carbon removal canada

Removals into Revenue

How Carbon Removal Rewrites Canada's Economic Future

ACRONYMS & ABBREVIATIONS IN THIS REPORT

BECCS bioenergy with carbon capture and storage

CAPEX capital expenditures

CDR carbon dioxide removal

CO2 carbon dioxide

CORSIA carbon offsetting and reduction scheme for international aviation

DAC direct air capture

GDP gross domestic product

GIGATONNE billion metric tonnes

ITMO internationally tranferred mitigation outcomes

MEGATONNE million metric tonnes

MRV monitoring, reporting, and verification

OAE ocean alkalinity enhancement

OPEX operational expenditures

Removals into Revenue:
How Carbon Removal Rewrites Canada's Economic Future

About Carbon Removal Canada

Carbon Removal Canada is an independent non-profit accelerating the responsible scale-up of carbon removal technologies through impactful policy advocacy grounded in rigorous research, shaping market development, and connecting the right people to the right information.

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Carbon Removal Canada thanks the Canadian Carbon Dioxide Removal Initiative for offering their critical feedback and insights on our economic modelling. However, the content of this report is not attributable to any of the technical reviewers and the views expressed are those of Carbon Removal Canada and do not necessarily reflect the views of the reviewers or their employers.

Executive Summary

What would it mean for Canada to build an entirely new industrial sector, one that rivals aerospace or automotive in economic contribution, while simultaneously increasing competitiveness for other Canadian industries?

This is the opportunity carbon removal presents. New economic modelling by Navius Research quantifies it:

By 2050, a scaled carbon removal industry could lead to:[1]

>50%
cut to the marginal cost of reaching net-zero, with savings as early as 2035

$78B
increase in economy-wide Canadian GDP

300K
jobs created across the economy

$23B
generated in government revenue annually

The Canada Energy Regulator recognizes that critical sectors like buildings, heavy industry, and transportation will have residual emissions by 2050. These industries employ hundreds of thousands of Canadians and produce essential goods and services that cannot be replaced. Canada needs a dual approach: aggressive decarbonization where possible, and carbon removal to address the emissions that persist, allowing us to achieve net-zero without devastating vital industries.

Carbon removal is not a substitute for emissions reductions. It is essential for complementing aggressive abatement, cleaning up residual emissions, and mitigating severe climate impacts. The results of the modelling confirm that the majority of today's emissions are most cost effectively addressed with direct emissions reductions efforts. But to achieve net-zero, a credible climate strategy requires investment in both reductions and removal.

Carbon removal functions as economic infrastructure. Like highways or ports, it lowers costs and enables activity across the entire economy. Not only will carbon removal ensure Canada can achieve net-zero, but it also opens new markets for established industries. For example, both the US and EU, two major markets for Canadian products, are pushing forward with carbon-based trade policies, such as the *PROVE IT Act* in the US, or carbon border adjustments in the EU.

Without carbon removal, sectors like steel, cement, mining, energy, agriculture, and forestry are locked out of the most cost-effective path to net-zero, and the opportunity is missed to create a new industry that strengthens Canada's economy while lowering the cost of achieving net-zero.

However, the emergence of carbon removal will not happen on its own. Policy action is required to capture this opportunity and scale these technologies.

As was realized due to policy support for solar, wind, and EVs, deliberate policy intervention is necessary to lower costs and create market conditions for innovation and competition. This support is crucial for bridging financing gaps for first-of-a-kind facilities, which private capital alone won't cover, thereby accelerating the learning curve and driving down costs of Canadian-developed technologies. This also makes domestic carbon removal the pragmatic tool for addressing residual emissions rather than another expensive burden on industry.

We recommend the following policies to seize this economic opportunity:

Short-Term*: Establish a $500M government backstop for both project financing and buyers to crowd-in private capital and new buyers.* This backstop would only activate if projects face payment challenges due to technical issues or market conditions, protecting government resources while crowding in private capital that currently views first-of-a-kind projects as too risky. A parallel buyer backstop would reduce the risk of non-delivery and crowd in additional demand from purchasers who would otherwise hesitate to enter the market.

Medium-Term*: Scale government carbon removal procurement over the next decade, growing from the initial $10 million to at least $100 million per round.* This will help the market mature and establish a robust demand signal to help companies move from demonstration to commercialization.

Long-Term*: Enable carbon removal to generate credits within domestic and international markets*. This would include Canadian compliance markets like the Output-Based Pricing System and Clean Fuel Regulations, while a strategy and further work on Article 6 is necessary to unlock internationally transferred mitigation outcomes (ITMOs). These can create the stable, predictable demand necessary for carbon removal to scale.

The window for action is finite and other nations are moving now. Early action creates compounding benefits through established supply chains and trained workforces that position Canada as a global leader. Delay means ceding market share, talent, and technological leadership to competitors who are investing today. Canada has a unique opportunity to define global standards and capture lasting competitive advantages, but only if it moves decisively to establish itself as the jurisdiction of choice for carbon removal development and deployment.

SECTION 1

Carbon Removal and Canada's Economic Choice

Key Takeaways

Carbon removal is necessary

Major economies and climate authorities now treat large-scale carbon removal as a necessary component of any credible net-zero pathway. The remaining question is which countries will build and capture the economic value.

Inaction carries rising economic and competitiveness costs

Without access to affordable carbon removal, Canadian industries face escalating abatement costs, exposure to carbon border measures, and pressure to relocate or curtail operations as low-cost emissions reductions are exhausted.

Carbon policy has become trade policy

Carbon border adjustment mechanisms and mandatory carbon markets in the EU, Japan, and the UK directly affect Canadian exporters. Maintaining market access increasingly depends on demonstrating credible, net-zero-aligned production pathways.

Carbon removal functions as economic infrastructure

Like highways or ports, carbon removal lowers costs and enables activity across the economy, while also supporting a standalone industry that generates jobs, revenue, and export opportunities.

Since 2021, ArcelorMittal Dofasco and Algoma Steel have received over $1 billion in federal and provincial support to electrify their production, unlocking the potential for the Canadian steel industry to halve its emissions. These landmark investments represent exactly the kind of bold action needed to decarbonize heavy industry. However, even after these milestones, Canada will still need to address the residual emissions that remain[2] to achieve net-zero. To fully compete in markets that price carbon, Canadian products, like those from Dofasco and Algoma, need a solution for those final tonnes, one that allows producers to achieve net-zero claims, meet border adjustment requirements in Europe, and win contracts against international competitors.

This is the challenge carbon removal solves. Not as a substitute for the hard work of decarbonization, but as the necessary complement that addresses what electrification and efficiency cannot.

Analysis by the Canada Energy Regulator has recognized that certain industries will have residual emissions by 2050 that are likely to remain despite aggressive mitigation efforts.[3] Hard-to-abate sectors like cement, aviation, agriculture, mining, and steel face fundamental technical barriers and collectively form the backbone of Canadian society, employing hundreds of thousands of Canadians and representing a significant portion of our GDP. This demands a dual approach: aggressive decarbonization where possible, and carbon removal to address the residual emissions that will persist while these critical sectors implement every feasible reduction measure.

Canada faces a defining choice at a unique moment. Over the past decade, climate policy focused primarily on reducing emissions. That focus remains essential, and will be relied upon to address the majority of our emissions. But the conversation has evolved. Current climate policy measures are making progress, but recent analysis suggests they are insufficient to reach net-zero.[4] New tools are needed, and in order to build support for them, governments and industries now ask not just how to decarbonize, but how to do so affordably and in a way that enables them to take advantage of new economic advantages.

Economic modelling conducted by Navius Research quantifies this opportunity, with detailed findings presented later in the report.

By 2050, a scaled carbon removal industry could lead to:[5]

>50%
cut to the marginal cost of reaching net-zero, with savings as early as 2035

$78B
increase in economy-wide Canadian GDP

300K
jobs created across the economy

$23B
generated in government revenue annually

Pyrocal's Continuous Carbonisation Technology is being deployed in British Columbia at the Hartland Landfill to convert waste into valuable biochar.

1.1 What is Carbon Removal and Why Does it Matter?

Carbon removal is the process of capturing carbon dioxide already in the atmosphere and storing it durably for centuries or longer. This distinguishes it from emissions reduction and carbon capture at industrial facilities, which prevent CO_2 from entering the atmosphere. Carbon removal cleans up what is already there.

Aggressive emissions cuts are necessary but insufficient on their own for Canada to reach net-zero. Some sectors have process emissions that are technologically or financially prohibitive to fully eliminate. Aviation, shipping, agriculture, and heavy industry all face similar constraints. Carbon removal provides the most affordable way to counterbalance these residual emissions and grow economic activity while, unlike emissions reductions alone, addressing historical emissions to fend off the worst effects of climate change. While emissions reductions stop things from getting worse, carbon removal can make things better. The International Energy Agency concurs that both are needed: they project that temperature rise will exceed the 1.5°C threshold, and that "returning warming to below 1.5°C requires immediate emissions reductions and carbon dioxide removal."[6]

Many carbon removal technologies deliver benefits beyond climate:

- Ocean alkalinity enhancement can deacidify marine environments, helping restore shellfish populations and coral ecosystems.
- Carbon mineralization can remediate legacy mine tailings, turning environmental liabilities into climate solutions.
- Bioenergy with carbon capture and storage (BECCS) generates dispatchable clean electricity while achieving net-negative emissions.
- Biochar and enhanced rock weathering (ERW) improve soil health and agricultural productivity.

These co-benefits mean carbon removal can address multiple challenges simultaneously, creating value that extends well beyond the carbon balance sheet. Canada has the potential to deploy all of these types of carbon removal, and project developers have recognized this. As of February 2026, Carbon Removal Canada's Carbon Console identifies 84 project and technology developers that are active in Canada, spanning the entire range of technologies. Some of these project developers are pursuing projects in Canada instead of other jurisdictions because of this perceived potential.[7] There are already 0.1 megatonne of annual removals taking place with an additional 10.9 megatonne worth of projects being planned.

1.2 The Cost of Missing Out on Carbon Removal

Without deploying carbon removal, the cost of decarbonization rises significantly. As accessible emissions reductions are exhausted, the cost of each additional tonne abated rises sharply. Hard-to-decarbonize sectors lose out on a critical tool to drive down their decarbonization costs and remain competitive in the international arena.

Canadian heavy industry faces this pressure directly. Producers that cannot demonstrate credible pathways to net-zero will face mounting carbon costs at the border and within. Assets built on the assumption of continued high-carbon operation become liabilities. Meanwhile, the global carbon removal market is projected to reach US$50 billion by 2030 and potentially exceeding US$250 billion by 2035.[8]

> The companies and countries that have invested in carbon removal will have options. Those that have not will face constrained choices and higher costs.

Researchers estimate that meeting Paris Agreement commitments will require 6 to 10 gigatonnes of removal annually by 2050, an industry that will rival the scale of coal, cement, and steel.[9] Canada has natural advantages in this emerging sector that few countries can match: vast geological storage, established regulatory frameworks, a skilled workforce, and abundant clean energy.

1.3 Carbon Removal is Economic Infrastructure

We build highways because they make everything else work better: factories can ship goods, workers can reach jobs, businesses can access customers. The highway itself is not the product. The economic activity it enables is.

Carbon removal is this kind of foundational infrastructure, providing a pragmatic solution to unavoidable emissions for key industries while becoming a domestic and globally traded commodity. Carbon removal infrastructure supports the broader economy while generating returns of its own.

When Canada has accessible, affordable carbon removal, producers facing border carbon costs or seeking low-carbon procurement contracts can grow market access. Meanwhile, the removal sector itself generates revenue, creates jobs, and builds exportable expertise. The infrastructure enables economic activity across industries while becoming a significant industry itself. Markets for carbon removal are already here, with major economies like the EU, Japan, and the UK implementing carbon border adjustments and compliance markets that directly affect Canadian exporters and create opportunities for carbon removal developers.

Carbon removal reshapes the economics of the entire transition. Without it, decarbonization means paying ever-higher costs for ever-harder abatement. Carbon removal cuts through every industry's abatement curve, providing a universal price ceiling for emissions reduction costs. This is not a way around decarbonization, it is a way through.

SECTION 2

A New Economic Engine for Canada

Key Takeaways

Carbon removal is economically indispensable to net-zero

Modelling shows Canada's most economically efficient path to net-zero requires 171 megatonnes of annual carbon removal by 2050, yet currently there is only 0.1 megatonnes of annual removal capacity in operation.

Carbon removal dramatically lowers the cost of the transition

Access to scalable removal cuts the marginal cost of net-zero by more than half by 2050 and presents savings as early as 2035.

The sector could rival Canada's largest industries in scale

By 2050, carbon removal could boost economy-wide GDP by $78 billion annually, comparable to other cornerstone industrial sectors. Between 2035 and 2050, carbon removal could unlock $250+ billion in cumulative GDP gains, while also providing an additional $23 billion in government revenue by 2050.

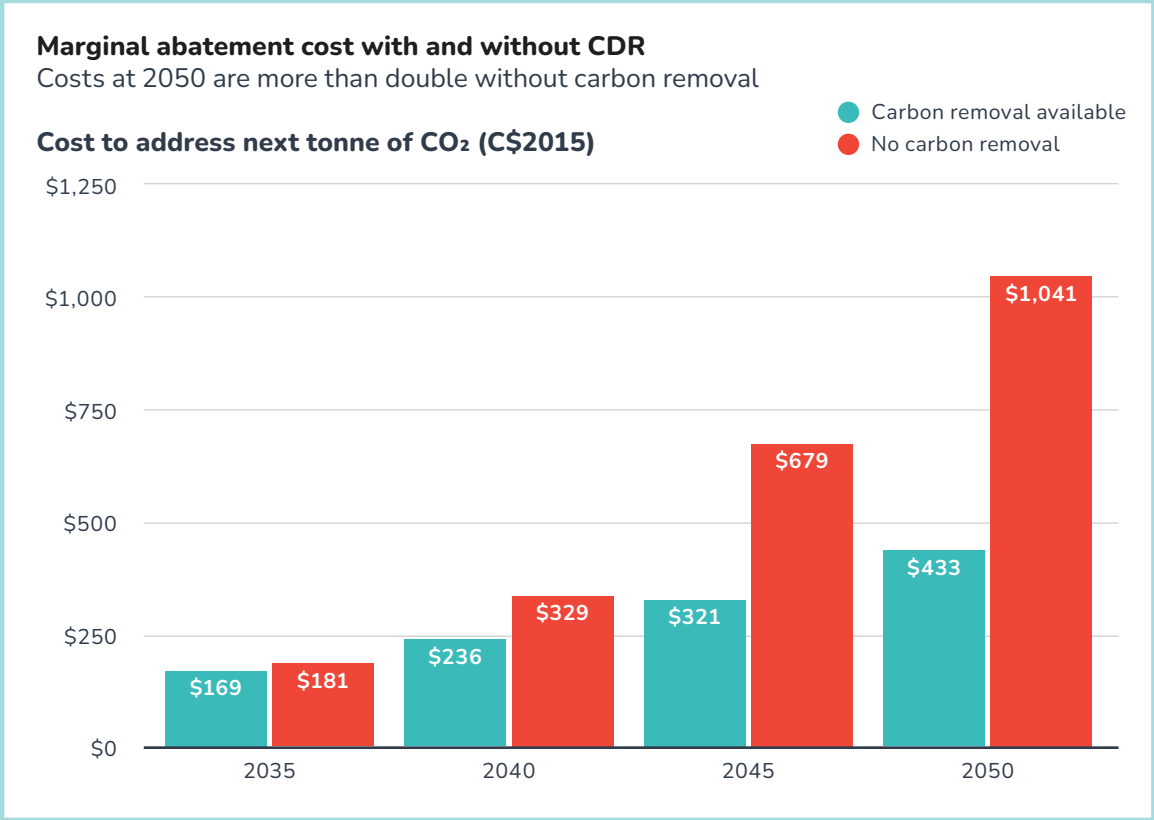
Carbon removal enables existing industries to remain competitive

Canadian industries benefit from using carbon removal as a tool to address residual emissions, preserving investment and jobs that would otherwise be at risk.

What would it mean for Canada to build an entirely new industrial sector, one that rivals aerospace or automotive in economic contribution, while simultaneously making every other sector more competitive?

Carbon Removal Canada contracted Navius Research to quantify this potential, estimate the likely amount of residual emissions from hard-to-abate sectors, and determine how carbon removal technologies can contribute to net-zero. The results in this section are derived entirely from this new modelling.

2.1 Cutting the Marginal Cost of Net-Zero in Half



When carbon removal is available, the cost of eliminating the final tonne of emissions in 2050 drops by more than half, with cost savings beginning as early as 2035.

The most significant economic finding is that carbon removal dramatically reduces the marginal cost of reaching net-zero, also known as the marginal cost of abatement.

The easiest emissions cuts happen first, leaving progressively harder and more expensive options. Navius modelling has shown that by 2050, if Canada does not pursue carbon removal technologies, the cost of eliminating one more tonne through abatement alone exceeds $1,000 per tonne. Carbon removal fundamentally alters the financial outlook: it offers an alternative way to neutralize residual emissions, which lowers the marginal abatement cost to $433 per tonne by 2050. This cost could potentially fall further, to $350 per tonne, should the costs of technologies such as direct air capture decline more rapidly than anticipated.

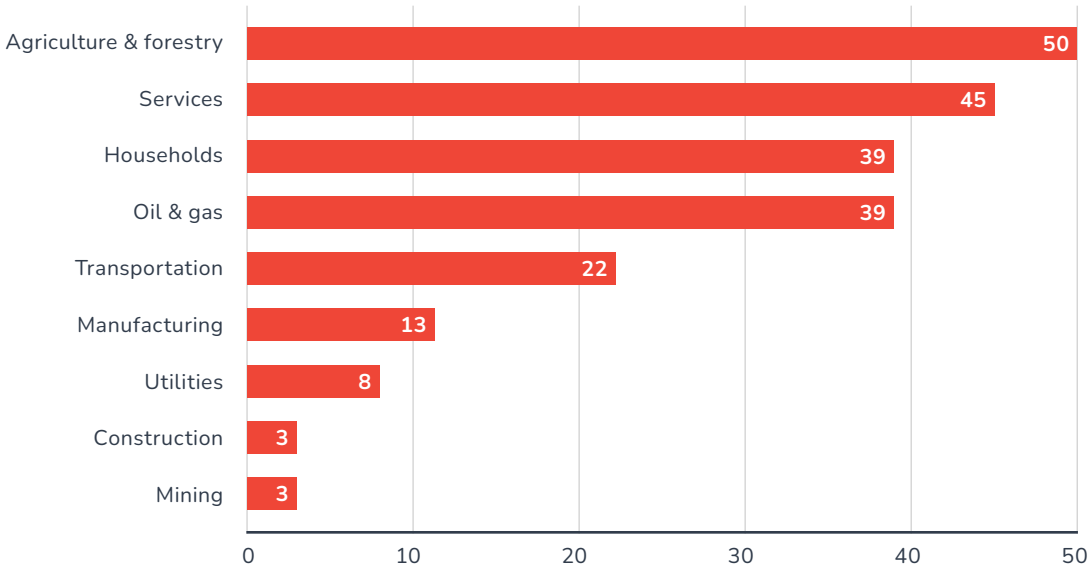
Does this mean that carbon removal will cost $433/t?
The model shows that, conservatively, the most expensive forms of carbon removal could cost $433 per tonne, with significant potential for it to drop even further to $350 per tonne.

Lower marginal abatement costs translate directly into reduced compliance costs for emissions-intensive industries. Without the possibility to offset hard-to abate emissions in these sectors, the model suggests that net-zero leads to activity reductions and early retirement of technologies. These industries face a less punishing cost curve when carbon removal provides an alternative to increasingly expensive technological retrofits. This provides additional time for Canada to bring down the cost of the most expensive emission reduction technologies and develop new low-carbon industrial processes.

Think of reducing emissions like picking fruit from a tree: you grab the low-hanging fruit first, but eventually you need a ladder, then a taller ladder, with each piece costing more to reach. That's the marginal abatement cost. Carbon removal is like having a second tree with plenty of fruit still within reach. Instead of stretching for the most difficult fruit on the first tree, you can pick from the second while waiting for better ladders to be invented.

The savings do not just happen at 2050. The cost of decarbonization is reduced as early as 2035, when it is able to lower the marginal abatement cost from $181/tonne in scenarios with no carbon removal to $169/tonne in scenarios that enable it. Along the path to net-zero by 2050, lower cost carbon removal options are already able to compete with direct emissions reductions opportunities in less than a decade.

Residual emissions at net-zero in 2050 (Mt)
Carbon removal can most affordably address these residual emissions

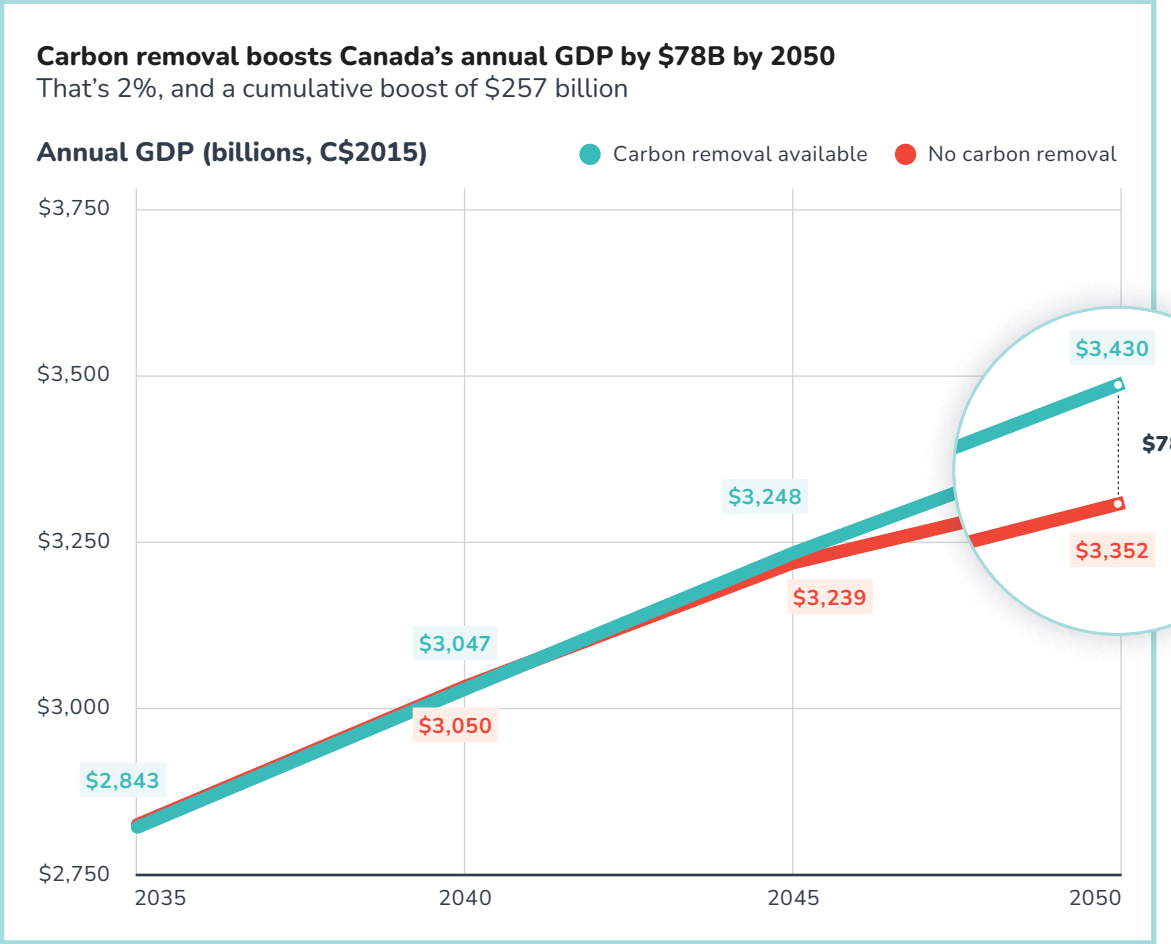


The most cost-effective path to net-zero uses negative emissions from carbon removal and Land Use, Land Use Change and Forestry to address residual emissions from multiple industries that cannot eliminate them entirely or can only do so at prohibitive cost.

Access to a domestic carbon removal industry gives Canadian heavy emitters a competitive edge, enabling them to secure predictable compliance costs and keep capital within the country. International competitors, by contrast, must look abroad for removal services, navigating foreign suppliers, currency risk, and less certain access to verified, high-quality credits. By providing a known, scalable option for addressing residual emissions, carbon removal offers businesses planning and investment certainty while enabling them to credibly decarbonize.

2.2 Boosting GDP by $78B Across Canada's Economy

Carbon removal technologies have the potential to increase Canada's GDP by $78 billion by 2050. This is roughly 2% of Canada's 2024 GDP[10] and the same order of magnitude as Canada's NATO defence spending target, illustrating the scale of the opportunity.



The carbon removal industry can lift Canada's GDP by $78 billion annually by 2050

Between 2035 and 2050, scenarios with carbon removal show cumulative GDP increases of more than $250 billion compared to scenarios without it.

The value extends beyond the sector itself, encompassing the economic benefits of enabling other sectors to operate by avoiding impossible decarbonization costs. Modelling shows meaningful GDP gains in mining, construction, energy, and agriculture through integration of carbon removal technologies.

2.3 Creating 300K Jobs for Canadian Workers

By 2050, carbon removal technologies help boost economy-wide employment by approximately 300,000 full-time equivalent positions compared to a scenario without carbon removal. Of these, more than 100,000 are directly employed in carbon removal operations, with additional gains across previously mentioned industries.

The sector creates opportunities for skilled trades, engineers, technicians, agricultural specialists, and geologists, among many more. This draws on expertise that already exists in Canada's resource and trades industries while creating new pathways for apprentices and skilled tradespeople seeking stable, long-term employment.

Opportunities for the jobs linked to carbon removal exist across all provinces. Provinces with geological storage capacity, biomass resources, mining operations, and agricultural land stand to benefit most directly.

This represents new economic opportunities for regions across Canada, including provinces like Alberta and Saskatchewan that have expressed a desire to diversify their economies, while leveraging existing workforce skills and infrastructure to provide a natural pathway.

British Columbia brings forestry residues, mining operations, and extensive coastline for ocean-based approaches.

Alberta and Saskatchewan offer world-class geological storage and existing pipeline infrastructure.

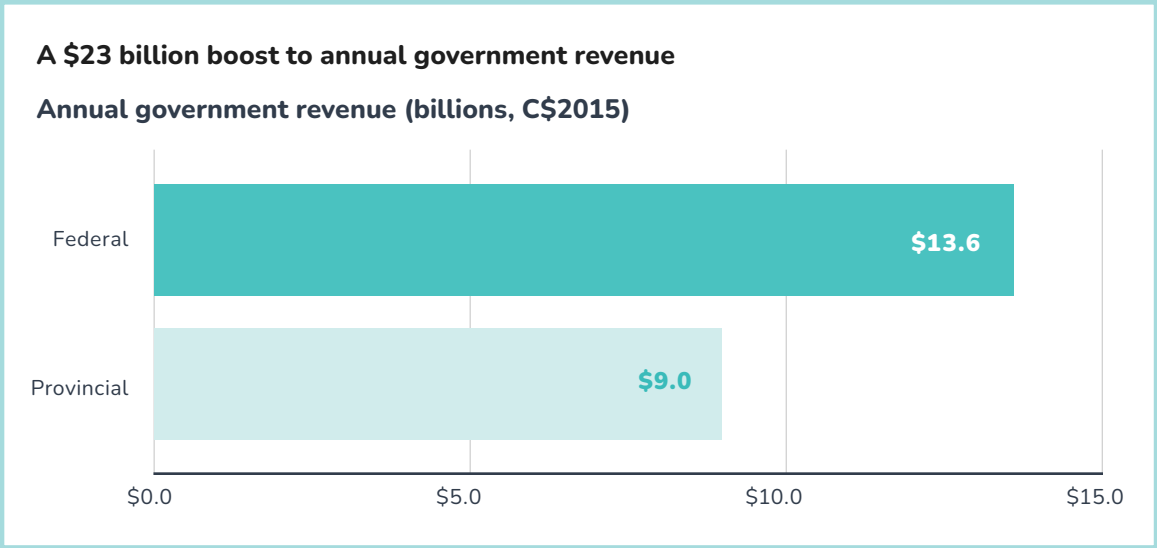
Ontario combines agricultural land with manufacturing expertise and proximity to Great Lakes shipping.

Quebec's existing mining and forestry industries offer significant feedstocks from asbestos tailings and forestry operations, allowing carbon removal technologies to integrate into established supply chains and scale more quickly.

Newfoundland and Labrador, Nova Scotia, and Prince Edward Island have significant offshore geological sequestration potential, and abundant coastlines to deploy ocean carbon removal methods.

2.4 A $23 Billion Carbon Removal Dividend for Governments

Development of a carbon removal sector increases both federal and provincial government revenue, driven primarily by higher overall economic growth. By 2050, annual government revenue is up to $23 billion higher in scenarios with carbon removal compared to scenarios without, with roughly two-thirds accruing to the federal government.



Forecasts that include carbon removal result in $13.6 billion and $9 billion more in annual federal and provincial government revenue, respectively, compared to scenarios without it.

This revenue increase does not depend on new taxes or carbon removal-specific levies. It flows naturally from a larger, more productive economy: more corporate profits generating corporate tax revenue, more employment generating income tax revenue, more economic activity generating consumption tax revenue. This revenue can support defence, healthcare, and infrastructure without increasing the tax burden.

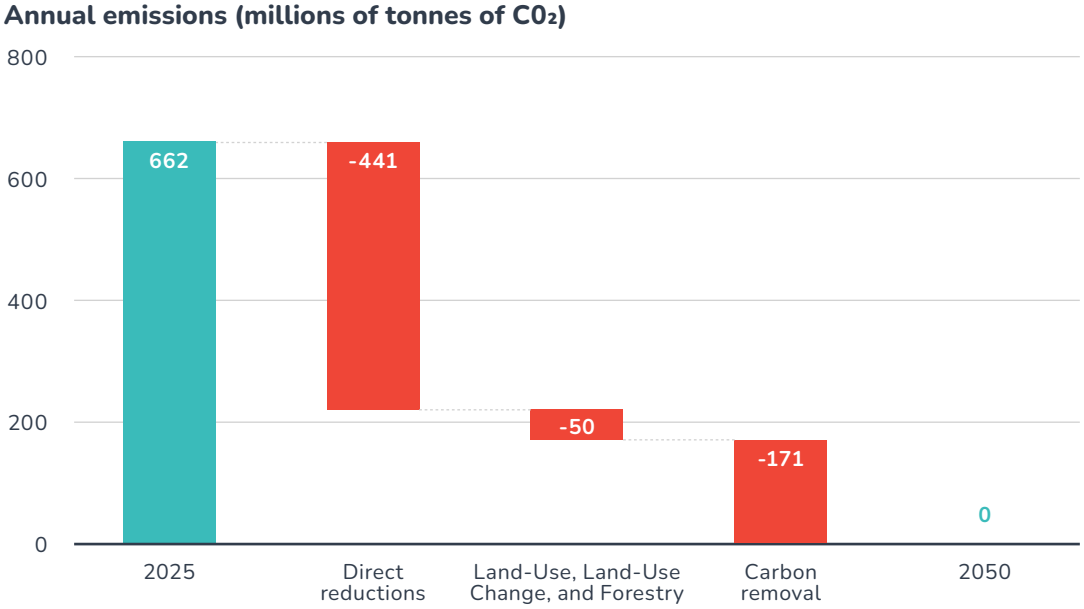
Climate policy is sometimes framed as a cost that governments must bear. The modelling suggests otherwise. A well-designed carbon removal sector generates revenue that exceeds the public investment required to catalyze it.

2.5 From Domestic Necessity to Global Exports

Economic modelling from Navius Research reveals a clear finding: the most economically efficient pathway to net-zero in Canada requires 171 megatonnes of annual carbon removal by 2050. For reference, according to Carbon Removal Canada's Carbon Console, Canada currently has 0.1 megatonnes of operational carbon removal capacity, with another 10.9 megatonnes in the project pipeline.

This 171 megatonnes of removal per year emerges from the model as the point where carbon removal provides maximum domestic economic benefit. This is equivalent to offsetting roughly one quarter of today's national emissions.

The affordable path to net-zero by 2050
Carbon removal is the most cost-effective way to address a quarter of today's emissions



Economic modelling by Navius Research shows that the most affordable path to net-zero requires scaling carbon removal to 171 megatonnes annually by 2050.

Critically, this is an entirely domestic number. It represents what Canada needs to meet its own net-zero commitments. This provides industry a tool to address residual emissions that, in a world without carbon removal, would be prohibitively expensive to address.

But 171 megatonnes is not a ceiling. Canada's natural advantages position it not just to meet domestic needs, but to become a global provider. Many nations lack the geological storage, clean energy, or technical capacity to build carbon removal at scale, making it more efficient to purchase services from countries like Canada. This export opportunity exists now: global demand for high-quality removal is growing, and Canadian providers are already attracting international buyers. Building these relationships early strengthens the industry, accelerates learning, and establishes Canada's reputation in the market.

The 171 megatonne target secures Canada's domestic competitiveness. What comes alongside, and after, positions Canada as a global leader in an emerging trillion-dollar market.

Carbon removal does not just create a new sector. It creates conditions under which existing sectors can thrive in a net-zero economy.

The Next Big Export Market

Key Takeaways

Canada can become a major supplier in an emerging trillion-dollar market

Countries like Singapore, Switzerland, Japan, and the EU need carbon removal but lack the geology or energy to deliver it domestically. Canada has both.

Carbon removal exports enable broader trade competitiveness

When Canadian manufacturers can back their products with verified domestic removal, they gain preferential access to climate-aligned markets where carbon intensity increasingly determines market access.

Canada can deploy all carbon removal technologies

Most countries will develop one or two approaches, or none. Canada can do them all, maximizing the range of export customers it can serve.

While the previous section quantified the domestic economic benefits of carbon removal, Canada's opportunity extends far beyond its borders. The fundamental driver for a carbon removal export market is geographic and economic mismatch. Countries with heavy industry driving their economies will require carbon removal to address their own residual emissions. However, not all of these jurisdictions possess the natural advantages to deliver carbon removal at scale.

Aerial view of Canadian Wollastonite's Kingston, ON mine, which supplies feedstock that UNDO distributes to Southern Ontario farmers to spread on their fields. This removes CO_2 from the atmosphere while also increasing crop yields.

The EU's 2040 climate framework explicitly allows up to five percent of its target to be met through high-quality international credits.

Japan's Green Transformation Emissions Trading System will accept credits from DAC, BECCS, and coastal blue carbon, as well as from projects in other countries.

Singapore lacks space for large-scale DAC or geological storage, yet its carbon tax allows facilities to meet up to five percent of their emissions liability through international credits.

Switzerland faces similar constraints and is actively pursuing partnerships with countries that can supply the removals it needs.

The International Civil Aviation Organization's Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA) will require airlines to offset emissions growth, creating global demand for high-quality carbon removal.

Carbon Removal Canada sees significant export potential in the carbon removal sector, as growing international demand for high-quality credits and low-carbon products creates new market opportunities for Canadian projects. Carbon Removal Canada intends to work with industry, government, and research partners to better quantify this export opportunity and develop strategies to help Canadian projects capture it.

Carbon Engineering's direct air capture innovation centre in Squamish, BC, where new technologies are tested and refined before being deployed in major projects worldwide

3.1 The Export Opportunity

Canada is exceptionally positioned to meet this demand. With more than 389,000 megatonnes[11] of geological storage potential, abundant renewable energy, and deep technical expertise, Canada can host carbon removal projects across all provinces and territories at a scale few other nations can match. Just as countries already trade renewable energy certificates or agricultural commodities based on comparative advantage, durable carbon removal is becoming a traded service. Countries with the right geology, energy, and expertise can specialize in removal. Others will purchase what they need. For Canada, this is not only about climate. It is about positioning ourselves in what could become a trillion-dollar global market.[12]

The export opportunity also amplifies the value of carbon removal for Canadian industry more broadly. When Canadian manufacturers can demonstrate that their products are backed by verified, permanent carbon removal from domestic facilities, they gain preferential access to climate-aligned markets. For example, a Canadian aluminum producer selling into the EU can point to a decarbonization pathway that competitors in removal-poor nations cannot easily replicate.

3.2 A Portfolio, Not a Bet

One of Canada's most significant advantages is the ability to deploy the full spectrum of carbon removal technologies. Most countries will develop one or two approaches, constrained by geography, resources, or expertise. Some will develop none at all. Canada can do them all.

A diversified portfolio of carbon removal technologies is crucial for Canada. Each technology is valuable, offering unique benefits across different sectors, geographies, and timeframes. Canada should avoid "picking winners" and instead focus on creating the optimal conditions for all approaches to develop.

This portfolio strategy allows the market, technological advancements, and regional strengths to ultimately determine the most effective mix of solutions.

This breadth also maximizes the export opportunity. A country seeking biochar credits can buy from Canada. A corporation looking for a diversified removal portfolio to back its net-zero commitment can source everything from a single jurisdiction with consistent regulatory standards and verification protocols. Canada becomes a comprehensive supplier of carbon removal, able to meet varied demands from varied buyers at varied price points.

The goal of taking a portfolio approach is to create an ecosystem, rather than relying on a single technology. The economic modelling reinforces this. GDP contributions come from a range of technologies and ripple out to adjacent industries. The exact mix will depend on how costs evolve, but the modelling shows economic value across the portfolio. Canada's advantage lies precisely in not having to choose.

SECTION 4

Policy Recommendations to Grow the Removal Industry

Key Takeaways

Loan guarantees and innovation funding address financing barriers for first-of-a-kind projects

Financiers see significant risk in new technologies, uncertain policy, and limited long-term buyers. A government loan backstop to reduce financing risk and a buyer backstop to guarantee demand would improve access to capital and give developers the confidence to move forward. An innovation challenge that makes early investments in nascent technologies would further de-risk the sector and accelerate scale-up.

Government procurement of carbon removal serves multiple objectives at once

Directly purchasing carbon removal services decarbonizes federal safety and security operations, invests in a sector essential to net-zero, and supports Canadian companies and jobs.

Export and compliance markets provide the demand signal needed to scale

Canada needs an international trading strategy that plays to its carbon removal strengths while also working to integrate these technologies into domestic frameworks to create predictable long-term demand.

The carbon removal industry offers the most affordable path to net-zero by 2050 while generating significant economic benefits for Canada. However, realizing this future will require significant policy action. The current suite of climate policies have enabled progress on lowering Canada's emissions, but are considered insufficient to reach net-zero.[13] Furthermore, they do not unlock the carbon removal capacity needed to achieve the most affordable path to net-zero. Comprehensive, ambitious, stable regulations that enable emitters to choose from a wide range of solutions, including carbon removal, are crucial for creating an environment conducive to investment, which in turn will support reductions in cost and increases in scale over time.

Policies can help create the market conditions where carbon removal can compete and innovate. Innovation is happening rapidly, but first-of-a-kind facilities face financing gaps that private capital alone won't bridge. Government support at this stage doesn't just enable individual projects, it generates the operational data, workforce training, and supply chain development that makes the next commercial facility viable and less expensive. The economic model assumes long-term cost reductions through learning by doing and economies of scale. To realize this potential, policy action is essential to create the necessary market conditions to reduce costs.

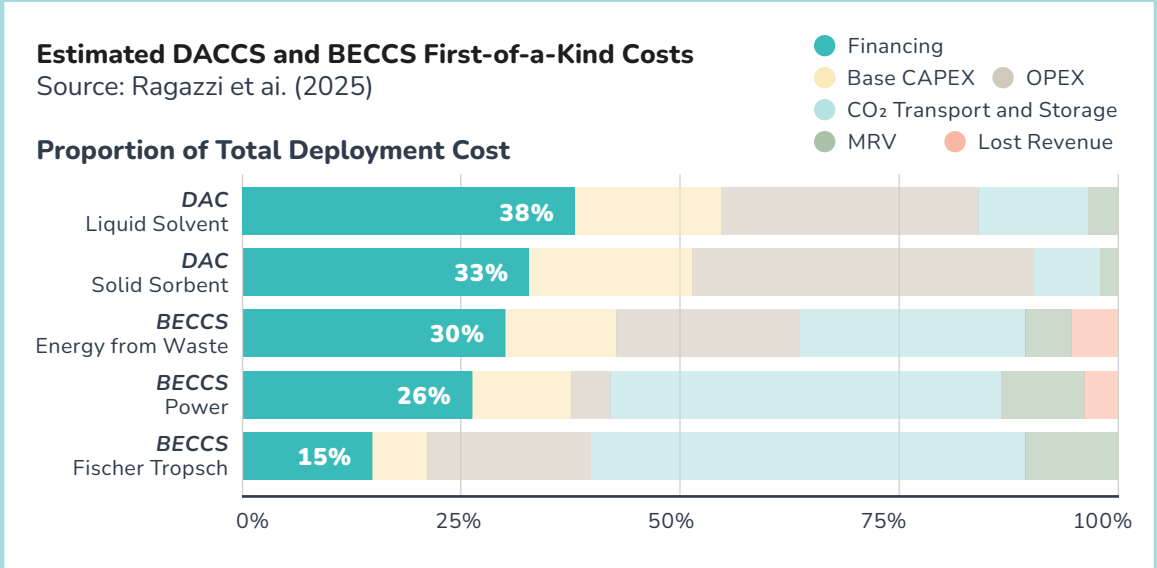
The ideal policy approach combines incentives to propel near-term project development with frameworks for long-term stability. Getting smaller projects off the ground today is critical for lowering the costs of carbon removal and building the industry at scale. Early deployments allow developers to learn what works in the field, finetune their operational processes, and begin progressing along technology cost curves, cultivating the iterative learning that establishes a foundation upon which larger projects can grow. First-of-a-kind projects also improve investor confidence in financing second and third-of-a-kind projects, which integrate learnings from earlier deployments and apply them at greater scale.

These larger projects will require stable demand signals and a reliable value for the carbon removal they deliver. Long-term investment decisions are based on the expectation of future revenue, and predictable, stable demand for carbon removal allows investors to confidently forecast revenue potential for large-scale projects with decades of assumed operational lifespan, improving their ability to greenlight new development. The right policy mix can accelerate this learning curve, drive down costs, and position Canada to capture the full economic opportunity.

4.1 Short-Term: $500M Government Backstop

The Government of Canada should institute a $500M government backstop for carbon removal companies to catalyze private investment in major carbon removal projects, while protecting government revenues.

Projects today face difficulties securing financing, which is critical for enabling capital development. Financiers see significant risk in first-of-a-kind projects from technology performance, policy uncertainty, supply chain volatility, and the absence of long-term buyers. This results in projects being unable to get financing, or paying high interest rates on any they do secure. Recent cost estimates indicate that financing costs might make up a third of total deployment costs for DAC and BECCS projects.[14]



Estimated cost breakdown of first-of-a-kind deployments across several types of DAC and BECCS technologies. The cost of financing alone might make up a third of total project costs.

Some of this risk can be addressed through public innovation funding, targeted at new scalable technologies. This type of funding is well-suited to get lab-scale and initial field pilot projects off the ground.

For projects that build off of successful pilots, there is still significant risk that private funders may be reluctant to support. Governments can address these barriers through complementary backstop mechanisms: a loan guarantee that activates only if a project cannot meet debt obligations due to specified disruptions, reducing financing costs; and a buyer-side backstop that ensures there will be reliable private demand and protects buyers against non-delivery. This $500 million commitment would protect government resources while crowding in the capital and demand.

4.2 Medium-Term: $500M for the Next Five Procurement Rounds

The Government of Canada should scale up its carbon removal procurement rounds over the next decade, growing from the initial $10 million to at least $100 million per round as the market matures, establishing a robust demand signal that will help companies go from demonstration to commercialization.

Increasing the volume of direct carbon removal procurement would enable the government to decarbonize its safety and security fleet and meet its Greening Government goals while supporting Canadian companies and jobs. The $10 million committed in Budget 2024 represents an important first step, but procurement rounds should scale up over the next decade as the supply of carbon removal matures, growing to at least $100 million per round. Structuring offtake agreements with ten-year terms would maximize the impact of this procurement by improving bankability and giving developers the long-term revenue certainty needed to attract financing. This extended commitment would provide the runway for the industry to become a mature cornerstone of Canada's economy.

4.3 Long-Term: Integration into Compliance and International Markets

The Government of Canada should ensure carbon removal can generate credits in regulatory systems like the Output-Based Pricing System or Clean Fuel Regulations, enabling heavy industry to grow competitively while creating the long-term demand needed to scale carbon removal beyond government procurement.

The Government of Canada should ensure carbon removal can generate credits in regulatory systems like the Output-Based Pricing System and Clean Fuel Regulations, enabling heavy industry to grow competitively while creating the long-term demand needed to scale carbon removal. A successful system would connect demand from industrial sectors facing high decarbonization costs with the supply of carbon removal, offering sufficient incentive to address emissions while supporting the ramp-up to the scale required for Canadian industries to reach net-zero. A stable, predictable system with long-term certainty would provide investors with confidence to deploy capital towards large-scale developments, unlocking the potential for cost savings through economies of scale.

Additionally, Canada should pursue the development of high-integrity ITMO that include permanent carbon removal technologies, utilizing foreign compliance markets to grow Canadian companies. To capture global market share while it is still up for grabs, Canada must establish clear rules for how domestically generated carbon removal can be transferred internationally under Article 6 of the Paris Agreement, including robust accounting frameworks that prevent double counting and transparent registries that international buyers can trust.

Where Does Carbon Removal Go From Here

Carbon removal at scale:[15]

>50%
cut to the marginal cost of reaching net-zero, with savings as early as 2035

$78B
increase in economy-wide Canadian GDP

300K
jobs created across the economy

$23B
generated in government revenue annually

The numbers tell a clear story, but let's return to where this report began: a Canadian steel plant electrifying its operations, with over a billion dollars in public support, that still faces residual emissions it cannot readily eliminate. That plant needs carbon removal to compete in markets that price carbon and so will our low-carbon manufacturing, mining, and farmers.

There is no question that direct emissions reduction efforts are crucial to reach net-zero. The results of the analysis confirm that the majority of the progress to net-zero will come from decarbonization efforts like electrification, renewable energy, and energy efficiency. But carbon removal's role is now becoming clear and significant: as a tool to lower the costs of addressing a quarter of today's emissions, all while injecting new economic benefits.

While the carbon removal sector can contribute billions to Canada's GDP directly, the deeper value lies in what carbon removal enables across the rest of the economy. Without carbon removal, hard-to-abate sectors have an extremely difficult path to address their residual emissions. Carbon removal is the only tool capable of addressing residual emissions while allowing hard-to-abate industries to remain competitive in a low-carbon economy, maintain Canadian employment, pursue every feasible decarbonization measure, and ultimately achieve net-zero.

The modelling confirms this. In scenarios with carbon removal compared to those without, GDP is higher not just in the removal sector but in energy, services, construction, agriculture, and mining. This is what economic infrastructure does. It creates value directly while enabling far greater value indirectly.

The economic case for Canadian carbon removal is quantified and grounded in reality. Carbon removal is beneficial on its own terms, but its greater significance is as a multiplier: the infrastructure that allows the rest of the Canadian economy to compete in a low-carbon future.

Annex

LEARN MORE ABOUT OUR MODELLING

A.1 Methodology

Navius Research employed an integrated energy-economy model to assess the macroeconomic impacts of carbon removal deployment in Canada under net-zero emissions constraints. The model simulates interactions between energy systems, economic sectors, and policy instruments to project outcomes for GDP, employment, investment, and government revenue.

All scenarios assume a national net-zero emissions cap beginning in 2035, phased in linearly from 2030 emission levels to net-zero by 2050. This cap is implemented on top of current federal and provincial policies, including the federal carbon pricing schedule to 2030. After 2030, the industrial carbon price is replaced by the national emissions cap, with the shadow carbon price emerging endogenously from the model based on the marginal cost of achieving the required emissions reductions.

To understand the organic level of carbon removal adoption given a requirement to reach net-zero by 2050, the model enabled the development of all of the technologies listed below, and solved for the most economically efficient path to address emissions in line with the trajectory to net-zero by 2050. This resulted in the adoption of 171 megatonnes of annual carbon removal in the baseline cost scenario. Many of the abatement options that were offset by carbon removal include activity reduction or production losses, carbon leakage, and technology retirement before their useful lifespan.

A.2 Key Assumptions

The analysis included six categories of carbon removal technologies, each characterized as a certain archetype:

- Biochar involves pyrolysis of agricultural and forestry residues to produce stable carbon that is applied to agricultural soils. The model constrained feedstock availability at 2025 levels to avoid unrealistic expansion and assumed no imports of residues from the United States. Agricultural co-benefits of biochar application were treated as a sensitivity given uncertainty in valuation.
- Enhanced Rock Weathering involves spreading silicate minerals on agricultural land to accelerate natural weathering processes that sequester CO_2. ERW and biochar adoption are presented together in results because these technologies can be applied on the same parcel of land, making efficient use of agricultural areas for carbon removal.
- Bioenergy with Carbon Capture and Storage covers both electricity generation and industrial applications. The model assumed a maximum 70% blend rate of bio-pellets into coal generation and did not constrain development of new BECCS facilities for electricity generation. BECCS in manufacturing sectors such as cement was also included.
- Direct Air Capture uses chemical processes to capture CO_2 directly from ambient air for geological storage. The model assessed both reference cost assumptions and low-cost sensitivities, given the significant impact of DAC cost trajectories on overall CDR deployment and economic outcomes.
- Ocean Alkalinity Enhancement involves adding alkaline materials to ocean waters to enhance CO_2 absorption. The modelled archetype relies on surficial release using existing coastal industrial infrastructure, constraining deployment to locations with appropriate existing facilities and limiting application rates accordingly.
- Carbon Mineralization accelerates natural processes by which silicate minerals react with CO_2 to form stable carbonate minerals. The modelled archetype is linked to silicate mining activity and assumes surficial application using rock churning technology on mine tailings. Deployment is limited by nickel mining activity and rock reactivity.

Scenarios without carbon removal assume that these technologies are not available, but still allow for renewable natural gas with CCS. Scenarios with carbon removal allow for these technologies to be available.

Net emissions from Land Use, Land-Use Change and Forestry (LULUCF) were assumed to remove 30 megatonnes in 2035 and 50 megatonnes in 2050, based on Environment and Climate Change Canada projections. These negative emissions contribute to achieving net-zero alongside permanent carbon removal.

Government revenue impacts flow from overall economic growth rather than carbon removal-specific taxation, capturing increased corporate, income, and consumption tax revenues from a larger economy.

A.3 Cost Sensitivities

The analysis assessed multiple cost trajectories for carbon removal technologies. Results presented in the main report primarily reflect reference cost assumptions unless otherwise noted. The cost of DAC had the largest impact on overall CDR adoption and economic outcomes among the sensitivities assessed. Under low DAC cost assumptions, total CDR adoption increases significantly and the technology mix shifts, with DAC displacing some BECCS deployment as lower DAC costs reduce the shadow carbon price and erode the business case for BECCS electricity generation.

A.4 Limitations and Caveats

Several limitations should be considered when interpreting results:

- The model solves for the most economically efficient solution given technology costs and policy constraints. Real-world deployment will be shaped by additional factors including financing availability, permitting timelines, public acceptance, and supply chain development that are not fully captured.
- Technology cost projections are inherently uncertain, particularly for less mature approaches like DAC and OAE. Results are sensitive to these assumptions, as demonstrated by the significant differences between reference and low-cost scenarios. For technologies like mineralization, characterizing additional types of feedstocks would likely materially change the results.
- The analysis focuses on domestic economic impacts and does not fully capture potential export market opportunities, which could significantly increase the economic value of Canadian carbon removal.

Endnotes

1 Monetary values that are referenced are in 2015 Canadian dollars.

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14 Ragazzi, I., Erbay, Y., Butnar, I., Gonev, H., Baltac, S., Workman, M., Ghaleigh, N. S., Westbury, P., & Smith, S. (2025). 2025 Update on Greenhouse Gas Removal Costs and Scaling Challenges. https://co2re.org/publication/2025-update-on-greenhouse-gas-removal-costs-and-scaling-challenges/

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