



# Money Talks

How government procurement can drive down emissions and boost Canadian industry

 CLEAN ENERGY CANADA

OCTOBER 2022

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Association  
of Canada



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This report was written by Clean Energy Canada based on analysis by Global Efficiency Intelligence. The findings and recommendations are endorsed by members of the Buy Clean Alliance, a coalition of groups representing Canadian industry, labour, and the environment. The Buy Clean Alliance is made up of the Aluminum Association of Canada, BlueGreen Canada, the Canadian Steel Producers Association, the Cement Association of Canada, Clean Energy Canada, and the Forest Products Association of Canada.

## Money Talks

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**SFU**

**MORRIS J. WOSK  
CENTRE FOR DIALOGUE**





# Executive Summary

When one thinks about carbon emissions, images of spewing smokestacks or tailpipes likely come to mind. But there is a pollution problem hidden in the built environment around us, from the buildings we live in to the roads we drive on.

A seventh of the world's carbon emissions are associated with building materials like steel, cement, and aluminum.<sup>1</sup> And globally, most companies that make these products are not on track to hit net-zero emissions by 2050.<sup>2</sup> Put simply, there is a construction-shaped hole in our global efforts to combat climate change.

Fortunately, solutions exist. Steel can be made without coal in an electric-arc furnace. Cement and concrete can be made with lower carbon fuels. In fact, many lower-carbon building materials are already available at little or no extra cost.<sup>3</sup> And there are a number of new technologies—such as clean hydrogen for steel and carbon capture, utilization and storage for cement—just around the corner that could reduce the carbon footprint of these materials to almost zero. The problem is that many are likely to cost more than the dirtier alternatives, which could hold up development and adoption.<sup>4</sup>

**The good news is that Canadian governments have the power to accelerate the shift to cleaner construction materials. And they can do it while supporting Canadian industries and workers.**

**Governments are among the largest buyers of building materials in Canada.** And by procuring construction products with a lower carbon footprint, governments can effectively support a sizable market for clean building products. This approach is referred to as “Buy Clean,” and it's taking hold around the world, from the Netherlands to California.

The federal government is already on board, having announced its Greening Government Strategy to disclose and reduce the carbon emissions associated with building materials in federal projects, like ports or government buildings. While this is a good start, we found that such federal purchasing makes up just 4% of all public spending and less than 1% of all infrastructure spending in Canada.<sup>5</sup> **The reality is that the heft of Canada's public infrastructure spending rests with provinces, municipalities, and Crown corporations.**

Put together, the Canadian public sector makes up around a fifth of all infrastructure spending in the country. **The production of materials used in public infrastructure creates at least 8 million tonnes of carbon emissions every year—equal to the pollution caused by 1.7 million gas cars.** When private construction is included, the figure rises to almost **28 million tonnes annually**—50% of Canada’s electricity generation emissions.



**By introducing an ambitious and truly national Buy Clean policy that spans all levels of government, Canada could avoid up to 4 million tonnes of emissions by 2030.** And because the public sector has such significant buying power, Buy Clean would likely have spillover effects into the rest of the market. Indeed, the more governments demand low-carbon products through their purchasing, the more incentive the private sector has to channel resources into developing and producing them. That, in turn, helps lower costs while making cleaner products more competitive with their dirtier counterparts.

In fact, if both governments and the private sector opted to ramp up low-carbon requirements to only buy materials with a 50% smaller carbon footprint by 2030, the cumulative total emissions savings across the whole market would be as much as 75 million tonnes of carbon dioxide between now and the end of the decade. That’s roughly equivalent to taking all the passenger vehicles off Canada’s roads for an entire year.<sup>6</sup>

A Buy Clean approach also has the added advantage of supporting many of Canada’s already leading low-carbon industries. Canada’s electricity grid is among the cleanest in the world, meaning that products made using that electricity are accordingly low-carbon.

As a result, Canada produces some of the world’s cleanest aluminum and steel.<sup>7,8</sup> Canada’s cement and concrete industry has made ambitious commitments to reduce emissions to net zero.<sup>9</sup> And provinces like B.C. and Ontario have enormous potential for a sustainable mass timber construction industry.<sup>10</sup>

Canada also punches above its weight in cleantech, with companies like Montreal-based CarbiCrete, whose technology can create “carbon negative” concrete, or Alberta-based Carbon Upcycling, which is using waste glass to make cleaner cement. And with 137 countries covering 91% of the world’s GDP committed to reaching net zero by 2050, the future market for low-carbon materials is potentially enormous. The more Canadian industries are incentivized to produce cleaner products, the more they can grow and compete in a world that is kicking carbon.

This economic upside is one reason why a coalition of industry associations—representing cement, steel, aluminum, and forestry—and groups representing labour and the environment have joined forces to form a Buy Clean Industry Alliance, calling for the federal government to release an ambitious and fully funded national Buy Clean strategy.

In short, Buy Clean is good for the climate and good for business, but only if Canada effectively leverages its full public purchasing power. **To do so, Canada must build a national Buy Clean framework by taking the following steps:**

1

Expand the scope

Mandate Buy Clean requirements across the whole federal government—including for Crown corporations and federal investments in provincial and municipal infrastructure.

2

Develop provincial and local capacity

Create a dedicated team in the federal government to provide support to all levels of government—from provinces to municipalities—and the private sector to get on board with Buy Clean.

3

Tighten standards and drive innovation

Reform building standards to enable low-carbon materials while also investing in data, tools, and programs to test and scale even cleaner construction solutions.



# The Buy Clean buy-in

Research has shown that using public procurement—the buying power of governments when choosing which goods and services to procure—is key to driving innovation and creating markets for low-carbon building materials.

Since governments are often the largest single buyers of construction materials, their decisions have a big impact. By “buying clean,” governments can preferentially purchase construction products with lower embodied carbon, creating a market for these cleaner products with positive spillover effects in the private sector.<sup>11</sup>

Around the world, governments are buying in. The U.S. Federal Buy Clean Initiative will prioritize the use of low-carbon steel, cement, asphalt and glass, covering over 90% of all federally funded infrastructure.<sup>12</sup> These policies will apply to the billions of dollars committed to clean infrastructure spending in its Inflation Reduction Act and Bipartisan Infrastructure Law.<sup>13,14</sup> Meanwhile, several European countries, such

as Sweden, the Netherlands, and France, have world-leading low-carbon procurement policies. The EU’s Big Buyers for Climate and Environment supports low-carbon materials procurement by local and regional governments.<sup>15</sup>

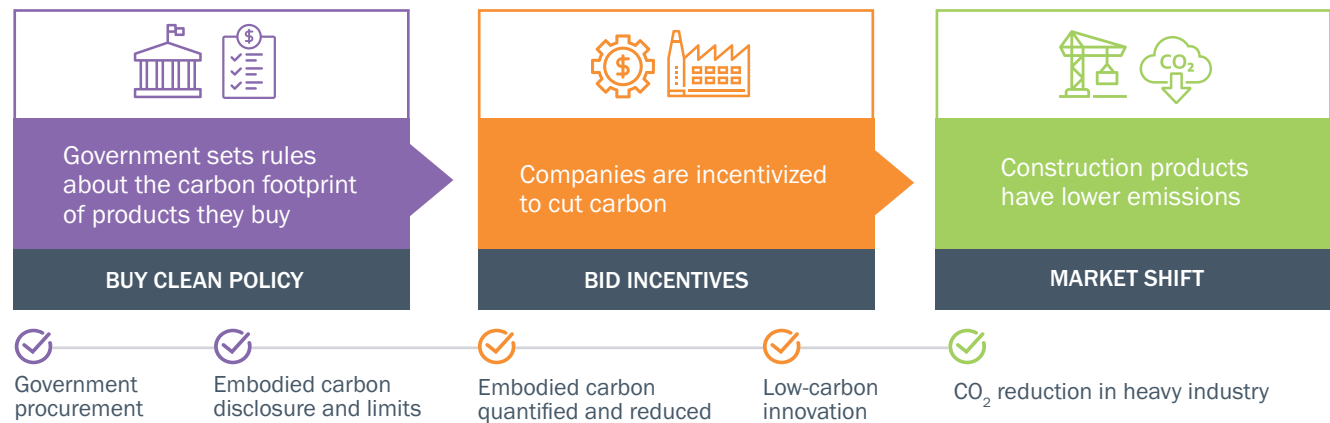
Here in Canada, the federal government has taken initial steps with its Greening Government Strategy, which aims to reduce embodied carbon from building materials and federal construction projects starting in 2025. In 2021, the government committed to expanding this approach to infrastructure spending more broadly, by developing a national Buy Clean strategy. There has been some progress to date, including funding to collect and publish data and support the uptake of low-carbon building materials.<sup>16</sup>

But so far, the federal government has focused primarily on its own procurement. Canada is among the most decentralized countries in the OECD, with provinces, local governments, and Crown corporations spending far more on construction materials than the federal government.<sup>17</sup> Thus, Buy Clean's true potential lies in adopting a national policy that can drive transparency and emissions reductions in all public construction spending at all levels of government.

Until now, the size of this Canada-wide public construction pie had not been calculated, and the true scope of a national Buy Clean policy, from the perspective of both the market size and the potential avoided emissions, was unknown.

Along with consulting firm Global Efficiency Intelligence, Clean Energy Canada set out to determine the amount, location, and type of construction materials Canadian governments buy and in which types of projects they are used. We also aimed to estimate the scale of embodied carbon emissions from construction projects in Canada. Several recent studies have estimated embodied carbon in buildings, but this may be the first estimate of embodied carbon for all infrastructure projects.<sup>18,19</sup>

### How public procurement can stimulate CO<sub>2</sub> reductions in industry



## BUY CLEAN 101

**Buy Clean represents a set of procurement policies that quantify the carbon associated with constructing public infrastructure and buildings.** This information is then used in conjunction with incentives and standards to ensure the materials governments buy are manufactured in a cleaner and more efficient way.

**Embodied carbon** refers to the combined emissions created over the full life-cycle of a product, including the extraction, production, and transport of its materials along with its eventual construction, upgrades, and renovations, followed finally by its demolition or end of life.

Buy Clean policies rely on a **life-cycle assessment (LCA)** to disclose this information in the procurement process, most commonly in the form of an **Environmental Product Declaration (EPD)**. Using the information from an EPD, governments, designers, and construction firms can compare and select products based on their embodied carbon footprint. Buy Clean policies can mandate this, by setting minimum standards or carbon caps, or provide financial incentives to encourage project bids to use low-carbon products.





## Methodology

Global Efficiency Intelligence (GEI) analyzed the input-output tables produced by Statistics Canada to develop construction spending estimates by public and private sector, different public jurisdictions (federal, provincial and local governments), construction sectors, and materials of interest.

GEI developed baseline CO<sub>2</sub> emissions intensity values for each material based on previous benchmarking research (for steel and aluminum) and government estimates (for cement) and created a weighted average based on the level of domestic versus imported use.

Finally, GEI estimated the avoided CO<sub>2</sub> emissions from Buy Clean in Canada by modelling four policy scenarios investigating a) the direct impacts from Buy Clean public procurement policy and b) the potential indirect impacts as producers shift to cleaner materials in private construction projects.

These four scenarios varied from 10% (“low”) to 50% (“transformative”) reductions relative to baseline emissions.

For more information about the methodology, see GEI’s technical report, *Advancing Buy Clean Policy in Canada*.<sup>5</sup>



## The bottom of the iceberg

All public infrastructure spending in Canada totalled a sizable \$62.5 billion in 2018, about one-fifth of all spending on infrastructure in the country, including housing.

However, of this public spending total, direct federal procurement accounts for just 4%, while federal spending that is transferred to provinces, territories, and municipalities accounts for another 13%.

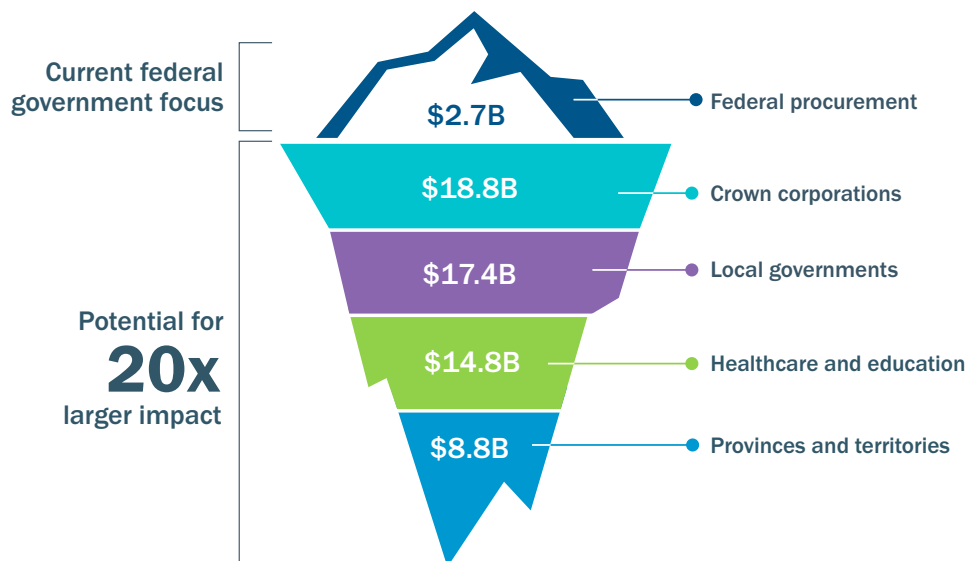
Most infrastructure spending is by government business enterprises (including Crown corporations), provinces, territories, municipalities, and the health and education sectors. This slice of the pie is 20 times larger than federal procurement and represents the true heft of public buying power. In short, a singular focus on federal spending alone is missing the bottom of the proverbial iceberg.

Overall, governments are particularly big buyers of concrete and steel, purchasing around a third of all concrete and steel products used in Canada, with a combined market value of around \$4 billion annually. Note that cement is a key component of concrete, but governments only buy concrete, and so references to concrete in this report also include cement.

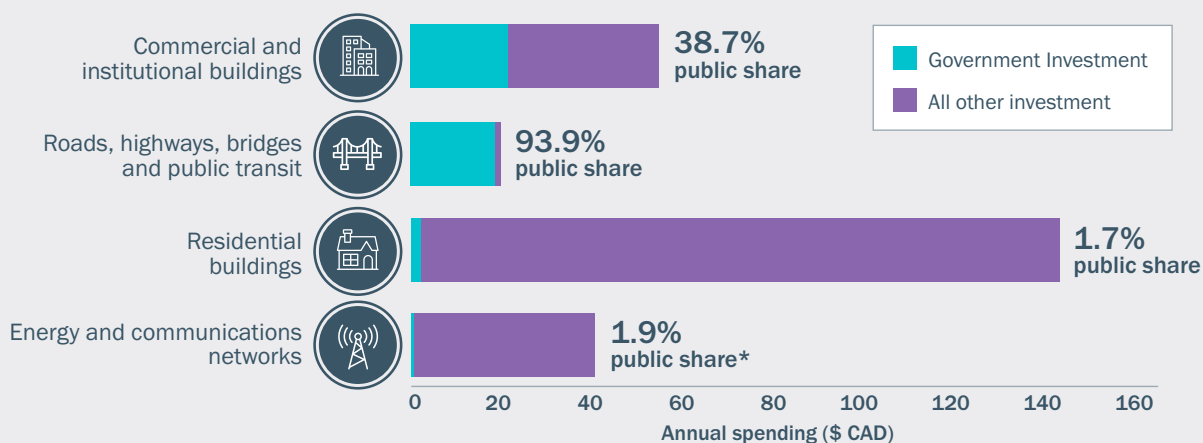
Canada's public spending also varies by infrastructure type. Governments are responsible for almost all investment in transportation infrastructure, including roads, bridges, and public transit, and nearly half the investment in non-residential buildings like schools, hospitals, and government buildings. Perhaps unsurprisingly, the private sector dominates residential buildings, as well as smaller markets like electricity, oil and gas, and communications infrastructure.



## Breakdown of public infrastructure spending by level of government and public agencies

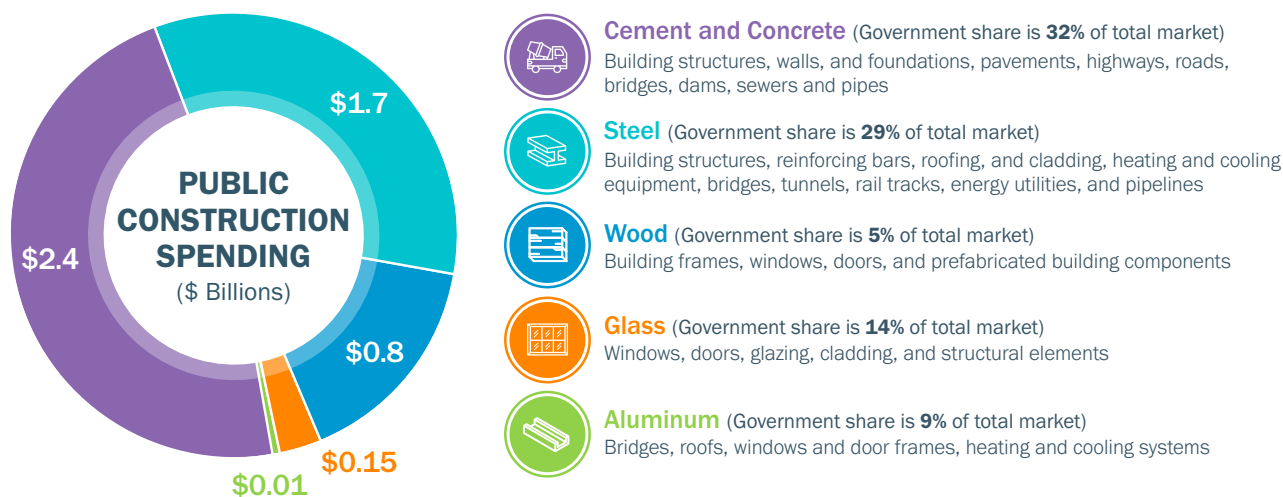


## Public and private shares in Canadian infrastructure investment (2018)



\*Crown corporations, including provincial electricity utilities, were not included in this analysis due to data limitations.

## Key construction materials and Canadian annual public spending (2018)



Sources: Cement Association of Canada; WorldSteel; Natural Resources Canada; Understand Construction



# The hidden pollution problem

About 13% of global emissions are “embodied” in the materials used to construct buildings and other infrastructure.<sup>1</sup>

Among the largest contributors are cement, steel, and aluminum, which are the focus of this report.<sup>20,21</sup> Demand for these materials is only projected to grow, with up to 45% more cement, 30% more steel, and 80% more aluminum expected to be required by 2050.<sup>21</sup> In short, left unchecked, the already-large embodied carbon problem is set to get a lot larger.

In Canada, we use about 25 million tonnes of cement, steel, and aluminum each year in infrastructure, resulting in almost 28 million tonnes of greenhouse gas emissions annually—that is half of Canada’s emissions from generating electricity. The true impact of embodied carbon could be up to two times larger when emissions from other building materials and products—like glass, roofing, and insulation—are factored in.<sup>22</sup>

The public sector is among the biggest buyers of these materials, and the embodied carbon in public infrastructure projects is responsible for 8 million tonnes of emissions annually—the equivalent of pollution from 1.7 million cars.

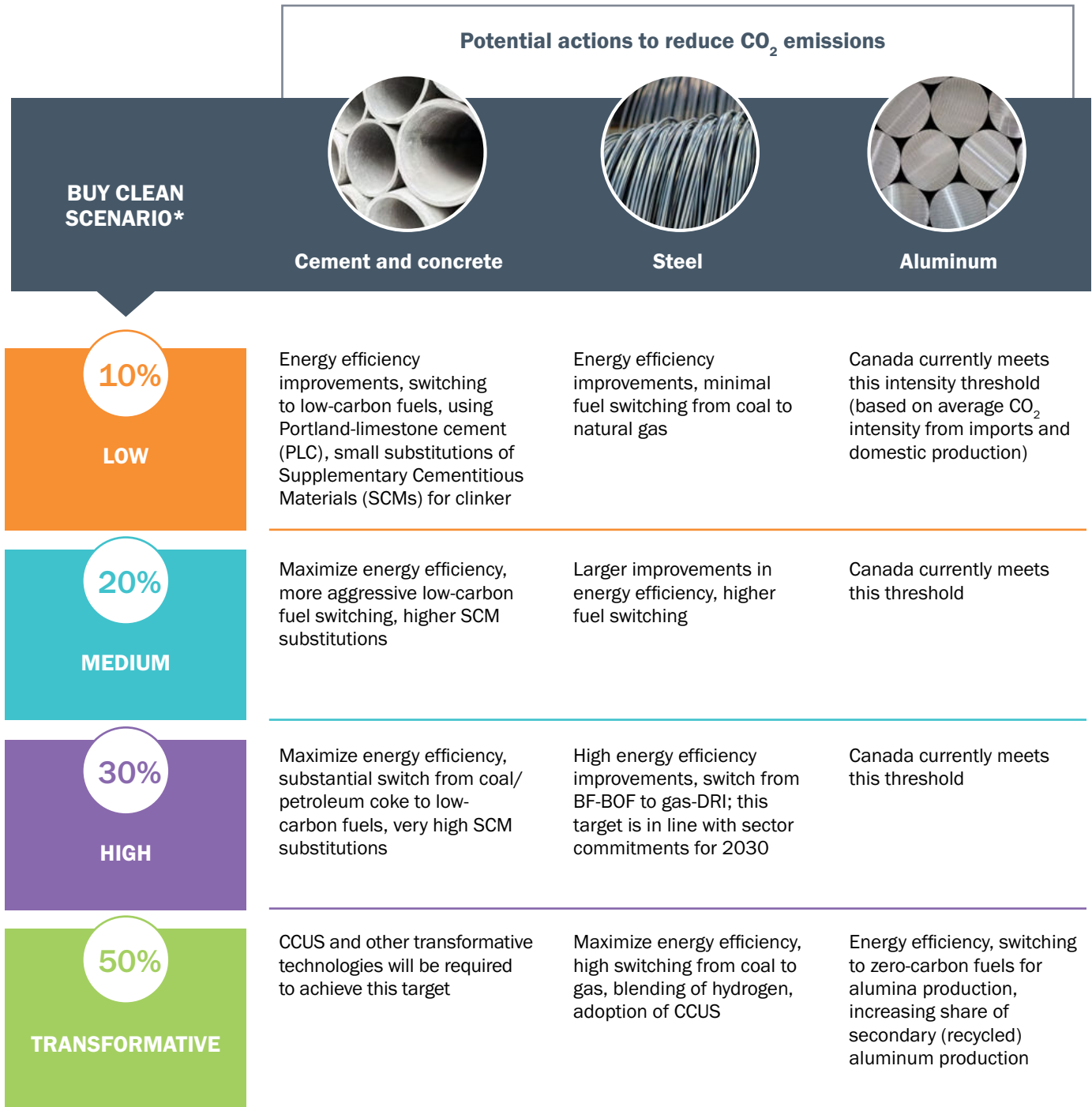
Steel accounts for two-thirds of this total due to the large volumes used and the carbon-intensive nature of producing steel in a blast furnace/basic oxygen furnace (on average, more than one tonne of CO<sub>2</sub> is released for every tonne of steel produced).

**Canada also imports large volumes of steel (64% of domestic consumption)<sup>23</sup> and imported steel from the U.S., EU, and China is between 16% and 200% more carbon-intensive than steel made in Canada.<sup>7</sup>**



# Policy potential

The four scenarios and actions required to achieve them






SCM = supplementary cementitious materials    CCUS = carbon capture, utilization and storage

BF-BOF = blast furnace-basic oxygen furnace    DRI = direct reduced iron

Source: [Global Efficiency Intelligence](#); \*the amount of embodied carbon reduced in each tonne of material relative to an industry average baseline

## Annual embodied emissions from materials used in Canadian infrastructure

	MATERIAL CONSUMPTION (tonnes)		EMBODIED EMISSIONS (Mt CO <sub>2</sub> e)	
	Total	Public construction	Total	Public construction
 Cement and concrete	9.5 million	3.0 million (32%)	7.3	2.3
 Steel	14.4 million	4.2 million (29%)	19.1	5.6
 Aluminum	0.6 million	0.05 million (9%)	1.2	0.1
<b>Total</b>	<b>24.5 million</b>	<b>7.3 million</b>	<b>27.7</b>	<b>8.0</b>

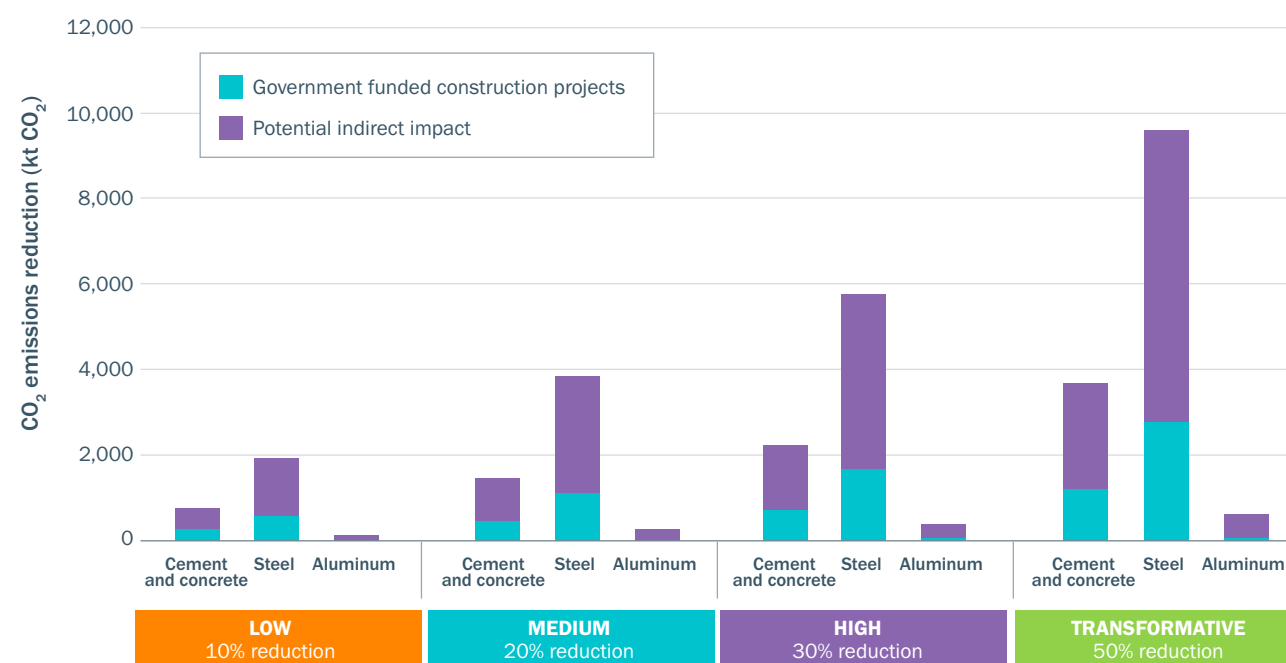
Note: Does not include steel and aluminum procured for non-construction purposes (e.g. vehicles and appliances). Numbers may not add up due to rounding.

To better understand Buy Clean's full potential, we investigated four different policy scenarios.

In a transformative scenario, where governments buy construction products with 50% lower embodied carbon than the current baseline, 4 million tonnes of carbon pollution could be avoided each year. By contrast, in the low-ambition scenario, where emissions are reduced by just 10% relative to current practices, only 800,000 tonnes are saved—just 20% of the policy's carbon-cutting potential. But Buy Clean policies could also have the knock-on effect of growing the broader market for low-carbon materials. As domestic industries are incentivized to produce

lower carbon materials for government projects, these products will become more widely available and more likely to be used in private construction projects. In fact, construction companies such as EllisDon<sup>25</sup> and Chandos Construction<sup>26</sup> are already leading the way in choosing low-embodied carbon materials. If the private sector were to procure materials with the same embodied carbon as the public sector, the impacts of Buy Clean could potentially reduce emissions by up to 13.8 million tonnes, depending on the scenario. At the high end, that's equivalent to taking 3 million cars off the road, which is greater than the annual emissions of New Brunswick.<sup>27</sup>

## Annual avoided emissions under four Buy Clean scenarios for concrete, steel, and aluminum





Although the megatonnes of emissions per year might be small relative to other big polluting sectors, the cumulative impact over time is significant. For example, a national Buy Clean program that ramps up emissions reductions requirements for all public infrastructure—eventually reaching the transformative scenario by 2030—could save more than 20 megatonnes of emissions over the next decade. When the knock-on effects for wider construction emissions are also factored in, this could be as much as 75 megatonnes. That’s roughly equivalent to taking all the passenger vehicles off Canada’s roads for an entire year.<sup>6</sup>

Embodied carbon savings have the additional benefit of being immediate, rather than incremental over time like those from building energy retrofits or other energy efficiency measures. Indeed, as the electricity grid becomes cleaner and buildings are built or renovated to be more energy efficient, the embodied carbon from construction materials will become a bigger proportion of the building sector’s total carbon footprint. Already in Ontario, which has a largely emissions-free grid, embodied carbon makes up 40% of the carbon footprint for a LEED-certified government building over its projected lifetime.<sup>28</sup> Buying clean allows governments to significantly cut the carbon footprint of a building from day one.



### Government spending projections

The federal government will invest more than \$160 billion over the next five years in infrastructure projects.<sup>30</sup> Currently, every \$1 million spent by the federal government on infrastructure creates 150 tonnes of embodied emissions from the use of steel, cement, concrete, and aluminum.\*

**This will result in 24 million tonnes of emissions between now and 2027 if left unchecked.**

\*Other building materials, such as asphalt, glass, and insulation, are not included in this calculation but would also have a large carbon footprint.



“The importance of embodied emissions is set to increase dramatically as more buildings are constructed and renovated to higher energy efficiency standards.”<sup>29</sup>

*2021 Global Status Report for Buildings and Construction, the United Nations Environment Program*

# COMPANY SPOTLIGHTS



CarbiCrete

> **CarbiCrete** is a Montreal-based carbon removal technology company that creates cement-free, “carbon-negative” concrete by using steel slag and captured CO<sub>2</sub>. The company recently partnered with concrete product manufacturer Patio Drummond.

> **Alcoa and Rio Tinto** are scaling up their ELYSIS technology for zero-carbon aluminum products, after successful full-scale production tests at their Industrial Research and Development Centre in Saguenay, Quebec.<sup>31</sup> ELYSIS aluminum has already been used in Apple technology products and in wheels for the latest Audi eTron GT.

> **Svante** is a company based in Burnaby, B.C., that is developing carbon capture and storage technology for cement production. It is currently running a pilot project at the Lafarge cement plant in Richmond, B.C., where flue gas is captured from the plant’s manufacturing facility to eventually be reused in concrete or fuel.

> **Carbon Upcycling** is an Alberta-based technology company that uses local industrial byproducts and natural materials to cut emissions from concrete and cement. Its technology is being piloted by Aecon and Dufferin Concrete in Ontario.



Svante



> **ArcelorMittal Dofasco** is a Hamilton-based steelmaker that has invested \$1.8 billion (including up to \$900 million from the federal and provincial governments) to replace existing coal-fired production with direct reduced iron production that will use natural gas and electric arc furnaces run by Ontario's low-emission electricity. This will reduce plant emissions by up to 60% by 2030. The company expects to eventually transition to hydrogen instead of natural gas, which could reduce emissions to near-zero levels, and is also testing the use of green hydrogen at its Contrecoeur plant in Quebec.<sup>32,33</sup>

> **Rio Tinto** has partnered with several European steelmakers to develop low-carbon iron (using Canadian iron ore and green hydrogen produced from hydropower) that could be exported and fed into green steel production.<sup>34</sup> The company is exploring the potential for an industrial-scale plant in Canada.

> **Element5** is an Ontario-based company specializing in the design, fabrication and assembly of timber buildings. The firm has been expanding its portfolio of projects in the province, including municipal buildings such as the new Oakville Fire Station 8, office units, and multiple affordable housing projects.<sup>35</sup>

> **Kalesnikoff Mass Timber** is a Castlegar, B.C., timber company that produces cross-laminated timber, glulam beams, and other innovative wood building products. Their products have been used in buildings across B.C. and the western U.S., including the Timber House mid-rise housing development in New Westminster and the University of Victoria student residences.<sup>36</sup>

> **Nordic Engineered Wood Products** produces cross-laminated timber, glulam, and other mass timber products from their Montreal-based headquarters. The company prioritizes sustainable construction, and projects include the Pomerleau Regional Office and the award-winning Synergia Complex, both in Quebec.<sup>37</sup>



Rio Tinto



Alcoa

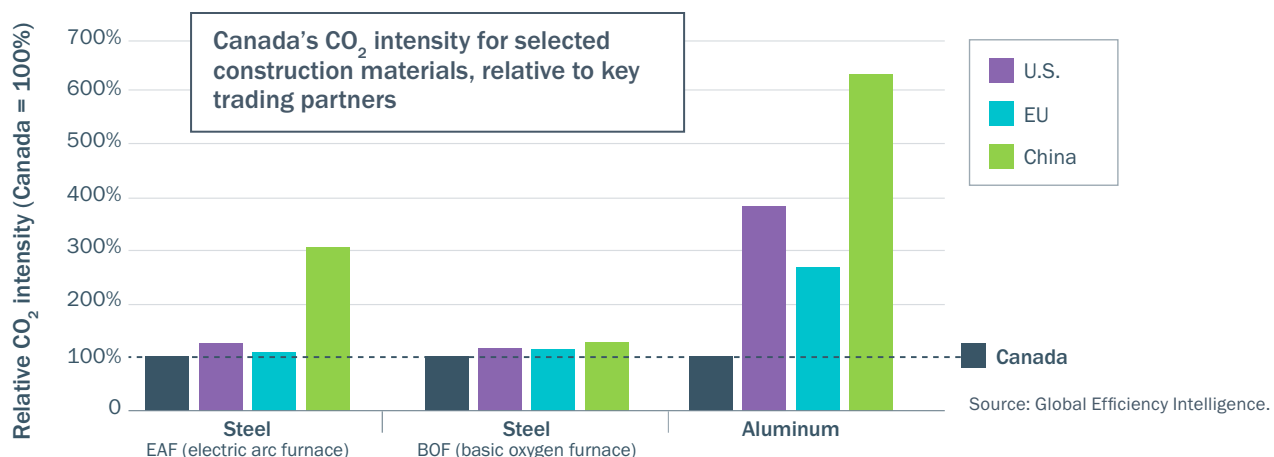


# Paying the premium

## Canada's clean industrial advantage

Canada's electricity grid is 84% non-emitting, making it one of the cleanest in the world, and some provincial grids are already almost entirely zero-emissions.<sup>38</sup> That means products made using electricity are accordingly low-carbon. As a result, Canada produces some of the cleanest aluminum and steel in the world: imported steel from the U.S., EU, and China (together accounting for almost two-thirds of imports) is between 16% and 200% more carbon-intensive than steel made in Canada, depending on the production method.<sup>7</sup>

Similarly, aluminum imports from the same countries are on average 170% to 535% more carbon-intensive than Canadian products.<sup>8</sup> Canada is also proximal to a large and growing market in the U.S., with an existing close and highly integrated trading relationship. And its geography and natural resources offer great potential for industrial net-zero solutions like carbon capture and storage, green hydrogen (which can be used for steelmaking), and sustainably managed forests (for timber production). In short, Canada is well-placed to lead the field on the industrial net-zero transformation.



# Three reasons why Canada needs to act fast on Buy Clean

1

## Markets and regulations are moving in this direction

When it comes to reaching net-zero emissions, it's not a case of "if" but "when." Around the world, 137 countries covering 91% of global GDP and 83% of emissions have net-zero pledges.<sup>39</sup> Meanwhile, 2,253 companies<sup>40</sup> covering one-third of global market size and 450 financial institutions representing more than US\$130 trillion in assets have made similar pledges.<sup>41</sup>

Companies are increasingly thinking about the carbon intensity of their purchases. Many are setting supply chain emissions targets, and 96% of corporate climate targets now cover Scope 3 emissions (emissions from assets that are not owned or controlled by the company but are used in its supply chain, including in the buildings it uses).<sup>40</sup>

Beyond the private sector, the U.S. government has proposed Scope 3 emissions disclosure requirements as part of its broader climate risk disclosure rules.<sup>42</sup> And the new Inflation Reduction Act includes nearly US\$11 billion to purchase and increase the supply of low-embodied carbon materials.<sup>43</sup> Importantly, this includes funding to define and label which materials qualify as "low-carbon."<sup>44</sup> The new bill joins a host of clean materials procurement efforts from other countries and sub-national governments around the world, including the U.K., Germany, France, Netherlands, and Sweden.

What's more, countries are looking to amend trade rules to limit the carbon "embodied" in the products they buy from other countries. The EU is phasing in a Carbon Border Adjustment Mechanism from 2023 to limit the embodied carbon in its imports.<sup>45</sup> Similarly, the U.S.-EU global arrangement on sustainable steel and aluminum will drop import tariffs in exchange for commitments to reduce embodied carbon.<sup>46</sup>

And in the private sector, the market for green building materials is set to grow at least 10% annually over the next five years.<sup>47</sup> Investors, such as the Bill-Gates-backed Breakthrough Energy, are looking for companies that are innovating and can take advantage of this growing market.<sup>48</sup>

2

## We can create new markets for green materials while bringing down costs

A Buy Clean policy will create a strong market for made-in-Canada, low-carbon products, making them more competitive in domestic procurement bids for major infrastructure projects. This also enables Canadian producers to be more competitive overseas too, as buyers like the U.S. and EU add carbon disclosure requirements to their procurement and trade rules.

As the costs of all construction materials rise in line with fossil fuel prices and inflation, buyers may look to source from suppliers whose prices are less dependent on volatile commodities. For example, steel produced in Canada by electric arc furnaces (which use clean electricity) will be subject to fewer price swings than steel produced by burning coal or natural gas.

What's more, using lower carbon materials need not always increase costs in the short term. Studies suggest that zero-emission steel and cement would add between 0.5% to 3% to the price of a vehicle or building after other construction costs are factored in.<sup>21</sup>

**And a Canada-specific study of residential buildings found no correlation between the carbon footprint and cost of materials.** In fact, in some categories, the lowest carbon materials were also the cheapest.<sup>51</sup>

Indeed, studies from the U.K. and U.S. found that the carbon footprint of construction materials can be cut significantly with little or no impact on lifecycle cost.<sup>3,52</sup> And even though some products will undoubtedly cost more in the short term (zero-emission steel will likely have a 20% to 40% premium at first), Buy Clean will help create a market that has the potential to drive innovation and reduce costs over time.



## How Canada stacks up to the U.S.

Criteria	U.S. 'Federal Buy Clean Initiative'	Canada current situation	Canada with Buy Clean Alliance proposals implemented
<b>Buy Clean policy applies to:</b>			
Federal procurement	✓	✓	✓
Federally funded infrastructure	✓	✗	✓
Priority materials identified	Steel, Concrete, Flat Glass, Asphalt	✗	Steel, Concrete, Aluminum, Wood Products
<b>Federal funding allocated:</b>			
R&D on low-carbon materials	✓ US\$1.2 billion	✓ Up to C\$183 million	✓ C\$483 million
Low-carbon materials procurement	✓ ~US\$5 billion + up to \$4 billion in loans	✗ N/A	✓ C\$500 million
Decarbonize industrial emitters	✓ US\$5.8 billion	✓ C\$8 billion	✓ C\$8 billion
Buy Clean pilot programs	✓	✗	✓
Development of Environmental Product Declarations	✓ US\$250 million	✗	✓
<b>Additional actions:</b>			
Creation of national lifecycle emissions database	✓ Federal LCA Commons	✓ LCA <sup>2</sup> Initiative	✓
Convening states / provinces	✓	✓	✓
International collaboration	✓	✓	✓

Note 1: Canadian federal departments are Treasury Board Secretariat; Innovation, Science and Economic Development Canada; National Research Council of Canada; Natural Resources Canada; Public Services and Procurement Canada; Infrastructure Canada; and Environment and Climate Change Canada

Note 2: \$183M in funding for the National Research Council announced in Federal Budget 2022 to “conduct research and development on innovative construction materials and to revitalize national housing and building standards to encourage low-carbon construction solutions.”

Sources: The White House, Council on Environmental Quality, Government of Canada, Industrial Deep Decarbonization Initiative.

## The U.S. Inflation Reduction Act and Buy Clean

**The U.S.’s new Inflation Reduction Act includes historic investments in growing the market for low-carbon building materials**, allocating US\$5 billion to identify and purchase “climate-friendly” materials in federal buildings, highways, and other infrastructure.<sup>14,49</sup> The Act also includes almost US\$6 billion to increase the supply of low-carbon materials through investments to decarbonize steel mills, cement plants, and other industrial polluters. By comparison, Canada has committed C\$8 billion to decarbonize large emitters, including building material producers,<sup>50</sup> but relatively little has been allocated for procurement of low-carbon materials and products.

**In September 2022, the White House launched its Federal Buy Clean Initiative that will prioritize low-carbon steel, concrete, glass, and asphalt, accounting for 98% of all federally purchased materials.** The policies will also apply to federally funded infrastructure projects such as highways and bridges, significantly extending the policy’s market reach and impact. With more than 90% of Canada’s building material exports heading to the U.S., Canadian producers will increasingly be required to demonstrate their products have a lower carbon footprint than competitors. As well, the Inflation Reduction Act’s generous tax incentives and investments mean Canada could lose its clean energy and industrial competitive advantage to its larger neighbour.



### We can create more, future-proofed clean jobs

Steel, aluminium, and concrete support an estimated 310,000 direct and indirect jobs in Canada. When other building materials sectors are included, such as forestry and wood products, this number rises to over half a million.<sup>53</sup>

There are multiple ways that Buy Clean policies support existing and new jobs.

First, low-carbon procurement often prioritizes domestically made products due to their proximity to markets and competitive carbon performance, like Canadian aluminum, which has significantly lower embodied carbon than its imported counterparts. Currently, imported products make up 60% of the market, often from countries with more polluting grids and industrial processes. Buy Clean helps make Canadian products more competitive, in turn supporting the hundreds of thousands of jobs that they provide.

Second, public procurement and green building policies can support the development of emerging industries and technologies, leading to job and economic growth.<sup>54</sup> U.S. green building policies created an estimated US\$173 billion in economic benefits and over a million jobs from 2000 to 2008.<sup>55</sup> Clean procurement measures adopted by South Korea in 2005 created more than 12,000 jobs by 2016.<sup>56</sup>

In addition to Buy Clean, green building policies can also help support jobs. Already, around 150,000 people are employed manufacturing materials for Canada's growing green building sector. With targeted government intervention, the sector is expected to grow more than three-fold by 2030, supporting hundreds of thousands of new jobs and billions of dollars in economic benefits.<sup>58</sup>

And in Ontario, the province's \$500 million investment in electrifying the ArcelorMittal Dofasco steel plant is expected to create decades of employment certainty for the plant's 4,600 workers.<sup>57</sup>



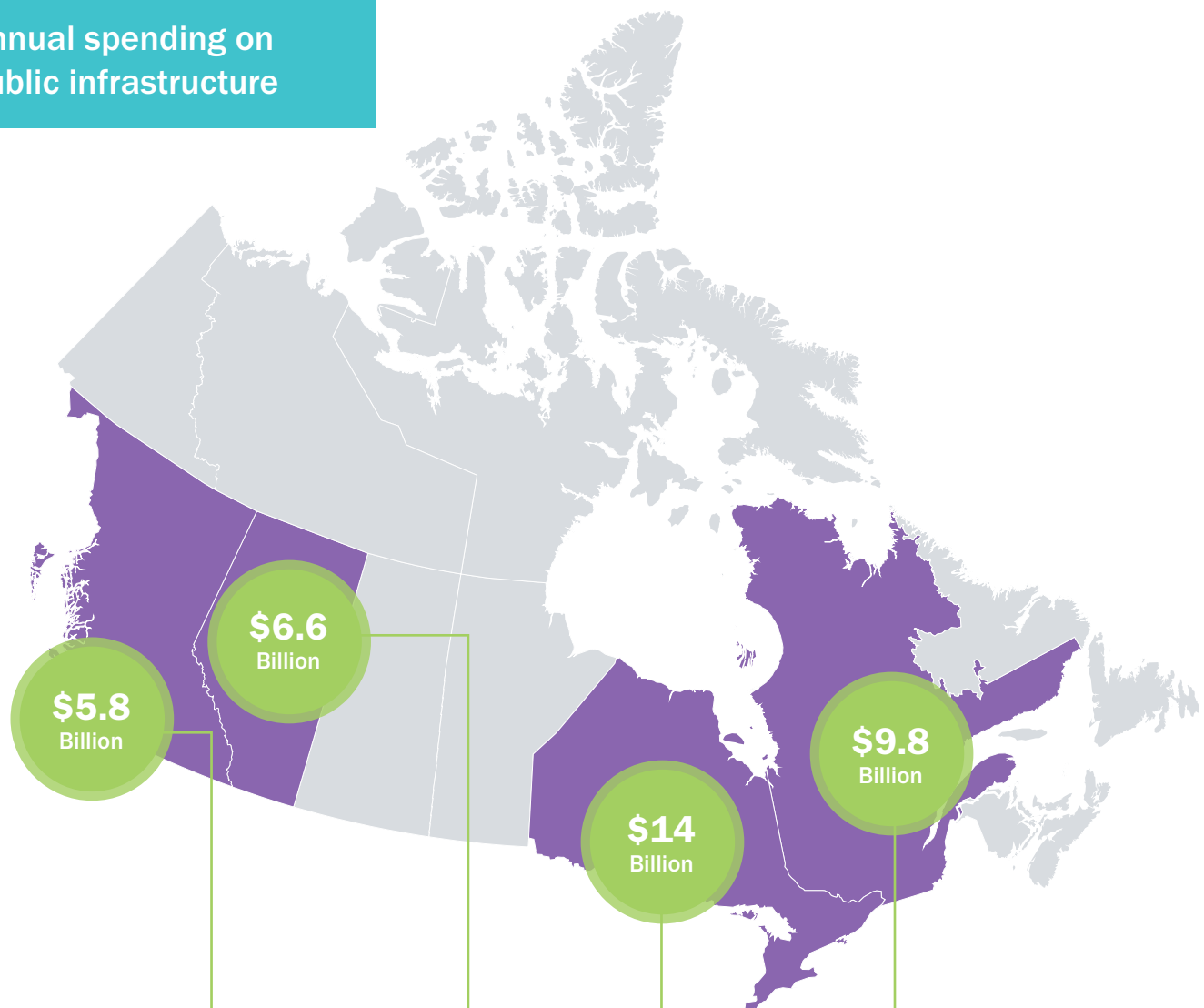
### Private sector buy in

Buying clean isn't just a public sector phenomenon. Driven by investor and consumer pressure, many private sector purchasers are opting to reduce their construction emissions. **Amazon** has adopted design standards that require concrete with 20% lower embodied carbon while sourcing electric-arc furnace steel for its data centres. It's also investing in Nova Scotia-based low-carbon concrete company CarbonCure.<sup>59</sup> The First Movers Coalition, a group of 55 corporate buyers including **Apple, Ford, Volvo, and Vestas**, have pledged to purchase a portion of their materials from suppliers using near-zero or zero-emission technologies, despite the premium cost.<sup>60</sup> Similarly, a group of construction companies, developers, architects, and other businesses—including **Orsted, Siemens Gamesa, and Maersk**—have made "ConcreteZero" and "SteelZero" pledges to only use net-zero concrete and steel by 2050.

# A provincial picture

Four provinces, Ontario, Quebec, B.C., and Alberta, account for more than **85% of Canadian infrastructure spending and up to 90% of spending on key materials**. As a result, these provinces are key public buyers for clean building materials and can also influence how large cities procure.

## Annual spending on public infrastructure



### BRITISH COLUMBIA

### ALBERTA

### ONTARIO

### QUEBEC

#### Cement and concrete



**0.4 million tonnes**  
(22% of provincial consumption)

**0.4 million tonnes**  
(25% of provincial consumption)

**1.3 million tonnes**  
(37% of provincial consumption)

**0.6 million tonnes**  
(36% of provincial consumption)

#### Steel



**0.5 million tonnes**  
(27% of provincial consumption)

**1 million tonnes**  
(26% of provincial consumption)

**1.3 million tonnes**  
(35% of provincial consumption)

**0.7 million tonnes**  
(38% of provincial consumption)



## Key projects and opportunities

### Ontario

- Lafarge's Bath Cement Plant, near Kingston, has fully converted to Portland Limestone Cement production (which is 10% less carbon-intensive than traditional cement).<sup>61</sup>
- CRH, which owns the Mississauga Cement Plant and Dufferin Concrete, has partnered with construction firm Aecon and Carbon Upcycling to pilot 30%-lower-embodied-carbon concrete in Ontario.<sup>62,63</sup>
- The federal and provincial governments have invested in decarbonizing steel production at the ArcelorMittal Dofasco plant in Hamilton and at the Algoma Steel plant in Sault Ste. Marie. By 2030, the two facilities are forecast to reduce emissions by 6 million tonnes—more than half the current total from steelmaking in Ontario.

### Quebec

- Quebec is a member of the Buyers for Climate Action, a coalition of large public buyers working to accelerate low-carbon procurement.<sup>64</sup>
- Quebec is home to 11 aluminum smelting plants that emit the majority (88%) of Canada's emissions from aluminum production. Quebec's aluminum sector is already among the world's least carbon-intensive.<sup>8</sup>
- Rio Tinto and Alcoa are developing a carbon-free smelting technology that has received funding from the Government of Canada and has been purchased by companies including Apple and Corona.



### Alberta

- Alberta is a Canadian leader in carbon capture, utilization, and storage (CCUS), supporting the rollout of the technology in facilities and funding transportation and storage infrastructure.<sup>65</sup>
- Lehigh Cement's Edmonton facility is currently assessing the viability of using CCUS technology to produce carbon-free cement. A 2019 feasibility study confirmed it was possible to capture 95% of the plant's CO<sub>2</sub> emissions. The company is now working to identify viable storage options for the captured CO<sub>2</sub>. Once operational, this will be one of the first industrial-scale CCUS projects in the world.<sup>66</sup>
- The Alberta government is investing in developing the next generation of bitumen-based products with its Bitumen Beyond Combustion campaign, including \$15 million to accelerate the technology to produce carbon fibre from bitumen.<sup>67</sup> Asphalt is one of the key materials covered by the U.S.'s federal Buy Clean policy.<sup>49</sup>

### British Columbia

- B.C. has committed to introduce Buy Clean targets for public buildings by 2030, and will release a Low Carbon Building Materials Strategy by 2023.<sup>68</sup>
- Lafarge's Richmond-based cement plant has already committed to producing 100% Portland Limestone Cement, which has 10% lower embodied carbon while retaining all the performance metrics of general-use cement.<sup>69</sup> The plant is also into the second phase of its carbon capture, utilization and storage pilot, working with B.C.-based Svante.<sup>70</sup>
- The province is exploring mass-timber construction. This includes Tallwood House at the University of British Columbia campus which, at 18 storeys, is one of the tallest mass timber buildings in the world.<sup>71</sup>

Lehigh Cement's Edmonton facility is currently assessing the viability of using carbon capture, utilization and storage (CCUS) technology to produce carbon-free cement.



# Buy Clean building blocks

To maximize the benefits of Buy Clean, Canada must build a national framework that does the following:

- 1** **Mandate Buy Clean requirements across the federal government from 2023, and all federal agencies by 2025.** Build on existing commitments in the Greening Government Strategy to disclose and reduce embodied carbon by making them mandatory for major construction projects across all federal departments and Crown corporations and set a 2030 target to reduce embodied carbon by at least 45%.
- 2** **Extend Buy Clean requirements to major federal infrastructure transfers by 2025, and to all infrastructure spending by 2030.** The federal government can leverage an additional \$40 billion in sub-national infrastructure spending—15 times the value of its own procurement—by attaching conditions to disclose and reduce embodied carbon as part of transfer payments to provinces, territories, and local governments. Budget 2023 should create a new \$500 million clean infrastructure fund to incentivize the uptake of low-carbon materials and Buy Clean policies by sub-national governments.
- 3** **Accelerate the creation of foundational data and tools to support a national Buy Clean strategy by 2024.** Working with industry and other stakeholders, the federal government must leverage the \$183 million committed to the National Research Council in Budget 2022 to establish common emissions reporting standards, regional embodied carbon benchmarks, and public life-cycle emissions calculators and datasets.



4

**Create a dedicated federal team by 2023 to support wider adoption of Buy Clean.** A dedicated federal low-carbon procurement team will provide oversight, support, and training for procurement teams at all levels of government, as well as private sector bidders, to ensure an increased and smooth implementation of Buy Clean.

5

**Transform the market for low-carbon materials by reforming codes, standards, and specifications.** This includes embodied carbon requirements in the national model building codes, introducing performance-based codes and standards that enable low-carbon alternatives to traditional building materials. Additionally, a roadmap to net-zero whole-life carbon buildings must be part of the forthcoming Canada Green Buildings Strategy.

6

**Fund programs to develop and test innovative low-carbon materials.** Many low- or near-zero-emissions materials are not yet commercially available and cost more than higher carbon alternatives. The federal government can help address this by creating a \$300 million fund to develop, test, demonstrate and deploy innovative materials with the potential for deeper embodied carbon reductions.

7

**Increase the Canadian supply of low-carbon materials while supporting workers.** The federal government should continue to strategically invest in projects that cut emissions from industries that can supply low-carbon materials for domestic use and exports, while supporting and creating good jobs and providing training for workers to transition to lower carbon industries.

## Existing Canadian policy leadership

In Canada, several municipalities are exploring low-carbon concrete or materials policies. The City of Vancouver has a city-wide target of reducing embodied carbon by 40% by 2030 and 50% by 2030 for public buildings.<sup>68</sup> The City of Langford, B.C., requires all concrete used in construction to meet low-carbon standards.<sup>72</sup> Even small communities are getting in on the act: the Township of Douro-Dummer, Ontario, developed one of the first embodied carbon programs in North America, offering financial incentives for developers building with low-carbon materials.<sup>73</sup>

Toronto, Canada's largest city, brought in its latest Green Standard for construction in May 2022. The new standards include voluntary embodied carbon limits and disclosure requirements for homes and other buildings.<sup>74</sup> The City of Toronto also provides financial incentives, in the form of a development charge refund, for verified projects.<sup>75</sup> Future Toronto Green Standard updates may include mandatory embodied carbon requirements.<sup>76</sup>

At the provincial level, B.C. has committed to developing a Low Carbon Building Materials Strategy by 2023, and setting embodied carbon targets for public buildings.<sup>77</sup> Quebec's new government strategy on public procurement aims to support innovative procurement practices, such as mandatory life-cycle assessment and carbon footprint criteria for construction products.<sup>78</sup> And several provincial building codes, including in Ontario and Quebec, have approved the use of Portland Limestone Cement which has a 10% lower carbon footprint than conventional cement.<sup>79</sup>

Meanwhile, Canada and several other countries have pledged to use low-carbon steel and concrete in public construction projects as part of the Industrial Deep Decarbonization Initiative, which aims to recruit at least 10 countries over the next three years.<sup>80</sup> It was announced in September 2022 that the U.S., Canada's largest trading partner, has also joined the initiative.<sup>81</sup>





# Endnotes

1. Delmastro, C. Buildings - Tracking Report. *IEA* <https://www.iea.org/reports/buildings> (2022).
2. Dietz, S. et al. *TPI State of Transition Report 2021*. <https://transitionpathwayinitiative.org/publications/82.pdf?type=Publication> (2021).
3. Esau, R., Jungclaus, M., Olgyay, V. & Rempher, A. *Reducing Embodied Carbon in Buildings*. <https://rmi.org/insight/reducing-embodied-carbon-in-buildings> (2021).
4. Ashraf, M., Bocca, R. & World Economic Forum. To reach net zero, heavy industries need to decarbonize urgently. Here's why. *World Economic Forum* <https://www.weforum.org/agenda/2022/07/net-zero-tracker/> (2022).
5. Hasanbeigi, A., Shi, D., Bhadbhade, N. Advancing Buy Clean Policy in Canada. *Global Efficiency Intelligence*. <https://www.globalefficiencyintel.com/advancing-buy-clean-policy-in-canada>
6. Greenhouse Gas Emissions - Economic Sectors. *Government of Canada* <https://www.canada.ca/en/environment-climate-change/services/environmental-indicators/greenhouse-gas-emissions.html>.
7. Steel Climate Impact - An International Benchmarking of Energy and CO2 Intensities. *Global Efficiency Intelligence* <https://www.globalefficiencyintel.com/steel-climate-impact-international-benchmarking-energy-co2-intensities>.
8. Hasanbeigi, A., Springer, C. & Shi, D. Aluminum Climate Impact - An International Benchmarking of Energy and CO2 Intensities —. *Global Efficiency Intelligence* <https://www.globalefficiencyintel.com/aluminum-climate-impact-international-benchmarking-energy-co2-intensities> (2022).
9. Our roadmap to net-zero. *Cement Association of Canada* <https://cement.ca/sustainability/our-roadmap-to-net-zero/> (2021).
10. Mass Timber Market in Canada and Beyond. *Mantle Developments* <https://mantledev.com/insights/mass-timber/mass-timber-market-in-canada/> (2020).
11. Hasanbeigi, A., Becqué, R. & Springer, C. The role of green public procurement. *Global Efficiency Intelligence* <https://static1.squarespace.com/static/5877e86f9de4bb8bce72105c/t/5d673d3d8fc07e0001636b2c/1567047107086/Green+Public+Procurement+-Final+28Aug2019.pdf> (2019).
12. The White House. FACT SHEET: Biden-Harris Administration announces new buy clean actions to ensure American manufacturing leads in the 21st century. *The White House* <https://www.whitehouse.gov/briefing-room/statements-releases/2022/09/15/fact-sheet-biden-harris-administration-announces-new-buy-clean-actions-to-ensure-american-manufacturing-leads-in-the-21st-century/> (2022).
13. Fact Sheet: Biden-Harris Administration Advances Cleaner Industrial Sector to Reduce Emissions and Reinvigorate American Manufacturing. *The White House* <https://www.whitehouse.gov/briefing-room/statements-releases/2022/02/15/fact-sheet-biden-harris-administration-advances-cleaner-industrial-sector-to-reduce-emissions-and-reinvigorate-american-manufacturing/> (2022).
14. Inflation Reduction Act of 2022 Includes Over \$5 Billion in Funding to Drive Low Carbon Procurement in Buildings and Construction. <https://www.businesswire.com/news/home/20220729005443/en/Inflation-Reduction-Act-of-2022-Includes-Over-5-Billion-in-Funding-to-Drive-Low-Carbon-Procurement-in-Buildings-and-Construction> (2022).
15. European Commission. Big Buyers for Climate and Environment. <https://bigbuyers.eu/>.
16. Budget allocates for net-zero capacity building. *REMI Network* <https://www.reminetwork.com/articles/budget-allocates-for-net-zero-capacity-building/> (2022).
17. Green public procurement: Catalysing the net-zero economy. *World Economic Forum* <https://www.weforum.org/whitepapers/green-public-procurement-catalysing-the-net-zero-economy/>.
18. Ontario's first benchmarking of embodied carbon for large buildings. *Mantle Developments* <https://mantledev.com/publications/ontarios-first-benchmarking-of-embodied-carbon-for-large-buildings/> (2022).
19. Magwood, C., Bowden, E., Trottier, M. *Emissions of Materials Benchmark Assessment for Residential Construction*. <https://www.buildersforclimateaction.org/report—embarc-report.html> (2022).
20. Fennell, P., Driver, J., Bataille, C. & Davis, S. J. Cement and steel — nine steps to net zero. *Nature* <http://dx.doi.org/10.1038/d41586-022-00758-4> (2022) doi:10.1038/d41586-022-00758-4.
21. The Net-Zero Industry Tracker: An interactive guide for executives. *World Economic Forum* <https://www.weforum.org/reports/the-net-zero-industry-tracker/in-full/>.
22. Chen, W., ShiyuYang, Zhang, X., Jordan, N. D. & Huang, J. Embodied energy and carbon emissions of building materials in China. *Building and Environment* <http://dx.doi.org/10.1016/j.buildenv.2021.108434> (2022) doi:10.1016/j.buildenv.2021.108434.
23. Steel Statistical Yearbook 2020 concise version. *World Steel* <https://worldsteel.org/wp-content/uploads/Steel-Statistical-Yearbook-2020-concise-version.pdf> (2020).
24. Report - Trade Data Online. *Government of Canada* <https://shorturl.at/bcDHJ> (2022).
25. EllisDon - Corporate Sustainability. *EllisDon* <https://www.ellisdon.com/corporate-sustainability>.

26. Sustainable development. <https://www.chandos.com/how-we-build/sustainabledevelopment/>.
27. Greenhouse gas sources and sinks in Canada: executive summary 2022. *Environment Climate Change Canada*, <https://www.canada.ca/en/environment-climate-change/services/climate-change/greenhouse-gas-emissions/sources-sinks-executive-summary-2022.html#toc6> (2022).
28. Embodied carbon benchmarks for Part 3 buildings in the Greater Toronto-Hamilton Area. *The City of Toronto* <http://dx.doi.org/10.32920/ryerson.14664711.v1> (2022) doi:10.32920/ryerson.14664711.v1.
29. United Nations Environment Programme. 2021 Global Status Report for Buildings and Construction. <https://globalabc.org/sites/default/files/2021-10/2021%20Buildings-GSR%20-%20Executive%20Summary%20ENG.pdf> (2021).
30. Parliamentary Budget Office. Federal Infrastructure Spending, 2016-17 to 2026-27. *Office of the Parliamentary Budget Officer* <https://www.pbo-dpb.ca/en/additional-analyses--analyses-complementaires/BLOG-2122-008--federal-infrastructure-spending-2016-17-2026-27--depenses-federales-infrastructure-2016-2017-2026-2027> (2022).
31. Carbon free aluminium smelting a step closer: ELYSIS advances commercial demonstration and operates at industrial scale. *Rio Tinto* <https://www.riotinto.com/news/releases/2021/Carbon-free-aluminium-smelting-a-step-closer-ELYSIS-advances-commercial-demonstration-and-operates-at-industrial-scale> (2021).
32. Peesker, S. ArcelorMittal Dofasco getting \$400M from Ottawa to cut greenhouse gas emissions. *CBC News* (2021).
33. Pfeifer, S. ArcelorMittal successfully tests use of green hydrogen at Canadian plant. *Financial Times* <https://www.ft.com/content/cce5439a-3c26-4331-9455-094edb638df4> (2022).
34. Rio Tinto teams up with Paul Wurth and SHS-Stahl-Holding-Saar on low-carbon iron in Canada. *Rio Tinto* <https://www.riotinto.com/news/releases/2021/Rio-Tinto-teams-up-with-Paul-Wurth-and-SHS-Stahl-Holding-Saar-on-low-carbon-iron-in-Canada> (2021).
35. Projects. *Element5* <https://elementfive.co/projects/> (2021).
36. Projects. *Kalesnikoff* <https://kalesnikoff.com/projects/>.
37. Structures. <https://www.nordic.ca/en/projects/structures>.
38. Government of Canada & Canada Energy Regulator. Provincial and Territorial Energy Profiles – Canada. <https://www.cer-rec.gc.ca/en/data-analysis/energy-markets/provincial-territorial-energy-profiles/provincial-territorial-energy-profiles-canada.html> (2022).
39. Net Zero Tracker. <https://zerotracker.net/>.
40. SBTi Progress Report 2021. *Science Based Targets* <https://sciencebasedtargets.org/reports/sbti-progress-report-2021> (2021).
41. About Us. *Glasgow Financial Alliance for Net Zero* <https://www.gfanzero.com/about/> (2021).
42. SEC Proposes Rules to Enhance and Standardize Climate-Related Disclosures for Investors. *U.S. Securities and exchange commission* <https://www.sec.gov/news/press-release/2022-46> (2022).
43. Stashwick, S. Climate Bill Will Invest Big in Cleaning Up Heavy Industry. *NRDC* <https://www.nrdc.org/experts/sasha-stashwick/climate-bill-will-invest-big-cleaning-heavy-industry> (2022).
44. Lee, S. Green Concrete Transition Has Path to Credibility in Climate Law. <https://news.bloomberglaw.com/environment-and-energy/green-concrete-transition-has-path-to-credibility-in-climate-law> (2022).
45. Cosbey, Bernstein & Stiebert. Enabling Climate Ambition: Border carbon adjustment in Canada and abroad. *International Institute for Sustainable Development*.
46. Joint EU-US Statement on a Global Arrangement on Sustainable Steel and Aluminium. *European Commission* [https://ec.europa.eu/commission/presscorner/detail/en/IP\\_21\\_5724](https://ec.europa.eu/commission/presscorner/detail/en/IP_21_5724) (2021).
47. Call for action: Seizing the decarbonization opportunity in construction. *McKinsey and Company* <https://www.mckinsey.com/industries/engineering-construction-and-building-materials/our-insights/call-for-action-seizing-the-decarbonization-opportunity-in-construction> (2021).
48. Low-Carbon Building Materials. *Breakthrough Energy* <https://playbooks.breakthroughenergy.org/us-policy-overview/buildings/low-carbon-building-materials>.
49. Federal Buy Clean Initiative. <https://www.sustainability.gov/buyclean/>.
50. Government of Canada, Innovation, Science, Economic Development Canada & Canada, I. Net zero accelerator initiative. <https://ised-isde.canada.ca/site/strategic-innovation-fund/en/net-zero-accelerator-initiative> (2022).
51. Magwood, C., Ahmed, J., Bowden, E. & Racusin, J. D. Achieving Real Net-Zero Emission Homes: Embodied carbon scenario analysis of the upper tiers of performance in the 2020 Canadian National Building Code. *Builders for Climate Action* [https://www.buildersforclimateaction.org/uploads/1/5/9/3/15931000/bfca-enercan-report-web\\_08\\_22.pdf](https://www.buildersforclimateaction.org/uploads/1/5/9/3/15931000/bfca-enercan-report-web_08_22.pdf) (2021).
52. Building to net zero: costing carbon in construction. *UK Parliament* <https://publications.parliament.uk/pa/cm5803/cmselect/cmenvaud/103/report.html> (2022).
53. Buy Clean: How Public Construction Dollars Can Create Jobs and Cut Pollution. *BlueGreen Canada* <https://bluegreencanada.ca/wp-content/uploads/sites/19/2021/01/Buy-Clean-How-Public-Construction-Dollars-Can-Crete-Jobs-and-Cut-Pollution-Eng-2-1.pdf> (2021).

54. Employment Implications of Green Growth: Linking jobs, growth, and green policies. *OECD* <https://www.oecd.org/environment/Employment-Implications-of-Green-Growth-OECD-Report-G7-Environment-Ministers.pdf> (2017).
55. Green Building Economic Impact Study. *U.S. Green Building Council* <https://www.usgbc.org/resources/2015-green-building-economic-impact-study> (2015).
56. UNEP. *Green Public Procurement in the Republic of Korea: a Decade of Progress and Lessons Learned*. <https://wedocs.unep.org/bitstream/handle/20.500.11822/32535/GPPK.pdf?sequence=1&isAllowed=y> (2019).
57. Brown, D. \$500M boost for ArcelorMittal Dofasco secures future steel jobs for Hamilton, province says. *CBC News* (2022).
58. Canada's Green Building Engine. *Canada Green Building Council* [https://portal.cagbc.org/cagbcdocs/advocacy/CaGBC\\_CanadasGreenBuildingEngine\\_EN.pdf](https://portal.cagbc.org/cagbcdocs/advocacy/CaGBC_CanadasGreenBuildingEngine_EN.pdf) (2020).
59. Our Carbon Footprint. *Amazon - Sustainability* <https://sustainability.aboutamazon.com/environment/carbon-footprint>.
60. First Movers Coalition. *World Economic Forum* <https://www.weforum.org/first-movers-coalition/> (2021).
61. Lafarge Canada Advances Lower Carbon Portfolio by Fully Converting Ontario Plant's Cement Production. *Lafarge Canada* <https://www.lafarge.ca/en/lafarge-canada-advances-lower-carbon-portfolio-fully-converting-ontario-plants-cement-production> (2022).
62. Our Products. *Dufferin Concrete* <https://www.dufferinconcrete.ca/products/> (2017).
63. Aecon Pilots Low Carbon Concrete at Innovation and Training Centre. *Aecon Group Inc.* <https://www.aecon.com/press-room/news/2022/05/31/aecon-pilots-low-carbon-concrete-at-innovation-and-training-centre> (2022).
64. Treasury Board of Canada Secretariat. Green procurement: Buyers for Climate Action. <https://www.canada.ca/en/treasury-board-secretariat/services/innovation/greening-government/green-procurement/buyers-climate-action.html> (2022).
65. Wolf carbon. *Wolf Midstream* <https://wolfmidstream.com/carbon/>.
66. Nixdorf, J. & Bruce, C. Cutting Carbon in Canada. *World Cement* 18–24 (2022).
67. Brunner, D. New future for Alberta bitumen in advanced materials. *Alberta Innovates* <https://albertainnovates.ca/impact/newsroom/new-future-for-alberta-bitumen-in-advanced-materials/> (2020).
68. City of Vancouver. Zero emissions buildings. <https://vancouver.ca/green-vancouver/zero-emissions-buildings.aspx>.
69. Lafarge's Richmond plant commits to 100% lower carbon cement. *Lafarge Canada - Sustainable cement, concrete, aggregates & construction across Canada* <https://www.lafarge.ca/en/lafarges-richmond-plant-commits-100-lower-carbon-cement>.
70. Project co2ment. *Lafarge Canada - Sustainable cement, concrete, aggregates & construction across Canada* <https://www.lafarge.ca/en/project-co2ment>.
71. Brock Commons – Tallwood House. <https://vancouver.housing.ubc.ca/residences/brock-commons/>.
72. New policy aims to reduce construction industry emissions. *Municipal World* <https://www.municipalworld.com/feature-story/langford-low-carbon/> (2021).
73. Logan, C. How a small Ontario township is taking climate action — one building at a time. *Canada's National Observer* <https://www.nationalobserver.com/2021/07/15/news/small-ontario-township-climate-action-low-carbon-building> (2021).
74. City of Toronto. Buildings energy & emissions. (2022).
75. Tier 2, 3 and 4 project profiles. *City of Toronto* <https://www.toronto.ca/city-government/planning-development/official-plan-guidelines/toronto-green-standard/tier-2-project-profiles/> (2017).
76. Report - EMBARC Report. *BUILDERS FOR CLIMATE ACTION* <https://www.buildersforclimateaction.org/report—embarc-report.html>.
77. Government of B. C. CleanBC Roadmap to 2030. <https://cleanbc.gov.bc.ca/> (2022).
78. Priorité à l'achat québécois : l'État donne l'exemple. <https://www.quebec.ca/gouvernement/politiques-orientations/priorite-achat-quebecois>.
79. Portland-limestone cement adopted in building codes. *Canadian Consulting Engineer* <https://www.canadianconsultingengineer.com/buildings/portland-limestone-cement-adopted-in-building-codes/1000403881/> (2011).
80. Industrial Deep Decarbonisation | Clean Energy Ministerial.
81. US joins Industrial Deep Decarbonization Initiative. *UNIDO* <https://www.unido.org/news/us-joins-industrial-deep-decarbonization-initiative> (2022).





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