SOLUTIONS FOR CIRCULARITY IN CANADA'S BUILT ENVIRONMENT

UNLOCKING THE BUSINESS CASE FOR ACTION

APRIL 2022

CIRCULAR ECONOMY SOLUTIONS SERIES

Circular Economy Leadership Canada

Circular Economy Leadership Canada (CELC) was launched in 2018 at the G7 Oceans Summit in Halifax as a network of corporate leaders, non profit think tanks, and academic researchers. An initiative of The Natural Step Canada, CELC is working to connect Canada's circular economy community and serves as a bridge to similar networks around the world. We provide thought leadership, technical expertise, and collaborative platforms for accelerating systems change and the transition to a low carbon, circular economy in Canada.

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The mission of CSA Group's Standard Development organization is to enhance the lives of Canadians through the advancement of standards in the public and private sectors. CSA is a leader in standards research, development, education, and advocacy. The technical and management standards developed with its 10,000 members improve safety, health, the environment, and economic efficiency in Canada and beyond.

Standards offer enormous benefits, such as: Helping to ensure the quality and safety of virtually every service, product, and system we encounter at home, at work and at play; Driving business innovation; Reducing our impact on the environment; and Enhancing trade. Watch our video.

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BACKGROUND

Adopting circular economy strategies and practices within Canada's built environment and construction sector can bring a broad range of benefits, including new waste-to-resource opportunities, diversified revenue streams, more resilient supply chains, and reduced environmental impacts such as GHG emissions.

Moving from the current linear system requires structural shifts, as well as growing the demand for circular products and services while addressing concerns around quality, consistency of supply, and cost issues – which help make the business case for circularity.

What would a truly circular economy within the built environment look like for Canada? What key issues must be addressed and what barriers tackled to make the business case? What actions should be prioritized and who should lead?

Event Overview

Solutions for Circularity in Canada's Built Environment: Unlocking the Business Case for Action was a 2-part, solutions-oriented, virtual event, powered by GLOBE Series, that explored the questions above. The event took place on **April 20** and **April 27, 2022**. The series convened leaders and stakeholders from across Canada who explored the critical factors for advancing the business case of and accelerating circular economy practices within Canada's built environment and construction sector.

Go to the Event Page

Key objectives for the event series included:

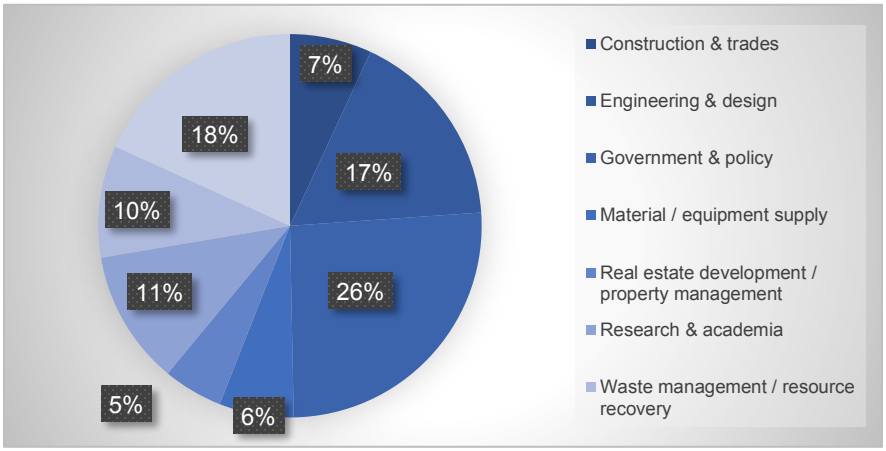
1. Share information from recent research on the current state of the circular built environment sector in Canada.
2. Explore key barriers and opportunities for advancing the business case for action that will help drive demand for more circular products and services.
3. Test the need for and interest in developing a circular economy roadmap for Canada's built environment sector, including alignment with existing sector priorities around net zero, embodied carbon, resource competitiveness, and the elimination of waste.
4. Explore the potential to harmonize approaches across Canada (policies, standards, and practices) to align and scale efforts.

The insights and recommendations from this Summary Report will be used to inform and prioritize next steps to address the key issues and advance identified opportunities.

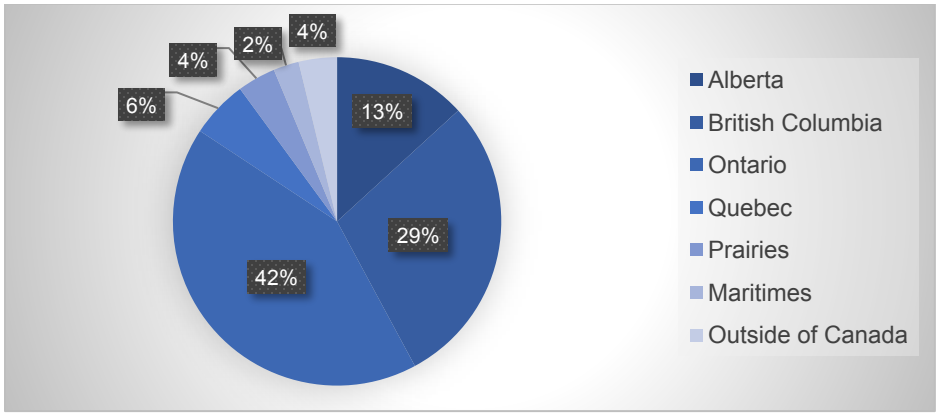
Participant Profile

More than 300 stakeholders participated in the 2-part event series from across Canada and globally, including:

- Real estate investors / owners / developers
- Builders
- Architects / engineers / designers
- Manufacturers and suppliers
- Government (at all levels)
- Standards bodies
- Academic / training institutions
- Research agencies
- Industry associations
- Financial institutions

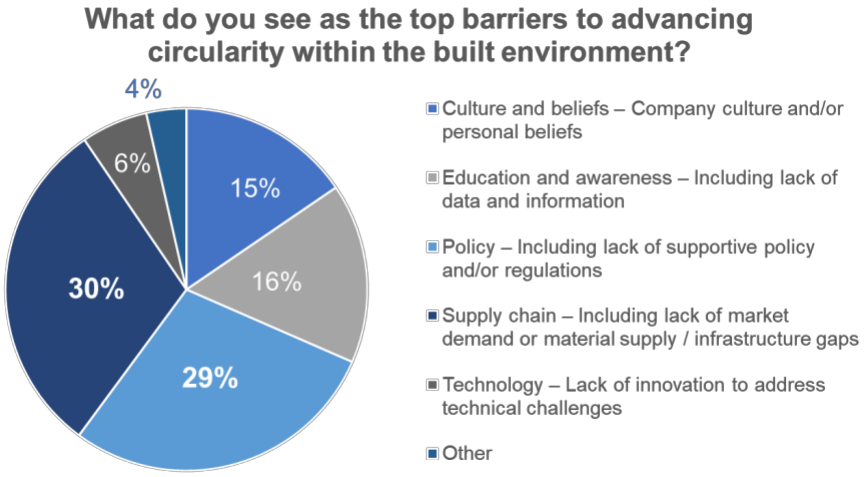


What aspect of the built environment value chain are you part of? (N=159)



What province / region are you joining us from? (N=159)

Polling Results

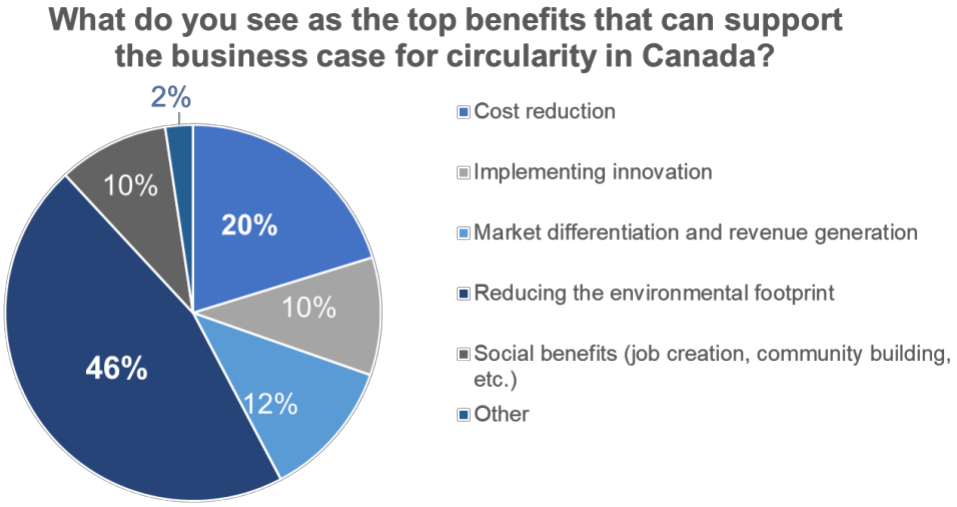


Top results:

- Supply chain – Including lack of market demand or material supply / infrastructure gaps – 30%
- Policy – Including lack of supportive policy and/or regulations – 29%

Secondary issues:

- Education and awareness – Including lack of data and information – 16%
- Culture and beliefs – Company culture and/or personal beliefs – 15%
- Technology was not seen as a big issue at only 6%



Nearly half (46%) thought reducing the environmental footprint was the number one benefit. About one in five (20%) saw cost reductions as a key benefit. A much smaller number saw the opportunities related to:

- Market differentiation and revenue generation – 12%
- Driving innovation – 10%
- Social benefits (job creation, community building, etc.) – 10%

KEY TAKE-AWAYS FROM DAY 1 (WEBINAR)

Part 1 of the event series, which took place on April 20, 2022, was a knowledge-sharing webinar where experts from industry and policy leaders reflected on a vision for the future and the critical factors required to advance the business case for action.

Click here to view a recording of Part 1

Opening Remarks

- **Paul Shorthouse**, Managing Director, Circular Economy Leadership Canada
- **Dwayne Torrey,** Director of Construction & Infrastructure standards, CSA Group

Visionary Keynote

William McDonough, Architect & Founding Principal, William McDonough + Partners

- Nature doesn't have a design problem - people do! The need for environmental regulation is a sign of our design failure. For example, regulations required to address chemical pollutants in the environment like micro-plastics.
- Our goal should be to design for more good, not less bad. **We need to have a plan** that ensures we are not causing harm but, rather, are doing good and being net positive in how we design and manage our built environment. **We can use nature as our model and mentor**, such as designing buildings like trees with a goal of carbon positive behaviour.
- We need to **design for a regenerative biosphere and circular technosphere**. Design must be done with two models in mind: a regenerative biosphere (which provides products for consumption) and circular technosphere (which stores raw materials during a use phase and then cycles them back).
- **The importance of collaboration**: We need to collaborate with unusual partners to innovate and develop circular solutions. For example, the Ford River Rouge green roof saved money over traditional mechanical systems (we need to speak with botanists rather than just roofers)!
- We must strive for **value creation rather than lowest cost**.
- We should consider **CE principles at different scales**: from the molecular level, to the product (with C2C certification as one standard), to the building and communities level, right up to the regional and country level. Integrating the concept of the **circular carbon economy** and the idea of carbon positive cities reveals a world of possibilities, for example inspiring real estate developments around the world that are using CE principles such as DfD and buildings as material banks.
- Carbon is not the enemy (it has been demonized; however, it exists in animals, in soil, in products).

Panel Discussion

- **Vince Catalli**, Circular Built Environment Specialist / Advisor (moderator)
- **Jonathan Westeinde**, CEO, Windmill Developments
- **Mary Van Buren**, President, Canadian Construction Association
- **Matt Keliher**, General Manager, Solid Waste Management Services, City of Toronto
- **Nick Xenos**, Executive Director, Centre for Greening Government, Treasury Board Secretariat of Canada





What gets you excited about moving to a circular built environment in Canada?

- The repositioning of our buildings and real estate developments with **value creation in mind instead of cost**. For example, added marketing potential from Dockside Green development when adding natural wetlands and streams (waterfront units) when investing in a local wastewater treatment system (instead of it being a cost).
- Governments investing billions into new and existing infrastructure presents an opportunity to apply circular principles that can also **attract the workforce of the future** that want to make a positive impact with their careers.
- The opportunity to think about how we **optimize the usage of our existing buildings and infrastructure**; getting the most out of existing infrastructure while saving embodied carbon at the same time.
- **Shifting our mindsets** from thinking about 'buildings' to 'material banks', where the materials in buildings can be used again and again in future projects.
- The importance of **modularity and disassembly** practices at end of life to retain the value of materials.
- **Procurement and purchasing** related to our buildings, projects, and materials becoming deliberate decisions focused on value creation. The question is: how can we use this as a tool to support a regenerative economy?

What are the key challenges or barriers that must be addressed?

- **Market Demand:** Supply will come if demand exists. There is a need to drive more demand (customer demand, or through government regulations or incentives).
- **Knowledge and standards gaps:** Buyers need to build capacity to know what to ask for in line with vision and targets – a process that needs to be made it easier. For example, buyers need to know the carbon footprint of a building material in a certain region (LCA

considerations).

- **Lack of Standards:** We need robust national standards that fit the building code and other specs, as well as more product certifications with CE standards to allow for a universal definition / understanding of circularity – which will come from owners asking for them and suppliers responding.
- **Supply chain issues:** We have seen massive disruptions with COVID and other issues. These need to get sorted out and risks need to be addressed.
- **Infrastructure gaps:** To get materials out of buildings and back into the supply chain, we need the infrastructure to allow these resources to be used in new product – which also requires demand to make the business case.
- **Data gaps:** There will still be a need to supply of raw materials, so this needs to be tracked and monitored to know the quantities available.
- **Lack of criteria in procurement and investment decisions to drive the business case:** We must consider full 'value', consider lifecycle costing, and reduce environmental footprints.
- **Society of instant gratification:** First capital cost / cheapest rules. How can we look more at life cycle costing and value-driven approaches to enable more value-driven, disruptive business models to emerge (e.g., maximizing the usage of assets, products as a service, etc.)? For example, green building might cost more up front but save money over time, but the lifetime benefits are often overlooked.

What are the top actions we must take in the short or medium terms to advance the circular economy business case?

- Establishing a long-term vision and plan.
- **Integrating thinking and approaches**: There is a growing importance of working more collaboratively early on in the process of making buildings, from owners, to designers, builders, and through to maintenance and repair.
- Supporting broad collaboration models across the supply chain to pilot and move together at the same time.
- **Establishing a common lexicon and definitions** around what are circular economy practices and products.
- **Developing national standards** that can help to minimize the risks around adopting circular products / materials
- **Improving information and data on material management** (how many buildings coming down, what materials are available, volume of resources, and informs demand side).
- **Focusing procurement efforts** (construction materials, whole building approach, etc.) and create demand for green / circular products in this area in collaboration with others, pilot this and work through the issues, and then replicate and scale (and develop principles to inform this).
- **Incentivizing financial innovation** – we need full life cycle approaches to be included in our cost-benefit analyses, and we need a greater focus on asset maintenance and retrofits, and financing models to support circular business models.

KEY TAKE-AWAYS FROM DAY 2 (WORKSHOP)

Part 2 of the event series, which took place on April 27, 2022, consisted of a virtual workshop where participants were invited to 'roll up their sleeves' and engage in interactive breakout group discussions to set a course for action and explore the potential for a circular economy action plan / roadmap for Canada's built environment and construction sector. Workshop participants were divided into self-selected themes / topic areas and asked to respond to the two following questions:

1. What are the key issues and/or barriers that must be addressed to achieve a more circular built environment in practice?
2. What are the key actions we need to prioritize to advance the business case for circularity in Canada's built environment sector?

A summary of the key take-aways from the collective breakout discussions can be found below, aggregated under the two guiding questions. For the more detailed discussion points within each breakout group, refer to Appendix A.

Key Issues and Barriers to be Addressed

1. Systems Change Issues
2. Lack of Definitions and Standards re. Approaches
3. Lack of Knowledge and Evidence to Support Decision-making and Investment
4. Communication & Collaboration Challenges
5. Cost for Secondary / Recycled Materials
6. Technology Risk
7. Policy Issues & Challenges

Key Actions to Advance the Business Case

- **Paradigm shift:** We are faced with the challenge of changing the paradigm of how people understand and recognize the urgency for a circular economy. We need a fundamental reset – to rethink the way we design, build, and use materials at the end of their life.
- **Improving standards and definitions**: More standard-based solutions are needed regarding common terminology and definitions of system boundaries of the circular built environment, as well as on viability of secondary construction materials for use along the value chain. Design for durability and disassembly standards are also a priority.
- **Gathering and sharing better data and information:** Sharing better data and developing key performance indicators (KPIs) will be critical in supporting decision-making and policy-making. Key data and KPIs include material flows and construction waste, energy efficiency, and embodied carbon, among others.
- **Improving circular design practices:** Key barriers include the costs of secondary materials, resistance to accepting new materials in RFP processes, and the cost and risk associated with the testing of new technologies. Among key actions are policy reform to incentivize reusability and recyclability, education and awareness building about the benefits of improving circular design practices, and leadership by governments and industry to develop innovative solutions to ensure long-term cost savings of deconstruction.
- **Enabling harmonized policy and regulations:** Low cost of landfilling and lack of policies are the main inhibitors. Lack of technical knowledge among policy-makers could be supported by Canadian case studies and projects that demonstrate success of new 'secondary thinking' in value chains. Among others, key priority areas include increasing collaboration at all levels of government and with industry to grow circular loops, to establish common language regarding materials and products, to develop and reference relevant standards in regulations, to provide incentives to drive material recovery, and to establish actions to reduce landfilling.
- **Enhancing procurement practices:** A move toward circular procurement will require clear guidance and specifications, as well as better consultation processes with all actors involved (e.g., procurement agencies, architects, and contractors). Cultural barriers around the use of secondary materials need to be addressed, with careful attention paid to regional differences and competitiveness issues at the local level.

- **Developing new business models that support deconstruction**: An entire systems-change is required to rework the costs of deconstruction. Deconstruction takes more time than demolishing and is often cost ineffective (especially for commercial buildings). Key actions must include developing policies to incentivize the reuse of materials (e.g., tax credits), to create partnerships (between deconstructors and waste management agencies, architects, and conventional material suppliers), and create economies of scale, to address labour shortages and social inequalities for largely manual work, and to develop performance-based codes and standards.
- **Addressing resource recovery infrastructure gaps:** Quantity and storage of available materials, as well as the lack of policies and standards around building material outputs, are among key barriers. More education, trainings and financial incentives are required for this still niche market. A priority action is to develop adequate infrastructure for material storage, including considerations for how this might integrate with a national online marketplace.

APPENDIX A:
DETAILED SUMMARIES FROM DAY 2 BREAKOUT GROUPS

Gathering and sharing better data and information

Question #1: In line with our specific topic / area of focus, what are the key issues and/or barriers that must be addressed to achieve a more circular built environment in practices?

- Both the scale and importance of this problem are enormous. We need a collaborative, consolidated, cohesive approach at the national level to addressing the issue.
- **Data Gaps re. Available Waste Flows / Resources**
    - Some data exist, but gaps undermine integrity of data - in many cases, qualitative estimates and assessments are as good as it gets.
    - Changing policy, investments by industry, etc. become very challenging when data is scarce
    - Lack of transparency and accountability for products/technologies once outside an organization's 'books' within the value-chain
    - Need to start with an inventory and then develop user-friendly decision matrices that rank materials by various criteria (e.g, embodied carbon and/or value – used in early stage of design
        - Help with making the business case
        - Help mine urban environment for pre-existing value/materials
        - Help make smarter, more circular building decisions down the line
- **Lack of Effective Industry KPIs**
    - How efficient and productive is the construction industry in Canada? What measures for tracking circularity should we use?
    - Very little data on resource use efficiency / productivity (i.e., inputs into a building vs. waste / material outputs after construction or demolition) leading to issues for improving circularity.
    - Canada is the one of the few G7 countries that does not run annual industry performance indicators.
    - KPIs can benchmark current practices and demonstrate improvements - otherwise hard to make the business case to construction companies they should care or invest given limited resources (this worked in UK, France, Germany).
    - Some data exists within industry and agencies like StatCan – but needs to be identified and collected.

- **Data Coherence & Accuracy**
    - It is not the amount of data available that is the problem, but rather the organization, relevance, and transferability of that data.
    - Need to help people understand the value they will get out of collecting and analyzing more information / data - not always apparent.
    - How do we ensure that data is accurate?
- **Data Ownership & Fragmented Access**
    - How do SMEs go about making their decisions? How are business decisions made at the ground level? Need to make data accessible and useable for decision making.
    - Who should own the data and be tracking the information?
    - Accountability is an issue, as is fragmentation with data collection.
    - Resistance to sharing the data as it forces people to be accountable; people consider it as proprietary at times.

Question #2: Within our specific topic / area of focus, what are the key actions we need to prioritize to advance the business case for circularity in Canada's built environment sector? Are there 2-3 in particular that should be prioritized over the next 12 months?

1. Need an accessible format to access open-sourced / depersonalized data - this can be supported by collaborative data hubs / platforms for information sharing.
    - E.g., Data analytics of community and climate services at UofT works to bring large public databases together within backend tools to do assessments
    - Country-wide database showcasing the raw materials available for design and connecting to the sources (zero emissions from get-go).
    - Information trading: linking data between waste-sorting facilities, suppliers, developers, etc.
2. Building passports (e.g, BAMB) for existing buildings - that inventory the value of materials within buildings (e.g. CREAM is an analytical risk management tool in Europe for identifying potential stranded assets inline with IPCC - could this be leveraged?).
3. Knowledge sharing hubs with case studies and tools for industry.
4. Develop better narratives and communicate the value of waste materials with consumers / customers
    - We need to communicate in an engaging way. Reports are dry – stakeholders have be told the really crunchy stories, and telling those stories needs to be done in way that evokes emotions
5. Collect better information / data on the value of co-benefits (i.e., quantify and communicate the financial value of environmental and social benefits).
6. Develop performance KPIs that help industry make the business case for why they should care (like in Scotland), focused on key indicators (e.g., waste, energy efficiency, client satisfaction, project efficiency in terms of time and budget, etc.).
    - UK's Glenegen – Building Excellence – Best Practice aggregator - KPI reports

for over 20 years (more than 500 reports).

7. Focus on collecting key types of information / data such as:
    - Material flow, inventory of resources in existing buildings, embodied carbon, data around the delta of what is supplied to and what is realized in the building – how much is wasted
    - Establish our frame of reference: establish the data we need and the decisions that need to be taken, then the rest can follow
8. Need to connect the data to impact: How can we further impact with data?
    - Standardization
    - Realistic and achievable parameters
    - Transparency and Accentuality
    - Interoperability

Improving standards and definitions

Question #1: In line with our specific topic / area of focus, what are the key issues and/or barriers that must be addressed to achieve a more circular built environment in practices?

- **Lack of an overarching standard for defining waste vs. resource**
  - How to define waste as opposed to a recovered resource?
  - Standards can help define elements that assess circularity:
    - Circularity – we must be looking beyond embodied carbon
    - Circularity considerations regarding virgin materials vs. reused materials
    - Circularity must also consider social and economic aspects
  - In a policy context, many different perspectives – definitions will help shape boundaries of how to use these materials / resources.
  - ISO CE Committees (TC323) have generic definitions of circularity- circular-reusability. Also working on data sheets – declaration see TC350/SC
  - Lack of standards exist for identifying viable secondary materials to encourage contractors and other value chain members to incorporate end-of-life materials into secondary products.

Question #2: Within our specific topic / area of focus, what are the key actions we need to prioritize to advance the business case for circularity in Canada's built environment sector? Are there 2-3 in particular that should be prioritized over the next 12 months?

1. Need to define upcycling versus downcycling, and how materials are treated at end of life.
2. Need to start at the highest level – align what these terms mean and how they are distinct.
3. Focus on de-risking circularity - provide certainty through policy on how materials can be used in line with circularity principles.
4. Undertake assessments circular performance of materials.
5. Emphasize design for durability from the beginning of a project. This is not being done and is an issue.
6. Update building codes to include reference to relevant standards important for circularity (e.g., CSA Standard required with respect to maintenance, durability, etc.)
7. Tie back definitions, approaches, and terminology to circular principles
   - Case to be made for Canadian specific performance because of our natural resource-based economy - there is guidance out there so Canada should identify what is best for Canada.
   - Opportunity for CSA Group to collaborate with European work – to leverage work that is already being undertaken.
   - Canada's standards versus European standards are very different because of

the base materials used. Our materials are heavily wood- based.

Enhancing procurement practices

Question #1: In line with our specific topic / area of focus, what are the key issues and/or barriers that must be addressed to achieve a more circular built environment in practices?

- **Education / training issues exist with industry stakeholders** (e.g., architects, contractors, etc).
    - Procurement agencies don't necessarily understand circular procurement - need to educate and communicate with procurement agencies to introduce CE factors in the practices. The info needs to be clearer for all stakeholders.
    - Economics remain key driver when it comes to material choice (primary vs secondary); co-benefits of increased secondary supply are often ignored.
    - Cultural barriers in regard to lack of understanding of viability of secondary materials (e.g., some believe secondary materials are inferior to primary materials).
    - How do we procure the materials, but also how to reuse them in a procurement cycle?
    - We need homogenous language and specifications for materials and construction procedures and strategies.
    - Issue exists when contractors are not in the initial meetings.
    - A huge void from the design community in the difference of materials and value of CE. Designers and architects should be informed ahead to make the right decisions.
    - For example, architects and designers have a lot of decisions to make - they have to know the aspects of circular economy pre-, during, and post design, including based on the various materials.
- **Lack of clear guidance around circular procurement practices for construction**
    - It is important to have centralized guidance to refer to for the different clients to avoid having them feeling they are doing that for the first time and manage the risk.
    - Having a way to provide guidance to all those different distinct procurers would be helpful (e.g., readily available environmental product declarations, emissions factors for concrete and steel, etc.).
    - Through consultations with the stakeholders, define what the circular economy related factors should be and then integrate them in the RFP for a specific project.
    - All materials should be considered in line with full LCAs.
- **Concerns around competitiveness of procurement processes**
    - Changing procurement rules may be anti-competitive for local suppliers, which is in conflict with the competitiveness rules.

- Governments and procurement departments are often worried about competitiveness, particularly in less populated centres
- Governments can feel tension in that space and may feel worried about changing procurement rules.

Question #2: Within our specific topic / area of focus, what are the key actions we need to prioritize to advance the business case for circularity in Canada's built environment sector? Are there 2-3 in particular that should be prioritized over the next 12 months?

1. Governments (federal, provincial, and municipal) to lead by example for their own buildings to encourage and showcase the process.
2. Education industry and policy-makers on circular economy principles, material considerations, carbon benefits, etc.
3. Define what the CE factors can be integrated in the RFP through consultations with the stakeholders – then develop the RFP
4. Look at the existing contractual environment and different practices and use existing ones - from other countries too.
5. Develop best practices guidelines, for the overall project management, not only procurement to be transferred to all size projects
6. Look at all the materials equally in terms of LCA and procurement process
7. Share existing practices - easier to use existing contractual obligations than starting from scratch
8. Consider Canada overall with differences between East and West, North and South

Addressing resource recovery infrastructure gaps

Question #1: In line with our specific topic / area of focus, what are the key issues and/or barriers that must be addressed to achieve a more circular built environment in practices?

- **Regulatory authority and stakeholder-ship**
  - Uncertainty with approvals from various authorities (e.g. when converting from non-renewable to renewable energy)
- **Scale requires standardizing building material outputs**
  - How to standardize materials coming out of construction projects?
- **De-construction and materials reuse**
  - More education is required since the market is very niche.
  - Limitation at the mercy of local projects.
  - Need for trained labor.
  - Local government (waste management) needs to be recruited and change its measure of success
  - Value of donations determined properly for tax break purposes to ensure financial incentive
- **Barriers around the reuse of salvaged materials**
  - The quantity needed on site. How to prioritize? How to store it?
  - Cost of salvage materials - Not cost effective for companies, hence very little demand.
- Gap is about the passion being placed in developing a workable model, and a lack of policy.

Question #2: Within our specific topic / area of focus, what are the key actions we need to prioritize to advance the business case for circularity in Canada's built environment sector? Are there 2-3 in particular that should be prioritized over the next 12 months?

Key actions need priority:

1. Educate the public (e.g., provided at a Home Depot)
2. Explore partnership with conventional builder supplier. More local suppliers, to integrate salvage material into their supply (business).
3. Mandate amounts of re-use materials by governments (policy)
4. Warehouses to have the right (knowledgeable) people rather than relying on big box stores.
5. Deconstruction takes more time than demolishing. Being competitive for residential build for tax credit. For commercial building, its very expensive still to deconstruct. Integrate national online marketplace since storage of materials is a big challenge.
6. Support partnerships between waste management (governments) and de-constructors through policy

Priorities over the next 12 months:

1. Developing adequate storage of material ready to use
2. Developing a business model to support de-construction and enable supply chains.
3. Going more mainstream and local while integrating national online marketplace
4. CRA providing a decent tax credit (to de-constructors)
5. Learn from launching more pilot projects

Enabling harmonized policy and regulations

Question #1: In line with our specific topic / area of focus, what are the key issues and/or barriers that must be addressed to achieve a more circular built environment in practices?

- **Certain Existing Policies Acting as Barriers to Circular Economy**
  - Low cost of landfilling inhibits business case for circular solutions (particularly construction/demolition waste)
  - Lack of policy to drive secondary materials (such as secondary content requirements)
- **Lack of Definitions and Standards re. Approaches**
  - It's important to get consistency on how to define key terms / activities. For example, not every province / territory has a definition of what is a 'steward'.
  - Different methodologies exist (e.g., how to calculate and implement policy around embodied carbon, how to plan for future use of buildings, etc.).
  - A "dynamic lifespan" needs to be considered (at present, some technologies assume a static lifespan). For example, if you look at a reference building versus your design which reduces embodied carbon, you may assume both buildings have the same lifespan. But your building that you are developing could have lower embodied carbon if the length of its useful life is longer.
  - Governments can build in standards that factor in the new National Research Council of Canada's work on life cycle assessment for construction materials. This is based on international standards.
  - The EU Commission has developed the "levels" program. A simplified LCA tool, so Member states can make use of it. It incorporates credits for life cycle elements.
- **Lack of Knowledge and Evidence to Support Policymaking**
  - Lack of technical knowledge amongst regulators (landfill, recycling program, programs for EPR).
  - Lack of demonstrable projects that highlight success of secondary thinking in value chains.
  - There is a lack of data to understand risks / opportunities.
  - Lack of understanding what secondary markets / end-uses are for certain materials.
- **Communication & Collaboration Challenges**
  - Working between different levels of government is challenging - there is a lack of communication and collaboration between various levels.
  - Regulatory departments often work in silos while there is a need for cross-sectional view for circularity.
  - Lack of collaboration in Canada particularly as circular solution deal with integrated supply-chains.

Question #2: Within our specific topic / area of focus, what are the key actions we need to prioritize to advance the business case for circularity in Canada's built environment sector? Are there 2-3 in particular that should be prioritized over the next 12 months?

1. Establish a collective voice / vision at all levels of government and elected officials.
2. Eliminate ambiguity and establish common language regarding materials, products, and standards.
3. Establish processes and frameworks to improve data, information sharing, and transparency for end-of-life waste and its composition.
4. Lifecycle considerations should be included in all building analysis. Integrate holistic lifecycle assessments and have the building code change to consider the end-of-life of for materials.
5. Government needs to work with industry in the pre-competitive stage to establish pathways to increase collaboration, build trust, increase transparency, and grow circular loops.
6. Consider how to incentivize more circular front-end design, including how to support quality assurance efforts for the integration of secondary materials into projects, update regulations / EPR to promote circularity, improve diversion, collection, sorting, and upcycling of materials, and consider product-as-a-service models.
7. Provide incentives (tax breaks, rebates, grants, etc.) to drive recovery of materials at their end-of-life. For example, grants that go through Infrastructure Canada could set out additional requirements (e.g., they could include circularity and embodied carbon requirement and require that all projects have a deconstruction plan and considerations for recycled content in materials, as well as material end-of-life use (although avoid being overly prescriptive in the approaches to avoid stifling innovation)..
8. Establish regulatory actions to reduce the economic incentive of landfilling - either at the municipal or provincial levels.
9. Keep materials out of landfill via landfill bans (ultimate end goal) and implement regulation nationally to require circular processing of landfill inputs, especially demolition waste, metals, and organics like wood.
10. Support construction materials exchanges where all types and sizes of projects can register, list items, upload images of removed or excess building materials in categories, etc.
11. Establish local pilot projects to demonstrate local experiences and not rely on European case studies as their context are different (one example is transport logistics as Canada is a large Country)
    a. Expand initiatives such as the Circular Cities & Regions Initiative to overcome regulatory barriers such as working in government silos.
    b. Establish a mutual vision to end-of-life management and establish standards and common language.
    c. Establish a cross-sectoral view on the circular economy amongst regulators to overcome existing siloed approaches.
12. Governments need to establish procurement standards. Public bodies are major procurers of construction projects and materials and have the ability to incorporate these ideas into government builds.

Improving circular design practices

Question #1: In line with our specific topic / area of focus, what are the key issues and/or barriers that must be addressed to achieve a more circular built environment in practices?

- **Systems Change Issues**
  - The challenge of changing the paradigm of how people understand and recognize the urgency for a circular economy and the need to improve circular design practices
  - We need a fundamental reset - to rethink the way we build things and how to design systems
  - The circular economy is all about changing the economic model, so a more systematized approach would be best
  - There is a need for an entire systems-change to rework the costs for deconstructing things
  - Resistance in bringing new technologies to building owners and municipal authorities due to lack of ability to accept/use new materials (and bids with new products usually do not get accepted).
  - Maybe need to provide incentives to change culture.
- **Cost for Secondary / Recycled Materials**
  - Difficult to make the business case for secondary materials, as well as circular processes, practices, etc.
  - Size and scalability can be the issues (lack economies of scale).
  - Added challenge of convincing the whole system to collectively shift and rework deconstruction costing, so that cost efficiencies can be felt sooner and across the board
  - More collaboration is needed within the deconstruction process to make it more cost and process-effective: “People who might deconstruct a building – architect, deconstruction workers, etc. - are not connected. There’s too much bifurcation among the parts.”
    - issue of hiring workers available to do the job of deconstruction - not a lot of people these days want manual labour jobs – they want tech jobs, instead, which is shrinking the hiring pool to properly deconstruct building materials for circular reuse
    - “How do we instill pride and satisfaction back into manual labour jobs?
    - “Us vs. them” hierarchy on construction sites and the social inequities workers face building homes they may not be able to afford to live in
  - Need consumers to drive more to circular construction. As an example, homes are not built to last hundreds of years, as the upfront costs would be significant.
  - Policy can help but sometimes this can be restrictive. Codes/standards would need to be performance based rather than prescriptive, and they should focus on CE strategies.

- **Technology Risk**
  - New materials require testing, and this also increases cost.
  - Option to partner with universities for research, as well as Federal agencies such as NRC.
  - Academic institutions have studies under way, and this might be an approach to help to get new materials in the marketplace and accepted.
  - In addition, it would be beneficial to accept testing done in other jurisdictions such as Europe.
- **Policy Issues & Challenges**
  - Lack of harmonization (within Canada and internationally).
  - Issues around permitting.
  - There are inconsistencies between the government initiatives versus when RFPs are issued and bids with new products are not accepted.
  - Authorities should also consider repurposing (school example given).
  - Costing as well as public perception tends to create a resistance with this approach.
  - Education and awareness of the long-term benefits could help (long term savings over life of asset could be quantified).

Question #2: Within our specific topic / area of focus, what are the key actions we need to prioritize to advance the business case for circularity in Canada's built environment sector? Are there 2-3 in particular that should be prioritized over the next 12 months?

- **Policy reform**
  - Introduce immediate policy regulation to motivate the industry to act and increase accountability on manufacturers and suppliers.
  - We need more accountability on manufacturers and suppliers for forethought on reusability and recyclability, noting that profits have been put ahead of this
    - One solution for this could be utilizing EPR regulation – considered an essential piece of the puzzle.
- **Education and awareness building**
  - There is a huge need for leadership to better educate and inform the public at the local level about the benefits and urgency of improving circular design practices; this will help drive consumer demand for change and create effective circularity within the built environment.
  - Subsidies and technical papers needed to raise awareness broadly.
- **Address cost issues**
  - Leadership within government and industry must advance opportunities to develop innovate solutions to forecast reuse and recycling methods of current materials in the future built environment.
  - We must design so deconstruction becomes part of the whole system of our current

and future buildings in order to save costs over the long-term.

- **Address labour shortages**
    - To address industry labour shortages, we need to promote manual work as an entry-point into other careers like design, infrastructure, management of projects, etc.
    - There is a need for Canada's education system to improve how it promotes jobs in the trades.
    - The sharing of labour (e.g., upskilling and brining seasonal workers on during off-season), equipment or assets, could be another way to address labour shortages

APPENDIX B:
LIST OF PARTICIPATING ORGANIZATIONS

+VG Architects
A.U.G. Signals
Actuo.ca
AFARA
Alberta Ecotrust Foundation
Alberta Forest Products Association
Alberta Infrastructure
Altasteel
Altus Group
Ambassade de France
AQUAVION SYSTEMS CORP
Aquent Studios
ARCO
Atlantis Fiber
Avery Dennison
B Collective Homes Inc
Bank of Montreal
Bay Area Climate Change Council
BBA
BC Freshwater Legacy Initiative
BC Public Service
BC Wood Specialties Group
BCIT Centre for Ecocities
BDC Capital
BioApplied
Bizbiz Global Inc
BOMA Canada
Boyd R. Algee Architect Ltd.
Brian G. Hart & Company
British Columbia Trade and Investment
BUILDGREEN Products
BuiltSpace Technologies Corp.
Calmura Natural Walls Inc.
Cambium Inc.
Camino Systems
Canada Green Building Council
CMHC
Cohabitat Québec
College Boreal
Canada Plastics Pact
Canada Post
Canadian Construction Association
Canadian Home Builders' Association
Canadian Wood Council
Canderel Group
CarbonCycle llc
Cascadia Ecohomes Ltd.
Catalli Associates
Catalyst Strategies Inc
CBPN
CEA
CE Institute
CEC
Cement Association of Canada
CEP Toronto
CFMS Consulting Inc.
CIBC
Circular Economy Club Toronto
Circular Economy Leadership Canada
Circular Innovation Council
CIMA
CISC-ICCA
City of Calgary
City of Edmonton
City of Guelph
City of Mississauga
City of Ottawa
City of Port Alberni
City of Richmond
City of Toronto
City of Vancouver
City of Victoria
CleanO2
Clima Renovable
Canada Plastics Pact
Gasonic Group LTD
Geocycle Canada Inc.
GFL Environmental

Columbia Shuswap Regional District
Community Energy Association
Concordia University
Convergence.tech
Convoy Supply
Counter Revolution Inc
CPMA
Crystalogix Inc..
CSA Group
CWB Group
CWC
Deloitte
Delphi Group
Destination Vancouver
Digital Engineering Inc.
Dillon Consulting
District of Squamish
Drawdown BC
Durham college
E2M/ The Collaboration
Éco Transition Inc.
EcoDomus Consulting
eGeo Geological and Environmental Consulting Services
Efficiency Canada
Elastochem
EllisDon
Envirolum Consulting Inc.
Environment and Climate Change Canada
ePAPHOS ADVISORS TEAMWORK
erthos inc
Federation of Canadian Municipalities
Fernwood Community Association
First Capital REIT
Fisheries & Oceans Canada
Force of Nature
Fortis BC
FPInnovations
Fraser Work Consulting
G West Building Services
Lett Architects
Light House Sustainability Society
Living Skies Solar
Loblaw Companies Limited
Maglin Site Furniture
Global Affairs Canada
Global Infrastructure Hub
GLOBE Performance Solutions
GLOBE Series
Gordon Estates Incorporated
Government of Alberta
Government of Manitoba
Government of Canada
Green Giant Design Build Inc.
Green Spark Group
Green Step
H2E Inc.
Hatch
Heman Shih Architect Inc.
Honda
hp
HSBC
Hudbay Minerals Inc.
Hyon Software Inc.
IBI Group
Ideal City Design Group
IFFCO
International Institute for Sustainable Development
INFC
Informa
Infrastructure Canada
Innovate Edmonton
Innovation Canada
International Timberframes
IRAP-NRC
JJ McNEIL Commercial Inc & Kuleana Events ltd
Karim H. Nurmohamed Architect
Kind Your Own Business
KGS Group
Korn Ferry
Lafarge Canada
Last40 Ventures
Lehigh Hanson Materials Ltd.
Let's Talk Trash
PAS
Peter's Expediting Ltd
PLAEX Building Systems Inc.
Plan A Capital
Pomerleau

MAINSPRING LLC
Mantle Developments
martinbradydesign
Material Reuse
Maxen technology
McGill University
MCM Architects Inc.
McMaster University
Medxcel/Ascension Health
Milenov Associates Architects
Modern West Advisory
Mondivan Developments Inc.
Morrison Hershfield Architects Inc.
Mott MacDonald
MRM Architects
Muse&Effect Consulting
MWS Engineering Inc.
NAIT
Nanaimo Recycling Exchange Society
National Research Council of Canada
Natural Resources Canada
Nexii
Niagara College
NorLand Limited
Northern Sky Architecture Inc.
Novex Delivery Solutions
NRCan
NRC-IRAP
NYC Department of Education
Obsidian engineering
Okanagan coLab
Olio Consultancy
Omicron Architecture Engineering Construction Ltd
OS&B
Ottawa Cohousing
PACE Alberta Co-op Ltd
Pacific Institute for Climate Solutions
SvN Architects + Planners Inc.
Teck Construction
The Canadian Food Garage
The Canadian Institute of Steel Construction
The Co-operators
Polytechnique Montreal
TROPICO SECO
Practice Greenhealth
Projet Canadien des Services d'Appui sur le Terrain (PSAT)
Province of British Columbia
Province of Manitoba
Purpose Building
Quantum Lighting, Inc.
Qumai SA
RBC
RECYC-QUÉBEC
Recycling Council of Alberta
Refuel Energy
Resort Municipality of Whistler
RetailAID Inc
Roarke Environmental
Root Architecture
RWA Group Architecture
Samantha Hayes Architect
Senate of Canada
Scius
SCN
Scotiabank
ShareWares
Simon Fraser University
Smart Cities (Guelph-Wellington)
Smart Prosperity Institute
Solar Earth Technologies Ltd.
Solid Surface Exchange
Southern Alberta Institute of Technology
SRS Consulting Engineers Inc.
SSRIA
Stantec
SuiteMods Inc
Summit Nanotech
SunHub Inc.
Sussex Strategy Group
Sustainable Resources Management Inc.
The Natural Step Canada
The Suen Group
Town of Banff
Town of Collingwood
Town of Comox
Town of St. Walburg
TRIREC

TSE Data Services
Turkeco
UC Berkeley
UNGSII
UNIVERSIDAD CENTRAL DE VENEZUELA
University of British Columbia
University of Calgary
University of Oxford
University of Toronto
University of Victoria
University of Waterloo
Up Marketing
Vancouver Coastal Health
veemo
Victorian Government of Australia
Village of Tahsis
Ville de Montreal
Waced Solutions
Walker Industries
Waterfront Toronto
WATRA AFRICA
WeRcircular
Winston Chong Architect Inc.
Wrangellia Consulting
Xpansiv
Yorkville University