

Investing in Sustainable Buildings



Reducing building emissions will help the world get to net zero.

In Milwaukee, a residential building is the world's tallest mass timber tower. In Rio de Janeiro, a museum uses the waters of an ocean bay to cool its interior. And in Lithuania, a £1 billion building-retrofit project serves as model for all of Europe.

The future of sustainable buildings is here. That's an encouraging sign for a sector that's responsible for a significant share of global emissions—and holds enormous potential to help the world get to net zero by 2050.

The buildings sector consumes an estimated 30% of global energy, according to the United Nations Environment Programme. Buildings accounted for around 37% of global emissions in 2021, after combining emissions from building operations and from producing building materials, it says.

If the world hopes to achieve the Paris Agreement's goals and limit global warming, the sector must almost completely decarbonize by 2050. The International Energy Agency say much of the work needs to take place this decade, and that the buildings sector isn't on track.

The expertise and technology required to substantially decarbonize buildings already exists. What's needed is the right mix of investment, incentives, and new behaviours to effect change at scale. In this report, we look at some targeted investments to move the needle.

At Ontario Teachers' Pension Plan, we have made several investments that are helping to make the buildings sector more sustainable. The ones profiled here underscore how we are aiming to use our capital to deliver measurable, real-world environmental and social impact as we create value for our members.




We spend close to

90%

of our time indoors

Source: U.S. Environmental Protection Agency

An aerial photograph of Singapore at sunset. The sun is low on the horizon, casting a golden glow over the city. The Marina Bay Sands hotel is prominent on the left, with its three towers and skybridge. The Esplanade - Theatres on the Bay is visible in the foreground. The city skyline is filled with illuminated skyscrapers, and the water of the bay reflects the lights and the setting sun. The overall scene is a vibrant mix of modern architecture and natural beauty.

This is a critical decade for investing in building sustainability.

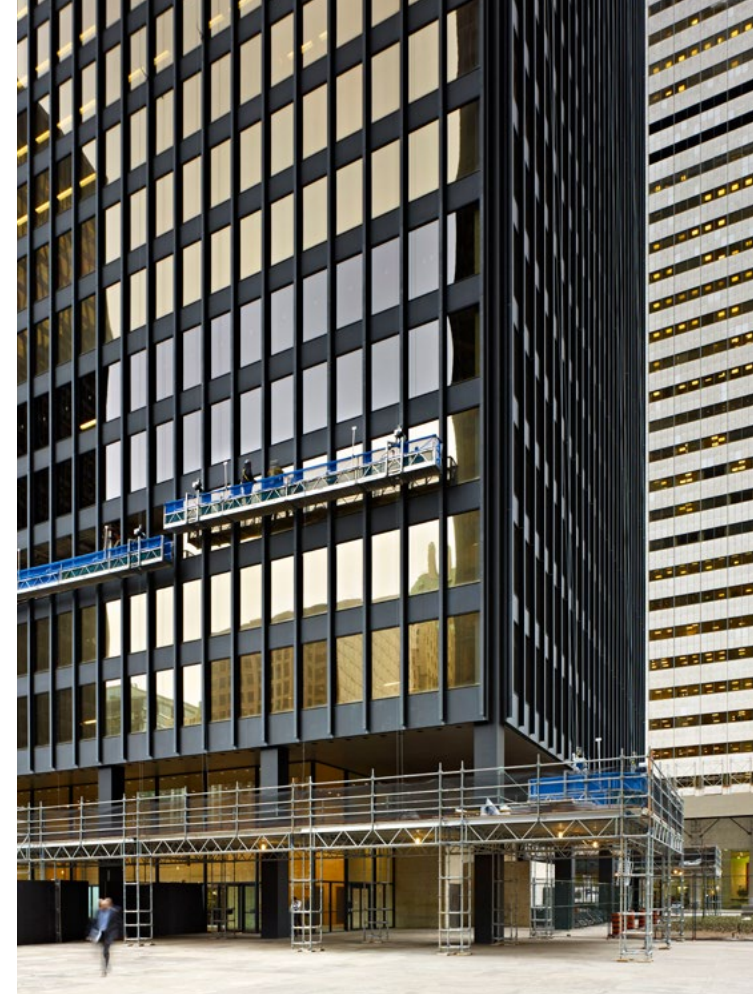
If the world is to transition to net zero by 2050, emissions from building operations must fall by more than half by 2030, the International Energy Agency says. Increases in population and urbanization will complicate matters. Floor area equivalent to the surface of Paris will be added to the global building stock every week through 2050, the agency estimates.

Ensuring that an ever-expanding built environment is more sustainable is a huge challenge. Three factors support the case for investing in building sustainability.

1. There are policy and regulatory tailwinds

Many countries are moving to green their building stock through a mix of investment, incentives, and regulation. The European Green Deal of 2020 outlines a plan to renovate 35 million buildings by 2030 to help slash the European Union's emissions. The U.S. Inflation Reduction Act of 2022 earmarks billions of dollars to install low-carbon materials in federal buildings and includes significant tax incentives for commercial landlords to cut their energy usage. The Canada Green Buildings Strategy aims to create a net-zero-emissions buildings sector by 2050, with an interim goal of 37% emissions reduction from 2005 levels by 2030.

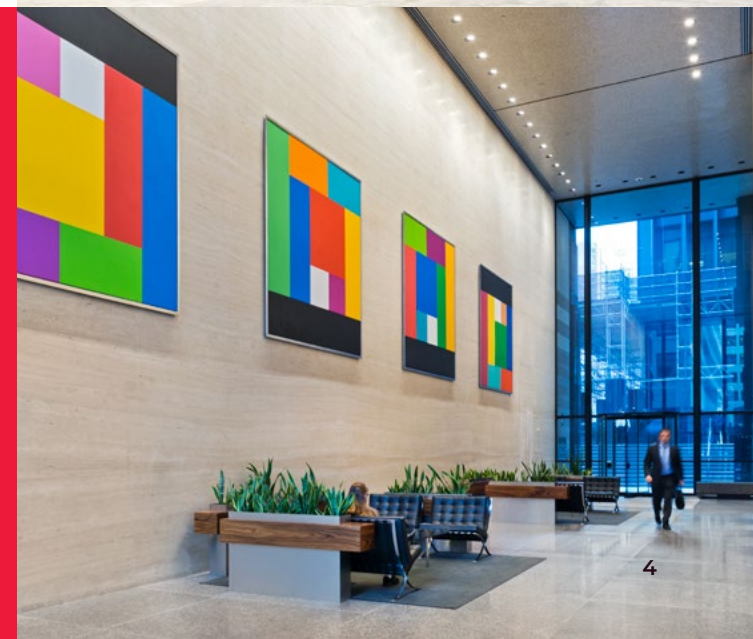
Commitments like these are creating investment opportunities across the buildings sector.



40% of countries

**had mandatory or voluntary
building energy codes in 2022**

*Source: 2022 Global Status Report for Buildings and Construction,
United Nations Environment Programme*



2. Making buildings more sustainable is good business

Investment in energy efficiency within the global buildings sector hit US\$237 billion in 2021, the United Nations Environment Programme says. In addition to a growing sense of urgency around climate change, other factors have spurred investment. Access to financing has improved as lenders recognize the higher value of sustainable buildings. New sources of capital—including green bonds and impact funds—have proliferated.

Because they are more energy-efficient, sustainable buildings typically deliver lower operating and maintenance costs. These benefits translate into higher rental revenue and occupancy rates. The market calls this the “green premium.”

Financial Benefits of Building Green, Compared with Traditional Buildings

	New Green Buildings	Green Renovation/Retrofit
Average Reduction in Operating Costs in Next 12 Months	10.5%	11.5%
Average Reduction in Operating Costs in Next 5 Years	16.9%	17%
Average Increase in Asset Value (According to Owners/Investors)	9.2%	9.1%

Dodge Data & Analytics, 2021 | Source: World Green Building Trends 2021



A 2020 study found sustainable office buildings in central London commanded a rental premium of

6%-11%

Source: Jones Lang Lasalle

3. There are risks associated with not investing in greener buildings

The risks of not investing in building sustainability are increasing. In a 2022 global survey of 4,000 real estate professionals by the Royal Institution of Chartered Surveyors, around half said buildings not classed as sustainable are subject to lower rents and prices than their greener counterparts. This “brown discount” is the flip side of the “green premium” that more sustainable buildings command.

Another risk is that less-sustainable buildings become stranded assets—assets that suffer extensive devaluation prior to the end of their useful lives. That loss of value could result from the inability to meet stricter environmental regulations or cater to tenants seeking more sustainable spaces.

Owners of less sustainable buildings could face:



Higher operating costs



Regulatory penalties



Dwindling demand



Reputational issues



Difficulty accessing financing



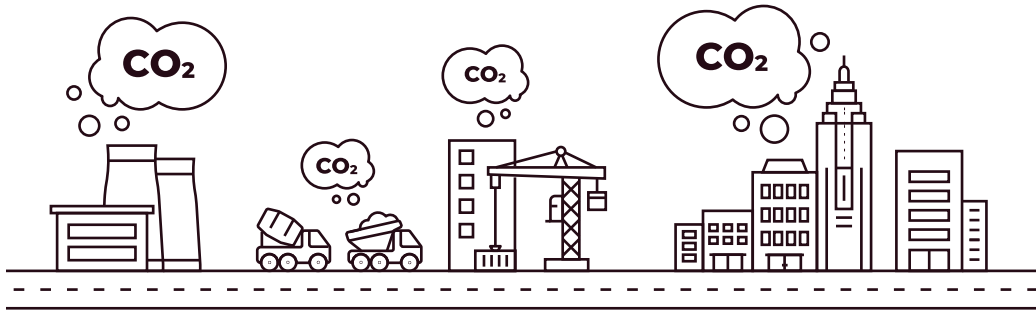


Targeted strategies can help make the buildings sector more sustainable.

The decarbonization of all sectors of the global economy will require sweeping changes to how we produce and consume energy: reducing the use of fossil fuels, increasing the supply of renewable energy, and electrifying more parts of the economy.

Targeted investments can also reduce the carbon associated with buildings. That carbon falls into two categories: embodied carbon, or the emissions associated with the construction, renovation and demolition of a building (including the materials that went into those activities), and operational carbon, or the emissions stemming from occupancy.

Here, we look at four areas that help make office and multifamily residential buildings more sustainable, with snapshots of some of our investments.



Embodied Carbon

Manufacture, transport and installation of construction materials

Operational Carbon

Building energy consumption

Stacy Smedley | Source: Heritage BC Learning Centre

1. Investing in deep retrofits

Most of the buildings that will be standing in 2050 are already built. For a world aiming for net zero by 2050, that's a challenge. Older buildings are, on average, inefficient compared with newer ones.

Retrofitting the world's existing building stock will be critical to reducing the sector's emissions. The International Energy Agency says annual retrofit rates need to ramp up significantly this decade—to 2.5% of the building stock in advanced economies, from 1% today.

Retrofitting ranges from upgrading a building's envelope—the walls, roof, and windows—and replacing mechanical equipment and lighting, to installing rooftop solar panels and heat pumps. Retrofits can help reduce a building's operational carbon. If they incorporate local or recycled materials, or those that sequester carbon, they can lower embodied carbon too.

Many governments are encouraging deep retrofits to help meet their climate goals, stimulate their economies, and create jobs. Initiatives include the Canada Infrastructure Bank's Building Retrofits Initiative, which works with private and public sector real estate owners, and the European Union's Renovation Wave strategy, which aims to trigger renovation of the worst-performing buildings by introducing minimum energy performance standards.



Deep retrofits of commercial buildings can reduce their energy use by up to

40%

Source: American Council for an Energy Efficient Economy

Case Study

Cadillac Fairview: Revitalizing the Toronto-Dominion Centre

One of Canada's most iconic examples of modernist architecture, the Toronto-Dominion Centre is in the downtown core of Canada's largest city. Designed by architect Ludwig Mies van der Rohe, the six-tower complex comprises 4.3 million square feet of office and retail space. Cadillac Fairview, our wholly owned real estate operating subsidiary, was a partner in building the project in the 1960s and still owns it. To stay competitive in Toronto's robust commercial office space market, it embarked on a comprehensive, multiyear project to revitalize the complex.

The TD Centre transitioned to district cooling for its air conditioning needs. By tapping into Enwave Energy's Deep Lake Water Cooling system (see page 15), the complex was able to cut its cooling-related energy consumption by 90% compared with the previous air conditioning system. The transition had the added benefit of enabling the complex to regain 20,000 square feet of leasable space.

Following this, Cadillac Fairview undertook a \$200 million initiative to refurbish the TD Centre's glass façade, replacing thousands of single-pane glass windows with double-pane glass to improve the buildings' thermal performance. It also modernized the complex's lighting system, replacing 55,000 fluorescent lights with efficient LED lighting.

The TD Centre revitalization is just one example of Cadillac Fairview's commitment to continual improvement of its \$42 billion property portfolio. The company has a proven track record of reducing energy use: it has cut its overall emissions by 56% since 2008 and aims to reduce them by another 35% by the end of this decade.

Cadillac Fairview has validated its sustainability efforts through several third-party certifications and benchmarks. The Global Real Estate Sustainability Benchmark survey ranked Cadillac Fairview first in its peer group in 2022—for the second year in a row.



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At Cadillac Fairview, sustainability is embedded in all parts of our business. Most importantly, it sits at the core of our Purpose, Transforming Communities for a Vibrant Tomorrow. With strong collaboration and knowledge sharing between Ontario Teachers' and Cadillac Fairview's sustainability teams, we continue to build upon our industry-leading results and remain committed to taking action against climate change by developing innovative solutions across our portfolio to achieve meaningful results. ”

John Sullivan, CEO, Cadillac Fairview

2. Using more sustainable building materials

When we think of the buildings sector, many of us visualize the skyscrapers of New York or Hong Kong. The towers that symbolize modern cities were made possible by late nineteenth-century advances in building materials, notably innovations in the mass production of steel.

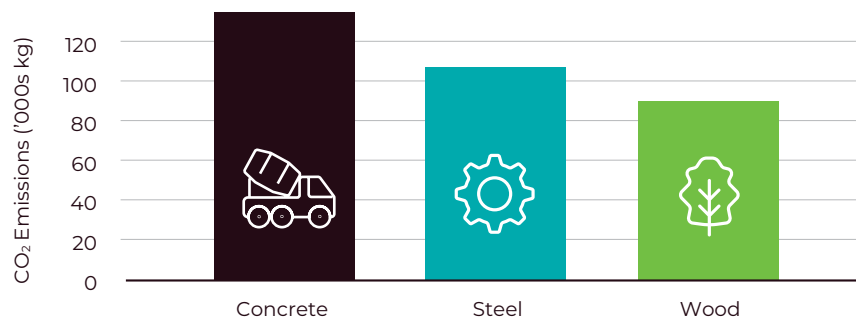
The buildings sector continues to rely heavily on materials like steel and concrete, which are produced using carbon-intensive processes. The emissions associated with making and transporting these materials make up a building's embodied carbon.

Multiple efforts are underway to reduce embodied carbon by making key building materials more sustainable. They include switching to electric arc furnaces to make steel, and rethinking the recipe for concrete, which has traditionally relied on carbon-intensive cement as a key binding ingredient.

Mass timber also holds promise. This engineered wood product is built to high strength ratings and can in some instances replace concrete and steel. Because it's prefabricated offsite, its financial benefits include faster construction times and lower labour costs.

Architects are testing the height limits of wooden structures. But mass timber's market share remains small, in large part due to regulatory constraints. That's changing as building codes evolve to take account of mass timber's competitive fire-resistance characteristics and growing popularity.

CO₂ Emissions from Equivalent Designs of a Large Office Building



Source: *Mass Timber's Carbon Impact*, Mantle Developments



Forests remove an average

2 Billion

tonnes of carbon from
the atmosphere each year

Source: *Massachusetts Institute of Technology*

Case Study

Tamarack Timberlands: Harvesting the benefits of large-scale managed forests

The construction sector can contribute to a better built environment in part by sourcing wood from sustainably managed forests. Because trees pull carbon out of the atmosphere and store it through photosynthesis, sustainably managed forests act as carbon sinks. That carbon remains sequestered in construction-related wood products long after the trees are harvested.

Through Tamarack Timberlands, Ontario Teachers' owns 870,000 acres of Loblolly pine forests across eight states in the southeastern U.S. Tamarack's portfolio is managed according to Sustainable Forestry Initiative® standards by our partner, Resource Management Service, an independent company that manages timber holdings on behalf of institutional investors.

The SFI® is a North American non-profit organization that works across the supply chain to promote healthy forests. By adhering to its standards, RMS ensures Tamarack's forests are harvested with long-term sustainability in mind. That includes quickly replanting harvested areas and promoting biodiversity and smart water use. It also means working to reduce chemical inputs and the risks posed by pests and wildfires.

According to our estimates, Tamarack forests stored about 75 million tonnes of CO₂ at the end of 2021.



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Ontario Teachers' natural resources portfolio includes certified sustainable forests focused on providing timber. But a responsible, sustainable and long-term approach to forestry has value beyond timber production. The Tamarack assets provide Ontario Teachers' with stable and robust cash yields as well as long-term capital appreciation, while also acting as a natural store of carbon to help mitigate the impacts of climate change. ”

Christopher Metrakos, Senior Managing Director,
Natural Resources at Ontario Teachers'

3. Investing in technology that supports building efficiency

Lowering emissions from routine building operations—heating or cooling spaces, keeping the lights on, and so on—is a challenge. Indeed, that operational carbon accounts for the bulk of emissions from the buildings sector.

Advanced technologies can play a key role, by better aligning energy demand and supply. These technologies include the sensors, smart meters and connected devices that capture granular data on energy and water usage, and the software and analytics that translate that data into actionable insights.

Technology also makes consumption-based pricing easier—a key driver of lower usage. A Carleton University study that compared the winter heating habits of residents in submetered and bulkmetered apartments in Ottawa is telling. It found that residents in submetered apartments (residents directly responsible for their heating bills) kept their thermostats about 2°C lower than those who weren't responsible for their own energy bills.



In 2021, CO₂ emissions from global building operations hit a record

10 Gigatonnes

Source: 2022 Global Status Report for Buildings and Construction



Case Study

Techem: Getting smart about lowering buildings' carbon footprint

Improving energy efficiency in buildings is an important pillar of the European Union's climate strategy. The effort has become even more critical given rising energy prices and concerns about the bloc's energy supply. In strengthening rules around metering and customer billing, the EU wants consumers to better understand how their energy usage contributes to the bloc's energy security and climate goals.

Germany-based Techem, a company in which we invested in 2018, was already a pioneer in providing consumption-based heating cost billing services to residential building owners. With increasing digitization, the company has developed new smart products that optimize energy and water use in multifamily buildings. They include more than 40 million installed devices equipped with radio technology, enabling remote reading of heat and water consumption and even water leak detection. They also include systems that enable more efficient distribution of heating in high-rise buildings.

By making residents of multifamily buildings more conscious of how and when they use heat and water, Techem helps them use less and keep their costs down. Those efforts in turn help building owners reduce overall emissions.

Techem's products, deployed in more than 12 million apartments across about 775,000 buildings, produced energy savings of about €1.8 billion in 2021 and avoided CO₂e emissions of around 7.7 million tonnes, according to Techem research.

Techem has a strong presence in Germany and is growing in another 18 countries, mostly in Europe. It's well positioned to benefit from policies mandating more transparent energy metering and billing across the EU. Techem is also undertaking new initiatives that support building sustainability, including the installation and management of shared EV charging stations at multifamily buildings.



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What unites Ontario Teachers' and Techem is the common belief that a sustainable foundation is crucial for a sustainable outcome—both in terms of finance, as well as climate-neutral buildings. For us at Techem, it is clear we need to press ahead with energy efficiency in buildings in order to meet the climate objectives. With our solutions and partners' support, we are already actively contributing to this, making buildings green, smart and healthy. ”

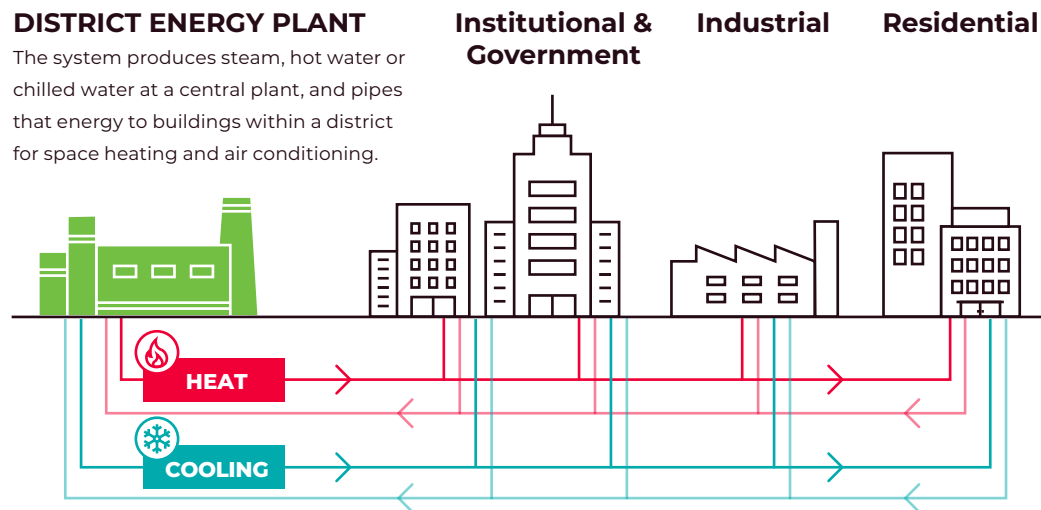
Matthias Hartmann, CEO, Techem

4. Tapping into the collective benefits of district energy

Neighbourhood-scale energy systems aren't new. The first commercial district heating system—which delivered steam heat via underground pipes—was built in New York State in the 1870s. Soon, hundreds of fast-growing cities in the U.S. and Canada had subterranean district heating systems serving office buildings, factories and hospitals.

Investment in district energy systems is growing once again because of the economic and environmental advantages they offer. These systems eliminate the need for buildings to maintain separate heating and cooling equipment, cutting installation, operating and maintenance costs. District energy systems can be integrated with municipal systems for water, waste, power and more, maximizing local resources. And while the steam-heating systems of old relied on the burning of fossil fuels, modern district energy systems are increasingly leveraging electricity-driven solutions.

District energy systems take many forms. What they have in common is matching a local energy source (electricity, heating or cooling) to a local use, reducing operational carbon. Examples include biomass district heating, which uses wood, agricultural waste or municipal solid waste to produce heat, and district cooling systems, which deliver a cleaner form of air conditioning by piping chilled water to buildings through a closed loop system.



Source: Enwave Energy

INVESTING IN SUSTAINABLE BUILDINGS



District energy can cut primary energy consumption for heating and cooling of urban buildings by up to

50%

Source: District Energy in Cities Initiative

Case Study

Enwave Energy: Energized by Toronto's waterfront location

Two centuries ago, the waters of Lake Ontario facilitated commerce and helped the fledgling city of Toronto blossom into an economic powerhouse. Today, those waters are helping Toronto as it pursues one of the most ambitious climate strategies in North America: net zero by 2040. Supporting this effort is a district cooling project operated by Enwave Energy, a company in which Ontario Teachers' acquired joint ownership in 2021.

By pumping cold water from the bottom Lake Ontario and piping it through a closed-loop system under Toronto's downtown core, Enwave's Deep Lake Water Cooling (DLWC) system delivers low-carbon, renewable cooling to almost 100 Toronto buildings. While Enwave operates the system, it benefits from an innovative partnership with the city's water utility. The two companies share water infrastructure that ultimately delivers clean drinking water to Torontonians while enabling hospitals, data centres and other large buildings to eliminate the use of carbon-intensive chiller facilities.

Enwave says its system reduces energy usage and emissions by over 80% compared with traditional air conditioning.

Enwave operates one of North America's largest low-carbon district energy systems. With more Toronto building owners and developers attracted to the economies of scale that its system offers, it has embarked on a major expansion that will see it boost the DLWC system's capacity by 40%. Ultimately, the DLWC system aims to displace up to 73 megawatts of energy at peak from Toronto's electric grid.

Enwave also develops smaller-scale geothermal energy systems for developers. And on Prince Edward Island, where space is limited, the company operates a district energy system that converts municipal solid waste and biomass into energy for heating and hot water, reducing the volume of every waste tonne produced by 90%.



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At Enwave, we recognize the role that district energy plays in the transition to a low-carbon economy. As the built environment accounts for 37% of global emissions, Enwave is focused on accelerating commercially scalable carbon mitigation strategies that address building needs. In line with Ontario Teachers' desire to achieve clear, measurable real-world environmental benefits and our shared goal of achieving net zero by 2050, we are embarking on ambitious and impactful decarbonization strategies that will provide significant carbon reductions in our district heating and cooling networks and enable the transition to net zero. ”

Carlyle Coutinho, CEO, Enwave Energy

A more sustainable built environment is within reach.

Investors will play a critical role in the decarbonization of the buildings sector. They can help meet growing demand for the technologies and approaches that reduce emissions in buildings. They can make investments that preserve value in the building sector for the long term. And they can be partners for the businesses and governments working to drive positive change in the sector.

At Ontario Teachers', we invest to deliver outstanding service and retirement security for our members. We believe that the best way to ensure better risk-adjusted returns over the long term is to create a lasting, positive impact on the world.

That's why we are making investments in building-sector decarbonization and supporting the energy transition in other ways. You can read more about our approach in our latest Annual Report.

More sustainable headquarters for Ontario Teachers'

To enable future growth, we are moving our headquarters to a newly constructed building at 160 Front Street West in Toronto's downtown core. When completed, the 46-story tower will comprise 1.2 million square feet of office space and be owned and managed by our Cadillac Fairview subsidiary.

160 Front Street West is targeting LEED® Platinum certification, the highest ranking in the widely used Leadership in Energy and Environmental Design green building rating system. The project is being built to rigorous standards addressing materials, energy and water usage, indoor environmental quality and much more. Post-construction, sustainability and wellbeing will be central to how the building is operated and managed.

We are additionally targeting LEED® Gold certification for the floors Ontario Teachers' will occupy. We are committed to sustainable choices regarding everything from furniture selection to waste collection. And to underscore the importance of our most valuable asset—our employees—we are also targeting WELL® Gold certification with numerous initiatives that prioritize human health and wellbeing.



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