

**MISSION FROM MaRS:  
BETTER BUILDINGS**



# A new blueprint

Canada has the opportunity to improve housing affordability, reduce carbon emissions and bolster the economy. That will require taking some risks and abandoning the status quo.



**MARCH 2026**

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# Building a better tomorrow

Key takeaways from year one of  
Mission from MaRS: Better Buildings

Canada has a generational opportunity. It can confront three fundamental challenges — housing affordability, climate change and economic growth — with a comprehensive campaign to promote the creation and management of better buildings that emit less carbon, are constructed for a lower cost and at a faster pace, and drive productivity in the construction industry.

These goals can be achieved with a few core initiatives:

- While government updates building codes, industry should build beyond those guidelines and raise the bar of what's possible by investing in emerging technologies that will reduce operational costs of ownership while also cutting carbon emissions over the long run.
- Boost the productivity of the construction industry by simplifying regulations and incentivizing innovative approaches to building new housing as well as keeping existing homes in a state of good repair.
- Make retrofits predictable and attractive to both asset managers and individual homeowners and demonstrate the ROI of these investments.



“There is an existential need to figure out

how to solve the housing crisis without adding 18 megatonnes of extra carbon, which is what we would add each year if we continued with business as usual. Then there is the current economic threat to our economy and uncertainty about what the future holds. There simply is no better time than now to invest in Canadian technology and to bet on ourselves.”

– Ria Perrault, Manager  
Climate Programs, MaRS



## INTRODUCTION

# A generational opportunity

By making optimization the default in both new builds and retrofits, Canada can improve affordability, foster sustainability and drive economic growth.

Canada is grappling with three existential and overlapping crises: housing affordability, climate change and economic survival. These challenges, however, provide a unique moment for decisive action. If we leverage targeted policy tools, financing mechanisms and cutting-edge technology to create better buildings — both new and retrofits — we can begin to solve all three and create positive impacts for society and the economy.

Mass-timber components are manufactured at Intelligent City's facility in Delta, B.C., before they are shipped and assembled on site.

With governments at all levels racing to spur the construction of millions of new homes by 2030, policy-makers have a generational opportunity to incorporate efficiency-oriented tech solutions into design and construction in ways that reduce operating costs while increasing jobs with high added value in emerging sectors, such as factory-built housing and mass timber. Most importantly, all this new housing can — and should — be designed to reduce operating costs and embodied carbon and adapt to the extremes of climate change.

Investing in energy-efficient buildings drives the economy and advances decarbonization. According to the [International Energy Agency](#), most nations now have mandatory or voluntary building codes: Since 2019, spending on energy retrofits and building envelopes has jumped 20 percent in the United States, China and the European Union, to U.S.\$120 billion. In Canada, annual investment for retrofits grew four-fold between 2021 and 2024, reaching U.S.\$662 million. These figures indicate that a highly focused set of policy incentives can accelerate retrofit activity and boost growth in jobs and orders associated with such projects.

Concern over the impacts of climate change is driving action in this space. In the commercial and office sectors, asset managers are showing a growing interest in technology that reduces carbon emissions, says Brent Gilmour, chief commercial officer for the [Canadian Green Buildings Council \(CaGBC\)](#). “Climate risk has become paramount to investment decision-making,” he says. “There is now this increased expectation of risk.”

Interest in established technologies, such as smart building systems, heat pumps and triple-pane window systems, has helped draw attention to a range of new innovations — everything from low-carbon concrete to energy-generating windows and drone-based sensors that can pinpoint heat loss in high-rises. Such technologies can help slash carbon in new projects and improve energy efficiency in existing structures. Yet the uptake, at scale, of better building solutions depends on a framework of ambitious building and energy code upgrades, reliable retrofit incentives and new business models that respond to regulatory imperatives to cut both cost and carbon. “We need carrots, sticks and a shift in mindset,” says Ria Perrault, who leads the Better Buildings mission.

Energy-efficient office towers and industrial buildings are only part of this technology adoption story. Canadian policy-makers at all levels are focusing political attention and capital on

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MEGATONNES

The estimated amount of carbon dioxide emitted by [buildings in Canada](#) each year, which accounts for almost [12 percent](#) of the nation’s annual greenhouse gas emissions. After oil and gas and transportation, buildings represent Canada’s third-highest emitting sector, exceeding heavy industry, agriculture and electricity generation.

4.8

MILLION

The number of [new homes](#) that the Canada Mortgage and Housing Corporation estimates will need to be constructed by 2035 to restore affordability levels.



## Laying the groundwork

With the aim of advancing the commercialization of Canadian technologies that will foster a more sustainable built environment, MaRS launched the Mission from MaRS: Better Buildings in June 2024. To explore what it will take to accelerate the adoption of low-carbon technologies, we established a coalition, convening more than 20 leaders from the housing, real estate management and construction sectors as well as government representatives, investors and other key stakeholders. **Six high-potential startups were selected to participate in the inaugural accelerator program.** (See profiles starting on page 8.) A second Better Buildings Adoption Accelerator cohort is launching later this spring. During the mission, which was made possible through funding from the Peter Gilgan Foundation, MaRS worked with ventures and industry partners to achieve three main objectives:

- Reduce operational emissions of Canada's building stock through the adoption of innovations.
- Accelerate the uptake of low-carbon building materials and methods that will lower the embodied carbon of new buildings.
- Amplify the role of Canadian cleantech in existing efforts to create a more resilient, adaptive and affordable built environment.

the shortage of affordable housing, especially in high-cost urban centres. Investments in energy-efficient, affordable housing will produce more jobs, expand markets for building materials and lower the cost of living.

Yet it's not enough to simply build more housing if it means falling further behind on our climate targets. As a 2024 [study](#) by University of Toronto and University of Waterloo scholars warned, perpetuating business-as-usual construction practices will have “substantial environmental consequences.” The researchers found that meeting both our housing commitments and climate goals will require a 83 percent GHG reduction per home — a major change to the status quo.

“The building industry has a lot of old ways of doing things, and it's very risk averse, which means it often ends up being tied to incremental changes,” adds Perrault. “That pace of progress is not the pace that it could be and that we need it to be.”

However, the federal government's new focus on developing a factory-built housing industry — dubbed [modern methods of construction](#) (MMC) — will serve as an accelerant for both the market and technology investment. “The industry is in an interesting space, testing out how much we can pre-fabricate,” observes Betsy Agar, director of building policy for [Efficiency Canada](#). MMC has the potential to disrupt the construction industry as a means of driving down cost, cutting waste and boosting productivity. “What we really need,” Agar says, “is a full cultural shift.”

Getting there with a sense of urgency will mean taking risks and abandoning inefficient and low-productivity practices — a difficult transition that other sectors have navigated successfully, but one that has, to date, largely eluded the building industry.

# \$10

The average incremental cost per square foot for deep retrofit investments required to reduce GHG emissions in buildings by [40 percent](#) by 2030.

# 1



## CLIMATE CHAMPION

# Reusing construction waste

## Adaptis

Year founded: 2022



**What it does:** Adaptis co-founder Sheida Shahi, a registered architect who has a PhD in circular engineering, launched the firm to help developers and building managers optimize the life-cycle carbon in their structures. The firm works with architects, builders and asset managers on new-build projects as well as retrofits and restorations, providing detailed plans that produce net-zero buildings. It's a road map that asset managers want, says Shahi. "That's how they evaluate the value of the building. That's how they make financial decisions about how much they need to spend."

Adaptis develops circular materials strategies that allow contractors to recycle, for instance, discarded beams or bricks produced during a renovation project or demolition. "If I produce 100 tons of waste with my building, and I want the new one to be net-zero carbon, I have to build a really

efficient building to replace it, to offset the carbon embodied in construction debris."

**The impact:** Adaptis can conduct life-cycle assessments of buildings and determine a building's carbon footprint 20 times faster than analog methods (in the past, asset stakeholders had to rely on outdated architectural drawings and multiple site visits from different consulting teams). These assessments enable up to 20 percent savings in capital expenditures. The market response has been strong. Between 2023 and 2025, Adaptis doubled its revenue, and has expanded into B.C., Washington and New York. The company is working on 600 buildings in Canada, U.S. and Brazil, and has another 200 in its pipeline.

Shahi says the company's goal is to equip developers and asset managers with the analysis they need to determine life-cycle carbon associated with building materials and different levels of resiliency and carbon reduction. "Everybody always loves to build a building that lasts," she notes. "What Adaptis is really trying to push for is, know your options. Know what additional investment it would take for you to de-risk your building at different points in time."

Adaptis conducted a detailed life-cycle assessment analysis of Walmer Road Baptist Church in Toronto.



## SOLUTIONS

# Areas of development

Increased automation can improve building energy efficiency and labour productivity on construction sites. By retrofitting existing buildings, Canada can strengthen its climate resilience, cut energy consumption and reduce operating costs.

Opportunities to advance the three overarching goals associated with better buildings fall into two broad categories: new construction, especially in the multi-unit residential sector, and the retrofit industry, which encompasses everything from post-war bungalows to office towers.

### New construction

The federal government's efforts to drive down construction costs through investments in factory-built, pre-fabricated components could provide an inflection point for the industry.

>\$6  
BILLION

Added cost of residential construction in Canada between 2019 and 2024 due to lost productivity.

Promise Robotics has developed an AI platform that enables builders to turn architectural plans into manufacturable components.

# 2



## CLIMATE CHAMPION

# Providing power more efficiently

## Cence Power

Year founded: 2021



**What it does:** The world runs on alternating current (AC) power. But the majority of gadgets, including energy efficient devices like LEDs, run on direct current (DC) power.

That means that eco-friendly light fixture becomes less sustainable as it loses heat energy converting the AC power it receives into the DC power it needs. Take for instance, laptop chargers, which typically heat up when they are in use, providing a tangible example of how energy is wasted when converting power from alternating current to direct current. Markham's Cence Power has developed power adaptor hubs that can plug into any existing electrical panel, converting power to DC on the spot, rather than putting the burden on devices. Its DC distribution

architecture uses patented fault-managed power (FMP) technology to provide near-instantaneous fault detection. This high-speed protocol replaces traditional mechanical protection, such as metal conduit and junction boxes, while optimizing energy efficiency and system reliability. Its panels allow for the safe distribution of high-voltage current to lighting systems and telecom and data centres.

The company has also developed centralized DC distribution architecture that optimizes energy efficiency by consolidating AC-to-DC conversion within high-efficiency, low-voltage hubs, eliminating the need for redundant conversion stages at every electrical load. The use of DC current for low-voltage applications mitigates energy losses and reduces grid-level emissions. Plus, Cence's FMP technology facilitates the use of reduced gauge cabling and eliminates the need for mechanical protection, such as conduit and junction boxes, helping companies save on capital costs.

**The impact:** Cence Power's low-voltage architecture reduces operational energy consumption by more than 20 percent by eliminating redundant AC-to-DC conversion stages for LED lighting, telecommunications and other digital loads, says president Bolis Ibrahim. He has started to see accelerated momentum in the market. Changes to the U.S. National Energy Code in 2023, which enabled the use of Cence's technology, have prompted widespread adoption across the United States. And the Canadian Standards Association is currently harmonizing standards to facilitate the deployment of Cence's FMP technology here at home. In jurisdictions with stringent energy mandates, such as California, DC power distribution is increasingly being used in new construction to address changing building codes and efficiency standards. "We've seen an increase in investors reaching out to us and wanting to invest in the technology, as well as an increase in customers, and also new competitors popping up," he says. "It's been a busy year."

Cence Power's electricity distribution systems are designed to enhance energy efficiency.



If we make optimization the default, we can achieve critical social and economic goals while also reducing emissions. The building sector would be more inclined to adopt technologies that improve building energy efficiency and labour productivity on construction projects. Indeed, [CMHC estimates](#) that lost productivity in home building added \$6 to \$8 billion in construction costs between 2019 and 2024, accounting for a fifth of the increase in prices.

The use of AI and advanced manufacturing can provide a major boost to productivity in the home-building sector. Housing startup [Promise Robotics](#), for instance, has developed a foundational AI platform to power industrial robots used in building component manufacturing. This platform enables builders to turn architectural plans into manufacturable components that can be produced in hours. In 2020, co-founders [Ramtin Attar](#) and [Reza Nassari](#) combined their respective experiences in software and home-building to develop the company’s “factory-as-a-service” offering. Many firms have invested heavily in manufacturing automation, Attar says. His company’s breakthrough service provides an autonomous robotics system that allows for infinite variability as well as an operating system that can handle inventory, logistics, labour and material cost estimates. “We’re really focused on re-tooling what we consider to be the next generation of automation,” he says.

The use of automation and factory-built components can also help address the industry’s skilled labour shortages, retool builders and upskill a new generation of workers while also increasing productivity. “An infill builder that does four-plex rentals in the Edmonton market told us that we saved them

~5%

Percentage of new homes built with factory-made components in Canada.

The parts for Tinybox Systems’ homes are designed to be light enough that two people can assemble them on their own.

\$1,000 a day over six weeks,” says Attar. “It just gave him a lot of certainty in terms of how he could deliver the project without necessarily managing a very large workforce.”

Oliver David Krieg, president of [Intelligent City](#), a B.C.-based startup that designs and prefabricates building components made of mass timber for multi-family, high-rise housing, agrees: “We don’t have enough people in construction if we want to build twice as much as we’re building right now,” he says. “We have to make everyone in construction twice as efficient. We do that by needing fewer people per construction site. We’re not putting anyone out of business — we just make each building a little bit more efficient so that you can spread the people over more buildings.”

In Scandinavia, up to 80 percent of new single-dwelling homes are built with factory-made components. In the U.S. and Canada, the proportion is far smaller — less than 10 percent — but Krieg believes the opportunity to build and scale the pre-fabrication industry is significant. “The challenge in North America is that the energy standards are very low, and, overall, the industry needs to modernize to allow for more engineered timber,” he says. “But we could build even faster and leapfrog Europe, because the prefab companies there are relatively small — they make a few hundred homes a year — and automation is still in its infancy. What we need in Canada is a mass production and mass customization market that can deliver thousands of homes.”

## Retrofits

According to the [UN](#), half the buildings that will still be in use in 2050 have already been constructed. In Canada, there are currently about 14.9 million private dwellings, and the average home was built 39 years ago (in Hamilton, the average abode is pushing 50.) These aging structures represent a huge potential retrofit market that generates local jobs, reduces utility costs for homeowners and creates demand for ventures and suppliers making energy efficiency products. The potential reduction in GHG emissions would be substantial.

CaGBC estimates that retrofit projects could reduce up to 21.2-million tonnes of building-sector emissions by 2030. Yet such investments require upfront outlays — about \$10 per square foot to achieve a 40 percent reduction by the end of this decade, according to a recent [CaGBC assessment of deep retrofits](#), based on modelling from the first year of Purpose Building’s retrofit accelerator. The project team worked with the managers of 1,300



Imported building materials, such as steel and glass, account for 35 percent of the construction sector’s carbon emissions.

## Carbon load

Canada’s residential sector produces the largest share — 42 percent — of total construction-related carbon. More than a third of those emissions are imported, via building materials like steel and glass. Globally, the emissions associated with those materials are growing faster than other carbon sources, a dynamic that pressures governments to find new ways of abating building-related emissions even as they seek to keep up with steadily rising demand for new housing.



3

CLIMATE CHAMPION

## Cooling the air more sustainably

### Evercloak

Year founded: 2018



**What it does:** [Evercloak](#) has developed a proprietary graphene oxide membrane-based dehumidification system called EverDROP that can be used in [HVAC and air conditioning systems](#) to significantly reduce humidity and therefore the energy required for cooling systems, which account for half of the electricity costs. Traditional air conditioners tend to over-cool the air, requiring property managers to run their heating systems to compensate, thus further driving up energy use and emissions. Evercloak's technology also uses a vacuum-assisted membrane process to selectively remove and expel water vapour, avoiding energy-intensive condensation cycles.

Industrial buildings, which require very precise humidity control, have been the first adopters, says CEO and co-founder Evelyn Allen. "If you're trying to remove humidity in a cold environment, like cold food storage, you're generating heat, and then you have to cool that space back down. The unique piece of our solution is that we can drop the humidity without changing the air temperature."

**The impact:** Air conditioning and refrigeration combined account for 10 percent of global GHG emissions. EverDROP can [cut energy use](#) by up to 50 percent while also reducing facility operating expenses. The company is working to make it easy to integrate, and is positioning EverDROP as a component of an air handling unit that can replace more traditional elements. The manufacturers "can use our solution rather than cooling coils," says Allen. "This is the fastest way to market."

Evercloak's proprietary dehumidification system can cut energy use by up to 50 percent.

buildings to first identify 350,000 tonnes of potential GHG reductions and then develop transition strategies to prioritize investments within portfolios, evaluate new technologies and assess the implications for both operating and capital budgets.

Bringing smaller older buildings up to current code requirements also prevents unnecessary demolitions and the associated impact on the climate via emissions caused by solid waste disposal. As well, new construction tends to increase the embodied carbon associated with the use of new materials like concrete, steel and glass. “The most sustainable building is the one that’s already built,” says Sheida Shahi, CEO and co-founder of [Adaptis](#), a company that helps developers and building managers optimize carbon across the life cycle of the structure. The goal, she says, is to “make the building make financial sense so it does not get demolished.”

Many of the solutions in the retrofit industry, such as sensors, AI, digitization and LIDAR, don’t come from the conventional construction sector, observes Efficiency Canada’s Betsy Agar. “It’s these higher tech solutions sitting outside of the traditional construction arenas that present a really interesting opportunity.”

Some of the most attractive retrofit ventures involve cladding, such as new building envelope materials or high-tech windows, says [Joanna Creed](#), director of operations and general counsel at [Venturon](#), a property tech investment group and consulting firm. “That’s where you’re going to get the most bang for your decarbonization buck.”

Far-sighted asset managers should also be looking to invest in efficient building products that make their portfolios more resilient in the face of the climate crisis and the increasing frequency of extreme weather events. In fact, these kinds of capital investments, while they may have a high up-front cost, will reduce operating outlays in the long run due to reduced energy consumption. Challenges arise, however, when the entity that pays for the retrofit is not the party that will reap the benefits.

Based on the CaGBC’s experience, Brent Gilmour adds that asset managers have increasingly altered the way they are making major decisions about major capital investments and renovations because of their awareness of how climate change affects buildings. “If you’re looking over 10 years, you’re giving a lot more thought to what the implications will be for what that building needs to do in terms of future energy cost but also what it’s going to have to withstand,” he says.

# 21.2

## MILLION TONNES

The reduction in carbon emissions by 2030 in Canada that could be achieved through retrofits of large buildings.



“Most of Canada’s housing stock is already

built. The opportunity is in what we do with it. Smart retrofit technology slashes operating and maintenance costs, protects against climate risk, and compounds in value over time. That delta shows up at in the long-term hold and resale — and investors who back those solutions will really come out on top.”

– *Deena Pantalone*  
*Founder, Venturon*



## CASE STUDY

# Major upgrade

*Circle Community Land Trust's recent project illustrates how a retrofit program can be deployed across a large portfolio of single-family dwellings.*

Established in 2022, [Circle Community Land Trust](#) took on the management and upkeep of a portfolio of 563 houses that formerly belonged to the Toronto Community Housing Corporation (TCHC). Information about the state of the buildings and their energy performance was either dated or incomplete, says Alia Abaya, CEO of Circle. That gave them the chance to think big. “We felt that if we are going to be a land trust and own these homes in perpetuity, we should really think long term about our investment,” she says. “We have this once-in-a-generation opportunity to conduct a deep energy retrofit and transition the houses as much as possible.”

With \$72.2 million in repayable and forgivable loans for capital improvements from CMHC, Circle has begun working through its portfolio, upgrading such elements as insulation, windows and roofs, as well as replacing gas furnaces with heat pumps and incorporating other improvements that strengthen

these buildings' climate change resilience. The upgrades are focused in three key areas: long-term stewardship of the houses, tenant comfort and future-ready design, with equal consideration given to material durability and repairability, health implications and life-cycle costs.

The land trust is looking at retrofits that are designed to last for decades, says Abaya, as opposed to the shorter replacement cycle that's more typical for renovations. With dozens of retrofits and hundreds of routine maintenance repairs complete, Circle is also looking to develop so-called “100-year” homes, using high-performance construction strategies and materials, including passive house frameworks, all-electric heat/cooling, high-quality healthy building materials, material circularity and life cycle assessments, as well as additions to create gentle density and new housing. Because Circle will own these dwellings in perpetuity, the savings/ROI associated with such improvements will flow through to the tenants. “We are committed to providing affordable housing, so rents don't change as a result of retrofits,” says Abaya. “Any surplus is put toward the capital reserve fund or new housing fund.”

Circle Community Land Trust is updating the 563 homes in its portfolio.



## CHALLENGES

# Growing pains

There are many hurdles that are hindering the adoption of sustainable solutions at scale.

When it comes to scaling new solutions that can reduce emissions, ventures, investors and property managers all face a range of obstacles. Participants in the MaRS Better Buildings Coalition surfaced these key challenges.

### **Lack of awareness and politicized perceptions**

Participants in the coalition reported that many Canadians, including decision-makers, are misinformed about, or indifferent to, the extent of carbon emissions associated with our built form, and often see debates about net-zero targets as polarizing. With decision-makers — either governmental or private sector participants (e.g., developers, lenders) — there's an aversion to emerging technologies and skepticism about the risks associated with partnering with SMEs that have developed technologies designed to reduce building emissions and/or improve energy efficiency.

Productivity rates in Canada's construction sector have been declining for decades.

- Lack of access to reliable information, resources and incentives
- Perception that sustainability measures and products are competing with other priorities, such as affordability, profitability, safety and health
- Lack of clarity around best practices
- Risk aversion among construction sector incumbents and procurement officials

## Market constraints

Emerging solutions also face barriers associated with the high cost of capital, supply chain reliability for novel materials and the lack of understanding among asset managers about the long-term payback of building efficiency investments versus upfront costs. Some technologies, such as ground source heat pumps, have higher prices, while the ROI of such investments isn't baked into the business case when owners are looking to renovate or replace outdated equipment.

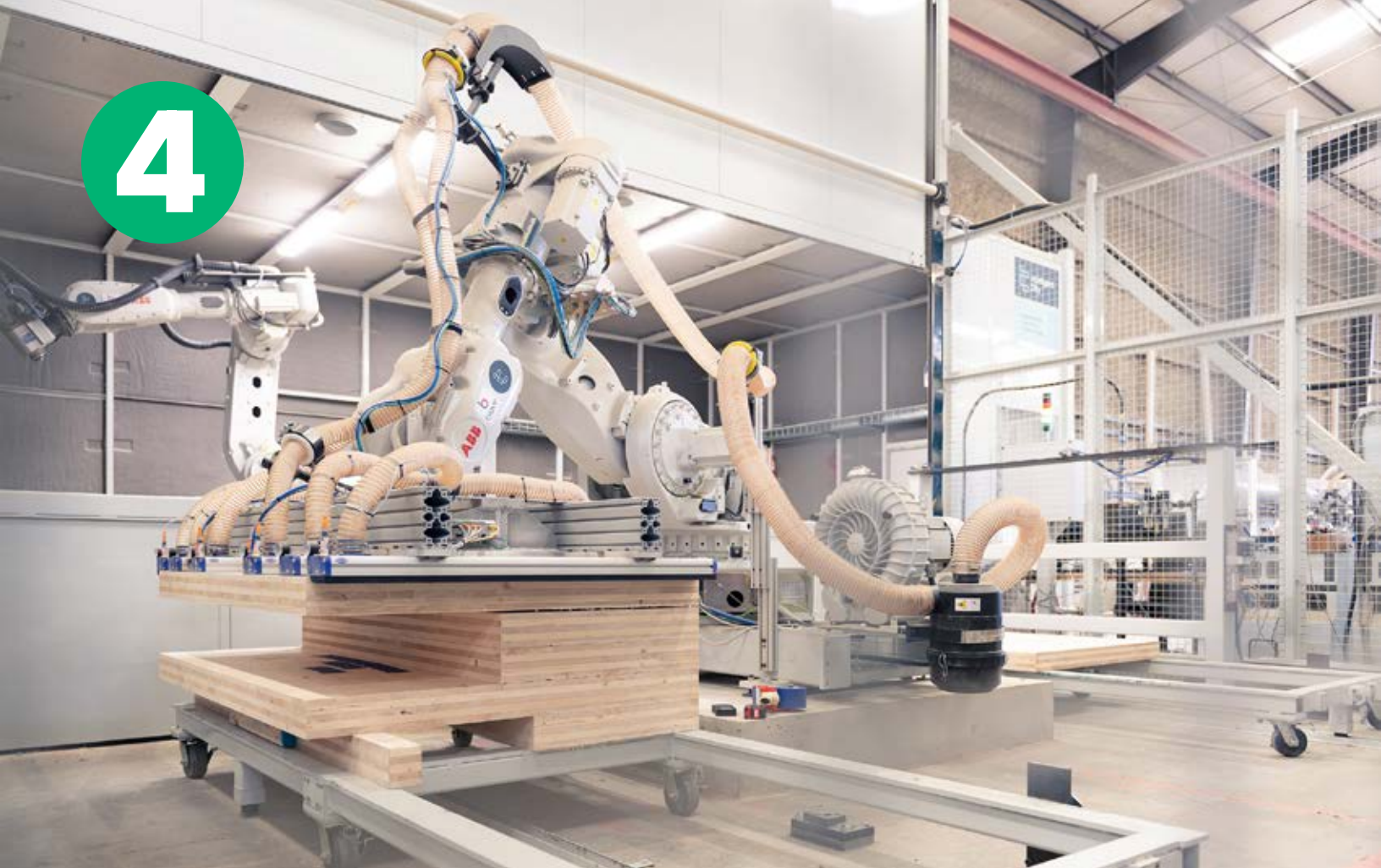
- High cost of capital and financing
- Supply constraints and manufacturing scale-up challenges
- ROI uncertainty and the real or perceived green premium
- Pro formas that don't account for the cost of carbon and are more oriented toward minimizing short-term expenditures instead of realizing long-term savings

## Regulatory hurdles and political inertia

New technologies must clear a range of regulatory and political hurdles, such as building code compliance, before they are accepted into the market. The lack of a streamlined adoption framework across all three orders of government can further hinder private market adoption of new or emerging energy efficient technologies and processes. Plus, when governments shift priorities and alter incentive programs, it can create uncertainty for SMEs (and their investors) looking to break into established construction markets with entrenched suppliers.

- Political cycles and shifting priorities create uncertainty for investors, buyers and startups
- Outdated building/energy codes and planning policies inhibit adoption of new technologies
- Lowest-cost bidder procurement rules tend to favour status quo technologies and materials

# 4



## CLIMATE CHAMPION

# Scaling new heights

## Intelligent City

Year founded: 2008



**What it does:** Using integrated design and production automation systems, Intelligent City fabricates and assembles mass timber components for multi-family housing. The idea is to vertically integrate several aspects of the building process, thus saving time, cutting expenses and reducing waste using sustainable materials in a highly controlled manufacturing environment.

The firm regularly works with developers, architects and engineers to refine their projects and their construction processes. “We are a supplier,” explains president OD Krieg. “We integrate ourselves with the project team, and ultimately, deliver and install these components on site.”

The company currently has a 15,000 square-foot demonstration plant in Delta, B.C., and is planning to move into a 100,000 square-foot factory that is designed to handle a growing volume of orders in 2027.

**The impact:** Mass timber not only stores carbon, it also requires far less energy to produce. Krieg also points to the benefits of factory-built housing: it’s faster, higher quality and more cost effective. He estimates that construction can be 25 percent faster and 10 percent less expensive than traditional buildings.

“In Canada, we need mass production and mass customization in order to deliver thousands of homes,” he says. “By using modern manufacturing technologies we can automate a lot of those processes.”

The manufacturing process for mass timber is significantly less energy-intensive, relying predominantly on electricity.



## OPPORTUNITIES

# What can help

To drive substantive — and sustainable — change in Canada’s housing and building sector, a mix of incentives and regulations is needed.

Policy conversations around housing often position innovation as a silver bullet. But while there are promising solutions, massive challenges stand in the way of large-scale adoption. Funnelling money into innovations isn’t enough. Throughout this mission, coalition members stressed the need for strong and consistent policy in the form of government incentives and regulatory changes designed to ensure that these fundamentally disruptive solutions are implemented by an industry that can be slow to change. As Ria Perrault says, “there’s a lot of opportunity for government to step in and catalyze the investment we need.”

QEA Tech’s drone pilots and on-site sensors capture visual and thermal data to conduct energy audits.

## CLIMATE CHAMPION

## Cutting energy costs

### NxLite

Year founded: 2015



**What it does:** Single-pane windows account for up to 40 percent of glazing in North American apartment buildings, and create the largest source of energy

loss in such structures. But window replacement programs are capital intensive and intrusive, especially when a unit is occupied. NxLite has developed a high-transparency, lightweight and energy-efficient coating for thermal management that's available on glass, acrylic and polymeric sheets that can be used in a variety of glazing applications. Window inserts easily fit into existing window frames to reduce energy loss. And because these inserts can be installed from the inside, they don't involve hefty labour-intensive construction expenditures, such as scaffolding, and can be rapidly completed whenever an apartment changes tenants.

The company, which has nine patents covering various aspects of its production process, sells its polymeric glass and coatings to window and window insert manufacturers, as well as other glazing fabricators. CEO David Mather says the product is disruptive in the sense that it offers a low-cost alternative to window replacement, but does so by supplying a new component to established frame manufacturers. "We have the chance to redefine energy efficiency and operating costs in every transparent application," says Mather.

**The impact:** According to product management director Lisa Green, post-installation energy savings from these secondary glazes range from 20 to 40 percent depending on building latitude (the reductions are higher in northern climates), while GHG reductions vary from 10 to 30 percent. Its nanocoating can also be used on passenger and industrial vehicles, as well as industrial refrigerator windows to improve insulation.

NxLite window inserts are installed from the inside, reducing construction costs.

## Building beyond code

While Canadian building codes at the national and provincial levels have added more stringent energy efficiency targets in recent years, change still comes slowly. It wasn't until 2022 that national building codes permitted the construction of mass timber projects up to 12 storeys (Ontario increased that limit to 18 storeys in 2024). Mass timber projects bring together sustainable materials, opportunities for domestic supply chains, factory-built components and faster construction timelines — all of which align with the three broad objectives of climate, economic growth and affordability.

But, as CaGBC's Brent Gilmour points out, building codes, even ambitious ones, only establish minimum standards. "If we only build to code, we risk hard-wiring tomorrow's retrofit bill in today's housing crisis." To achieve real gains, developers need to go beyond baseline parameters by investing in emerging efficient building technologies that will reduce operational costs of ownership while also reducing carbon emissions over the long run.

## Simplifying regulation

Municipal planning regulations can lead to unintended consequences. In some big cities, zoning and land-use policies have led to the development of very tall towers, which have been shown to have higher levels of embodied carbon than mid-rise projects due to their reliance on steel and concrete.

Outdated or overly complicated zoning rules, in fact, add cost and delays to all sorts of buildings, observes Intelligent City's OD Krieg. "All your setback requirements, your balcony requirements and your parking requirements are really difficult to make — whether it's mass timber or concrete." Zoning and site-plan regulations should consider the sustainability of proposed dwellings by encouraging builders to propose technically straightforward projects and discouraging features known to increase emissions, such as floor-to-ceiling glazing and balconies constructed without thermal breaks. (Balconies are often constructed by cantilevering steel beams through exterior walls, allowing heat to escape.) Ultimately, a more straightforward regulatory system allows projects to be completed more quickly, which produces cost savings that can either be passed on to occupants or re-invested in improved energy efficient features.



“The gravity of these compounded crises is

sobering, but it should also provide more than enough incentive for stakeholders across the board — from government policy-makers to forward-thinking building managers — to collaborate on efforts to spur wider adoption of the solutions that are already available.”

– Tyler Hamilton, Senior Director Climate, MaRS



## CLIMATE CHAMPION

## Taking a modular approach

### Tinybox Systems

Year founded: 2022



**What it does:** The company's premise is that conventional construction techniques are not just out of date but contribute to the unaffordability of housing.

“The way we’ve been building homes for the past 100 years is very laborious and slow,” says co-founder Charlie Frise. “There’s a way to do things differently.”

Frise and co-founders Oliver Zhang and Pooya Saberi reckoned that the solution involved an approach known to all university students — flat-packed IKEA furniture that is easy to transport and easy to assemble. “We looked at what parts we can produce at scale with great unit economics in factories that are already running, and then ship

them flat pack to the job site,” he says. Flat-packed wall units fit easily into shipping containers and are designed to be readily assembled without heavy equipment.

**The impact:** Tinybox structures are well suited to locations that are difficult to access with heavy equipment. They can be built on any type of foundation, meaning the construction process itself is energy efficient and less expensive. “We really shine by building where others can’t, such as in the Canadian Arctic,” says Frise. After constructing several units across North America, the company built its first Arctic home this fall in Kuujjuaq, a community in the Nunavik region of Quebec where there is an acute lack of housing. Two local carpenters assembled the 160-square-foot, net-zero bunkie in 10 days. The company is planning to triple production this year and by 2030 expects to build hundreds of homes in partnership with various developers.

Two local carpenters assembled this net-zero bunkie in Kuujjuaq, Que., in just 10 days.

## Boosting productivity in the construction sector

Overall, there is a lack of incentive to innovate within Canada's construction industry. The sector is currently dominated by long-established firms, which tend to be less productive. In fact, the industry's notoriously low productivity rates — the worst among any of Canada's goods sectors — have been on a 30-year-long decline, according to an analysis by TD Economics, causing delays, price escalation and waste. And because of the sector's increased importance within Canada's economy, its performance has had severe knock-on effects, accounting for the “vast majority of the decline in overall Canadian productivity relative to the pre-pandemic period,” according to TD's analysis. Streamlined regulation could help reverse this trend: When there is less red tape, it becomes easier for the building industry to explore new solutions, which can lead to greater competition and a faster adoption of innovations.

In such regions as Northern Europe, the building sector's productivity has increased due to the advent of factory-built housing, modular design and supply chains that serve those facilities. “We need to focus on building the industrial backbone for digitization and automation and strengthen the supply chain to bring this advanced automation to the building industry,” says Promise Robotics's Attar.

To boost productivity in construction, Canada needs to incentivize the uptake of technologies that facilitate these gains, create demand signals that enable the industry to invest in these solutions and then deploy the necessary capital.

## Making retrofits predictable and attractive

Canada's housing stock is aging and much of it was built prior to the advent of stringent energy codes, according to statistics compiled by Natural Resources Canada. This suggests that a vast proportion of Canada's housing supply is likely in need of some kind of energy efficiency upgrade, which translates into a massive market opportunity. “This is the big challenge,” says Efficiency Canada's Betsy Agar. “We have literally millions of decision-makers, millions of buildings and millions of solutions. This is where big signal policies can help.”

In the Netherlands, an organization known as Energiesprong delivers retrofits to large numbers of homeowners using mass-produced, factory-made components. By contrast, scaling up retrofit activity in Canada remains difficult because there's almost

## Building better

Here are some of the key considerations from MaRS's Better Building coalition that could help bolster innovation in Canada's building sector.

- Harmonize national and provincial building codes to foster Canada-wide sustainable building materials supply chains.
- Scale up modular housing construction by standardizing regulations across provincial borders.
- Establish demand-side incentives for factory-built housing as well as training programs for skilled trades working in such facilities in order to link innovation to high-skilled jobs.
- Encourage more predictability and continuity in federal and provincial home-energy retrofit incentive programs.
- Remove regulatory obstacles to the use of low-carbon building materials, including low-carbon concrete.
- Invest in the Canadian mass timber supply chain, including processing.
- Fund deep energy retrofits by non-profit housing providers, including land trusts.
- Promote resilient design in affordable housing projects to mitigate financial risks (and thus higher tenant occupancy costs) created by extreme weather events.
- Accelerate investment in electrification and grid modernization, which will drive developer decision-making around building infrastructure, such as HVAC systems.



no way of attaining economies of scale across a large portfolio of dwellings owned by individuals who may or may not have the means or the interest to invest in these changes.

The mass retrofit approach, however, is being used by the Circle Community Land Trust, which owns and operates hundreds of dwellings formerly managed by Toronto Community Housing (see page 15). After investing in ambitious energy improvements on a handful of those dwellings, the trust is in the process of rolling out its upgrade program to the rest of its portfolio, says CEO Alia Abaya. It has the advantage of being able to draw on a pool of capital provided by CMHC when the assets were transferred. Plus, because it operates as a non-profit, its projects are not designed to yield a profit.

In Canada, however, individual homeowners make decisions about retrofits, and their choices will be determined by a wide range of variables, including the age of the home, the amount of capital the owner is willing to invest, and their receptivity to arguments around the importance of retrofits. The most effective ways to reach homeowners, therefore, are attractive, predictable and easy-to-access incentives, supplemented by government public awareness campaigns to promote them.

## **Demonstrating the ROI on energy retrofits to apartment buildings**

Aging and energy-inefficient multi-unit residential buildings (MURBs) often require extensive remediation to HVAC systems, boilers, windows and external cladding. Apart from the logistical challenge of carrying out such retrofits in buildings full of tenants, the capital outlays can be prohibitive, and many property managers still question whether there's a meaningful ROI, even if these fixes do drive down energy costs.

Policy-makers need to implement incentives that persuade building owners to make those investments instead of simply adhering to the building code, which is a minimum safety standard. Federal leadership is critical, says CaGBC's Brent Gilmour. "To break through a market or change it requires a way of moving capital there," he says. "Investors want confidence, and they want that return. Getting there requires moving from the pilot to the proof." And industry plays a critical role, too. When building managers demonstrate what is possible technically and financially, it can help set a new standard.

## CONCLUSION

# Next steps

Key considerations to help create more affordable and sustainable buildings.

An effective building agenda touches on three critical public policy outcomes: more affordable housing, reduced emissions and increased domestic economic activity, which includes opportunities for ventures developing new technologies linked to efficiency and resilience.

The challenge is to develop an approach that satisfies all key stakeholders. Each level of government can spur the market with a mix of regulations and incentives, such as building code upgrades, reliable subsidies for retrofits, ambitious decarbonization mandates for gas and electric utilities, and the use of green building standards in the municipal development approvals process. In addition, building managers, REITS, non-profits and government agencies should leverage analytical tools at their disposal to better understand the full scope of the return on such investments in their assets. This will help increase the pace of change.

By building a solid foundation that allows for greater adoption of innovative building solutions, we can tackle several critical issues facing this country. Through tailored incentives from government, forward-thinking projects from the building industry and smart innovations from startups, Canada can start to address our housing shortage, increase productivity, reduce carbon emissions and build a stronger future.

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