Building Success: Implementing Effective Buy Clean Policies

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Prepared by: Clean Energy Canada

BUY CLEAN INDUSTRY ALLIANCE:

CLEAN ENERGY CANADA

Cement Association of Canada

BLUEGREEN CANADA

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Workshop participants

The following stakeholders and representatives participated in the workshop. This report and the recommendations within reflect a broad consensus coming out of the workshop. However, not every participant has formally endorsed each specific recommendation or assertion.

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About the Buy Clean Industry Alliance and the Future of Infrastructure Group

The Buy Clean Industry Alliance is a coalition of industry associations, think tanks, and labour and environmental groups, with a common goal of advocating for a national Buy Clean strategy and net-zero construction materials sector. The Buy Clean Industry Alliance is made up of: Aluminum Association of Canada, Blue Green Canada, Canadian Steel Producers Association, Cement Association of Canada, Clean Energy Canada, EllisDon, and Forest Products Association of Canada.

The Future of Infrastructure Group brings together leading infrastructure companies to provide a positive, collaborative, and coherent voice to governments across Canada. This member-based group aims to make Canada the global leader in delivering innovation and the best value throughout the lifecycle of infrastructure. Members of the group include Altus Group, AECOM, Arup, Colliers Project Leaders, EllisDon, Kiewit, Pomerleau, Siemens, SNC Lavalin, and WSP Global Inc.

Executive summary

Public infrastructure is responsible for eight million tonnes of embodied emissions* annually, presenting a significant opportunity to reduce emissions and prepare the industrial and construction sectors for a net-zero future.[1]

Canada's public sector makes up about a fifth of all infrastructure spending in the country. Wielding that spending power strategically through Buy Clean policies could have a large direct impact on emissions, as well as an even larger indirect impact by shifting the market toward low-carbon materials.

Buy Clean policies set requirements for publicly procured construction projects to use lower-carbon building materials, construction, and design practices. Since government is such a significant buyer, this creates demand for low-carbon materials and incentivizes the market to transition toward net zero.

The opportunity is not only environmental but also economic. Because of Canada's relatively green grid and ongoing efforts to reduce emissions, many of Canada's heavy industries already produce lower-emissions products than international competitors. Buy Clean policies are therefore well-positioned to support Canadian industry and Canadian jobs. This is an approach that has already been adopted by the U.S. and used to channel US$9 billion into supporting the production of clean materials, largely in the United States.

The Canadian federal government has committed to launch a Buy Clean strategy in the 2021 mandate letters of three ministers. While Buy Clean policies have enormous potential, their implementation presents a number of challenges, from data availability to cost and cultural barriers in the sector. Governments can and should be leaders as the construction sector adapts to incorporate low-carbon materials and techniques. Implementing Buy Clean is a vital opportunity to learn lessons that can be applied to the entire built environment.

For successful implementation of the federal government's Buy Clean strategy, as well as Buy Clean policies at other levels of government, it is crucial to identify barriers early on and formulate constructive solutions. To that end, the Future of Infrastructure Group and the Buy Clean Industry Alliance brought together relevant stakeholders across the policy area and supply chain for a workshop on October 18, 2023. This report summarizes the findings and recommendations from that workshop and preceding interviews.

* 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.

Workshop participants identified a number of potential challenges to successful Buy Clean implementation, which can be grouped into six barriers:

1. **Data availability and reliability:** participants highlighted the absence of good information for decisionmaking and identified a number of data needs:
   - Facility-specific Environmental Product Declarations (EPDs)
   - Industry average baselines of embodied emissions of key construction materials
   - Databases of available low-carbon materials
   - Material flow analysis
   - Complete, up-to-date, location-specific, and consistent background data

   Information on the availability and associated cost of low-carbon materials

2. **Limited demand for and availability of low-carbon materials:** the experts indicated they were concerned about a lack of low-carbon materials on the market, and at the same time perceived a lack of information about what materials *are* available with lower embodied emissions.

3. **Cost of transition to low-carbon materials:** participants emphasized that the challenge lies both in increased cost as well as in a lack of information about financial and economic costs. Some large shifts in technology or fuel will (initially) increase the cost of production and result in a price premium on low-carbon materials. However, participants also emphasized that there is insufficient information available to understand the scope of any increase or opportunities for low- or-zero cost emissions reductions.

4. **Patchwork of requirements:** with several subnational jurisdictions starting to adopt their own policies to reduce embodied carbon in public infrastructure, there is a risk that a patchwork of requirements will complicate implementation for industry.

5. **Acceptance, knowledge, and room for innovation:** there is a lack of knowledge about embodied carbon in the construction sector and a need to build capacity across the supply chain on how to use lower-carbon materials and make design choices that reduce embodied emissions.

6. **Regulatory and economic environment:** successful implementation of Buy Clean policies relies on aligned building codes, regulation of technologies, and a strategic plan for industrial decarbonization and the creation of sustainable jobs.

A Buy Clean strategy at the federal level (and harmonized Buy Clean policies adopted across provinces and municipalities) can drive demand and induce supply of low-carbon construction materials, and at the same time increase knowledge and awareness of their importance and use. The success of these policies relies on careful implementation.

Interviewees and workshop participants converged on three specific pillars upon which a strong Buy Clean policy can be built, as shown in Figure 1 on the next page.

Figure 1: Overview of recommendations

	GOVERNMENTS SHOULD:	INDUSTRY SHOULD:
1 Mandate and centralize data	1. Require the submission of data on embodied carbon (ideally in the form of EPDs) in bids to RFPs, working toward increased stringency and accuracy over time; 2. Facilitate a centralized EPD database; 3. Provide accessible and standardized background data for EPD development; 4. Provide financial support for small and midsize enterprises to develop EPDs; 5. RFIs to assess what low-carbon materials are available.	1. Support the creation of sector-wide or regional industry average EPDs for all common product categories and keep them regularly updated; 2. Develop regularly updated, product-specific and facility-specific EPDs.
2 Build a clear Buy Clean pathway that ensures early success	1. Set predictable, performance-based requirements that ramp up over time and provide initial flexibility to accommodate for limited data availability; 2. Create different performance tiers to allow for regional variation and different levels of ambition across jurisdictions; 3. Design procurement and delivery processes to be collaborative and to leave room for innovation and flexible design choices; 4. Use incentive structures to support early movers, through a point system or bid discounts.	1. Translate Buy Clean requirements down the supply chain.
3 Increase awareness and decrease risk	1. Reduce the risk for project proponents who are adopting Buy Clean practices by providing a safe "sandbox" and by funding pilot projects; 2. Provide capacity building and clear implementation guidance for different stakeholder groups; 3. Organize ongoing dialogue with stakeholders; 4. Share best practices with other levels of government.	1. Find opportunities to explore lower-embodied-carbon construction and share best practices; 2. Leverage existing internal knowledge and incentivize idea sharing.

An introduction to Buy Clean

The Government of Canada has committed to bring greenhouse gas emissions to net-zero by 2050. Measures to achieve this goal are being implemented across the economy, and the construction sector presents a major opportunity to reduce emissions.

The production of construction materials is highly emissions-intensive, with iron, steel, and cement together making up almost 4% of Canada's greenhouse gas emissions.[2] Transitioning to low-carbon production of these materials is critical, but it will take significant levels of innovation and investment.

Canada's public sector makes up about a fifth of all infrastructure spending in the country, and a third of the market for both cement and construction steel.[1]

A Buy Clean policy wields that spending power strategically, requiring and incentivizing the use of lower-carbon construction materials and practices in public construction projects. By moving the public infrastructure market toward low-carbon materials, the government aims to not only reduce its own emissions impact, but also create incentives for material producers and contractors to transform their production methods and construction practices in line with a net-zero future.

Figure 2: How public procurement can stimulate CO_2 reductions in industry

Adopting a Buy Clean policy across construction products procured at all levels of government could avoid up to four million tonnes of carbon emissions each year. When the indirect effects of consequent market shifts are considered, annual emissions could reduce by as much as 13.8 million tonnes annually, equivalent to taking three million gas-powered cars off the road.[1]

As part of its effort to stimulate markets for low-carbon construction materials, the federal government has committed to introduce a federal Buy Clean strategy. While yet to be published, a well-designed strategy would detail a comprehensive package of policies focused on the procurement of clean (lower-carbon) construction materials, not only at the federal level, but at all levels of government. The strategy should include requirements for the disclosure of embodied carbon, updates to standards and building codes, and construction specifications that will decarbonize the construction sector. In Canada, these efforts can build off of the existing Greening Government Strategy, which focuses on federal procurement. Existing strategies, regulations, and programmes relevant to Buy Clean at the federal level are detailed in Annex 1.

Some of Canada's main trading partners, including the United States, have adopted Buy Clean policies of their own, as have subnational jurisdictions within Canada. The City of Toronto, for example, has set sustainable design and performance standards for private and city-owned developments since 2010.*[6]

Buy Clean approaches such as policies adopted by President Biden in the United States often focus on material-specific requirements, creating a market for low-carbon concrete or steel. But Buy Clean for buildings and infrastructure projects can also take a whole-asset life cycle approach, requiring a project as a whole, rather than any specific material, to have lower embodied emissions. Under this more comprehensive approach, bidders for public infrastructure projects are incentivized to identify emissions reductions opportunities in design and construction, as well as in material choices. After all, the lowest-emission material is often the one that is not used.

CANADA'S ADVANTAGE

Importantly, many Canadian construction material producers already have a built-in advantage when it comes to producing lower-carbon materials, owing mainly to our relatively clean electricity grid. Steel imported from the U.S., EU, and China is between 16% and 200% more carbon-intensive than steel made in Canada, while aluminum from those countries is between 170% and 535% more carbon-intensive than Canadian products.[3,4] Buy Clean policies can therefore create new opportunities for Canadian industry and boost Canadian jobs.

* The newest version of this Toronto Green Standard (TGS V4) came into effect in May 2022 and requires developers of city-owned buildings to conduct an upfront embodied emissions assessment, and to specify low-carbon alternatives to use in the building project. The standard also sets a maximum upfront embodied emissions intensity (life cycle stages A1-A5) for city-owned buildings of 350 $kgCO_2e/m^2$.[5]

Low-carbon construction in Canada

We are still in the early days of the transition to net-zero construction and low-carbon construction materials, but the first steps have been taken by both government and industry. Throughout the process of preparing this report, we heard positive examples of stakeholders making progress towards decarbonization.

Almost all cement producers in Canada have started making changes to their operations to reduce emissions, such as increasing the volumes of blended cements including Portland Limestone Cement (PLC) and increasing the use of lower-carbon fuels to power kilns. The Canadian steel industry already produces steel at lower emissions than its international counterparts and is investing in decarbonization by, for example, transitioning to electric arc furnaces, increasing process efficiency, and increasing the use of scrap steel. The lumber industry sees the shift toward low-carbon construction as an opportunity for the sector and has already reduced emissions within its operations by 55% since 1990. Lower-carbon alternatives are also available for products like gypsum board, which can be achieved by reducing the weight of the product or reducing energy use in the drying process.

There is a growing interest in the disclosure of embodied carbon in construction, especially in the form of EPDs—although one interviewee described this growth as going "from an extremely small number to a slightly less small number" of clients that were requesting EPDs. Material producers are increasingly developing product and facility-specific EPDs, with many noting that they think it will provide a competitive advantage.

Beyond primary materials, embodied emissions in construction can be reduced by improving design: using less material while building to the same quality and safety standards. Some large general contractors such as EllisDon have already started implementing lower-carbon materials, using design and product-based solutions on flagship projects.

This transition is driven by numerous factors including regulatory pressures, demand for sustainable products, investor expectations, ESG commitments, and the potential for competitive advantages in global and regional markets that increasingly value sustainability.

Canada's move to a low-carbon construction sector also secures sustainable jobs for the future. The Canadian steel, aluminum, and concrete sectors currently support an estimated 310,000 direct and indirect jobs.[7] By adding other construction material sectors such as forestry and wood products, this employment number rises to over half a million. **With government support, the green building sector is expected to grow more than threefold by 2030, supporting hundreds of thousands of new jobs and billions of dollars in economic benefits.**[8] That's why unions and environmental NGOs have been working together to advocate for an ambitious Buy Clean strategy, in particular through Blue Green Canada.

Workshop and recommendations process

Given this enormous potential—but also the possible challenges of implementing Buy Clean policy—the Future of Infrastructure Group and the Buy Clean Industry Alliance brought together relevant stakeholders and experts across the policy area and supply chain on October 18, 2023 to identify a common set of principles and recommendations for successful Buy Clean implementation in the infrastructure sector.

Participants in the workshop jointly agreed about the importance of the Buy Clean strategy, and even its potential to resolve some of the current barriers to decarbonizing the construction supply chain. However, the workshop and this paper is focused on recommendations to government and industry on how to ensure this policy is a success and achieves its full potential.

Organizers conducted 22 interviews ahead of the workshop (see Annex 2), which they used to shape a discussion paper to guide participants. The full-day workshop focused on finding solutions for challenges identified in the interviews and discussion paper. This report is the result of those discussions and provides concrete recommendations to the federal government, industry stakeholders, and governments at any level seeking to implement their own Buy Clean policies.

Barriers to Buy Clean implementation

To seize the opportunities associated with a transition to low-carbon construction materials, experts felt it was critical that governments understand the challenges that the construction sector and material producers currently face. Thoughtfully addressing these barriers can ensure successful implementation of a Buy Clean strategy.

Data availability and reliability

The availability, reliability, and consistency of data is another important challenge in Buy Clean implementation. The procurement of low-carbon buildings and materials requires accurate information on embodied emissions based on consistent standards. Without reliable data, developers and procurement professionals cannot easily assess the feasibility of proposed embodied carbon reductions or how different suppliers compare.

In particular, successful Buy Clean implementation requires the following types of data:

- **EPDs** that are updated regularly and can ideally be catered to a specific product or plant (such as a precise concrete mix), based on harmonized Product Category Rules (PCRs) so that EPDs are reliable and comparable.
- **Industry average baselines** on the current level of embodied emissions in key construction materials (industry-wide EPDs) and material emissions factors.
- **Databases of available low-carbon materials** from Canadian suppliers.
- **Material flow analysis** for construction projects and high-quality, transparent estimates on the quantity of materials needed for construction projects.
- **Complete, up-to-date, location-specific, and consistent background data** to use in the creation of EPDs, such as data on the emissions of electricity grids, fuels, transportation types, and data for raw material production.
- **Information on the availability and associated cost** of low-carbon materials.

The availability and reliability of those categories of data are twin problems. Canada is less advanced on data collection than some other jurisdictions, including France, the Netherlands, and Germany, which have centralized, government-funded EPD databases. Where EPDs exist in Canada, the resulting data is housed in different databases rather than aggregated, and datasets are still very young. Increasing the availability of publicly available data is key in Buy Clean implementation, but it may raise concerns about competitiveness.

Traceability of supply is another hurdle, with construction materials changing hands many times before ending up in a piece of infrastructure. Project proponents usually do not procure raw materials directly from a mill, and material manufacturers, such as rebar producers, often build up their stock of materials throughout the year from different suppliers. As a result, it can be difficult to keep an up-to-date EPD attached to each product.

Participants noted that the time and resources required to produce good data may vary by sector. Within the steel sector, for example, there are thousands of different product lines which would need to be covered by EPDs. Developing this data will require time and other resources.

When it comes to reliability, participants raised that LCA data is always an imperfect representation, relying on assumptions and simplifications. Depending on these assumptions, the same material could be assigned differing embodied emissions values. A lack of standardized rules for EPDs and embodied emissions calculations could mean results might not be comparable across products within Canada, let alone across jurisdictions.

The lack of reliable data also makes it more difficult to set realistic baselines. The federal government's commitments under the Greening Government Strategy, for example, are largely expressed as percentage reductions below a baseline. If such a baseline is insufficiently aligned with real emissions outcomes, targets can turn out to be unrealistic. Transparency of data and calculation methods could alleviate these concerns, as could third-party verification, but this might again raise questions about cost and competition sensitivity.

Demand and availability of low-carbon materials

Across all parts of the supply chain, from general contractors to rebar producers to developers, we heard one consistent barrier to adopting low-carbon materials: there is no market to innovate and provide lower-carbon alternatives. This is mainly because decisions are made based on price, not emissions—and more specifically, the upfront cost rather than the lifecycle cost, further limiting consideration of sustainability. As long as embodied carbon is not an explicit requirement, buyers and suppliers will opt for the most cost-efficient production methods, not the lowest-carbon.

Buy Clean policies aim to address that lack of demand and consequently spur an increase in supply. However, stakeholders have concerns that, especially in early days, the uptick in demand brought on by Buy Clean policies could lead to a range of supply chain issues and question whether there are sufficient low-carbon materials currently available to fulfill the government's Buy Clean requirements.

Participants acknowledged that there are many lower-carbon products already on the market, but were concerned there was a lack of information about what lower-embodied-emissions materials are currently available. They also recognized that availability requires consistency and locality. Where materials are not yet widely available across all regions of Canada, developers or sub-trades that want to purchase low-carbon materials might find themselves limited to a single supplier, which may lead to increased cost, limited choice in product specifications, increased risk of delays, or other supply chain issues.

Cost of transition to low-carbon materials

Several participants were also concerned about the price premium that comes with shifting to low-carbon production materials and methods. Interviewees said, "It's hard to convince anyone to do anything that costs money," and that "customers appear unwilling to pay the green premium associated with low-carbon building products."

Participants considered three separate challenges around cost: the real costs of low-carbon materials, the perceived costs of low-carbon materials, and process costs associated with a shift to low-carbon construction.

Transitioning material production processes to low-carbon methods and technologies can raise the overall cost of production, specifically by taking large steps in decarbonization such as switching to direct-reduced iron in electric arc furnaces.

However, it's important to note that construction companies and other stakeholders often do not have clear information on the incremental cost of switching to low-carbon materials.

Some opportunities for emissions reductions may already be available and decrease cost. Using recycled materials, an adjusted concrete mix or blended cements like PLC, or construction with timber can often be substituted at no additional cost or even at cost savings. Therefore, both real and perceived costs may be barriers to uptake.

Switching a share of production to low-carbon materials also brings process costs for each part of the supply chain. Material producers need to invest in collecting data and developing EPDs for their products, which often requires paying external consultants or life cycle assessment (LCA) experts.* General contractors and project developers must plan for low-carbon options, which are not always easily identifiable, bringing an additional potential cost for planning and consulting. For producers of construction materials such as rebar, who purchase primary materials from several different suppliers, creating a separate low-carbon production stream for products would also create additional—and potentially costly—logistical challenges (such as separate storage and processing).

Part of these cost increases may be systematic, but a large share are temporary transition costs which could be tackled and potentially alleviated in the implementation of Buy Clean policies.

Patchwork of requirements

Buy Clean policies are becoming an increasingly common instrument to drive the uptake of low-carbon construction materials. Within Canada, municipalities such as Toronto and Vancouver are already requiring disclosure of embodied emissions, and internationally, trading partners like the United States have adopted Buy Clean policies of their own.

Consequently, material producers, especially in internationally traded commodities, will be increasingly required to submit EPDs or other standardized estimates of embodied carbon in different jurisdictions, and general contractors will have to submit bids that show they meet embodied emissions standards.

Existing policies diverge in their requirements and are therefore increasing the administrative cost for industry stakeholders and material producers that export, or work in, multiple jurisdictions. In the words of one of the government-side experts, "if we're asking for the same thing in different ways, we will frustrate industry."

Of course, there can be differing levels of ambition between jurisdictions, but the structure of standards should be similar. As one interviewee put it, "while the policies don't have to be the exact same, the intention should be to align."

Acceptance, knowledge, and room for innovation

Although many of the interviewees and workshop participants were optimistic about transitioning to low-carbon construction, there was also consensus that this transition would face resistance, with one interviewee saying, "overcoming traditional mindsets and patterns" was an important barrier. Some attributed this to a lack of political will or a reluctance to change within the industry, while others emphasized that this reluctance was caused by a lack of education or awareness of low-carbon materials and experience in using them.

Both designers working at the beginning of the project and construction crews on-site may not have experience with low-carbon materials and feel uncertain about the safety and usability of unfamiliar products. More broadly, there is no clear consensus about when certain materials meet the threshold of being "low-carbon," or what levels of embodied carbon reductions are realistically achievable with current technologies. Participants mentioned the need for capacity building around embodied emissions and life cycle assessments in both the private sector (construction and material production sectors) as well as in the public service (particularly procurement professionals).

In addition to a lack of knowledge, the way large construction projects are organized often leads to missed opportunities for emissions reductions and increased costs. Design decisions and choices of material early on can have significant influence on the embodied carbon of a construction project, but architects, designers, or government project managers involved in these decisions may not be aware of the importance of embodied carbon or the options available for reducing emissions. Communication between different parts of the supply chain was seen to be insufficient or ineffective.

Some industry stakeholders felt that innovation was not sufficiently rewarded in current procurement processes. They attributed this to risk aversion within government. Once a request for proposals (RFP) has been published, alternative concepts or innovations are sometimes seen as out of scope, with some bidders finding that submitting new approaches is at times detrimental to their bid in the eyes of evaluators.

* The cost of EPDs is expected to come down as more companies enter the field of EPD development and companies such as Climate Earth develop technological solutions to create automatic, on-demand EPDs. Still, there is more work to be done, especially on developing EPDs beyond the concrete sector.

Additionally, design teams are often not allocated the time to think about how to save on materials in the design phase, time to explore new strategies to reduce embodied carbon, or the flexibility to go back to a design later in the process and make improvements on carbon performance. Large infrastructure projects procured by the federal government are planned far in advance, which means the translation from a new standard into a real project with low-carbon material usage will take significant time. This means projects under construction now will not have the budget built in to use lower-carbon materials. The fact that developers and engineers are often paid for construction projects through a "cost-plus" model* may also disincentivize a reduction in material use and cost.

Regulatory and economic environment

A successful Buy Clean implementation is dependent on a conducive regulatory and economic environment. In order to keep conversations focused, the workshop was scoped to exclude other regulatory barriers outside the direct remit of any Buy Clean policy. However, participants concluded it was important to raise these broader issues in the context of industrial and built environment decarbonization.

Some interviewees and workshop participants had concerns about regulatory barriers that could prevent them from implementing low-carbon solutions in construction. This included restrictions in building codes on new and existing low-carbon materials, such as Portland Limestone Cement**, the use of timber in buildings over 12 storeys, or using recycled asphalt in road projects. Others referenced barriers in the production of low-carbon materials, such as the regulation of carbon capture and storage by both federal and provincial governments, potentially prohibiting the use of this decarbonization technology.

Other participants emphasized the need for a skilled workforce and trades. Buy Clean has the potential to keep industry and jobs in Canada by supporting domestic low-carbon production. However, we need to ensure these are well-paid jobs and that skilled workers are attracted and retained to produce the low-carbon materials and infrastructure projects we need.

* A cost-plus contract means a contractor is paid for expenses incurred plus a fee, which is often defined as a percentage. As a result, a higher total expense may mean a higher take-home fee.

** PLC is not part of building codes in the Territories or Prince Edward Island.

Toward solutions

When carbon is included as a performance metric for procurement decisions, it encourages and enables contractors, developers, and material producers to present competitive products and projects with reduced embodied emissions.

The aim of a Buy Clean policy is to shift markets to low-carbon materials. Buying Clean can drive demand and induce supply of low-carbon materials, while increasing knowledge and awareness of the need to reduce embodied emissions.

Moreover, a Buy Clean policy, and more broadly a low-carbon construction sector, cannot be implemented successfully without a skilled workforce in all parts of the supply chain and across the country. Seeing Buy Clean as a core part of industrial decarbonization strategy means aligning it with the *Sustainable Jobs Act* and with Canada's current and future labour market projections to maintain existing and create additional well-paid jobs, including unionized jobs.

Beyond these broad takeaways, participants converged on three specific pillars upon which a strong Buy Clean policy can be built:

1. **Mandate and centralize data.**
2. **Build a clear Buy Clean pathway that ensures early success.**
3. **Increase awareness and decrease risk.**

1 Mandate and centralize data

GOVERNMENTS SHOULD:

1. Require the submission of data on embodied carbon (ideally in the form of Environmental Product Declarations (EPDs)) in bids to Requests for Proposals (RFPs), working toward increased stringency and accuracy over time.

Workshop participants widely agreed that the most important thing would be to start collecting data, even if imperfect, and to work toward generating more accurate data over time. Governments can build a foundation of data on embodied carbon in construction by requiring bids for RFPs to include EPDs. Data requirements should be harmonized across jurisdictions within Canada and internationally as much as possible. Governments should work with industry toward harmonizing Product Category Rules (PCRs) and ultimately using Type III EPDs* across all sectors. The open EPD format (in compliance with ISO 22057) can also be used to ensure EPDs are machine readable and easier to use in Building Information Models.

2. Facilitate a centralized EPD database.

Compiling EPDs in a central database will allow procurement professionals and others in the construction sector to compare the embodied emissions of different materials on offer.

Currently, there are multiple private databases that contain this type of information. To facilitate transparency, consistency, and comparability, the federal government should endorse a centralized database. The United States, for example, uses the Embodied Carbon in Construction Calculator (EC3) database, a privately run, not-for-profit repository of EPDs. Such a database could be integrated with a procurement workflow system that connects policy, procurement, and project management requirements with architecture, engineering, and construction project stakeholders.

3. Provide accessible and standardized background data for EPD development.

Whole-asset Life Cycle Assessments (LCAs) require data for the product and construction phases. Particularly for the construction phase (parts A4 and A5 in Figure 3), there will likely not be site-specific data, especially in earlier years of policy implementation.

The government can play an important role in creating clarity through:

- Providing standardized emissions factors that enable businesses to create complete LCAs and EPDs, or;
- Providing clear guidance on which data and assumptions are to be used so that resulting EPDs are comparable.

4. Provide financial support for small and midsize enterprises to develop EPDs.

The development of EPDs comes at a cost, as it usually requires hiring external consultants with expertise in LCAs. Especially for smaller businesses, this could prove a barrier in responding to government requests for proposals. Government should create a fund to support businesses in developing at least a first EPD, paying particular attention to small and medium-sized businesses and Indigenous-owned businesses.

5. Regularly publish requests for information to assess what low-carbon materials are available.

Public Services and Procurement Canada, on behalf of the Treasury Board of Canada Secretariat, has previously published a request for information to assess the availability of low-carbon materials in the Canadian market and what is possible in terms of emissions reductions with currently available technologies. Issuing regular requests for market information could alleviate uncertainty about availability of low-carbon materials and what level of ambition in government requirements is realistic. Organizations such as Sydney Metro and Infrastructure BC have also held open market soundings on projects to identify market opportunities for innovation, and have reported on their findings.

*Type III EPDs are environmental product declarations based on independently verified LCA data and life cycle inventory analysis (LCI) data as defined in ISO 14025.

INDUSTRY SHOULD:

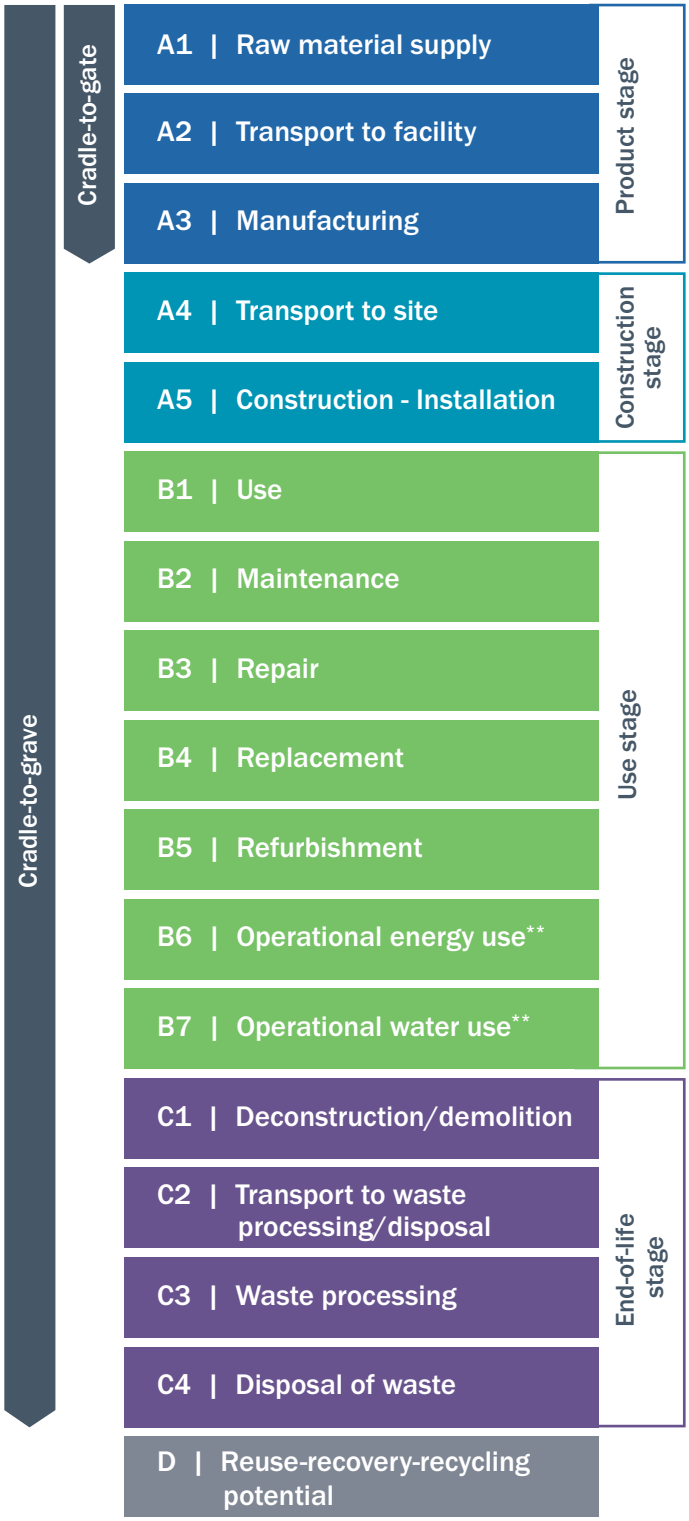
1. Support the creation of sector-wide or regional industry average EPDs for all common product categories and keep them regularly updated.

A sector-wide average provides a benchmark, which gives insight into the current levels of embodied emissions. This can help make standards more realistic and achievable, and allow for the comparison of specific products to their competitors. Several industry associations, including in the cement and concrete, reinforcing steel, wood, and insulation industries, have already created or are working on creating industry-wide average EPDs. In the cement and concrete industry, in addition to an EPD for cement, which is broken up into three Canadian regions (west, central, and east), there are province-specific EPDs for several concrete products.* Sector-wide average EPDs should be continually updated (at least every five years) to provide realistic benchmarks and should be paid for by regional sectors collectively, potentially coordinated by industry associations.

2. Develop regularly updated, product-specific and facility-specific EPDs.

Several interviewees mentioned that, ideally, EPDs would be fully dynamic, providing up-to-date data that can be adjusted to an exact product such as a specific concrete mix. However, workshop participants emphasized that the collection of data for EPDs is resource-intensive and that an EPD that is updated every five years may be the most realistic goal for now. Over time, industry should also work toward integrating EPDs into material passports to increase traceability of low-carbon materials.

Figure 3: Life cycle stages



** Operational carbon stages that are typically excluded from life cycle assessments focused on embodied carbon.

* These include insulated precast panel concrete, concrete manholes and catch basins, structural precast concrete, below grade precast concrete, concrete block masonry, and concrete pipe.

2 Build a clear Buy Clean pathway that ensures early success

With Buy Clean requirements in place, procurement officers will have to look beyond price and take embodied emissions into account when making their decisions, creating demand for low-carbon solutions.

However, these requirements need to be well-designed and well-communicated to avoid or minimize cost and supply chain issues, and to increase support in the sector.

GOVERNMENTS SHOULD:

1. Set predictable, performance-based requirements that ramp up over time and provide initial flexibility to accommodate for limited data availability.

These requirements can be set as separate policies and regulations, such as in the federal government's Standard on Embodied Carbon in Construction,[9] or as part of a broader building standard, such as in Toronto's Green Standard or international standards like the International Cost Management Standard. Requirements should be set with predictable timelines and horizons so industry can prepare for upcoming increases in ambition.

Requirements should take the following form:

- **Based on output and performance (both technical and emissions), rather than on specific material inputs**. For example, a request for proposals should specify what purpose a railway platform needs to fulfill, rather than whether it should be made of asphalt or concrete. This also leaves room for retrofits or using recycled materials.
- **Based on whole-building or whole-asset LCAs where possible, supplemented by material-specific requirements where appropriate**. Requirements that focus on the whole lifecycle are more comprehensive than material-specific requirements and allow for creativity in design and material choices. Moreover, the adoption of a lifecycle approach helps shift the focus to long-term thinking.
- **Absolute embodied emissions limits rather than relative requirements where possible**. Setting whole-asset emissions limits in absolute terms (as is done in Toronto's Green Standard*) is preferable, since the alternative—a percentage emissions reduction relative to a reference building/structure—can enable gaming. However, with the diverse set of assets in the government's portfolio, not all classes may be well-suited for an absolute limit. Where a lack of data availability prevents the use of absolute requirements, governments could use a phased approach or set absolute requirements for standard asset classes such as office buildings while requiring relative reductions for other asset classes.
- **Harmonized with other jurisdictions as much as possible**, specifically for jurisdictions across Canada but also particularly between Canada and the United States. The federal government is already working together with the United States and other countries—including through the International Deep Decarbonization Initiative—to create guidance for harmonized approaches. This includes working on common standards and support for the development of Product Category Rules.

2. Create different performance tiers to allow for regional variation and different levels of ambition across jurisdictions.

The possibilities for embodied emissions reductions vary greatly across regions within Canada due to geography, regulations, trade patterns, energy mixes, and market availability and capacity. These regional differences should be considered by creating Buy Clean requirements with different performance tiers for different regions. In its Standard on Embodied Carbon in Construction, the federal government already sets different performance requirements per region by using regional baselines. A set of reference tiers for different ambition levels co-created by different levels of government could also be used to harmonize requirements across jurisdictions.

3. Design procurement and delivery processes to be collaborative and to leave room for innovation and flexible design choices.

As one interviewee said, designers and engineers "should use sharper pencils" and start thinking actively and creatively about how to reduce embodied carbon through improved design, for example, by reducing underground construction for buildings.[10] Governments should encourage two-way, open dialogue early to identify low hanging fruit around

* The TGS V4 came into effect in May 2022 and requires developers of city-owned buildings to conduct an upfront embodied emissions assessment. It sets a maximum embodied emissions intensity (life cycle stages A1-A5) for city-owned buildings of 350 $kgCO_2e/m^2$.[5]

cleaner materials or approaches.* For projects with long timelines, there should be an option to return to designs when new opportunities for material reduction or the use of low-carbon materials emerge later in the process.

4. Use incentive structures to support early movers through a point system or bid discounts.

First-of-kind projects can serve as case studies to show what is possible. However, they may not yet be able to compete on cost. Creating incentives in the procurement process based on low-carbon performance could enable the government to support these early projects.

INDUSTRY SHOULD:

1. Translate Buy Clean requirements down the supply chain.

Interviewees and workshop participants indicated that requirements are not always passed on clearly from the project manager to sub-trades and material producers. The government has a role in translating specifications into clear embodied carbon requirements in requests for proposals that make it into the hands of designers and subcontractors, but industry stakeholders should also work on enhancing communication up and down the supply chain, communicating what is asked for and what is possible. General contractors should emphasize the importance of lowering embodied carbon early on and designers, subcontractors, and materials producers should communicate the possibilities and expected costs of making adjustments.

DESIGN SUGGESTIONS FOR INCENTIVE POLICIES

Workshop participants evaluated several options for incentive policies, putting particular focus on policies that could be implemented by the federal government with relative ease and at low cost. Three approaches were found to be worth exploring:

1 Reward frontrunners with bid discounts.

A bid discount could reduce the bid with the lowest embodied carbon or any bids that meet the highest tier of performance by a certain percentage (e.g., 5% or 10%). This can make the lowest-emission option more cost-competitive in the bidding process as shown in figure 4. Ex-post verification of a project's embodied emissions and a financial penalty could be used to ensure predicted outcomes are in fact met. Alternatively, to avoid reliance on predicted outcomes (which could be contentious), a bid discount could instead be awarded to companies that have achieved a third-party certification of their overall emissions reductions efforts. This model has been successfully used for example in the CO_2 Ladder policy in the Netherlands.[11]

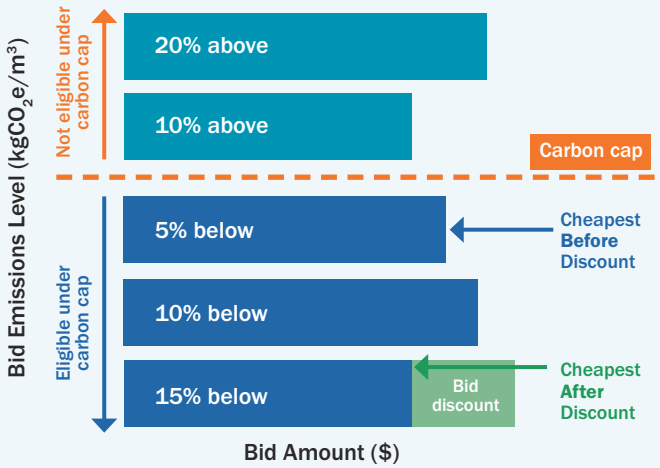
2 Implement procurement models based on points, with a share of the points allocated to embodied emissions.

For example, points could be awarded based on predicted emissions performance of a project or third-party certification of a company, as in the CO_2 Ladder policy. If a system of tiers is adopted, as recommended above, a points-based procurement system could allocate points depending on which tier of performance is reached. This would also allow Buy Clean requirements to be combined with other potential procurement policies, such as socially responsible procurement.

3 Gain-share incentive mechanisms for reduced embodied emissions.

Splitting cost-savings from interventions that reduce embodied emissions between government and bidders can incentivize innovation by engineers and contractors to find cost-effective emissions reductions.

Figure 4: Illustration of bid discounts in procurement



* An example of such an approach is the Alberta Ministry of Transportation and Economic Corridors's Contract Design Change Proposal process, which provides an opportunity for contractors and engineers to put forward technology, materials, or methods that can provide an equivalent or improved end product at a lower cost, with reduced disruption, and/or provide an environmental benefit.

3 Increase awareness and decrease risk

GOVERNMENTS SHOULD:

1. Reduce the risk for project proponents who are adopting Buy Clean practices by providing a safe "sandbox" and by funding pilot projects.

Pilot projects can derisk future infrastructure projects by showcasing how low-carbon materials and design choices can be safely used. Early pilot projects should be chosen carefully, with an appropriate level of risk. A newly developed material could, for example, be shown to be durable in a lower-risk environment through use in a pavement before it is used in a bridge. It is important to not only fund pilot projects, but to also publicly document achieved outcomes and embodied emissions, as is done, for example, in the U.K.'s Built Environment Carbon Database.[12]

2. Provide capacity building and clear implementation guidance for different stakeholder groups.

Successful implementation should ensure stakeholders at different points in the supply chain are well-informed about the possibilities and their responsibilities. This will require capacity building at all stages of the supply chain, including architects, engineers, and procurement professionals. The federal government can build on its previous guidance on applying the Greening Government Strategy.[13]

3. Organize ongoing dialogue with stakeholders.

The implementation of Buy Clean policies will come with early challenges and transition costs. Governments should ensure they are aware of the specific implementation challenges along different parts of the supply chain, so policy and programs can be designed to meet these challenges. At the same time, industry stakeholders must cooperate to transition supply chains and procurement practices. Having a platform for regular dialogue would facilitate that cooperation.

4. Share best practices with other levels of government.

Demonstrating the suitability of a new construction material, method, or standard will take time and resources. Sharing lessons learned and data collected with provinces and municipalities can help implement (harmonized) Buy Clean policies at different levels of government. The federal government can build on existing efforts under the Buyers for Climate Action Coalition and learn from successful international examples.*

INDUSTRY SHOULD:

1. Find opportunities to explore lower-embodied-carbon construction and share best practices.

Frontrunners within industry need to develop positive examples of low-carbon construction to show the viability and safety of new practices and materials. It will be key for these pilot projects to not only be built, but documented in detail, with data collection on embodied carbon, design, and lessons learned.

2. Leverage existing internal knowledge and incentivize idea sharing.

Project teams should be encouraged to suggest innovations that could reduce embodied emissions. Companies should create an environment open to ideas that can drive innovation as well as potentially cut costs and incentivize such ideas.

* For example, the United States Federal Highways Administration program *Every Day Counts* which accelerates the adoption of proven innovations across state departments of transport.

Conclusion

Buy Clean has the potential to be a transformative policy for Canada's construction and material production sectors. It can be an important tool in accelerating our net-zero transition, increasing our global economic competitiveness, and unlocking innovation in the sector.

But, like all ambitious policies, it must be done in consultation with stakeholders, and it must recognize the challenges that industries face in overhauling legacy systems and approaches. Canada is fortunate to be home to some of the most innovative companies in construction and heavy industry. This innovation needs to be supported with procurement policies that place carbon intensity at the heart of their deliverables.

In implementing this strategy, the federal government should treat Buy Clean as a core piece of a wider industrial decarbonization strategy. Many of the federal government's industrial decarbonization policies, such as carbon pricing and its suite of investment tax credits, focus on the supply side of low-carbon industry. A Buy Clean strategy would complement supply side measures by creating a sizable market for low-carbon products.

This paper has aimed to identify the biggest potential hurdles to Buy Clean implementation and provide recommendations on how to overcome these, hurdles and facilitate successful implementation. With the support of industry and experts in the built environment, government can leverage its spending power to drive new growth and prosperity in Canada's building and material sector while leading on climate action. It's time to turn strategy into reality and build a cleaner, more innovative, and prosperous Canada.

Annex 1
Federal Buy Clean Policy in Canada

The Canadian federal government has had a Policy on Green Procurement since 2006 but has significantly increased the focus on low-carbon construction materials and projects in the last few years. Some of the most important green procurement policies at the federal level are:

- The **Greening Government Strategy** (introduced in 2017 and due to be updated in 2024) is led by the Centre for Greening Government of the Treasury Board of Canada Secretariat.[14] It committed to the disclosure of embodied carbon of the structural materials of major construction projects by 2022 (a target that was achieved for concrete, but not other materials) and to reduce embodied carbon in materials in these categories by 30% for projects starting in 2025. It also committed to conducting whole building life cycle assessments by 2025 for major buildings and infrastructure projects.[14] As part of its efforts under the Greening Government Strategy, the federal government also compels companies who wish to enter contracts over $25 million to participate in *Canada's Net-Zero Challenge*[15] or otherwise set emissions reduction targets.
- The **Standard on Embodied Carbon in Construction** applies to federal procurements that started after December 31, 2022.[9] It sets a requirement for procured ready-mix concrete to be at least 10% below regional industry averages. The standard applies to projects of at least $10 million for projects starting in 2023 or 2024 and for projects of at least $5 million from 2025 onward.*
- The federal government has committed to launch a **Buy Clean Strategy**. This commitment was included in the 2021 mandate letters of three ministers for Natural Resources Canada, Infrastructure Canada, and Public Services and Procurement Canada. Since 2021, the Buy Clean Industry Alliance has advocated for a strategy which would include changes to the building code, and additional requirements on the embodied carbon of federally funded construction projects.

  The alliance has also been providing policy recommendations and advocating for key components of this strategy including capacity building in government, support for EPD development, clear guidelines around disclosure, a phased approach to emissions reduction requirements, and financial incentives built into the procurement process.[16]

In addition to these strategies and standards on green procurement, the federal government has implemented several programs meant to support the adoption of low-carbon construction materials, including:

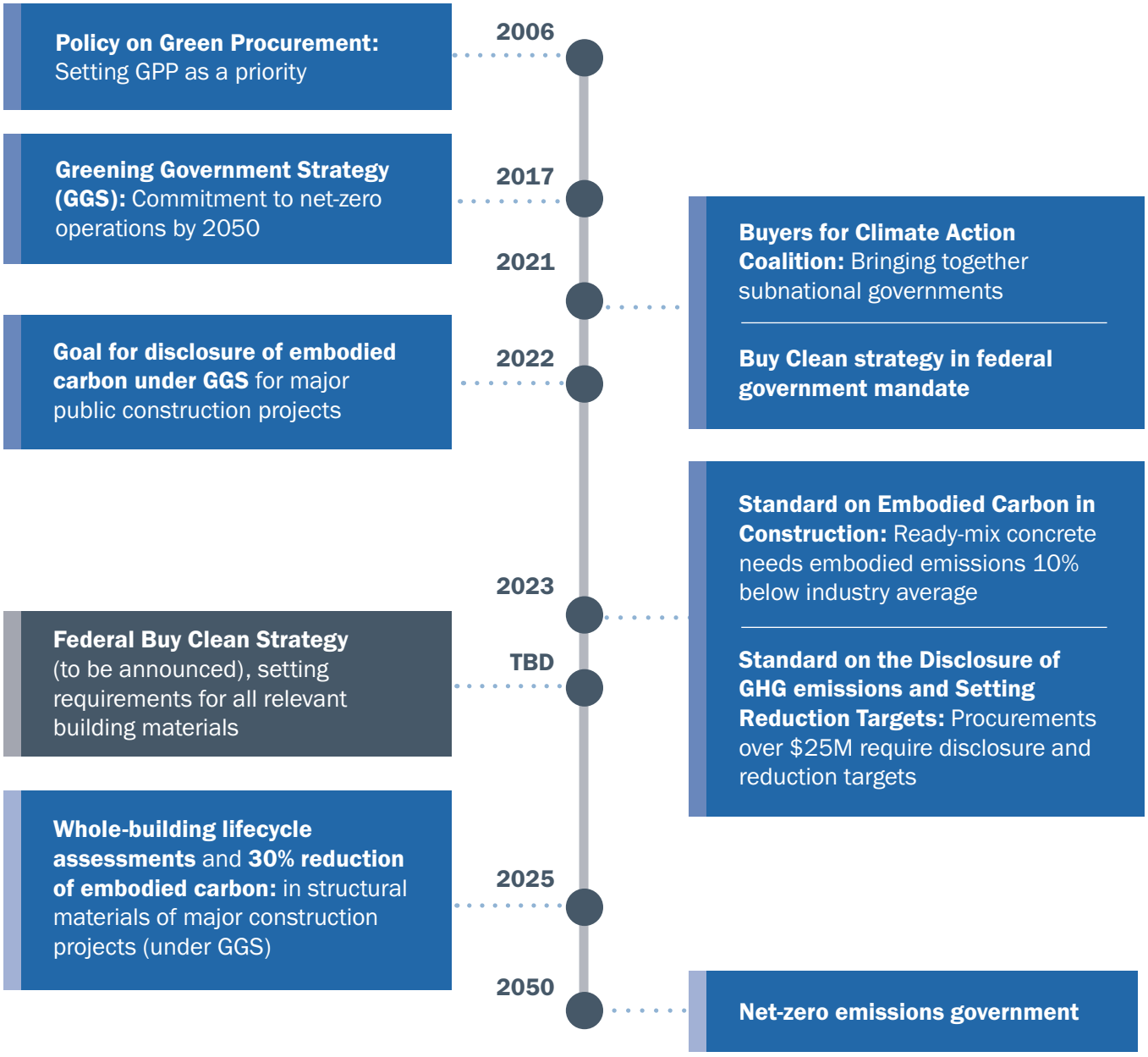
- The **low-carbon assets through life cycle assessment initiative (LCA²)**, which was led by the National Research Council and ran between 2019 and 2023. The program worked on developing LCI datasets of primary construction materials.[17] Under the initiative, EPDs have been developed for general use and PLC, ready-mix concrete (province- and Atlantic region-specific), precast and prestressed concrete elements, and concrete masonry blocks. Other construction materials will be added. The initiative also published a national guideline for whole-building life cycle assessment,[18] a primer on low-carbon concrete,[19] and an update to the National Master Specification to include references that support low-carbon concrete products and methods.[20]

The **Platform to Decarbonize the Construction Sector at Scale**, which builds on the work of the LCA² initiative and is also run by the National Research Council. It focuses on research, development, and demonstration in the construction sector and includes several programs, including the **Low Carbon Built Environment Challenge program** which aims to support industry in the development of low-carbon construction materials and the creation of life cycle assessments. This includes support through the **Centre of Excellence in Construction Life Cycle Assessment (CECLA)**.[21, 22]

* Projects may be exempt if they use less than 100 m^3 of ready-mix concrete.

Policy at the federal level

Figure 5: Buy Clean policy developments at the federal level in Canada



Annex 2
List of Interviewees

The interviewees listed below provided their insights and opinions in earlier stages of the research, which fed into this paper and recommendations. However, participation in this process is not necessarily an endorsement of all statements and recommendations made in the paper.

Interviewees

Interviews were held with:

- Elizabeth Logan, ESG Practice Lead, and Jennifer Routhier, Air Quality Engineer & GHG Specialist - AECOM
- Jeffrey Leonard, Manager, Development—Allied Properties REIT
- Christine Jones, Manager, Industrial Decarbonization—BlueGreen Canada
- David Billedeau, Director, Climate & Environment—Canadian Steel Producers Association
- Sarah Petrevan, Vice President, Sustainability—Cement Association of Canada
- Chetak Shah, Managing Director, and Kristina Fasciano, Manager, Infrastructure Advisory—Colliers Project Leaders
- Jolene McLaughlin, Vice President, Climate and Sustainability—EllisDon
- Mahima Sharma, Vice President, Innovation, Environment, and Climate Policy—Forest Products Association of Canada
- Laura Husak, Manager, GHG Mitigation—Infrastructure Canada
- Ryan Zizzo, Founder & CEO—Mantle Developments
- Soledad Reeve, Senior Advisor, Innovation Branchr—Natural Resources Canada
- Tim Hill, Commercial General Manager, Sustainability—Nucor Corporation
- Chris Seon, Member—Reinforcing Steel Institute of Canada
- Anil Sawhney, Director of the Infrastructure Sector—Royal Institution of Chartered Surveyors
- Michael Gamberg, Director, Project Delivery—Salit Steel
- Rob Cooney, Senior Advisor Buy Clean—Treasury Board of Canada Secretariat
- Shoshanna Saxe, Associate Professor and Canada Research Chair in Sustainable Infrastructure—University of Toronto

The following individuals and companies provided written responses to interview questions:

- Paul Hughes, Senior Director, Cost Consulting and Project Management—Altus Group
- Pierre Berté, Director Corporate Social Responsibility and Indigenous Affairs—Colas Canada
- Annie Stefanec, Director, Communications & Government Affairs—EVRAZ North America
- Susan Neil, President—Hanscomb Limited
- Alejandra Nieto, Sustainability Manager—ROCKWOOL North America
- Stacy Simpson, Sustainability Manager—USG Corporation

Input was also gathered in a brief discussion session with members of the Canadian Steel Producers Association Procurement Sub-Committee.

Glossary

CECLA	Centre of Excellence in Construction Life Cycle Assessment
EC3	Embodied Carbon in Construction Calculator
EPD	Environmental product declaration
LCA	Life cycle assessment
LCA²	Low-carbon Assets through Life Cycle Assessment initiative
LCI	Life cycle inventory
PCRs	Product category rules
PLC	Portland Limestone Cement
RFI	Request for information
RFP	Request for proposals
TGS V4	Toronto Green Standard version 4

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