DISCUSSION PAPER / JULY 2022

The Canada Green Buildings Strategy

Natural Resources Canada
Ressources naturelles Canada

Canada

CONTENTS

OUR BUILT ENVIRONMENT

Canada's built environment includes over 16 million dwellings and 482,000 commercial and public buildings.[i] The sector is responsible for 13% of Canada's direct greenhouse gas (GHG) emissions, or 88 Mt.[ii] When accounting for off-site generation of electricity for use in buildings, it brings the total to around 18%, and even more emissions are embedded in the materials and supply chains associated with the buildings and construction sector. **These emissions are trending upward.**[1]

At the same time, the built environment is facing **increasing pressure from extreme weather and climate change** and building stock climate resilience is a concern. It is estimated that 14% of Canadian homes are located in areas at risk of flooding.[iii] However; the overall rate of return on investments in adaptation is high, with benefit-cost ratios ranging from 2:1 to 10:1, and in some cases even higher.[iv] We must take the opportunity to increase buildings' resilience, alongside retrofits to reduce emissions.

The majority of buildings standing today will still be in use in 30 years, which means that in addition to building better new buildings, **to achieve net-zero and climate resilience**, **we need to retrofit a large majority of the standing buildings in this country**.

Retrofits that are being undertaken today are often not going far enough in terms of emissions reduction and increased efficiency. **We need to transform programs and investment toward deep decarbonization**.

Over 78% of operational building emissions come from space and water heating, the majority of which is due to equipment that runs on fossil fuels, such as natural gas furnaces.[v] **Electrification of space and water heating will be an essential component of decarbonizing the buildings sector**, with other clean fuels also playing a role where access to electricity is a barrier.

Canada's green building industry currently employs 462,000[vi] workers, ranging from disciplines in architecture, interior and product design, engineering, data science, building material and equipment manufacturing and supply, logistics, marketing, and construction trades – **most of which are already facing labour and supply chain shortages**.

WHY DO WE NEED A STRATEGY?

Canada has legislated a commitment to reach **net-zero emissions by 2050**. In the interim, the 2030 Emissions Reduction Plan sets out a potential buildings sector contribution that would **reduce direct residential, commercial and institutional building emissions to 53 Mt by 2030** (37% reduction from 2005 levels).

These are ambitious objectives. The challenge of decarbonizing buildings is significant – as is the opportunity. Creating net-zero emissions, climate resilient buildings supports the economy on multiple fronts, increasing economic activity, increasing jobs, and increasing money in Canadians' pockets. It will improve energy affordability for Canadians, reduce impacts of energy price fluctuations and extreme weather

[1] Emissions decreased by 3 Mt between 2019 and 2020; however, this is not expected to reflect a downward trend and the extent of influence of changes in building use due to the COVID-19 pandemic is unknown.

events, and position Canada as a global provider of choice for technology and materials. The Strategy will seek to lower the costs of transforming Canada's buildings.

The Canada Green Buildings Council estimates that with the appropriate framework and investments in place, the Canadian green buildings industry could support approximately 1.5 million direct jobs and 150 billion in direct gross domestic product by 2030[vii]. *We need to make this potential a reality.*

At the current annual retrofit rate of under 1%, Canada would need 142 years to retrofit all homes and 71 years to retrofit all commercial and public buildings.[viii] *We don't have that much time.*

Efficiency Canada estimates that retrofitting the entire building stock by 2050 would require $20 to $32 billion annually,[ix] and the Canadian Institute for Climate Choices estimates that damages to homes and buildings from flooding and sea-level rise could cost as much as $13.6 billion per year by 2100.[x] *Governments alone cannot provide the needed investments.*

The buildings sector is facing significant labour and supply chain shortages. *We need new building practices, a larger skilled labour force, and low/zero carbon supplies to get the job done.*

Housing affordability is already a serious challenge in all of Canada. *As we transform the sector, we need to ensure the pursuit of resilient, highly energy efficient housing that complements our affordability and supply goals.*

Canada is a diverse country, and each region has unique circumstances that the Strategy will need to consider and address in developing concrete actions. *Provinces, territories and Indigenous governments will be critical partners for driving the proposed transformation.* The Canada Green Buildings Strategy must be a national strategy in order to mobilize action from all partners. Provinces and territories have jurisdiction over key levers, including building codes, and bring regional expertise needed to drive meaningful progress. By collaborating on a national strategy that recognizes and addresses regional priorities, we can drive the bold actions essential to reaching net-zero emissions in the sector by 2050.

Indigenous communities face unique challenges with respect to inefficient buildings and infrastructure (including housing). These include insufficient infrastructure funding overall, insufficient funding for the incremental costs of energy efficiency and greener technologies, and the need to direct scarce funding to more pressing priorities. Underpinning these challenges are high rates of energy poverty and income disparity, higher infrastructure costs in northern and remote locations, and less access to materials, training, and skilled labourers to do the work. The Strategy will consider and seek to advance existing efforts to mitigate some of these challenges.

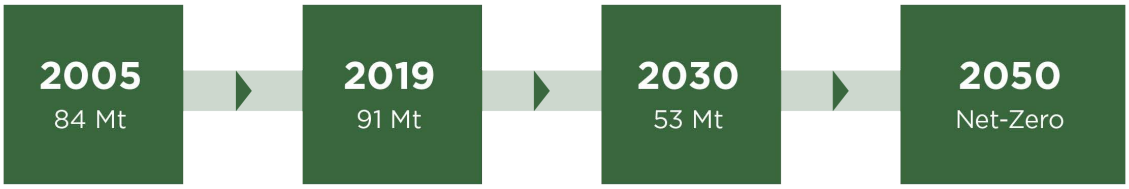
Given the scope and scale of the challenge, the **Canada Green Buildings Strategy** is needed to mobilize commitment from all parts of the sector – public and private – to strategically deploy investment toward the market transformation and the cost compression needed to rapidly and cost-effectively transform the built environment. A summary of the challenges, strategic themes, objectives and development process for the Canada Green Buildings Strategy is available in Annex A.

To achieve net-zero emissions from Canada's building sector, we need to take a market transformation perspective and that means working across jurisdictions to set a high bar and prepare the market to meet it. We look forward to engaging provincial/territorial governments across Canada, and other partners who will have leadership roles to play.

GOALS

A zero-emissions building is designed to be highly energy-efficient and uses only non-emitting energy for heat and power, while a climate-resilient building means it is prepared for climate risks such as temperature increases, floods, wildfires, and other extreme weather events. **Net-zero means reducing GHG emissions from operations to as close to zero as possible and then balancing out any remaining emissions with an equivalent amount of carbon removal.** The ultimate goal for the Canada Green Buildings Strategy **is a net-zero emission and climate-resilient buildings sector by 2050**, with an interim goal of 37% emissions reduction from 2005 levels, by 2030.[2]

Figure 1. Canada's Buildings Sector Emissions and Goals



There is also an opportunity to reduce embodied carbon in new buildings and retrofit materials by prioritizing low-carbon building materials and going beyond net-zero as tools, information, and technology continue to improve.

To reach net-zero in the buildings sector, potential outcomes for the strategy could include:

1) **Build net-zero carbon and climate-resilient from the start:** We must ensure that new buildings achieve the highest levels of energy, carbon performance, and climate resiliency. *All new buildings need to be net-zero carbon-ready as early as 2027 and no later than 2032 and conform to the latest applicable codes, standards and guidelines for climate resilience as early as 2025 and no later than 2030*.
2) **Increase the rate of deep,[3] climate-resilient building retrofits:** The majority of buildings standing today will still be in use in 30 years, which means that in addition to constructing better new buildings, to achieve a net-zero and climate-resilient buildings sector, we need to retrofit nearly all the existing buildings in this country, and take advantage of joint opportunities for resiliency upgrades. *The deep retrofit rate* would need to reach *3% to 5% of buildings annually by 2025 and applicable codes, standards and guidelines for climate-resilient retrofits would need to be referenced in building retrofit programs at all levels as soon as possible (including retroactively wherever possible)*.

[2] The interim goal is notional and based on Environment and Climate Change Canada's *2030 Emissions Reduction Plan: Canada's Next Steps for Clean Air and a Strong Economy* (2022).

[3] A deep retrofit usually includes reducing energy demand and switching from fossil fuels to electricity for space and water heating – to achieve 70% energy savings and 80% to 100% GHG emissions reductions.

3) **Transform space and water heating:** The overwhelming majority of building emissions come from space and water heating equipment, largely due to fossil fuel equipment, such as natural gas- and oil-fired furnaces. Electrification of space and water heating (allowing for flexibilities such as hybrids where full electrification is not feasible) – and ensuring that building envelopes are well insulated – will be essential components of decarbonizing the buildings sector. *Phased timelines for transition off of fossil fuel heating systems are needed (e.g. when installation of oil or natural gas heating systems would no longer be permitted).*

Looking toward 2030 and 2050, the Canada Green Buildings Strategy will align with an economy-wide approach to achieve net-zero emissions by 2050, in particular through supporting increased use of low-carbon construction materials in buildings; increasing the energy efficiency of buildings to free up electricity for other needs (e.g. electric vehicles); and making sure electricity supply is taken into consideration for operationalizing the strategy.

WHAT OTHER FEDERAL STRATEGIES WILL INFLUENCE THE BUILDINGS STRATEGY?

The Strategy will be developed within the wider ecosystem of the Emissions Reduction Plan and other federally led strategies that also help position Canada to achieve net-zero emissions in the buildings sector by 2050. It also builds on previous actions under the Pan-Canadian Framework on Clean Grown and Climate Change and Strengthened Climate Plan, summarized in Annex B.

It will reflect, and in some cases directly help advance, complementary initiatives – such as those outlined below – to ensure the guiding principles, objectives and actions of the Strategy work collaboratively to deliver on Canada's vision for a buildings sector composed of net-zero emission, climate-resilient buildings.

Strategy	Objective
National Adaptation Strategy	To unite actors across Canada through shared priorities, cohesive action, and an integrated whole-of-Canada approach to reducing climate change risks
Urban, Rural and Northern Indigenous Housing Strategy	To ensure more Indigenous People have access to safe and affordable housing (this is a stand-alone companion to the National Housing Strategy). This strategy will be co-developed with Indigenous governments and peoples - its link to the Canada Green Buildings Strategy will need to be determined through the co-creation process.
National Housing Strategy	To build stronger communities and help Canadians across the country access a safe, affordable home.
National Supply Chain Strategy	To help build more resilient and efficient supply chains to meet the needs of the Canadian economy and withstand disruptions caused by climate change and global events
Innovation Superclusters	To support further growth and development of Canada's innovation ecosystems, including joint missions between the private sector, academia and government

Just Transition	To ensure that the transition to a net-zero economy is done in a way that creates new opportunities for Canadian workers and their communities – providing sustainable jobs for Canadians in every region
Clean Electricity Standard	To reduce GHGs from the generation of electricity to achieve a net-zero electricity supply by 2035
Greening Government Strategy	To transition the Government of Canada to net-zero emissions and climate-resilient operations, while also reducing environmental impacts beyond carbon, including on waste, water and biodiversity

ENGAGEMENT PROCESS

The Canada Green Buildings Strategy will engage partners – across all levels of government, Indigenous organizations, utilities, building owners, the construction industry, the financial sector, training and research institutions, as well as environmental non-government organizations and think tanks – with a focus on elaborating:

(1) Coordinated *actions* from *all partners* that, taken as a whole, will reduce emissions and enhance climate resilience, mobilize investment, and drive a robust retrofit and net-zero emission and climate-resilient buildings market. The early federal actions identified in this discussion paper are necessary, but not sufficient to achieve Canada's net-zero emissions goals and protect Canadians from climate impacts. The federal government is considering what bolder steps it could take and is looking for partners to do the same.
(2) *Modelling* to confirm objectives and engage on mobilizing actions, while in parallel modelling impacts of actions to confirm a path forward. We will work with partner organizations that are already modelling in this space.
(3) A process for *evolving the strategy* over time and *continued collaboration* throughout implementation.

The development of the Canada Green Buildings Strategy will be iterative. Our path forward includes:

- Release the Discussion Paper and launch engagement: July 2022
- Develop an evidence base and identify actions with key partners: July and August 2022
- Public engagement via our online engagement portal: August 2022
- Synthesize what has been discussed to date and seek concurrence: September and October 2022
- Release the (evergreen) Canada Green Buildings Strategy: Spring 2023
- Engagement on revisions based on implementation, evolving technology and market context: Ongoing

Engagement with Indigenous organizations and governments will take place in a manner consistent with the principles of Indigenous Climate Leadership outlined in Canada's Strengthened Climate Plan – i.e. to recognize the unique realities of Indigenous Peoples, respect self-determination, advance early and meaningful engagement, ensure inclusiveness-by-design, and create space for First Nations, Métis and Inuit voices across the country. Engagement will, to the extent possible, leverage existing and past processes where related actions and priorities were outlined and discussed.

EVOLVING THE STRATEGY

The Canada Green Buildings Strategy will evolve and adapt through the *Canadian Net-Zero Emissions Accountability Act* (the Act) and its related progress and assessment reports, required at regular intervals. To start, the Strategy will be published in 2023, and progress will be reported in the 2025 progress report under the Act.

Under the Act, the Government of Canada is also required to set progressively more ambitious GHG emissions targets for 2035, 2040 and 2045. These targets must be set by the Government no later than 10 years in advance of the target date. To align with future targets, the Canada Green Buildings Strategy will be updated every five years, starting in 2028. This will ensure the Strategy remains relevant and ambitious, reviews challenges and opportunities, and reflects the current state of the built environment. This iterative approach will also allow the Strategy to be periodically aligned with other federal strategies mentioned above.

PRINCIPLES

The following proposed principles will guide collaboration on the Strategy:

1. **Drive Green Investment**: Canadians already spend upwards of $80 billion annually on building renovations and $57 billion on fuel and electricity to power and heat buildings.[xi] The Strategy will take advantage of this opportunity by creating the conditions that will incentivize reallocating existing capital toward net-zero emission, climate-resilient renovations and new construction.
2. **Enable Indigenous Climate Leadership**: The Strategy will seek to co-develop measures and milestones that reflect Indigenous climate priorities and leadership with respect to green buildings.
3. **Prioritize Equity, Diversity and Inclusion**: This lens will be woven into all aspects of the Canada Green Buildings Strategy – recognizing: the disproportionate impact of climate change and housing unaffordability on, for example, Indigenous communities, people with low incomes, and other vulnerable groups in Canadian society; the challenges of energy poverty, particularly in racialized communities; and the value of embracing diverse experiences, characteristics, and perspectives.
4. **Design With Affordability in Mind**: The Strategy will ensure that new actions address the unique challenges of affordability by balancing our net-zero emissions and climate-resilience objectives with other housing priorities.
5. **Be Collaborative and Ambitious**: Driven by a common goal of reaching Canada's 2030 Paris Agreement target and net-zero emissions in the buildings sector by 2050, the Strategy will be developed collaboratively to aggressively increase efficiency and resiliency and reduce greenhouse gas emissions.
6. **Consider Economy-wide Transformative Planning**: Canada cannot reach net-zero emissions by 2050 if the buildings sector acts alone. The decarbonization of heavy industry, electricity, transportation, and other sectors will influence the actions taken to reach net-zero emissions across the Canadian economy, including through transforming the way Canadians interact with buildings. The Strategy will take interconnectivity into account to ensure that buildings are built with purpose and used efficiently.
7. **Ensure Data Informs Policies**: Transparent traditional and scientific knowledge and data will inform actions and allows us to report on our progress.
8. **Stay Flexible**: The Strategy will apply a dynamic, flexible approach to enable adjustments for learning and to account for regional differences – across diverse provinces, territories, and Indigenous lands and territories – reflecting their unique geography, circumstances and priorities.

Increasing Affordability Through the Canada Green Buildings Strategy

Longstanding affordability challenges in the housing sector have recently been augmented by labour shortages, supply chain challenges, slow investment, and the invasion of Ukraine, which have all lead to inflationary pressure, creating an affordability crisis. Affordability is not only a priority for Canadians but governments too. As such, it is not only a consideration within this Strategy, but a guiding principle. When this Strategy refers to reducing greenhouse gas emissions, it does not mean at any cost, which is why the goals, principles, and themes detailed within this Strategy have all been developed with affordability in mind. In fact, many of the actions are to reduce costs – of housing, government programming, capital, and technology solutions.

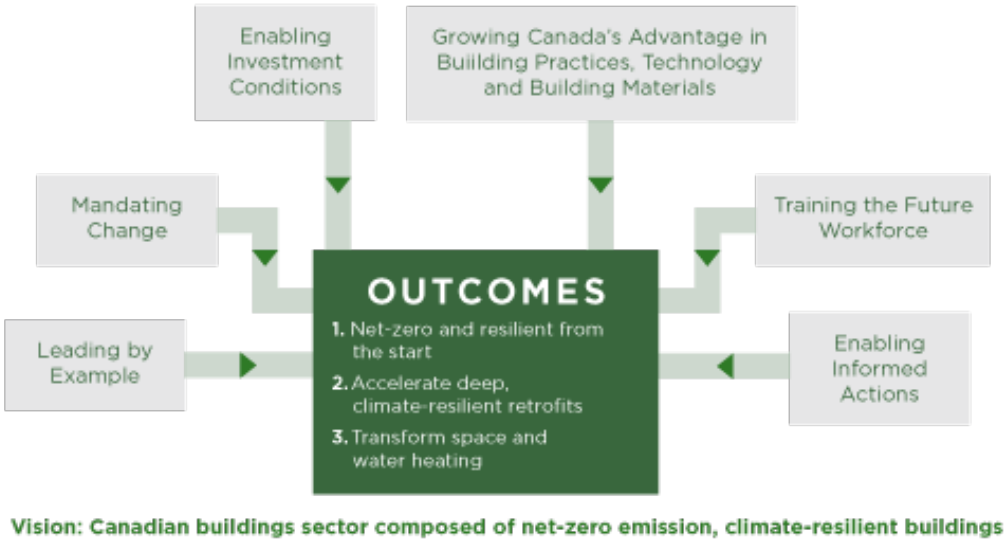
Furthermore, the impacts of a changing climate exacerbate costs related to insurance, retrofits, and energy – the cost of inaction. Addressing affordability means integrating the needs of today and the future.

STRATEGIC THEMES

With a view to achieving net-zero and enhancing climate resilience new actions are needed in at least six thematic areas to transform the market and policy environment. The following section provides *context*, a desired *objective* or *end state*, *areas for change* and *early actions* to advance each theme.

Through the Canada Green Buildings Strategy engagement process and complementary engagement processes, we will expand the *actions* list to reflect bolder federal actions and commitments from partners across the country.

Figure 2. Advancing Action Under Key Themes to Drive Common Outcomes



THEME 1. LEADING BY EXAMPLE

CONTEXT

Governments lead and influence policy, programs and regulations, but they also manage large procurement programs and portfolios of buildings that need to be decarbonized and climate-resilient. This fiscal lever provides an opportunity to show leadership and early action to meet our goals but also to drive market transformation by demonstrating and de-risking new approaches and building technologies and increasing the capacity of the industry to scale retrofits and high performance construction.

OBJECTIVE

All levels of government demonstrate leadership by holding themselves to higher standards for transitioning to all net-zero emission, climate-resilient buildings and ensuring spending power is aligned with this overall goal.

AREAS REQUIRING CHANGE

UNDERTAKE PUBLIC SECTOR BUILDING RETROFITS

Government can be among the first to demonstrate a portfolio of all net-zero emissions, climate-resilient buildings. Governments could take a leading role by ensuring that all new public buildings are net-zero carbon-ready and conform to applicable codes, standards and guidelines for climate resilience by 2025, and all existing public buildings are net-zero emissions and climate-resilient prior to 2050.

UPDATE APPROACHES TO SERVICE DELIVERY AND URBAN PLANNING

There is an opportunity to reshape the way government services are delivered. Through evaluating operating models and applying a “digital-by-default” approach, hybrid working practices may reduce building demand and influence infrastructure needs. Portfolio-level planning activities may be expanded to consider climate goals and circular economy principles and balance the supply and demand of workplace buildings. Through changing the way we plan around our workplaces, governments have the opportunity to create a ripple effect that permeates urban planning processes and ultimately influences emissions reductions across multiple sectors.

ENSURE FUNDING PROGRAMS SUPPORT GREEN BUILDING OBJECTIVES

Each level of government could support green building objectives by ensuring that all funding programs drive a rapid transition to high performance, climate-resilient, net-zero emissions buildings through:

- Setting ***conditions*** within funding programs to ensure support for green building objectives (e.g. establishing cyclical existing building commissioning [EBCx]);
- Targeting ***incentives*** toward deep retrofit projects with high potential for significant decarbonization and enhanced climate resilience that *require* financial support to achieve a deeper retrofit;
- Enabling ***bulk purchasing*** to help reduce the cost of low-carbon and climate-resilient building materials, products, and services; and,
- ***Prequalifying*** suppliers to accelerate the uptake and implementation of energy management services.

These programs could consider flexibility to address affordability, and northern and remote contexts to ensure funding is equitable, without compromising emissions reduction goals, and avoiding creating future liabilities for building owners and governments. Alternatively, additional support and funding may be appropriate in these contexts (e.g. considering higher incremental cost, potential benefits from an energy security and resilience perspective).

ESTABLISH A COHESIVE APPROACH TO GREEN PROCUREMENT

Public purchasing power can be used to drive additional demand for low-carbon construction materials and technologies for climate resilience, establish greater investor certainty and confidence, and ultimately encourage market transformation. Public procurement can also influence transformation in the commercial leasing market.

ACTIONS

Current and potential federal actions (below) will advance change, but bolder actions are required from the federal government and partners.

- **Accelerate Retrofits of Federal Buildings**: In order to meet the commitments in the Greening Government Strategy, federal organizations must accelerate building retrofits and adapt their real property strategies to achieve greater energy efficiency, make greater use of low-carbon materials, enhance climate resilience, and switch to fuels with low carbon or none at all.
- **Develop a Buy Clean Strategy**: The federal government intends to introduce a Buy Clean Strategy that would support and prioritize the use of made-in-Canada, low-carbon products in Canadian infrastructure projects and could consider linkages with reducing embodied carbon in buildings.
- **Implement Federal Funding Conditions:** The federal government could use funding levers, including integrating new requirements into building-related federal funding opportunities. Categories for criteria that are under consideration could include those listed below – with appropriate flexibility (e.g. program adjustments, phasing in) for affordability, northern and remote contexts, and Indigenous self-determination for housing support to Indigenous partners:
    - *High Performance New Construction (e.g.* New buildings should be constructed to the highest energy efficiency requirements feasible.)
    - *Deep Retrofits (e.g.* Building retrofits should result in at least 50% (targeting 70%) energy savings, and should target 80% to 100% GHG emissions reduction.)
    - *Reducing Embodied Carbon* (e.g. disclose the amount of embodied carbon in the structural materials of major construction projects by the end of 2022 and reduce embodied carbon by 30%, starting in 2025)
    - *Resiliency* (e.g. New buildings and retrofits should have a resiliency assessment and conform to the latest applicable guidelines and standards for climate resilience.)

THEME 2. MANDATING CHANGE

CONTEXT

Governments are uniquely positioned to apply policy levers, and related tools to advance decarbonization and climate resilience within the buildings sector. This includes the use of building codes, standards, legislation, and regulations.

OBJECTIVE

Governments consistently **use existing legislative authorities and develop new ones** to set measurable, ambitious requirements that provide the **market signals** necessary for key players (e.g. building owners, manufacturers, financial institutions) to make the significant investments required to achieve net-zero emissions across the buildings sector.

AREAS REQUIRING CHANGE

ACCELERATE THE CREATION, ADOPTION AND ENFORCEMENT OF HIGH PERFORMANCE, CLIMATE-RESILIENT AND ZERO-CARBON BUILDING CODES, STANDARDS, AND SPECIFICATIONS

Efforts to harmonize code adoption and reduce or eliminate variations across Canada are underway. Provinces and territories have committed to adopting new codes, such as the recently published 2020 model codes, within two years of publication, and subsequent iterations within 18 months. This commitment addresses the adoption of the model codes, but does not address performance pathways set out in the codes (e.g. energy performance tiers in the 2020 model building codes).

As innovation in low-carbon materials and technologies progresses, codes and standards must adjust to fairly assess new products and not restrict their application, where appropriate. Performance-based codes are the best regulatory practice internationally to enable innovative construction projects and to allow the buildings sector to improve and measure its performance. A performance-based national building code would enable greater uptake of a full range of low-carbon building materials such as mass timber, low-carbon concrete or steel. In addition, model building codes could be developed for measuring, reporting and reducing the embodied carbon of building materials.

With respect to resiliency, Canada's buildings are guided by codes and standards that were developed based on historical data, such that some buildings are not designed to withstand the future impacts of climate change. The Federal Advisory Committee on Climate Resilience and Infrastructure is working on linkages with federal objectives and priorities for codes and standards development, including flood risk management, wildfires, climate-resilient building envelopes, and building material durability. There is significant work that remains to be done to address the growing risk of extreme weather events, and the associated hazards to Canadians' well-being, which creates an urgency to adapt and build resilience.

MODERNIZE LEGISLATIVE TOOLS

Current federal, provincial, and territorial legislative tools need to reflect our climate priorities, digitalized world, integrated systems, advanced technologies, how we think about energy efficiency, embodied carbon (or low-carbon materials), re-use of building materials at end of life, and building resiliency. These tools need to be designed with a net-zero carbon and climate-resilient future in mind. This means taking an ambitious approach that is capable of driving the required change (e.g. enable better data sharing and gathering, mandate carbon disclosure in buildings, introduce modern regulations).

REGULATE AND INCENTIVIZE THE TRANSFORMATION OF SPACE AND WATER HEATING

Space and water heating accounts for **78% of all emissions** from energy used in buildings.[xii] The majority of Canada's buildings (60% of homes and over 80% of commercial and institutional buildings) heat with fossil fuels. Transitioning the majority of these buildings off fossil fuel heating systems by 2050 is core to decarbonizing the sector. In most buildings across Canada, electric heat pumps are the right solution. Not only is electricity cleaner than fossil fuels in most jurisdictions (and will continue to get cleaner via the Clean Electricity Standard), the technology to use them more efficiently than fossil fuels to heat our buildings is available. Full electrification may not be feasible for some homes, such as in northern, remote and Indigenous communities, and consideration can be given to alternative solutions such as heat-pump/cleaner-fuel hybrid systems. Remote buildings that are off the electricity grid will also require unique solutions to decarbonize.

ACTIONS

Current and potential federal actions (below) will advance change, but bolder actions are required - from the federal government and partners.

- **Advance Model Building Codes:** The federal government will work with stakeholders to support the development and publication of code provisions for the 2025 code cycle that address energy efficiency when making alterations to existing buildings; and, develop the next evolution of the codes, starting in 2025, that focus on operational carbon emissions and expand to life-cycle emissions by 2030. The new codes will also offer an approach to increase the climate resilience of the built environment.
- **Advance Integration of Climate Resilience into Building Codes:** Continue to develop new research, guidelines, tools, standards and codes related to climate resilience. It will be important to generate new science-based knowledge to enable evidence-based decision-making and to support knowledge mobilization, uptake and implementation, including through the National Research Council-led provincial and territorial engagement meetings on climate resilience in codes and standards.
- **Launch a new Net-Zero Building Code Acceleration Fund**: The federal government will launch a new fund to accelerate adoption and implementation of the higher performance tiers of the national model energy codes, while addressing persistent challenges in Canada's codes system. This Fund will be available to provinces and territories, municipalities, Indigenous governments and organizations, and other national and non-governmental organizations.
- **Modernize the *Energy Efficiency Act*:** The government could consider modernizing its suite of legislative tools to support the level of change required by this strategy (e.g. account for digitalization and e-commerce).
- **Develop Regulatory Standards and an Incentive Framework for Transitioning off Fossil Fuels for Heating Systems:** The federal government will work with partners to, for example, set phased timelines for ending the installation of new oil or natural gas heating systems, with accommodation for electric-gas hybrid systems and remote buildings with no or limited access to the electricity grid. This would be complemented with an incentive framework. An incentive framework for heat pumps will be important to facilitate rapid uptake.
- **Ensure Clean Energy is Used Efficiently:** Canada's work on standards and labelling programs will continue to drive important improvements in how buildings, homes, and the products within them, consume energy. Clean energy must be treated as a limited resource and used as efficiently as possible to maximize its benefits.

THEME 3. ENABLING INVESTMENT DECISIONS

CONTEXT

To produce the swift and drastic growth required within the retrofit market, access to the right information and support for property owners and investors must be improved to mobilize private sector capital. This theme discusses examples of the types of tools that may be used to drive the transformation.

OBJECTIVE

Canadians, businesses and investors have more information on the performance of different building types and cost-effective strategies that improve performance to make investment decisions.

AREAS REQUIRING CHANGE

REVIEW CANADA'S MORTGAGE FINANCE SYSTEM

Achieving our 2050 goals will require significant changes to our broader mortgage finance system. We need to have a mortgage finance system that enables and promotes deep retrofits and that fairly prices lending according to the climate risk the underlying assets pose. This will involve government, regulators and industry working together to make structural changes to mortgage regulations, mortgage funding sources, capital requirements, and the mortgage securitization system. It will be important that this transition happens in a measured, thoughtful manner to ensure housing affordability and economic stability are maintained.

NORMALIZE BENCHMARKING, LABELLING AND DISCLOSURE

Energy benchmarking, labelling and disclosure allows tracking and recording a building or home's energy use and comparing it with other buildings or a reference home of a similar size, followed by disclosing or reporting this information to the public. This can help drive data transparency on energy costs and incentivize building investment decisions on energy performance. For commercial and institutional buildings, the tools and resources for benchmarking, labelling and disclosure are readily available; however, regulations are not yet in place in most provinces and territories. For residential buildings, standardizing home labelling policies across Canada could dramatically transform our real estate market. Development of this system must include a better understanding of how the federal government can support provinces, territories, municipalities, real estate associations, and other key stakeholders in implementing benchmarking, labelling and disclosure initiatives.

SIMPLIFY DEEP RETROFIT PROJECTS

Concierge services are a powerful solution to simplify complex retrofit projects. For large buildings, energy service companies (ESCO) are available across Canada to provide a comprehensive suite of services and attractive financing models. Recently new contracting models such as energy-as-a-service (EaaS), have emerged alongside a new market leading "super ESCO" that acts as an intermediary between building owners and private sector ESCOs. For smaller commercial and institutional buildings and homes, community-led retrofit coaching programs offer owners the expertise and support to implement projects, including selecting an appropriate financing option (e.g. property assessed clean energy (PACE) program, on-bill financing). Accelerating the adoption of these types of concierge services for both small and large buildings presents a significant opportunity to expand retrofit activities and attract additional private sector investment to decarbonize Canada's buildings sector.

IMPLEMENT TRANSITION PLANS FOR BUILDING PORTFOLIOS

All large building owners and operators need to implement a timeline road map that connects their building renewals lifecycle to GHG reduction investments. Mechanical and enclosure systems have long lifespans and most large buildings will have only one opportunity to replace these systems between now and 2050 – timed to when these systems reach the end of their useful life.

STANDARDIZE DEEP RETROFIT PROJECTS IN COMMERCIAL AND INDUSTRIAL BUILDINGS

The timeframe (5 to 20 years) and sustainable nature of deep retrofit projects suggest that these projects are ideal for investors seeking conservative, long-term returns (i.e. institutional investors). However, the relatively small deal size generally does not warrant the administrative costs, which has been a significant impediment to successfully attracting financing at scale. Aggregation alone could present a solution to attract some investors. Securitization of commercial and industrial retrofit loans may go a step further through packaging aggregated retrofit loans as tradeable securities, which could attract a broader audience of investors. To be aggregated, a financial product must be homogenous and therefore standardized. Before the financial sector can aggregate or securitize deep retrofit loans, there is a need for a standardized replicable model for a retrofit project to first, understand how to price the risk of a retrofit financing product and second, aggregate them.

CROWD-IN PRIVATE CAPITAL WITH GOVERNMENT FINANCING FOR BUILDINGS WITH PUBLIC INTEREST

Innovative and blended financing approaches such as performance guarantees, public-private partnerships, and the Canada Infrastructure Bank, could be explored to expand the role of private sector expertise in managing building design, construction, operation and maintenance, and revenue risk associated with publicly-provided buildings, which can also have revenue generating characteristics.

REDUCING THE RISK OF INVESTMENT IN **DEEP** RETROFITS THROUGH PUBLIC FUNDING

Even once investment decision-makers have more information on deep retrofit projects, there may be residual risk – related to income, displacements of residents, remote contexts, achieving *deep* retrofits – requiring government intervention, especially given time constraints. Financial incentives are particularly appropriate in the case of low-income housing. Further, there are a number of targeted funding and financing programs across Canada that can be accessed, in combination, to reduce the cost of retrofit projects (e.g. utility programs, the Canada Greener Homes Program). Work is needed to maximise coordinated outcomes of these programs across jurisdictions (e.g. stacking where appropriate), and ensure building owners are aware of options.

ACTIONS

Current and potential federal actions (below) will advance change, but bolder actions are required from the federal government and partners.

- **Advance Benchmarking, Labeling, and Disclosure for Residential and Commercial and Institutional Buildings:** The federal government will develop an approach to require labelling of homes at the time of sale, and design a complementary Climate Adaptation Home Rating Program. The federal government will also work with provinces, territories, municipalities, real estate associations, and other key stakeholders to ensure the widespread adoption of benchmarking, labelling, and disclosure standards for residential and commercial and institutional buildings.
- **Establish the Deep Retrofit Accelerator Initiative:** The initiative will provide support for retrofit project before development and aggregation to accelerate the pace of deep retrofits in Canada, including a focus on low-income housing.
- **Develop Guidance for Retrofit Financing:** Guidance could be developed that would include energy efficiency finance underwriting techniques, energy efficiency project finance standardization, and assessment of climate-related risk.
- **Expand Residential Retrofit Support Services**: The federal government could work with other levels of government, and private sector partners to work towards ease-of-access to key services (e.g. technical advice) and financing models, such as the PACE model and on-bill financing.
- **Mobilize Private Sector Capital via the Net-Zero Capital Allocation Strategy:** The Sustainable Finance Action Council will develop and report on strategies for aligning private sector capital with the transition to net-zero emissions, with support from the Canadian Climate Institute and in consultation with the Net-Zero Advisory body. This will include consideration of the buildings sector.
- **Launch the Canada Greener Homes Loan Program: The Canada Mortgage and Housing Corporation will offer the Canada Greener Homes Loan** for homeowners and a stream of grants and low-interest funding for affordable housing providers.
- **Raise Awareness of Programs and Services:** The federal government could pursue further work with partners to achieve maximum benefit from available programs and raise awareness (e.g. information consolidated to a central website).

THEME 4. GROWING CANADA'S ADVANTAGE IN BUILDING PRACTICES, TECHNOLOY AND BUILDING MATERIALS

CONTEXT

The buildings sector needs advanced, holistic low-carbon solutions to overcome persistent challenges in decarbonization, many of which have not yet entered the market. Sustained innovation and science and technology (S&T) support across diverse regions and building types are required to ensure that decarbonization and enhanced climate resilience through evolving technology, materials, and building practices, will be timely, efficient, cost-competitive, and affordable.

OBJECTIVE

Low-carbon and climate-resilient, high performance technologies, building materials, and construction practices are cost-competitive, and their use is common practice in building design, construction, and operation.

AREAS REQUIRING CHANGE

CHART COST-EFFECTIVE DECARBONIZATION PATHWAYS

Sustained innovation and S&T support are required to ensure that future buildings can adhere to stringent and evolving codes and standards, and that deep retrofits can reach an unprecedented scale and depth. This is new territory for most building types and regions. The market needs direction on cost-effective, validated pathways for constructing new buildings and achieving deep energy retrofits across building types and regions. To be adopted, these decarbonization pathways must account for affordability, consumer preferences, and optimized use of electricity and renewables in buildings, and demonstrate to private market stakeholders how to most efficiently enhance the building stock's sustainability and resilience to climate risks.

INCORPORATE LIFE-CYCLE CARBON INTO BUILDING PERFORMANCE METRICS

To truly decarbonize buildings, we must minimize carbon emissions associated with the entire life cycle of the building – the carbon from materials, construction, and disposal phases must be evaluated alongside emissions produced during building operation.

In practice, this requires development of standardized environmental product declarations (EPDs), life-cycle inventories for embodied carbon in Canadian construction materials, guides, standards for performing whole building life-cycle assessment, and carbon accounting tools. There is currently poor market understanding of embodied carbon, life-cycle assessment, and optimization of the carbon impacts of building material and technology choices in design. There is also a lack of incentive for industry to produce and purchase low-carbon products or use EPDs and carbon accounting practices in buildings projects. Federal S&T actors can act as impartial third-party conveners of information to establish standardized GHG emission data to create a national database of construction materials, develop standards for whole-building life-cycle assessment, and support industry to develop carbon accounting tools that comply with standards. When supported by diverse, competitive construction sector stakeholders, these activities will allow life-cycle carbon to be meaningfully addressed in building project metrics, codes, and standards.

ACCELERATE DEVELOPMENT AND ADOPTION OF NEW TECHNOLOGIES, MATERIALS, AND PRACTICES

The buildings sector has made major advancements in technologies, materials, and building practices; however, significant barriers remain to integrating these solutions into standard practice by 2030. In addition, major innovations are still required to achieve net-zero emissions across Canada's building stock by 2050, particularly

among hard-to-decarbonize building types and regions. These developments are required to unlock affordable electrification, minimize grid disruption, fortify low-carbon building material and technology supply chains, and shed building costs to keep construction affordable at higher performance levels – all of which underpin the successful transformation of the built environment to net-zero emissions.

These advancements can be delivered through combined government and industry collaboration on research, development and demonstration (RD&D) and key innovation activities such as demonstration programs to validate novel approaches and emerging technologies (e.g. prefabricated building envelopes, district energy, automated ongoing commissioning), technology and material development and testing (e.g. high efficiency heating and cooling equipment), and dissemination of design tools and guidelines. These activities will validate the pace and sequence of major investments needed to decarbonize and fortify the built environment against climate risks.

ACTIONS

Current and potential federal actions (below) under this theme will advance change, but bolder actions are required from the federal government and partners.

- **Launch a Low-Carbon Building Materials Innovation Hub**: The federal government will develop a hub to drive further research and demonstration activities and inform building code reform to promote the use of low-carbon construction materials in the built environment.
- **Develop Standardized Tools and Guidelines for Conducting Life-cycle Assessments**: The federal government will advance its Life Cycle Assessment (LCA) initiative to develop a national life-cycle inventory (LCI) database of construction materials, provide best practice guides, and support the industry in developing EPDs and carbon accounting tools to evaluate whole building life-cycle carbon in accordance with standards and guidelines.
- **Launch the Greener Neighbourhoods Pilot Program**: A community-level net-zero emissions, climate resilient homes initiative will be launched to explore new cost-effective pathways to decarbonizing the existing affordable housing sector through aggregated deep energy retrofits and the creation of market development teams.
- **Facilitate Green Construction in Housing and Buildings**: The federal government will conduct research and development on innovative construction materials, products, and construction processes. It will execute pilots and inform the development of codes for life-cycle carbon to revitalize national housing and buildings standards, such as the National Master Specification, to encourage development and uptake of low-carbon construction solutions.
- **Support Development of Regional Pathways:** Federal S&T capacity and tools can support identification of the best regional pathways to net-zero emissions. The federal government has unique testing facilities to validate the performance and safe application of emerging technologies needed to achieve deeper energy retrofits and greater climate resilience. These are available to partners for collaborative work.
- **Build Upon the Local Energy Efficiency Partnership Initiative (LEEP):** The federal government S&T capacity could build upon the successful model in engaging local builders and technology providers to spur innovation in the commercial buildings market.

THEME 5: TRAINING AND INCENTIVIZING THE FUTURE WORKFORCE

CONTEXT

To respond to an increased demand for high performance construction and net-zero, climate-resilient retrofits, the labour market faces the challenge of re-skilling existing workers and attracting new workers.

OBJECTIVE

A skilled workforce is in place to support building decarbonization and enhanced climate resilience, including in the fields of architecture, construction, renovation, trades, housing development and non-profit housing providers, engineering, equipment manufacturing, installation and repair, energy assessment and management, and building maintenance.

AREAS REQUIRING CHANGE

MAKE ZERO-CARBON, CLIMATE-RESILIENT BUILDING SKILLS THE NEW NORM

Current buildings sector employers and workers will need to develop new skills to successfully support the transition to an energy-efficient, climate-resilient building stock and low-carbon building materials (e.g. mass timber, low-carbon steel, and concrete). Employers and workers must be prepared for a change in culture, as the construction industry will undergo a shift in required skill sets. This shift will need to focus on employee retention and develop lifelong learning practices for workers to stay relevant and effective in this changing environment.

INCREASE THE SIZE OF THE GREEN BUILDINGS SECTOR WORKFORCE

Achieving a net-zero emission, climate-resilient buildings sector by 2050 will require a dramatic increase in the number of green building jobs across Canada. As new measures and tools, such as more stringent building codes and standards, come into effect, there will be a critical job growth opportunity for the industry and Canadians to seize. Given the number of retrofits required and retirement projections for the construction industry, a tremendous increase in the number of workers is required – in addition to the current workers whose skills will be upgraded. Workers transitioning from other sectors, attracting new entrants and newcomers to Canada are all potential avenues for building the needed workforce.

INCREASE DIVERSITY OF THE WORKFORCE

Workforce growth and transition efforts must address current barriers and underrepresentation, which currently prevent many women, Indigenous Peoples, persons with disabilities and racialized people from participating in the buildings sector workforce. Addressing these barriers will significantly increase the potential talent pool and support a more inclusive Canada.

ACTIONS

Current and potential federal actions (below) will advance change, but bolder actions are required from the federal government and partners.

- **Develop Regional Workforce Plans:** Working with provincial and territorial governments, regional workforce plans could be developed to identify the future skill sets, current gaps, and a path forward to fill those gaps. Actions could include training for professionals (engineers and architects), skilled trades, new workers, retraining for experienced workers, requalifying skills as new technologies emerge, and designing entirely new training programs and strategies for recruiting underrepresented segments of the population.
- **Launch a Clean Jobs Training Centre:** Working with key stakeholders, the government will launch a Clean Jobs Training Centre to help workers across sectors and occupations improve or gain new skills to be on the leading edge of the zero carbon industry.

- **Expand Training Funding:** The federal government will expand funding for the Union Training and Innovation Program that supports union-based apprenticeship training, innovation and enhanced partnerships in the Red Seal trades, which are vital to the low-carbon, climate-resilient buildings workforce.

THEME 6. ENABLING INFORMED ACTIONS

CONTEXT

Robust, accurate, and science-based data and information provide the basis for policy development and decision-making that will support the provision of a net-zero emission, low-carbon building stock.

OBJECTIVE

Robust, transparent data and modelling are easily accessible to market participants – while respecting (individual) privacy – to inform investment decisions, public sector programming and evolution of the Strategy.

AREAS REQUIRING CHANGE

INCREASE ACCESS TO ROBUST, TRANSPARENT DATA

Currently, Statistics Canada collects energy consumption data on households, commercial enterprises, and institutions every 4 to 5 years, and Natural Resources Canada's EnerGuide program collects energy retrofit data. Increasing the frequency and improving the targeting of data collection can support policy and program development needs (e.g. equity, diversity and inclusion data, labour force data, expanded coverage of retrofit data).

CLEAR DEFINITIONS FOR RETROFITS TO EASILY COMPARE COSTS

There is a need for standardized data to support estimating retrofit energy savings and the associated costs, including:

- standard approach to recording energy efficiency gains to understand the full extent of the retrofit (pre- and post-retrofit energy intensity and actual (raw) energy intensity values in both thermal energy demand intensity and physical energy intensity);
- recording the age and starting condition of the building; and,
- standardizing an approach for recording cost (e.g. incremental cost, total cost, including depreciation of equipment value).

DEVELOP A TRANSPARENT MODEL FOR NATIONAL BUILDINGS SECTOR EMISSIONS

Creating a transparent model for estimating Canada's buildings sector emissions that is accessible to users on a platform to estimate various scenarios would enhance collaboration and learning across the sector, leading to better policies and investments.

ACTIONS

Current and potential federal actions (below) will advance change, but bolder actions are required from the federal government and partners.

- **Develop a Data Strategy:** The federal government could lead in developing a data strategy *through collaboration among all data holders* (e.g. provinces, territories, municipalities, utilities) to:
    - develop a robust model to inform how actions that form part of the Strategy will contribute to emissions reduction, assess progress and adjust as required;
    - identify and seek new pathways and partnerships to share data among all partners, including addressing barriers and challenges, simplifying data collection, and exploring legislative enablers and constraints;
    - harmonize energy use disclosure; and,
    - address the lack of data on adaptation measures and climate risks.

MILESTONES

The Canada Green Buildings Strategy will set milestones along our path to achieving a net-zero emission, climate-resilient buildings sector. The potential key *areas where milestones may need to be set* are noted below. Further work on modelling, and understanding data that is available to support tracking against milestones is needed to identify *actual milestones*:

- Direct emissions and embodied carbon emissions
- New construction:
    - Percentage of net-zero carbon new construction
    - Percentage with zero-emissions space and water heating systems
    - Percentage of new construction conforming to applicable codes, standards and guidelines for climate resilience
- Existing buildings
    - Deep retrofit rate
    - Heating system fuel switching
    - Building stock turnover (retrofit rate)
    - Number of buildings made more resilient to climate change impacts, hazards and risks, including flooding and wildfires
- Number of buildings that have benchmarked, labeled, and disclosed their energy use
- Re-skilling and growing the building workforce

DISCUSSION QUESTIONS

Partners are asked to provide written feedback to greenbuildingsstrategy-strategiepourlesbatimentsverts@nrcan-rncan.gc.ca by September 16, 2022.

1. Does this discussion paper target the right strategic themes and areas requiring change, and communicate the level of action required?

2. This discussion paper identifies current and potential actions that the federal government is taking under each theme. What actions can your organization contribute to support achieving the changes needed within each theme?

3. Are there other actions that you believe need to be taken, best practices we should consider, or potential risks to pursuing the Strategy?

4. What milestones should be used to track progress toward a net-zero emissions, climate-resilient buildings sector?

5. What structures or processes should be put in place to support continued collaboration to 2050?

6. What modelling has your organization done that could inform modelling out all the actions that will be identified under this strategy to ensure they are ambitious enough to meet our net-zero buildings sector commitment?

7. How can we best consider Indigenous priorities that have been raised through existing federal processes and initiatives regarding the built environment on reserves and in other remote and northern communities (e.g. the work to close critical infrastructure gaps by 2030, conduct infrastructure needs assessments, develop and implement Indigenous distinctions-based housing strategies, and co-develop the Urban, Rural and Northern Indigenous Housing Strategy)?

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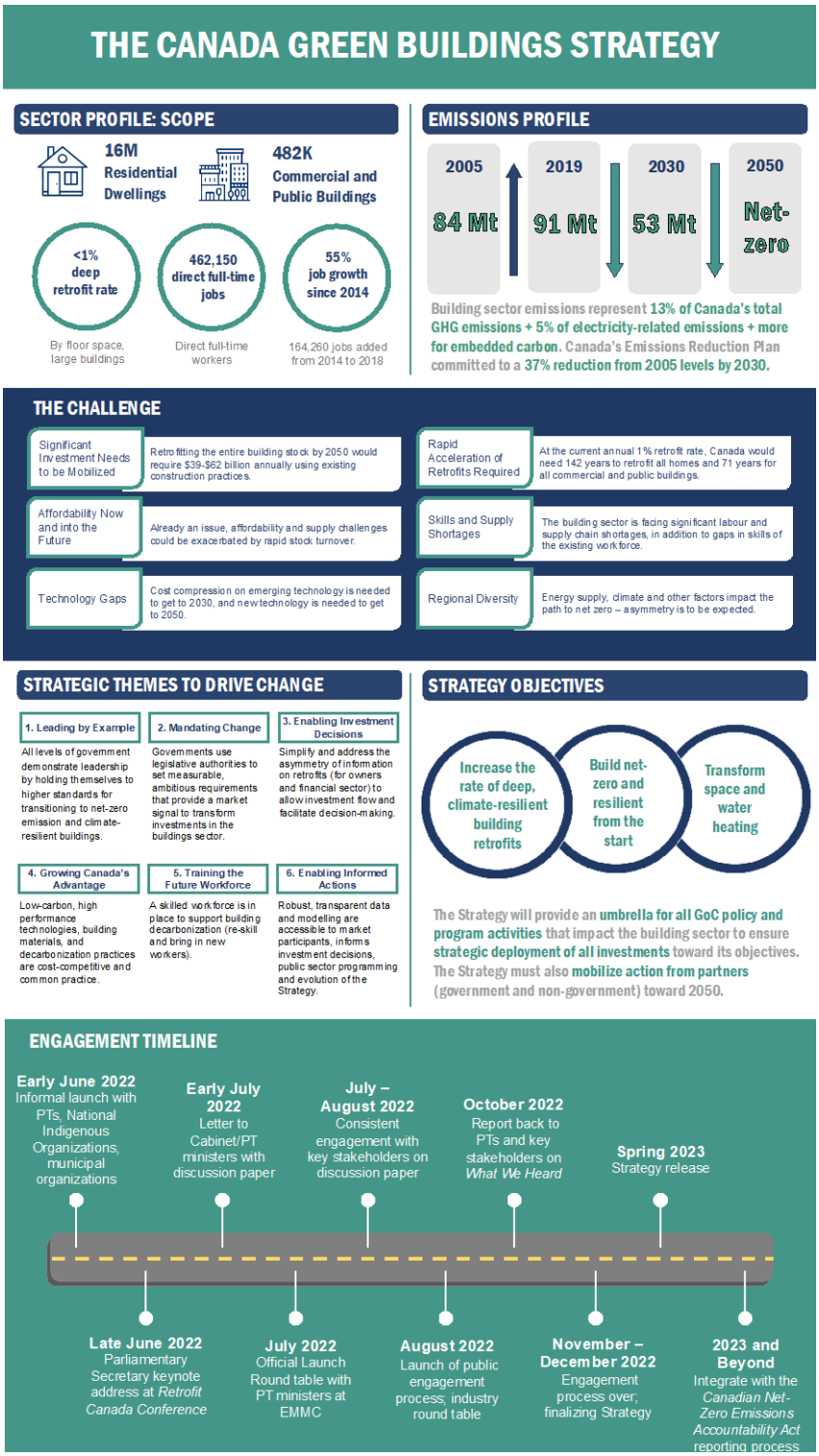
[i] Natural Resources Canada (2019), *Comprehensive Energy Use Database*; Natural Resources Canada (2014) *Survey of Commercial and Institutional Energy Use Database*
[ii] Environment and Climate Change Canada (2022), *2022 National Inventory Report*
[iii] The Canadian Institute for Climate Choices (2021), *Under Water: The Costs of Climate Change for Canada's Infrastructure*
[iv] World Resources Institute (2019), *Estimating the Economic Benefits of Climate Adaptation Investments*
[v] Natural Resources Canada (2018), *Comprehensive Energy Use Database*
[vi] Canada Green Building Council (2020), *Canada's Green Building Engine – Market Impact and Opportunities in a Critical Decade*
[vii] Ibid.
[viii] Efficiency Canada (2021), *Canada's Climate Retrofit Mission – Why the climate emergency demands an innovation-oriented policy for building retrofits*
[ix] Ibid.
[x] Canadian Institute for Climate Choices (2021), *Under Water: The Costs of Climate Change for Canada's Infrastructure*
[xi] Efficiency Canada (2021), *Canada's Climate Retrofit Mission*
[xii] Natural Resources Canada Comprehensive Energy Use Database (2018): 55.9 Mt of total 65.6 Mt from residential sector Table 2 (Secondary Energy Use and GHG Emissions by End-Use), and 33.2Mt of total 49 Mt from commercial / institutional sector Table 4 (Secondary Energy Use and GHG Emissions by End Use – Including Electricity-related Emissions)

ANNEX A. THE CANADA GREEN BUILDINGS STRATEGY - INFOGRAPHIC



THE CANADA GREEN BUILDINGS STRATEGY

ANNEX: CURRENT FEDERAL ACTIONS