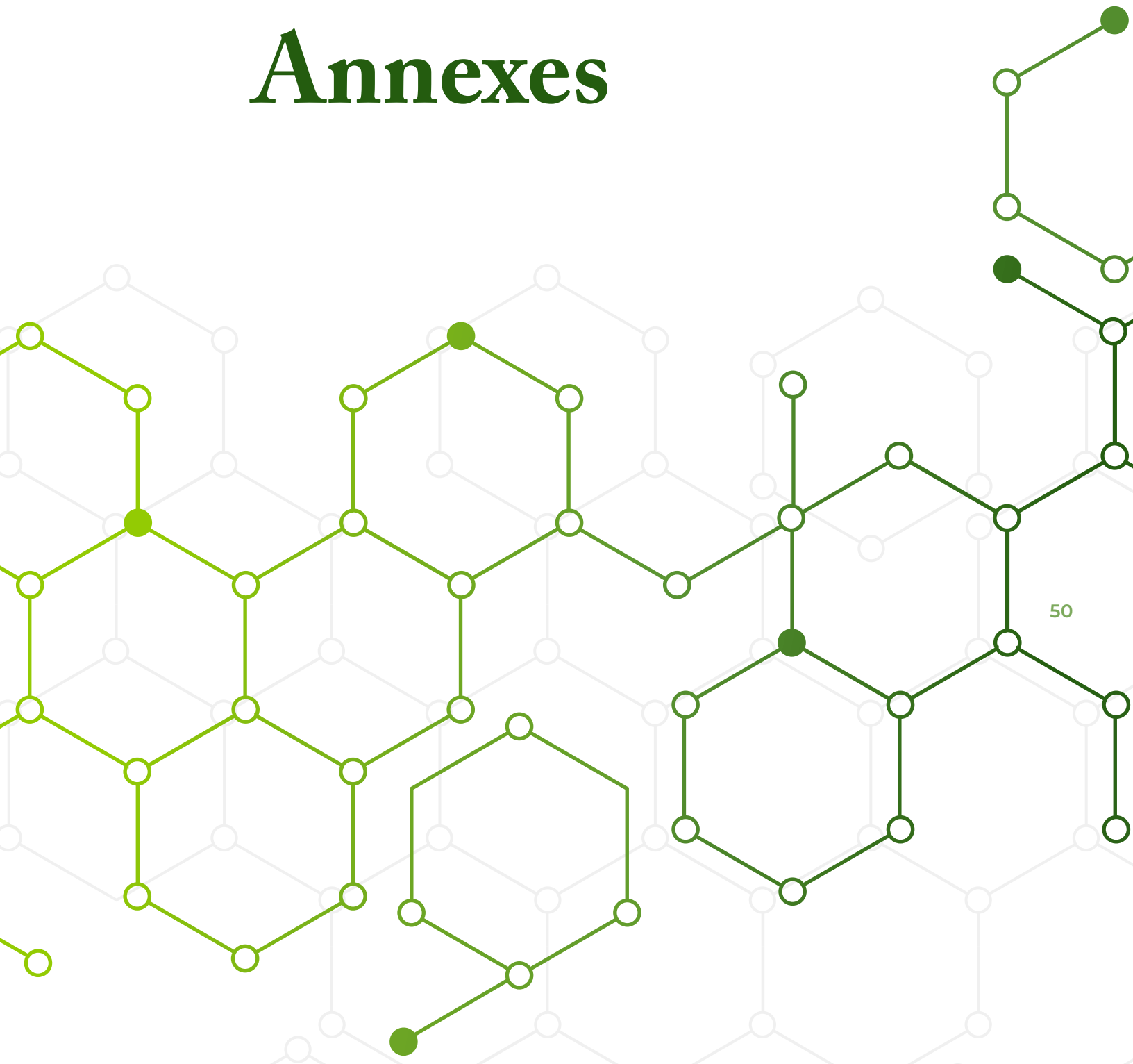
- Work with the private sector to explore blended finance options and alternative financing tools
- Support strategic investments in key industrial sectors, spur large-scale projects, and advance hub development

5. Building partnerships and growing inclusive workforces:

- Identify workforce gaps and regional opportunities to foster diversity and inclusion in the carbon management sector
- Advance Indigenous leadership and participation in the carbon management industry



Annexes



ANNEX A: Roadmap to 2050 for carbon management in Canada

Roadmap to 2050 for carbon management in Canada

By 2030, deployment supports industrial decarbonization across many sectors, while development of earlier-stage carbon management solutions accelerates.

- Federal and provincial support spurs private sector jobs and investment in infrastructure expansion and technology adoption, with CO₂ sequestration nearly quadrupling to at least 16 Mt per year by 2030, in line with current federal projections.
- RD&D drives innovation that supports cost reductions and advancements in breakthrough technologies and CDR approaches, while also informing regulations, codes, and standards.
- Provincial and federal regulatory frameworks are in place to enable re-use and removal of CO₂, along with safe and permanent CO₂ storage.
- Canadian companies, researchers, and institutions continue to develop leading-edge solutions and Intellectual Property (IP).
- Canadian firms grow their market share by seizing global opportunities for trade, IP licensing, and supply chain integration, including through

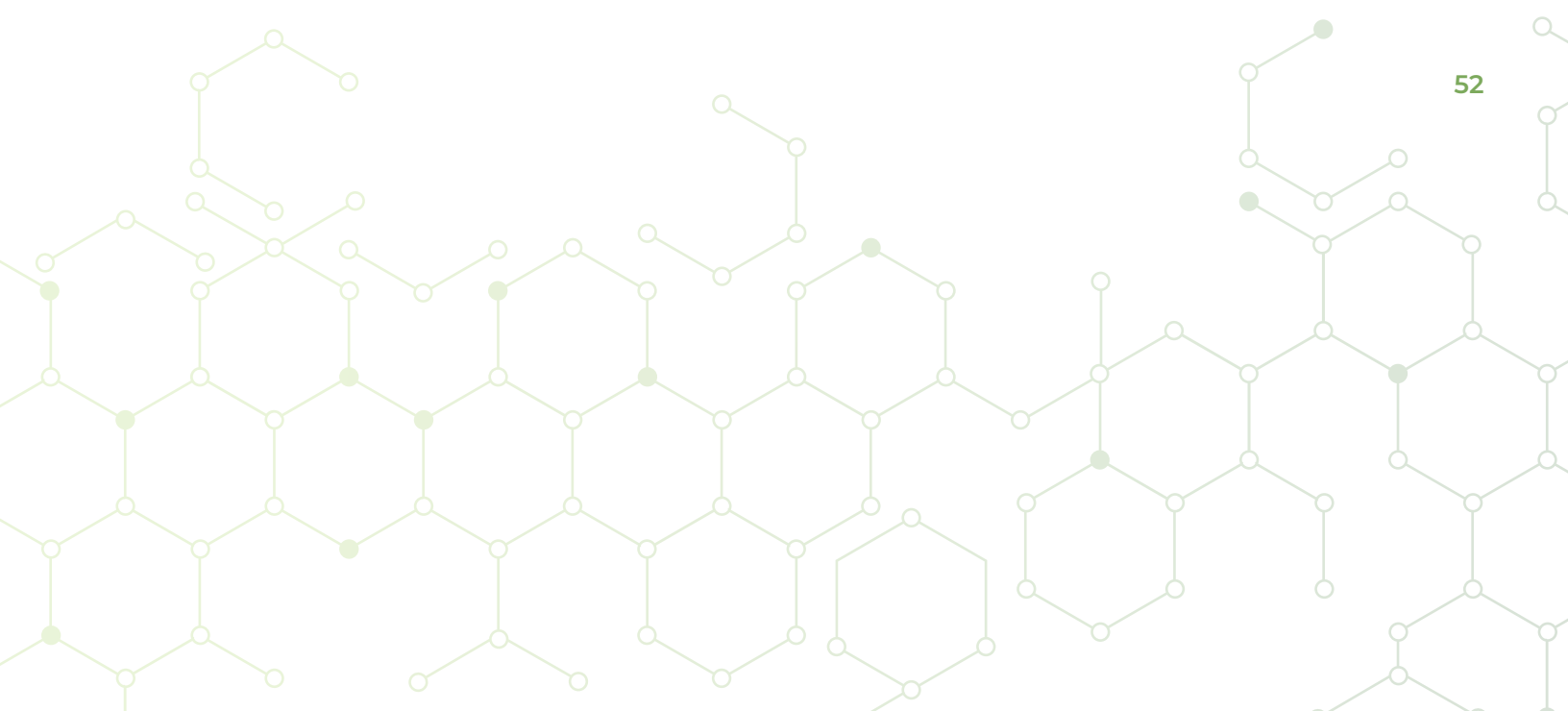
partnerships with interested Indigenous groups, to create good, sustainable jobs and contribute to an economically prosperous transition towards net-zero emissions.

By 2040, emissions reduction technologies see rapid uptake across applications in industrial sectors and CDR is scaled up to deliver permanent removals.

- Mitigation technologies scale up in hard-to-decarbonize applications, supporting job retention and improving ESG performance of Canadian industrial sectors, including the oil and gas industry.
- CDR approaches are deployed across the country, where appropriate, to provide permanent removals of emissions to contribute to domestic GHG reductions, attract direct foreign investment, and create good, sustainable jobs ready for a prosperous net-zero economy.
- Carbontech products by Canadian innovators contribute to a circular economy, displace emission-intensive products, and grow demand for captured CO₂, enabling the export of low-carbon solutions.

By 2050, Canada achieves net-zero emissions, delivering on its climate goals by reducing and permanently removing emissions, supported in part by wide deployment of carbon management technologies in several industrial sectors and regions.

- Canada's carbon management sector creates good, sustainable jobs and unlocks new economic opportunities for Canada's prosperous net-zero economy and an inclusive natural resource sector.
- Mitigation technologies are commercially available and cost-competitive for all industries where they can support net-zero or net-negative emissions.
- CDR approaches are fully commercialized and help achieve Canada's net-zero target.
- Canada continues to provide international leadership, exporting knowledge and technologies to help other countries achieve their climate and energy goals.



ANNEX B: Enabling federal programs, policies, and regulations in Canada

Carbon management-specific measures

Policy and Regulatory Measures	Description	Carbon Management Implications
Carbon Management Strategy	Announced in the Strengthened Climate Plan (2020) and reiterated in the 2030 Emissions Reduction Plan (2022), the Government of Canada committed to developing a CCUS strategy. This commitment evolved into Canada's Carbon Management Strategy to focus on both emissions reduction and removal technologies.	A forward-looking strategic and directional document recognizing that carbon management is cross-cutting and that part of the portfolio of integrated and coherent measures will help Canada mitigate climate change.
RD&D Support	Budget 2021 committed \$319 million/7 years. Administered under NRCan's Energy Innovation Program through a series of funding calls. Also supports RD&D across 14 federal laboratories.	Serves to support RD&D to improve the commercial viability of carbon management technologies—including CO ₂ capture, DAC, and CO ₂ utilization, transport, and storage across a broad range of sectors. Funds will support businesses, academia, non-profits, government, and federal laboratories on the path to net-zero emissions by 2050.

Policy and Regulatory Measures	Description	Carbon Management Implications
<p>CCUS Investment Tax Credit (ITC) Available for investments from 2022 to 2040</p>	<p>Once legislated, the tax credit will be retroactively available to businesses that have incurred eligible CCUS expenses, starting in 2022.</p> <p>Eligibility: The refundable ITC will be available to businesses incurring eligible CCUS capital expenses, to the extent that they permanently store captured CO₂ through an eligible use: dedicated geological storage or storage in concrete. CO₂-EOR is not eligible.</p> <p>For dedicated geological storage, ITC will be available in jurisdictions with sufficient regulations to ensure CO₂ is permanently stored as determined by the Minister of the Environment. To date, this will apply in Alberta, Saskatchewan, and British Columbia.</p> <p>For storage in concrete, the qualified concrete storage process is a process by which at least 60% of the CO₂ that is injected into concrete is expected to be mineralized and permanently stored in the concrete. Budget 2023 specifies requirements that these must be validated by a third party based on an ISO standard prior to claiming the ITC.</p> <p>Budget 2023 announced additional eligibility of dual-use heat or power equipment and water use equipment with tax support prorated in proportion to the use of energy or material in the CCUS process.</p>	<p>Incentivizes CCUS with the goal of reducing emissions by at least 15 Mt of CO₂ per year.</p> <p>Encourages industry to move quickly to lower emissions, given that the credit rates decrease after 2030.</p> <p>The eligibility of dual-use equipment announced in Budget 2023 is a key enhancement that will result in more efficient CCUS process integration and will potentially lower costs due to these greater design and operating efficiencies.</p> <p>Other CO₂ uses could be made eligible in the future if permanence of storage can be demonstrated and no incremental CO₂ emissions result from the use of the product.</p> <p>Other jurisdictions could be made eligible in the future if regulatory frameworks are developed and determined to meet the criteria. The GoC is engaging jurisdictions interested in eligibility to help advance regulatory development and evaluations.</p>

Policy and Regulatory Measures	Description	Carbon Management Implications
<p>CCUS Investment Tax Credit (ITC) Available for investments from 2022 to 2040 (continued)</p>	<p>Credit rates: 60% for DAC; 50% for capture equipment in all other projects; 37.5% for transportation, storage, and utilization.</p> <p>To incentivize early investments, rates to be reduced by 50% between 2031 and 2040 (i.e., to 30% for DAC, 25% for all other projects, and 18.75% for transportation, storage, and utilization). ITC will be reviewed before 2030 to ensure this reduction aligns with the Government of Canada's climate objectives.</p> <p>Refurbishment ITCs: Budget 2023 indicates that total eligible refurbishment costs over the first 20 years of a project would be limited to a maximum of ten percent of the total pre-operational costs that were eligible for the CCUS ITC. B2023 Tax Measures: Supplementary Information includes information on refurbishment ITCs, with an example of how Refurbishment ITCs are calculated, and how the recovery would be determined.</p> <p>Stacking: In the case of particular property being eligible for more than one tax credit, businesses would only be able to claim the CCUS ITC or the ITC for Clean Hydrogen, Clean Technologies, Clean Electricity, or Clean Technology Manufacturing. However, multiple tax credits could be available for the same project if the project includes different types of eligible property.</p> <p>Knowledge Sharing: Climate Risk Disclosure reports will be required; CCUS projects with eligible expenses of \$250 million or greater over the life of the project will also be required to contribute public knowledge sharing in Canada.</p>	<p>The Government intends to apply labour requirements to the ITC, which will come into effect on October 1, 2023. Details to be announced.</p>

Broader measures not specific to carbon management

Policy and Regulatory Measures	Description	Carbon Management Implications
<p><i>Federal Carbon Pricing System under the Greenhouse Gas Pollution Pricing Act</i></p>	<p>The price on carbon pollution started at \$20/t in 2019 and increased by \$10/t per year to \$50/t in 2022. Starting in 2023, the price will increase by \$15/t each year to reach \$170/t in 2030.</p> <p>Part 1—fuel charge: regulatory charge on fossil fuels like gasoline and NG. Currently applies in Alberta, Manitoba, Saskatchewan, Ontario, Yukon, and Nunavut. Beginning on July 1, 2023, it will also apply in Nova Scotia, Prince Edward Island, and Newfoundland and Labrador.</p> <p>Part 2—Output-Based Pricing System (OBPS): performance-based regulatory emissions trading system designed to ensure that there is a price incentive for industrial emitters to reduce GHG emissions while maintaining competitiveness and protecting against carbon leakage. Currently applies in Manitoba, Prince Edward Island, Yukon, Nunavut, and partially in Saskatchewan. Saskatchewan will transition to an expanded provincial system retroactively as of January 1, 2023.</p> <p>Other provinces and territories have their own pricing systems, aligned with updated minimum national stringency standards (the “federal benchmark”). Provinces and territories are currently strengthening their systems to meet criteria for 2023–2030.</p>	<p>The OBPS, provincial and territorial industrial systems, and Canada’s rising carbon price can provide an incentive to invest in carbon management. The OBPS recognizes storage in deep saline aquifers and depleted oil reservoirs, which provides an incentive to invest in carbon management technologies with permanent storage. Provincial carbon pricing systems provide similar incentives to invest in carbon capture and storage.</p>

Policy and Regulatory Measures	Description	Carbon Management Implications
Canada's GHG Offset Credit System	<p>To encourage cost-effective domestic GHG emissions reductions and removals from activities that are not covered by carbon pollution pricing and go beyond legal requirements.</p> <p>Final Canadian Greenhouse Gas Offset Credit System Regulations were published in CGII on June 8, 2022, along with the Landfill Methane Recovery and Destruction protocol.</p> <p>Protocols for improved forest management on private lands, enhanced soil organic carbon, and direct air carbon dioxide capture and sequestration (DACCS) are under development. Bioenergy carbon capture and sequestration (BECCS) has been identified as a project type under consideration for future protocol development as well as a protocol for improved forest management on public lands.</p> <p>Other protocols are currently under development, and additional project types will be considered for protocol development in the future.</p>	<p>This measure will incentivize CDR and permanent storage opportunities—including potentially through CO₂ utilization approaches—that are not currently covered by the carbon pricing systems.</p>
Clean Fuel Regulations (CFR)	<p>Under compliance category 1 (CC1), CCS and CO₂-EOR projects eligible for credit creation where they reduce the life-cycle carbon intensity of liquid fossil fuels used in Canada.</p> <p>Other CCS-related opportunities for credit creation include DAC projects that produce a low-carbon intensity synthetic fuel or clean hydrogen that displaces traditional liquid fuels.</p> <p>CCS projects at low-carbon-intensity fuel production facilities would also be accounted for in the carbon intensity of the fuel being produced.</p>	<p>The CFR is expected to create a strong signal for investments in CCUS projects.</p>

Policy and Regulatory Measures	Description	Carbon Management Implications
Clean Fuels Fund	<p>Budget 2021 committed \$1.5 billion over 5 years to de-risk capital investment required to build new or expand existing clean fuel production facilities.</p> <p>In Budget 2023, the government has proposed to introduce amendments to the <i>Canadian Environmental Protection Act, 1999</i>, to allow the enabling authorities of the Minister of ECCC to establish a compliance fund to collect contributions from parties regulated under the Clean Fuel Regulations.</p>	<p>Has the potential to support CCUS deployment via the expansion of clean fuel production (e.g., hydrogen, sustainable aviation fuel, synthetic fuels).</p>
Program of Energy Research and Development (PERD) and the Energy Innovation Program (EIP)	<p>The Office of Energy Research and Development (OERD) at Natural Resources Canada delivers funding to advance RD&D activities in federal departments and agencies.</p>	<p>Funding to federal researchers and external partners to support CCUS R&D and technology development. The total EIP/PERD federal research envelope supports a wide range of R&D across the energy innovation spectrum, which is revised on a 5-year basis to account for changes in government priorities.</p>
Strategic Innovation Fund (SIF) Net Zero Accelerator (NZA)	<p>Administered by Innovation, Science and Economic Development Canada (ISED).</p> <p>Budget 2021 allocated an additional \$5 billion, for a total of \$8 billion over 7 years to support the decarbonization of large industrial emitters, industrial transformation, and the adoption of clean technologies.</p> <p>Budget 2023 proposes to provide \$500 million over ten years to the SIF to support the development and application of clean technologies in Canada. The SIF will also direct up to \$1.5 billion of its existing resources towards projects in sectors including clean technologies, critical minerals, and industrial transformation.</p>	<p>Supports CCUS deployment in industry.</p> <p>Call to Action for projects in high-emitting sectors to reduce existing GHGs in the next decade was closed in June 2022. In late fall 2022, several projects were invited to the next phase of assessment.</p>

Policy and Regulatory Measures	Description	Carbon Management Implications
Canada Growth Fund	<p>Budget 2022 introduced a new arm's length public investment vehicle to help attract private capital to build Canada's clean economy, amounting to \$15 billion over 5 years. Details were provided in the 2022 Fall Economic Statement. Budget 2023 proposes to introduce legislation and legislative amendments to deliver the fund.</p> <p>The fund will accelerate the investment of private capital into decarbonization and clean technology projects while helping to meet Canada's climate targets and diversify Canada's economy.</p> <p>One of the investment tools the Canada Growth Fund will provide to support clean growth projects is contracts for differences. These contracts can backstop the future price of carbon, providing predictability that helps to de-risk major projects that cut Canada's emissions</p>	<p>CGF will accelerate the deployment of key technologies, including CCUS.</p>
Canada Infrastructure Bank (CIB) Investments	<p>The CIB is mandated to attract private and institutional investment into revenue-generating infrastructure projects in the public interest. The Government of Canada has provided the CIB with a series of priority investment categories, which include Clean Power (\$5 billion) and Green Infrastructure (\$5 billion).</p> <p>Budget 2022 announced a broadened role for the CIB to invest in private sector-led infrastructure projects that will accelerate Canada's transition to a low-carbon economy—including small modular reactors; clean fuel production; hydrogen production, transportation, and distribution; and CCUS.</p> <p>The CIB continues to explore how its model could support CCUS in the future in alignment with broader government policy direction in this space.</p>	<p>CIB's existing green infrastructure investments can now support private sector-led CCUS infrastructure projects, which includes common access multi-user infrastructure (pipelines, storage), as well as CO₂ capture projects.</p>

Policy and Regulatory Measures	Description	Carbon Management Implications
SDTech Fund	Sustainable Development Technology Canada (SDTC) supports small and medium-sized enterprises (SMEs) through 3 funding streams (seed, start-up, and scale-up), in the development, demonstration, and commercialization of a range of technologies with the potential to deliver strong environmental and economic benefits.	Includes support for CCUS technology development, demonstration, and commercialization.
Indigenous Natural Resource Partnerships Program	Natural Resources Canada (NRCan) invests in projects that aim to increase the economic participation of Indigenous communities and organizations in the development of natural resource projects that support the transition to a clean energy future.	Potential for projects associated to carbon management to be supported if there is a link to economic benefits for Indigenous communities or organizations.
Low Carbon Economy Fund (LCEF) Low Carbon Economy Challenge	<p>Since 2015, \$4.2 billion has been allocated to support the installation of emission-reducing technologies for provinces and territories, businesses, Indigenous communities, and other organizations.</p> <p>The ERP announced a \$2.2 billion renewal of the LCEF, including the renewal of the Low Carbon Economy Challenge. This Challenge provides funding to projects that leverage ingenuity across the country to reduce emissions and generate clean growth in support of Canada’s climate plan.</p>	Potential for CCUS projects to receive funding via regular calls for proposals. The next call for proposals is expected in fall 2023.
Output-Based Pricing System (OBPS) Proceeds Fund Decarbonization Incentive Program (DIP)	Launched early in 2022, the DIP is a merit-based program funded by proceeds collected from the OBPS. DIP’s objectives are to incentivize long-term decarbonization of Canada’s industrial sectors and to support Canada’s GHG emissions reduction goals.	Potential for CCUS projects to receive funding. Limited to provinces covered by the federal OBPS or those that opt in.
<i>Canadian Net-Zero Emissions Accountability Act</i> (June 29, 2021)	<p>Legislates Canada’s target to achieve net-zero emissions by 2050, with a series of interim targets at 5-year milestones.</p> <p>Canada’s enhanced NDC announced at the April 2021 Leaders’ Summit on Climate is a 40–45% reduction from 2005 levels, by 2030.</p>	Scaling up CCUS deployment will be critical to meet Canada’s enhanced 2030 goal and net zero 2050 goal, as noted in the 2030 Emissions Reduction Plan.

Policy and Regulatory Measures	Description	Carbon Management Implications
Emissions cap for the oil and gas sector (under development)	Commitment to cap emissions generated by the oil and gas sector at the pace and scale needed to get to net zero by 2050, with 5-year targets.	Could drive the adoption of carbon management to meet emission cap targets.
Clean Electricity Regulations (draft regulation introduced)	Set out in the 2030 Emissions Reduction Plan as a measure to lead the electricity sector to net-zero emissions by 2035.	Could drive the adoption of carbon management to meet emission standards.
Greenhouse Gas Reporting Program (GHGRP)	<p>Collects information on GHG emissions from facilities across Canada that meet the requirements. Facilities must also follow specified methods for identified emission sources and activities (including CCUS).</p> <p>Has been collecting data from facilities every year since 2004, under section 46 of the <i>Canadian Environmental Protection Act, 1999</i>.</p> <p>Existing CCUS requirements under the GHGRP are aligned with national inventory requirements and international IPCC methodological guidelines.</p>	<p>As of 2017, all facilities engaged in CCUS activities are required to report the amounts of CO₂ captured, transported, injected, and geologically stored to the Government of Canada. This reporting also includes CO₂ used for EOR.</p> <p>Facilities must also report CO₂ emissions (leakages) from equipment or infrastructure used in CCUS activities and from geological storage sites.</p> <p>For new (or future) CCUS activities, robust monitoring (e.g., metering devices) and data collection requirements would need to be developed to ensure accurate and credible tracking of CO₂ quantities impacted by CCUS.</p>

Policy and Regulatory Measures	Description	Carbon Management Implications
Canadian National Inventory submission	The Canadian National Inventory submission (National Inventory Report—NIR) and Common Reporting Format (CRF) is used by the UNFCCC to monitor Annex 1 countries to confirm if they are meeting their Kyoto Protocol and Paris Agreement commitments.	The NIRs contain detailed descriptive and numerical information, and the CRF tables contain all greenhouse gas (GHG) emissions and removals, implied emission factors, and activity data. Supplementary information submitted in accordance with Article 7, paragraph 1, of the Kyoto Protocol by Parties included in the submissions of the NIR and CRF.
<i>Canadian Environmental Protection Act, 1999</i>	Regulates disposal of waste or other matter at sea, including CO ₂ . Implements the London Protocol which in 2006 added sub-seabed sequestration of CO ₂ to the list of activities that can be granted a permit for disposal at sea, and in 2013 added a regulatory regime for ocean-based CDR.	Until CO ₂ is added to Schedule 5 of CEPA (in progress), sub-seabed sequestration of CO ₂ is prohibited in Canada, and open ocean sequestration will remain prohibited. Changes are required to implement 2013 amendments to the London Protocol that will provide a regulatory regime for ocean-based CDR projects.
Green Procurement Buy Clean Initiative [implementation starting in 2023]	Green procurement and adopting clean technologies, products, and services such as low-carbon building materials. Federal government projects will require disclosure of embodied carbon in concrete with 10% reduction in 2023, and in 2025, 30% reduction in embodied carbon in major construction projects.	While the policy does not mention CCUS, it provides a policy signal that could stimulate CCUS adoption to reduce embodied carbon in concrete.

Policy and Regulatory Measures	Description	Carbon Management Implications
Regulation on Coal-Fired Generation (amended 2018)	<p>Accelerates the phase-out of unabated coal-fired power by 2030.</p> <p>Requires all coal-fired units to meet a performance standard of 420 t CO₂/GWh at the end of their useful life or by Dec 31, 2029, whichever comes first.</p>	<p>Contains CCUS provisions to meet the performance standard, which allow coal-fired units to operate with CCUS beyond 2030. For example, the Boundary Dam CCUS-equipped coal unit in SK can operate post-2030.</p>
Border Carbon Adjustments (BCAs) [under consideration]	<p>Canada currently mitigates the risk of carbon leakage through the design of domestic carbon pricing systems. Another complementary approach is to apply border carbon adjustments.</p> <p>BCAs (import charges and potentially export rebates) can account for differing carbon costs incurred in producing emissions-intensive goods across jurisdictions that are subsequently traded internationally.</p> <p>The Government of Canada is exploring BCAs as a potential tool to complement domestic carbon pricing to allow for greater ambition and stringency.</p>	<p>As a complement to domestic carbon pricing, could support greater ambition and stringency.</p>
International Business Development Strategy for Clean Technology	<p>Delivered through the Trade Commissioner Service's (TCS) network across Canada and abroad, this strategy provides enhanced support for Canadian clean technology firms, including through trade promotion and innovation collaboration services.</p> <p>Budget 2021 renewal of the strategy announced \$21.3 million over 5 years and \$4.3 million per year ongoing.</p>	<p>The TCS network is actively supporting Canadian clean technology firms, including those with carbon management solutions.</p>

Policy and Regulatory Measures	Description	Carbon Management Implications
<i>Canadian Energy Regulator Act</i> and Onshore Pipeline Regulations	Allows the Canada Energy Regulator (CER) (formerly the National Energy Board) to ensure safety, security, and environmental protection throughout the entire life-cycle of pipelines, from design through to construction, operation, and abandonment.	In the case of transboundary CCUS potential, the CER has jurisdiction over interprovincial and international commodity pipelines and is experienced in regulating CO ₂ pipelines. ⁵⁸
Business Scale-up and Productivity (BSP)	Regional development agencies (RDAs) deliver the BSP funding program to support high-growth firms in accelerating their growth, to assist them in scaling up, and to enhance their productivity and competitiveness in both domestic and global markets.	Since 2018, PacifiCan and PrairiesCan (formerly part of Western Economic Diversification Canada) have supported a significant number of cleantech projects in BC and the Prairies.
Regional Innovation Ecosystems (RIE)	RDAs deliver the RIE funding program to create, grow, and nurture inclusive regional ecosystems that support business needs throughout the innovation continuum, and foster an entrepreneurial environment conducive to innovation, growth, and competitiveness.	Since 2018, PacifiCan and PrairiesCan (formerly part of Western Economic Diversification Canada) have supported a significant number of cleantech projects in BC and the Prairies.

58 In 1998, the NEB approved the construction and operation of Canada’s first international CO₂ pipeline, the Souris Valley pipeline, which transports CO₂ from North Dakota to the Weyburn and Midale oil fields in Saskatchewan. CER regulates the Canadian portion of the CO₂ pipeline.

Policy and Regulatory Measures	Description	Carbon Management Implications
<p>Clean Electricity ITC; Clean Technology ITC; Clean Hydrogen ITC; Clean Manufacturing ITC</p>	<p>Several federal Investment Tax Credits are being proposed to incentivize the development of Canada’s clean economy and provide additional support for projects that need it.</p> <p>Clean Electricity ITC: To support and accelerate clean electricity investment in Canada, Budget 2023 proposes to introduce a 15 percent refundable tax credit for eligible investments.</p> <p>Clean Manufacturing ITC: Budget 2023 proposes a refundable tax credit equal to 30 percent of the cost of investments in new machinery and equipment used to manufacture or process key clean technologies, and extract, process, or recycle key critical minerals.</p> <p>Clean Technology ITC: The 2022 Fall Economic Statement announced the details of the Clean Technology Investment Tax Credit, which will provide support to Canadian businesses in adopting clean technology at a 30 percent refundable rate. In Budget 2023, the federal government is expanding the eligibility for the Clean Technology Investment Tax Credit to further support the growth of Canada’s burgeoning clean technology sector.</p> <p>Clean Hydrogen ITC: Budget 2023 announced details and key design features:</p> <p>The levels of support will vary between 15 and 40 percent of eligible project costs, with the projects that produce the cleanest hydrogen receiving the highest levels of support.</p> <p>Will also extend a 15 percent tax credit to equipment needed to convert hydrogen into ammonia, in order to transport the hydrogen. The tax credit will only be available to the extent the ammonia production is associated with the production of clean hydrogen.</p>	<p>Budget 2023 states that businesses would only be able to claim one ITC if a particular property is eligible for more than one of these tax credits, including the CCUS ITC. However, multiple tax credits could be available for the same project if the project includes different types of eligible property. Further information on the interactions between these ITCs and the CCUS ITC will be released at a later date.</p>

Policy and Regulatory Measures	Description	Carbon Management Implications
Clean Electricity ITC; Clean Technology ITC; Clean Hydrogen ITC; Clean Manufacturing ITC (continued)	<p>Labour requirements will need to be met to receive the maximum tax credit rates.</p> <p>Labour requirements: The 2022 Fall Economic Statement announced the government’s intention to attach prevailing wage and apprenticeship requirements (together referred to as “labour requirements”) to the proposed Clean Technology and Clean Hydrogen Investment Tax Credits. The government also proposes to have these requirements apply to the proposed Clean Electricity Investment Tax Credit. In addition, the government intends to apply labour requirements to the Investment Tax Credit for Carbon Capture, Utilization, and Storage. Details will be announced at a later date.</p>	

